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Executive Summary

BACKGROUND

On December 13, 2019, the City of Nashua, New Hampshire, contracted Emergency Services Consulting International (ESCI) to produce a Long-Range Master Plan for Nashua Fire Rescue. The purpose of the study was threefold:

1. Evaluate current operational service delivery.
2. Identify future service delivery needs.
3. Provide recommendations for operational service delivery.

SUMMARY FINDINGS

Nashua Fire Rescue is a historically proud and very traditional New England Fire Department.

Operationally, the fire department meets most of the national standards for the provision of fire and rescue services. Staffing and deployment are adequate in the Emergency Services Division, however there are a number of administrative and support functions that are woefully understaffed. The staffing evaluation is included within the Staffing section of this plan.

Fire department infrastructure will require significant financial investments in the coming years. While the city has done a good job maintaining and replacing the apparatus in its fleet, four of the six fire stations are more than 40-years-old. Many of these fire stations have outlived their useful life and some are no longer located in the optimal location to meet the current service demands in the City of Nashua. Consideration should be given to relocating some of these stations as they come due for renovation. GIS Models for Fire Station Optimization are included within the Long-Range Deployment Options Section of this plan.

While the number of staff and fire department infrastructure are both critical components of Nashua Fire Rescue’s ability to serve the city, this plan would be doing the fire department a disservice if it didn’t identify that Nashua Fire Rescue has a very significant and deeply embedded morale problem. ESCI’s interviews and survey both revealed five common themes that stood out within Nashua Fire Rescue. These themes were:

1. Nashua Fire Rescue members are proud to be part of Nashua Fire Rescue.
2. Nashua Fire Rescue members almost unanimously agree that the people that make up the department are the department’s biggest strength. Members repeatedly cited the “manpower” and “aggressive firefighting” as specific examples of this strength.
3. Morale is a problem. Members overwhelmingly believe that communication (or a lack thereof) is the biggest contributor to the department’s poor morale.
4. Members very directly stated a desire for consistent accountability within Nashua Fire Rescue. They went so far as to request that chief officers hold the members accountable from the top-down while the union holds the members accountable from the bottom-up. There were repeated concerns voiced that not everyone was being held equally accountable.

5. Training was repeatedly identified as one of the biggest weaknesses within Nashua Fire Rescue.

While this report includes 41 specific recommendations, the critical issues of morale, communication, accountability, and firefighter training must be addressed before Nashua Fire Rescue will be capable of working toward implementing any of the other recommendations in this report.

ESCI suggests that the most effective and immediate way to address these issues is to restructure the Administrative Division to include an Assistant Chief of Uniform Professional Standards. This Assistant Chief would report to the Chief of Department and be tasked with:

- **Investigating all internal affairs type activities, thus removing this work from the Chief and existing Assistant Chief.** The single point of contact within the fire department as well as close collaboration with Human Resources will better position Nashua Fire Rescue to address these types of issues more consistently and to hold members accountable as appropriate.

- **Develop and manage a communications plan for regular and consistent communications with the Operations Division.** Communication has been a critical weakness within Nashua Fire Rescue for decades that is getting progressively worse. This problem will continue to fester, thus further negatively impacting morale and the operations of the fire department until such a time that there are focused resources dedicated to improving this deficiency.

- **Manage the recruitment of new firefighters, thus removing this work from the Training and Safety Division.** Training was repeatedly identified as a major weakness within Nashua Fire Rescue. The reassignment of recruitment duties to the Assistant Chief of Uniform Professional Standards will allow the Training and Safety Division to focus their efforts on improving the Nashua Fire Rescue Training Program.

- **Oversight of the Nashua Fire Rescue Training Program.** As previously noted, training was repeatedly identified as a major weakness within Nashua Fire Rescue. Placing the Training Safety Division under the direction of the Assistant Chief of Uniform Professional Standards will provide the oversight that is necessary to establish and then achieve simple, manageable, achievable, reasonable, and timely (SMART) goals to systematically improve the Nashua Fire Rescue Training Program.

- **Manage the promotion process in conjunction with Human Resources.** ESCI recommended within the *Promotions Processes* Section of this report that Nashua Fire Rescue re-evaluate the merits of including the civilian Board of Fire Commissioners within the promotional process. It is ESCI’s suggestion that Nashua Fire Rescue may be able to improve the current promotional process by allowing the professional human resources and fire department personnel to conduct the entire process, thereby eliminating the potential political influence that could be introduced by the inclusion of the elected board. The Assistant Chief of Uniform Professional Standards would be well-positioned to facilitate this process on behalf of the fire department.
- Develop, implement, and manage a Professional Development Program for Nashua Fire Rescue. Officers who fail to learn leadership skills are challenged almost immediately upon promotion. As detailed in the Career Development section of this report, both Nashua Fire Rescue and its employees stand to gain from the development and implementation of a Career Development Program.

It is worth noting that morale, communication, accountability, and training are deep-seated issues that permeate the culture of Nashua Fire Rescue. In 2001, Municipal Resources, Inc. completed an Organizational Assessment, which included a survey of Nashua Fire Rescue members that yielded very similar results. Almost 20 years later, those issues still remain unresolved. These issues will continue to degrade until Nashua Fire Rescue and the City of Nashua commit the necessary resources to address these problems.

ESCI recognizes that this report contains a multitude of recommendations that cannot all be accomplished simultaneously. Nashua Fire Rescue should facilitate a Strategic Plan to consider and prioritize the goals and objectives that are recommended within this Master Plan.

The strategic planning process would ideally result in a three-to-five-year work plan, intended to guide the work effort of the entire organization toward a common set of goals and objectives. The process should include representation from every major interest group in the organization. Each person in the Department should feel that their interests are represented by someone in attendance on the planning team.

A successful strategic planning process will result in a plan for Nashua Fire Rescue to systematically implement the recommendations that are contained within this report. Organizations that do not engage in the strategic planning process often fail to benefit from the master planning process because Master Plan recommendations do little more than exist in the report if they are not implemented.
Acknowledgments

ESCI would like to thank the members of Nashua Fire Rescue as well as the elected and appointed officials of the City of Nashua for their assistance with the Nashua Fire Rescue Master Plan. This project would not have been possible without their support.

Emergency Services Consulting International Team

The ESCI Team for the Nashua Fire Rescue Master Plan was comprised of the following members:

- Stuart McCutcheon, Director of Business Intelligence
- Mary-Ellen Harper, Director of Operations
- Andrea Hobi, Business Manager
- Melissa Vazquez Swank, Quality Assurance Specialist
- Otto Drozd, Associate
- Michael Gulino, Associate
- Dan Machande, Associate
- Kerri Reynolds, Associate
- Jason Smedick, Associate
- Michael Tucker, Associate

Project Methodology

The City of Nashua contracted ESCI to develop a Long-Range Fire Department Master Plan. Specifically, the project has three primary deliverables:

1. **Evaluate current operational service delivery.** Using information provided by Nashua Fire Rescue, ESCI was tasked to establish an informational baseline, benchmark emergency operations performance, and provide a detailed analysis of existing conditions and emergency operations.

2. **Identify future service delivery needs.** ESCI was tasked with providing a basic community risk assessment to identify potential service gaps and redundancies, considering community expectations, needs, and resources.

3. **Provide recommendations for operational service delivery.** ESCI was tasked with identifying system strengths, weaknesses, opportunities, and threats for a SWOT analysis and developing recommendations to improve and enhance emergency services delivery for both the intermediate short-term and long-term. Where possible, recommendations were to include consideration of cost/benefit analysis, benchmarks, standards, and best practices.
Using organizational, operational, staffing, and geographic information system (GIS) models, this evaluation provides a comprehensive appraisal of the City of Nashua’s emergency operations as found upon ESCI’s completion of fieldwork and data collection in July 2020. ESCI based this evaluation on data provided by the City and collected during ESCI’s fieldwork. The information is evaluated against a combination of New Hampshire state laws and regulations, National Fire Protection Association (NFPA) standards, Commission on Fire Accreditation International (CFAI) self-assessment criteria, health and safety requirements, federal and state mandates relative to emergency services, and generally accepted best practices within the emergency services community, as well as the experience of ESCI’s consultants.  

Each section in the following report provides the reader with general information about that element, as well as observations and analyses of any significant issues or conditions.

**STAKEHOLDER INPUT**

The ESCI project team conducted more than 22 virtual and in-person interviews, meetings, and facility tours to gather information from key stakeholders to provide context for the recommendations identified within this study. The purpose of these interviews is to gain an understanding of the current issues, concerns, and opinions related to Nashua Fire Rescue’s emergency services delivery system. General topics discussed during each interview included:

- Perceived strengths and weaknesses of the current system
- Identified strengths and weaknesses of the current system
- Opportunities for enhancement to the current system
- Future challenges that may warrant attention

ESCI’s interviews with Nashua Fire Rescue stakeholders included, but were but not limited, to the following individuals:

<table>
<thead>
<tr>
<th>Stakeholder Interviews</th>
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<tbody>
<tr>
<td>Mayor</td>
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<tr>
<td>Members of the Board of Aldermen</td>
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<tr>
<td>Members of the Board of Fire Commissioners</td>
</tr>
<tr>
<td>City Directors and Key Staff</td>
</tr>
<tr>
<td>Fire Department Executive Staff</td>
</tr>
<tr>
<td>Fire Department Division Heads</td>
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<tr>
<td>Uniformed Members of Nashua Fire Rescue</td>
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<tr>
<td>Automatic and Mutual Aid Partners</td>
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<tr>
<td>Emergency Medical Services Partners</td>
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1. NFPA, National Fire Protection Association is a standard developing organization. Standards developed by NFPA are “voluntary consensus standards,” created through procedures accredited for their consensus decision-making, openness, balance of interests represented, and fairness by the American National Standards Institute (ANSI).

2. The CFAI organization is now a subsection of the Center for Public Safety Excellence (CPSE) but maintains its prime function of accrediting fire agencies.
Section II. Community Profile and Risk Identification

NASHUA, NEW HAMPSHIRE

Nashua, New Hampshire, is located on the southern border of New Hampshire in Hillsboro County. The city is 31.9 square miles and houses the second largest population in the state. The city was first settled in 1653 and was originally part of a 200 square mile area called Dunstable that included Nashua as well as ten other towns in New Hampshire and Massachusetts.

After the governors of the two states resolved a dispute over the border location in 1741, approximately half of the land area remained in the State of New Hampshire and kept the name Dunstable. Dunstable was then incorporated in 1743 and renamed Nashua in 1836. Nashua was again divided in 1842 when the parcels located on the north side of the Nashua River were established and the community of Nashville and became incorporated. In 1853, these two communities rejoined and were incorporated into the present-day City of Nashua.

Figure 2. The City of Nashua, New Hampshire
The following communities and rivers border the City of Nashua.

<table>
<thead>
<tr>
<th>Border</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merrimack</td>
<td>North</td>
</tr>
<tr>
<td>Pennichuck Brook</td>
<td>North</td>
</tr>
<tr>
<td>Litchfield</td>
<td>Northeast</td>
</tr>
<tr>
<td>Dunstable, MA</td>
<td>South</td>
</tr>
<tr>
<td>Merrimack River</td>
<td>East</td>
</tr>
<tr>
<td>Hudson</td>
<td>East</td>
</tr>
<tr>
<td>Hollis</td>
<td>West</td>
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</table>

**NASHUA FIRE RESCUE**

Nashua Fire Rescue was established in 1853 when the towns of Nashville and Nashua combined to protect a growing mill town with 7,000 mostly immigrant workers. The Department was organized as a volunteer fire department and transitioned to being a career fire department in the 1950s.

**Governance and Lines of Authority**

The City of Nashua operates under a Mayor-Alderman form of government. The Board of Aldermen is a 15-person legislative body that is elected to either a two- or four-year term. There are six at-large aldermen that are elected to four-year terms (with three of these elected in opposite cycles every two years). Each of the nine wards has an elected alderman whose terms are two-years. The position of Mayor is elected every four years.

The Board of Fire Commissioners is the elected board charged with the responsibility of the operation of the fire department. The City of Nashua Charter is the foundational policy document for the establishment and operation of the Fire Department. Specifically, *Subpart A §73. Fire commissioners, how chosen*. This document establishes the Board of Fire Commissioners. This is a five-member board, and each is an elected position. Each term is four years, and they are elected every two years.

According to this chapter, the Board shall exercise all powers and perform all the duties that the laws and ordinances now prescribe, or will be hereafter.

In *Subpart B-Related Laws §§ A-101-A-1214* of the same document, Chapter 7 provides additional legislation. Chapter 7, *Fire Department*, states in summary that the fire department of the City of Nashua shall consist of a Board of Fire Commissioners. These are elected officials (as indicated in §73), and they cannot hold any other municipal office. The Board of Fire Commissioners will select one member to serve as the chairperson of the Board. They will also select a clerk. The Board is responsible for making rules and regulations for their own government and the government of all other officers and members of the fire department. In addition, they are responsible for all buildings (including the land) and apparatuses.
Organizational Design

Nashua Fire Rescue operate six fire stations, a dispatch center, and a training site. The Fire Chief is the head of the Department who oversees:

- **Administration Division**: Assistant Chief and two Administrative Assistants
- **Emergency Response Division**: Four Deputy Chiefs, seven Captains, 29 Lieutenants, and 112 Firefighters
- **Training Division**: Captain, Lieutenant, Administrative Assistant
- **Fire Alarm Division**: Superintendent, Assistant Superintendent, 12 Dispatchers
- **Mechanical Division**: Superintendent, Assistant Superintendent, Mechanic
- **Fire Marshal Division**: Fire Marshal, two Inspector/Investigators, Administrative Assistant
Figure 4. Nashua Fire Rescue Organizational Chart

Board of Fire Commissioners

Fire Chief

Administrative Assistant

Administrative Assistant

Assistant Fire Chief

Emergency Response Division

1 Deputy Chief and 1 Shift Management Technician Per Shift (4 shifts)

38 uniformed members per shift, including 1 Captain per station per shift and 1 Officer (Captain or Lieutenant) per apparatus per shift (4 shifts)

Fire Marshal Division

Fire Marshal

Administrative Assistant

Fire Alarm Division

Superintendent

Assistant Superintendent

Mechanical Division

Superintendent

Assistant Superintendent

Training and Safety Division

Training Captain

2 Inspectors/Investigators

Training Lieutenant

3 Dispatchers per shift (4 shifts)

Mechanic

Training Division

Training Captain

Administrative Assistant

Assistant Superintendent

Mechanic
COMMUNITY RISK ASSESSMENT

A Community Risk Assessment provides an assessment of risks and potential risks present in the service area. Mitigation of risks through internal and external resources is developed over time, improving the response, recovery, and resilience of the community. Unless otherwise specified, all population and demographic information is propriety data provided by Earth Systems Research Institute (ESRI).

Population

The population in the City of Nashua is 90,972. This includes 37,124 households with an average of 2.4 people per household.

![Image of population and household size](image)

The city’s population is educated, with 91% of the population having graduated from high school (compared to 92.9% statewide and 87.7% nationally) and 36% of the population has a Bachelor’s Degree or higher (compared to 36.5% statewide and 31.5% nationally).

![Image of education](image)
Demographics
The racial makeup of Nashua is predominately white (73.2%), followed by Asian (8.4%), and Black or African American (4.1%).

![Figure 7. Racial Makeup](image)

Population Trends
The population in Nashua has increased by 60.52% since 1970. The largest population increases were in the 1970s, 1980s, and 1990s. The city saw a slight decline in population between 2000 and 2010 and saw an increase of 3.59% during the last decade.

![Figure 8. Population Trends](image)

---

3 Population Trends According to the U.S. Census Bureau.
Population Density
Nashua is a densely populated city with 2,893 residents per square mile. For the sake of comparison, the population density of New Hampshire is 152 residents per square mile, and the population density nationally is 91 residents per square mile.

The most densely populated areas of Nashua, with more than 10,000 residents per square mile, are in the eastern part of the city in the neighborhoods surrounding fire stations 1, 2, and 4. There is also a pocket of dense population in the south near Station 3.

Figure 9. Population Density
At-Risk Populations

The Journal of General Internal Medicine defines “Populations at Risk” very broadly. The definition includes the poor, frail, disabled, economically disadvantaged, homeless, racial, and ethnic minorities, as well as people with low literacy. The National Fire Protection Association (NFPA) Urban Fire Safety Report further reinforces the “at-risk” groups as:

- Males
- Children under 5 years of age
- Adults over the age of 65 years
- Persons with disabilities
- Persons with language barriers; and
- Persons in low-income communities

Males

Males, especially those under 25 years of age, are more prone to engage in risky activities. Additionally, males are 1.7 times more likely to die in fires than females. In Nashua, 48.8% of the population is male. This is slightly less than both the state and nation, which are 49.6% male and 49.2% male, respectively.

Persons by Age-Risk

The median age in Nashua is 39.83 years old. In terms of age, the residents in Nashua are very evenly distributed in an almost perfect bell curve. Generation G and the Alpha Generation, which are the oldest and youngest generations in the city, comprise 6.8% and 4.5% of the population, respectively. The most prominent generations are the Millennials (24.6%), Baby Boomers (21.9%), and Generation X (21.1%).

The Center for Disease Control states that Millennials have the highest risk of death caused by unintentional injury; however, they are difficult to target for prevention programs because of occupational obligations and a decline in community participation.

Figure 10. Population by Generation
Persons with Disabilities
Fires in the home can be potentially dangerous and deadly for everyone, but persons with disabilities and impairments face additional challenges. Persons with disabilities often have a difficult time identifying or escaping a fire.

8,922 of the 37,124 households within the City of Nashua reported having one or more members with a disability. This comprises 24%, or almost a quarter of the households, which presents an opportunity for education and community risk reduction within the Nashua community.

Figure 11. Households with Disabilities

Persons with Language Barriers
According to the NFPA, “Language barriers, cultural differences, and inexperience with unfamiliar home technologies are factors that mark the challenges of helping newcomers live safely from the threat of fire in the home.” By itself, speaking a language other than English at home does not directly contribute to a higher risk of emergencies; however, if a person has difficulty speaking English, it may contribute to negative outcomes during an emergency.

The minority population in the city is higher than the New Hampshire average but less than the national average. The percentage of the population that is foreign-born (15.8%) is very high comparatively. In addition, 21.7% of the population of Nashua speaks a language other than English. This suggests that normal English versions of fire safety messages are potentially missing a large cross-section of the community. Prevention and education messages could reach more residents if communication methods expanded to include additional languages.

Persons Living in Poverty
Persons living in poverty experience increased risk from fire and medical emergencies due to the age and condition of their housing, inability to pay for routine medical care, lack of medical insurance, and general health conditions. Sometimes a lack of access to transportation leads to increased use of emergency medical care and transport. Those living below the poverty line are the most at-risk. The low-income category is often combined with other factors such as education, disability, and work status. In 2015, the United States reported that 8.8% of seniors were living below the poverty level compared to 19.7% of children. In addition, facing poverty or near poverty is more likely to occur if a person is Black or African-American, Hispanic, or in a family (of any race) that is headed by a single woman.
In the October 2018 edition of Health Briefs, a peer-reviewed publication supported by the Robert Wood Johnson Foundation, published “Culture of Health.” The article highlighted a strong link between health and income. The key findings were that there are significant morbidity disparities between the lower- and upper-income brackets in the United States, leading to gaps in life expectancy of as much as 15 years for men and 10 years for women. The publication stated that “Poor health also contributes to reduced income, creating a negative feedback loop sometimes referred to as the health-poverty trap.”

In Nashua, 9.9% of the population is at or below the poverty level. For comparison, the poverty rate in New Hampshire is 7.6%, and nationally it is 11.8%.

**Persons Without Health Care Coverage**

Poor health can lead to elevated levels of strain on the healthcare system and emergency services system within a community as those agencies are often the first contact for those without a primary care provider. Determinants of Health include:

- Access to Quality Health Care Coverage
- Policies and Interventions
- An Individual’s Behavior and Biology
- Physical Environment
- Social Environment

Within Nashua, 7.3% of the residents are estimated not to have health insurance.

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Natural Hazards

Nashua has a four-season climate with long, cold, snowy winters and very warm and somewhat humid summers; spring and autumn in between are relatively brief transitions.

Flooding

Floods are one of the costliest natural hazards in the world, yet most flood loss is both predictable and preventable.

The Nashua River passes through the center of the city, flowing northeast and into the Merrimack River. NOAA reports that 32 flooding events have occurred within Hillsborough County since 1950.

![Figure 13. Flood Events in Hillsborough County, 1950–2019](image)

From 1973 through the present (2018), there have been 11 flood-related declared disasters by FEMA in Hillsborough County. The most recent declared flooding disaster was in March 2010.

Drought/Water Supply Shortage

Drought is a consequence of anticipated natural precipitation reduction over an extended period, usually a season or more in length. Droughts are short-term or long-term water deficiencies that cause agricultural, environmental, and societal impacts. Drought is normally part of all climatic regions, including areas with high and low average rainfall.

Four indicators are monitored to gauge the presence and severity of hydrologic drought:

- Groundwater Levels
- Precipitations Deficits
- Streamflow
- Reservoir Storage

---

5 Storm Events Database, Search Results | National Centers for Environmental Information (noaa.gov).
The U.S. Drought Monitor (USDM), established in 2000, maps the location and intensity of drought across the country. USDM classifies droughts in accordance with the following criteria.\(^6\)

**Figure 14. U.S. Drought Monitor**

Since 2000, the longest duration of drought (D1–D4) in New Hampshire lasted 47 weeks, beginning on June 7, 2016, and ending on April 25, 2017. The most intense period of drought occurred the week of October 6, 2020, where D3 affected 21.99% of New Hampshire.

\(^6\) New Hampshire | Drought.gov.
As of November 17, 2020, USDM was reporting that parts of Nashua were experiencing D2 and D3 conditions.
Earthquakes
An earthquake is caused when the Earth's crust, composed of a dozen or more rigid plates, bump against one another. Most earthquakes are the result of strain release along zones of weakness (faults) in response to the slow motion of those crustal plates.

Damage from an earthquake's impact can be as small as a slight shift or vibration or as serious as sustaining structural and critical infrastructure damage and/or collapse on a severe scale, including damage to energy pipelines in the area.

Nashua has a low earthquake risk, with a total of 30 earthquakes since 1931. The USGS database shows a 2.38% chance of a major earthquake within 50km of Nashua, NH, within the next 50 years. The following figure illustrates magnitude 3 and greater that have affected New Hampshire during the last 50 years.

Figure 17. Magnitude 3+ Earthquakes

Extreme Temperatures
A heatwave is a prolonged period of excessive heat, often combined with excessive humidity. Extreme heat, when temperatures hover 10 degrees or more above the average high temperatures for the region, can be potentially lethal and last for several weeks. A heatwave combined with drought can be a very dangerous situation.

---

7 Earthquaketrack.com.
During these periods, public health impacts include concerns of heat exhaustion or heat stroke and a higher vulnerability to wildfire. Individuals, especially the elderly, who live in residences without air-conditioning or if there are electrical service blackouts, are more susceptible to heat-related emergencies. Local water supply distribution from natural sources can be severely compromised, reducing water supply for firefighting purposes.

The Centers for Disease Control and Prevention (CDC) report that while heat-related deaths and illnesses are preventable, more than 600 people die in the United States as a result of extreme heat.8

Between 1979 and 2016, Nashua averaged between zero and 17 extreme heat days where the temperature was at least 90 degrees Fahrenheit each day.

### Figure 18. Historical Extreme Heat Days: 90 Degrees Fahrenheit or Greater (1979–2016)9

Looking to the future, the CDC’s National Environmental Public Health Tracking Network Query Tool projects that Nashua will average between 19 and 30 days of extreme heat with the temperature in excess of 90 degrees Fahrenheit each year between 2020 and 2084.

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8 *Extreme Heat | Natural Disasters and Severe Weather | CDC.*
9 *National Environmental Public Health Tracking Network Query Tool (cdc.gov).*
High Wind Events/Tornadoes
Tornadoes form when warm rotating columns of air extending from a thunderstorm create a vortex and a spiraling funnel of wind. Classified by the Enhanced Fujita Scale (EF-Scale 2007), tornados are categorized by a numeric score of zero to five based on observed damage severity. Tornadoes are rare in New Hampshire, but mainly occur from April through September, and are mainly low intensity of EF-2 or lower. If a tornado occurs, damage can be caused to roofs or siding, can cause complete destruction of buildings, or down trees.

10 National Environmental Public Health Tracking Network Query Tool (cdc.gov).
Figure 20. Tornado Intensity, Enhanced Fujita Scale

<table>
<thead>
<tr>
<th>Designation</th>
<th>Wind Speed, mph</th>
<th>Typical Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EF-0</strong></td>
<td>65–85</td>
<td>Minor or no damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF-0.</td>
</tr>
<tr>
<td><strong>EF-1</strong></td>
<td>86–110</td>
<td>Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.</td>
</tr>
<tr>
<td><strong>EF-2</strong></td>
<td>111–135</td>
<td>Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.</td>
</tr>
<tr>
<td><strong>EF-3</strong></td>
<td>136–165</td>
<td>Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.</td>
</tr>
<tr>
<td><strong>EF-4</strong></td>
<td>166–200</td>
<td>Devastating damage. Well-constructed and whole frame houses completely leveled; cars and other large objects thrown and small missiles generated.</td>
</tr>
<tr>
<td><strong>EF-5</strong></td>
<td>&gt; 200</td>
<td>Extreme damage. Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks, and train cars can be thrown approximately 1 mile (1.6 km).</td>
</tr>
</tbody>
</table>

Since 1956, NOAA reports that 19 tornados have touched down in Hillsborough County. The dates and Enhanced Fujita Scale Classification are as follows.

Figure 21. Tornado Touchdowns in Hillsborough County, 1956–2019

<table>
<thead>
<tr>
<th>Date</th>
<th>Enhanced Fujita Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/27/1956</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>7/2/1961</td>
<td>EF-2</td>
</tr>
<tr>
<td>7/21/1961</td>
<td>EF-1</td>
</tr>
<tr>
<td>5/9/1963</td>
<td>EF-1</td>
</tr>
<tr>
<td>5/20/1963</td>
<td>EF-1</td>
</tr>
<tr>
<td>6/9/1963</td>
<td>EF-2</td>
</tr>
<tr>
<td>8/28/1965</td>
<td>EF-1</td>
</tr>
<tr>
<td>7/19/1966</td>
<td>EF-1</td>
</tr>
<tr>
<td>7/17/1968</td>
<td>EF-2</td>
</tr>
<tr>
<td>8/20/1968</td>
<td>EF-1</td>
</tr>
<tr>
<td>8/20/1968</td>
<td>EF-3</td>
</tr>
<tr>
<td>7/16/1970</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>7/19/1972</td>
<td>EF-1</td>
</tr>
<tr>
<td>6/19/1978</td>
<td>EF-0</td>
</tr>
<tr>
<td>7/5/1984</td>
<td>EF-1</td>
</tr>
<tr>
<td>7/5/1984</td>
<td>EF-1</td>
</tr>
<tr>
<td>6/16/1986</td>
<td>EF-1</td>
</tr>
<tr>
<td>7/3/1997</td>
<td>EF-2</td>
</tr>
<tr>
<td>5/31/1998</td>
<td>EF-2</td>
</tr>
</tbody>
</table>
Infectious Diseases/Pandemic

A communicable disease is an illness caused by an infectious agent or its toxic products that develops when the agent or its product is transmitted from an infected person, animal(s), or arthropod to a susceptible host. To develop a successful communicable disease control program, pertinent information should be provided to families and communities as well as recommendations for implementation measures that control the spread of the disease. Resource management will be difficult to accomplish, especially if the disease outbreak is prolonged. New Hampshire has been impacted economically and financially during the 2019 Novel Coronavirus (COVID-19) pandemic, with conditions having an ongoing impact on a local and state level.

Landslides

FEMA defines landslides as “rocks, earth, or other materials moving down a slope.” A mudflow is a landslide that is combined with up to 60% water. The various types of landslides can be differentiated by the kinds of material involved and the mode of movement. The following figure illustrates the most common types of landslides.

**Figure 22. Most Common Types of Landslides**

<table>
<thead>
<tr>
<th>Type of Landslide</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slides</td>
<td>Mass movements, along zones of weakness separating the slide material from more stable underlying material.</td>
</tr>
<tr>
<td>Falls</td>
<td>Abrupt movements of rocks or boulders that become detached from steep slopes or cliffs.</td>
</tr>
<tr>
<td>Debris Flows</td>
<td>Rapid mass movement of a combination of loose soil, rock, organic matter, air, and water that flow downslope as a slurry. These are most often caused by heavy precipitation and intense surface water runoff in steep gullies.</td>
</tr>
<tr>
<td>Mudflows</td>
<td>Earthflow consisting of material that is wet enough to flow rapidly and contains at least 50% sand, silt, and clay. Mudflows can travel at speeds of 35 mph or greater.</td>
</tr>
<tr>
<td>Creep</td>
<td>Imperceptibly slow, steady, downward movement of soil or rock. Coastal bluff erosion: The collapse of coastal bluffs due to undercutting erosive forces of wave action.</td>
</tr>
</tbody>
</table>

Landslides often happen after wildfires, because the brush that slows rain runoff has burned away and the soil can be less porous, making it harder for the land to soak up the rain. Prolonged heavy rain could cause this soil to fail and trigger a landslide. Their mass and speed make them particularly destructive: landslides can strip vegetation, block drainages, damage structures, and endanger human life. Heavy rainfall can trigger landslides for up to two years following a fire.

Lightning

In the United States, an average of 300 people are injured and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms.
Severe Winter Weather

Winter storms include blizzards, snowstorms, ice, sleet, freezing rain, and extremely cold temperatures. A Nor’easter is the biggest threat for winter weather, usually from November through April, causing significant snowstorms and mixed frozen precipitation. Strong winds are produced that cause coastal flooding and erosion.

The impacts of winter storms are primarily measured in financial costs associated with management and recovery from the disaster. House fires and carbon monoxide poisoning pose higher risks as people use supplemental heating devices to combat the cold temperatures. Power outages and downed trees have a significant impact on residents.

NOAA reports that since 1950, there have been two blizzards in Hillsborough County—in 2013 and 2015. NOAA defines a blizzard as a storm with sustained wind or frequent gusts to 35 miles an hour or greater; and considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than a quarter-mile. There were an additional 149 heavy snow events during that time period. Heavy snow is defined as snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.

Solar Storms and Space Weather

FEMA defines space weather events as solar flares, solar energetic particles, and geomagnetic disturbances that occur regularly and could have measurable effects on critical Earth-based infrastructure, such as the Global Positioning System (GPS), satellite operations, communications, aviation, and the electrical power grid. Space weather events of extreme intensity have the potential to disable large portions of the electrical power grid, resulting in cascading failures that would affect key services such as water supply, healthcare, and transportation.

In recognition of this threat, the President issued Executive Order (EO) 13744, “Coordinating Efforts to Prepare the Nation for Space Weather Events.” The creation of this document, the Federal Operating Concept for Impending Space Weather Events, was directed by section 5f of EO 13744 “to coordinate federal assets and activities to respond to notification of, and protect against, impending space weather events. Departments and agencies (D/As) shall develop their own operational plans that document their procedures and responsibilities to prepare for, protect against, and mitigate the effects of impending space weather events. Such operational plans will be developed to support the Federal operating concept, be compatible with the National Preparedness System, and ensure continuity of D/A’s Mission Essential Functions (MEF).”

Tropical Storms and Hurricanes

Tropical storms are extremely low-pressure areas over the ocean with a cyclonic rotation of winds. They can be considered very strong thunderstorms. The tropical storms are called tropical storms because they usually develop in the tropics. A tropical storm is classified according to its speed. When the wind speed is between 39 mph to 73 mph, the tropical depression developed is classified as a tropical storm. Those storms that form in the middle latitudes are often called extratropical storms.

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15 Federal Operating Concept for Impending Space Weather Events (fema.gov).
The National Oceanic and Atmospheric Administration (NOAA) reports three recorded tropical and extratropical storms in Nashua dating back to the 1800s.

**Figure 23. Tropical and Extratropical Storms**

When the wind speed exceeds 74 miles per hour, the storm becomes a hurricane. Nashua is subject to the impacts of tropical storms and hurricanes. The high winds associated with these storms can result in widespread damage to buildings, downed trees, and power outages.

The Saffir-Simpson Hurricane Damage Scale describes tropical storms and hurricanes based on wind speeds.

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22 Historical Hurricane Tracks (noaa.gov).
Figure 24. Saffir-Simpson Hurricane Damage Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Wind Estimate</th>
<th>Typical Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 1</td>
<td>74–95 mph</td>
<td>Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.</td>
</tr>
<tr>
<td>Cat 2</td>
<td>96–110 mph</td>
<td>Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power losses are likely.</td>
</tr>
<tr>
<td>Cat 3 (Major)</td>
<td>111–129 mph</td>
<td>Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.</td>
</tr>
<tr>
<td>Cat 4 (Major)</td>
<td>130–156 mph</td>
<td>Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.</td>
</tr>
<tr>
<td>Cat 5 (Major)</td>
<td>157 mph or Higher</td>
<td>Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.</td>
</tr>
</tbody>
</table>

Strong winds can damage power, telephone, and satellite communications for energy pipelines in the area. Commercial and residential occupancies can also lose power and communications. Severe damage can be caused to structures, power lines, and critical infrastructure. NOAA reports that one recorded hurricane passed through Nashua in 1954.
Wildfires
The Wildland-Urban Interface (WUI) is the contact zone between undeveloped forested areas and urban areas. This transitional environment is most susceptible to fire. As people and wildlands come into contact, conflict arises from the threat of wildfire or from emergency services inadequate to protect rural populations.

Though wildfires are more common in rural communities, small wildfires impacting areas up to 10 acres are a concern in wooded areas in the outskirts of Nashua, particularly in the northwest and southwest quadrants of the city as well as in Mine Falls Park. Wildfires can encroach the urban interface creating the potential for structure fires in homes or businesses.

Damage to structures and services, as well as the magnitude of the wildfire event, can all have a devastating impact on the City. Economic and financial impacts could be long-term.

Human-Caused Hazards
Technological or human-caused hazards result from accidents or failures of systems and structures; or the actions of people, either accidental or intentional. Human-caused incidents result from the intentional actions of an adversary, such as a threatened or actual chemical attack, biological attack, or cyber incident. Intentional acts are always deliberate, with varying levels of intent. Accidental acts are careless or reckless, or poorly planned or executed, with the outcome having unintended consequences.

\footnotesize{\textsuperscript{13} Historical Hurricane Tracks (noaa.gov).}
Land Use
Risk classification begins with documenting the types of activities occurring within a building or on a property. Activities occurring within a structure or on an undeveloped property can be used to begin the process of risk classification. The Nashua Land Use Code establishes the following zoning districts within the city.

**Figure 26. Zoning District Purpose Statements**

<table>
<thead>
<tr>
<th>District</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural Residence</strong>&lt;br&gt;(R-40)</td>
<td>The Rural Residential District has a minimum lot size requirement of 40,000 square feet (or approximately one acre). This district is reserved primarily for the southwest quadrant of the City and other areas with limited infrastructure capacity and environmental or topographical restrictions. The R-40 District is also the primary district where individual wells and septic systems are in use, although sewer and water extensions have been made to some parts of the district.</td>
</tr>
<tr>
<td><strong>A Suburban Residence</strong>&lt;br&gt;(R-30)</td>
<td>The R-30 District is similar to R-40, with a slightly smaller minimum lot size of 30,000 square feet. Most of the R-30 Districts provide a buffer between the R-40 District and suburban areas, such as the southwest quadrant and the northwest quadrant near the Hollis border west of the airport.</td>
</tr>
<tr>
<td><strong>B Suburban Residence</strong>&lt;br&gt;(R-18)</td>
<td>These districts are more evenly distributed throughout the City, although the majority of the R-18 and R-9 land is found in the southwest quadrant. This district provides suburban densities and intensities for primarily residential neighborhoods, with conservation subdivisions permitted as an option in order to encourage the preservation of natural resources.</td>
</tr>
<tr>
<td><strong>C Suburban Residence</strong>&lt;br&gt;(R-9)</td>
<td>These districts are more evenly distributed throughout the City, although the majority of the R-18 and R-9 land is found in the southwest quadrant. This district provides suburban densities and intensities for primarily residential neighborhoods, with conservation subdivisions permitted as an option in order to encourage the preservation of natural resources.</td>
</tr>
<tr>
<td><strong>A Urban Residence</strong>&lt;br&gt;(R-A)</td>
<td>This district is appropriate for the older residential sections of Nashua surrounding the urban core. R-A is predominantly single family, although duplexes are allowed subject to special standards.</td>
</tr>
<tr>
<td><strong>B Urban Residence</strong>&lt;br&gt;(R-B)</td>
<td>This district is appropriate for the older residential sections of Nashua surrounding the urban core. The R-B District permits duplexes by right and multifamily dwellings with three or more units subject to special standards.</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>District</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C Urban Residence (R-C)</strong></td>
<td>This district is appropriate for the more well-established residential sections of Nashua that include areas immediately surrounding the urban core and neighborhoods throughout the urban area. The R-C District permits all residential types by right, provided all dimensional requirements are met.</td>
</tr>
<tr>
<td><strong>Local Business (LB)</strong></td>
<td>Local Business (LB) Districts are commercial areas primarily located adjacent to or within established residential neighborhoods. They are intended as convenience commercial districts that support adjacent neighborhoods. The LB District is pedestrian-oriented as opposed to automobile-oriented.</td>
</tr>
<tr>
<td><strong>Highway Business (HB)</strong></td>
<td>Highway Business (HB) Districts are commercial areas located primarily adjacent to heavily traveled arterial roads, such as Amherst Street and the Daniel Webster Highway.</td>
</tr>
<tr>
<td><strong>General Business (GB)</strong></td>
<td>General Business (GB) Districts are similar to the HB Districts in purpose, function, and appearance, but require a smaller minimum lot size. The GB Districts are generally found in close proximity to the HB Districts, but tend to be developed as shopping centers with large parking areas (including the malls), rather than for &quot;strip&quot; commercial development, which characterizes development in the HB Districts.</td>
</tr>
<tr>
<td><strong>Downtown (D-1 and D-3)</strong></td>
<td>The D Districts consist of the downtown and the surrounding business area. These are mixed-used districts, which permit some apartment and multifamily uses as well as commercial and institutional uses. The D Districts are pedestrian-oriented as opposed to automobile-oriented. These districts include many of Nashua's historic structures.</td>
</tr>
<tr>
<td><strong>Park Industrial (PI)</strong></td>
<td>The Park Industrial (PI) Districts are industrial areas that, for the most part, abut the major turnpike interchanges, and are adjacent to residential zones. The PI District provides locations for light industry and industrial parks. This district implements the Master Plan recommendation to provide adequate zoning for industrial park-type development.</td>
</tr>
<tr>
<td><strong>General Industrial (GI)</strong></td>
<td>The General Industrial (GI) Districts are the older, traditional industrial areas of the inner City. They are often in close proximity to the Nashua or Merrimack Rivers and are generally accessible by railroad and/or local roads. Most of Nashua's heavy industries are located in the GI Districts. This district implements the Master Plan recommendation to provide a reasonable amount of space for heavy industrial uses, provided they are environmentally sound and do not detract from neighboring land uses.</td>
</tr>
<tr>
<td><strong>Airport Industrial (AI)</strong></td>
<td>This district includes the Boire Field Airport and the surrounding industrially zoned land. It supports the airport's operations by providing an area for airport-related and airport-compatible uses.</td>
</tr>
</tbody>
</table>
Zoning maps provide permitted use information for each parcel. The following figure shows the general classes of zoning found in community development planning.

Figure 27. Zoning Map

Zoning-Map-PDF (nashuanh.gov).
Housing

Risk indicators in a community involve property value, occupancy rate, and ownership status of homes in the community’s neighborhoods. Less maintenance and repairs are performed on low valued, vacant, or rental properties than higher value categories. Owner-occupied homes are maintained more often as owners are seeking to sustain or improve property values.

The rate of owner-occupied properties in Nashua is much lower than that of New Hampshire and the U.S. This high number of rental properties carries an increased risk as minor issues and maintenance are not typically addressed as quickly in rental properties as they are for when the owner is on site.

**Figure 28. Owner-Occupied Properties**

<table>
<thead>
<tr>
<th></th>
<th>Housing Units</th>
<th>Nashua</th>
<th>New Hampshire</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner-Occupied Rate</td>
<td>54.4%</td>
<td>71.0%</td>
<td>63.8%</td>
<td></td>
</tr>
</tbody>
</table>

According to the National Fire Protection Association (NFPA), the top five causes of fatal fires, which account for 90% of fire deaths, are cooking, heating, electrical, intentional, and smoking. These types of fires occur in all residential types, warranting the need for a foundational fire safety campaign that incorporates educational information and messages for homeowners and renters alike.

Home heating risk is higher, especially in the colder months, as many homes are heated with natural gas, propane, or wood stoves, which increases the risk for carbon monoxide poisoning compared to all-electric homes. Fire safety programs regarding carbon monoxide poisoning prevention and the use of a carbon monoxide alarm would benefit Nashua residents.

Reducing fire fatalities and injuries in the home should be the main goal of any fire prevention campaign. Statistics show that smoke alarms improve human survivability in residential fires by at least 50%. NFPA’s best practice for smoke alarm replacement is 10 years from the date of manufacture. In addition, emphasis should be given to homes that were built when there were fewer life safety codes required for smoke alarms, electrical receptacles, and electrical panels. Incorporating a smoke alarm installation program with a home fire safety inspection by targeting homes that are 10 years or older can substantially reduce the risk from fire and fire-related hazards. The following figure shows that most of the homes in Nashua were built before 1990 and are now more than 30 years old.
An important indicator of risk in the community involves property value, occupancy rate, and ownership status of homes in a community’s neighborhoods. Often, homes with less value, vacant houses, and rental properties are maintained and repaired less often than those in higher-value categories. More than 60% of the homes in Nashua are valued between $250,000 and $400,000.

There is little developable land in Nashua that remains undeveloped. It constitutes approximately 100 acres and is currently zoned for R-40.

There is a massive housing demand occurring in the city. An estimated 0.6% of housing units are vacant. The City is planning for this by rezoning certain areas. There are two parcels in the city that are designated as Transit Oriented Development (TOD). These zones are in the vicinity of the two proposed commuter rail stations. The Crown Street TOD is approximately 234 acres and the Daniel Webster TOD is approximately 565 acres. These areas have been up-zoned from industrial to high density housing, and the infrastructure is already in place. The City of Nashua is estimating that there could be a 5% increase in population from 2020–30.

The City of Nashua is actively pursuing and achieving more conservation easements. Currently, there are 1,292.2 acres of conservation easements. This represents 6.3% of Nashua’s land area. 82.2% of this land has been obtained since 2000.
Hazardous Substances and Processes

As of 1986, businesses that possess or maintain hazardous chemicals that exceed thresholds established by the Emergency Planning Community Right-to-Know Act are required to complete a Tier II Hazardous Chemical Inventory Report. These occupancies are required by the Environmental Protection Agency to submit annually Tier II reports to local fire departments, Local Emergency Planning Committees (LEPC), and State Emergency Response Commissions (SERCs) so that these agencies can plan for the response and mitigation of any potential spills or accidents. Additionally, the reporting facilities’ designated emergency point of contact is also required as part of the submission.

The release of hazardous materials can occur throughout the community, either during transport or while in production, use, packaging, or storage in a fixed facility. These locations can create a dangerous environment for the community and first responders during a spill or fire. Special equipment such as protective clothing and sensors, along with specialized training, are necessary to mitigate a hazardous materials incident successfully.

Hazardous materials are part of everyday life in manufacturing and industrial processes. When they leave their container or react with other chemicals or compounds, hazardous materials become a problem for humans and the environment. Nashua Fire Rescue is the agency of first resort for hazardous materials emergency incidents; the Souhegan Mutual Aid Response Team responds to hazardous materials incidents as a part of a joint Hazardous Materials Team and response plan.

The Superfund Amendment and Reauthorization Act, found in Title III of the Federal Code (SARA Title III), defines requirements for the tracking of extremely hazardous substances (EHS) used in fixed facilities and establishes requirements for emergency response planning. The Department has developed response plans for specific high-risk target hazards and hazardous materials locations. Additionally, the Department has assigned the shift Deputy Chief the responsibility of being involved with the Local Emergency Planning Committee (LEPC) in place at the local level. The LEPC is charged with the responsibility to identify and collect information on the use of hazardous materials by private and public entities. Information collected includes the type of material, quantity, and location at each site. Additionally, the LEPC is charged with ensuring local response plans are adequate based on potential risk.

Ferrell Gas trans-loading facility. This is located at the rail yard on the east side of the city. In addition, there are multiple industrial manufacturers of hazardous materials located throughout Nashua. None of them have their own fire brigades, and Nashua Fire Rescue is the first responder at these facilities. Facilities of note include:

- **BAE Systems** is a leader in research, development, implementation, and maintenance of commercial, defense, and space electronics. They utilize large amounts of hazardous materials. BAE Systems is Nashua's largest employer with 3,200 workers in four locations in the city.

- **Harcros Chemicals, Inc.** is a distributor and manufacturer of industrial and specialty chemicals. The company produces surfactants, emulsifiers, defoamers, and other chemicals.

- **Worthen Industries** is a chemical and technology manufacturer and storage warehouse of adhesives & coatings, thermoplastic extrusions, and coated substances.
Target Hazards
The Federal Emergency Management Agency (FEMA) defines target hazards as “facilities in either the public or private sector that provide essential products and services to the general public, are otherwise necessary to preserve the welfare and quality of life in the community, or fulfill important public safety, emergency response, and/or disaster recovery functions.” The NFPA further breaks these down into three risk categories for occupancies.

- **High-Risk Occupancy:** An occupancy that has a history of a high frequency of fires, high potential for loss of life or economic loss, or that has a low or moderate history of fires or loss of life, but the occupants have a high dependency on the built-in fire protection features or staff to assist in an evacuation during a fire or other emergency.
- **Moderate-Risk Occupancy:** An occupancy with a history of a moderate frequency of fires or a moderate potential for the loss of life or economic loss.
- **Low-Risk Occupancy:** An occupancy with a history of a low frequency of fires and minimal potential for life or economic loss.

Critical infrastructure is defined as the assets, systems, and networks, whether physical or virtual, that are so vital to the community that their damage or destruction would have a debilitating effect. Examples of critical infrastructure or target hazards can include the following:

- Hospitals
- Assisted Living Centers
- Community Shelters
- Schools
- Hazardous Materials Sites
- Roadways
- Water/Sewage Treatment Facilities
- Communications Systems
- Utilities
- Emergency Operations Centers
- Airports
- Important Government Offices
- Assembly Occupancies
- Entertainment Venues

Large buildings, such as warehouses, malls, industrial complexes, and so forth, require larger volumes of water for firefighting. Additional firefighters are needed to advance hose lines long distances in the building. Additional safety hose lines and rapid intervention crews (RIC) must be utilized, which also require additional personnel and water supply capabilities. Large buildings and facilities also create a greater risk for occupants as search and rescue times are increased in correlation to the number of stories and square footage of the structure. These structures rely on fire protection systems to extinguish and/or stop the fire from progress past the area or room of origin. Negative economic impacts follow an emergency incident of this magnitude.
Target Hazards within the City of Nashua include the following:

**Figure 31. Target Hazards**

<table>
<thead>
<tr>
<th>Target Hazard</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Large Apartment Buildings** | There are three large apartment buildings built in the 1970s and 80s. Each is 3–4 stories tall and has multiple buildings (50–60) in each complex. Each of these is a target hazard with its own set of challenges. Overall, there are approximately 18,000 units that are in multi-family structures.  
1. Royal Crest Estates  
2. Boulder Park  
3. The Woodlands |
| **Colleges and Universities** | There are two universities located in Nashua. Rivier University has over 2,200 total students enrolled. It is located on a 68-acre campus and provides housing for 400 students in four residence halls. Nashua Community College is part of the Community College system of New Hampshire, and has no residential housing. The college has over 1,500 students enrolled, particularly part-time. |
| **Hospitals and Medical Centers** | St. Joseph Hospital is a full-service health care system with 208 beds.  
Southern New Hampshire Medical Center is a clinical affiliate of Massachusetts General Hospital with 188 beds with over 500 primary and specialty care providers. |
| **Assisted and Special Needs Housing** | There are approximately 30 facilities that provide housing and services, such as convalescent/nursing homes, group homes, and shelters for both children and adults. |
| **Shopping Mall**             | Pheasant Lane Mall is the largest mall in Nashua with 1,000,000 square feet of leasing space. |
| **Stadiums**                  | Holman Stadium is a 2,800-seat outdoor stadium owned by the City of Nashua. The Nashua Silver Knights of Futures Collegiate Baseball League play approximately 28 home games there.  
Stellos Stadium is a 3,500-seat outdoor stadium that is owned by the City of Nashua. The stadium hosts local high schools, local youth organizations, state tournaments and other games for a total of approximately 200 events per year. |
Transportation Networks

Roads
The F.E. Everett Turnpike, also known as U.S. Route 3, runs through Nashua. The turnpike is a high-speed connection to the interstate highway system, granting access south into metro-Boston and north into Manchester. Nashua has eight highway exits, making virtually any location in the city no more than a few short minutes away from the highway.

Buses
The Nashua Transit System provides bus service within the City of Nashua. All Nashua Transit System buses and trolleys are ADA accessible and equipped with bike racks. The company operates two electric hybrid buses, ten compressed natural gas buses, three low-floor Arboc passenger vans, six low-floor cutaway passenger vans, and two trolleys.

The Nashua Transit System operates three distinct travel programs.

<table>
<thead>
<tr>
<th>Travel Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CityBus</td>
<td>A daytime fixed route service that runs on 13 different routes.</td>
</tr>
<tr>
<td>After 7</td>
<td>An evening service that runs on four routes.</td>
</tr>
<tr>
<td>City Lift</td>
<td>A Paratransit and senior citizen service that operates on the same routes as CityBus and includes some additional service areas.</td>
</tr>
</tbody>
</table>

Rail Lines
Nashua has two active rail lines that pass through the city—the New Hampshire Main Line and the Hillsborough Branch. Both of these rail lines are owned by Pan Am Railways.

Nearly three-quarters of all freight shipped into New Hampshire by rail is received in this region. The New Hampshire Department of Transportation has a proposed project called the Nashua-Concord Corridor, which would provide a direct passenger rail connection from Boston to Nashua by expanding the Massachusetts Bay Transportation Authority’s service area of the Lowell Commuter Rail Line.

Airport
Nashua Airport, otherwise known as Boire Field, is a very active General Aviation Airport in the northwest corner of the city. Boire Field is a low-capacity facility with a 6,000-foot asphalt runway. Airport operations include flight training, charter, corporate, military, recreational flights, and small-scale fueling operations.

Waterways
The Merrimack and Nashua Rivers both flow through Nashua. The Merrimack River allows for boat traffic. There is a low frequency of events, but there are also very few access points.

The Nashua River is not navigable with motorized boats but is frequented by kayaks. Nashua Fire Rescue does receive calls to respond to medical and rescue incidents on this river.
Mass Gatherings
Mass gathering events are planned each year across the city. Examples include sporting events, festivals, parades, conventions, dedications, memorials, and occasionally high-profile meetings or visits by dignitaries. In today’s environment, special events increase police, fire, and EMS workloads and may be considered terrorist targets due to large concentrations of crowds, the symbolic nature of the event, high-profile attendees, and increased media attention.

High concentrations of people can overwhelm first responders and compromise basic human services. Treating these events as “planned emergencies” and using the national incident management systems for planning and operating will allow for a rapid transition to emergency response should an incident occur during the mass gathering.16

The city has a robust downtown area that hosts parades, festivals, and other gatherings throughout the year. These events were widely canceled or scaled-back as a result of the 2020 COVID-19 pandemic but are expected to resume when the pandemic is controlled. Some of Nashua’s traditional events include:

- Holiday Stroll
- Taste of Downtown Nashua
- Restaurant Week
- Downtown Dinner & Movie series
- Summer Fun
- Farmers’ Market

Civil Disturbance
The Federal Emergency Management Agency (FEMA) defines a civil disturbance is “a civil unrest activity such as a demonstration, riot, or strike that disrupts a community and requires intervention to maintain public safety.”

Civil unrest has doubled in the past decade as citizens protest issues ranging from economic hardship to police brutality and political instability, according to the 2020 Global Peace Index.17 The COVID-19 pandemic could make things worse, according to Steve Killelea, founder of the Institute for Economics and Peace (IEP), which annually publishes the index. “It’s likely that the economic impact of COVID-19 will magnify tensions by increasing unemployment, widening inequality, and worsening labor conditions—creating alienation from the political system and increasing civil unrest. We, therefore, find ourselves at a critical juncture, “Killelea said.”

The United States Fire Administration offers guidance for responding to civil disturbances. Civil Disturbance Management should include coordination of response activities, modifying operations based on perceived threats or risk, and maintaining situational awareness.18

18 https://www.usfa.fema.gov/operations/civil_unrest/operations.html.
COMMUNITY RISK PRIORITIES

Assessing community risks can be a complex process. There is no one-size-fits-all approach to scoring risks and no single correct way to prioritize those risks. Risk scoring methodologies can include a wide variety of mathematical formulas, three-axis calculations, scoring charts, and critical tasking staffing tables. Just as every community is different, the mitigating factors within a community can have varying impacts. For this reason, ESCI recommends that communities employ a variety of different risk assessment methodologies and then evaluate the results in totality when establishing community risk priorities.

In her recent article *3 Elements of an Effective Fire Department Community Risk Assessment*, Dr. Lori Moore-Merrell provided the following explanation for the three main elements that should provide the foundation for all community risk assessments:19

<table>
<thead>
<tr>
<th>Community Risk Assessment Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Probability (likelihood) of an incident occurring.</td>
<td>Probability is associated with the frequency of an incident type. Incidents with high probability will occur more frequently. Once these predictions are made, risks can then be ranked as having a low, moderate, or high probability of occurring.</td>
</tr>
<tr>
<td>2. Consequence (magnitude) of an incident on the community.</td>
<td>Consequence is the measure of the outcome of an incident type occurrence. To assess consequence, fire department leaders must first identify, categorize, and prioritize community hazards. Hazards are the causes of danger and peril in the community. Risk quantifies the degree of potential danger the hazard presents. The consequences of an emergency incident result from a combination of the risk level of the hazard, the duration and nature of the event, and the response interventions. Consequences are divided into four categories: 1. Civilian and firefighter injury or loss of life 2. Property damage or loss 3. Critical infrastructure damage or loss 4. Environmental damage or loss</td>
</tr>
<tr>
<td>3. Impact of an incident on the department’s response system.</td>
<td>Impact is a measure that explains the effects of multiple concurrent incidents on the fire department. Impact describes a fire department’s ability to provide ongoing services to the remaining areas of a community considering frequent activity in known high-volume demand areas.</td>
</tr>
</tbody>
</table>

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The goal of any fire department is to provide adequate resources within a period of time to reasonably mitigate an emergency event. However, all emergency events inherently carry their own set of special circumstances and will require varying levels of staffing based upon factors surrounding the incident. Properties with high fire risk often require greater numbers of personnel and apparatus to mitigate the fire emergency effectively. Nashua Fire Rescue should make staffing and deployment decisions with consideration of the level of risk involved.

One way to classify risk is the Three-Axis Calculation Method. Risks are classified as low, moderate, high, or maximum where the fire department gauges threats considering the probability of occurrence, hazard, danger, or loss and measures it in consequence. This method allows an agency to assign a numeric value to each axis, which represents Probability, Consequence, and Impact. The surface area of the triangle helps to determine the magnitude of the risk. The higher the surface area, the greater the risk score. The next figure is an example of a medium risk score—moderate risk.

![Figure 34. Three-Axis Calculation Method Example](image)

**Nashua Hazard Mitigation Plan**

The Federal Disaster Mitigation Act of 2000 requires the City of Nashua to have a FEMA-approved Local Hazard Mitigation Plan in order to be eligible for certain pre- and post-disaster mitigation funds.

Nashua updates its Hazard Mitigation Plan at least every five years. In order to monitor, evaluate, and update the Mitigation Strategies, the Resilient Nashua Initiative meets and coordinates updates to the plan. The Directors of both the City of Nashua Community Development Division and the Office of Emergency Management through the Resilient Nashua Initiative, are responsible for working on updates to the Plan throughout the 5-year cycle. They meet every three months or more frequently if a project is underway. Proposals or suggestions regarding the Hazard Mitigation Plan go directly to this group. Due to the City’s Community Rating System requirements, a formal progress report is required annually, including hazard impacts and mitigation action status since the last update. The most recent update was on August 26, 2019.

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20 Nashua Hazard Mitigation Plan Update 2019, Google Docs.
The Nashua Hazard Mitigation Action Plan includes a very thorough community risk assessment. The following section summarizes the process that led to the development of the plan as well as the resulting Hazard Assessments, Goals, and Objectives. ESCI will then correlate the Hazard Mitigation Plan with the Historical Service Demand and Performance of the City of Nashua.

Hazard and Risk Identification Process

The hazards in the Hazard Mitigation Plan Update 2019 align with the hazard names identified in the State of New Hampshire Multi-Hazard Mitigation Plan Update 2018. Two hazards identified in the State plan that do not impact Nashua are Avalanche and Coastal Flooding.

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Location</th>
<th>Hazard Extent</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avalanche</td>
<td>This hazard does not occur in Nashua</td>
<td>This hazard does not occur in Nashua</td>
<td>This hazard does not occur in Nashua</td>
</tr>
<tr>
<td>Coastal Flooding</td>
<td>This hazard does not occur in Nashua</td>
<td>This hazard does not occur in Nashua</td>
<td>This hazard does not occur in Nashua</td>
</tr>
</tbody>
</table>
| Inland Flooding   | All special flood hazard areas, areas have been identified that experience localized flooding on a regular basis. Slopes along Merrimack & Nashua Rivers prone to erosion. Roadways with the potential to flood include: FEE Turnpike: Southbound at crossing of Spit Brook Rd Circumferential Hwy: Within Floodway Daniel Webster Hwy: In .1% and .2% Floodplain at Royal Crest Dr Canal St: From Merrimack River to Salvail Ct Bridge St: Within Area With Reduced Risk Due to Levee E Dunstable Rd: Proximity to Floodway and .2% Floodplain but no flooding Main Dunstable Rd: Within .2% Floodplain from Valhalla Dr to Memory Ave; Proximity to .2% Floodplain for much of its run Spit Brook Rd: Within 1% Floodplain at intersection with FEE Turnpike W Hollis St: Within Floodway at Nashua River crossing E Hollis St: Within Area With Reduced Risk Due to Levee from Denton Street to Crown Street/Merrimack River Concord St: Within Floodways/.2% Floodplain at crossing of Pennichuck Brook and change into DW Highway Broad St: Within .2% Floodplain at Canter Ct and Broadcrest Ln, proximity to .2% Floodplain at Spar Ave Main St: Within Floodway at Nashua River crossing | FEMA flood probability elevation:  1%  0.2%  
In the 1960s, the United States government decided to use the 1% annual exceedance probability (AEP) flood as the basis for the National Flood Insurance Program. The 1% AEP flood was thought to be a fair balance between protecting the public and overly stringent regulations. Because the 1% AEP flood has a 1 in 100 chance of being equaled or exceeded in any 1 year, and it has an average recurrence interval of 100 years, it often is referred to as the “100-year flood.” More recently, people talk about larger floods, such as the “500-year flood,” as tolerance for risk is reduced and increased protection from flooding is desired. The “500-year flood” corresponds to an AEP of 0.2%, which means a flood of that size or greater has a 0.2% chance (or 1 in 500 chance) of occurring in a given year. | Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, City communications, City radio system, power generation facility, domestic water, and wastewater treatment plant. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding. Sewer backups. |
<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Location</th>
<th>Hazard Extent</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allds St:</td>
<td>Within Floodway at Salmon Brook crossing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine Hill Rd:</td>
<td>Within .2% Floodplain near intersection with Perimeter Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchester St:</td>
<td>Within Floodway at Harris Pond and within .2% Floodplain near Tinker Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad Street Pkwy:</td>
<td>Within .2% Floodplain on approach to Nashua River crossing and crosses Floodway</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Types of Roads Included:**

- **Highways:** The top of the hierarchy. They are limited access, provide largely uninterrupted travel over long distances and are designed for high speeds. Example: Everett Turnpike
- **Arterial Roads:** The next level of roadways. They serve to move large volumes of traffic through a town or to connect one section of town with another section. Example: NH 101A
- **Collector Roads:** Act to feed traffic to or from local roads and arterials. Collector roads provide direct access to abutting properties and distribute it to or from arterials. Traffic using a collector is usually going to or coming from somewhere nearby. Example: Henri Burke Highway

**Drought**

Entire jurisdiction

NH DES Drought Management Plan:
- **Level 1—Alert**
- **Level 2—Warning**
- **Level 3—Emergency**
- **Level 4—Disaster**

U.S. Drought Monitor
- **D0**—Abnormally Dry
- **D1**—Moderate Drought
- **D2**—Severe Drought
- **D3**—Extreme Drought
- **D4**—Exceptional Drought
- **S**—Short term, typically less than 6 months
- **L**—Long term, typically more than 6 months

<table>
<thead>
<tr>
<th>D0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term dryness slowing planting, growth of crops</td>
</tr>
<tr>
<td>Some lingering water deficits</td>
</tr>
<tr>
<td>Crops not fully recovered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some damage to crops</td>
</tr>
<tr>
<td>Streams, reservoirs, or wells low, some water shortages developing or imminent</td>
</tr>
<tr>
<td>Voluntary water-use restrictions requested</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop losses likely</td>
</tr>
<tr>
<td>Water shortages common</td>
</tr>
<tr>
<td>Water restrictions imposed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major crop losses</td>
</tr>
<tr>
<td>Widespread water shortages or restrictions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceptional &amp; widespread crop loss</td>
</tr>
<tr>
<td>Shortages of water in reservoirs, streams, &amp; wells creating water emergencies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts on agriculture</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts on hydrology &amp; ecology</td>
</tr>
<tr>
<td>Hazard Type</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
</tbody>
</table>
| **Earthquake**      | Entire jurisdiction                      | Richter Scale:                                                               | Structural damage or collapse of buildings  
                      |                           | • < 3.4 (detected only by seismometers)  
                      |                           | • > 8 (total damage, surface waves seen, objects thrown in air)  
                      |                           | For full definitions of Richter Scale, see Section 3.5 Vulnerability by Hazard | Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, City communications, City radio system, power generation facility, domestic water, and wastewater treatment plant  
                      |                           |                                                                              | Loss of water for fire protection  
                      |                           |                                                                              | Increased risk of fire  
                      |                           |                                                                              | Risk to life, medical surge |
| **Extreme Temperatures** | Entire jurisdiction                      | Extreme heat—period of 3 consecutive days which air temperature reaches 90F or higher on each day.  
                      |                           | Extreme cold—period of 3 consecutive days of minimum temperatures at or below 0F | Overburdened power systems may experience failures due to extreme heat  
                      |                           |                                                                              | Shortages of heating fuel in extreme cold due to high demand.  
                      |                           |                                                                              | Medical surge  
                      |                           |                                                                              | Loss of municipal water supply for drinking water and fire protection due to freezing temperatures |
| **High Wind Events** | Entire jurisdiction                      | Enhanced Fujita Tornado Damage Scale:                                        | Wind damage to structures and trees  
                      |                           | • EF0—winds 65–85 mph  
                      |                           | • EF1—winds 86–110 mph  
                      |                           | • EF2—winds 111–135 mph  
                      |                           | • EF3—winds 136–165 mph  
                      |                           | • EF4—winds 166–200 mph  
                      |                           | • EF5—winds over 200 mph | Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, City communications, City radio system, power generation facility, domestic water, and wastewater treatment plant  
                      |                           |                                                                              | Environmental hazards resulting from damage  
                      |                           |                                                                              | Medical surge  
                      |                           |                                                                              | Loss of natural resources |
| **Infectious Diseases** | Entire jurisdiction                      | Disease epidemics                                                            | Burden on healthcare facilities  
                      |                           | Large-scale incidents of food or water contamination  
                      |                           | Extended periods without adequate sanitation services | Possible quarantine to prevent disease from spreading. |
| **Landslide**       | Limited steep hills that are prone to landslide in jurisdiction | While no universally accepted standard or scientific scale has been developed for measuring the severity of all landslides, severity can be measured several other ways:  
                      |                           | • Steepness/grade of the Slope (measured as a percent)  
                      |                           | • Geographical Area  
                      |                           | ▪ Measured in square feet, square yards, etc.  
                      |                           | ▪ More accurately measured using LiDAR/GIS systems | Structural damage or collapse of buildings  
                      |                           | Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, City communications, City radio system, power generation facility, domestic water, and wastewater treatment plant  
                      |                           | Loss of water for fire protection  
                      |                           | Increased risk of fire from gas break  
<pre><code>                  |                           | Risk to life, medical surge |
</code></pre>
<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Location</th>
<th>Hazard Extent</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake, either causing the event or caused by the event (measured using the Moment Magnitude Intensity or Mercalli Scale)</td>
<td>There are also multiple types of landslides:</td>
<td>Smoke and fire damage to structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Falls: A mass detaches from a steep slope or cliff and descends by free-fall, bounding, or rolling</td>
<td>Disruption to power lines, traffic control systems, and communications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Topple: A mass tilts or rotates forward as a unit</td>
<td>Damage to critical electronic equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slides: A mass displaces on one or more recognizable surfaces, which may be curved or planar</td>
<td>Injury or death to people involved in outdoor activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flows: A mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Like flooding, landslides are unique in how they affect different geographic, topographic, and geologic areas. Therefore, consideration of a multitude of measurements is required to determine the severity of the landslide event.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightning</td>
<td>Entire jurisdiction Areas with large populations present outdoors and large open spaces are particularly vulnerable</td>
<td>Lightning Activity Level:</td>
<td>Solar Storms and Space Weather:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level 1</td>
<td>Space weather can produce electromagnetic fields that induce currents in wires, disrupting power lines and causing widespread power outages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level 2</td>
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<td>Level 3</td>
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<td>Level 4</td>
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<td></td>
<td>Level 5</td>
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<td></td>
<td></td>
<td>Level 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For full definitions of Lightning Activity Level, see Section 3.5 Vulnerability by Hazard</td>
<td></td>
</tr>
<tr>
<td>Severe Winter Weather</td>
<td>Entire jurisdiction</td>
<td>Depth of snow in a given time frame (ex. 2 or more inches per hour over a 12-hour period)</td>
<td>Disruption to road network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blizzard—violent snowstorm with minimum winds of 35 mph and visibility less than 1/4 mile for 3 hours</td>
<td>Damage to trees and power lines, communications, gas lines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground snow load factor</td>
<td>Structural damage to roofs/collapse.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ice Storm—Sperry-Piltz Ice Accumulation Index:</td>
<td>Increase in CO, other hazards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o—little impact</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5—catastrophic damage to exposed utility systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For full definitions of Sperry-Piltz Ice Accumulation Index, see Section 3.5 Vulnerability by Hazard</td>
<td></td>
</tr>
<tr>
<td>Solar Storms and Space Weather</td>
<td>Entire jurisdiction</td>
<td>Geomagnetic Storms:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>G5—Extreme</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>G4—Severe</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>G3—Strong</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>G2—Moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>G1—Minor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solar Radiation Storms:</td>
<td></td>
</tr>
<tr>
<td>Hazard Type</td>
<td>Hazard Location</td>
<td>Hazard Extent</td>
<td>Impact</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>S5—Extreme</td>
<td>Severe space weather can produce solar energetic particles, which can damage satellites used for communications, global positioning, intelligence gathering, and weather forecasting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S4—Severe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3—Strong</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2—Moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S1—Minor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>R5—Extreme</td>
<td>Wind damage to structures and trees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R4—Severe</td>
<td>Water damage to structures and their contents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R3—Strong</td>
<td>Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, City communications, City radio system, power generation facility, domestic water, and wastewater treatment plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R2—Moderate</td>
<td>Environmental hazards resulting from damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R1—Minor</td>
<td>Isolation of neighborhoods resulting from flooding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water pressure, quality, and capacity issues impacting fire protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Loss of natural resources</td>
</tr>
<tr>
<td>Tropical and Post-Tropical Cyclones</td>
<td>Entire jurisdiction</td>
<td>Saffir-Simpson Hurricane Wind Scale:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Category 1—sustained winds 74–95 mph</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Category 2—sustained winds 96–110 mph</td>
<td></td>
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<td></td>
<td>Category 3—sustained winds 111–129 mph</td>
<td></td>
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<td></td>
<td>Category 4—sustained winds 130–156 mph</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Category 5—sustained winds 157 mph or higher</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Smoke and fire damage to structures in wildland/urban interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Damage on habitat</td>
</tr>
<tr>
<td>Wildfire</td>
<td>Forested areas in jurisdiction, particularly in northwest and southwest quadrants as well as in Mine Falls Park</td>
<td>NWCG Fire Size Classification:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas outside of municipal water supply system</td>
<td>A—greater than 0 but less than or equal to 0.25 acres</td>
<td>Smoke and fire damage to structures in wildland/urban interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B—0.26 to 9.9 acres</td>
<td>Damage on habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C—10.0 to 99.9 acres</td>
<td>Impacts on air quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D—100–299 acres</td>
<td>Impact to roadways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E—300 to 999 acres</td>
<td>Loss of natural resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F—1,000 to 4,999 acres</td>
<td>Potential for urban conflagration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G—5,000 to 9,999 acres</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H—10,000 to 49,999 acres</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I—50,000 to 99,999 acres</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>J—100,000 to 499,999 acres</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>K—500,000 to 999,999 acres</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>L—1,000,000+ acres</td>
<td></td>
</tr>
</tbody>
</table>
**Prioritizing Risk**

Nashua used the following process to identify risks within the community.

1. **Identification of Hazards**: For each hazard type, the hazard location within the city, extent, and impact are noted within the Hazard Mitigation Plan.

2. **Description of Previous Hazards**: The first step in determining the probability of future hazard events in the City of Nashua was to examine the location, extent, and impact of previous hazards.

3. **Probability of Future Hazard Events**: After documenting the occurrence of previous hazard events in the City of Nashua and the surrounding region, the Resilient Nashua Initiative stakeholders used this information to calculate the annual probability of these events occurring in the future.
   
   a. The first step was to determine how many times a particular hazard had occurred in a given number of years. The year range is based upon the most detailed database being used for the assessment. Because of this, there may be a number of significant hazard event outliers, primarily before 1960, that are not included in the probability calculation due to limited historical data. The number of occurrences was then divided by the number of years to determine the average number of events per year. For example, if history shows that a particular hazard typically occurs 1 time every 4 years, the average number of events per year is 0.25. The average number of events per year was calculated twice for each hazard. First, the average number of events per year was calculated since the first recorded historical occurrence of the event.

   b. Second, the average number of events per year was calculated based on occurrences since 2000 (up to 2016) to reflect potential recent changes in hazard event occurrence rates.

   c. Finally, the estimated probability of one or more hazard events in any year was calculated using the Poisson Distribution. For the Poisson Distribution, $\lambda$ is the average number of events per year and $X$ is 1 (the number of years to be evaluated for probability). The calculation looked at the greater to or equal likelihood of occurrence.

4. **Critical Faculties and Their Vulnerabilities**: The next step in determining the City’s overall vulnerability was to inventory Nashua’s community assets and determine what assets would be affected by each type of hazard event. The Resilient Nashua Initiative stakeholders began by reviewing the City of Nashua Land Use Code to provide information on where and how the City builds and to identify the corridors where critical facilities would likely be located. The stakeholders then identified the broad categories of important assets within the City, including critical facilities essential to health and welfare; vulnerable populations, such as children and the elderly; economic assets and major employers; areas of high-density residential and commercial development; and historical, cultural, and natural resources.

5. **Vulnerability by Hazard**: Finally, Nashua’s vulnerability to each hazard was identified and categorized.

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21 [https://homepage.divms.uiowa.edu/~mbognar/applets/pois.html](https://homepage.divms.uiowa.edu/~mbognar/applets/pois.html).
**Hazard Mitigation Goals, Priorities, and Strategies**

The Resilient Nashua Initiative stakeholders developed a plan that specifies who is responsible for implementing the prioritized mitigation actions, how they will be funded, and when they will be completed.

After completing a Benefit-Cost Review for each action in the plan, the Resilient Nashua Initiative stakeholders then prioritized the actions by conducting a STAPLEE Analysis, which stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental factors. For each mitigation action, the stakeholders asked the following questions:

**Figure 36. STAPLEE Analysis**

<table>
<thead>
<tr>
<th>STAPLEE Analysis</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social</strong></td>
<td>Will the action unfairly impact any one segment of the population?</td>
</tr>
<tr>
<td></td>
<td>Will it disrupt established neighborhoods? Is it compatible with present</td>
</tr>
<tr>
<td></td>
<td>and future community values? Will it adversely affect cultural</td>
</tr>
<tr>
<td></td>
<td>resources?</td>
</tr>
<tr>
<td><strong>Technical</strong></td>
<td>How effective is the action in avoiding or reducing future losses?</td>
</tr>
<tr>
<td></td>
<td>Will it create more problems than it solves? What are some secondary</td>
</tr>
<tr>
<td></td>
<td>impacts? Does it solve a problem or only a symptom?</td>
</tr>
<tr>
<td><strong>Administrative</strong></td>
<td>Does the community have the capability to implement the action?</td>
</tr>
<tr>
<td></td>
<td>Can the community provide the necessary maintenance? Can it be</td>
</tr>
<tr>
<td></td>
<td>accomplished in a timely manner?</td>
</tr>
<tr>
<td><strong>Political</strong></td>
<td>Is there public support both to implement and maintain the action?</td>
</tr>
<tr>
<td></td>
<td>Is the political leadership willing to support it? Does it present a</td>
</tr>
<tr>
<td></td>
<td>financial burden to stakeholders?</td>
</tr>
<tr>
<td><strong>Legal</strong></td>
<td>Does the community have the authority to implement the action?</td>
</tr>
<tr>
<td></td>
<td>Is enabling legislation necessary? What are the legal side effects?</td>
</tr>
<tr>
<td></td>
<td>Will the community be liable for the actions, support of actions, or</td>
</tr>
<tr>
<td></td>
<td>lack of actions?</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>Economic What are the costs of this action? How will the costs be</td>
</tr>
<tr>
<td></td>
<td>borne? Are state/federal grant programs applicable? Does the action</td>
</tr>
<tr>
<td></td>
<td>fit into existing capital improvements or economic development budgets?</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>How will this action affect the environment? Does it comply with local,</td>
</tr>
<tr>
<td></td>
<td>state, and federal environmental regulations? Is it consistent with</td>
</tr>
<tr>
<td></td>
<td>community environmental goals? Are endangered or threatened species</td>
</tr>
<tr>
<td></td>
<td>likely to be affected?</td>
</tr>
</tbody>
</table>

The cost and benefit of each mitigation action were then evaluated and assigned a quantitative score based on the STAPLEE criteria.

**Benefit Score Range:** 0 = Not Beneficial, 1 = Somewhat Beneficial, 2 = Beneficial, 3 = Very Beneficial

**Cost Score Range:** 0 = Not Costly, -1 = Somewhat Costly, -2 = Costly, -3 = Very Costly
Next, the scores for each action were added to determine priority. Finally, the Resilient Nashua Initiative stakeholders reviewed the scores and resulting prioritization to make sure it was consistent with the City’s goals and Master Plan. The STAPLEE prioritized mitigation actions appear in the following figure. STAPLEE scores of 0 or below were determined to have costs that outweigh the benefits and will be reassessed in the next plan update. These actions were not continued to the implementation review.

**Figure 37. Nashua Hazard Mitigation Actions**

<table>
<thead>
<tr>
<th>Nashua Hazard Mitigation Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Signal failure prevention through additional wireless communications and backup power sources.</td>
</tr>
<tr>
<td>2. Mast arm inspections throughout City.</td>
</tr>
<tr>
<td>3. Improve drainage capacity of problem flood areas, particularly Wethersfield/Westwood, Shelly Drive and Browning Ave, Victor Ave at Emmett St, Westchester Dr, Wilmington Rd at New Searles Rd, Pemberton Rd at Belfast St, Park Ave/Lawndale Ave area, Courtland St/Hall Ave area; C, D, E Streets, Marshall St (Bowers to East Hollis), and Spaulding Ave.</td>
</tr>
<tr>
<td>4. Work with Pennichuck to increase public awareness of methods to reduce water consumption during drought conditions.</td>
</tr>
<tr>
<td>5. Improve outreach and education regarding mold and other health concerns resulting from flooding.</td>
</tr>
<tr>
<td>6. Increase the capacity of culverts and storm drains and ensure drainage systems are properly engineered, citizens are included in the planning process, particularly as part of future paving initiatives.</td>
</tr>
<tr>
<td>7. Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.</td>
</tr>
<tr>
<td>8. Enforce building codes, particularly those related to wind and snow load.</td>
</tr>
<tr>
<td>9. Provide ongoing outreach and education regarding snow load.</td>
</tr>
<tr>
<td>10. Work with local utilities to conduct public outreach and education to ensure energy users are operating systems efficiently during times of extreme temperatures and are aware of heating and cooling assistance options.</td>
</tr>
<tr>
<td>11. Enforce fire permit regulations.</td>
</tr>
<tr>
<td>12. Make available NFIP, insurance, and building codes explanatory pamphlets or booklets.</td>
</tr>
<tr>
<td>13. Enhance local officials, builders, developers, local citizens, and other stakeholders' knowledge of how to read and interpret the Flood Insurance Rate Map (FIRM).</td>
</tr>
<tr>
<td>15. Ask residents to help keep storm drains clear of debris during storms (not to rely solely on Public Works).</td>
</tr>
<tr>
<td>16. Collect rainwater and use natural runoff to water plants.</td>
</tr>
<tr>
<td>17. Provide grassy swales along roadsides.</td>
</tr>
<tr>
<td>18. Add building insulation to walls and attics and conduct overall weatherization upgrades.</td>
</tr>
<tr>
<td>19. Install generators, solar + storage, and quick-connect emergency generator hook-ups for critical facilities and other residential, commercial, industrial, &amp; specialty properties.</td>
</tr>
</tbody>
</table>
### Nashua Hazard Mitigation Actions

<table>
<thead>
<tr>
<th>Action Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.</td>
<td>Adopt the most current International Building Code (IBC) and International Residential Code (IRC).</td>
</tr>
<tr>
<td>21.</td>
<td>Promote the installation of air conditioners and heat pumps and opportunities to subsidize the equipment and energy costs for low-income families.</td>
</tr>
<tr>
<td>22.</td>
<td>Promote the installation of low-flow water saving showerheads and toilets and opportunities to subsidize the equipment for low-income families.</td>
</tr>
<tr>
<td>23.</td>
<td>Increase tree plantings around buildings to shade parking lots and along public rights-of-way.</td>
</tr>
<tr>
<td>24.</td>
<td>Encourage the installation of green roofs, which provide shade and remove heat from the roof surface and surrounding air.</td>
</tr>
<tr>
<td>25.</td>
<td>Work with insurance industry representatives to increase public awareness of the importance of multi-hazard insurance and coverage limitations.</td>
</tr>
<tr>
<td>26.</td>
<td>Install, repair and/or replace HVAC systems at public facilities, particularly at schools, the library, fire stations, police department.</td>
</tr>
<tr>
<td>27.</td>
<td>Install redundancies in municipal fiber and fire alarm network.</td>
</tr>
<tr>
<td>28.</td>
<td>Incorporate hazard mitigation principles into all aspects of public-funded building.</td>
</tr>
<tr>
<td>29.</td>
<td>Incorporate mitigation retrofits for public facilities into the annual capital improvements program.</td>
</tr>
<tr>
<td>30.</td>
<td>Incorporate a stand-alone element for hazard mitigation &amp; resilience into the upcoming master plan.</td>
</tr>
<tr>
<td>31.</td>
<td>Add at least a 1-foot “freeboard” requirement (feet above base flood elevation) in the flood damage ordinance to maintain Nashua’s Class 8 CRS Rating in 2020.</td>
</tr>
<tr>
<td>32.</td>
<td>Prepare and adopting a community-wide stormwater management master plan to maintain compliance with the City’s MS4 permit.</td>
</tr>
<tr>
<td>33.</td>
<td>Implement an inspection, maintenance, and enforcement program to help ensure continued structural integrity of municipal dams and the Merrimack River Right Bank – Flood Damage Reduction System levee. Recommendations from the Army Corps of Engineers inspection reports should be resolved to bring the levee to an “Acceptable” status.</td>
</tr>
<tr>
<td>34.</td>
<td>Promote the Resilient Nashua Toolkit interactive website for educating the public on hazard mitigation and preparedness measures.</td>
</tr>
<tr>
<td>35.</td>
<td>Designated local floodplain manager and CRS coordinator achieve CFM certification.</td>
</tr>
<tr>
<td>36.</td>
<td>Install, upgrade, or maintain back-up generators for pumping and lift stations in sanitary sewer systems along with other measures (e.g., alarms, meters, remote controls, and switchgear upgrades).</td>
</tr>
<tr>
<td>37.</td>
<td>Raise utilities or other mechanical devices above expected flood levels, particularly in areas likely to be redeveloped soon in the Millyard.</td>
</tr>
<tr>
<td>38.</td>
<td>Wet floodproof basements residential and non-residential structures, which may be preferable to attempting to keep water out completely because it allows for controlled flooding to balance exterior and interior wall forces and discourages structural collapse, particularly in areas likely to be redeveloped soon in the Millyard.</td>
</tr>
</tbody>
</table>
### Nashua Hazard Mitigation Actions

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>39.</strong></td>
<td>Identify the best approach to prevent new development or to require flood-resilient site &amp; building design in developable parcels adjacent to the Merrimack River.</td>
</tr>
<tr>
<td><strong>40.</strong></td>
<td>Develop a coordinated GIS Department. Find out who uses GIS, determine how it is used, and identify other potential uses.</td>
</tr>
<tr>
<td><strong>41.</strong></td>
<td>Obtain hazard data and using GIS to map risk for various hazards.</td>
</tr>
<tr>
<td><strong>42.</strong></td>
<td>Develop and maintain a database to track community exposure to flood risk, particularly smaller nuisance events, for future benefit-cost analysis use.</td>
</tr>
</tbody>
</table>

The City of Nashua is now working to integrate requirements of the Nashua Hazard Mitigation Plan into other planning mechanisms. Additionally, the City’s Capital Improvement Plan includes many of the large-scale City mitigation projects that were identified in the Hazard Mitigation Plan, and the Division of Public Health and Community Services is working on incorporating public health mitigation strategies into its Community Health Improvement Plan update cycle. The Resilient Nashua Initiative will be responsible for helping other City departments to integrate the Hazard Mitigation Plan into its own planning mechanisms.
Section III. Evaluation of Fire Department Current Conditions

The Evaluation of Current Conditions provides a summary of agency composition, configuration, and services provided by Nashua Fire Rescue. ESCI analyzed data provided by the administrative and management staff of Nashua Fire Rescue. In addition, ESCI combined interviews with line personnel, supervisory and administrative staff, elected/appointed officials, and allied governmental agencies with information collected during ESCI’s fieldwork to develop the following overview.

The purpose of this section is two-fold. First, it verifies the accuracy of baseline information along with ESCI’s understanding of Nashua Fire Rescue’s composition and operations. This section provides the foundation from which ESCI developed the Master Plan. Secondly, the overview serves as a reference for the reader, who may not be fully familiar with the details of Nashua Fire Rescue’s operations.

The following evaluation and analysis of data and other information is based primarily on the internal data provided by Nashua Fire Rescue, the city’s demographic information, and other external resources. The Current Conditions section compares the Department and its operations to industry best practices, National Fire Protection Association (NFPA) standards, Commission on Fire Accreditation International (CFAI) self-assessment criteria, health and safety requirements, national mandates relative to emergency services, and generally accepted best practices within the emergency services community.

INTERNAL CUSTOMER ASSESSMENT

ESCI solicited input from the members of Nashua Fire Rescue using a 20-question online survey. The survey was open for participation from August 14 through September 4, 2020. Nashua Fire Rescue shared the survey link with its firefighters and encouraged their participation. In addition to the online survey, ESCI solicited input from members of Nashua Fire Rescue through a series of in-person meetings with on-duty crews as well as union leadership. The feedback from the in-person sessions was entirely consistent with the results of the survey. The following summarizes the results of the online internal survey.

Ninety-four members of Nashua Fire Rescue completed this survey, which is 54% of the Department’s 172 members. This survey can be considered to be representative of the majority of Nashua Firefighters. The number of years of service of the members that participated in the survey was well-distributed: 19% of the members had 20 or more years of service, 40% had between 10 and 20 years of service, 21% had between six and 10 years of service, and 19% had less than 5 years of service.
The ranks of the survey participants were representative of the makeup of Nashua Fire Rescue: 66% held the rank of Firefighter, 22% were Lieutenants, 5% were Captains, 3% were Chief Officers, and 4% were Fire Alarm Operators (Dispatchers).

The internal survey revealed that the overwhelming majority of Nashua Fire Rescue personnel were very consistent in their feelings. The survey results indicated that there exists within Nashua Fire Rescue a significant morale problem. The majority—64% (60 people)—classified morale within the fire department as “poor.” The second most common response was that morale was “average,” with 27% of the participants (25 people) selecting that answer. Only 10% of the survey participants (9 people) felt that morale within Nashua Fire Rescue was “good.” Not a single survey participant felt that morale within Nashua Fire Rescue was “excellent.”
An analysis of the individual results of the 20-question internal survey presents a very clear picture of the current state of Nashua Fire Rescue. The survey results, as well as the in-person interviews, both revealed five common themes that stood out within Nashua Fire Rescue. These themes were:

- Nashua Fire Rescue members are proud to be part of Nashua Fire Rescue.
- Nashua Fire Rescue Members almost unanimously agree that the people that make up the Department is the Department’s biggest strength. Members repeatedly cited the “manpower” and “aggressive firefighting” as specific examples of this strength.
- Morale is a significant problem within Nashua Fire Rescue. Members overwhelmingly believe that communication (or a lack thereof) is the biggest contributor to the Department’s poor morale.
- Members very directly stated a desire for consistent accountability within Nashua Fire Rescue. They went so far as to request that chief officers hold the members accountable from the top-down while the union holds the members accountable from the bottom-up. There were repeated concerns voiced that not everyone was being held equally accountable.
- Training was repeatedly identified as one of the biggest weaknesses within Nashua Fire Rescue.

It is worth noting that the issues of morale, communication, accountability, and training are deep-seated issues that permeate the culture of Nashua Fire Rescue. In 2001, Municipal Resources, Inc. completed an Organizational Assessment, which included a survey of Nashua Fire Rescue members that yielded very similar results. Almost 20 years later, those issues still remain unresolved. The results of the survey are included in Appendix A.
FINANCIAL ANALYSIS

The financial health of Nashua Fire Rescue is critical to ensure that the department can continue to provide fire services at an acceptable level to the community. To assist the department in determining how its financial policies have impacted its financial stability, a data-driven model was developed to represent these policies fairly and consistently. The models offer an overview of the current state of Nashua Fire Rescue.

In this section, background information provided by Nashua Fire Rescue and the City of Nashua is used to describe the department’s historical and current financial condition. This includes a multi-year historical review of revenues and expenses. This analysis relies solely on the financial documentation provided by Nashua Fire Rescue and the City of Nashua. Those sources provided include general fund budgets, revenues, and fund balances for 2016–2020.

Historical Revenue

Nashua Fire Rescue is funded through the city’s General Fund. The primary source of funding is property taxes, followed by motor vehicle revenues. The city's unassigned general fund balance at the end of FY 2019 was $30.0 million, an increase of $900,000 from the prior fiscal year.

The city continues to grow, reinvent, and strengthen its economic health by being responsive to the ever-changing market trends. Nashua remains an economic hub and jobs-generator for the region.

The city uses a multi-year model to plan for future budget periods. The city manages its capital budget process over a six-year time horizon. It appears that Nashua Fire Rescue pays for equipment through a mixture of cash and bonds based on needs.

The city has $115.1 million of authorized unissued debt. Standard and Poor’s Global Ratings and Fitch Ratings affirmed their AAA rating and stable outlook on the City. All these things will benefit Nashua Fire Rescue as cash requirements continue to rise.

The current General Fund Budget for the City of Nashua is approximately $270,000,000. The size of the budget has shown stable growth from 2016–2020. Growing at an average rate of 2.52%, 2018 brought a spike in growth that is shown in the following figure.

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.25%</td>
<td>4.28%</td>
<td>3.53%</td>
<td>1.03%</td>
</tr>
</tbody>
</table>

From 2016 through 2020, the General Fund appropriation for Nashua Fire Rescue has also increased. The annual appropriation has grown at an average annual rate of 2.97% per year. In 2018, there was a greater increase in appropriations than average. This results in the bump in the following figure. It appears that Nashua Fire Rescue has experienced consistent growth year to year in appropriations.
General Fund Revenues for Nashua Fire Rescue have experienced significant volatility during the period 2016–2020. The amounts involved appear to be inconsequential to the overall operation of Nashua Fire Rescue. However, volatility should be considered when planning.
**Historical Expense**

For budgeting purposes, Nashua Fire Rescue is broken down into a single budgetary department. Within the budget, expenses are broken down into nine categories: Salaries and Wages, Fringe Benefits, Professional and Technical Services, Property Services, Other Services, Supplies and Materials, Other Expenses, Equipment, and Budget Adjustments. Each of these unique categories represents several different expenses, with Salaries and Wages being the largest and fastest-growing category. This is followed closely by Fringe Benefits. It is common for personnel costs by the largest and fastest-growing expenses; it also requires the most attention when budgeting.

From 2016–2020, Salaries and Wages make up, on average, approximately 64.6% of the total budget. Fringe Benefits is next at approximately 31.75% of the total budget. Year to year, the categories tend to remain consistent with little variation in total percentage. The following figure summarizes the budget by expense classification.

![Figure 45. Average Budget Amount by Category, 2016–2020](image)

The following figure illustrates the growth across categories over time. Beginning in FY 2019, the City of Nashua was negatively impacted by the decision of the State of New Hampshire to abandon its decades-long commitment to providing support of 35% of the City’s retirement costs. The assumption could be made that this is part of the reason for the growth that is shown in Figure 46.
Nashua Fire Rescue does use supplemental funding in addition to the General Fund. These supplements are found in FEMA and State Grants. They also include some ongoing funds. The following figure illustrates the ongoing impact of those revenues. The FEMA/State Grants vary greatly while the funds remain consistent.
Itemized Grant Awards 2016 through 2020 are as follows.

**Figure 48. Itemized List of Nashua Fire Rescue FEMA/State Grants, FY 2016–2020**

<table>
<thead>
<tr>
<th>Year</th>
<th>Grant Source</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>FEMA Assistance to Firefighters Grant</td>
<td>Rope Rescue Equipment Training</td>
<td>$86,000</td>
</tr>
<tr>
<td>2017</td>
<td>SHSP - State of New Hampshire Hazardous Materials FEMA Pass-Through Grant</td>
<td>Leak Sealing Kit, Fan Lockout Kit, Bonding Kit</td>
<td>$15,293</td>
</tr>
<tr>
<td>2018</td>
<td>Firehouse Subs</td>
<td>Particulate Blocking Hoods</td>
<td>$15,010</td>
</tr>
<tr>
<td>2018</td>
<td>FEMA Assistance to Firefighters Grant</td>
<td>Rescue Truck</td>
<td>$650,000</td>
</tr>
<tr>
<td>2019</td>
<td>SHSP- State of New Hampshire Hazardous Materials FEMA Pass-Through Grant</td>
<td>Leak Control Kits, Drum Repair Kits</td>
<td>$7,295.00</td>
</tr>
</tbody>
</table>

The following figure illustrates the Nashua Fire Rescue Recurring Fund Balances for 2016 through 2020.

**Figure 49. Nashua Fire Rescue Recurring Fund Balances, FY 2016–2020**
Current or Upcoming Areas of Interest

In 1993, Nashua voters passed a Budget Control Charter Amendment that limited budget growth to an increase of no more than the average annual consumer price index (CPI-U) over the past 3 years. This could severely limit the flexibility of the city to respond during an economic crisis. In 2019, the New Hampshire Supreme Court upheld the decision by lower courts that the Amendment was unenforceable, making this no longer a concern.

The City has an ordinance stating that its policy is to maintain a minimum unassigned general fund balance of 10% of the fiscal year appropriations. This allows for additional reserves as well.

The City of Nashua continues to perform well in all audits and has been awarded the Certificate of Achievement for Excellence in Financial Reporting from the Government Finance Officers Association of the United States and Canada for its CAFR for the past 14 fiscal years.

Management Components

Effective fire department management is a common challenge for fire service leaders. Today’s fire departments must address management complexities that include an effective organizational structure, adequacy of response, maintenance of competencies, a qualified workforce, and financial sustainability for the future. In the following report section, ESCI examined Nashua Fire Rescue’s current efforts to manage the organization, and identified measures and best practices as the Department moves into the future.

The development of baseline management components in an organization enables it to move forward in an organized and effective manner. In the absence of foundational management elements, the organization will tend to operate in a random and generally ineffective manner.

NFPA 1201: Standard for Providing Fire and Emergency Services to the Public, addresses the need to have an adopted master plan, an established organizational structure, established mutual aid systems, and a variety of other managerial attributes in place to best serve the community effectively. Of specific focus are mission, vision, and values statements that can be utilized as the department moves forward.

Mission, Vision, and Organizational Values

A mission statement is an explanation of the organization’s reason for existence. The mission statement supports the vision and communicates purpose and direction to employees, customers, and other stakeholders. The mission statement should answer the questions “What is our organization's purpose?” and “Why does our organization exist?” As illustrated below, Nashua Fire Rescue’s Mission Statement answers these questions.

Figure 50. Nashua Fire Rescue’s Mission Statement

To create a safe and vibrant community through risk reduction, preparedness, and a proactive all hazards response plan.
A vision statement establishes the ideal image that the organization wishes to achieve. The vision statement should answer the questions “Where are we headed?” and “If we achieved all strategic goals, what would we look like 10 years from now?” Nashua Fire Rescue’s Vision Statement answers these questions.

**Figure 51. Nashua Fire Rescue’s Vision Statement**

To be the premier emergency services provider in our region that is constantly striving for excellence in service delivery through education, innovation, teamwork and collaboration.

We place extreme value on continually evaluating Nashua Fire Rescue’s policies, procedures, and training guidelines in order to provide our customers and personnel with the safest environment possible.

An organizational values statement includes the core principles that guide the organization and its culture. In a values-led organization, the values guide decision-making and establish a standard against which actions can be assessed. The values statement should answer the questions “What values should guide the operations of our organization?” and “What conduct should our employees uphold?” The Organizational Values Statements listed below clearly identify the values that guide the operations of Nashua Fire Rescue and are upheld by the Department’s members.

**Figure 52. Nashua Fire Rescue’s Organizational Values**

Our core values are driven by:

- **Accountability**: Personal, to each other and our community
- **Compassion**: We demonstrate kindness and empathy
- **Dedication**: We are committed to our organization and community
- **Ethics**: We will consistently strive to do the right thing
- **Honesty**: Truth and fairness in endeavors large and small
- **Integrity**: We adhere to sound moral principals

ESCI commends Nashua Fire Rescue for having established clear mission and vision statements as well as relevant organizational values. Just as the operations of a fire and EMS department are dynamic, so are the guiding principles for the organization. These components can change as the department and community change.
Julie Chakraverty recently wrote an article for Forbes.com titled *Company Vision and Values: Do They Still Matter?* In this article, she cited a recent report from the World Economic Forum that found that a “sense of purpose” in work is the second most important criteria for millennials considering a job, after salary. Ms. Chakraverty concluded that given that this generation will make up the majority of the workforce in coming years, it is not difficult to predict that if candidates for employment do not believe or support an organization’s mission, they will not accept a job offer. This can lead to recruitment challenges. Ms. Chakraverty’s research further suggested that employees aged between 45 and 54-years-old and 55 to 64-years-old—not uncommon age groups for management—were the least likely age groups to be able to recite their organizations’ mission and vision.

Nashua Fire Rescue’s Mission, Vision, and Organizational Values were last approved on January 8, 2018. Nashua Fire Rescue’s Mission, Goals, and Values are typically updated annually at the Board of Fire Commissioners’ organizational meeting in January. ESIC commends Nashua Fire Rescue for its commitment to this process to ensure that these management components accurately reflect the current organization and the service demand from the community.

**Organizational Planning Processes**

Now more than any other time in the history of the United States, fire and emergency services agencies operate in a rapidly changing environment. Along with improved tools and technologies used to provide service, there is the increased regulation of activities, new risks to protect, and other challenges that can quickly catch the unwary off guard. Only through continuous internal and external environmental awareness and periodic course corrections can an organization stay on the leading edge.

For Nashua to do the best job possible with available resources, the focus must be on improving services while identifying programs or activities that may no longer serve its changing needs. Through planning, a fire and EMS department is able to establish a vision, create a framework within which decisions are made, and chart its course to the future. The quality and accuracy of the planning function determine the success of the organization.

To be truly effective, an emergency services agency must consider planning on four distinct levels:

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**Figure 53. Levels of Planning**

<table>
<thead>
<tr>
<th>Planning Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tactical Planning</td>
<td>The development of strategies for potential emergency incidents.</td>
</tr>
<tr>
<td>2. Operational Planning</td>
<td>The organization of day-to-day activities, as primarily outlined by a department’s standard operating guidelines and procedures. This includes the integration of the agency into other local, regional, or national response network.</td>
</tr>
<tr>
<td>3. Master Planning</td>
<td>Preparation for the long-term effectiveness of the agency as the operating environment changes over time.</td>
</tr>
<tr>
<td>4. Strategic Planning</td>
<td>The process of identifying an organization’s mission, vision, and values and prioritizing goals and objectives for things that need to be accomplished in the near future.</td>
</tr>
</tbody>
</table>

Without effective planning, it is impossible for any organization to know when it is reaching milestones or providing exceptional services to its constituency. The National Fire Protection Association has established NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity/Continuity of Operations Programs* and NFPA 1201: *Standard for Providing Fire and Emergency Services to the Public*, as standards to assist fire and EMS departments in establishing and maintaining planning documents and conducting planning activities.

**Tactical Planning in the Organization**

Beyond the fire station, the firefighter’s emergency operational work environment is, more often than not, an unknown environment. Normally, a firefighter’s first visit to a building is when the building is involved in a fire or another emergency. In the case of a fire, the internal environment is at its worst. Contrary to movie portrayals, visibility during a fire is at or near zero due to smoke. A lack of familiarity with a building can easily lead a firefighter to become disoriented or injured by an unfamiliar internal layout, or by equipment or other hazards that might be encountered.

It is critically important that firefighters and command staff have comprehensive, accurate information readily at hand to identify hazards, direct tactical operations, and use built-in fire-resistive features. This can only be accomplished by building familiarization tours, developing pre-fire plans, and conducting tactical exercises, either on-site or by tabletop simulation.

ESCI recommends that Nashua Fire Rescue purchase a software program that is specifically designed to make the information that is collected during pre-plans readily accessible to firefighters in an emergency. Many such programs are on the market including Streetwise, Blazmark, and Raxar, among others.

**Operational Planning in the Organization**

Operational planning includes the establishment of minimum staffing policies, standardized response plans or protocols, regional incident command planning, mutual and automatic aid planning (locally and regionally), resource identification and planning, and disaster planning.
Within any agency, operational plans should be in place that ensure adequate volumes of the appropriate types of resources are deployed to an emergency. Doing so involves:

- Identification of potential risk types;
- Determination of resources needed to mitigate an incident affecting the particular risk type; and
- A methodology of ensuring that adequate resources are dispatched to an incident via 911 center protocols.

The development and implementation of rules, regulations, and policies have enabled Nashua to move forward in an organized and effective manner. In the absence of these documents, an organization will tend to operate in a random and generally ineffective manner. Currently, Nashua Fire Rescue possesses a series of documented rules, regulations, and policies to be utilized by members at all organization levels.

Nashua Fire Rescue’s Rules and Regulations require a complete review. The current policy of reviewing and updating by a committee comprised of uniformed members, administration, and the Board of Fire Commissioners on an “as-needed” basis has resulted in several years passing since the last full review and revision has occurred. ESCI suggests that rather than leaving the policy review schedule open to interpretation of “as needed”, that Nashua Fire Rescue set a review schedule that provides for every policy to be reviewed and updated no less than every three years. This review should also include an annual gap analysis to identify the need for new rules and regulations. Nashua Fire Rescue would benefit from having review of all rules and regulations conducted by an independent third-party to assure compliance with industry standards and best practices.

General Orders are kept on file in the Administration Office and are available for reference by all members on the department’s intranet.

**Master Planning in the Organization**

Master or long-range planning is preparation for Nashua Fire Rescue’s future service delivery effectiveness based on projections of the future service delivery environment. This long-range master plan focuses on the big picture perspective, distant future needs of Nashua, and is particularly important in an agency experiencing growth. The need for stronger planning processes is communicated regularly by members of the fire service and the community members it serves. Fire service organizations that engage in a long-range master planning process will be able to utilize this valuable information to answer the following three questions:

1. Where is the organization today?
2. Where will the organization need to be in the future?
3. How will this organization get there?

Nashua Fire Rescue has contracted ESCI to develop a Master Plan. This Master Plan will give Nashua a clear idea of where it is today based on an evaluation of current conditions. The Master Plan will also project the future needs of Nashua Fire Rescue, along with providing the strategies to meet them. A master plan is designed to provide a view of the organization in a 15-year time frame.
Strategic Planning in the Organization

Strategic planning supports the organization’s mission and sets and prioritizes short-term internal goals. A strategic plan typically involves a three-to-five-year planning window. Community involvement in the process is critical as the strategic plan should be customer-oriented while accomplishing the following:

- Development of a mission statement giving careful attention to the services currently provided and which logically can be provided in the future.
- Development of a vision statement of the agency moving forward.
- Establish the values of the members of the agency.
- Identification of the strengths, weaknesses, opportunities, and challenges of the agency.
- Determination of the community’s service priorities.
- Understanding the community’s expectations of the agency.
- Establishment of realistic goals and objectives for the future.
- Identifications of implementation tasks for each objective.
- Definition of service outcomes in the form of measurable performance objectives and targets.

Nashua Fire Rescue does not have a current strategic plan in place. Once the Nashua Fire Rescue master plan is formulated, the list of recommendations, guidance for changes, and new initiatives will provide direction for developing a new strategic plan, as it is the most effective way to prioritize and plan for implementation of the master plan’s findings. The strategic planning process would ideally result in a three-to-five-year work plan, intended to guide the work effort of the entire organization toward a common set of goals and objectives. The process should include representation from every major interest group in the organization. Each person in the department should feel that their interests are represented by someone in attendance on the planning team.

Internal Communications Processes

Internally, Nashua Fire Rescue provides a variety of methods to communicate with staff members. These include monthly staff meetings where written minutes of the meetings are distributed to those not in attendance at the monthly meeting. The Department uses email, intranet, and written memorandums to distribute information within the organization.

Internal communications were repeatedly identified as a major deficiency within Nashua Fire Rescue during both the member interviews and in the member survey. Members requested more engagement from the Department leadership. Specifically, members would like to see more of the leadership and have time to talk with them on both a professional and personal level.
When asked in the survey what was the best method for communications within Nashua Fire Rescue, the two most common responses were email and face-to-face communications. Many of the respondents felt that these two forms of communication were best used in tandem. There were multiple requests for start-of-shift briefings so that everyone knows what to expect. There was a common theme in the responses that some of the current Deputy Chiefs regularly visit the station in person more often than others. There was a perception that the crews who received personal visits from the deputies were better informed than those who only received emails.

**External Communications Processes**

Externally, Nashua Fire Rescue maintains a website to provide information to its customers, but it does not have a formal citizen feedback/input mechanism in place to receive necessary end-user feedback. The department uses Facebook (2,000 followers) and Twitter (3,000 followers) in an effort to communicate key information to its customers. Historically, successful fire departments have used a community newsletter to communicate with the citizens of their jurisdictions. Now, these same agencies have begun to transition to social media platforms as the customer base has begun to express an expectation of digital communication and in a more real-time environment.

ESCI recommends that Nashua Fire Rescue continue to develop its social media presence in an effort to provide information to, and receive information from, its customers. It is also recommended that Nashua Fire Rescue evaluate the use of a survey tool to collect performance feedback of those citizens who have used the services of Nashua Fire Rescue. The gathering of information directly from these individuals will allow Department and City leadership to key in on specific performance issues that allow for intervention in a timelier manner, as well as highlight those performance issues that customers indicate as being of high value.

**Reporting and Recordkeeping**

Nashua Fire Rescue uses reporting and recordkeeping processes and procedures generally considered consistent with the practices observed in most fire departments across the United States. These records include patient care reports, emergency incident reports, as well as equipment service and maintenance records. Service records include those conducted internally as well as those completed by external service providers for critical equipment, including annual ladder testing and self-contained breathing apparatus (SCBA) units.

**Document Control and Security**

The Department has established processes and procedures for the security of both digital and hard copy records. All digital records are backed-up locally as well as off-site.

Nashua Fire Rescue has implemented computers at all fire stations to use in recording incidents, accessing emails and Department operating procedures, and recording equipment inventories. At the time of this report, the Department did not have a formal IT management strategy in place.
Technology is an evolving field and agencies failing to have plans in place to address ongoing changes in operating systems can be caught in a position of being required to expend significant and finite budget revenues to update computers no longer supported by manufacturers. As part of its records management efforts, the Department utilizes Alpine RedNMX RMS® and Windows® based computers to accomplish its organizational responsibilities. The Department uses the City’s IT services to maintain its computer inventory and securely store digital records off-site. ESCI recommends that Nashua Fire Rescue work with its IT services to ensure an effective IT management strategy is in place to address current and future department related software are operated and maintained in accordance to standards within NFPA 950: Standard for Data Development and Exchange for the Fire Service and NFPA 951: Guide to Building and Utilizing Digital Information.

Information Technology (IT) is a challenge within Nashua Fire Rescue. The city currently staffs a central IT Division that services all city departments with the exception of the police department. In recent years, the fire department has become increasingly more reliant on computers, laptops and tablets for both routine and emergency operations more. The fire department should consider staffing a dedicated IT position to support these applications.

Interviews with various stakeholders indicated that Nashua Fire Rescue sometimes encounters challenges with ensuring accountability for reading and confirming understanding of the new, or updated, policy when placed onto the intranet. ESCI recommends that Nashua Fire Rescue implement the use of an online platform, such as Target Solutions®, as a mechanism to inform individuals when new policies and procedures are published. This system allows each employee to receive the new documents personally and acknowledge receipt with an electronic timestamp. The system also enables the Department to require each employee to answer questions specific to the document’s content and ensure the employee receives the desired information. Since Nashua Fire Rescue is preparing to begin using the Target Solutions® platform in its Training Program, using the program to track policies and procedures would be a logical next step.

**Facility Security**

Fire departments have typically been considered to be open environments where residents and visitors from the community have been allowed access to any part of a fire station with very few limitations. Unfortunately, the current social environment requires emergency services providers to implement specific security measures limiting and controlling access to fire department facilities. This is driven by the need to protect firefighters, expensive equipment, and sensitive data from inadvertently being accessed by individuals desiring to harm the community.

ESCI recommends that the Department implement video monitoring and recording at exterior entry points to ensure an increased level of security and awareness as to who is or attempting to enter Nashua Fire Rescue facilities. The Department should also evaluate the implementation of an access card system that identifies each fire department member accessing facilities. This evaluation should also include the ability of Nashua Fire Rescue leadership to change access of a staff member immediately from a central location based upon a member’s employment status or operational concern.
**PERSONNEL MANAGEMENT**

While the purchase of capital equipment can appear expensive when viewed as a one-time expense, personnel expenses typically account for more than 70% of an organization’s annual expenditures. It is important that special attention be given to managing human resources in a manner that achieves maximum productivity while ensuring a high level of job satisfaction for the individual. Consistent management practices combined with a safe working environment, equitable treatment, opportunity for input, and recognition of the workforce’s commitment and sacrifice are key components impacting job satisfaction.

In this section, ESCI will review and analyze personnel management related activities of Nashua Fire Rescue.

**Compensation**

When ESCI conducted the site visit for Nashua Fire Rescue in July 2020, one of the issues that was repeatedly mentioned as contributing to the morale problem was the lack of a contract. Members of the Nashua Fire Rescue bargaining unit had been working without a contract for more than a year—since June 30, 2019. Further contributing to the poor morale was the fact that the Board of Alderman had rejected the proposed bargaining agreement that had been reached between the union and the City in June.

In November 2020, the Board of Alderman approved a contract with the bargaining unit that included, among other things:

- Annual cost of living increases (FY20: 3.5%; FY21: 2.5%; FY22: 2%; FY23: 2%)
- 3% increases for certain steps on the payroll and step grids in FY22 and FY23
- The addition of 30+ years step to payroll grids
- Possible 0.5% wage increases in FY22 and FY23 based on health insurance enrollment

The contract is scheduled to go into effect on January 1, 2021, retroactively for July 1, 2019, through June 30, 2023.

**Labor-Management Relationships**

The City of Nashua recognizes the International Association of Fire Fighters (IAFF) Local #789, as the sole bargaining agent and sole and exclusive representative of all employees of Nashua Fire Rescue. The Chief, the Assistant Chief, and Deputy Chiefs are not members of the bargaining unit. The four other civilian members of Nashua Fire Rescue are represented by the United Auto Workers (UAW).

ESCI’s interviews with both union members and members of the management team revealed that in recent years, the labor-management within Nashua Fire Rescue relationship had become very contentious. The union had recently elected a new President, and both labor and management expressed a sincere desire to work together to improve the labor-management relationship.

**Disciplinary Process**

Disciplinary Procedures are clearly articulated in Article 9 of the bargaining agreement between the City of Nashua and IAFF Local #789. The contract specifies that both parties agree “...that the City has the right to discipline or discharge employees for just cause. Discipline shall be corrective in its nature and progressive in its severity.”
The normal order for disciplinary action within Nashua Fire Rescue is as follows:

1. Verbal warning
2. Written warning
3. Suspension without pay
4. Discharge

The City is permitted to deviate from the order above when the occasion or severity of the offense warrants.

The contract further stipulates that “…it is specifically agreed that any employee may be discharged for reporting to work under the influence of intoxicating liquor or illegal substances, becoming under the influence of intoxicating liquor or illegal substances while on the job, or offenses involving moral turpitude. A sobriety test and/or the appropriate testing for substance abuse is mandatory and any employee who refuses such test(s) may be discharged at the option of the Department.”

Counseling Services
Our nation’s firefighters are faced with emotional needs that are very different and unique to the occupation. The percentage of firefighters struggling with career-related stress is very high, with suicide rates climbing each year. These issues manifest themselves through higher divorce rates and addictions such as alcohol, drugs, or gambling. Frequently seen in recent studies and another major concern is Post Traumatic Stress Disorder (PTSD). As these symptoms occur, employees need a support system in place that is readily accessible from someone who is qualified and truly understands his or her circumstances.

Nashua has in the past provided mental health education for its firefighters. In light of the increasing need across the nation for mental health support for firefighters, the department has also taken the initiative to add IAFF Center for Excellence as an in-network provider.

Application and Recruitment Processes
Nashua Fire Rescue develops a Recruit Firefighter eligibility list as needed.

Entry-level hiring requirements are as follows:

- 18 years of age
- High School Diploma or equivalent
- Candidate must hold a minimum of Pro-Board Firefighter II Certification. Candidates holding out of state certification must provide a letter from the New Hampshire Fire Standards and Training granting equivalency and/or reciprocity prior to the date of hire.
- National Registry of Emergency Medical Technicians—EMT Basic Certification. Candidates holding out of state certification must obtain National Registry certification prior to the close of application. Candidates are required to maintain a current certification throughout the hiring process.
- Current CPR Certification. Candidates are required to maintain a current certification throughout the hiring process.
- Must have current (within 26 months of the date of hire) Candidate Physical Abilities Test (CPAT) as required by the State of NH Division of Fire Standards and Training. For applicants with out of state CPAT certifications, candidates must submit the certification to the NH Fire Standards and Training granting equivalency prior to the date of hire.
- Ability to pass Pre-Employment Physical Screening per NFPA 1582: “Standard on Medical Requirements for Firefighter.”
- Ability to pass Acrophobia Ability Test – 100’ Aerial Ladder Climb as required by the State of NH Division of Fire Standards and Training, administrative rule “Part 702.”
- Ability to pass 1.5 mile run in 12:00 minutes or less.
- Candidate must not have been convicted of a felony under federal law, the law of this state or any other state.
- No more than three (3) points in three (3) years on your Driver’s License for moving violations.
- No DWI convictions within seven (7) years.
- No convictions involving the transportation of alcohol or drugs within seven (7) years.
- Ability to pass a comprehensive motor vehicle record check.
- Ability to pass a comprehensive background check.
- NH CDL-B with airbrake (or obtain within three (3) years of hire).

The recruitment process for new firefighters is conducted by the Training and Safety Division.

Promotion Processes
Article 18 of the bargaining agreement between the City and Local #789 outlines the processes for appointments, promotions, and demotions.

The State of New Hampshire Fire Service Training Division, or an agreed-upon equivalent organization, conducts and supervises written examinations for available promotions within Nashua Fire Rescue. The Testing Agency is then required to submit to the Board of Fire Commissioners the names of the candidates who pass the written examinations for each available promotional opportunity. Nashua Fire Rescue defines a passing score as 70%. Seniority points are added at this point to determine eligibility to move on in the promotional process.

The names of all eligible candidates are then submitted to the Deputy Chiefs for their recommendation. The Deputy Chiefs, acting as one body, then rank the candidates relative to each other. The rankings are then given in a sealed envelope to the Human Resources Department at the conclusion of the Deputy Chiefs’ review and consideration.

Eligible candidates are then interviewed by a panel that consists of a quorum of the Board of Fire Commissioners and the Chief of the Department or designee. A representative from the City of Human Resources assists in this process.
After all eligible candidates have been interviewed, each panel member ranks the candidates relative to each other. The Human Resources representative then determines the aggregate score for each candidate and submits the panel’s final rankings to the Fire Commission. It is the responsibility of the Fire Commission to meet to compile and approve the promotional lists. The Fire Commissioners add the points from the oral interview and Deputy Chiefs’ rankings to the combined written examination score and years of service point/in-grade points for each candidate. The candidates are then ranked from the highest overall score to the lowest overall score, and these shall constitute the promotional lists.

ESCI noted that there is new language related to the promotional process in the contract that was recently approved for the period July 1, 2019, through June 30, 2023. Article 18, Section AA states that:

*Upon signing of this contract, the union and the administration shall establish a joint labor management committee to review the current promotional processes.*

*This committee shall have four (4) members from the union, (4) members from administration, and one (1) mutually agreed upon full voting member, who is not affiliated with either organization. The committee shall review this Article 18, and propose changes to this Article to the Board of Fire Commissioners and the Union. This committee shall be formed within 60 days of signing and shall have a report for members to vote on by September 1, 2021.*

*NFPA 1021 is the Standard for Fire Officer Professional Qualifications. This standard identifies the minimum job performance requirements (JPRs) for the various ranks of fire officers. ESCI recommends that the joint labor management committee that reviews the current promotional process evaluates the process in its entirety to ensure that the test components correlate to the current job descriptions and JPRs established by the national standard as they relate to the positions within Nashua Fire Rescue. As the ultimate goal should be to ensure a defensible promotion process in the event of a legal challenge, ESCI also suggests that Nashua Fire Rescue re-evaluate the merits of including the civilian Board of Fire Commissioners within the promotional process.*

It is ESCI’s suggestion that Nashua Fire Rescue may be able to improve the current promotional process by allowing the professional human resources and fire department personnel to conduct the entire process, thereby eliminating the potential political influence that could be introduced by the inclusion of the elected board.

**Safety and Health**

Article 12 of the collective bargaining agreement between the city and Local #789 states that:

*There shall be established a departmental safety committee, a truck committee, an equipment committee and other committees as may be mutually agreed upon by the parties, each comprised of one private and one officer named by the Union and the Chief or designee. The committee shall meet as necessary and will keep minutes of all proceedings. A copy of the minutes and any reports issued by the committee shall be posted at each station, and a copy forwarded to the Fire Commission and the Union. There shall be compensation paid for attendance at committee meetings by members of the bargaining unit unless they are on duty.*
NFPA 1500: Standard on Fire Department Occupational Safety and Health Program, is the industry standard for the development and administration of a fire department safety program. ESCI strongly encourages the Department to ensure all safety committee activities are in alignment with Chapter 4 of NFPA 1500. To be effective, safety committees must be diverse in their representation from across the department, ensuring representation by shift, rank, function, and interest, and including representation from non-uniformed and staff members as well.

The safety committee should meet monthly and include in its mission the raising of awareness and modifying of member behaviors that will result in a safe work environment. Additionally, the committee should review all accidents, injuries, near-miss incidents, and workplace safety suggestions. The committee should analyze the information and report its findings to the Fire Chief. In contrast to being reactionary through the development of additional rules, ESCI recommends that the committee should work to implement member safety education programs and encourage members’ safety self-awareness. The committee should maintain regular and open meeting times and locations; and minutes of the meetings should be recorded and posted for all members of the department to review.

One issue that was repeatedly brought up to ESCI during the site visit meetings was a strong desire by the membership to have quiet stations. Nashua Fire Rescue responded to more than 8,000 calls last year. That’s an average of 21 calls per day. At the time of ESCI’s site visit, firefighters in every station heard the radio traffic for every call, whether or not the members of that station were assigned to respond.

A study published in the American Journal of Industrial Medicine in 2018 found higher rates of hypertension and high cholesterol in people who were regularly exposed to loud noises at work. Loud noises were defined as four or more hours a day, several days a week, when individuals needed to raise their voice or shout to be heard by someone standing a few feet away. The researchers concluded that as many as 14% of cases of hypertension and 9% of cases of high cholesterol were potentially a result of noise exposure—possibly due to the stress of a loud working environment. Nashua Fire Rescue should make it a priority to alert only the fire station(s) that are dispatched to calls to reduce the constant radio traffic that is currently transmitted to all of the stations.

**Career Development**

Article 31 of the collective bargaining agreement between the City of Nashua and Local #789 includes the following Career Development Benefits:

- The City agrees to provide each station with the following IFSTA manuals: forcible entry, ground ladder practices, hose, salvage and overhaul, fire streams, apparatus, ventilation, rescue and protective breathing practices, first aid, inspection, training programs, water supplies, aircraft, fire department officer, and facilities.
- The City agrees to purchase and make available the textbooks used in firefighting courses, which textbooks shall be retained by the department after use by individual employees.
The City will reimburse employees for one hundred percent (100%) of the total tuition and laboratory fees paid by employees from their own funds, for the successful completion of job-related courses, as well as courses leading to the granting of degrees in Fire Science, within the budget allowed. Successful completion is defined as a grade of “C” or above for undergraduate studies and a grade of “B” or above for graduate studies. The City shall budget $20,750 for fiscal year 2020 and thereafter shall increase the budgeted amount by $1,000 each year beginning in fiscal year 2021 if the budget line for this benefit has a balance of $1,000 or less at the end of each full fiscal year. Courses not directly related to present job function but are functions performed by other personnel in the department, the City will reimburse up to 50% of the total tuition and laboratory fees paid by the employees from their own funds upon successful completion.

While Nashua Fire Rescue has a program in place to provide books and tuition reimbursement for its firefighters, it is lacking a Professional Development Program. A successful Professional Development Program will benefit both the employees and the organization they serve. The intent of the Professional Development Program is to engage employees in identifying gaps in understanding and development that prepares and enables him or her to be successful in current and future roles. This directly translates to personal fulfillment and job satisfaction as well as positioning employees for future success within the organization. A comprehensive Personal Development Program should be developed for each organizational level: front-line personnel, first-level supervisors, mid-level managers, and senior leaders.

Nashua Fire Rescue should develop a Professional Development Program for all positions within the organization. The International Association of Fire Chiefs has developed the Officer Development Handbook, which is intended to function as the foundation for any organization’s Professional Development Program. The handbook provides a foundation and explanation of the basic tenets of a Professional Development Program upon which an organization can build upon and customize to meet its own needs.

**STAFFING**

The size and structure of an organization’s staffing are dependent upon the specific needs of the organization. These needs must directly correlate to the needs of the City of Nashua as a structure that works for one agency may not necessarily work for another. This section provides an overview of Nashua Fire Rescue’s staffing configuration and management practices.

Fire department staffing can be divided into two distinct groups. The first group is typically recognized by the citizens and is commonly known as the operations section; it can be generally classified as the emergency response personnel. The second group works behind the scenes to provide the support needed by the operation’s personnel to deliver an effective emergency response and is commonly known as the administrative section or support services section. Like many fire-rescue organizations, Nashua Fire Rescue has distinct staff personnel—Chief Officers—who perform specific administrative functions but are also required to perform operationally if the need arises.
While a fire department’s evaluation focuses on several factors, staffing is one of the most important. When reviewing staffing, one must define the expectations of each work unit in addition to the organization’s overall performance. Once the work product (output or outcome) is defined, and performance metrics are established, senior leadership assumes responsibility in determining appropriate staffing necessary to accomplish goals and meet performance objectives.

**Administrative Staffing**

One of the primary responsibilities of the administrative team is to ensure that the operations segment of the organization has the ability and means to respond to and mitigate emergencies safely and efficiently. An effective administration and support services system is critical to the success of the Department.

Typical responsibilities of the administration and support staff include planning, organizing, directing, coordinating, and evaluating the various programs within Nashua Fire Rescue. This list of functions is not exhaustive, and other functions may be added. It is also important to understand these functions do not occur linearly and can more often occur simultaneously. This requires the Fire Chief and administrative support staff to focus on many different areas concurrently.

Figure 54 illustrates the administration and support structure of Nashua Fire Rescue.

**Figure 54. Nashua Fire Rescue’s Administrative Staffing**

<table>
<thead>
<tr>
<th>Position Title</th>
<th>Number of Full-Time Positions</th>
<th>Hours Worked per Week</th>
<th>Work Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Chief</td>
<td>1</td>
<td>40</td>
<td>M–F</td>
</tr>
<tr>
<td>Assistant Chief</td>
<td>1</td>
<td>40</td>
<td>M–F</td>
</tr>
<tr>
<td>Executive Assistant</td>
<td>1</td>
<td>40</td>
<td>M–F</td>
</tr>
<tr>
<td>Administrative Assistant II</td>
<td>1</td>
<td>40</td>
<td>M–F</td>
</tr>
<tr>
<td><strong>Total Admin &amp; Support</strong></td>
<td><strong>4</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nashua Fire Rescue’s administrative functions are led by the Fire Chief and supported by an Assistant Chief. ESCI noted that currently, the level of administrative and support staffing function within Nashua Fire Rescue is comprised of four full-time equivalent (FTE) positions. This represents 2.22% of the Department’s total staffing of 180 full-time positions. It is ESCI’s experience that effective administrative staffing totals for municipal fire department operations typically range from 12 to 15% of agency totals. After reviewing the functions and responsibilities assigned to the workgroup, ESCI concluded that the number of full-time equivalents (FTEs) assigned resides in the extreme lower range of the normally experienced administrative levels to support the responsibilities of Nashua Fire Rescue’s administration appropriately.
ESCI’s surveys and interviews with Nashua Fire Rescue members revealed that two of the biggest concerns within the organization are morale and a desire for consistent accountability. Morale was identified as a problem in every one of the interviews that were conducted by ESCI. Members overwhelmingly believe that communication (or a lack thereof) is the biggest contributor to the department’s poor morale. Members also very directly stated a desire for consistent accountability within Nashua Fire Rescue. They went so far as to request that chief officers hold the members accountable from the top down while the union holds the members accountable from the bottom up. There were repeated concerns voiced that not everyone was being held equally accountable.

The members of the Nashua Fire Administration were acutely aware of the morale and accountability issues. The members of the administration also agreed that communication was an integral key to fixing these issues. Challenges exist regarding the current organizational model that allows the Deputy Chiefs to manage their shifts with very different expectations, management styles, and ways of communication. The Chief and the Assistant Chief reported regularly coming to work with a list of projects to accomplish for the day, only to have an entirely new set of immediate issues arise and spend the entire day doing work other than what they had planned to do. The competing demands of the fire department and city hall, coupled with the workload and limited staffing of the Administrative Division, are creating a perfect storm that is directly contributing to the communication challenges, the perception of inconsistent accountability, and the overall poor morale.

ESCI recommends that Nashua Fire Rescue re-institute the second Assistant Chief Position that was eliminated some years ago. This Assistant Chief should be charged with the oversight of Uniform Professional Standards.

Nashua Fire Rescue should evaluate the potential benefits of restructuring the Administrative Division to include an Assistant Chief of Uniform Professional Standards. This Assistant Chief would report to the Chief of Department but be tasked with:

- **Investigating all internal affairs type activities, thus removing this work from the Chief and existing Assistant Chief.** The single point of contact within the fire department as well as close collaboration with Human Resources will better position Nashua Fire Rescue to address these types of issues more consistently and to hold members accountable as appropriate.

- **Develop and manage a communications plan for regular and consistent communications with the Operations Division.** Communication has been a critical weakness within Nashua Fire Rescue for decades that is getting progressively worse. This problem will continue to fester, thus further negatively impacting morale and the operations of the fire department until such a time that there are focused resources dedicated to improving this deficiency.

- **Manage the recruitment of new firefighters, thus removing this work from the Training and Safety Division.** Training was repeatedly identified as a major weakness within Nashua Fire Rescue. The reassignment of recruitment duties to the Assistant Chief of Uniform Professional Standards will allow the Training and Safety Division to focus their efforts on improving the Nashua Fire Rescue Training Program.
- **Oversight of the Nashua Fire Rescue Training Program.** As previously noted, training was repeatedly identified as a major weakness within Nashua Fire Rescue. Placing the Training Safety Division under the direction of the Assistant Chief of Uniform Professional Standards will provide the oversight that is necessary to establish and then achieve simple, manageable, achievable, reasonable, and timely (SMART) goals to systematically improve the Nashua Fire Rescue Training Program.

- **Manage the promotion process in conjunction with Human Resources.** ESCI recommended within the Promotions Processes Section of this report that Nashua Fire Rescue re-evaluate the merits of including the civilian Board of Fire Commissioners within the promotional process. It is ESCI’s suggestion that Nashua Fire Rescue may be able to improve the current promotional process by allowing the professional human resources and fire department personnel to conduct the entire process, thereby eliminating the potential political influence that could be introduced by the inclusion of the elected board. The Assistant Chief of Uniform Professional Standards would be well-positioned to facilitate this process on behalf of the fire department.

- **Develop, implement, and manage a Professional Development Program for Nashua Fire Rescue.** Officers who fail to learn leadership skills are challenged almost immediately upon promotion. As detailed in the Career Development section of this report, both Nashua Fire Rescue and its employees stand to gain from the development and implementation of a Career Development Program.

**Emergency Services Division**

It takes an adequate and properly trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an emergency scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved.

**Staff Allocation of Various Functions**

Nashua Fire Rescue allocates its staff to six fire stations with crew members assigned to engine and ladder trucks. These stations are located based on the specific geographic requirements and service level needs of the area.

The following figure depicts the emergency response staffing employed by Nashua Fire Rescue.
Figure 55. Nashua Fire Rescue Total Emergency Response Staffing

<table>
<thead>
<tr>
<th>Position Title</th>
<th>Number of Positions</th>
<th>Hours Worked/Week</th>
<th>Work Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Staff (full-time &amp; part-time)</td>
<td>Individuals considered full-time employees, primarily assigned to provide emergency services at the operational level.</td>
<td>Average 42 hours in an 8-week cycle</td>
<td>24 Hours Broken into 2 Shifts: 10 on/14 on/then 48 or 96 off</td>
</tr>
<tr>
<td>Deputy Chief</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shift Management Technician</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Captain</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lieutenant</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firefighter</td>
<td>108</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A baseline overview of the career staffing model, staffing levels, and relief factors provides an opportunity to review and analyze the current staffing patterns, shifts, and options to increase efficiency, effectiveness, and capabilities. The Deputy Chief, supported by a Shift Management Technician, provides general direction and support for operations staff as well as command level assistance when needed at incidents with additional alarms. Nashua Fire Rescue operates with an officer assigned to each company, one Captain assigned to each station, and one Captain in charge of Hazardous Materials Operations who is assigned to Station 2 for a total of seven captains. The Department does not use a promoted apparatus operator to serve as the individual responsible for all aspects of maintaining and operating fire engines and aerial units.

Each Nashua Fire Rescue firefighter is expected to be able to operate the fire apparatus. ESCI suggests that Nashua Fire Rescue consider creating a promotional position for Driver. In 2017 alone, more than 15,000 fire department vehicles were involved in collisions nationwide, resulting in 4,555 firefighter injuries occurring while responding to or returning from an incident.\(^{23}\) Considering the risk involved in operating emergency vehicles, it would be prudent for Nashua Fire Rescue to establish promoted Driver positions that require additional and ongoing safe driver training.

Considerable ongoing local, regional, and national discussion and debate draws a strong focus and attention to the matter of firefighter staffing. Frequently, this discussion is set in the context of firefighter safety. The jurisdiction may choose to establish response demand zones and use the criteria outlined in NFPA standards. As detailed in the *Historical System Performance* section of this report, NFPA 1710, 2020 edition, specifies the number of firefighters assigned to an engine company to be “minimum of four on-duty members personnel per engine company.”\(^{24}\)

ESCI notes that the more critical issue is the number of firefighters assembled at the scene of an incident in conjunction with the scope and magnitude of the job tasks expected of them, regardless of the type or number of vehicles upon which they arrive. NFPA 1710 recommends that the number of on-duty fire suppression members shall be sufficient to perform the necessary firefighting operations given the expected firefighting conditions.\(^{25}\) The standard further recommends that the numbers shall be determined through task analyses that take the following factors into consideration.

### Figure 56. Staffing Factors\(^{26}\)

<table>
<thead>
<tr>
<th>Staffing Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life hazard to the populace protected.</td>
</tr>
<tr>
<td>Provisions of safe and effective firefighting performance conditions for the firefighters.</td>
</tr>
<tr>
<td>Potential property loss.</td>
</tr>
<tr>
<td>Nature, configuration, hazards, and internal protection of the properties involved.</td>
</tr>
<tr>
<td>Types of fireground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene.</td>
</tr>
</tbody>
</table>

**Staff Scheduling Methodology**

The total number of positions required becomes a policy decision based on the needs of the jurisdiction. The jurisdiction also establishes the number of employees needed above the minimum to allow for vacancies due to vacation, sick, and other types of leave. This staff requirement above the minimum yields a total number of full-time employees required to ensure necessary daily minimum staffing is achieved according to policy. Minimum staffing for Nashua Fire Rescue is four firefighters per engine company or ladder company.

Nashua Fire Rescue uses a four-platoon (shift) system that uses rotations of one 10-hour day that is immediately followed by one 14-hour night, and then either 48 or 96 hours off. This rotation yields a 42-hour average workweek over an eight-week cycle for shift operations. Each shift is led by a Deputy Chief (4 total) who serves as the senior officer on the shift. These Deputy Chiefs answer directly to the Assistant Chief, who is on a weekly 40-hour schedule and occasionally assumes an operational role as needed. These individuals are responsible for all aspects of the shift operations and serve as the Fire Chief’s representative at significant incidents.

\(^{24}\) NFPA 1710 2020 ed.: 5.2.3.1.1.
\(^{25}\) NFPA 1710 2020 ed.: 5.2.2*. 
\(^{26}\) NFPA 1710 2020 ed.: 5.2.2.1.
The staffing methodology used by Nashua Fire Rescue is very common across the United States for firefighters working a 10-hour day/14-hour night schedule.

A common industry practice to achieve optimal staffing and efficiency is to determine the appropriate minimum staffing factor and then the relief factor based on the needed coverage for sick, vacation, and other unplanned leave.

**Minimum Staffing Factor Determination**

The starting point for the analysis was to determine the minimum number of personnel needed to fill the minimum 38 daily staffing positions for fire operations and avoid overtime for unscheduled hours.

**Minimum Staffing**

- 365 days per year x 24 hours per day = 8,760 hours per year per position.
- 8,760 hours per year x 38 minimum positions daily = 332,880 hours per year that must be staffed for 24/7 coverage.
- 42-hour workweek equals 2,184 scheduled hours per position annually: 332,880/2,184 = 152.4 FTE positions for minimum staffing.
- Nashua Fire Rescue currently has 152 FTEs budgeted for operations staffing.

**Relief Factor**

The next staffing factor to be analyzed is the “relief factor," or the amount of additional FTE positions needed to reasonably cover “off time“ including, leave, training, vacancies, etc. The following is an industry-accepted methodology used to determine a relief factor to cover paid leave, training time off, and vacancies adequately for 24-hour fire and EMS department shifts. Determining the relief factor is outlined in the following:

- The average of Nashua Fire Rescue FY 2017–19 firefighter paid leave, time off for training, unscheduled time off, and position vacancies is 54,720 hours annually.
- 54,720 hours divided by the scheduled 2,184 hours per position annually = 25.1 FTEs of annual coverage required for time off.
- When the total average time off per FTE (360) is subtracted from the total annual hours per FTE (2,184) the result is an average of 1,824 hours per year actually worked.
- By dividing total annual hours scheduled (2,184) by hours actually worked (1,824), a relief factor of 1.2% is achieved.
- This results in a total of 176 operational FTEs or 44 FTEs per shift using the 1.2% relief factor.

In some fire and EMS departments, the need to apply the relief factor to a specific rank or classification is needed based on staffing criteria or these instances. The above exercise considers the entire operations staffing group and does not distinguish between officer and line staffing or the use of operations staff in other areas. In these cases, the relief factor may be more or less than the overall number identified here. This becomes a policy decision and is usually based on specific staffing needs or criteria of the specific rank or classification in question.
Deployment Methods and Staffing Performance for Incidents

NFPA 1710 addresses apparatus staffing, response time, and the effective firefighting force (also referred to as the effective response force), which is the minimum number of firefighters to carry out essential fireground tasks.

Fire Responses

The number and types of tasks needing simultaneous action dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the commanding officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention

The following figure describes initial full alarm assignments for a residential structure fire, open-air shopping center fire, and an apartment fire. All three of these types of occupancies are common throughout Nashua. These are generalizations representative of different types of structures and risks. Each department may handle these types of fires with fewer or more personnel; however, this describes the work functions that must take place for the handling of a fire.

When a fire escalates beyond what can be handled by the initial assignment, the fire has unusual characteristics such as a wind-driven fire, or has been accelerated with a highly flammable compound, additional personnel will be needed. There are also types of scenarios that may not be fires, but mass casualty incidents, explosions, tornadoes, etc., that may require additional staffing. It is difficult or impossible to staff for these worse case incidents. These require a strong mutual aid or automatic aid plan for assistance.

NFPA 1710 states that in response zones with high numbers of incidents, geographical restrictions, geographical isolations, or urban areas the engine and truck staffing should be increased to five, while in response zones with tactical hazards, high-hazard occupancies, or dense urban areas, the staffing should be increased to six. The standard defines the term geographical isolation as areas where over 80% of the response area is outside of a 10-minute response of the next closest fire suppression unit, and geographical restriction as being where there are predictable response delays.
The minimum response to the benchmark structures is 17 firefighters for a residential structure, 28 for an open-air shopping center, and 28 for an apartment. The previous standard was 15 firefighters for residential structures. The two additional positions required in the 2020 standard result from an increase in the recommended size of the rapid intervention crew (RIC). As previously noted, both NFPA 1500 and OSHA 29 CFR 1910.134(g)(4) require a minimum of a team with at least two members located outside an immediately dangerous to life and health (IDLH) atmosphere to monitor and provide emergency rescue for responders until a more formalized rapid intervention crew is created; this is generally referred to as “two-in/two-out.” The four-person RIC outlined in the revised standard must consist of an officer and three firefighters.

The following is Nashua Fire Rescue’s initial assignment for a Reported Working Structure Fire (residential or commercial). Nashua deploys 18 firefighters, thus exceeding the NFPA 1710 Standard of 17 firefighters by one firefighter.
Nashua Fire Rescue does not differentiate the initial alarm assignment by occupancy. As such, a fire in a strip mall or garden apartment, both of which NFPA 1710 recommends 28 firefighters on an initial full alarm assignment, will each have 18 firefighters initially dispatched. It would be up to the Incident Commander to request a “Working Fire” assignment which would increase the response from 18 to 26 firefighters. A second alarm assignment would send an additional engine and ladder truck and a total of 8 additional firefighters. The second alarm assignment would put a total of 34 firefighters on-scene for a fire in a strip mall or garden apartment, which exceeds the 28 firefighters specified by NFPA 1710. ESCI suggests that Nashua Fire Rescue should modify its current alarm assignments to satisfy critical staffing functions for fires in occupancies such as strip malls and garden apartments by ensuring that the initial full alarm assignment deploys at least 28 firefighters.

**Emergency Medical Services Responses**
Nashua’s standard response for an EMS response is to send either an engine or a ladder truck with a crew of four firefighters as “first responders.” This crew is tasked with providing patient care on the scene in advance of an ambulance’s arrival. At a minimum, all Nashua firefighters have basic first aid and Cardiopulmonary Resuscitation (CPR) training. All Nashua firefighters hired after 1999 are required to maintain Emergency Medical Technician Certification. A number of firefighters hold advanced certifications such as paramedic.

**Special Operations Responses**
The Nashua Fire Rescue Hazmat Team is broken into two groups: primary (A Team) and backup (B Team) member. The A Team Members are all stationed at Station 2.

When the team is in quarters, the A Team will respond to a hazardous materials incident with Engine 2, and Special Hazards 1. The decontamination trailer will only respond if needed. In the event that the A Team members are previously committed to another call, the B Team members will respond to the Station and then respond to the incident with Special Hazards 1 and another engine company in place of Engine 2.

The Dive Team is a part of the Emergency Services Division. A cooperative effort with the Nashua Police Department, the Nashua Fire Rescue Dive Team’s primary role is to rescue and work in a support capacity with the Police Department for recovery situations. Nashua’s Dive Team members are not assigned to one specific fire station. For dive calls, the diver in the first due area will respond to the scene and begin size-up operations. The remaining on-duty divers will respond from their assigned stations to Station 2, where they will then respond with the Dive Truck, Marine 1, two boats, and an air supply.

Nashua Fire Rescue uses a Dive/HazMat Report (DHMT) to determine response for out-of-town specialty team responses. This plan is distributed to the on-duty shift, Fire Alarm Division, and Fire Training and Safety Division and specifies which on duty members are to respond on what apparatus and what functions they are assigned to perform.
Fire Marshal Division

Fire prevention is the most vital non-emergency function the fire service provides. National best practices suggest that prevention programs include the five E’s of emergency response, education, engineering, enforcement, and economic incentive. In addition, fire prevention offices should meet the requirements of NFPA 1730: Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations. Under the New Hampshire Revised Statutes Annotated (RSA) 154:2 and New Hampshire Administrative Rule SAF-C 6000, the Fire Chief is responsible for the administration and enforcement of the New Hampshire State Fire Code. The Fire Chief then delegates that authority through the adoption of NFPA 1, Uniform Code, 2015 edition.

Fire investigations are also the responsibility of the Fire Chief under New Hampshire RSA 154:7 and are delegated to others under New Hampshire RSA 154:7 a II. All of the aforementioned functions are vital components of a model community risk reduction program.

The duties of Nashua Fire Rescue’s Fire Marshal’s Office are shared among a full-time Administrator, a Fire Marshal, and two Fire Inspectors/Investigators. The Department previously had a Public Educator position; however, the funding mechanism was removed in the 2006 fiscal year budget.

The Fire Marshal’s Office operates out of the Lake Street Community Fire Station. Staff members work four 10-hour days. The office is staffed Monday through Friday from 0700 to 1700. At the time of this report, there was no on-call coverage after normal business hours. Availability of staff after hours for enforcement, questions, and fire investigations was reported to be about 50% of the time. When staff is not available, complaints, code enforcement, and investigations are generally followed up the following business day. Staff within the Fire Marshal’s Office reported that the current operational model is challenged by coverage gaps, a lack of ability to perform inspections, staffing, workload, and funding.

The present staffing level does not allow for regular inspections to be completed at all target hazard occupancies such as apartment complexes and multi-family dwellings. These occupancies are often only inspected when a complaint is generated by a tenant, landlord, or the building official.

The office recently switched from IMC software management system over to Alpine Red MNX. Staff report the new system to be more user friendly, thus allowing for improved data management and statistical analysis.

Just prior to ESCI’s site visit, the Fire Marshal’s Office had made a transition to placing the majority of the permits issued by the office online. This has helped streamline the process for both office staff and contractors and has been met with very positive feedback from both.

During 2019, the Fire Marshal’s Office conducted 3,170 inspectional/investigative activities. This equates to the Fire Marshal and the two Inspector / Investigators conducting an average of 1,056 activities each during the calendar year.
Qualifications


Currently, the Nashua Fire Marshal’s Office has three full-time personnel assigned to these functions. All three personnel meet only certain portions of these qualifications. Under the collective bargaining agreement that was in place at the time of ESCI’s site visit, members are permitted to take the test for a position in the Fire Marshal’s Office; however, they do not need to be certified in any areas of fire prevention/investigation. In addition, all three current members of the office are eligible to retire. This puts the office in a very precarious position and has the potential to affect the continuity of operations. Fire prevention and investigation are very specialized areas of the fire service, and it takes years to learn these positions.

ESCI notes that the recently approved contract for the period of time July 1, 2019, through June 30, 2023, requires Fire Marshal’s Office candidates to have Inspector 1 and Investigator Certifications in order to be eligible to test for the position. Eligibility will be determined as of the date the vacancy occurs.

Fire Code Enforcement

The Fire Chief is the Authority Having Jurisdiction under New Hampshire Administrative Rule Saf-C 6000. His powers are then granted to his designees through the adoption of NFPA 1. The Nashua Fire Marshal’s Office also works with the City of Nashua Building Safety Department. This department enforces the City’s housing code, which is the New Hampshire State Building Code. The Building Safety Department is staffed with four full-time Inspectors and one Plans Examiner. The Building Department is also responsible for all gas piping and mechanical inspections as required under the New Hampshire State Fire Code in addition to the inspections required under the New Hampshire State Building Code. Both offices meet weekly to ensure continuity of operations and proper enforcement.

Plan Reviews

Plan reviews are required for all fire protection systems and new construction as required by the New Hampshire State Fire Code. Conversely, the Building Safety Department is under the authority of the New Hampshire State Building Code. In 2019, there were 1,208 plan reviews and/or permits issued within the Fire Marshal’s Office. Currently, the Fire Marshal completes all of the plan reviews.

Nashua Fire Rescue should consider the addition of a civilian plans reviewer to the Fire Marshal’s Office. A civilian plans reviewer position could bring stability to the Fire Marshal’s Office because that position would not be expected to promote out of the office. This position could be an economical way redistribute the Fire Marshal’s workload, thus allowing for the completion of regular inspections of all target hazards in the City.
Inspections
The Nashua Fire Marshal’s Office conducted 3,170 plan reviews/permits, inspections, complaints, and investigational activities during 2019. It should be noted that 1,685 of these activities are required to be inspected/issued under specific New Hampshire statutes as they are places of assembly and schools.

The current inspection program includes regular inspections of places of assembly, schools, hospitals, and nursing homes. In addition, the Office works very closely with the Building Safety Department to ensure all complaints on vacant and blighted buildings are addressed. The Building Safety Department handles all mechanical and gas piping inspections for the City even though the authority to enforce the specific codes and standards is granted to the Fire Chief under New Hampshire RSA 154:2 II (a).

Fire Investigations
Under New Hampshire 154:7 a, all fires in the State of New Hampshire are required to have an Origin and Cause Investigation performed. Furthermore, if the fire is determined to be of a suspicious or incendiary nature, the investigation will involve members of the police department. The Nashua Fire Marshal’s Office handles fire investigations with prosecution handled by the Nashua Police Department. The Nashua Fire Marshal’s Office can also request assistance from the New Hampshire State Fire Marshal’s Office.

ESCI’s review of statistical data related to the number of structure fires during the last five years revealed no adverse trends in fire loss for the City.

Public Education
Public education is an essential function performed by the fire service and is a vital part of any agency’s community risk reduction program. The Public Educator position was eliminated in the 2006 budget and currently, Nashua Fire Rescue does not have an established fire prevention or community risk reduction program in place. In addition, Nashua had a strong regional Juvenile Fire Setter program; however, it was disbanded many years ago. NFPA 1730 and the Vision 20/20 National Strategies for Fire Loss Prevention program are the current best practices in regards to this area of fire prevention.

Training & Safety Division
Training programs are critical to ensuring that agencies are able to provide a number of competent and cutting-edge emergency response services to the community. Nashua Fire Rescue currently provides the following emergency response services:

- Firefighting
- Emergency Medical Services
- Regional Hazardous Materials Response
- Dive Team Response
- Confined Space Rescue
- Trench Rescue
- Automobile Extrication
- High and Low Angle Rescue
Each of these disciplines requires ongoing training to ensure that members keep up with the ever-changing skills and technologies. Within the State of New Hampshire, newly hired full-time firefighters must meet the requirements of New Hampshire RSA 21-P and then must complete Nashua Fire Rescue’s internal five-week recruit school.

In addition, ISO requires specific hours of training in certain disciplines in order to receive full credit during the department evaluation. The following is a summary of the initial and annual required training hours.

- Facilities Training: 18 hours
- Company Training 192 hours
- Officer development training: 12 hours
- New driver training: 60 hours
- Driver continuing education: 12 hours
- Hazardous materials training: 6 hours
- New recruit training: 240 hours
- Pre-fire planning annual review

It is worth noting that although Nashua Fire Rescue was credited with 8.26 points of the total 9 points available, ISO does not analyze the quality of training. In conversations with department members, throughout the organization the desire to improve upon the quality and frequency of training was identified. While the department has assigned the training officer function, this is an additional duty that comes after other primary duties are completed with little time to focus on quality and a limited ability to ensure a consistent delivery.

Furthermore, NFPA 1410: Standard on Training for Emergency Scene Operations contains the context and minimum requirements for fire departments to evaluate training for fire suppression and rescue procedures used by members operating at emergency scenes. ESCI recommends that Nashua Fire Rescue develop and implement of a formalized training manual that encompasses an umbrella-type system to ensure members of the Training and Safety Division and company officers can affect clear and defined training.

Nashua Fire Rescue is also a New Hampshire licensed non-transport EMS agency. The Department is responsible for providing all continuing education for recertification of first responders, EMTs, and AEMTs.

Training Competencies
In order for training programs to be effective, they must be based on proven national and local standards and best practices. The State of New Hampshire has established the Fire Standards and Training Commission, which has set the minimum training requirements for firefighters in the state. Training programs are then approved by the New Hampshire Fire Academy and can then be delivered by New Hampshire certified Fire Instructors at a local level.

Nashua Fire Rescue requires all firefighters have Firefighter I and II at the time of hire. Members are then required to complete a five-week internal recruit training program where members learn the standard operating guidelines and procedures of the Department while refining their firefighting and rescue skills.
Most Fire Officers are certified to the fire instructor and fire officer I level; however, many have completed fire officer II. Although this level of training is not a requirement, it provides an added level of support to the Department as the officers are responsible for training their companies’ members.

All members of the department have been trained on the National Incident Management System (NIMS). It is used on all incidents throughout the city and provides a framework for successful mitigations of all incidents.

The Department is responsible for providing several areas of specialized rescue training such as high and low angle rescue, confined space, dive team, hazardous materials, trench, and automobile extrication. These are very specialized areas of training and response that require constant updates to ensure that members stay up to date on the latest changes in technology and techniques. Members currently train in the disciplines throughout the year.

Training Administration

The Nashua Fire Rescue Training Division operates out of the Lake Street Community Fire Station. The building has a large classroom equipped with modern technology that aids in delivering training programs and provides a professional environment for adult learning.

The Training and Safety Division is staffed by a Captain, Lieutenant, and an Administrative Assistant. The division is responsible for the following:

- Facilities management of the fire training grounds, classroom, and equipment areas, and a fire resource library.
- Management of the Department’s hiring process includes recruitment, testing, oral boards, and background checks.
- Development, evaluation, and delivery of the Department’s internal five-week recruit school and oversee the nine-month probationary period for new hires.
- The management and delivery of all fire and EMS continuing education programs. This includes the development and maintenance of training programs and schedules, maintenance of all training records, certification and licenses, and development of training schedules and objectives.
- The writing of Department policy, the development and implementation of standard operating guidelines, training bulletins, and performance evaluations.
- The oversight and management of operational safety and incident investigation for calls involving fire, EMS, and special operations.
In previous years, the majority of training was administered by the company officers due to the numerous tasks that fall on the limited staffing of the Training and Safety Division. Beginning in January 2021, as a result of feedback received during interviews with department membership, quarterly training objectives are being issued with specific and more detailed descriptions of the tasks to be accomplished. The process is also being assisted by the Assistant Fire Chief to ensure that these objectives meet the level desired; however, as Nashua Fire Rescue is extremely lean administratively this is most likely a short-term solution to the issue. Nashua should evaluate the impact to training and communication within the department as a result of its current administrative staffing model.

Currently, the Training and Safety Division does not have an assigned budget. This poses a problem for the addition and delivery of outside training programs that could assist in the development of both firefighters and officers as a whole. ESCI encourages the integration of outside instructors into the Nashua Fire Rescue Training Program as it diversifies the perspectives of the firefighters and brings new ideas into the organization.

The Nashua Fire Rescue Training Program was repeatedly identified by members of the Department as a significant weakness. The addition of a fourth position within the Division would streamline the delivery of fire and rescue training as well as the administration of EMS continuing education and the quality control of the New Hampshire’s required Trauma and EMS Information System (TEMSIS) reports.

In addition to adding a full-time instructor to the Training and Safety Division, the addition of an online learning platform such as Target Solutions would allow for more efficiency and better tracking for training purposes.

Currently, the New Hampshire Fire Academy has online platform called NHOODLE, which provides a variety of fire and EMS training. With the addition of an online platform, the members of the Training and Safety Division could deliver training skills sheets and documents that would allow for the optimization of hands-on training hours. The addition of an online training platform may also alleviate the problem of taking companies out of service for training while ensuring a robust emergency response capability. This will also allow for members of the Division to be present for more training evolutions.

**Instructors and Instructor Requirements**

Nashua Fire Rescue currently uses internal staff for the development and delivery of training. The members of the Training and Safety Division meet the requirements of NFPA 1041: *Standard for Fire and Emergency Services Instructor Professional Qualifications*. Under the current collective bargaining agreement, members of the department may apply for a position within the Training and Safety Division; however, they are not required to have either a fire instructor or safety officer certification at the time of appointment.
Training Records and Record-Keeping

NFPA 1401: *Recommended Practice for Fire Service Training Reports and Records* is the minimum national standard for departments to maintain training records. The Department previously used IMC to track all training data. Currently, Nashua Fire Rescue utilizes Alpine Red NMX software to track all training activities. During the course of conducting interviews with members of the Division, it was apparent that the current software has been frustrating as it does not allow for easy tracking of training and analytical data. Current staff in the Division would like to switch to the Target Solutions data platform as it would be much more efficient in tracking training.

Training Schedule

Based on the services provided, it is very difficult for the Division with current staffing to meet all of the training competencies for the services that they provide. This is a challenge for countless fire departments throughout the country. Currently, the Training and Safety Division set forth yearly goals for training, which is on par with the minimum national standard. This has ensured that the Department meets current guidelines and keeps its personnel on the cutting edge of ever-evolving techniques and technology.

Strong training programs rely on clearly defined schedules and objectives in order to meet the needs of the Department.

Training Methodologies

In order to ensure the effective delivery of training programs to the members of the fire department, there are necessary resources and tools that an instructor must use to meet these requirements. This includes audio visual technology, a proper classroom environment and a hands-on training facility. Nashua Fire Rescue currently has these resources in place.

Interviews with Nashua Fire Rescue members revealed that the majority of training is delivered by the company officer in between emergency responses. This can make it extremely difficult to practice the manipulative skills that are necessary to ensure that members of the Department remain efficient in the delivery of highly skilled services. Task proficiency should be reviewed on a continuing basis to ensure that the members of the department are meeting minimum performance requirements.

Training Facilities

Training facilities are a vital part of reinforcing what members learn in a traditional didactic learning format. These facilities allow members to apply hands-on learning skills that are a critical component to ensuring the effective delivery of the vast emergency response capabilities that Nashua Fire Rescue delivers to the city and its surrounding mutual aid partners.

The current training grounds are located on West Hollis Street at the Four Hills Landfill. In 2016, Nashua Fire Rescue applied for and received a Fire Act Grant to replace the previously condemned live fire training grounds. The grant was written as a regional grant to also offer training to Nashua Fire Rescue’s mutual aid partners. The new facility consists of a modern Class A and Liquified Petroleum Gas live fire training Conex building, a standpipe system, SCBA maze, confined space prop, high angle tower, and windows for bailouts. The training ground also includes a tank car for members of the hazardous materials response team for training.
ESCI heard from members at virtually every meeting that their access to the training facility was very limited or, in some cases, almost non-existent. The value of hands-on training in a controlled environment cannot be understated. Nashua Fire Rescue should coordinate regular use of the fire training facility by all of its companies to ensure proficiency.

**Training Procedures and Manuals**

Within the fire service, there are many textbooks and training mediums available that allow for organized and efficient delivery of various training programs. Often referred to as “canned“ programs, they are vital to ensuring clear and attainable outcomes.

Currently, Nashua Fire Rescue does not have a formal fire department training manual that includes formal lesson plans for various training competencies that members are required to meet. The addition of a formal manual for all levels of training to include recruit school, company-level training, and specialized training, such as dive team and hazardous materials responses, will allow for measurable objectives and formalized delivery.

**Training Oversight**

As previously noted, training was repeatedly identified as a major weakness within Nashua Fire Rescue. Placing the Training Safety Division under the direction of the Assistant Chief of Uniform Professional Standards will provide the oversight that is necessary to establish and then achieve simple, manageable, achievable, reasonable, and timely (SMART) goals to systematically improve the Nashua Fire and Rescue Training Program.

**Fire Alarm Division**

The Fire Alarm Division is responsible for the installation and maintenance of the municipal fire alarm wiring, which ties street boxes and master boxes to the fire alarm. The City of Nashua maintains over 875 fire alarm boxes and hundreds of miles of municipal and fiber optic cabling.

The Nashua Fire Communications Center, part of the Fire Alarm Division, dispatches for Nashua Fire Rescue. In 2019, the Center created 11,359 fire events and 25,960 medical and non-fire events for a total of 37,319 calls for service. In addition to the Fire Communications Center, the Nashua Police Department staffs its own communications center. Together, these two communication centers receive and dispatch for the City, receiving requests directly from callers and from the New Hampshire Bureau of Emergency Communications E-911 Center. The Fire Communications Center is staffed by two Administrators and 12 Telecommunicators working four shifts, with three telecommunicators on each shift.

The Center adheres to the NFPA 1221: *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems*, 2019 Edition, with the following exceptions:

- An exposure hazard (NFPA 1221 Chapter 4, Section 4.2).
- Windows that view public access areas (NFPA 1221 Chapter 4, Section 4.6)
- Primary HVAC Systems (NFPA 1221 Chapter 4, Section 4.4)
The Fire Communications Center is not compliant with the Americans with Disabilities Act, Title II, as there is no elevator to the Center, located on the second floor.\footnote{https://www.ada.gov/regs2010/titleII_2010/titleII_2010_regulations.pdf}

The Fire Communications Center has five dispatch workstations—three in dispatch and two in the back conference room, which serves as a backup facility. The backup workstations do not have radio consoles but do have telephone and CAD. The workstations meet current ergonomic standards, with sit/stand desks and adjustable keyboard trays. There are eight computer monitors per workstation that are displayed in two tiers. There is only one keyboard, but three mice at each workstation. All workstations in the Fire Communications Center are interchangeable, so the dispatchers can sit down at any workstation and perform all job tasks. The backup workstations are not completely interchangeable.

There are kitchen facilities available for the Dispatchers and a sleeping area if needed during disasters.

**Physical Security**

The public is not allowed inside the Fire Communications Center building at any time. There are three windows that look out on public areas, but the glass is not bullet resistant, as required by NFPA 1221, Chapter 4, Section 4.6.4. The walls are not blast-resistant, as required by NFPA 1221 Chapter 4, Section 4.6.5. There are two locked doors between dispatch and any public areas, and there are closed-circuit cameras that are looking at access doors, parking lots, and other spaces.

**Power**

All radio towers and antennas, as well as incoming copper phone lines, are grounded for lightning protection. An uninterruptable power system (UPS) is supplied for all critical electronics in the building. There is a diesel backup generator in the parking lot. The parking lot is accessible by the public, and while no bollards are protecting the unit, the generator doors are locked. The generator is run under a full load once a week. The diesel tank is 425 liters, or 112 gallons, and is rated at 3.43 gallons per hour. The Fire Communications Center is able to operate for approximately 30 hours on one tank of diesel. NFPA 1221, Chapter 4, Section 4.7.4.12 requires 72 hours of fuel to be available.

**Radio**

Nashua Fire Rescue operates on a Motorola 800 Trunked Radio system for primary communications and a VHF legacy system as a backup system. There are three transmitter sites on the simulcast system. Fire responders utilize up to five talk groups, and EMS is assigned talk groups. There are five other talk groups that are available for support. The dispatchers use Motorola MCC 7500 radio consoles, which were last upgraded in 2018. The only reported coverage issues in the current system are when responders go below grade (basements, etc.). Digital vehicle repeaters are used to mitigate this deficiency.
Computer-Aided Dispatch (CAD)
The Alpine Software CAD system was installed in Nashua in 2017. The system is running Alpine’s Red NMX, with revisions sent regularly. There are a total of seven CAD consoles in the communications center: Dispatch Floor (3), Training Room (2), Administrators Offices (2). The Fire Communications Center reported very little CAD system downtime since the system was moved from a Cloud platform to a local server solution. The Cloud platform was experiencing multiple issues, so it was decided to convert to a local platform with servers in the backroom. The CAD system is taken down once a quarter to have the dispatchers go to manual CAD system for practice. The City possesses its own fiber network, which connects the fire stations to the Center.

Mapping
Maintaining the CAD map is the responsibility of the City GIS and the Fire Department. The map is ESRI-based, with a Google maps integration. The map uses the ESRI layer to define the city limits, then it changes to the Google maps option.

Management Information Systems (MIS) and Records Management Systems (RMS)
Alpine Software has both a MIS and RMS module in CAD. NFIRS reports come from the RMS module. Statistical reports can be generated on request. Dispatchers have access to RMS.

9-1-1
There are two 9-1-1 Public Safety Answering Points (PSAPs) in New Hampshire. These PSAPs are located in Concord and Laconia. All 9-1-1 calls are routed to one of two sites; additionally, both of the sites back each other up. They perform all 9-1-1 call interrogation and will perform Emergency Medical Dispatch pre-arrival instructions if needed. The Fire Communications Center can see when a 9-1-1 call is placed in its jurisdiction and entered in the 9-1-1 system. This allows the dispatcher to be prepared for events before the call is given to them. There are two dedicated trunks for call/data transfer from the 9-1-1 PSAP, six 10-digit emergency lines, eight non-emergency lines, and three business lines call forwarded from City offices.

The State of New Hampshire provides 9-1-1 customer premise equipment (CPE). All 9-1-1 lines are Voice over Internet Protocol (VoIP). The Fire Communications Center also has copper phone lines as a backup. The 9-1-1 CPE was upgraded in 2020 and includes a management information system (MIS) platform as a part of the 9-1-1 system.

Fire Box System
The Fire Communications Center monitors the City-wide telegraph fire alarm box system that includes 865 fire alarm boxes. The central alarm station is located in another building separate from the Fire Communications Center. Box transmissions are relayed to the Center via a Digitizer system.

Mobile Data
The fire department utilizes tablets for mobile data computers in its vehicles. The software application is by the CAD vendor—Alpine Software, which is running RedNMX—the current version of software. Connection from the vehicles is through a cellular card to Cloud servers to the CAD system.
Fire Station/Personnel Notification
Fire station alerting is a part of the telegraph fire box system—bells sound in the station when there is an alarm or fire box activation. The system also controls apparatus bay doors on stations with newer door electronics, as well as turn on lights in the station. Additionally, the CAD system transmits digital pages when there is an event. All stations have a CAD status monitor that will display the alarm information.

Response Determinations
The Center uses station (box) order to determine responses. The station orders are predesigned by administrators then the dispatcher reviews unit availability and response criteria for a response.

Workflow
While there is no operations committee to collect feedback and input from the users of the system, Deputy Chiefs can ask for changes at any time for temporary solutions. More permanent changes require senior staff approval or direction.

There is a separation of duties for on-duty staff. Dispatchers receive an assignment of either radio dispatcher or call-taker. The Center does not track call answer performance or use dispatching protocols as EMD is performed at the primary PSAP.

Upon answering an emergency call, the call-takers will determine the location and type of event, then send out a pre-alert on the radio. The event goes into a CAD pending queue for a radio dispatcher to handle.

The dispatcher will announce a new event on a dispatch out-only channel. Then there are five fire, and three EMS Control/Command channels for use. On average, there are five units on each channel at any one time, and the dispatchers are required to listen to multiple channels at the same time. There are tactical channels assigned by the dispatcher on request. The dispatchers are required to monitor the tactical channels.

Quality Assurance (QA)
QA is performed on phone and radio calls, but it is not done consistently. Typically, QA is only done to review complaints/issues. The administrative staff does the audits. The dispatchers do not receive feedback from these audits.

Other Duties as Assigned
Despite a recent move to an online option, dispatchers still receive controlled burn questions on Burn Days. Additionally, dispatchers are responsible for tracking the local hospital status and monitoring the 100 milliamperes system (Fire Alarm Boxes).

Mutual Aid
Dispatchers are required to be aware of their mutual aid partners' unavailability only.
**Performance Standards**

NFPA 1221 has standards for call answering and call processing. For call answering, the standard is to answer all emergency lines within 15 seconds, 90% of the time, and 95% of events are to be answered in 20 seconds.\(^{28}\) For call processing (from time of call answer to fire station notification), events shall be completed in 60 seconds.\(^{29}\) The Center does not track these performance standards.

**Center Staffing**

The Center has a total of 14 positions—two administrators—a Superintendent and an Assistant Superintendent and 12 authorized dispatcher positions. The Superintendent reports to the Assistant Chief. The dispatchers work in four shifts of three telecommunicators. Minimum staffing is three dispatchers. The dispatchers are represented by IAFF Local #789. Supervisors are scheduled to be added in the new contract that goes into effect in 2021.

Technical staff work for the City and report to the Information Technology Director. There are two CAD Administrators/Technicians who are City of Nashua Fire Rescue personnel. These personnel are responsible for CAD configuration changes. The City has two personnel working on the City of Nashua radio system.

**Hiring**

The minimum qualification for an entry-level dispatcher is to have previous emergency services experience. Applicants for a dispatch job must pass screening tests for typing ability, verbal ability, and multitasking. Applicants also take a basic IQ test and a personality assessment. It takes approximately one month from the job offer to them being in the building ready to start training.

**Training**

New employees are required to complete an initial two-week training academy that is hosted in house. They then receive on-the-job training with an on-duty dispatcher. The time it takes to get signed off will vary with the individual. Each trainee receives daily observation reports to track their progress. The probationary period is nine months.

**Shift Schedules**

Minimum staffing is three dispatchers on duty at all times. The dispatchers’ work schedule is a 10-hour day shift (0800–1800), followed the next day by a 14-hour night shift (1800–0800), then a day off, followed by a 10-hour day shift, then a 14-hour night shift, then three days off. Shifts do not overlap. The busiest hours of the day are between 1400 hours and 1800 hours. Employees are paid weekly.

**Mechanical Division**

The Mechanical Division is staffed by a team of three—a Superintendent, an Assistant Superintendent, and a Mechanic. The Division is responsible for the maintenance and repair of all Nashua Fire Rescue apparatus and equipment, including:

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- Eight Pumpers
- Four Aerial Trucks
- Vehicles assigned to staff and support functions
- Station Generators
- Self-Contained Breathing Apparatus (SCBA)

The Mechanical Division also offers in-house welding services and responds the Mobile Air Truck to multiple alarm emergencies. While on the scene, Mechanical Division staff are responsible for refilling SCBA and refueling apparatus. This Division also provides snow removal for all six fire stations and Fire Alarm Headquarters.

**CAPITAL IMPROVEMENT PROGRAMS**

Nashua Fire Rescue has done a good job providing and maintaining facilities and apparatus for its firefighters given the budget constraints in recent years.

**Facilities**

Six fire stations, Fire Alarm Headquarters, and a Training Facility with a burn building make up the fixed facility capabilities of Nashua Fire Rescue. Appropriately designed facilities provide safe living amenities for personnel and house appropriate assets for deployment in order to provide timely service.

ESCI visited each of the Fire Rescue facilities in July 2020. In general, the Nashua fire stations were in fair to good condition and categorized according to the following criteria:
<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong></td>
<td>Like new condition. No visible structural defects. The facility is clean and well maintained. Interior layout is conducive to function with no unnecessary impediments to the apparatus bays or offices. No significant defect history. Building design and construction match the building’s purposes. Age is typically less than 10 years.</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td>The exterior has a good appearance with minor or no defects. Clean lines, good workflow design, and only minor wear of the building interior. Roof and apparatus apron are in good working order, absent any significant full-thickness cracks or crumbling of apron surface or visible roof patches or leaks. Building design and construction match the building’s purposes. Age is typically less than 20 years.</td>
</tr>
<tr>
<td><strong>Fair</strong></td>
<td>The building appears to be structurally sound with a weathered appearance and minor to moderate non-structural defects. The interior condition shows normal wear and tear, but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building’s purposes well. Showing increasing age-related maintenance, but with no critical defects. Age is typically 30 years or more.</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>The building appears to be cosmically weathered and worn with potentially structural defects, although not imminently dangerous or unsafe. Large, multiple full-thickness cracks and crumbling of concrete on the apron may exist. The roof has evidence of leaking and/or multiple repairs. The interior is poorly maintained or showing signs of advanced deterioration with moderate to significant non-structural defects. Problematic age-related maintenance and/or major defects are evident. May not be well suited to its intended purpose. Age is typically greater than 40 years.</td>
</tr>
</tbody>
</table>
### Figure 60. Nashua Fire Stations and Facilities

<table>
<thead>
<tr>
<th>Fire Station</th>
<th>Picture</th>
<th>Address</th>
<th>Date of Construction</th>
<th>Apparatus Housed</th>
<th>Condition</th>
</tr>
</thead>
</table>
| 1            | ![Picture](image1.png) | 15 Amherst Street | 1893                 | Engine 1  
Ladder 1  
Forestry 1  
Marine 1  
Marine 2 | Fair      |
| 2            | ![Picture](image2.png) | 177 Lake Street  | 1998                 | Engine 2  
Ladder 2  
Special Hazards 1  
Dive Truck  
Confined Space  
Trailer  
2 Training/Safety  
Vehicles  
3 Fire Marshal  
Division Cars | Good      |
| 3            | ![Picture](image3.png) | 124 Spit Brook Road | 1977 | Engine 3  
Ladder 3  
Forestry 3 | Fair      |
| 4            | ![Picture](image4.png) | 70 East Hollis Street | 2005 | Chief’s Car  
Assistant Chief’s Car  
Deputy’s Vehicle  
Engine 4  
Air Trailer  
Spare Deputy  
Chief Tahoe  
Spare Enclosed Trailer  
1947 Mack  
Antique Engine  
Ambubus (OEM)  
Crime Scene Unit (NPD)  
Spare Ladder 4  
2 Spare Staff Cars | Good      |
ESCI noted that all of the Nashua stations have automatic fire sprinkler systems as well as smoke/heat detectors and diesel exhaust systems. Each building is also outfitted with a generator.

The older fire stations serving the City were noted to be maintained fairly well, considering the buildings' ages. Stations 1, 3, and 4 have “back-in” bays, which are considered to be a serious safety concern as many firefighter injuries and accidents occur when emergency vehicles are being backed into the fire station. ESCI notes that all stations use “back-in” procedures; however, drive through bays are the recommended configuration. For future stations, Nashua should consider a design that allows for drive through bays that are large enough to accommodate frontline and reserve apparatus.

The occupation of firefighter is recognized as one where those working in the industry are more likely to be diagnosed with cancer than the general public. The “battle environment” in which today's firefighter operates is distinctly different than what was faced by firefighters 30 to 40 years ago. In the mid-20th century, firefighters generally responded to structure fires containing class “A” materials (i.e., wood and paper), but as society has grown to rely more upon chemicals to improve their quality of life, the firefighter of today faces a highly toxic work environment. Rather than considering a structure fire as simply being a fire, it is more appropriate to recognize these emergencies to be more realistic of a hazardous materials incident that happens to be involved in fire.
Of additional concern is that the danger for firefighters does not stop when the fire is extinguished, but returns to the fire stations through their gear, equipment, and vehicles which were exposed and contaminated by smoke or other vapors. When contaminated gear and equipment is returned to the station via their respective response apparatus, the potential for cross-contamination occurs. Many agencies have developed significant on-scene decontamination procedures intended to minimize the potential for contaminants entering the work environment. While these efforts have a positive impact, additional consideration must be given to the physical design of the fire station to minimize these exposures further. Nashua Fire Rescue should limit/reduce firefighter exposure to toxic products of combustion which occur after the fire (i.e., off-gassing). This can be done by storing turnout gear in a well-ventilated room to prevent additional firefighter exposure to off-gassing of chemicals absorbed into turnout gear during a fire.

**Apparatus**

Nashua Fire Rescue operates and maintains a sizeable fleet of emergency response vehicles as well as a variety of service and support units. The most visible units are the fire engines and aerial units, but also include vehicles utilized by Deputy Chiefs and the Fire Chief, as well as Fire Inspectors serving in support of firefighters. In reviewing the Department’s frontline emergency response units, ESCI finds a fleet that is well-maintained with an average age of nearly seven years. ESCI finds that the current volume of emergency response vehicles is sufficient to meet current and projected departmental services needs and demands, outside of any significant changes in the Department’s response jurisdiction.

In evaluating any fleet, leadership must consider a variety of factors in determining the department’s operational capabilities. These considerations include, but are not limited to, age, cost of operation (i.e., repair costs), and out-of-service time. As with any mechanical device, a fire apparatus possesses a finite life. Fire departments typically classify emergency response as either being frontline or reserve. Generally, at a point when a frontline apparatus reaches a certain threshold regarding age or wear and tear, or begins to require increasing maintenance costs, it is either moved to reserve status or decommissioned. The decision to move an apparatus to reserve status or decommission it is a local decision, and no definitive industry standards exist whereby hard and fast rules exist. However, Annex D of NFPA 1901: *Standard for Automotive Apparatus* (2016) suggests the following:

*The safety improvements addressed in the most recent edition of NFPA 1901 are so significant that the standard suggests that apparatus more than 15 years old should be refurbished to meet current standards or removed from service; however, the standard acknowledges that apparatus can continue to be serviceable far beyond the 15-year threshold, depending on maintenance, wear and tear, service demands, and driver training programs. Finally, 1901 recommends that apparatus over 25 years in age should be replaced.*
Nashua Fire Rescue has established a Capital Equipment Replacement Fund (CERF) that is intended to serve as a guiding document in planning for the replacement of its entire fleet of emergency and non-emergency units. As a general rule, the CERF uses a unit’s age as an initial assessment factor in planning to move a unit from frontline status to a reserve unit status. However, the ultimate determination to replace a unit is conducted on a case-by-case basis using many of the factors previously mentioned. According to the Department’s CERF document, fire engines are scheduled to be used in a frontline capacity for 12 years before moving into a reserve status, and reserve units are maintained until a newer unit is cycled into reserve status. Nashua Fire Rescue has also identified a frontline benchmark of 15 years for an aerial (ladder) apparatus before a unit is rotated into a reserve status, with the reserve unit being kept until a newer unit is cycled into reserve status. The current benchmarks utilized by Nashua Fire Rescue are considered to be within generally accepted industry standards. Beyond the frontline lifecycle of fire engines and aerial units, the Department has also established various frontline service lifecycles of all capital assets and has been relatively successful in adhering to the established schedule, with the ultimate replacement made upon a comprehensive assessment of the unit’s operational status.

As previously mentioned, the replacement of apparatus based entirely on age does not account for many factors that should be considered. ESCI encourages Nashua Fire Rescue leadership to continue using the following additional criteria when evaluating a unit for replacement:

- Mileage and/or engine hours.
- Reliability schedule (based on days or shifts in which the vehicle is out of service for maintenance).
- Maintenance and repair costs (excluding fuel).
- Current financial value, or financial cost/benefit, associated with keeping or disposing of the apparatus.

A variety of fleet analysis models exist to assist a department’s leadership in evaluating when a unit should be replaced. One system for evaluating apparatus replacement is to score the relevant factors on a scale (i.e., a 1–5 or 1–10 scale), which may be weighted to reflect the importance or value (e.g., repair & maintenance costs coupled with decreased reliability measures may overshadow an arbitrary aged-based replacement schedule). A second model establishes a point value for each of the following factors:

- Every year of age adds one point.
- Mileage (1 point for each 10,000 miles).
- Repairs/month, on average (< 1/month = 1 point, 1 per month = 2 points, > 2 months = 5 points).
- Maintenance/repair costs (excludes non-routine): 1 to 5 points awarded based on lifetime maintenance/repair costs for the apparatus (e.g., 5 points awarded for M&R costs = 80% to 100% of vehicle purchase price, prorated for lesser cost amounts).

Total ultimate “points” earned by a particular unit can help to determine when a vehicle should be transitioned from frontline status to reserve status and ultimately taken out-of-service.
These examples are presented as a “total picture” approach to determining an apparatus’s operational status, as opposed to simply replacing a unit based upon an arbitrary number that may or may not apply to the department. Should Nashua Fire Rescue’s leadership establish a similar model, it must be understood that the entire fleet should be updated annually.

A comprehensive review of the distribution and deployment of Nashua’s fire engines and aerial units is provided in the Service Delivery section of this report. The current number and types of apparatus are sufficient in quantity to service the City of Nashua. The determination to locate types of units within any community’s jurisdiction cannot be based entirely on a one-size-fits-all approach, and the needs of each community must be considered. With this in mind, any future decisions relative to the locations of these apparatus should be based upon the actual performance of each apparatus when measured against adopted performance standards.

The full inventory of Nashua Fires Rescue’s fire engines and aerial units is listed in the following figure.

**Figure 61. Nashua Fire Rescue’s Engines and Aerial Apparatus**

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturer</th>
<th>Type</th>
<th>Scheduled Replacement</th>
<th>Replacement Cost (2018 $)</th>
<th>Unite ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Pumpers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>Pierce</td>
<td>1500 Pump/750 Tank</td>
<td>Not in CERF</td>
<td>Not in CERF</td>
<td>Eng. 6 (T32)</td>
</tr>
<tr>
<td>2016</td>
<td>Pierce</td>
<td>1500 Pump/750 Tank</td>
<td>2028</td>
<td>644,490</td>
<td>Eng. 4 (T14)</td>
</tr>
<tr>
<td>2014</td>
<td>Pierce</td>
<td>1250 Pump/750 Tank</td>
<td>2026</td>
<td>688,787</td>
<td>Eng. 1 (T31)</td>
</tr>
<tr>
<td>2011</td>
<td>Pierce</td>
<td>1250 Pump/750 Tank</td>
<td>2023</td>
<td>688,787</td>
<td>Eng. 2 (T01)</td>
</tr>
<tr>
<td>2010</td>
<td>Pierce</td>
<td>1250 Pump/750 Tank</td>
<td>2022</td>
<td>688,787</td>
<td>Eng. 5 (T05)</td>
</tr>
<tr>
<td>2009</td>
<td>Pierce</td>
<td>1250 Pump/750 Tank</td>
<td>2021</td>
<td>688,787</td>
<td>Eng. 3 (T22)</td>
</tr>
<tr>
<td>2008</td>
<td>Pierce (reserve)</td>
<td>1250 Pump/750 Tank</td>
<td>Missing CERF</td>
<td>Missing CERF</td>
<td>Eng. 7 (T13)</td>
</tr>
<tr>
<td>2004</td>
<td>Pierce (reserve)</td>
<td>1250 Pump/750 Tank</td>
<td>Missing CERF</td>
<td>Missing CERF</td>
<td>Eng. 8 (T41)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Tower Ladder/Ladder Company</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>Pierce</td>
<td>95’ Tower</td>
<td>2030</td>
<td>1,458,608</td>
<td>Lad. 2 (T02)</td>
</tr>
<tr>
<td>2012</td>
<td>Pierce</td>
<td>105’ Ladder</td>
<td>2027</td>
<td>1,389,150</td>
<td>Lad. 1 (T11)</td>
</tr>
<tr>
<td>2005</td>
<td>Pierce</td>
<td>105’ Ladder</td>
<td>2020</td>
<td>1,389,150</td>
<td>Lad. 3 (T03)</td>
</tr>
<tr>
<td>1995</td>
<td>Pierce (reserve)</td>
<td>105’ Ladder</td>
<td>Missing CERF</td>
<td>908,736</td>
<td>Lad. 4 (T29)</td>
</tr>
</tbody>
</table>

In addition to the emergency response units, Nashua utilizes the units identified in Figure 62 as staff and utility functions relative to emergency response, administration, and fire prevention. As with the emergency response units, Nashua Fire Rescue leadership has identified these units within its capital replacement planning activities. In general, Nashua Fire Rescue has established a range of seven to ten years as a guideline for the replacement of these units. In reviewing these types of units, the Department currently has an average age of 6.69 years.
### Figure 62. Nashua Fire Rescue’s Staff and Utility Vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturer</th>
<th>Type</th>
<th>Scheduled Replacement</th>
<th>Replacement Cost (2018 $)</th>
<th>Unite ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Ford</td>
<td>F150 4x4</td>
<td>2025</td>
<td>67,352</td>
<td>R-1 (T37)</td>
</tr>
<tr>
<td>2018</td>
<td>Ford</td>
<td>Explorer</td>
<td>2025</td>
<td>40,060</td>
<td>C-1 (C02)</td>
</tr>
<tr>
<td>2018</td>
<td>Ford</td>
<td>Explorer</td>
<td>2025</td>
<td>38,834</td>
<td>C-2 (C03)</td>
</tr>
<tr>
<td>2018</td>
<td>Ford</td>
<td>F150 4x4</td>
<td>2022</td>
<td>67,352</td>
<td>C-4 (T33)</td>
</tr>
<tr>
<td>2015</td>
<td>Ford</td>
<td>Interceptor</td>
<td>2025</td>
<td>38,596</td>
<td>K-2 (C01)</td>
</tr>
<tr>
<td>2015</td>
<td>Ford</td>
<td>Interceptor</td>
<td>2025</td>
<td>36,853</td>
<td>K-1 (T27)</td>
</tr>
<tr>
<td>2016</td>
<td>Ford</td>
<td>F250 4x4</td>
<td>2025</td>
<td>49,333</td>
<td>M-1 (T19)</td>
</tr>
<tr>
<td>2014</td>
<td>Ford</td>
<td>Interceptor</td>
<td>2024</td>
<td>35,202</td>
<td>K-3 (T39)</td>
</tr>
<tr>
<td>2013</td>
<td>Ford</td>
<td>F150 4x4</td>
<td>2023</td>
<td>56,937</td>
<td>R-2 (T06)</td>
</tr>
<tr>
<td>2013</td>
<td>Ford</td>
<td>F150 4x4</td>
<td>2023</td>
<td>40,937</td>
<td>W-1 (T36)</td>
</tr>
<tr>
<td>2012</td>
<td>Chevy</td>
<td>Tahoe</td>
<td>2020</td>
<td>52,722</td>
<td>Spare (T04)</td>
</tr>
<tr>
<td>2009</td>
<td>Ford</td>
<td>F350 4x4</td>
<td>2021</td>
<td>58,486</td>
<td>F-3 (T12)</td>
</tr>
<tr>
<td>2006</td>
<td>Ford</td>
<td>F350 4x4</td>
<td>Missing CERF</td>
<td>Missing CERF</td>
<td>Utility (T07)</td>
</tr>
<tr>
<td>2004</td>
<td>International</td>
<td>7400</td>
<td>2035</td>
<td>$265,564</td>
<td>Bucket Truck (T38)</td>
</tr>
</tbody>
</table>

Figure 63 provides an understanding of the age and anticipated replacement schedule for each of Nashua Fire Rescue’s boat and support assets. Unlike the previous figures listing vehicles, Nashua Fire Rescue’s support assets inventory includes breathing air compressors, self-contained breathing apparatus (SCBA), and trailers. While these units are not commonly recognized as part of the emergency response system, they are critical to the success of the Department, and have the potential of creating a significant impact on the department’s budget when replacement must occur.
### Figure 63. Nashua Fire Rescue’s Boat and Support Asset Inventory

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturer</th>
<th>Type</th>
<th>Scheduled Replacement</th>
<th>Replacement Cost (2018 $)</th>
<th>Unite ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boat/Water Craft</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>Rescue One</td>
<td>Boat</td>
<td>2023</td>
<td>14,062</td>
<td>Marine One (B01)</td>
</tr>
<tr>
<td>2011</td>
<td>Zodiac</td>
<td>Boat</td>
<td>2020</td>
<td>6,524</td>
<td>Marine Two</td>
</tr>
<tr>
<td><strong>Support Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>Pierce</td>
<td>Rescue/Air Supply</td>
<td>2039</td>
<td>752,456</td>
<td>SH-1</td>
</tr>
<tr>
<td>2015</td>
<td>Bauer</td>
<td>Compressor</td>
<td>2033</td>
<td>53,188</td>
<td>Station 2</td>
</tr>
<tr>
<td>2008</td>
<td>Ford</td>
<td>F550/Foam</td>
<td>2026</td>
<td>159,565</td>
<td>CFR-1 (T28)</td>
</tr>
<tr>
<td>2004</td>
<td>Eagle</td>
<td>Compressor</td>
<td>2022</td>
<td>59,098</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>International</td>
<td>Rescue/Dive Truck</td>
<td>2024</td>
<td>275,625</td>
<td>T16</td>
</tr>
<tr>
<td>2011</td>
<td>MFI TRL 18-20</td>
<td>Fire Alarm Wire Trailer</td>
<td>2023</td>
<td>5,535</td>
<td>TR8</td>
</tr>
<tr>
<td>2011</td>
<td>Haulmark</td>
<td>Decon Trailer</td>
<td>2023</td>
<td>3,893</td>
<td>TR7</td>
</tr>
<tr>
<td>2006</td>
<td>Scott</td>
<td>Utility Trailer (air)</td>
<td>2026</td>
<td>100,507</td>
<td>TR5</td>
</tr>
<tr>
<td>2015</td>
<td>Scott</td>
<td>Breathing Apparatus</td>
<td>2030</td>
<td>624,377</td>
<td>N/A</td>
</tr>
<tr>
<td>2017</td>
<td>Amkus</td>
<td>Extrication Rescue (2)</td>
<td>2036</td>
<td>81,682</td>
<td>N/A</td>
</tr>
<tr>
<td>1999</td>
<td>Allegheny</td>
<td>Trailer</td>
<td>Missing CERF</td>
<td>8,502</td>
<td>TR4</td>
</tr>
<tr>
<td>1947</td>
<td>Mack</td>
<td>LS95</td>
<td>Antique</td>
<td>N/A</td>
<td>T08</td>
</tr>
<tr>
<td>1997</td>
<td>Ford</td>
<td>F350 4X4</td>
<td>Missing CERF</td>
<td>Missing CERF</td>
<td>F1 (T10)</td>
</tr>
<tr>
<td>2020</td>
<td>Ford</td>
<td>F350 4X4</td>
<td>2030</td>
<td>65418</td>
<td>M2(T35)</td>
</tr>
<tr>
<td>2005</td>
<td>Surrey</td>
<td>Trailer</td>
<td>Missing CERF</td>
<td>Missing CERF</td>
<td>T42</td>
</tr>
<tr>
<td>2006</td>
<td>Haulmark</td>
<td>Confined Space Trailer</td>
<td>Missing CERF</td>
<td>6,295</td>
<td>TR6</td>
</tr>
</tbody>
</table>
Section IV. Analysis of Service Delivery and Performance

An evaluation of service delivery and performance within the City of Nashua provides the fire department and its community with the baseline performance that it can expect. As the City continues to grow and develop, public services should maintain pace with that growth if effective and equitable services are to be provided to all taxpayers. In this section, multiple areas of evaluation will be identified and discussed, and the performance and deployment methodology of Nashua Fire Rescue compared with national and industry standards. Ultimately, the decision regarding the appropriate level of fire and rescue services for the City of Nashua and their related costs will be made by Nashua’s citizenry.

Service Demand Analysis

The demand for services drives Nashua Fire Rescue’s mission to provide a safe and vibrant community through risk reduction, preparedness, and a proactive all hazards response. The ways in which Nashua Fire Rescue is deployed, the types of services provided, and the way training is accomplished should be reflective of the types of incidents to which the department responds, the level of risk associated with those incidents, and the relative frequency of occurrence of these incident types.

Trends in the data provided can provide insights into how service demand may change year to year and the major categories of incident types. Knowledge of when high demand periods occur will assist Nashua Fire Rescue in determining whether staffing levels are sufficient for that demand. Additionally, that knowledge will assist in scheduling additional duties such as training, fire safety inspections, and vehicle maintenance.

First, annual calls for service by calendar year are displayed.

Figure 64. Annual Calls for Service, 2014–2019
When service demand is examined by annual calls for service, a sharp increase in demand occurred in 2016 and 2017, then leveled off and reduced in 2019. The increase in demand rose 56.2% from 2015 through 2017 and fell by 40.5% from the peak in 2017 to 2019. The reason for this increase and decline was due to a change in policy regarding medical call types that the department responded to. In 2016, the fire department began responding to low level nonemergency medical calls in addition to their emergency responses; however, it was determined that this policy was not needed and placed additional wear and tear on equipment and apparatus. In 2018, the decision was made to return to the previous policy of not responding to nonemergency medical calls, resulting in the decline in annual call volume.

Figure 65 provides additional information about Nashua Fire Rescue’s annual service demand. In this figure, service demand by incident type was evaluated. Categories used in this analysis are based upon the National Fire Incident Reporting System (NFIRS) guidelines for grouping of incident types. Within the NFIRS classifications, the following incident types are grouped within the corresponding series:

- 100  Fires
- 200  Overheat/Overpressure
- 300  EMS
- 400  Hazardous Conditions
- 500  Service Call
- 600  Good Intent
- 700  False Alarms
- 800  Severe Weather
- 900  Special Incident

The following figure displays service demand during 2014 through 2019 by general NFIRS classifications.
When annual demand is displayed by incident type, EMS is clearly the driving force for the increased demand with service calls and good intent calls also contributing to overall service demand increases. In 2019, the demand for EMS calls for service fell nearly as sharply as it rose from 2015 to 2017.

Finally, the distribution of call types from 2017 through 2019 is presented as a pie chart to provide an understanding of service demand relative to incident categories.
When the relative frequency of incident types is compared, the majority (59.6%) of Nashua Fire Rescue’s demand is for emergency medical services. Additionally, 35.7% of Nashua’s total call volume across the three-year period was for nonemergent call types such as service calls, good intent, and false alarms. Fires, hazardous conditions, and overpressure/overheating emergencies accounted for 4.5% of the total call volume.

In Figure 67, GIS software was used to create a 10-acre hexagon grid across the City of Nashua. Geocoded incident locations were added, and the number of incidents that occurred within each hexagon was calculated and presented. Dark green hexagons represent 1 incident occurred within the hexagon, while red hexagons represent incident counts from 250 to 1,200.

![Figure 67. Incident Count by 10-Acre Hexagons, 2017–2019](image)

The areas of highest demand cluster between stations 1, 2, and 4 with additional increased demand in the southeast and northwest areas of Nashua. The areas north of the airport should anticipate increased travel times due to the location of Station 5 on the southeast corner of the airport. Outside of the areas identified, most locations across Nashua accounted for lower levels of service demand, with many 10-acre areas producing 2 to 10 calls for service from 2017 through 2019.
Temporal Variation Analysis

Temporal variations are the patterns of activity occurring within certain periods of time. In this section, these patterns are displayed by month, day, and hour to provide Nashua Fire Rescue with insights into when increases and decreases in service demand based on historical patterns are anticipated. In Figure 68, the temporal variation by month of the year for Nashua is shown.

Demand for services increases slightly from April through October, with a decline during late fall and winter months, November through March. This is most likely due to increased activity coinciding with warmer weather. In the next figure, service demand patterns are displayed by the day of the week for 2017 through 2019.
When demand for service is analyzed by the day of the week, Fridays and Saturdays stand out as the days of greatest demand while Sundays have the least amount of demand. Monday through Thursdays are relatively constant with nearly equal levels of demand.

Finally, in Figure 70, the demand by hour of the day is shown.

While Nashua’s data generally presents the typical pattern observed in fire departments with demand beginning to rise in the early morning hours, peak around the middle of the day, and decrease in the evening hours, a significant spike in demand is present from 3 p.m. to 4 p.m. This spike is due to how the fire department issues burn permits. Although burn permits are currently issued online, in the past fire crews would travel to the location requesting a burn permit and issue it in person at 3 pm each day. These burn permits requests would receive a NFIRS number, which is why they appear within this figure. Today this is no longer the practice.

Of note is that while demand is lower in the early morning hours, fatal residential fires occur most frequently late at night or in the early morning. From 2014 to 2016, fatal residential fires were highest between 1:00 a.m. to 2:00 a.m. The 8-hour peak period (11:00 p.m. to 7:00 a.m.) accounted for 48% of fatal residential fires.
POPULATION DENSITY AND GEOGRAPHICAL DEMAND

A major contributing factor to the levels of service demand experienced by Nashua is the population density of the areas served within its jurisdiction. The City of Nashua is an urban municipality, with many of its developed areas exceeding population densities of 3,000 people per square mile.

Figure 71 displays population density by U.S. Census blocks, the smallest unit of division available from the census bureau. Using proprietary software by Esri, population density information for 2019 was compiled by census blocks and displayed. Detailed census block information from the U.S. Census is updated every ten years following the completion of the U.S. Census survey.

The greatest concentration densities in Nashua occur in and around the downtown area, with additional pockets of high density scattered throughout the city. In areas of greater population density, higher demands for service should be anticipated. This is also reflected in Nashua’s deployment of fire stations. The current stations are distributed more densely in areas with higher populations around downtown and less densely distributed in areas of lower total population.
The next figure provides an analysis of incident density using three years of fire rescue response data from January 1, 2017, through December 31, 2019. This analysis, commonly referred to as Hot Spot Mapping, calculates areas of greatest demand based on the density of incidents within an area. This analysis does not indicate how many calls actually occurred within each ring, but instead provides a way to compare each area to one another. In this analysis, each ring is calculated to display incidents per square mile and provides a range of how densely located calls for service were to each other.

The areas indicated as having the highest levels of incident density correlate with those areas identified as having the densest populations from the previous figure. While stations 1, 2, and 4 surround the region of greatest calculated density, it does not necessarily mean that these units are busier than others, particularly those stations with larger service areas. However, this analysis would suggest that the stations surrounding the downtown area are located proximal to the majority of their service demand.
To determine how Nashua Fire Rescue’s current deployment model affects coverage throughout the City, the current performance of the department must first be evaluated. Using fire service industry standards to include the National Fire Protection Association (NFPA) standards and Insurance Services Office (ISO) criteria, Nashua’s deployment model and performance were evaluated.

In the first section, NFPA criteria specific to fire department performance were applied, and Nashua Fire Rescue’s performance was evaluated.

**NFPA 1710 Criteria**

The National Fire Protection Association (NFPA) is an industry trade association that develops and provides standards and codes for fire departments and emergency medical services for local governments. One of these standards, NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, serves as a national consensus standard for career fire department performance, operations, and safety. Within this standard, a travel time of 240 seconds, or 4 minutes, is identified as the benchmark for career departments to reach emergency calls within their jurisdiction with the first arriving unit. Additionally, the balance of the response (called the effective response force) is required to arrive at the incident within 480 seconds, or 8 minutes. Figure 73 provides a synopsis of Nashua Fire Rescue’s ability to meet these standards based upon predicted travel times using historical traffic data from Esri for traffic patterns at 8 a.m. on Monday mornings. Unshaded pockets indicate that the area falls outside of the model’s maximum extension from the road network.
While the central core of Nashua should have the ability to adequately provide emergency responses with the first due unit arriving in a 4-minute or less travel time, other areas of the city lie outside of this standard. Of particular note are those areas previously identified as having high incident counts or increased incident density, specifically the southeast part of the city east of the Everett Turnpike and, to a lesser extent, areas north and west of the airport. Nashua Fire Rescue’s ability to assemble an Effective Response Force (ERF) will be evaluated in the Resource Concentration section. The decision as to whether or not a community possesses adequate coverage is dependent upon the expectations of the community and their ability to fund services. While ideally all structures would be located within a 4-minute travel time and a sufficient number of firefighters present, in most communities this is not possible. The City should evaluate the fire department’s current capabilities and determine if they meet the community’s expectations.
ISO Response Performance

The Insurance Services Office (ISO) is a data analytics organization that provides insurance carriers with a classification rating of a local community's fire protection. The Property Protection Class (PPC®) score or rating classifies communities based upon an overall scale of 1 (best protection) to 10 (no protection) and assesses all areas related to fire protection. These areas are broken into four major categories, which include: emergency dispatch and communications (10% of the rating), water supply system and distribution capabilities (40%), the fire department (50%), and Community Risk Reduction efforts (an additional 5.5% credit is available above 100%).

As part of the Master Planning Process, ESCI conducted a complete benchmarking assessment for Nashua to identify key performance measures based on the Insurance Services Office (ISO) criteria. This report has been submitted to Nashua Fire Rescue as a separate report. These criteria were graded based on past and current performance and deficiencies prioritized based on the greatest impact on overall score improvement versus the cost of those improvements.

Engine Company Performance

A key area of credit towards a jurisdiction's PPC® score is the degree to which structures protected by the fire department fall within a 1.5 road-mile service area of a fire station. This 1.5 road-mile standard is used to estimate a 4-minute travel time for first responding units as required by NFPA 1710. In Figure 74, an analysis was completed for current fire stations with areas in yellow indicating those structures within a 1.5-mile drive. Based on the ISO engine company travel criteria, approximately 50% of Nashua is included within the 1.5-mile travel distance.
Ladder Company Performance

In many jurisdictions across the country, ladder companies are deployed only to certain types of incidents and are not necessarily considered as the first due unit for all other incident types. Because of this, ISO uses a 2.5 road-mile travel distance for ladder companies to estimate an 8-minute travel time in urban and suburban areas by ladder companies to provide the balance of personnel and equipment needed for incidents such as working fires. The next figure displays Nashua Fire Rescue’s ladder company performance in the city.
Deployed from stations 1, 2, and 3, Nashua Fire Rescue has the ability to provide ladder coverage to approximately 65% of the city along its central and eastern core. Prior to adding or removing ladder companies to the deployment strategy for Nashua, the Department should consult with its local ISO representative to discuss the potential implications and impact to the overall rating when ladder companies are added or removed.

**ISO Fire Station Coverage**

In order to receive a PPC® rating that indicates fire coverage is available from ISO, structures must generally be located within 5 miles of a fire station. Areas outside of 5 miles are subject to receiving a PPC® rating of 10, meaning that no fire department coverage is available. Within the City of Nashua, all areas lie within 5 miles of a fire station and are eligible to receive a rating based upon the performance of the fire department.
Figure 76. ISO 5-Mile Service Area

Nashua Fire Rescue
412.1 Miles of Roads
Roads within 5 miles of a Fire Station: 412.1 miles
Percentage of Coverage: 100.0%
**Water Supply and Hydrant Locations**

Access to water is a fundamental requirement for fire suppression in urban settings. Without an adequate supply of water, fire suppression operations are challenging. Additionally, the access point for this water supply must be located close enough to the structure to allow for rapid access by the fire department.

Next, fire hydrant coverage within Nashua is displayed using ISO requirement that structures must be located within 1,000 feet of a fire hydrant.

*Figure 77. ISO Fire Hydrant Coverage*

At nearly total coverage, Nashua’s water supply should be sufficient in most areas of the city. For the small pockets that lack fire water coverage within 1,000 feet, Nashua Fire Rescue should work with both the water utility provider and preplan structures within those areas to ensure an adequate water supply can be established and maintained.
**General ISO Considerations**

The City of Nashua possesses the ability to dramatically improve its ISO PPC® rating and potentially receive an ISO 1 rating. A review of the fire department’s latest ISO survey indicates that significant credit was lost within the emergency communications, staffing, water supply, deployment, and community risk reduction sections of the evaluation and subsequently contributed to a rating of 82.04 or a low ISO Class 2 rating.

**Resource Concentration**

While the majority of responses within Nashua are EMS in nature and are typically handled by one to two units, some incidents require large numbers of resources and personnel to mitigate the emergency condition and reduce loss safely and effectively. The ability of Nashua Fire Rescue to effectively deploy multiple units to an incident scene within a timely manner will often make the difference between minor damage and a total loss.

NFPA 1710 requires that for moderate risk incidents or greater, such as a fire in a 2,000 square foot residential dwelling, the balance of needed resources arrive at the scene within an 8-minute travel time. To achieve this, the concentration of Nashua’s resources were evaluated to determine how the spacing of multiple resources (the response apparatus within their respective fire stations) are arranged so that an initial Effective Response Force (ERF) can arrive on scene within the time frames outlined in the on-scene performance expectations. An effective response force is defined as “the minimum amount of staffing and equipment that must reach a specific emergency zone location within a maximum prescribed total response time and is capable of initial fire suppression, EMS, and/or mitigation. The ERF is the result of the critical tasking analysis conducted as part of a community risk assessment.”

To determine Nashua Fire Rescue’s ability to assemble an effective response force, GIS software was used to overlay Nashua’s daily minimum staffing at each station within 8-minute travel areas, then add the totals. The results are shown in Figure 78.
In this figure, an 8-minute travel time extends from each fire station with the minimum staffing of each station applied to this travel area. Where areas overlap, the minimum staffing totals from each constituent area are added together to model Nashua Fire Rescue's deployment and ERF capabilities. In this model, it is assumed that all units are available and in quarters. As illustrated in this figure, the central core of the city possesses adequate numbers of firefighters for residential and small commercial fires; however, outside of this area, Nashua Fire Rescue's ability to provide sufficient staffing in a timely manner is significantly less, particularly in the northwest, southwest, and southeast areas of the city. While a balance must be struck between the desired levels of service within a community and the ability to pay for those services, the northwestern and southeastern portions of the city experienced both increased incident density and incident counts, as compared to other less densely staffed areas of Nashua, and have little to no overlap by other stations. If stations 3, 5, or 6 were unavailable at the time of an incident, first due unit arrival times would be expected in excess of an 8-minute travel time and also experience prolonged assemblies of the ERF.
RESOURCE RELIABILITY

In this section, resource reliability is evaluated using several metrics to establish a global perspective on Nashua’s ability to provide sufficient responding resources to meet service demand within the city. When all units are available and in quarters, supplying sufficient resources is typically not a problem; however, when multiple calls occur simultaneously, units are committed to incidents for extended periods of time, or when insufficient resources exist to mitigate an emergency, further preparation and planning safely and effectively must be completed.

Call Concurrency

First, call concurrency is evaluated. Call concurrency is a comparison of how often multiple calls are occurring and placing additional demand on resources. In the next figure, a concurrent call is identified when a second unit is dispatched to a separate incident prior to the first unit clearing the scene and becoming available. When two incidents are occurring simultaneously and a third separate incident is dispatched, three concurrent calls are present, and so on.

<table>
<thead>
<tr>
<th>Call Concurrency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Incident</td>
<td>63.3%</td>
</tr>
<tr>
<td>2</td>
<td>25.4%</td>
</tr>
<tr>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>4 or more</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

When units are committed to an incident in Nashua, only one incident is occurring 63.3% of the time. However, this also indicates that 36.7% of the time that units are committed at two or more separate incidents and are unavailable to respond to additional calls. When comparing these findings to the ERF analysis in the previous figure, Nashua’s ability to provide a sufficient number of firefighters to the downtown area and central core of the city the majority of the time appears to be adequate while the response to outlying areas, particularly the northwestern and southeastern portions of the city possesses the potential for delayed responses and insufficient personnel to mitigate medium or high-risk incidents safely and effectively.

Unit Hour Utilization

Another component that must be considered when evaluating Resource Reliability is Unit Hour Utilization (UHU). UHU provides an expression of the workload placed on the crew assigned to that unit and can also describe the amount of time that a unit is not available for response because it is already committed to another incident. The larger the percentage, the greater its utilization, and the less available it is for assignment to subsequent calls for service, training, and ancillary duties. UHU rates are expressed as a percentage of the total hours in a year.

In May 2016, Henrico County (VA) Division of Fire published an article after studying its department’s EMS workload. As a result of the study, Henrico County Division of Fire developed a general commitment factor scale for its department. The next figure is a summary of the findings as it relates to commitment factors.
Figure 80. Commitment Factors as Developed by Henrico County (VA) Division of Fire, 2016

<table>
<thead>
<tr>
<th>Factor</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.16–0.24</td>
<td>Ideal Commitment Range</td>
<td>Personnel can maintain training requirements and physical fitness and can consistently achieve response time benchmarks. Units are available to the community more than 75% of the day.</td>
</tr>
<tr>
<td>0.25</td>
<td>System Stress</td>
<td>Community availability and unit sustainability are not questioned. First-due units are responding to their assigned community 75% of the time, and response benchmarks are rarely missed.</td>
</tr>
<tr>
<td>0.26–0.29</td>
<td>Evaluation Range</td>
<td>The community served will experience delayed incident responses. Just under 30% of the day, first-due ambulances are unavailable; thus, neighboring responders will likely exceed goals.</td>
</tr>
<tr>
<td>0.30</td>
<td>“Line in the Sand”</td>
<td>Not Sustainable: Commitment Threshold—the community has less than a 70% chance of timely emergency service and immediate relief is vital. Personnel assigned to units at or exceeding 0.3 may show signs of fatigue and burnout and may be at increased risk of errors. Required training and physical fitness sessions are not consistently completed.</td>
</tr>
</tbody>
</table>

In Figure 81, the UHUs of Nashua Fire Rescue units are displayed with their relative workloads from 2017 through 2019. While other units responded to incidents within the city during this time, their activity levels of response were low, 1% or less, and not included in this figure.

Figure 81. Unit Hour Utilization 2017–2019

<table>
<thead>
<tr>
<th>Unit</th>
<th>Count</th>
<th>Average</th>
<th>90th Percentile</th>
<th>UHU</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS-10</td>
<td>818</td>
<td>0:37:00</td>
<td>1:00:39</td>
<td>1.9%</td>
<td>504:22:07</td>
</tr>
<tr>
<td>ALS-11</td>
<td>770</td>
<td>0:37:06</td>
<td>0:59:30</td>
<td>1.8%</td>
<td>476:10:31</td>
</tr>
<tr>
<td>ALS-12</td>
<td>763</td>
<td>0:37:31</td>
<td>1:00:19</td>
<td>1.8%</td>
<td>477:09:53</td>
</tr>
<tr>
<td>ALS-9</td>
<td>870</td>
<td>0:33:30</td>
<td>0:58:58</td>
<td>1.8%</td>
<td>485:44:45</td>
</tr>
<tr>
<td>C4</td>
<td>4631</td>
<td>0:13:39</td>
<td>0:22:33</td>
<td>4.0%</td>
<td>1054:02:46</td>
</tr>
<tr>
<td>E1</td>
<td>7192</td>
<td>0:14:59</td>
<td>0:23:30</td>
<td>6.8%</td>
<td>1795:09:15</td>
</tr>
<tr>
<td>E2</td>
<td>6416</td>
<td>0:14:56</td>
<td>0:22:40</td>
<td>6.1%</td>
<td>1596:27:51</td>
</tr>
<tr>
<td>E3</td>
<td>3860</td>
<td>0:18:48</td>
<td>0:27:49</td>
<td>4.6%</td>
<td>1209:46:09</td>
</tr>
<tr>
<td>E4</td>
<td>8977</td>
<td>0:15:09</td>
<td>0:22:37</td>
<td>8.6%</td>
<td>2267:36:14</td>
</tr>
<tr>
<td>E5</td>
<td>5388</td>
<td>0:18:18</td>
<td>0:28:49</td>
<td>6.3%</td>
<td>1643:49:45</td>
</tr>
<tr>
<td>E6</td>
<td>5739</td>
<td>0:15:31</td>
<td>0:24:20</td>
<td>5.6%</td>
<td>1483:30:49</td>
</tr>
<tr>
<td>L1</td>
<td>5451</td>
<td>0:14:43</td>
<td>0:24:36</td>
<td>5.1%</td>
<td>1336:17:38</td>
</tr>
<tr>
<td>L2</td>
<td>4512</td>
<td>0:14:36</td>
<td>0:22:40</td>
<td>4.2%</td>
<td>1098:31:52</td>
</tr>
<tr>
<td>L3</td>
<td>2575</td>
<td>0:17:45</td>
<td>0:28:17</td>
<td>2.9%</td>
<td>762:03:58</td>
</tr>
</tbody>
</table>
When the Unit Hour Utilization of Nashua Fire Rescue units is calculated, all fall well below the thresholds for adding additional units to the system. Given the annual call volume, call concurrency rates, and UHUs, the fire department should have ample time for additional duties such as training, career development, and pre-fire planning.

**RESPONSE PERFORMANCE**

The most visible element of Nashua Fire Rescue is its response performance. How quickly units arrive on the scene and the efficiency they resolve an emergency situation are typically the only interaction most residents will have with the fire department. To evaluate the fire department’s performance, ESCI used NFPA 1710, which is the applicable standard for career fire departments.

Response time performance is comprised of the following components:

- **Call-Processing Time:** The amount of time between when a call is answered by the 911 Primary Public Safety Answering Point, or dispatch center, and when resources are dispatched.
- **Turnout Time:** The time interval between when units are notified of the incident and when the apparatus responds.
- **Travel Time:** The amount of time the responding unit actually spends on the road traveling to the incident until arrival at the scene. This is a function of speed and distance.
- **Response Time:** This time is calculated from the time the fire department is dispatched to the arrival of the first apparatus. Response Time equals the sum of “Turnout Time” and “Travel Time.”
- **Total Response Time:** This is the most apparent time to the caller requesting emergency services. Total response time is the amount of time that occurs from the time they place the emergency call until units arrive. This time often includes factors both within and outside the control of the fire department, particularly when another agency provides dispatch services.

Tracking the individual components of response time will enable Nashua to identify deficiencies and areas for improvement. Once Nashua Fire Rescue’s leadership understands the current performance for Call Processing, Turnout Time, and Travel Time, this information can be used to develop response goals and standards that are both relevant and achievable. Fire service best practices recommend that fire service organizations monitor and report the components of Total Response Time.

The Time Continuum is comprised of the three elements described above—Call-Processing, Turnout Time, and Travel Time. Total Response Time is the sum of all of the times starting with the call-processing time, turnout time, and travel time. The components of the Nashua Fire Rescue Response Time Continuum will each be evaluated in further detail in the next sections. The following figure is an illustration of the total response time continuum.
Historically, fire rescue service providers have used the performance measurement of average response to describe the levels of performance. The average is a commonly used descriptive statistic, also called the mean of a data set. Averages may not accurately reflect the performance for the entire data set because the average can be significantly skewed by data outliers, especially in small data sets. One extremely good or bad value can skew the “average” for the entire data set. Percentile measurements are a better measure of performance since they show that most of the data set has achieved a particular level of performance. The 90th percentile means that 90% of responses were equal to or better than the performance identified, and that the other 10% can be attributed to data outliers, inaccurate data, or situations outside of normal operations that delayed performance. This can be compared to the desired performance objective to determine the degree of success in achieving the goal.

An important consideration when evaluating fractile performance is that the results of each category are not additive, meaning that the sum of two or more constituent metrics cannot be simply added together to find the sum. This is because each dataset is discrete and, as such, must be observed individually, particularly when data quality is an issue. If a metric, such as response time, possesses the majority of its data points, while turnout time is not accurately documented, a significant difference can exist between the response time calculated using the fractile descriptive and the sum of turnout time and travel time.

In evaluating the various response time components using the fractile analysis method, each component must be evaluated and quantified separately, as the available data—and the quality of the data may vary significantly.
To provide an analysis of performance for emergency calls within Nashua, the following assumptions were made:

- Non-emergency incident types were removed
- Mutual and auto aid given were removed
- Other aid given were removed
- NFIRS call types within the 500, 600, 800, and 900 series were removed
- Cells containing zeros or no value were removed

**Call Processing Time Performance**

The industry standard for call processing (or alarm handling) is NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*. This standard provides for communication centers to have processing times of not more than 60 seconds, 90% of the time. For special operations, calls requiring translation, or other factors described in the standard, times should not exceed 90 seconds at the 90th percentile. It should be noted that Nashua Fire Rescue does not have direct supervision over the initial processing and transferring of emergency calls, so these performance measures are not within its control. This component of the process is performed at the state level by the New Hampshire Bureau of Emergency Communications (NHBECC). ESCI recommends that Nashua Fire Rescue actively work with the state of New Hampshire to ensure compliance with NFPA 1221.

Examination of Nashua’s 2017 through 2019 data revealed that overall alarm handling through the NHBECC exceeded the benchmark across all categories. Data containing missing time stamps or zero-time stamps for call processing were not included. The following figure illustrates call processing performance for the NHBECC shown at the 90th percentile.

**Figure 83. NHBECC Alarm Handling Time, 90th Percentile, 2017–2019**

<table>
<thead>
<tr>
<th>Category</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>02:57</td>
</tr>
<tr>
<td>OverPress</td>
<td>03:10</td>
</tr>
<tr>
<td>EMS</td>
<td>03:18</td>
</tr>
<tr>
<td>Haz Cond</td>
<td>03:36</td>
</tr>
<tr>
<td>Alarms</td>
<td>02:36</td>
</tr>
<tr>
<td>Total</td>
<td>03:11</td>
</tr>
</tbody>
</table>
Once the initial alarm handling is complete, the call is then routed to Nashua Fire Alarm for additional call processing and dispatch.

**Figure 84. Nashua Fire Alarm Dispatch Time, 90th Percentile, 2017–2019**

<table>
<thead>
<tr>
<th>Category</th>
<th>Average Dispatch Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>01:10</td>
</tr>
<tr>
<td>OverPress</td>
<td>00:59</td>
</tr>
<tr>
<td>EMS</td>
<td>00:58</td>
</tr>
<tr>
<td>Haz Cond</td>
<td>01:36</td>
</tr>
<tr>
<td>Alarms</td>
<td>00:59</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>01:03</strong></td>
</tr>
</tbody>
</table>

Overall, Nashua Fire Alarm nearly meets NFPA standards for call processing and dispatch. Additionally, Nashua Fire Alarm receives direct alarm notification of fire alarms and call box activations. This dramatically reduces the amount of time required to receive and transmit the notification of a potential emergency. The City of Nashua provides this as an included service to its residents.

Since the receipt of an emergency call, the alarm handling, and dispatch often occur in two steps within New Hampshire, the overall call processing time (NHBEC and Nashua Fire Alarm) is presented at the 90th percentile to illustrate the actual performance of the system as a whole.
The total call processing time for Nashua at the 90th percentile is 3 minutes, 32 seconds for emergency calls, 3 ½ times the industry standard. As shown in this figure, alarm processing times are much faster than other categories due to the direct receipt of many alarms from call boxes or directly linked fire panels within the city. The two-step process of all emergency calls first received at the NHBECC then transferred to the local department for dispatch creates additional delays within the system; however, this saves some communities the costs of additional infrastructure to support a standalone Public Safety Answering Point (PSAP).
**Turnout Time Performance**

The second component of the response continuum, and one that is directly affected by response personnel, is turnout performance. Turnout is the time it takes personnel to receive the dispatch information, move to the appropriate apparatus, and begin responding to the incident.

NFPA 1710 calls for a 90th percentile turnout performance of 80 seconds for fire and special operations calls and 60 seconds for EMS incidents. The following figure illustrates the turnout performance for Nashua Fire Rescue.

![Figure 86. Turnout Time, 90th Percentile, 2017–2019](image)

Overall, turnout times exceed NFPA standards by nearly double, with the best performance occurring on fire-related incidents. While it is the experience of ESCI that most departments cannot meet turnout time standards, Nashua has room for improvement in this area. Factors to consider when evaluating turnout times are station design configurations, staffing schemes, and crew performance.
Travel Time Performance

The third component of the response continuum is travel time. It is important to understand that travel time is not specifically a factor of speed as much as it is the result of proper placement of fire stations from which emergency response begins. Travel time is the amount of time between when the apparatus departs for the call and when it arrives on the scene, measured at the 90th percentile. NFPA 1710 requires that the first due fire or EMS unit arrives on the scene within a 4-minute, or 240-second, travel time. The following figure provides the travel time performance for Nashua Fire Rescue.

Figure 87. Travel Time, 90th Percentile, 2017–2019

Although above NFPA standards, Nashua’s travel time performance is strong at 4 minutes, 48 seconds overall. While travel times could be improved by the addition of resources in areas remote from current fire station locations, the City must balance community expectations with its ability to financially support public services, including the fire department.

In Figure 88, Nashua’s travel performance is illustrated as 10-acre hexagons, with each providing the average travel time to that area. Not surprisingly, travel performance is best in areas immediately adjacent to fire stations.
While the overall travel performance within Nashua is near or below 4 minutes, there are areas of the city that experience increased travel times. Areas north of the airport are difficult to reach directly due to the location of Station 5, and areas along the western border experience longer travel times as well. The commercial area between the Nashua Country Club and Circumferential Highway along the Merrimack River is an area for future evaluation. This location, as well as most locations along the river, are prime locations for additional development within the city. As commercial fires are generally more labor-intensive responses, delayed travel times to this area may compound fire suppression efforts. Additionally, increased development most often leads to increases in demands for services.
**Response Time Performance**

Response time is the amount of time from initial notification to the fire department until the first unit arrives on-scene. While not specifically addressed by NFPA 1710, it is a combination of turnout and travel time standards or 5 minutes, 4 seconds for the majority of responses and 5 minutes, 24 seconds for fire and special operations calls.

**Figure 89. Response Time, 90th Percentile, 2017–2019**

At under 7 minutes, response time performance within Nashua is strong. While improving turnout times will also improve response performance, overall, Nashua Fire Rescue provides fast responses when compared to other departments ESCI has evaluated. Finally, total response time is evaluated.
Total Response Time Performance

The culmination of the Response Time Continuum is total response time. When citizens call for emergency assistance, this metric represents what they experience as they place the call and wait for help to arrive. Total response time is the amount of time that elapsed from when the call was initiated at the communications center until the first emergency unit arrived on the scene. Like response time performance, NFPA 1710 does not provide a standard for this metric; however, it is presented here for informational purposes at the 90th percentile.

As previously discussed, the initial receipt of the emergency call occurs at the NHBECC and is then transferred to Nashua. To provide a comparison, first the total response time of Nashua Fire Rescue resources is displayed and then compared to the actual performance when the NHBECC component is included.

With an overall total response time of 7 minutes, 15 seconds, Nashua Fire Rescue’s ability to provide rapid response to emergencies is extremely fast based on ESCI’s experience. However, this performance represents only the components the City has direct control over. Since Nashua provides call boxes and direct alert notifications from alarm panels to Nashua Fire Alarm, these figures are representative of responses initiated using that system. Next, performance when calls are routed through the NHBECC is displayed.
When emergency calls pass through the NHBECC, 2 minutes, 30 seconds is added to the overall total response time at the 90th percentile for the City of Nashua. Nashua Fire Rescue may consider working with the NHBECC to determine if performance can be improved as well as educate its citizens regarding the limitations of the current system.

**Mutual Aid and Automatic Aid Systems**

Few if any organizations possess all the resources needed to mitigate all possible types of incidents. Additionally, when mutually beneficial agreements are possible, particularly when they occur at little cost to the organizations, good governance suggests that these opportunities should be seized to provide higher service levels to the communities involved. Two types of agreements are discussed in this section, mutual and automatic aid agreements. In mutual aid agreements, two or more organizations agree that, when requested, they will supply the other agency with the requested resources if available. For emergency services, this typically occurs at the request of responding or on-scene personnel. The other type of agreement, automatic aid, occurs, as the name implies, automatically. When an emergency call is received by the dispatch center, all available resources are examined based on the appropriate unit type and their proximity to the call, typically with the closest unit responding regardless of the jurisdiction in which the incident occurred. The following figure presents the locations of Nashua Fire Rescue stations, as well as the locations of automatic aid fire stations surrounding the municipal boundaries of Nashua.
Surrounding the City of Nashua, several fire departments are available to provide mutual aid if requested. The City of Nashua belongs to two mutual aid organizations that have jurisdiction in this area: the Border Area Community Group and the Souhegan Mutual Aid Association. For the majority of incidents, Nashua Fire Rescue possesses sufficient staffing to mitigate the emergency. However, if requested, numerous resources exist outside Nashua and could potentially provide additional assistance. Nashua should continue to participate in the mutual aid system and conduct periodic training with its mutual aid partners to ensure a continuity of operations while on the scene of emergency incidents.
Section V. Future System Demand Projections

The City of Nashua reports that the following projects are various phases of the planning stages:

**Figure 93. Nashua Economic Development**

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bridge Street Waterfront Development Project</strong></td>
<td>A mixed-use development with up to 700 units of housing situated in a village concept. The project will include supporting commercial and retail space.</td>
</tr>
<tr>
<td><strong>Buck Meadow Road</strong></td>
<td>Construction of a new middle school.</td>
</tr>
<tr>
<td><strong>Central Street</strong></td>
<td>Demolition of existing 50-unit public housing project. Four new 4 story buildings to be constructed; approximately 260 units. Building A: 90,840 square feet Building B: 93,400 square feet Building C: 39,837 square feet Building D: 29,532 square feet</td>
</tr>
<tr>
<td><strong>Credit Union on Broad Street</strong></td>
<td>New construction; 10,000 square feet.</td>
</tr>
<tr>
<td><strong>Crown Street Shelter</strong></td>
<td>Renovation of a 25,000 square foot vacant Catholic School into a homeless shelter.</td>
</tr>
<tr>
<td><strong>Daniel Webster Highway</strong></td>
<td>Renovation of vacant retail building into a supermarket; 45,000 square feet.</td>
</tr>
<tr>
<td><strong>Downtown Circulation Study</strong></td>
<td>The purpose of the study is to identify potential strategies to improve roadway and intersection traffic flow and mobility within Downtown Nashua, strengthen pedestrian and bicycle connections with the core downtown area, and enhance accessibility for residents and businesses.</td>
</tr>
<tr>
<td><strong>Dumaine Avenue</strong></td>
<td>30 units of new 2 story townhouses.</td>
</tr>
<tr>
<td><strong>Exit 36 South</strong></td>
<td>Progress continues to be made on the Exit 36 South Planning Study to assess the effectiveness of a southbound off-ramp at Exit 36 on the F.E. Everett Turnpike, near the New Hampshire and Massachusetts border. Once constructed, the project will help to alleviate traffic bottlenecks in Nashua’s south end, facilitate growth on development sites, and help maximize multi-modal transportation opportunities.</td>
</tr>
<tr>
<td><strong>Fairgrounds Middle School</strong></td>
<td>Renovation and addition.</td>
</tr>
<tr>
<td><strong>Flex Buildings on Innovative Way</strong></td>
<td>Single story commercial buildings, new construction. Building (1) 12,000 square feet Building (2) 16,800 square feet Building (3) 10,500 square feet</td>
</tr>
<tr>
<td><strong>Groton Road</strong></td>
<td>25-unit detached condo development.</td>
</tr>
<tr>
<td><strong>Groton Road</strong></td>
<td>11-unit subdivision of single-family homes.</td>
</tr>
<tr>
<td><strong>Innovative Way</strong></td>
<td>4-story self-storage building; 73,442 square feet.</td>
</tr>
<tr>
<td>Project</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lock Street</td>
<td>18 New townhouse units.</td>
</tr>
<tr>
<td>Nashua Downtown Riverfront Development</td>
<td>The plan’s broad recommendations include connected walkways, landscaping, enhanced access to the waterfront and the River itself, wayfinding amenities, historical and natural resource protection, lighting, alternative parking solutions with potential for new construction, and ensuring future maintenance of improvements. This plan represents a vision for dramatically improving the way our Downtown riverfront looks and feels, to become a true asset for the community and a destination for the region.</td>
</tr>
<tr>
<td>Nashua Landing</td>
<td>Multistory self-storage; 105,000 square feet. Construction of new Costco store with fueling station; 150,000 square feet.</td>
</tr>
<tr>
<td>New Hampshire Capitol Corridor</td>
<td>The New Hampshire Capitol Corridor project will evaluate a diverse set of rail and bus options for improving connectivity in the NH Capitol Corridor by leveraging existing transportation infrastructure, including the Pan Am Railway, US Route 3, and I-93.</td>
</tr>
<tr>
<td>Pennichuck Middle School</td>
<td>Renovation and large addition.</td>
</tr>
<tr>
<td>Performing Arts Center Feasibility Study</td>
<td>In the Fall of 2016, the Economic Development Division and a special working group of Alderman and stakeholders in the arts community began working with the arts consultant Webb Management on the establishment of a new arts district as well as the creation of a new 500–700 seat performing arts venue in Downtown.</td>
</tr>
<tr>
<td>Public Health Department on Mulberry Street</td>
<td>100% renovation to building; 15,500 square feet.</td>
</tr>
<tr>
<td>Renaissance Nashua Phase 2</td>
<td>New construction of 3 five story apartment buildings: Building A: 76,400 square feet Building B: 51,715 square feet Building C: 60,989 square feet</td>
</tr>
<tr>
<td>School Street Flats</td>
<td>New construction of 7-Story apartment/mixed use building; 151,772 square feet.</td>
</tr>
<tr>
<td>Spring Street Shelter</td>
<td>Renovation of a 20,000 square foot vacant Catholic School into a homeless shelter.</td>
</tr>
<tr>
<td>Supermarket on Daniel Webster Highway</td>
<td>30,000 square feet, renovation of existing space.</td>
</tr>
<tr>
<td>Townhouses on Storage Drive</td>
<td>New construction: 28 Units, 3 stories.</td>
</tr>
<tr>
<td>U-Haul Self-Storage on Amherst Street</td>
<td>New construction 2-story climate-controlled storage building; 68,000 square feet.</td>
</tr>
</tbody>
</table>
POPULATION PROJECTIONS

The population of the City of Nashua has remained consistent since the 2010 U.S. Census. During the last 10 years, census projections estimate that the city experienced a population increase of approximately 3,100 people or 3.6%. Based on U.S. Census population projections, proprietary demographic data from Environmental Systems Research Institute (Esri), and information from the Nashua Regional Planning Council, three estimates were developed for future population estimates. All models maintain annual population growth below 0.5% per year with a population difference of 7,683 by 2040.

Figure 94. Nashua Population Projections, 2020–2040

An important consideration to population is its relationship to service demand. Generally speaking, service demand will be greater in areas of high population density than lower population density; however, the area’s demographics also play a large role in demand. For example, a newly constructed subdivision occupied by young professionals and families would likely be much less dependent upon emergency medical services than a neighborhood occupied primarily by retirees. Although the population densities may be equivalent, the dependence upon emergency responders would differ.
SERVICE DEMAND PROJECTIONS

The demand for services is central to the existence of a fire department. Often as the population rises or falls, so does the demand for services. As discussed in the previous section, the population of Nashua has remained relatively constant since 2010. Because of this, it can be anticipated that the demand for service should be consistent year to year as well. As this level of increase is generally in line with the local estimates for population change, a per capita rate using the high and low rates of incidents per year divided by population for 2016 through 2019 was applied to forecast populations and projected out to the year 2040. The results are shown in the following figure.

Based on this rate of increase, Nashua Fire Rescue could anticipate that annual service demand would remain fairly constant through 2040. As with any forecast, local and external factors can dramatically impact changes to both population and service demand. Changes in demographics, the median age of a population, and other factors also influence the demand for services. New construction along the river front may also impact the rate of change as homes and businesses are established in previously underdeveloped areas.
Section VI. Recommended Future Delivery System Models

The project concludes with strategies that are intended to place Nashua Fire Rescue in a position to manage the risk within the community successfully and to respond to the future demand for service effectively. ESCI developed the following recommendations with the specific intent of identifying options that can deliver the desired levels of service at the most efficient cost.

Within each of the five operational areas detailed in this report, ESCI offers both Short- and Mid-Term Strategies, as well as Long-Term Strategies.

Short- and Mid-Term Strategies vary in complexity and financial impacts. While future drivers of service demand are considered, these recommendations tend to be based on the current conditions of an organization and strategic objectives obtainable in less than three years.

Long-Term Strategies are typically associated with timeframes over three years. Future drivers of increased service demand are often critical components to be considered when identifying long-term strategies. These recommendations vary in complexity and financial impacts.

Short and Mid-Range Deployment Options

Management Components

1. **ESCI recognizes that this report contains a multitude of recommendations that cannot all be accomplished simultaneously. Nashua Fire Rescue should facilitate a Strategic Plan to consider and prioritize the goals and objectives that are recommended within this Master Plan.**

   The strategic planning process would ideally result in a three-to-five-year work plan, intended to guide the work effort of the entire organization toward a common set of goals and objectives. The process should include representation from every major interest group in the organization. Each person in the Department should feel that their interests are represented by someone in attendance on the planning team.

2. **Nashua Fire Rescue’s Rules and Regulations are reviewed and updated by a committee comprised of uniformed members, administration, and the Board of Fire Commissioners on an “as-needed” basis. All department policies are incorporated into Nashua Fire Rescue’s Rules and Regulations.**

   ESCI suggests that rather than leaving the policy review schedule open to interpretation of “as needed”, that Nashua Fire Rescue set a review schedule that provides for every policy to be reviewed and updated no less than every three years. This review should also include an annual gap analysis to identify the need for new rules and regulations.

3. **Nashua Fire Rescue would benefit from having a review of all rules and regulations conducted by an independent third-party.**

   ESCI suggests that Nashua engage the services of an independent third party to the fire department’s rules and regulations to assure compliance with industry standards and best practices.
4. **Nashua Fire Rescue maintains a website and social media presence to provide information to its customers, but it does not have a formal citizen feedback/input mechanism in place to receive necessary end-user feedback.**

ESCI recommends that Nashua Fire Rescue continue to develop its social media presence in an effort to provide information to, and receive information from, its customers. ESCI also recommends that Nashua Fire Rescue evaluate the use of a survey tool to collect performance feedback of those citizens who have used the Department’s services. The gathering of information directly from these individuals will allow Department and City leadership to key in on specific performance issues that allow for intervention in a timelier manner, as well as highlight those performance issues that customers indicate as being of high value.

5. **Nashua Fire Rescue has implemented computers at all fire stations to use in recording incidents, accessing emails and Department operating procedures, and recording equipment inventories. At the time of this report, the Department did not have a formal IT management strategy in place.**

Technology is an evolving field and agencies failing to have plans in place to address ongoing changes in operating systems can be caught in a position of being required to expend significant and finite budget revenues to update computers no longer supported by manufacturers. As part of its records management efforts, the Department utilizes Alpine RedNMX RMS® and Windows® based computers to accomplish its organizational responsibilities. The Department uses the City’s IT services to maintain its computer inventory and securely store digital records off-site. ESCI recommends that Nashua Fire Rescue work with its IT services to ensure an effective IT management strategy is in place to address current and future department related software are operated and maintained in accordance to standards within NFPA 950: Standard for Data Development and Exchange for the Fire Service and NFPA 951: Guide to Building and Utilizing Digital Information.

6. **Nashua Fire Rescue should consider staffing a dedicated IT position.**

Information Technology (IT) is a challenge within Nashua Fire Rescue. The city currently staffs a central IT Division that services all city departments with the exception of the police department. In recent years, the fire department has become increasingly more reliant on computers, laptops and tablets for both routine and emergency operations more.

7. **ESCI recommends that Nashua Fire Rescue implement the use of an online platform, such as Target Solutions®, as a mechanism to inform individuals when new policies and procedures are published.**

Interviews with various stakeholders indicated that Nashua Fire Rescue sometimes encounters challenges with ensuring accountability for reading and confirming understanding of the new, or updated, policy when placed onto the intranet. ESCI recommends that Nashua Fire Rescue implement the use of an online platform, such as Target Solutions®, as a mechanism to inform individuals when new policies and procedures are published. This system allows each employee to receive the new documents personally and acknowledge receipt with an electronic timestamp. The system also enables the Department to require each employee to answer questions specific to the document’s content and ensure the employee receives the desired information. Since Nashua Fire Rescue is preparing to begin using the Target Solutions® platform in its Training Program, using the program to track policies and procedures would be a logical next step.
8. **Nashua Fire Rescue should work to formalize its mental health program to ensure that its firefighters have the resources they need when they need them.**

Our nation’s firefighters are faced with emotional needs that are very different and unique to the occupation. The percentage of firefighters struggling with career-related stress is very high, with suicide rates climbing each year. These issues manifest themselves through higher divorce rates and addictions such as alcohol, drugs, or gambling. Frequently seen in recent studies and another major concern is Post Traumatic Stress Disorder (PTSD). As these symptoms occur, employees need a support system in place that is readily accessible from someone who is qualified and truly understands his or her circumstances.

While the Department has provided mental health education for its firefighters, in light of the increasing need across the nation for mental health support for firefighters, Nashua Fire Rescue may choose to use local resources to establish a program or can draw from national resources such as those that are available through the IAFF or the First Responder Center for Excellence (FRCE).

9. **ESCI recommends that the joint labor management committee that reviews the current promotional process evaluates the process in its entirety to ensure that the test components correlate to the current job descriptions and JPRs established by the national standard as they relate to the positions within Nashua Fire Rescue.**

NFPA 1021 is the Standard for Fire Officer Professional Qualifications. This standard identifies the minimum job performance requirements (JPRs) for the various ranks of fire officers. As the ultimate goal should be to ensure a defensible promotion process in the event of a legal challenge, ESCI also suggests that Nashua Fire Rescue re-evaluate the merits of including the civilian Board of Fire Commissioners within the promotional process. It is ESCI’s suggestion that Nashua Fire Rescue may be able to improve the current promotional process by allowing the professional human resources and fire department personnel to conduct the entire process, thereby eliminating the potential political influence that could be introduced by the inclusion of the elected board.

10. **Nashua Fire Rescue should make it a priority to alert only the fire station(s) that are dispatched to calls to reduce the constant radio traffic that is currently transmitted to all of the stations.**

One issue that was repeatedly brought up to ESCI during the site visit meetings was a strong desire by the membership to have quiet stations. Nashua Fire Rescue responded to more than 8,000 calls last year, or an average of 21 calls per day. At the time of ESCI’s site visit, firefighters in every station heard the radio traffic for every call, whether or not the members of that station were assigned to respond.

A study published in the *American Journal of Industrial Medicine* in 2018 found higher rates of hypertension and high cholesterol in people who were regularly exposed to loud noises at work. Loud noises were defined as four or more hours a day, several days a week, when individuals needed to raise their voice or shout to be heard by someone standing a few feet away. The researchers concluded that as many as 14% of cases of hypertension and 9% of cases of high cholesterol were potentially a result of noise exposure—possibly due to the stress of a loud working environment.
11. **Nashua Fire Rescue should develop a Professional Development Program for all positions within the organization.**

While Nashua Fire Rescue has a program in place to provide books and tuition reimbursement for its firefighters, it lacks a Professional Development Program (PDP). A successful Professional Development Program will benefit both the employees and the organization they serve. The intent of the Professional Development Program is to engage employees in identifying gaps in understanding and development that prepares and enables him or her to be successful in current and future roles. This directly translates to personal fulfillment and job satisfaction as well as positioning employees for future success within the organization. A comprehensive PDP should be developed for each organizational level: front-line personnel, first-level supervisors, mid-level managers, and senior leaders.

The International Association of Fire Chiefs has developed the Officer Development Handbook, which is intended to function as the foundation for any organization’s Professional Development Program. The handbook provides a foundation and explanation of the basic tenets of a Professional Development Program upon which an organization can build upon and customize to meet its own needs.

**Service Delivery**

12. **Nashua Fire Rescue should work with the New Hampshire Bureau of Emergency Communications to ensure compliance with NFPA 1710 4.1.2.1.**

   *(1) Alarm handling time completion in accordance with 4.1.2.3.*

<table>
<thead>
<tr>
<th>Response Interval</th>
<th>NFPA/CFAI Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Processing</td>
<td>64 seconds or less at 90%</td>
</tr>
</tbody>
</table>

Figure 96. NFPA 1710 4.1.2.3

It should be noted that Nashua Fire Rescue does not have direct supervision over the initial processing and transferring of emergency calls, so these performance measures are not within its control. This component of the process is performed at the state level by the New Hampshire Bureau of Emergency Communications (NHBECC). ESCI recommends that Nashua Fire Rescue actively work with the State of New Hampshire to ensure compliance with NFPA 1221.

Examination of Nashua’s 2017–2019 data revealed that overall alarm handling through the NHBECC exceeded the benchmark across all categories. Data containing missing time stamps or zero-time stamps for call processing were not included. The following figure illustrates the call processing performance for the NHBECC shown at the 90th percentile.
Once the initial alarm handling is complete, the call is then routed to Nashua Fire Alarm for additional call processing and dispatch.

Overall, Nashua Fire Alarm nearly meets NFPA standards for call processing and dispatch. Additionally, Nashua Fire Alarm receives direct alarm notification of fire alarms and call box activations. This dramatically reduces the amount of time required to receive and transmit the notification of a potential emergency. The City of Nashua provides this as an included service to its residents.

Since the receipt of an emergency call, the alarm handling, and dispatch often occur in two steps within New Hampshire, the overall call processing time (NHBECC and Nashua Fire Alarm) is presented at the 90th percentile to illustrate the actual performance of the system as a whole.
The total call processing time for Nashua at the 90th percentile is 3 minutes, 32 seconds for emergency calls, 3 ½ times the industry standard. As shown in this figure, alarm processing times are much faster than other categories due to the direct receipt of many alarms from call boxes or directly linked fire panels within the city. The two-step process of all emergency calls first received at the NHBECC then transferred to the local department for dispatch creates additional delays within the system; however, this saves some communities the costs of additional infrastructure to support a standalone Public Safety Answering Point (PSAP).

13. Nashua Fire Rescue should work toward compliance with NFPA 1710 4.1.2.1. The Department shall establish the following performance objectives for the first-due response zones that are identified by the AHJ:

(2) 80 seconds turnout time for fire and special operations responses and 60 seconds turnout time for EMS responses.

Turnout is the time it takes personnel to receive the dispatch information, move to the appropriate apparatus, and begin responding to the incident.

NFPA 1710 calls for a 90th percentile turnout performance of 80 seconds for fire and special operations calls and 60 seconds for EMS incidents. The following figure illustrates the turnout time performance for Nashua Fire Rescue.
Overall, turnout times exceed NFPA standards by nearly double, with the best performance occurring on fire-related incidents. While it is the experience of ESCI that most departments cannot meet turnout time standards, Nashua has room for improvement in this area. Factors to consider when evaluating turnout times are station design configurations, staffing schemes, and crew performance.

Additionally, technology such as television monitors that provide real time incident information, pre-alerting, and consistent use of mobile data terminals to capture response metrics can also improve turnout times. Ultimately, Nashua Fire Rescue must adopt their own performance goals and should report on performance on a regular basis such as monthly or quarterly. Finally, all radio traffic is broadcast throughout all fire stations day and night. A contributing factor to delayed turnout times may be related to firefighters tuning out the majority of radio traffic throughout the day and relying on someone within the station to hear when a unit is actually being dispatched from that station. Nashua should work to correct this immediately.
14. **Nashua Fire Rescue should work toward compliance with NFPA 1710 4.1.2.1. The Department shall establish the following performance objectives for the first-due response zones that are identified by the AHJ:**

   (3) *240 seconds or less travel time for the arrival of the first engine company at a fire suppression incident.*

It is important to understand that travel time is not specifically a factor of speed as much as it is the result of proper placement of fire stations from which emergency response begins. Travel time is the amount of time between when the apparatus departs for the call and when it arrives on the scene, measured at the 90th percentile. NFPA 1710 requires that the first due fire or EMS unit arrives on the scene within a 4-minute, or 240-second, travel time. The following figure provides the travel time performance for Nashua Fire Rescue.

![Figure 101. Travel Time, 90th Percentile, 2017–2019](image)

Although above NFPA standards, Nashua’s travel time performance is strong at 4 minutes, 48 seconds overall. While travel times could be improved by the addition of resources in areas remote from current fire station locations, the City must balance community expectations with its ability to financially support public services, including the fire department.

In Figure 101, Nashua’s travel performance is illustrated as 10-acre hexagons with each providing the average travel time to that area. Not surprisingly, travel performance is best in areas immediately adjacent to fire stations.
While the overall travel performance within Nashua is near or below 4 minutes, there are areas of the city that experience increased travel times. Areas north of the airport are difficult to reach directly due to the location of Station 5, and areas along the western border experience longer travel times as well. The commercial area between the Nashua Country Club and Circumferential Highway along the Merrimack River is an area for future evaluation. This location, as well as most locations along the river, are prime locations for additional development within the city. As commercial fires are generally more labor-intensive responses, delayed travel times to this area may compound fire suppression efforts. Additionally, increased development most often leads to increases in demands for services.

15. **Nashua Fire Rescue should capture the benchmarks to track the following data and monitor compliance with NFPA 1710 4.2.1.**

The Department shall establish the following performance objectives for the first-due response zones that are identified by the AHJ:

*(4) 360 seconds or less travel time for the arrival of the second company with a minimum staffing of 4 personnel at the fire suppression incident.*

*(5) For other than high-rise, 480 seconds or less travel time for the deployment of an initial full alarm assignment at a fire suppression incident.*
(6) For high-rise, 480 seconds or less travel time for the deployment of an initial full alarm assignment at a fire suppression incident.

At the time of ESCI’s site visit, Nashua Fire Rescue was not tracking and monitoring these performance metrics.

16. **Nashua Fire Rescue should work toward compliance with NFPA 1710 4.1.2.1. The Department shall establish the following performance objectives for the first-due response zones that are identified by the AHJ:**

(7) 240 seconds or less travel time for the arrival of a unit with first responder with automatic external (AED) or higher-level capability at an emergency medical incident.

The standard for travel time for EMS calls is 240 seconds, or 4 minutes. As illustrated previously, Nashua Fire Rescue’s travel time performance to EMS calls overall was 5 minutes, 2 seconds, which is 1 minute, 2 seconds longer than the expected performance. With geographic location having the greatest impact on travel time, leadership and governing bodies must weigh the factors associated with working to meet that standard.

17. **Nashua Fire Rescue should submit an annual report to the AHJ in accordance with NFPA 1710 4.1.2.5.1.**

4.1.2.5.1 The fire department shall evaluate its level of service and deployment delivery of alarm handling time, turnout time, and travel time performance objectives on an annual basis.

4.1.2.5.2* The evaluations shall be based on emergency incident data relating to the level of service, deployment, and the achievement of each travel time performance objectives in each geographic area within the jurisdiction of the fire department.

4.1.2.6 The fire department shall provide the AHJ with a written report annual.

4.1.2.6.1 The annual report shall define the geographic areas and/or circumstances in which the requirements of this standard are not being met.

4.1.2.6.2 The annual report shall explain the predictable consequences of these deficiencies and address the steps that are necessary to achieve compliance.

4.1.2.6.3 The annual report shall identify any deficiencies that are anticipated to develop in the next 3 years and address the steps necessary to continue to achieve compliance to this standard.

Nashua Fire Rescue currently collects and evaluates the data that is identified in this section of NFPA 1710. ESCI suggests that Nashua Fire Rescue should include a concise report to the AHJ that includes only the aforementioned information. This document should serve as an ongoing source of evaluation and discussion between Nashua Fire Rescue and City Officials about the resources that are required to meet the established performance criteria.
18. **Nashua Fire Rescue should modify its current alarm assignments to satisfy critical staffing functions for fires in occupancies such as strip malls and garden apartments.**

Nashua Fire Rescue does not differentiate the initial alarm assignment by occupancy. As such, a fire in a strip mall or garden apartment, both of which NFPA 1710 recommends 28 firefighters on an initial full alarm assignment, will each have 18 firefighters initially dispatched. It would be up to the Incident Commander to request a “Working Fire” assignment which would increase the response from 18 to 26 firefighters. A second alarm assignment would send an additional engine and ladder truck and a total of 8 additional firefighters. The second alarm assignment would put a total of 34 firefighters on-scene for a fire in a strip mall or garden apartment, which exceeds the 28 firefighters specified by NFPA 1710.

ESCI suggests that Nashua Fire Rescue should modify its current alarm assignments to satisfy critical staffing functions for fires in occupancies such as strip malls and garden apartments by ensuring that the initial full alarm assignment deploys at least 28 firefighters rather than requiring the Incident Commander to request additional alarms to provide the appropriate number of firefighters.

**Administrative Staffing**

19. **Nashua Fire Rescue should evaluate the potential benefits of restructuring the Administrative Division to include an Assistant Chief of Uniform Professional Standards. This Assistant Chief would report to the Chief of Department and be tasked with:**

   - **Investigating all internal affairs type activities**, thus removing this work from the Chief and existing Assistant Chief. The single point of contact within the fire department as well as close collaboration with Human Resources will better position Nashua Fire Rescue to address these types of issues more consistently and to hold members accountable as appropriate.

   - **Develop and manage a communications plan** for regular and consistent communications with the Operations Division. Communication has been a critical weakness within Nashua Fire Rescue for decades that is getting progressively worse. This problem will continue to fester, thus further negatively impacting morale and the operations of the fire department until such a time that there are focused resources dedicated to improving this deficiency.

   - **Manage the recruitment of new firefighters**, thus removing this work from the Training and Safety Division. Training was repeatedly identified as a major weakness within Nashua Fire Rescue. The reassignment of recruitment duties to the Assistant Chief of Uniform Professional Standards will allow the Training and Safety Division to focus their efforts on improving the Nashua Fire Rescue Training Program.

   - **Oversight of the Nashua Fire Rescue Training Program.** As previously noted, training was repeatedly identified as a major weakness within Nashua Fire Rescue. Placing the Training Safety Division under the direction of the Assistant Chief of Uniform Professional Standards will provide the oversight that is necessary to establish and then achieve simple, manageable, achievable, reasonable, and timely (SMART) goals to systematically improve the Nashua Fire Rescue Training Program.
- **Manage the promotion process** in conjunction with Human Resources. ESCI recommended within the *Promotions Processes* Section of this report that Nashua Fire Rescue re-evaluate the merits of including the civilian Board of Fire Commissioners within the promotional process. It is ESCI’s suggestion that Nashua Fire Rescue may be able to improve the current promotional process by allowing the professional human resources and fire department personnel to conduct the entire process, thereby eliminating the potential political influence that could be introduced by the inclusion of the elected board. The Assistant Chief of Uniform Professional Standards would be well-positioned to facilitate this process on behalf of the fire department.

- **Develop, implement, and manage a Professional Development Program** for Nashua Fire Rescue. *Officers* who fail to learn *leadership* skills are challenged almost immediately upon promotion. As detailed in the Career Development section of this report, both Nashua Fire Rescue and its employees stand to gain from the development and implementation of a Career Development Program.

**Emergency Services Division**

20. **Nashua Fire Rescue should consider creating a promoted position of Apparatus Driver.**

Each firefighter within Nashua Fire Rescue is expected to be able to operate the fire apparatus. ESCI suggests that Nashua Fire Rescue consider creating a promotional position for Driver. In 2017 alone, more than 15,000 fire department vehicles were involved in collisions nationwide, resulting in 4,555 firefighter injuries occurring while responding to or returning from an incident.\(^{30}\) Considering the risk involved in operating emergency vehicles, it would be prudent for Nashua Fire Rescue to establish promoted Driver positions that require additional and ongoing safe driver training.

21. **To reduce overtime expenses, Nashua should consider hiring additional firefighters to achieve a 1.2% Staffing Relief Factor.**

In 2020 and for 2021, Nashua budgeted $842,818 in overtime and overtime coverage. An alternative approach to using overtime coverage is the use of a staffing relief factor. A relief factor is the amount of additional FTE positions needed to reasonably cover time off including, leave, training, vacancies, etc. The following is an industry-accepted methodology used to determine a relief factor to cover paid leave, training time off, and vacancies adequately for 24-hour fire and EMS department shifts. While overtime cannot be reasonably eliminated in all situations, the relief factor, when calculated based on the department’s time off usage, will significantly reduce overtime and ensure that adequate staffing is available. Determining the relief factor is outlined in the following:

- The average of Nashua Fire Rescue FY 2017–19 firefighter paid leave, time off for training, unscheduled time off, and position vacancies is 54,720 hours annually.
- 54,720 hours divided by the scheduled 2,184 hours per position annually = 25.1 FTEs of annual coverage required for time off.

When the total average time off per FTE (360) is subtracted from the total annual hours per FTE (2,184), the result is an average of 1,824 hours per year actually worked.

By dividing total annual hours scheduled (2,184) by hours actually worked (1,824), a relief factor of 1.2% is achieved.

This results in a total of 176 operational FTEs or 44 FTEs per shift using the 1.2% relief factor.

In most cases, organizations seeking to achieve the desired relief factor must do so in stages. In the case of Nashua, it may be reasonable to add four firefighters per year over a 6-year period to achieve a 1.2% relief factor. Additionally, the Staffing for Adequate Fire and Emergency Response (SAFER) grant offered through FEMA can provide funding for the hiring of new firefighter positions.

**Fire Marshal Division**

22. *Nashua Fire Rescue should establish a formal Community Risk Reduction Program and re-institute the Public Educator Position that was eliminated in 2006.*

The duties of Nashua Fire Rescue's Fire Marshal's Office are shared among a full-time Administrator, a Fire Marshal, and two Fire Inspectors/Investigators. The Department previously had a Public Educator position; however, the funding mechanism was removed in the 2006 fiscal year budget. Public education is an essential function performed by the fire service and is a vital part of any agency's community risk reduction program. The Public Educator position was eliminated in the 2006 budget and currently, Nashua Fire Rescue does not have an established fire prevention or community risk reduction program in place. In addition, Nashua had a strong regional Juvenile Fire Setter program; however, it was disbanded many years ago. NFPA 1730 and the Vision 20/20 *National Strategies for Fire Loss Prevention* program are the current best practices regarding this area of fire prevention. ESCI would further recommend that the Public Educator's position that was eliminated in the 2006 fiscal year budget be reinstated to ensure the development and implementation of a model community risk reduction program within the city.

23. *Nashua Fire Rescue should create a targeted Community Risk Reduction Program for people with disabilities.*

8,922 of the 37,124 households within the City of Nashua reported having one or more members with a disability. This comprises 24%, or almost a quarter of the households which presents an opportunity for education and community risk reduction within the Nashua community.

24. *Nashua Fire Rescue should create a targeted Community Risk Reduction Program for people who speak a language other than English.*

The minority population in the city is higher than the New Hampshire average, but less than the national average. The percentage of the population that are foreign-born (15.8%) is very high comparatively. In addition, 21.7% of the population of Nashua speak a language other than English. This suggests that normal English versions of fire safety messages are potentially missing a large cross-section of the community. Prevention and education messages could reach more residents if the messaging was expanded to include additional languages.
25. **Nashua Fire Rescue should take steps to ensure that firefighters and command staff have comprehensive, accurate information readily at hand to identify hazards, direct tactical operations, and use built-in fire-resistive features by purchasing software that is designed for this purpose.**

ESCI recommends that Nashua Fire Rescue purchase a software program that is specifically designed to make the information that is collected during pre-plans readily accessible to firefighters in an emergency. Many such programs are on the market including Streetwise, Blazmark, and Raxar, among others.

26. **Nashua Fire Rescue should increase the number of Fire Inspectors to bring inspection frequency into compliance with NFPA 1730.**

The present staffing level does not allow for regular inspections to be completed at all target hazard occupancies such as apartment complexes and multi-family dwellings. These occupancies are often only inspected when a complaint is generated by a tenant, landlord, or the building official.


6.6* Required Personnel. The AHJ shall determine the minimum resources, personnel, and equipment levels necessary to perform code enforcement and inspection activities.

6.7 Minimum Inspection Frequency. Existing occupancy fire prevention inspection and code enforcement inspection frequencies shall not be less than those specified in Table 6.7.

<table>
<thead>
<tr>
<th>Occupancy Risk Classification</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Annually</td>
</tr>
<tr>
<td>Moderate</td>
<td>Biennially</td>
</tr>
<tr>
<td>Low</td>
<td>Triennially</td>
</tr>
<tr>
<td>Critical Infrastructure</td>
<td>Per AHJ</td>
</tr>
</tbody>
</table>

27. **Nashua Fire Rescue consider the addition of a civilian plans reviewer position.**

A civilian plans reviewer position could bring stability to the Fire Marshal's Office because that position would not be expected to promote out of the office. This position could be an economical way to redistribute the Fire Marshal's workload, thus allowing for the completion of regular inspections of all target hazards in the City.

**Training and Safety Division**

28. **Nashua Fire Rescue should establish a dedicated budget for the Training and Safety Division.**

Currently, the Training and Safety Division does not have an assigned budget. This poses a problem for the addition and delivery of outside training programs that could assist in the development of both firefighters and officers as a whole. The importance of these additions can have a major impact on the training goals for the entire Department. Nashua Fire Rescue may consider breaking out funding for each division and having those dollars tracked to allow for better management and understanding across divisions.
29. **The Nashua Fire Rescue Training and Safety Division needs at least one additional instructor.**

Members of the Department repeatedly identified the Nashua Fire Rescue Training Program as a significant weakness. The addition of a fourth position within the Division would streamline the delivery of fire and rescue training as well as the administration of EMS continuing education and the quality control of the New Hampshire required TEMSIS EMS reports.

30. **An online learning platform such as Target Solutions into the Nashua Fire Rescue Training Program would allow for more efficiency and better tracking for training purposes.**

Members of the Department repeatedly identified the Nashua Fire Rescue Training Program as a significant weakness. While the Division is in dire need of at least one additional full-time Instructor, the addition of an online learning platform such as Target Safety would allow for more efficiency and better tracking for training purposes.

Currently, the New Hampshire Fire Academy has NHOODLE, which serves as an online platform for certain fire and EMS trainings. With the addition of an online platform, the members of the Training and Safety Division could deliver training skills sheets and documents that would allow for the optimization of hands-on training hours. The addition of an online training platform may also alleviate the problem of taking companies out of service for training while ensuring a robust emergency response capability. This will also allow for members of the Division to be present for more training evolutions.

31. **Nashua Fire Rescue should coordinate regular use of the fire training facility by all of its companies to ensure proficiency.**

ESCI heard from members at virtually every meeting that their access to the training facility was very limited or, in some cases, almost non-existent. The value of hands-on training in a controlled environment cannot be overstated.

32. **ESCI encourages the integration of outside instructors into the Nashua Fire Rescue Training Program.**

The use of instructors from outside of Nashua Fire Rescue is critical to the future success of the Nashua Fire Rescue Training Program as it diversifies the perspectives of the firefighters and brings new ideas into the organization.

33. **ESCI recommends that Nashua Fire Rescue develop and implement a formalized training manual that encompasses an umbrella-type system to ensure members of the Training and Safety Division and company officers can affect clear and defined training.**

NFPA 1410: *Standard on Training for Emergency Scene Operations* contains the context and minimum requirements for fire departments to evaluate training for fire suppression and rescue procedures used by members operating at emergency scenes.
**Fire Alarm Division**

34. *Nashua Fire Rescue should consider the possible future need to make the communications compliant with the Americans with Disabilities Act.*

The Center is not compliant with the Americans with Disabilities Act, Title II, in that they do not have an elevator to the Center, which is located on the second floor.\(^{31}\)

35. *Nashua Fire Rescue should install a bollard around the generator in the parking lot at the Communications Center.*

The backup power generator for the Communications Center is located in the parking lot. Bollards should be installed to prevent a vehicle from disabling the generator.

**Capital Improvements**

36. *Nashua Fire Rescue should implement video monitoring and recording at exterior entry points to ensure an increased level of security and awareness as to who is or attempting to enter Nashua Fire Rescue facilities.*

These monitoring systems also can record activity occurring in the area of a fire station while crews may not be in the station. ESCI recommends that Nashua Fire Rescue implement video monitoring and recording at all exterior entry points to ensure increased security and awareness of those who may attempt to gain access to facilities.

37. *Nashua Fire Rescue should consider implementing an access card system that identifies each fire department member accessing facilities.*

This evaluation should also include the ability of Nashua Fire Rescue leadership to change access of a staff member immediately from a central location based upon a member’s employment status or operational concern. While the mechanical locks limit the ability of the general public from entering a facility unannounced, the potential still exists for former employees who may be disgruntled to enter a facility and act out.

38. *Nashua Fire Rescue should store turnout gear in a well-ventilated room to prevent additional firefighter exposure to off-gassing chemicals absorbed into turnout gear during a fire in Stations 1 and 5. This issue has already been addressed in the rest of Nashua’s fire stations.*

The danger for firefighters does not stop when the fire is extinguished, but returns to the fire stations through their gear, equipment, and vehicles which were exposed and contaminated by smoke or other vapors. When contaminated gear and equipment is returned to the station via their respective response apparatus, the potential for cross-contamination occurs. Many agencies have developed significant on-scene decontamination procedures intended to minimize the potential for contaminants entering the work environment. While these efforts have a positive impact, additional consideration must be given to the physical design of the fire station to minimize these exposures further. Nashua Fire Rescue should limit/reduce firefighter exposure to toxic products of combustion which occur after the fire (i.e., off-gassing).

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39. **Nashua Fire Rescue should plan for significant fire station maintenance and renovations in the coming years.**

Four of the six fire stations in Nashua are more than 40-years-old. ESCI evaluated these four stations to be in “fair” condition which means that “The building appears to be structurally sound with a weathered appearance and minor to moderate non-structural defects. The interior condition shows normal wear and tear, but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building’s purposes well. Showing increasing age-related maintenance, but with no critical defects. Age is typically 30 years or more.”

Many of these fire stations have outlived their useful life and some are no longer located in the optimal location to meet the current service demands in the City of Nashua. Consideration should be given to relocating some of these stations as they come due for renovation. GIS Models for Fire Station Optimization are included within the Long-Range Deployment Options Section of this plan.

**LONG-RANGE DEPLOYMENT OPTIONS**

*Staffing and Deployment*

40. **For future stations, Nashua should consider a design that allows for drive through bays that are large enough to accommodate frontline and reserve apparatus.**

Stations 1, 3, and 4 have “back-in” bays, which are considered to be a serious safety concern as many firefighter injuries and accidents occur when emergency vehicles are being backed into the fire station. ESCI notes that all stations use “back-in” procedures; however, drive through bays are the recommended configuration.

41. **Identify locations for future new or relocated fire stations.**

To assist Nashua in identifying locations that could serve as optimized locations for future new or relocated fire stations, GIS software was used to develop a baseline model for projected performance as well as additional optimized locations based on 2019 incident data. The model seeks to locate the best location based on creating the largest service area that captures the greatest number of calls within a 4-minute travel time. The baseline model is displayed in Figure 104.
The baseline performance for current fire stations projects that 67.2% of incidents were within a 4-minute travel of a Nashua fire station. Next, three additional locations were selected by the model to provide an indication of location and performance if these locations were added.
When additional locations are added to the system, performance improves from 67.2% to 83.6%, a 16.4% improvement. The gap between stations 3 and 4 is filled, a location north of the airport selected, and a station in the southwestern portion of the City identified to fill gaps within the current model. Should Nashua seek to construct or relocate fire stations to improve performance at some point in the future, ESCI recommends that factors such as property size, grade, drainage, and access be evaluated along with current demand to discover the optimal location available at that time.
Section VII. Conclusion

The ESCI project team began collecting information about Nashua Fire Rescue in December 2019. The team members recognize that this report contains a large amount of information, and ESCI would like to thank Nashua Fire Rescue and City of Nashua officials for their efforts in bringing this project to fruition.

It is ESCI's sincere hope the information contained in this report is used to its fullest extent, and that the emergency services that Nashua Fire Rescue provides to the citizens in and the surrounding area will be improved by its implementation.
Appendix A: Internal Customer Assessment

A summary of the most common comments has been listed for each question. Nashua Fire Rescue has been provided with a complete copy of all responses.

1. Please identify your total number of years of service at Nashua Fire Rescue:

![Figure 106. Internal Survey Question 1 Results]

2. Which one of the following best describes your current position?

![Figure 107. Internal Survey Question 2 Results]
3. If you could change one thing about the department’s training program, what would it be?
   - 59 of the requests included a formally established and organized program, hands-on scenarios including use of the training facility, and more consistency to assure that everyone is being trained uniformly.
   - 25 of the responses to this question requested Officer Development. Specific topics included Human Resources, Personnel Management, Mayday Management, and Professional Ethics.
   - 3 of the responses suggested more funding for travel outside training as well as shift coverage.
   - 2 of the responses suggested that the firefighters would benefit from spending some time learning about the role of the dispatchers.

4. In your opinion, what is the best way to communicate information within Nashua Fire Rescue?
   - The two most common responses to this question were email (23) and face-to-face (20) communications. Many of the respondents felt that these two forms of communication were best used in tandem.
   - There were multiple requests for start-of-shift briefings so that everyone knows what to expect. There was a common theme in the responses that some of the current Deputy Chiefs regularly visit the station in person more often than others. There was a perception that the crews who received personal visits from the deputies were better informed than those who only received emails.
   - An additional 12 respondents noted the necessity to implement and consistently enforce the chain of command within Nashua Fire Rescue.

5. How would you rate morale at the department?

![Figure 108. Internal Survey Question 5 Results](chart.png)
6. **What suggestions do you have for improving firefighter morale at the department?**
   - The most common response (45) to this question suggested changes in the way the fire department is managed. There were repeated requests for better and more consistent communication. Accountability was another very common theme. Respondents wanted to see the leadership hold the membership accountable from the top down, but they also called for the union to hold members accountable from the bottom up.
   - A number of the respondents also felt that the Board of Fire Commissioners created complications within the fire department system that negatively impacts morale. The current promotional process was repeatedly listed as a detractor from morale as well.

7. **In your opinion, what should the Department’s leadership be doing more of?**
   - The most common response to this question (22) was a request for more engagement from the department leadership. Specifically, members would like to see more of the leadership and have time to talk with them on both a professional and personal level.
   - The next most common response (19) was for more decisive leadership. They wanted to see decisions made, explained, and then implemented. Other suggestions included listening to the membership, allowing company officers to take more initiative, and more requests for better and more consistent communication.

8. **How would you rate your overall personal work environment at the department?**

![Figure 109. Internal Survey Question 8 Results](image-url)
9. How proud are you to tell other people that you are a member of Nashua Fire Rescue?

**Figure 110. Internal Survey Question 9 Results**

- Very Proud: 54%
- Somewhat Proud: 32%
- Not Proud: 11%
- No Opinion: 3%

10. On a scale of 1 to 10, where 1 is poor and 10 is excellent, how would you rate the following external services and programs provided to the public by the Department?

**Figure 111. Internal Survey Question 10 Results**

- Fire Suppression: 8.96
- Emergency Medical Services: 7.26
- Code Enforcement: 6.86
- Plan Inspections: 6.64
- Technical Rescue (as currently provided): 5.9
- Public Education: 5.08
11. On a scale of 1 to 10, where 1 is poor and 10 is excellent, how would you rate the following internal services and processes provided by the Department?

Figure 112. Internal Survey Question 11 Results

<table>
<thead>
<tr>
<th>Service</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment and Apparatus Maintenance</td>
<td>8.15</td>
</tr>
<tr>
<td>Facility Maintenance</td>
<td>6.38</td>
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<tr>
<td>Firefighter Benefits</td>
<td>5.89</td>
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<td>Firefighter Relations</td>
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<td>Safety Programs</td>
<td>5.04</td>
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<td>Dispatch/Communications</td>
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<td>Organizational Planning</td>
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<tr>
<td>Administrative Support</td>
<td>3.24</td>
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<tr>
<td>Wellness/Fitness Program</td>
<td>2.81</td>
</tr>
</tbody>
</table>

12. Please identify your level of agreement with each of the following statements about the Department’s facilities and apparatus:

Figure 113. Internal Survey Question 12 Results

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
<th>No Opinion</th>
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</thead>
<tbody>
<tr>
<td>Pump testing is completed on a regular basis.</td>
<td>86%</td>
<td>10%</td>
<td>4%</td>
<td></td>
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</tr>
<tr>
<td>Ladder testing is completed on a regular basis.</td>
<td>85%</td>
<td>11%</td>
<td>4%</td>
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</tr>
<tr>
<td>Hose testing is completed on a regular basis.</td>
<td>84%</td>
<td>13%</td>
<td>3%</td>
<td></td>
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</tr>
<tr>
<td>Apparatus repairs and maintenance are completed in a timely manner.</td>
<td>40%</td>
<td>46%</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apparatus are well maintained.</td>
<td>59%</td>
<td>38%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The current fleet of apparatus is adequate to meet the needs of the department.</td>
<td>49%</td>
<td>41%</td>
<td>7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The facilities are in good repair.</td>
<td>12%</td>
<td>60%</td>
<td>23%</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>The facilities are well maintained.</td>
<td>20%</td>
<td>59%</td>
<td>17%</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>The existing facilities are adequate to meet the needs of the department.</td>
<td>22%</td>
<td>61%</td>
<td>15%</td>
<td></td>
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</tbody>
</table>
13. If you could change only one thing about the work environment at Nashua Fire Rescue, what would it be?
- The most common response (29) to this question was morale. Specific repeated comments included requests for more brotherhood and less negativity among the members.
- The next most common responses (16) were to improve accountability throughout the Department.
- Other common requests included single station dispatching (9) and improved communication (6).

14. Please identify your level of agreement with each of the following statements as they relate to the Department’s community relations:

![Figure 114. Internal Survey Question 14 Results](image)

15. In your opinion, what is the community’s overall image of Nashua Fire Rescue?

![Figure 115. Internal Survey Question 15 Results](image)
16. In your opinion, what is the Department's single greatest strength?
The most common response to this question (86) was "manpower." The staffing level was highly valued as were the people who make up Nashua Fire Rescue. Most of the respondents felt that they worked with good people who were both proficient at their jobs and dedicated to the organization.

The next most common response (14) was that Nashua Fire Rescue's strength is its aggressive firefighting capability.

17. In your opinion, what is the Department's single greatest weakness?
Leadership was the most common response to this question (26 respondents). The other common answers were communications (10), the Board of Fire Commissioners (8), and morale (6).

18. In your opinion, what single greatest opportunity should the Department take advantage of in the future?
The most common response to this question (33) was that Nashua Fire Rescue should become more involved in EMS, including both transport and Advanced Life Support.

The second most common response (19) to this question was that the department should provide more and better training for its members.

19. In your opinion, what is the single most significant threat that the Department faces in the future?
The most common response (18) to this question is that the department is threatened by a lack of qualified incoming candidates to be firefighters.

The second two most common answers to this question were politics (15) and low morale (14).

20. Please use the space below to tell us your suggestions or final thoughts for improving Nashua Fire Rescue.
The most common responses (18) to this question reiterated the need for better personnel management, including more communication and transparency.

The other most common responses included offering more and better training (8) and eliminating the Fire Commission (4).
Appendix B: Development of Response Standards and Targets

There are three main factors that lead to successful mitigation of emergencies; sufficient numbers of well-trained personnel, arriving on reliable and well-equipped apparatus appropriate to the task at hand, quickly enough to make a positive difference in property preserved or lives saved. The previous sections of this report have laid out the current staffing levels, facilities and equipment, and response performance for Nashua Fire Rescue. The following describes the consequences of failing to deliver sufficient personnel and equipment early enough to mitigate the emergency addressed.

Dynamics of Fire in Buildings

Most fires within buildings develop in a predictable fashion unless influenced by highly flammable material. Ignition, or the beginning of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be generated during this phase.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heat and ignite, which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and highly toxic.

The spread of the fire from this point continues quickly. Soon the flammable gases at the ceiling as well as other combustible material in the room of origin reach ignition temperature. At that point, an event termed “flashover” occurs; the gases and other material ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant and the environment within the room can no longer support human life. Flashover usually occurs about five to eight minutes from the appearance of flames in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water to a fire before flashover occurs.

Although modern codes tend to make fires in newer structures more infrequent, today’s energy-efficient construction (designed to hold heat during the winter) also tends to confine the heat of a hostile fire. In addition, research has shown that modern furnishings generally ignite more quickly and burn hotter (due to synthetics). In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes.32 The necessity of effective early warning (smoke alarms), early suppression (fire sprinklers), and firefighters arriving on the scene of a fire in the shortest span of time is more critical now than ever.

The prompt arrival of at least four personnel is critical for structure fires. Federal regulations (CFR 1910.120) require that personnel entering a building involved in fire must be in groups of two. Further, before personnel can enter a building to extinguish a fire, at least two personnel must be on scene and assigned to conduct search and rescue in case the fire attack crew becomes trapped. This is referred to as the two-in, two-out rule. However, if it is known that victims are trapped inside the building, a rescue attempt can be performed without additional personnel ready to intervene outside the structure. Further, there is no requirement that all four arrive on the same response vehicle. Many fire departments rely on more than one unit arriving to initiate interior fire attack.

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. “Light weight” roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a dangerous environment for firefighters.

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for early application of water essential to a successful fire outcome.

The next figure illustrates the sequence of events during the growth of a structure fire over time.
As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire losses can demonstrate.

The National Fire Protection Association found that fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). As evidenced in the following figure, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

**Figure 117. Fire Extension in Residential Structures, United States, 2011–2015**

<table>
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<tr>
<th>Fire Extension</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Average Dollar Loss Per Fire</th>
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<td>Confined to room of origin or smaller</td>
<td>1.8</td>
<td>24.8</td>
<td>$4,200</td>
</tr>
<tr>
<td>Confined to floor of origin</td>
<td>15.8</td>
<td>81.4</td>
<td>$36,300</td>
</tr>
<tr>
<td>Confined to building of origin or larger</td>
<td>24.0</td>
<td>57.6</td>
<td>$67,600</td>
</tr>
</tbody>
</table>

Source: National Fire Protection Association
**Emergency Medical Event Sequence**

Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation. The American Heart Association (AHA) issued a set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include goals for the application of cardiac defibrillation to cardiac arrest victims. Cardiac arrest survival chances fall by 7 to 10% for every minute between collapse and defibrillation. Consequently, the AHA recommends cardiac defibrillation within five minutes of cardiac arrest. As with fires, the sequence of events that lead to emergency cardiac care can be graphically illustrated, as in the following figure.

![Figure 118. Cardiac Arrest Event Sequence](image)

The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain medications as a means of improving the opportunity for successful resuscitation and survival.

**People, Tools, and Time**

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, is not the only factor. Delivering sufficient numbers of properly trained, appropriately equipped personnel within the critical time period completes the equation.
For medical emergencies this can vary based on the nature of the emergency. Many medical emergencies are not time critical. However, for serious trauma, cardiac arrest, or conditions that may lead to cardiac arrest, a rapid response is essential. Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest, this can be up to six personnel; two to perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care. Thus, for a medical emergency, the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient’s condition, not necessarily the time it takes for the first person to arrive.

Critical Tasks, Risk, and Staffing Performance
The goal of any fire service organization is to provide adequate resources within a period of time to reasonably mitigate an emergency event. However, all emergency events inherently carry their own set of special circumstances and will require varying levels of staffing based upon factors surrounding the incident. Properties with high fire risk often require greater numbers of personnel and apparatus to effectively mitigate the fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk involved. Common risk categories used in the fire service are:

- **Low Risk**: Areas and properties used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- **Moderate Risk**: Areas and properties used for medium density single family residences, small commercial and offices uses, low intensity retail sales, and equivalently sized business activities.
- **High Risk**: Higher density businesses and structures, mixed use areas, high density residential, industrial, warehousing, and large mercantile structures.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate the application of water to a fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as “arrival” by the fire department. The Management and Staffing section of this report detailed the NFPA 1710 critical tasks expected to be performed by firefighters concurrently, referred to as the “effective response force” (ERF) and compared that to the number of Nashua firefighters that are initially deployed for structure fires.
Response Time Performance Objectives

To initiate the process of developing performance objectives, several items must be considered. Although the specific information needed to complete this process will vary with each organization, the following items will generally need to be addressed during this process. Historical call data must be collected and analyzed to determine current performance baselines and identify any gaps in data required; response zones must be established based on agreed-upon criteria (i.e., population zones, geographic boundaries, etc.); and benchmarks established as goals for these demand zones.

Current Response Goals

ESCI emphasizes the importance of establishing and regularly monitoring performance metrics for the deployment of resources. These metrics serve as the foundation for determining whether or not the organization is meeting the expectations of the community that it serves. Without regular and consistent performance evaluation, it is impossible to set and achieve goals established to meet community expectations.

Response standards established by the Department must originate from the community served to create a balance between what is desired and what can be afforded. Because of this, ESCI cannot establish baseline and benchmark performance metrics for a given organization. However, recommendations based upon the analysis conducted throughout this report may help serve as a starting point for these discussions with the community served or may serve as a reevaluation tool for the Department’s current standards.

Response standards are individual to each organization. Multiple factors such as staffing, financial constraints, size of the service area, and political will influence each department’s ability to set achievable goals and objectives for response.
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