NOVATO FIRE PROTECTION DISTRICT

NOVATO, CALIFORNIA

2009 ALL RISK STANDARDS OF COVER

The Novato Fire Protection District exists to care for, protect, and serve our communities.
Acknowledgements

We gratefully acknowledge the dedicated work of the Accreditation and Standards of Cover team members:

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Standards of Cover

Introduction

The following report serves as the Novato Fire Protection District (NFPD) “Integrated Risk Management Plan: Standards of Cover” document and replaces the 2003 edition. The Commission of Fire Accreditation International (CFAI) defines the process, known as “deployment analysis,” as a written procedure which determines the distribution and concentration of fixed and mobile resources of an organization. The purpose for completing this document is to assist the NFPD in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations in addition to homeland security issues. This document conforms to the 5th edition of the CFAI Standards of Cover guidelines.

Creating an Integrated Risk Management Plan – Standards of Cover requires that a number of areas be researched, studied, and evaluated. The following report will begin with an overview of both the community and the NFPD. Following this overview, the NFPD will discuss areas such as risk assessment, critical task analysis, agency service level objectives, and distribution and concentration measures. The NFPD will provide documentation of reliability studies and historical performance through charts, maps, and graphs. The report will conclude with policy recommendations.
Executive Summary

Levels of Service

One major issue the fire service has struggled with in the past decade is defining levels of service. There have been many attempts to create a standard methodology for determining how many firefighters, fire stations, or fire inspectors a community needs.

CFAI Systems Approach Process

The diversity of fire service challenges in each community has defied efforts to create a “one size fits all” solution. It is not surprising therefore, that a national or state consensus has never been reached. To address this situation, the International Association of City Managers (ICMA) and the International Association of Fire Chiefs (IAFC) formed the Commission on Fire Accreditation International (CFAI).

This process uses a “systems” approach to deployment rather than a one-size-fits all prescriptive formula. In a comprehensive approach, each agency should be able to match local need (risks and expectations) with the costs of various levels of service. In an informed public policy debate, each city council or governing board “purchases” the fire and EMS protection (insurance) the community needs and can afford.

Risk Assessment

If resources arrive too late, or are under-staffed, the emergency will continue to escalate drawing more of the agency’s resources into a losing battle. Fire companies must, if they are to save lives and limit property damage, arrive within a short period of time with adequate resources to do the job. To control a fire before it has reached its maximum intensity requires geographic dispersion (distribution) of technical expertise and cost-effective clustering (concentration) of apparatus for maximum effectiveness against the greatest number and types of risk. Matching arrival of resources with a specific point of fire growth or medical problem severity is one of the greatest challenges of chief fire officers today.

Some medical emergencies such as multiple car accidents on a freeway, or industrial accident rescues, require speedy arrival of multiple crews to control the scene, perform rescue operations, and provide medical care. A high-risk area requires timely arrival of fire companies for several reasons. More resources are required to rescue people trapped in a high-risk building with a high occupant load than in a low-risk, building with a low occupant load. More resources are required to control fires in large, heavily loaded structures than are needed for small buildings with limited contents.
Executive Summary

There are usually three reasons to redo or challenge existing levels of service - expansion, contraction of service areas (typically the result of a reduction in service area, a decline in risk or value, or a decline in available fire protection funding), and change in risk expectations.

Regardless of the reasons, elected officials should base changes in levels of service on empirical evidence and rational discussion leading to effective, informed policy choices.

Standards of Cover Document

This document outlines the all-risk capabilities of the Novato Fire Protection District and conforms to the 5th edition of the CFAI Standards of Cover guidelines. Current and future environmental conditions that affect the delivery of fire protection and emergency medical services in the Novato Fire Protection District are described in this document.
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Section A. The Community of Novato

History

The Novato Fire Protection District (NFPD) is an independent special fire district formed by the Marin County Board of Supervisors on July 6, 1926.

The formation was requested by the residents living in a 71 square mile area of unincorporated lands around the Community of Novato. A committee was established and approved by the Marin County Board of Supervisors to oversee the organization; the committee consisted of W. E. Cole, Chairman, L. Nave, Vice Chairman, and Dr. W. H. Busher, Secretary. The first mobile piece of fire equipment was the 1923 Ford Model T chemical truck, now owned by and displayed at Fireman’s Fund Insurance Company. Charles Kiser was appointed the first Fire Chief.

In 1964, the City of Novato incorporated. The NFPD now provides service to the City of Novato and to unincorporated areas of Marin County.

Figure 1   Novato Presbyterian Church, circa 1906
The District is governed by a five-person Board of Directors elected by the citizens for four-year terms.


**Location and Size**

The NFPD is located in the northernmost section of Marin County, California. The Fire District encompasses approximately 71 square miles and serves a population of 65,000.

The District protects approximately 43,000 acres of which approximately 44 square miles are wildland urban interface areas. It is bounded on the north by San Antonio Creek and Sonoma County, by Pacheco Grade and the community of Marinwood to the south, by the Petaluma River and San Pablo Bay to the east, and westerly to a point approximately three miles past Stafford Lake and along the ridgeline of Big Rock Ridge. The City of Novato, a general-purpose governmental entity, lies within as well as outlining areas of unincorporated county lands and is served by the District.

**District Facilities**

The first fire station was located at 1000 Grant Avenue in 1930, and was relocated to 7025 Redwood Boulevard in 1988. Station 2 was built at 999 South Novato Boulevard in 1959 and relocated to 450 Atherton Avenue in 1991. Station 3 was built at 65 San Ramon Way in 1966 and Station 4 was built at 319 Enfrente Drive in 1976. Station 5 was built in 2004, staffed in October 2005 and is located on the former Hamilton Air Force Base located at 9 Bolling Drive. The Fire District headquarters administrative offices were re-located to 95 Rowland Way from Station 1 in February of 2004.

![NFPD's First Motorized Fire Apparatus](image)
Geographical Description

The City of Novato is the northernmost city in Marin County, located 29 miles north of San Francisco on Highway 101 across the Golden Gate Bridge, and 37 miles northwest of Oakland, California. Incorporated in January 1960, Novato has the distinction of being the area’s newest and largest city in land area, covering 28 square miles. The Fire District covers an area of 71 square miles, which includes 15,000 acres of open and park space. There are approximately 43 square miles of unincorporated Marin County within the Fire Protection District.

Novato has 27 city parks. There are 7,895 school age children. The average temperature is 67 degrees Fahrenheit, and rainfall averages 27.5 inches per year.

Big Rock Ridge represents the District’s highest elevation at 1,887 feet. Winds are predominantly southwesterly with the exception of summer when off-shore northeast often winds infiltrate the District.

Figure 3   Novato Protection Orientation Map
Development Trends and Projections

Community Description
The District serves both homes and businesses in its service area. There are approximately 65,000 residents within the incorporated and unincorporated boundaries of the District, and another 25,000 workers within the District, which comprises the “service population.” The service population reasonably represents the need for emergency response and services needed by the constituents.

Service Population
Table 1 provides estimates of the District’s total service population in 2001 and 2016. The total service population figure is comprised of residents and workers within the City and the unincorporated areas within the District. The year 2016 is the planning horizon used by the City of Novato’s current General Plan. These service population estimates represent the population and employment projections for the City as a whole because, as mentioned previously, the District serves the entire City. Service population projections were also made for the surrounding unincorporated areas of Marin County, served by the District.

To calculate service population, a worker is weighted at .69 of one resident to reflect the lower per capita need for services associated with businesses. Nonresidential buildings are typically occupied less intensively than dwelling units, so it is reasonable to assume that average per worker usage of services is less than average per resident usage. Therefore, the total build out service population within the District calculated in Table 1 is the sum of the resident population plus .69 percent of the total worker population in the City and unincorporated area of the District, as calculated in Table 1 Service Population.
Table 1 Service Population

<table>
<thead>
<tr>
<th>Description</th>
<th>Residents</th>
<th>Workers</th>
<th>Service Population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Novato</td>
<td>48,249.00</td>
<td>24,504.00</td>
<td>65,337.00</td>
</tr>
<tr>
<td>Unincorporated Area</td>
<td>11,052.00</td>
<td>496.00</td>
<td>11,394.00</td>
</tr>
<tr>
<td>Total Existing</td>
<td>59,301.00</td>
<td>25,000.00</td>
<td>76,731.00</td>
</tr>
<tr>
<td><strong>New Development (2001-2016)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Novato</td>
<td>5,535.00</td>
<td>4,070.00</td>
<td>8,343.00</td>
</tr>
<tr>
<td>Unincorporated Area</td>
<td>248.00</td>
<td>2,855.00</td>
<td>2,218.00</td>
</tr>
<tr>
<td>Total New Development</td>
<td>5,783.00</td>
<td>6,925.00</td>
<td>10,561.00</td>
</tr>
</tbody>
</table>

Note 1:
Residents + (.69 x Workers) = Total Build-out Service Population

65,264 + (.69 X 31,925) = 87,292

Note 2: Service population weighting factors based on the City of Phoenix service call data weighted by the relative proportions of residential and nonresidential land use in the City, allowing the results of this survey to be applied in other areas.

Note 3: Service population equals residents plus workers with each weighted by appropriate factor shown at the bottom of Table 1.

Sources: United States Bureau of Census, Census 2000; California Department of Finance, Association of Bay Area Governments, Projections 2000; City of Phoenix; City of Novato; County of Marin; Muni-Financial.

The 0.69 per worker weighting used in this context is derived from an extensive study carried out by planning staff in the City of Phoenix. NFPD used data from that study to calculate a per capita factor that is independent of land use patterns. Because of the large geographical area covered by this study, it is the best source of data for application to other areas that the District is aware of. It is reasonable to assume that relative demand for fire service between residents and workers does not vary substantially on a per capita basis across communities, enabling NFPD to use this data for other communities in the documentation of fire service delivery models.
**Census Tracts**

For the purpose of identifying where the emergency incidents originate, the District is now divided into twelve census tracts that correspond to the United States Census Bureau and are depicted in Figure 4. These zones now alter the previously provided information, making comparisons of new and old data difficult.

These census tracts were utilized as they encompass the District’s urbanized areas and include the demographics for each area.

![Image of Novato Fire Protection District Census Tracts]
Table 2 summarizes the 12 census tracts and indicates the respective square miles, population, and geographical confines depicted by their common neighborhood names.

<table>
<thead>
<tr>
<th>Census Tract</th>
<th>Square Miles</th>
<th>Pop.</th>
<th>Common Neighborhood Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1011</td>
<td>13.04</td>
<td>2,539 Bahia, Green Point, Black Point, Gnoss Field, Atherton Acres, Renaissance Estates</td>
</tr>
<tr>
<td>2</td>
<td>1012</td>
<td>4.06</td>
<td>2,584 East Novato, Fruit Bowl, Wildwood Glen, Woodlands, Valley Oak Estates, Deer Island, Olive District, Reichert-Lamont, Scottsdale</td>
</tr>
<tr>
<td>3</td>
<td>1021</td>
<td>3.73</td>
<td>2,347 San Marin, Partridge Knolls</td>
</tr>
<tr>
<td>4</td>
<td>1022.01</td>
<td>2.1</td>
<td>9,981 San Marin, Northwest Quadrant, Downtown Novato Business District, Central Novato, Nave Gardens, The Vistas, Hidden Valley, The Elms District</td>
</tr>
<tr>
<td>5</td>
<td>1031</td>
<td>13.02</td>
<td>7,682 Pleasant Valley, Wildhorse Canyon, Marin Highlands</td>
</tr>
<tr>
<td>6</td>
<td>1032</td>
<td>1.8</td>
<td>6,590 Lu Sutton, McClay, Wilson, Hospital District, The Orchard District</td>
</tr>
<tr>
<td>7</td>
<td>1041.01</td>
<td>2.29</td>
<td>6,666 Rafael Village, Hillside Estates, Westridge, Monte Maria, Forest Park, College District, Sunset</td>
</tr>
<tr>
<td>8</td>
<td>1041.02</td>
<td>0.82</td>
<td>4,959 Crossroads, Western Oaks, Leafwood Area, Lynwood District</td>
</tr>
<tr>
<td>9</td>
<td>1042</td>
<td>6.68</td>
<td>5,722 Pacheco Valle, Marin Country Club, Rafael Village, Loma Verde</td>
</tr>
<tr>
<td>10</td>
<td>1043</td>
<td>4.42</td>
<td>1,665 Bel Marin Keys, Ignacio Industrial Park</td>
</tr>
<tr>
<td>11</td>
<td>1050</td>
<td>3.67</td>
<td>3,771 Ignacio, Hamilton, Marin Valley Park, Los Robles</td>
</tr>
<tr>
<td>12</td>
<td>1330</td>
<td>16.17</td>
<td>3,220 Indian Valley</td>
</tr>
</tbody>
</table>

NOTE: The Appendix contains the 12 specific geographical confines of each zone.
Density and Intensity Standards

Residential density ranges control the number of units on each acre of land, and standards for floor area ratio (FAR) establish the intensity of non-residential buildings. Multiplying the low and high ends of the ranges by a parcel’s acreage provides the range of potential development envisioned by the City of Novato General Plan.

Table 3 Land Use

<table>
<thead>
<tr>
<th>Land Use</th>
<th>1996 General Plan Estimated Increase 1995</th>
<th>1996 General Plan Total Estimated Buildout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>5,465 DUs</td>
<td>25%</td>
</tr>
<tr>
<td>Commercial</td>
<td>3,372,103 SF</td>
<td>54%</td>
</tr>
<tr>
<td>Industrial</td>
<td>2,080,229 SF</td>
<td>1534%</td>
</tr>
<tr>
<td>Office</td>
<td>1,253,848 SF</td>
<td>110%</td>
</tr>
</tbody>
</table>

NOTES:
"Existing built and vested" includes development under construction as of May 1995 and development, which is "vested" as guaranteed by a Development Agreement or other means.

"Commercial" includes all development not strictly defined as "Industrial" or "office." It includes retail, wholesale, services, mixed non-residential uses, etc.

Build out estimates include development on all vacant or under-developed land not publicly owned.

DUs = Dwelling Units      SF = Square Feet
Table 4 Build Out Under The 1981 And 1996 General Plans
Existing Conditions and Potential Development

Existing land use in Novato is predominantly residential in the valley areas west of Highway 101 and in pockets along the San Pablo Bay historic flood plain east of the freeway. Most units are single-family detached on lots under one acre in size. With the increasing costs of land, however, the number of attached and multi-family units has increased.

**Commercial**

Commercial uses are concentrated downtown along Grant Avenue, along Redwood Boulevard, in pockets along Highway 101, and in various small clusters and convenience centers. The Vintage Oaks Shopping Center, located east of the freeway and south of the Rowland Boulevard interchange in the Novato Redevelopment Project Area, opened in 1991. The Novato Redevelopment Project is among the special land use controls in place in the City. It was established to re-plan and reuse a previously underutilized area by developing a regional shopping center, to increase employment opportunities and the supply of low and moderate income housing, and to provide public improvements. The project area covers approximately 400 acres east of Highway 101, north of Route 37, and south and west of Novato Creek.

**Office Space**

Offices are located along the freeway, in and around Downtown, near the Novato Community Hospital, along Novato and South Novato Boulevards, and within the industrial parks. Novato Industrial Park contains the bulk of the District’s warehousing, distribution, and manufacturing uses. Several industrial operations remain near the downtown, between Railroad Avenue and Redwood Boulevard. The Bel Marin Keys area has 600 businesses, 2 million square feet of industrial zone: offices, warehouses, manufacturing, auto repair shops, biotechnology, and computer related firms. It is the largest concentration of industry in the County.

**Agricultural**

Agricultural activities continue primarily outside the City Limits, in the areas west of Gnoss Field, south of Bel Marin Keys, and within the Indian Valley area.

**Open Space**

A network of open space surrounds the Sphere of Influence defined in the Marin Countywide Plan as bounded by the Inland Rural Corridor on the west and north, San Pablo Bay on the east, and the San Rafael Sphere of Influence on the south. The Ignacio Valley and Indian Valley Open Space Preserves form the southwestern edge of the Sphere of Influence the Verissimo Hills Open Space Preserve, O’Hair Park site, and Mt. Burdell Open Space Preserve form the northwestern edge; Pacheco Valley and Loma Verde form the southeastern edge; and the Petaluma River and San Pablo Bay from the eastern and northeastern edges.
Recent Public and Private Development Projects

Several public and private projects have been the subject of great attention in recent years. Among the most significant to the District’s future are:

**Hamilton Field Air Force Base**

The Hamilton Base was closed in 1974; approximately 450 acres were declared surplus in 1979 and auctioned to private sector bidders in 1984. Approximately 270 acres adjacent to San Pablo Bay were transferred to the State of California for open space preservation. In 1993 the City approved plans of the New Hamilton Partnership for mixed use with subsequent revisions, the project will have up to 955 residential units; 825,000 square feet of office, light industrial, and retail use; and 200 acres of parks, open space, and sport fields. Construction of the Hamilton Master Plan area started in 1995 and was 80 percent complete in 2008. The City, in cooperation with Marin County, has adopted a plan for the remaining 1,099 acres, known as the “Hamilton Reuse Plan.” This plan includes: Low Density, Medium Density, and Medium Density Multiple Family Residential uses, representing 1,208 units; 43 acres of Community Facilities and Civic Uses (including an 80-bed homeless housing and services facility and up to 60 transitional housing units); 8 acres of commercial uses (including Neighborhood and General Commercial uses); 24 acres of parkland; and 795 acres of open space and wetlands.

**Buck Center for Research in Aging**

The Buck Center for Research in Aging (BCRA) project is located within the northern District limits, west of Highway 101. The project consists of a 355,000-square-foot laboratory, research facility, and 130 units of housing for research assistants and other BCRA personnel.
Table 5 summarizes the single- and multiple-family dwellings approved for construction.

### Table 5 Proposed Development and Growth

<table>
<thead>
<tr>
<th>Location/Development</th>
<th>Type</th>
<th>Units</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sutro Ave/Novato Blvd</td>
<td>SF</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>N. Novato Blvd./Sutro Ave</td>
<td>SF</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>San Marin/San Andreas Dr.</td>
<td>SF</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>San Marin/San Carlos</td>
<td>SF</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Woodview Subdivision</td>
<td>SF</td>
<td>20</td>
<td>Complete</td>
</tr>
<tr>
<td>Laguna Vista Drive</td>
<td>SF</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Rudnick Estates</td>
<td>SF</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Atherton Ranch Residential</td>
<td>SF</td>
<td>91</td>
<td>Complete 2005</td>
</tr>
<tr>
<td>Atherton Ranch Residential</td>
<td>MF</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Nova Ro III Senior</td>
<td>MF</td>
<td>40</td>
<td>Complete 2004</td>
</tr>
<tr>
<td>Marion Heights</td>
<td>SF</td>
<td>12</td>
<td>Complete 2008</td>
</tr>
<tr>
<td>Marion Ave</td>
<td>SF</td>
<td>10</td>
<td>Complete 2008</td>
</tr>
<tr>
<td>Hamilton Meadows</td>
<td>SF</td>
<td>27</td>
<td>Complete 2004</td>
</tr>
<tr>
<td>San Pablo Ave</td>
<td>SF</td>
<td>20</td>
<td>Complete 2003</td>
</tr>
<tr>
<td>Rafael Village</td>
<td>SF</td>
<td>344</td>
<td>Complete 2005</td>
</tr>
<tr>
<td>Rafael Village Senior Housing</td>
<td>MF</td>
<td>100</td>
<td>Complete 2002</td>
</tr>
<tr>
<td>Capeheart Housing</td>
<td>Attached</td>
<td>351</td>
<td>Complete 2006</td>
</tr>
<tr>
<td>Capeheart Transitional</td>
<td>Attached</td>
<td>60</td>
<td>Complete 2007</td>
</tr>
<tr>
<td>Pacheco Ranch</td>
<td>SF</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Olive Ridge</td>
<td>SF</td>
<td>19</td>
<td>Complete 2007</td>
</tr>
<tr>
<td>Alvarado Inn</td>
<td>MF</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Buck</td>
<td>SF</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Tranquility</td>
<td>SF</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cherry Hill Apts.</td>
<td>MF</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Twin Creeks</td>
<td>MF</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Marin Country Club Estates</td>
<td>SF</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Virginia Oaks</td>
<td>SF</td>
<td>5</td>
<td>Complete</td>
</tr>
<tr>
<td>Sansone</td>
<td>SF</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Maginisi</td>
<td>SF</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fiedel</td>
<td>SF</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Paradise Ranch</td>
<td>SF</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Laguna Vista</td>
<td>SF</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Case Subdivision</td>
<td>SF</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Leveroni</td>
<td>SF</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Villas at Hamilton</td>
<td>MF</td>
<td>121</td>
<td>Complete 2002</td>
</tr>
<tr>
<td>Summerhill</td>
<td>SF</td>
<td>37</td>
<td>Complete 2005</td>
</tr>
<tr>
<td>Whole Foods Condominium</td>
<td>MF</td>
<td>168</td>
<td></td>
</tr>
</tbody>
</table>

SF = Single Family  MF = Multi-Family
Summary of Proposed Commercial/Industrial/Office Growth

<table>
<thead>
<tr>
<th>Type</th>
<th>Additional Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>511,001</td>
</tr>
<tr>
<td>Industrial</td>
<td>4,008</td>
</tr>
<tr>
<td>Office</td>
<td>2,022,826</td>
</tr>
</tbody>
</table>

The community wants to attract major employers and retailers to Novato, but does not want to lose the locally owned and operated businesses that make up a part of Novato’s small town character. New commercial ventures that provide goods and services which are not already in adequate supply in town should be encouraged. Ideally, Novato’s future economic development should attract a variety of businesses that can provide a range of job opportunities suitable for residents to work within the community, thereby reducing out-commuting and traffic congestion.
Projected Growth of Population and Jobs

Between 1980 and 1990, the City of Novato and its Sphere of Influence (SOI) grew from a population of 51,209 to 53,015, an increase of 3.5 percent. The number of jobs in Novato increased by a far greater percentage, 31 percent, over this 10 year period; the majorities were service and retail jobs. Population in 1995 was 54,900, reflecting the slow growth after 1990 due to a national and state recession. The Association of Bay Area Governments (ABAG) projects the population in 2015 to be 66,400. There has been much more job growth since 1990, with the opening of the Vintage Oaks shopping center. ABAG projects a total of 25,750 households in Novato by the year 2010. The General Plan projects a higher number of housing units, about 27,000 at buildout, which could occur later than the year 2015. ABAG projects jobs in Novato will increase by 82 percent between 1995 and 2015.

Urban Growth Boundary

The City seeks to protect agricultural, natural resources, open space and community separator uses, public and private outdoor recreation; uses that foster public health and safety, and farming enterprises. The City also seeks to encourage efficient growth patterns that foster and protect the rural character of Novato while encouraging appropriate economic development in accordance with the City’s unique local conditions. The establishment of an Urban Growth Boundary will protect the quality of life of the citizens of Novato by concentrating future residential, commercial and industrial growth in areas already served by urban services.
Transportation

There are several modes of transportation within the Fire District. They include roadways, a municipal airport, bus service, and a rail line that has been deactivated but is expected to resume service by 2014. The District also has a whole system of “fire roads” to allow access to the wildland urban interface areas and ranch properties that exist. These fire roads require four-wheel drive vehicles.

Boats also traverse the Petaluma River with access from the San Pablo Bay and the Port of Sonoma, and are designed for pleasure rather than transportation. The County of Marin is exploring a ferry system at the Port of Sonoma that would assist with commute traffic.

Highways and Other Access

Primary access to Novato is US Highway 101, the main north-south corridor in the West Bay Area. Novato is 12 miles north of Interstate Highway 580, a major east-west corridor serving the Bay Area. State Highway 37 joins US 101 at Novato making the District a hub for North Bay travel. State Highway 116 is ten miles north of Novato. Numerous common carriers provide interstate and intrastate service.

Gnoss Air Field is located within Novato, and both the Petaluma River and the Northwestern Pacific Railroad provide access via water and rail, respectively.
Table 6 Transportation – Level of Service (LOS) Definitions

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Flowing</td>
<td>Relatively free-flow. No restrictions to vehicle maneuverability or speed. Very slight delay.</td>
</tr>
<tr>
<td>LOS A</td>
<td>Relatively free-flow. No restrictions to vehicle maneuverability or speed. Very slight delay.</td>
</tr>
<tr>
<td>Tolerable Delays</td>
<td>Approaching unstable flow operation. Queues develop. Little freedom to maneuver. Tolerable delays for short periods.</td>
</tr>
<tr>
<td>LOS D</td>
<td>Approaching unstable flow operation. Queues develop. Little freedom to maneuver. Tolerable delays for short periods.</td>
</tr>
<tr>
<td>Significant Delays</td>
<td>Unstable flow or operation. Low operating speed; momentary stoppages. This condition is not uncommon in peak hours. Congestion and lengthy delays.</td>
</tr>
<tr>
<td>LOS E</td>
<td>Unstable flow or operation. Low operating speed; momentary stoppages. This condition is not uncommon in peak hours. Congestion and lengthy delays.</td>
</tr>
<tr>
<td>Excessive Delays</td>
<td>Forced flow or operation. There are many stoppages. The highway acts as a vehicle storage area. Jammed. Gridlock.</td>
</tr>
<tr>
<td>LOS F</td>
<td>Forced flow or operation. There are many stoppages. The highway acts as a vehicle storage area. Jammed. Gridlock.</td>
</tr>
</tbody>
</table>

Level of Service (LOS) is normally used to describe peak-hour transportation conditions, which occur during the early morning or late afternoon when traffic is the heaviest.

Traffic engineers and planners use the Level of Service designations to evaluate the relative congestion of roads and highways. It is used to design where and what type of roadway improvements are required, such as the location and timing of traffic signals, the configuration of intersections, and the number of lanes for new streets. LOS is intended to provide an approximate measurement of roadway operations similar to the driver’s perceptions of traffic conditions.

Table 6 provides Levels of Service and their respective service level descriptions.
Marin Countywide Congestion Management Agency

The Marin Countywide Congestion Management Agency develops and administers a Countywide Congestion Management Plan (CMP) as required of every urbanized county in the State under the terms of a State referendum approved in 1990. The State law requires all State highways plus the principal arterials in Marin County to be on the designated CMP system. The following facilities in Novato are on the CMP designated system:

✓ US 101
✓ SR 37
✓ Bel Marin Keys Blvd from US 101 interchange to Commercial Blvd.
✓ South Novato Boulevard from Diablo Avenue to US 101
✓ Rowland Boulevard from South Novato Boulevard to US 101
✓ Novato Boulevard from Sutro Avenue to Diablo Avenue

County of Marin
Maintains and plans the county road system.

Golden Gate Bridge, Highway and Transportation District
The Golden Gate Bridge, Highway and Transportation District operates Golden Gate Transit with express and local bus service, ferry service and the Golden Gate Bridge linking Novato to Sonoma and Marin County cities, and San Francisco.

Metropolitan Transportation Commission
Prepares and carries out a Regional Transportation Plan, establishes priorities for federal and state funding, and conducts studies of transportation corridors.

The Marin Countywide Planning Agency
The City is a member of this agency which is conducting a Sonoma/Marin multimodal transportation and land use study.
Streets and Roads

The street system has shaped land use in Novato and continues to be the principal element of the City’s transportation system. Streets and highways are classified according to their function.

### Table 7 1995 Traffic Levels of Service

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>A high-speed, limited-access roadway used primarily for long trips. California State Department of Transportation (CalTrans) controls the design, operation and maintenance of freeways.</td>
</tr>
<tr>
<td>Arterial</td>
<td>A medium-speed, medium capacity roadway typically averaging 10,000 to 35,000 trips daily that provides travel and access within the City and access to expressways and highways. Direct access to land fronting an arterial is usually prohibited.</td>
</tr>
<tr>
<td>Collector</td>
<td>A relatively low-speed, relatively low-volume street typically averaging 5,000 to 10,000 trips daily that provides access within and between neighborhoods. Collectors usually serve short trips and are intended for collecting trips from local streets and distributing them to arterial streets. Collector streets may have restricted access under certain circumstances, for safety reasons.</td>
</tr>
<tr>
<td>Local Street</td>
<td>A low-speed, low-volume street that provides access to adjacent properties. Local streets are designed for trips within neighborhoods and to collector and arterial streets, and not to serve through-traffic.</td>
</tr>
<tr>
<td>Rural Road</td>
<td>A relatively low-speed, low-volume roadway that provides access to adjacent land. Rural roads are designed for trips within low density areas where there is relatively little locally-generated traffic. The City has adopted special standards for rural roads.</td>
</tr>
</tbody>
</table>

During the non-commute hours of the day, traffic generally moves well, experiencing little delay. Most intersections are operating at a LOS of A to C, indicating that the street system is relatively non-congested. Traffic congestion occurs, however, during the peak commute hours. Most of Highway 101 is currently operating at LOS F in the Novato area. During the morning commute hours backups occur from the Alameda del Prado or Miller Creek interchanges to as far north as Atherton Avenue interchange, causing significant diversion of traffic onto City streets.

Local streets and roads generally remain at acceptable levels of service during the peak hours. The exceptions include Bel Marin Keys Boulevard and the Redwood Boulevard/Olive Avenue intersection. The latter operates at LOS E during the morning peak period.
Traffic congestion will continue to worsen as more development occurs in Marin and Sonoma Counties. In response, Novato is working to adopt innovative measures to reduce impacts of Highway 101 traffic on City streets, implement growth management programs, and emphasize alternatives to the single-occupant vehicle.

The traffic projections showed that the highways and roads in the Novato area in 1995 cannot accommodate all of the development projected to the year 2015, even with the roadway improvements that are under construction or funded. The projections confirm that there is currently no reserve capacity on Highway 101.

Table 8 provides descriptions of capital improvement projects and their current status.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Capacity Improvements</th>
<th>Status As of 11/2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown traffic signal and intersection improvements</td>
<td>Coordination of the traffic signals on De Long Avenue from U.S. 101 to Diablo Avenue and coordination of the traffic signals on Redwood Boulevard from Lamont Avenue to Grant Avenue.</td>
<td>Project complete.</td>
</tr>
<tr>
<td>Highway 101</td>
<td>Auxiliary Lane improvements in San Rafael, none in the Novato Area of Interest.</td>
<td>Approved and partially funded by CalTrans</td>
</tr>
</tbody>
</table>

Following are the principal intersections, which will experience severe traffic congestion at build out if improvements are not constructed when travel demand increases.

- Novato Boulevard/Seventh Street/Tamalpais Avenue, which operates at a LOS D during the P.M. peak hour.
- Novato Boulevard/Diablo Avenue, which operates near capacity at LOS E in the P.M. peak hour.
- Redwood Blvd./Diablo Avenue/DeLong Avenue, which operates at mid LOS D in the P.M. peak hour.
- Ignacio Boulevard/Nave Drive/Northbound US 101 Ramp, which operates at low LOS D during the A.M. peak hour, and at capacity (LOS F) during the P.M. peak hour.
Standards of Cover
The Community of Novato

- DeLong Boulevard/Enfrente Road/US 101 Ramps southbound, which operate at mid-LOS D during the A.M. peak hour and at near capacity (high LOS E) during the P.M. peak hour.
- Novato Boulevard/Sunset Parkway, which operates at LOS E in the A.M. peak hour.
- Redwood Blvd/Olive Avenue, which operates at LOS F during the P.M. peak hour.
- Atherton Avenue/Bugeia Lane, which operates at LOS F during the P.M. peak hour.

Table 9 summarizes the location, project description, and status of major roadway improvements planned by the City of Novato.

<table>
<thead>
<tr>
<th>Location</th>
<th>Description of Improvement</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novato Blvd./Seventh Street/Tamalpais Ave.</td>
<td>Add an additional through lane on the northbound and southbound approaches on Novato Boulevard.</td>
<td>Complete</td>
</tr>
<tr>
<td>Redwood Boulevard/Diablo Avenue/DeLong Avenue</td>
<td>Change southbound Redwood Boulevard approach to include two left-turn lanes and a shared through/right-turn lane. Change eastbound Diablo Avenue approach to include two left-turn lanes, two through lanes, and a right-turn lane.</td>
<td>Complete</td>
</tr>
<tr>
<td>U.S. 101 North Ramp/Nave Drive/</td>
<td>Change the eastbound Bel Marin Keys Boulevard approach to include a through lane, a shared through/right-turn lane.</td>
<td>Complete</td>
</tr>
<tr>
<td>Bel Marin Keys Blvd.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redwood Blvd./Olive Avenue</td>
<td>Install a traffic signal.</td>
<td></td>
</tr>
<tr>
<td>Atherton Ave./Bugeia Lane</td>
<td>Install a traffic signal.</td>
<td></td>
</tr>
<tr>
<td>Bel Marin Keys/HWY 37</td>
<td>Construct a connector.</td>
<td></td>
</tr>
<tr>
<td>Rowland Boulevard</td>
<td>Construct an extension to Highway 37. The extension may be limited to an emergency access way.</td>
<td></td>
</tr>
<tr>
<td>Redwood/San Marin Intersection and 101 South Ramps</td>
<td>Add turn lanes.</td>
<td></td>
</tr>
</tbody>
</table>
Air Transportation

Gnoss Field is located in the County of Marin outside of the City of Novato’s Sphere of Influence. It is a general aviation airport owned by the County and has no scheduled commercial flights. It has, however, a significant number of private aircraft operations and an air taxi service. The County’s Gnoss Field Master Plan describes the expected growth in airport operations and related development. It projects a doubling of based aircraft in the period 1986 to 2010, with an increase in operations (one landing or one take-off) from 189,000 in 1996 to 204,000 in 2010. The improvements called for in the Master Plan include facilities to maintain a fixed-based aviation operator.

Housing Background

The Housing Background summarizes the following: demographic characteristics; employment trends; inventory of vacant residential land; and the constraints that exist to the construction of housing in Novato.

Following are several principal findings of this section:

- The ten-year growth rates for Novato are: 1960s, 23 percent; 1970s, 42 percent; and 1980s, 8.4 percent.
- Population growth is projected by The Association of Bay Area Governments (ABAG) to increase by 5.2 percent from 1995 to the year 2000; 4.2 percent from the year 2000 to 2005; and 6.4 percent between the year 2005 and 2010. The population projection is 65,300 persons for the year 2010.
- A smaller proportion of Novato’s population comprises minorities (15.2 percent) than the average for the State (33 percent). The largest minority groups include persons of Asian and Hispanic origin.
Over one third of Novato households are in the low or very-low income category, earning equal or less than 50 percent of the median household income for Marin County. This portion of the community may experience difficulty in affording adequate housing.

There will be a significant increase in the number of senior citizens living in Novato and the surrounding urban areas. Consequently there will be a continuing need to provide more senior housing.

Special housing needs include the disabled, large families, single-parent households, and persons in need of emergency shelter. There is not sufficient housing in Novato to meet the special needs of these groups.

The total number of new jobs in Novato is projected by ABAG to increase as additional office and commercial developments develop along the Highway 101 corridor.

ABAG housing needs determinations for Novato are for 4,318 additional units by 1997, consisting of 2,029 units affordable to above-moderate income households, 864 units affordable to moderate income households, 648 units affordable to low income households and 777 units affordable to very-low income households. ABAG housing determinations are based on assumptions regarding the future growth of Novato and the region, and may not accurately reflect the local conditions, nor the residential development that will likely occur during the next five years.

Novato is a predominantly single family residential community. Over 72 percent of Novato housing is single-family dwellings. During the 1980s 1,399 multifamily dwellings were constructed in the District. In the 1990s there were less than 100 dwellings constructed, and virtually no rental units.

From 1990 to 2008 significant residential and commercial development occurred primarily due to the closing of the Hamilton Air Force Base and its subsequent redevelopment.
Population Projections

Projected growth of population projections for the Novato area, prepared by ABAG. The projections indicate a 5.6 percent increase in the City’s population during the period 1990-1995; a 4.2 percent between the years of 1995 and 2000, and a 6.4 percent between the years of 2000 and 2010.

Table 10 summarizes the Novato area population projections between the years of 1990 and 2005.

Table 10  Population Projections 1990 to 2005 (Novato Area)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>55,015</td>
<td>56,000</td>
<td>58,900</td>
<td>61,400</td>
<td>65,300</td>
</tr>
<tr>
<td>Household Population</td>
<td>52,662</td>
<td>55,500</td>
<td>58,300</td>
<td>60,700</td>
<td>64,600</td>
</tr>
<tr>
<td>Number of Households</td>
<td>20,216</td>
<td>21,040</td>
<td>22,330</td>
<td>23,630</td>
<td>25,330</td>
</tr>
</tbody>
</table>

Source: Projections 94, ABAG and Novato Community Development Department. Projections Apply to the City and Its Sphere of Influence

Significant population growth is expected to continue for the Bay Area but less so for Marin County. Over the forecast period 1990-2010, ABAG projections indicate that the population of the nine-county Bay Area may increase by almost 1.5 million people. Marin County’s population is projected to increase by 17 percent over this period to 270,300 persons, making it one of the slower growing counties in the Bay Area.

Although Novato’s population is not expected to increase significantly in size, demand for housing within the District will continue to be strong as the growth in the region’s population continues.

Household Characteristics

In general, Novato has a larger average household size than Marin County. This trend is expected to continue. As indicated in Table 11 Persons per Household, the average household size in Marin County is projected to drop from 2.38 persons per household in 1995 to 2.33 persons per household in 2005. For Novato these figures are 2.64 persons per household in 1995 and 2.57 persons per household in 2005.
Table 11  Persons per Household

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marin</td>
<td>2.43</td>
<td>2.33</td>
<td>2.38</td>
<td>2.35</td>
<td>2.33</td>
<td>2.31</td>
</tr>
<tr>
<td>Novato</td>
<td>2.79</td>
<td>2.6</td>
<td>2.64</td>
<td>2.61</td>
<td>2.57</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Source: Projections 94, ABAG. Projections Apply to the City and Its Sphere of influence

While the average household size has decreased, the total number of households has increased and is projected to continue to increase. ABAG projects a 20.4 percent increase in the number of Novato households between 1995 and 2010, with a population figure that will remain relatively stable. This trend increases the demand for smaller housing units.

Age Structure

Significant changes are occurring in the age structure of Novato’s population reflecting state and national trends. The District’s proportion of elderly residents (over 55 years old) has increased, from 12.8 percent of the population in 1980 to 17.9 percent of the population in 1990. This increase in Novato’s senior population is accompanied by a commensurate decrease in the proportion of children. Children under 18 years old constituted 30.7 percent of the population in 1980 and 24.9 percent of the population in 1990. The decrease in those under 18 years is partially attributable to lower birth rates and aging of the population. Nonetheless, there is a higher proportion of children (persons under 16 years of age) in Novato than in Marin County as a whole. The relatively small percentage of residents between the ages of 18 and 29 years can be attributed in part to the scarcity of affordable housing in Novato, as compared with other communities in California.
The State Department of Finance (DOF) projections for Marin County indicate that the elderly population is expected to grow by 50 percent between 1985 and the year 2000, while the proportion of the population under the age of 18 years will continue to fall. Novato will likely follow the State Department of Finance projections for Marin County. These trends will have a significant impact on the provision of health and social services, as well as on the demand for specialized housing for the growing senior population. Table 12 Population by Age (Source: 1990 U.S. Census) summarizes these findings.

### Minority Population

The minority population in Novato represents approximately 15.2 percent of the population, less than half the average for the State as a whole. The largest minority are persons of Hispanic origin (7.3 percent) followed by Asian or Pacific Islanders (4.7 percent), African American (2.7 percent) and American Indian (0.4 percent).

It is likely that the minority population of Novato will continue to have an increasing number of persons of Hispanic and Asian origin, as immigration from Central and South America and Asia to the San Francisco Bay region continues.
Age and Condition of Housing Stock

Significant percentages (48.5 percent) of homes in the District were constructed prior to 1960, as shown in Table 13 Age of Housing. The City of Novato Chief Building Official estimates that 5 percent of the City’s housing units are in need of some rehabilitation such as repairs to windows or roofs and repair of termite-related damage. The majority of units that require rehabilitation were built prior to 1960. It is estimated by the Building Division that approximately 75 units throughout the City will require rehabilitation within the next five years and it is estimated that of this figure approximately 10 units may need to be replaced.

Novato is a predominantly residential community. The existing housing stock defines the character of the District and its neighborhoods and is, therefore, the District’s most precious resource. The relatively high number of older homes in the District underlines the need for policies and programs, which continue to maintain and enhance the quality of older residential areas.

Table 13  Age of Housing

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1989</td>
<td>4.1</td>
</tr>
<tr>
<td>1980-1989</td>
<td>16.46</td>
</tr>
<tr>
<td>1970-1979</td>
<td>31.25</td>
</tr>
<tr>
<td>1960-1969</td>
<td>23.03</td>
</tr>
<tr>
<td>1950-1959</td>
<td>16.57</td>
</tr>
<tr>
<td>&lt;1949</td>
<td>8.54</td>
</tr>
</tbody>
</table>

Standards of Cover
The Community of Novato
Annual Construction of Housing Units by Type 1981 to 1994

Fluctuations in the type of housing built reflects not only the relative amount of land zoned for different types of residential development in Novato, but also changes in various economic factors such as tax codes and the real estate and financial markets. Table 14 summarizes the trends in annual construction of housing units by type.

Table 14: Annual Construction of Housing Units by Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Family</th>
<th>Percent</th>
<th>Multiple Family</th>
<th>Percent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>75</td>
<td>65</td>
<td>41</td>
<td>35</td>
<td>116</td>
</tr>
<tr>
<td>1982</td>
<td>44</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>44</td>
</tr>
<tr>
<td>1983</td>
<td>86</td>
<td>36</td>
<td>154</td>
<td>64</td>
<td>240</td>
</tr>
<tr>
<td>1984</td>
<td>104</td>
<td>31</td>
<td>229</td>
<td>69</td>
<td>333</td>
</tr>
<tr>
<td>1985</td>
<td>104</td>
<td>36</td>
<td>182</td>
<td>64</td>
<td>286</td>
</tr>
<tr>
<td>5-Year Average</td>
<td>83</td>
<td>41</td>
<td>121</td>
<td>59</td>
<td>204</td>
</tr>
<tr>
<td>1986</td>
<td>81</td>
<td>40</td>
<td>122</td>
<td>60</td>
<td>203</td>
</tr>
<tr>
<td>1987</td>
<td>94</td>
<td>63</td>
<td>56</td>
<td>37</td>
<td>150</td>
</tr>
<tr>
<td>1988</td>
<td>286</td>
<td>43</td>
<td>386</td>
<td>57</td>
<td>672</td>
</tr>
<tr>
<td>1989</td>
<td>109</td>
<td>32</td>
<td>229</td>
<td>68</td>
<td>338</td>
</tr>
<tr>
<td>1990</td>
<td>82</td>
<td>80</td>
<td>21</td>
<td>20</td>
<td>103</td>
</tr>
<tr>
<td>5-Year Average</td>
<td>130</td>
<td>44</td>
<td>163</td>
<td>56</td>
<td>293</td>
</tr>
<tr>
<td>1991</td>
<td>22</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>1992</td>
<td>25</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>1993</td>
<td>37</td>
<td>67</td>
<td>18</td>
<td>33</td>
<td>55</td>
</tr>
<tr>
<td>1994</td>
<td>49</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>49</td>
</tr>
<tr>
<td>4-Year Average</td>
<td>33</td>
<td>87</td>
<td>5</td>
<td>13</td>
<td>38</td>
</tr>
<tr>
<td>14-Year Average</td>
<td>86</td>
<td>46</td>
<td>103</td>
<td>54</td>
<td>188</td>
</tr>
</tbody>
</table>

Source: Community Development Department. Data based on the fiscal year beginning July 1, rather than the calendar year. Rounding affects averages.
There has been little rental or multifamily housing constructed in Novato since 1990. Future increases in multiple family housing will depend on the availability of vacant and underdeveloped land, the continuing involvement of the Redevelopment Agency, and extending the Mixed Use designations combined with favorable market and financial conditions.

Various Housing Characteristics

Table 15 and Table 16 chart the Tenure and Number of Housing Unit characteristics of the housing stock in Novato. These tables indicate that more than one third of the District’s housing units are rental units. Single-family detached units comprise only 54 percent of the total, while 23 percent comprise multiple family dwellings. Novato also has relatively large number of mobile homes in relation to other Marin County cities.

<table>
<thead>
<tr>
<th>Tenure</th>
<th># of Housing Units</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner Occupied</td>
<td>11,289</td>
<td>60.11</td>
</tr>
<tr>
<td>Renter Occupied</td>
<td>6,947</td>
<td>36.99</td>
</tr>
<tr>
<td>Vacant</td>
<td>546</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>18,782</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: 1990 Census

<table>
<thead>
<tr>
<th>1 Unit Detached</th>
<th>1 Unit Attached</th>
<th>2 to 4 Units</th>
<th>5 or More Units</th>
<th>Mobile Home</th>
<th>1 Unit Detached</th>
<th>1 Unit Attached</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No.</td>
<td>10,385</td>
<td>3,535</td>
<td>1,073</td>
<td>3,481</td>
<td>640</td>
<td>10385</td>
<td>3535</td>
</tr>
<tr>
<td>Percentage</td>
<td>54.33%</td>
<td>18.49%</td>
<td>5.61%</td>
<td>18.21%</td>
<td>3.34%</td>
<td>54.33%</td>
<td>18.49%</td>
</tr>
</tbody>
</table>

Source: California Department of Finance, Demographic Research Unit, 04/28/94

The California Department of Finance reports a vacancy rate of 3 percent in 1994 in Novato. It is generally accepted that a vacancy rate of at least 4 percent is needed to provide for normal turnover in housing units. Novato’s vacancy rate indicates a continuing strong demand for housing in the community.
Mobile Homes
Mobile homes provide a significant number of affordable housing units in Novato. The Los Robles, Marin Valley, Novato RV Park, and Dean’s RV Park provide a total of 543 units of housing within the NFPD service area.

Special Housing Needs – Disabled Persons
The number of disabled persons in the District has important planning and social implications, which affect the demand for specialized access, and EMS demands. There were 1,476 disabled persons, representing 2.4 percent of the District’s population in 1990. The U.S. Census defines disabled persons as those with impaired mobility, including the blind.

Special Housing Needs – Large Families
Approximately 3 percent of the District’s population lives in large families, which comprise five or more persons per family. Although demographic trends indicate that family size will continue to decrease, thereby reducing the demand for housing units with more than four bedrooms, there continues to be a strong demand for this type of housing.

Overcrowding
The Census Bureau defines overcrowding as a condition in which there is more than one person per room (exclusive of bathrooms). Thus if a five person household lived in a four-room apartment, the Census Bureau would define their living circumstances as “overcrowded.” According to the 1990 Census, 136 owner households and 474 renter households lived in overcrowded conditions, or 3.3 percent of all households. Of these households, 237 lived in severely overcrowded conditions, more than 1.5 persons per room. Overcrowding is a problem affecting primarily families with five or more members.

At Risk Population
The “at risk” population is defined as Novato residents who are in danger of becoming homeless. In many communities one reliable measure of the “at risk” population is the number of below market rate units, which are scheduled to lose their affordability status when the HUD-sponsored or related financing contracts expire. There are, however, other indicators of the “at risk” population in the community. The City carried out a study in 1993 to identify this population. The study reported that there were 760 Novato residents classified by the 1990 US Census as living at or below the poverty line; 2,100 renters and 814 owners paying more than 35 percent of their income for housing; and 242 households with severely overcrowded living conditions.

One of the fastest growing sectors of the population in Novato and Marin County are seniors. The State Department of Finance projects that the proportion of senior population will double by the year 2005. Data indicates that 48 percent of senior households earned less than $35,000 per year in 1994. Therefore, there are
now approximately 1,640 lower income senior households in Novato. With the number of seniors projected to increase, it is clear that there is a strong need for additional senior housing in the community.

A total of 1,559 housing units have been built in Novato during the period 1988-1994.

**Community Characteristics and Facilities**

**Downtown**
Downtown Novato (including Old Town) is located primarily along Grant Avenue, between Railroad Avenue and Seventh Street. “Old Town” is the area between Railroad Avenue and Redwood Boulevard, while “Downtown” occupies the area between Redwood Boulevard and Seventh Street.

The Downtown/Old Town area encompasses a mix of businesses, including restaurants, clothing stores, boutiques, various other kinds of retail, construction/home improvement-related businesses.

**Senior Citizen Facilities**
Nearly 20 percent of Marin County’s senior citizen population lives in the Novato area. Between 1980 and 1990, the number of older people (60+) living in Northern Marin increased by 56 percent, the fastest rate of growth in the county. By the year 2010, the senior population (age 65 and over) is expected to double. With this aging of the population, the demand for elder care will grow. Often families in the “sandwich generation” are pressed by needs to care for both aging parents and their own children.
The following privately-owned housing complexes in the Novato area are assisted by the federal Department of Housing and Urban Development (HUD) or accept Section 8 certificates:

- La Casa Novato, located at 450 Entrada, Ignacio, contains 10 units for the elderly and disabled.
- Nova-Ro I Apartments, located at 1128 Olive Avenue, Novato, contains 30 units for the elderly.
- Nova-Ro II Apartments, located at 1130 Seventh Street, Novato, provides 56 units for the elderly.
- The Meadows, located at 1514 Hart Court, Novato, provides 20 units for the elderly and families.
- Marion Park Apartments, located at 1725 Marion Avenue, Novato, contains 34 units for the elderly, disabled, and families.
- Mackey Terrace, located on Owens Drive in Novato, contains 50 units for low-income seniors.
- Bay Vista Apartments, located on Hutchins Way, Novato, contains 12 buildings.

**Community Care Homes**

Community care homes are residential facilities that provide protective oversight but are not licensed as nursing homes. They provide room and board, housekeeping, personal hygiene care, and short-term basic bedside care for temporary illness. Some of the facilities may accept individuals with marginal resources, through Social Security and/or any State supplementary payments. Community care homes in Novato include:

- Crestwood, 1705 Center Road
- Family Manor, 830 Tamalpais Avenue
- Lensvelt Home, 2771 Center Road
- Maribel’s Villa, 270 Fairway Drive
- Marin Pines, 625 Louise Avenue
- S. Alexander’s Haven, 120 Kaden Drive
- St. James Residence, 1942 Center Road
- Villas at Hamilton, 410 South Palm Drive

**Retirement Homes**

Retirement homes provide housing and special services for retired people. There are two retirement residences in Novato: Deer Park, located at 646 Canyon Road, and Tamalpais Creek Retirement Community, located at 853 Tamalpais Avenue. Deer Park provides rooms, meals, and housekeeping services but no personal
care assistance for seniors who are disabled. Tamalpais Creek does have units where personal care (also known as residential care or board and care) is also provided.

**Convalescent Hospitals**

Convalescent hospitals provide long-term, 24-hour nursing services or short-term respite care for the elderly, the chronically ill, or convalescing patients. The Marin County Department of Health and Human Services provides assistance and information to those needing help in planning for convalescent care. There is only one convalescent hospital in Novato, the Novato Convalescent Hospital at 1665 Hill Road.

**Senior Apartment Complexes**

Since the redevelopment of the former Hamilton Air Force Base 15 apartment complexes have been constructed. These are fully sprinklered and multi-story complexes which serve approximately 200 units.

**Streams and Other Bodies of Water**

The Novato area contains a network of rivers, streams, creeks, lakes, and other water bodies, including:

- **The Petaluma River**, which originates approximately 20 miles north of the City of Petaluma and forms the northeast border of the Novato area. Petroleum and gravel products are transported from Petaluma to San Pablo Bay via the river. Marshlands along the Petaluma River have been considered for nomination as a federal estuarine sanctuary.

- **San Pablo Bay**, which borders the eastern edge of the area and is connected to the terminus of the Petaluma River. This shoreline extends for approximately seven miles. San Pablo Bay is a navigable waterway that provides access to San Francisco Bay and the Pacific Ocean.

- **Novato Creek**, which flows from west to east and bisects the area. The watershed of Novato Creek encompasses the majority of the area, and its drainage basin encompasses 44 square miles. Numerous streams flow into Novato Creek, including Warner Creek, with a 5.1-square-mile drainage; Arroyo Avichi, with a 1.6-square-mile drainage; and Arroyo San Jose, with a 5.7-square-mile drainage. In addition to these major waterways, numerous local drainage channels and storm drains discharge into Novato Creek and its tributaries. Pacheco Creek flows through the southern part of Novato.
✓ **Rush Creek**, which flows eastward from Highway 101 to the Petaluma River, north of the City limits.

✓ **Stafford Lake**, a reservoir and headwater for Novato Creek is located approximately 11 miles upstream from San Pablo Bay. The reservoir, which was established in 1951 by the North Marin Water District, stores water for domestic use and reduces flooding along Novato Creek. The reservoir has a storage capacity of 4,430 acre-feet and a water surface area of 245 acres.

The North Marin Water District (NMWD) supplies about 95 percent of Novato with potable water. NMWD receives most of its water from the Russian River, via the North Marin Aqueduct. NMWD has an agreement with the Sonoma County Water Agency that provides an annual entitlement of 12,360 acre-feet (4 billion gallons) of Russian River water. NMWD also receives a small amount of its supply from Stafford Lake, a reservoir on Novato Creek in the western corner of the District. The water supply is adequate to meet the demand under General Plan build out. Water distribution facilities are developed on a site-by-site basis, financed by the developer through agreements with the water agency. NMWD is the primary water purveyor in the NFPD and is the sole provider of the fire flow delivery system.

![Stafford Lake](image-url)
Wildlife, Vegetation, and Habitats

The Novato Area of Interest contains a wide range of plant and animal communities, including:

- **Wintering habitat**, existing along California’s coastline, and provide essential resting, feeding, and wintering habitat for millions of birds of the Pacific Flyway extending from Canada to Mexico, as well as providing habitat for a range of species.

- **Freshwater wetlands**, which are found where fresh stream water or storm water runoff permanently or seasonally inundates low-lying areas. Freshwater wetlands are typically among the most productive wildlife habitats in California, supporting a variety of birds, small mammals, reptiles, and amphibians.

- **Riparian habitat**, which is found along the upper portions of Novato Creek and its tributaries. The complex structure and diversity of vegetation within riparian areas, as well as their close proximity to water, creates an extremely productive habitat for numerous mammal, bird, and reptile species. Riparian habitat is scarce because it only forms along watercourses and lakes, and because in California much of this habitat has been lost to agricultural uses, urbanization, and channelization for flood control. Shade provided by trees along watercourses helps maintain cooler water temperatures, retarding algae growth and enhancing fish habitat.

- **Oak woodlands**, which are found on north-facing slopes and in canyons and ravines on more exposed, slopes. In the Novato area, the proximity of oak woodland to open grassland and riparian habitat provides shelter and cover located close to feeding areas. This promotes a great diversity of wildlife, including a wide variety of animal, bird, reptile, and insect species. There are also forested areas, including redwood groves, within the oak woodlands.

- **Grassland/oak savannah**, in drier upland areas, interspersed with oak woodland, in the northern portion of the area. Most oak savannah lands in the area have been developed with urban uses, and few oaks have survived. The deep root system of oak trees make the savannah community particularly valuable for erosion control on slopes that otherwise support only grassland.

- **Agricultural land**, in valley areas and leveed bayside plains. Important agricultural crops grown in the area include nut crops, vineyards, fruit orchards, and field crops. Agricultural land can also provide valuable wildlife habitat, including critical habitat for migrating waterfowl and shorebirds during the winter. The State Department of Conservation has classified much
Standards of Cover
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of Novato’s agricultural land, particularly bay front land, as Farmland of Local Importance (i.e., land currently in agricultural production that meets the criteria for Prime Farmland or Farmland of Statewide Importance, but is not irrigated). Some lands along the Bay produce oat hay, an important animal food source for ranches in Central and West Marin.

✓ Urban landscaped areas, concentrated in the Novato Valley where they occupy former grassland, oak woodland, and savannah areas. Exotic trees, shrubs, flowers, and vegetables in these areas have replaced native plants, providing habitat for many birds, rodents, mammals, reptiles, and insects.

Wetlands

Wetlands in the area include saltwater and brackish water-marshland, and freshwater wetland. The marshes and much of the freshwater wetlands habitat are part of the San Francisco Bay Estuary. Saltwater marsh communities occur in the upper intertidal zone of protected shallow bays, estuaries, and coastal lagoons. Brackish-water marshes occur at the mouth of large streams, which enter northern San Pablo Bay, creating a gradual transition zone between salt marsh and riparian vegetation communities.

Marshlands are very productive ecosystems which provide food, cover, nesting and roosting habitat, generate organic matter to fuel aquatic food chains, and function as natural flood control and pollution filtration systems. The bayside plains adjacent to Novato Creek east of Highway 101, and those along the lower reaches of the Petaluma River and Miller Creek, are subject to tidal action and support saltwater marsh and brackish-water marsh biotic communities.

Many of the wetlands in the Novato area are seasonal freshwater wetlands occurring in areas that were once part of the Bay and are diked to provide agricultural land. Freshwater wetlands are typically among the most productive wildlife habitats in California. Their functions include providing food chain support, providing habitat for waterfowl, fish, and other wildlife, and moderating hydrologic processes.

Ridgelines and Other Scenic Resources

Ridgelines surrounding Novato generally enhance the community’s visual resources. Mt. Burdell, located north of the City of Novato, is a significant landmark in the open space network surrounding the District. Pinheiro Ridge functions as a ridge and upland greenbelt separator between the Atherton area and Gnoss Field. Big Rock Ridge, with a high point of about 1,800 feet, forms the western and southern edge of the Area of Interest, with an eastward extension to San Pablo Bay separating Hamilton Field from the St. Vincent’s Silveira property. A series of canyons stretches into the western edges of the Area of Interest, following creek corridors. Small ridgelines also have a role in providing visual barriers from one residential area to another. Other scenic resources are hillsides, Bay plains, and Bay shorelines. Hillsides, whether open and grassy like
southern Mt. Burdell, or heavily wooded, provide a backdrop for developed areas. Bay plains provide expansive views to the east and south and are important to maintain the scenic qualities along Highways 101 and 37. The Bay shoreline is a scenic resource that would be of greater value if more public access were provided.

Open Space for Environmental Protection

In 1972, Marin County voters established the Marin County Open Space District and approved the assessment of a property tax for the purpose of acquiring and managing open space in the County. The District works cooperatively with federal agencies, the State Parks Department, and local communities to acquire open space in the eastern part of the County. The City of Novato also owns approximately 200 acres of open space, obtained through acquisition or dedication, and located throughout the City. There is approximately 4,000 acres of open space land in public ownership (state, county, city) in the City limits with another 1,000 acres in the Sphere of Influence.

Open space areas in the Novato area that are identified in the Marin Countywide Plan include community separators, water edge lowlands, stream and creak reserves, Hamilton Army Airfield, and parks and recreation trails and cultural facilities.

Community Separators

- **Big Rock Ridge**, separating the Novato basin from the Lucas Valley/Marinwood Communities, extending to Stafford Lake Park and bordering the Indian Valley Campus. (6,400 acres, of which 4,512 have been publicly acquired.)
- **Hills east of Highway 101 south of Hamilton Field**, separating Novato from the St. Vincent’s property and extending to San Pablo Bay. (1,070 acres, of which 263 are publicly owned.)
- **Pinheiro Ridge**, the northern boundary of urban development east of the freeway, separating the Atherton area from Gnoss Field. (970 acres, of which 109 are publicly owned.)
- **Mount Burdell**, a major landmark of North Marin. (1,400 acres, all publicly owned. The Olompali State Historic Park borders to the north.)

Water Edge Lowlands

- **McInnis County Park**, (1,850 acres, 788 in public ownership.)
- **Novato Creek to Black Point**, including the entire tidal marsh and flood pond area. (1,808 acres, publicly owned.)
- **Petaluma River** (950 acres, of which 196 acres of wetlands between Rush Creek and Basalt Creek are publicly owned.)
Standards of Cover
The Community of Novato

✓ Deer Island Open Space Preserve (120 acres northeast of the intersection of Novato Creek and Highway 37, owned by the Marin County Open Space District.)

Stream and Creek Reserves
✓ Arroyo San Jose, extending through the Novato Golf and Country Club and Rafael Village.
✓ Novato and Warner Creeks, among the few remaining natural streams in East Marin.

Hamilton Air Force Base
The former Hamilton Air Force Base is a 700-acre property currently under Federal ownership that is being processed through the Federal disposal process known as the Base Realignment and Closure Commission (BRAC). The Reuse Plan prepared by the Hamilton Local Reuse Authority envisioned wetlands conversion for this property, which is below sea level and currently protected by a levee. The ownership of the property has been accepted by the California Nature Conservatory. Another portion of the base has an approved development plan that also provides for open space and wetlands restoration as part of the projects required mitigation measure.

Parks and Recreation Trails
The City of Novato owns over 59 acres of developed parks and 169 acres of undeveloped future park lands. The 700-acre Olompali State Historic Park, north of the District and west of Highway 101, was established in 1981. The State Park contains sites once occupied by the Coastal Miwok people, as well as the Burdell House, which was built in the 1860s. The Olompali State Historic Park General Plan, adopted by the State Park and Recreation Commission in 1988, calls for improvements to historical resources and trails. Capacity of the park is currently limited to 225 visitors at any one time because of parking availability.

Table 17 summarizes the Developed Parks by name and number of acres.

Table 18 summarizes the Undeveloped Parks by name and number of acres.
## Publicly Owned Developed Parks in Novato

<table>
<thead>
<tr>
<th>Park Site</th>
<th>Number of Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill Recreation Area</td>
<td>13</td>
</tr>
<tr>
<td>Hillside Park (Aaron &amp; Highland)</td>
<td>1</td>
</tr>
<tr>
<td>Pioneer Memorial</td>
<td>8.75</td>
</tr>
<tr>
<td>Josef Hoog</td>
<td>9.94</td>
</tr>
<tr>
<td>Miwok</td>
<td>6.14</td>
</tr>
<tr>
<td>Marin Highlands</td>
<td>4.07</td>
</tr>
<tr>
<td>Slade</td>
<td>3.1</td>
</tr>
<tr>
<td>Marion/Stafford Grove</td>
<td>2.75</td>
</tr>
<tr>
<td>Lee Gerner</td>
<td>1.88</td>
</tr>
<tr>
<td>Arroyo Avichi</td>
<td>0.58</td>
</tr>
<tr>
<td>Bahia Mini Parks (6)</td>
<td>1</td>
</tr>
<tr>
<td>Partridge Knolls</td>
<td>0.5</td>
</tr>
<tr>
<td>Olive/Elmwood</td>
<td>0.25</td>
</tr>
<tr>
<td>Joyce Street</td>
<td>0.25</td>
</tr>
<tr>
<td>Pansy Tong Lo</td>
<td>0.75</td>
</tr>
<tr>
<td>Robinhood</td>
<td>0.25</td>
</tr>
<tr>
<td>Pacheco Valle/Creekside</td>
<td>4.65</td>
</tr>
<tr>
<td>Fairway - Alameda</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Total - Developed Parks</strong></td>
<td><strong>59.16</strong></td>
</tr>
</tbody>
</table>

Source: Community Profile, 1994, City of Novato
Table 18  Publicly Owned Undeveloped Parks in Novato

<table>
<thead>
<tr>
<th>Park Site</th>
<th>Number of Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>O’Hair/Fuchs</td>
<td>100</td>
</tr>
<tr>
<td>Lynwood Hill</td>
<td>13.3</td>
</tr>
<tr>
<td>San Andreas Park Site</td>
<td>4.43</td>
</tr>
<tr>
<td>Scottsdale Pond and Marsh</td>
<td>40.63</td>
</tr>
<tr>
<td>Pacheco Valle</td>
<td>2.37</td>
</tr>
<tr>
<td>Park Novato</td>
<td>1.3</td>
</tr>
<tr>
<td>Pell</td>
<td>0.88</td>
</tr>
<tr>
<td>Terry Circle</td>
<td>0.6</td>
</tr>
<tr>
<td>Spyglass Park</td>
<td>1</td>
</tr>
<tr>
<td>Hamilton Parks</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Total - Undeveloped Parks</strong></td>
<td><strong>69.01</strong></td>
</tr>
<tr>
<td><strong>Total Park Acreage</strong></td>
<td><strong>228.77</strong></td>
</tr>
</tbody>
</table>

Source: Community Profile, 1994, City of Novato

Cultural Facilities

Novato has several cultural facilities which include The Marin Museum of American Indian located at 2200 Novato Boulevard. The museum focuses on all of the Native American cultures on our continent, especially the Miwok Indians. The museum includes many exhibits and hands on displays.

The Novato History Museum, located at 815 Delong, is in a Victorian home built in 1850. The museum provides an overview of Novato’s history.

Hamilton Field History Museum is under construction and will showcase the significant impact of Hamilton Air Force Base on Novato and California. The museum is housed in an abandoned firehouse constructed in 1934, one of two servicing the airbase.

The Novato Theatre, located at 924 Grant Avenue, opened in 1946 and replaced the Pini Mercantile building that was destroyed by fire. The Novato Theatre Restoration plan will transform the defunct movie theatre into a performing arts center for live performances including music, dance, theatre, and film.
Figure 6  Value Assessor Parcels – Parcel Use Classes

The Figure 6 map provides a spatial view of parcel use classification within the District service area.
Section B. Services Provided

Introduction

The Novato Fire Protection District provides an integrated all risk response to the community. Services include but are not limited to emergency medical services, fires, rescue response for vehicle accidents, surface water bodies, confined space, technical rescue, and hazardous material incidents. The NFPD delivers these services via five fire stations, five engine companies, one truck company, and two ALS transport ambulances.

Of the District’s 71 square miles, approximately 40 square miles is wildland-open space or wildland urban interface area. Because of this, NFPD provides initial attack to inter-mix areas and first response to State Responsibility Area (SRA) lands where primary authority for fire suppression lies with the California Department of Forestry and Fire Protection (Cal Fire). Marin County Fire Department acts as the Cal Fire agent under contract.

The NFPD is bisected by two major highways and a once well traveled rail line operated by the Northwest Pacific Railway. The rail line was abandoned in 1995. However, in early 2014 freight and passenger rail service will resume.

These primary transportation routes present hazardous material response challenges as well as the commercial and light industrial areas of the Hamilton Industrial Park. As such, the NFPD is an integral part and signatory of a Marin County Fire Chiefs Hazardous Material Response Team Joint Powers Agreement (HMRT-JPA). The NFDP is the JPA administrator and has four members of the District trained to the California State Training Institute (CSTI) Specialist level.

In addition to the Marin County HMRT JPA, District members are assigned to the Marin County Urban Search and Rescue (USAR) team certified by the California Office of Emergency Services as the California Regional Task Force 1.
Number of Companies

The number of fire companies increased since the 2003 Standards of Cover was published and this is directly related to the building of a new fire station, Station 5, being built on the former Hamilton Air Force Base; located at 5 Bolling Drive. This added an additional ALS engine company to the complement of response personnel effective October 2005.

The District has five Type I ALS Engine Companies; one Truck Company that cross staffs a Rescue Squad, and two ALS transport paramedic ambulances. One ALS paramedic transport ambulance is crossed staff at Station 2. Three stations (Stations 1, 3, and 5) are crossed staffed with Type III Engines during wildland fire season.
Existing Fire Station Locations

Fire Stations and the Administrative facility are located as follows:

Administration Building
95 Rowland Way

Station 1
7025 Redwood Blvd.

Station 2
450 Atherton Ave.

Station 3
65 Ramon Way

Station 4
319 Enfrente Road

Station 5
5 Bolling Drive
Staffing Levels and Staffing Patterns

The NFPD currently has daily 22 emergency response personnel on duty plus one Battalion Chief per shift. There are three shifts (A, B and C) and the personnel work a 2 x 4 (48 x 96 hours) work week known as the modified “Kelly” schedule.

There are an additional 19 administrative and executive team members for a total of 88 District members.

Emergency Response Staffing
All ALS Type I Engines are staffed with three personnel: Captain, Engineer, and Firefighter/Paramedic.

All ALS transport ambulances are staffed by two Firefighter/Paramedics.

The Truck Company/Rescue is staffed with three personnel: Captain and two engineers.

District Administrative Chief Officer Staffing
The District administrative Chief Officers are operations response capable and respond to greater alarms and provide District coverage, general or staff command functions to support the incident or the joint City of Novato/NFPD Emergency Operations Center. These personnel include the Fire Chief, Deputy Fire Chief, Division Chief – Fire Marshal, Battalion Chief of Organization Resources and Planning, Battalion Chief of the Training Division and the Battalion Chief of the Emergency Medical Services Division.

Emergency Response Training and Certifications

California Training and Educations System
All personnel are trained to the California Fire Services Training and Education System (CFSTES) certifications commensurate with their respective position within the organization including: Firefighter, Paramedic, Engineer-Apparatus Operator, Fire Officer-Engine Boss, and Chief Officer.

Hazardous Materials, Confined Space, OSHA
Additionally, all personnel are trained to the first responder operations levels for hazardous material, confined space, and the California and Federal OSHA levels for medical emergency response. All firefighters are certified and licensed paramedics according to the requirements of the State of California and the Marin County Emergency Medical Services Agency.

California Incident Command Certification System (CICCS)
In addition to the previously stated minimum level training requirements and certifications, personnel meet the California Incident Command Certification System (CICCS) requirements for their respective positions in accordance with
the National Wildfire Coordinating Group (NWCG) relative to wildland firefighting operations and command.

**CSTI Hazardous Materials**

All safety members of the District are trained to the CSTI Haz Mat First Responder Operations and Operations Decontamination levels. All Chief Officers are trained and certified as Hazardous Material Incident Commanders consistent with California Code of Regulations CCR Title 19.

**Chief Fire Officer (CFOD) and Executive Fire Officer Program (EFO) Designations**

Several of the Chief Officers have obtained, through the Commission on Fire Accreditation International, the Chief Fire Officer (CFOD) designation. Some have also completed or are in the process of completing the National Fire Academy’s Executive Fire Officer Program (EFO) distinction.

**Available Equipment and Apparatus**

**Station 1**

Station 1 has nine personnel on duty daily and the following equipment and apparatus:

- One Type I ALS Engine
- One 105ft. Aerial Ladder
- One California Office of Emergency Services certified Medium Rescue Squad
- One Water Tender
- One Type III Engine
- One ALS Transport Ambulance
- One Battalion Chief’s command vehicle

**Station 2**

Station 2 has three personnel on duty daily and the following equipment and apparatus:

- One Type I ALS Engine
- One Light Duty Rescue Boat (Zodiac)
- One ALS Transport Ambulance
Standards of Cover

Services Provided

**Station 3**
Station 3 has three personnel on duty daily and the following equipment and apparatus:

- One Type I ALS Engine
- One Type III Engine
- One Mobile Command Vehicle

**Station 4**
Station 4 has five personnel on duty daily and the following equipment and apparatus:

- One Type I ALS Engine
- One ALS Transport Ambulance

**Station 5**
Station 5 has three personnel on duty daily and the following equipment and apparatus:

- One Type I ALS Engine
- One Type III Engine
- One Type II County Wide Haz Mat Vehicle (HM-1)

**Administrative Support Services**
Administrative support services are located at 95 Rowland Way. The Administrative Building was purchased and renovated in 2003 and opened in February 2004 as the new administrative support services facility. A total of 18 support personnel provide District administration and direction for the Finance, Fire Loss Management, and Emergency Medical Services divisions, and the EMS Billing Department. It services and hosts the office of the Fire Chief and Deputy Fire Chief.
First-due Areas of Response by Station Zone

NFPD station response zones are delineated by the District’s Manual of Operations Policy 3-IX-2. These response zones are also delineated for spatial perspective in Figure 7 Station Response Zones map.

Figure 7   Station Response Zones
Current Deployment of Resources – Baseline Performance

Baseline performance was originally identified in the Standard of Cover 2003 edition. Current analysis of response data has proven that baseline response has changed and improved primarily due to the addition of Station 5 as well as the automatic move-up configuration when resources are committed or in cases of simultaneous calls for service.

NFPD is bisected by Highway 101 (North – South) and Highway 37 (East – West). As such, three Stations are located to the north, west, and east areas of the District and two Stations are located to the south of Highway 37.

The Table 19 and Table 20, and Figure 7 and Figure 8 illustrate baseline performance for all urgent calls within the District by Station zone.

Table 19

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Calls</th>
<th>Average Calls Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>4,571</td>
<td>12.52</td>
</tr>
<tr>
<td>2004</td>
<td>4,546</td>
<td>12.45</td>
</tr>
<tr>
<td>2005</td>
<td>4,826</td>
<td>13.22</td>
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<tr>
<td>2006</td>
<td>4,864</td>
<td>13.33</td>
</tr>
<tr>
<td>2007</td>
<td>4,855</td>
<td>13.30</td>
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</table>
Table 20  Incidents per Year by Type and Percentage

<table>
<thead>
<tr>
<th>Type of Incident</th>
<th>2003 Incidents</th>
<th>%</th>
<th>2004 Incidents</th>
<th>%</th>
<th>2005 Incidents</th>
<th>%</th>
<th>2006 Incidents</th>
<th>%</th>
<th>2007 Incidents</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Aircraft Fire</td>
<td>1</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
</tr>
<tr>
<td>Explosions</td>
<td>3</td>
<td>0.1%</td>
<td>1</td>
<td>0.0%</td>
<td>7</td>
<td>0.1%</td>
<td>2</td>
<td>0.0%</td>
<td>2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other Fires</td>
<td>62</td>
<td>1.4%</td>
<td>73</td>
<td>1.6%</td>
<td>50</td>
<td>1.0%</td>
<td>55</td>
<td>1.1%</td>
<td>57</td>
<td>1.2%</td>
</tr>
<tr>
<td>Structure Fires</td>
<td>45</td>
<td>1.0%</td>
<td>56</td>
<td>1.2%</td>
<td>46</td>
<td>1.0%</td>
<td>51</td>
<td>1.0%</td>
<td>43</td>
<td>0.9%</td>
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<tr>
<td>Vehicle Fires</td>
<td>49</td>
<td>1.1%</td>
<td>38</td>
<td>0.8%</td>
<td>43</td>
<td>0.9%</td>
<td>35</td>
<td>0.7%</td>
<td>37</td>
<td>0.8%</td>
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<tr>
<td>Wildland Fires</td>
<td>108</td>
<td>2.4%</td>
<td>73</td>
<td>1.6%</td>
<td>65</td>
<td>1.3%</td>
<td>50</td>
<td>1.0%</td>
<td>87</td>
<td>1.8%</td>
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<tr>
<td>Total Fires</td>
<td>268</td>
<td>5.9%</td>
<td>241</td>
<td>5.3%</td>
<td>211</td>
<td>4.4%</td>
<td>193</td>
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<td>4.7%</td>
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<td>False Alarms</td>
<td>231</td>
<td>5.1%</td>
<td>203</td>
<td>4.5%</td>
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<td>Haz Mat</td>
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<td>45</td>
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<td>42</td>
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<tr>
<td>Rescue EMS</td>
<td>2,701</td>
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<td>2,682</td>
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<td>2,878</td>
<td>59.6%</td>
<td>2,778</td>
<td>57.1%</td>
<td>2,870</td>
<td>59.1%</td>
</tr>
<tr>
<td>Service Calls</td>
<td>1,033</td>
<td>22.6%</td>
<td>1,051</td>
<td>23.1%</td>
<td>1,173</td>
<td>24.3%</td>
<td>1,280</td>
<td>26.3%</td>
<td>1,216</td>
<td>25.0%</td>
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<tr>
<td>Vehicle Accident</td>
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<td>6.5%</td>
<td>330</td>
<td>7.3%</td>
<td>337</td>
<td>7.0%</td>
<td>362</td>
<td>7.4%</td>
<td>338</td>
<td>7.0%</td>
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<tr>
<td>Water Rescue</td>
<td>-</td>
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<td>-</td>
<td>0.0%</td>
<td>1</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total Incidents</td>
<td>4,571</td>
<td>100.0%</td>
<td>4,546</td>
<td>100.0%</td>
<td>4,826</td>
<td>100.0%</td>
<td>4,864</td>
<td>100.0%</td>
<td>4,855</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure 8  Fire Incidents 2003 – 2007
Current Performance Goals

The current performance goals identified in the 2003 Standards of Cover are as follows:

“The response time is inclusive of the departure of fire crews to the unit’s arrival on scene.”

<table>
<thead>
<tr>
<th>Response Time</th>
<th>Arrival Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>70%</td>
</tr>
<tr>
<td>6 minutes</td>
<td>80%</td>
</tr>
<tr>
<td>8 minutes</td>
<td>90%</td>
</tr>
</tbody>
</table>

A discrepancy has been identified with the previously stated “District Response Time Goal” in that the definition stated within the goal of response time is “response time is inclusive of the departure of fire crews to the unit’s arrival on scene.” This statement is actually the “travel time” definition as stated by the CFAI Standards of Cover manual and does not meet the minimum standard.
guided by the 5th edition Standards of Cover or the 7th edition of the CFAI Self-Assessment Manual.

The goals statements and desired outcomes will be properly sated as required by the 5th Edition of the CFAI Standards of Cover Manual and may be found in the Section F Performance Objectives and Performance Measures of this revised Standards of Cover document.

**Current Performance Objectives**

The following performance objectives and recommendations were identified in the (2003) Standards of Cover:

1. Continue to utilize mutual aid for incidents beyond our capabilities.
2. Support County wide efforts for both Hazardous Material Response and Urban Search and Rescue.
3. Work with Marin County Sheriff’s Communications to improve the level of information used in evaluating response criteria both pre and post event.
4. Enter into an agreement with Marin County Sheriff’s Communications to refine dispatch criteria and establish performance criteria.
5. Continue with the addition of one additional paramedic engine company to be located in east of Highway 101 in the southern quadrant of the Fire District.
6. When the current aerial ladder is replaced, retain the unit for reserve status.
7. Installation of speed humps as traffic calming devices must be balanced against travel time reduction for emergency units and community benefit.
8. Continue with the EMTREC signal program to allow for traffic interruption for code 3 response, enhancing our capability to respond quickly and safely to emergency incidents.
9. Continue with an aggressive public education program for the wildland urban interface including securing matching grants for vegetation management.

Unfortunately, there were no time frames for compliance or performance measurement reporting frequency for these objectives within the Standards of Cover. This is contrary to the CFAI requirements for the (2003) Standards of Cover.

The revised objective statements, timelines and specific outcomes will be properly stated as required by the 5th Edition of the CFAI Standards of Cover Manual and may be found in Section H Overall Evaluation.
Standards of Cover

Services Provided

Current Performance Measures

Since the adoption of the (2003) Standards of Cover performance measurements of the goals and some objectives has been reported via the quarterly work plan published for the District Board of Directors and their regularly scheduled Board meetings.

This performance criteria and reporting frequency will require greater depth and breadth and is addressed in the revised performance goals and objectives and recommendations stated in the Overall Evaluation portion of this revised Standard of Cover.
Section C. Community Expectations and Performance Goals

Introduction

Within this Section, the community’s expectations are detailed and documented. The revised performance goals have been re-created to ensure the level of service provided to the community is stated. This process was initiated through a comprehensive Community-Based Strategic Planning process conducted December 8-12, 2008. This section documents the efforts undertaken to ensure the community understands its current service level and the citizens are satisfied with the services currently being delivered.

This section details the work, which occurred to establish the revised service level categories used throughout the document and the study process. Each service level is defined in explicit terms.

In addition, the establishment of community baselines is detailed in this section. These show the current and historical performance trends for the past three years. This section also includes a discussion of the current ISO rating, date of a last rating, and anticipated next grading.

ISO Rating

To help establish appropriate fire insurance premiums for residential and commercial properties, insurance companies need reliable, up-to-date information about a community’s fire-protection services. The Insurance Services Organization (ISO) provides that information through the Public Protection Classification (PPC) program.

ISO collects information on municipal fire-protection efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data using their Fire Suppression Rating Schedule (FSRS). They then assign a Public Protection Classification from 1 to 10. Class 1 generally represents superior property fire protection, and Class 10 indicates that the area’s fire-suppression program does not meet ISO’s minimum criteria. The Novato Fire Protection District was graded in April of 1989 and re-evaluated again in November of 2002. The NFPD currently holds a Class 3 rating for its Urban and sub-urban areas of the District and a Class 9 rating in its rural areas.

By classifying the communities’ ability to suppress fires, ISO helps the communities evaluate their public fire-protection services. The program provides an objective, countrywide standard that helps fire departments in planning and budgeting for facilities, equipment, and training. And by securing lower fire insurance premiums for communities with better public protection, the PPC
program provides incentives and rewards for communities that choose to improve their firefighting services.

ISO has extensive information on more than 44,000 fire-response jurisdictions.

The PPC program recognizes the efforts of communities to provide fire-protection services for citizens and property owners. A community’s investment in fire mitigation is a proven and reliable predictor of future fire losses. As such, insurance companies use PPC information to help establish fair premiums for fire insurance — generally offering lower premiums in communities with better protection. By offering economic benefits for communities that invest in their firefighting services, the program provides a real incentive for improving and maintaining public fire protection.

The program also provides help for fire departments and other public officials as they plan for, budget, and justify improvements.

The most significant benefit of the PPC program is its effect on losses. Statistical data on insurance losses bears out the relationship between excellent fire protection — as measured by the PPC program — and low fire losses. By helping communities prepare to fight fires effectively, ISO’s PPC program saves lives.

To determine a community’s Public Protection Classification, ISO conducts a field survey. Expert ISO staff visit the community to observe and evaluate features of the fire-protection systems. Using a manual called the Fire Suppression Rating Schedule (FSRS), ISO objectively evaluates three major areas:

- **Fire Alarm and Communications Systems**
  A review of the fire alarm system accounts for 10 percent of the total classification. The review focuses on the community’s facilities and support for handling and dispatching fire alarms.

- **Fire Department**
  A review of the fire department accounts for 50 percent of the total classification. ISO focuses on a fire department’s first-alarm response and initial attack to minimize potential loss. Here, ISO reviews such items as engine companies, ladder or service companies, distribution of fire stations and fire companies, equipment carried on apparatus, pumping capacity, reserve apparatus, department personnel, and training.

- **Water Supply**
  A review of the water-supply system accounts for 40 percent of the total classification. ISO reviews the water supply a community uses to determine the adequacy for fire-suppression purposes. They also consider hydrant size, type, and installation, as well as the inspection frequency and condition of fire hydrants.
After completing the field survey, ISO analyzes the data and calculates a PPC. The grading then undergoes a quality review. The community will receive a notification letter identifying the new PPC. ISO also provides a hydrant-flow summary sheet, along with the classification details and improvement statements. The classification details summarize each subcategory and indicate the total points the community earned. The improvement statements indicate the performance needed to receive full credit for the specific item in the Schedule, as well as the quantity actually provided.

In analyzing the results from the 2002 grading, it is determined that NFPD could improve the service levels and receive substantially improved rating in the following areas:

- Distribution and Company Personnel
- Reserve Aerial Apparatus
- Training Facilities
- Pre-fire Planning and Inspections

An improvement in the distribution and company personnel was accomplished in 2005 with the construction and staffing of Fire Station 5 located at 5 Bolling Drive. Although plans to build and staff this station were known and considered by ISO at the time of the 2002 grading evaluation, points were not allocated because the facility and personnel were not yet in place. Total points received for this current level of service were 2.24 out of 4.00.

An improved rating for a reserve aerial apparatus was also not achieved. In 2009, the NFPD will replace its current 105ft. Pierce aerial ladder apparatus. This apparatus was purchased and placed into service in 1992 and based on the NFPD fleet life expectancy and capital replacement program is due for replacement. Placing the current apparatus in reserve status will not only provide for back-up apparatus during the out of service periods but will also provide greater “turnout times” when the aerial apparatus is being used for training. Total points for a reserve aerial apparatus was 0.26 out of a total of 1.0. While this fraction may seem insignificant, the method of calculating the overall fire department rating category has a factoring that makes this deficiency significant.

An improvement in training facilities will also provide significant improvements in ISO grading. In 2002, the NFPD received a 4.14 rating out of a total of 9.0 points. Although one would consider the current training facility located at Station 2 modern, it is nearly 40 years old and does not have the modern technology, infrastructure, or firefighting props required of an ISO modern training facility. This deficiency is addressed in the capital improvement goal stated in the NFPD 2009/2013 Community-Based Strategic Plan.

A deficiency in conducting pre-fire planning inspections was noted by ISO during the 2002 evaluation. During the 1989 service level evaluation, the NFPD had a rigorous pre-fire planning and inspection program that addressed building
risks within the community. Due to a shift in training requirements and priorities primarily due to the implementation of the paramedic program, new hazardous materials facilities opening in the commercial zones, improvements to the wildland urban fire response, and new development, pre-fire planning and inspections decreased because of available time allocation versus priority and state mandated training. Although ISO provides highest performance credits for conducting pre-fire planning inspections twice annually on each facility, a total of 100 points could have been realized for this practice. The NFPD received 0.0 points because it did not have a current program in place. Even if NFPD conducts pre-fire planning inspections once annually, significant points that would improve its rating would be achieved. This deficiency is addressed in the all risk hazard mitigation goal stated in the NFPD 2009/2013 Community-Based Strategic Plan.

In summarizing, NFPD received an overall point rating of 74.93 in 2002. By making some of the suggested improvements noted previously and as outlined in the 2009/2013 Community-Based Strategic Plan, it is anticipated that this would raise the required points to at least 80.0 if not higher. If this were the case, NFPD would improve its overall urban and suburban ISO grading classification from its current level 3 to a level 2 classification. This improvement would benefit the community in overall performance of the District through quality improvements and in turn, improve the insurance premium benefits of the community.

Service Level Categories

Service level categories have been identified through the “risk assessment process” which is described in Section F Performance Objectives and Performance Measures of this document. Service level categories and specific service level objectives based upon the risk analysis are established and presented in this section.

The following service level categories have been identified and established:

√ Urban Area
√ Suburban Area
√ Rural Area

Service level categories have been identified using the CFAI Self Assessment guidelines and census tract data. These service level categories are established based upon population per square mile of service area within a specific census tract.

An “urban” designation refers to an incorporated or unincorporated area with a population of over 30,000 people and/or a population density of over 2,000 people per square mile. The following census tracts meet this definition:

√ Census Tracts 1022.01, 1032, 1041.01, and 1041.02
A “sub-urban” designation refers to an incorporated or unincorporated area with a population of 10,000 to 29,999 people and/or any area with a population density of 1,000 to 2,000 people per square mile. The following census tract meets this definition:

✓ Census Tract 1050

A “rural” designation refers to incorporated or unincorporated area with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile. The following census tracts meet this definition:

✓ Census Tracts 1011, 1012, 1021, 1031, 1042, 1043, and 1330

For specific Census Tract Maps summarizing each area by square miles, population and common neighborhood names refer to the Appendix.

Community Expectations

A key element of NFPD’s organizational philosophy is having a high level of commitment to customers, as well as recognizing the importance of customer satisfaction. Therefore, NFPD, through its Community-Based Strategic Planning process asked 80 representatives from the community to participate in a meeting, which would focus on their needs and expectations of the District. Discussion centered not only on the present services provided but also on priorities for the future.

In order to dedicate time, energy and resources on services most desired by its customers, NFPD needed to understand what the customers consider to be their priorities. The External Stakeholders were asked to prioritize the services offered by the agency through a process of direct comparison.

Table 22 lists NFPD customer service priorities.
Table 22  Customer Service Priorities

<table>
<thead>
<tr>
<th>SERVICES</th>
<th>RANKING</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS First Response</td>
<td>1</td>
<td>285</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>2</td>
<td>262</td>
</tr>
<tr>
<td>Basic Rescue</td>
<td>3</td>
<td>232</td>
</tr>
<tr>
<td>Advanced Rescue</td>
<td>4</td>
<td>222</td>
</tr>
<tr>
<td>Hazardous Materials Mitigation</td>
<td>5</td>
<td>176</td>
</tr>
<tr>
<td>Disaster/Emergency Preparedness</td>
<td>6</td>
<td>137</td>
</tr>
<tr>
<td>Response to WMD/Bioterrorism</td>
<td>7</td>
<td>125</td>
</tr>
<tr>
<td>Fire Inspections</td>
<td>8</td>
<td>110</td>
</tr>
<tr>
<td>Community Fire/EMS Safety Education</td>
<td>9</td>
<td>81</td>
</tr>
<tr>
<td>Arson Investigation</td>
<td>10</td>
<td>77</td>
</tr>
</tbody>
</table>

Understanding what the community expects of its fire and emergency services organization is critically important to developing a long-range perspective. With this knowledge, internal emphasis may need to be changed or bolstered to fulfill the customer needs. In certain areas education, on the level of service that is already available may be all that is needed. The following are some of the expectations of the community’s External Stakeholders. For the complete list of community expectations refer to the 2009/2013 Community-Based Strategic Plan Appendix.

- Ability to respond quickly.
- Have well trained personnel.
- Competent, professional, courteous service.
- Well maintained equipment.
- Emergency medical help in five minutes.
- Best possible wildland interface protection.
- State-of-the-art services.
- Fire suppression response in five minutes.
- Continued mutual-aid and interagency cooperation.
Standards of Cover

Community Expectations and Performance Goals

- Fiscal responsibility.
- That the fire department provides medical care with quick triage, treatment, and transportation to the hospital.
- Maintenance of above average response time to requests from our community.
- Exceptional, friendly customer service.
- Innovative programs and the ability to collaborate with other County, City, and community organizations.
- Work with organizations to set up a city-wide strategy for emergencies like terrorism, earthquake, and other disaster responses.
- Honest answers to questions.
- Educate the children in our schools.
- Management of the “environment” surrounding and in the NFD service area to ensure we remain defensible against wildfires.
- Actively participate in the community beyond fire issues.

While not all of the community expectations have been listed, and while not all of the specific expectations can be achieved without developing performance goals, objectives and measures, the external stakeholder input has provided NFPD with valuable information to help craft qualitative and quantitative performance goals and objectives within the fiscal, physical, and political constraints and abilities of the NFPD Board of Directors. As such, all of the community expectations have been considered in the development the goals outlined within the Community-Based Strategic Plan and this revised Standards of Cover.

Community Baseline – Historical Performance Trends

See the Annex to the 2009 All Risk Standards of Cover document for the FireStats™ Risk Assessment.

2007 Baseline Turnout, Travel, and Response Times

See Table 23 for 2007 baseline turnout, travel, and response times. These times were extracted from the Fire Stats data analysis report included in the Annex to the 2009 All Risk Standards of Cover, on pages 13, 15, and 16 respectively.
Table 23 2007 Baseline Turn-out, Travel, and Response Times

<table>
<thead>
<tr>
<th>Type</th>
<th>Units</th>
<th>Time</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-out Time</td>
<td>All Units</td>
<td>1:37</td>
<td>75th</td>
</tr>
<tr>
<td>Travel Time</td>
<td>All Units</td>
<td>5:55</td>
<td>75th</td>
</tr>
<tr>
<td>Travel Time</td>
<td>1st Unit on Scene</td>
<td>5:07</td>
<td>75th</td>
</tr>
</tbody>
</table>

These response units are all Advance Life Support (ALS) Engines or Medic units. For individual unit turn-out and travel times refer to the Annex to the 2009 All Risk Standards of Cover, pages 14 and 17 respectively.
Section D. Risk Assessment and Risk Levels

Risk Assessment Defined

Each community has risks. Risks are based on the probability of an event occurring and the consequences of that event occurring.

Each creates different requirements in the community for commitment of resources. We have divided the risk assessment into four major components:

- Low Probability, Low Consequences
- Low Probability, High Consequences
- High Probability, Low Consequences
- High Probability, High Consequences

Distribution is an equity issue between neighborhoods

Concentration is a risk/cost issue and

Both are variables, thus:

Increased Risk = Increased Concentration

For example, the risk assessment for Novato may include defining the differences between a detached single-family dwelling, a multiple family dwelling, an industrial building, and a mid-rise by placing each in a separate category on this model. Fire stations and apparatus may have to be equally distributed in the community to provide an initial attack service to all of them. Conversely, the fire station locations and staffing patterns must be prepared to respond to a need for worst-case scenarios. There are many factors that make up risk: the ability of occupants to take self-preserving actions, construction features, built-in fire protection, fire flow, nature of the occupancy or its contents, etc.

While risk factors all have some common thread, the rationale of placing an occupancy within any risk assessment category is to assume the worst. Fire flow as a risk assessment criteria or requirement is based on defining the problem that will occur if the occupancy is totally involved, and therefore creates the maximum demand upon fire suppression services.
The level of service provided by an agency should be based on the agency’s ability to cope with the type and size of emergencies that are reasonably expected after conducting a risk assessment.

Figure 10     Novato School, circa 1906

**Building (Occupancy) Risk Assessment**

The Fire Flow concept of occupancy risk assessment addresses one of the most important aspects of fire control; the assessment of water supplies needed once a structure has become fully involved. The fire flow method does not address other equally important issues such as occupant risk and content vulnerability to fire origin.

In most communities the majority of losses occur in the smallest percentage of emergencies that reach the significant, major or total destruction loss ranges. The objective of risk assessment technique is to reduce the truly serious loss to a very unusual event in the community. This involves trying to keep routine emergencies from becoming serious loss situations.
Existing Commercial Occupancy Inspection Program

The Novato Fire Protection District (NFPD) has adopted a strategic approach to fire prevention and overall life safety rather than the traditional code enforcement or system installation requirement model. It starts with collecting and analyzing data to project trends to focus inspection and education activities; measuring the actual fire problem and “fire loss potential” with life and values at risk. This approach provides a process by which to engage and be productive in the ever-changing political and economic demands of our communities. It provides meaningful insights for the types of fire prevention challenges faced in Novato and Marin County in the twenty-first century.

The NFPD is committed to identifying and developing public, private and fire community partnership opportunities to implement and enhance fire prevention and awareness activities. NFPD requires automatic fire sprinklers in all new and substantial remodeled buildings within the service area and is far more restrictive than the model building and fire codes primarily due to the challenges presented by topographic, climatic, and geologic conditions. This is also accomplished through additional fire suppression and detection technology and practices in the design and construction of all structures—including ignition resistant construction and modifying existing vegetation landscapes with fire resistive plants in wildland urban interface areas.

The frequency of inspections is based on fire history, fire potential, life safety-high risk occupancies, available personnel, and legislative responsibility. The recommended inspection cycles are influenced by factors that help establish fire and life safety priorities. These priorities can change but include: identified problems, perceived problems, seasonal influence, type and use of occupancy, code-specified inspection frequency, and new construction versus existing properties.

State mandated inspections include those that are required to be inspected annually by the California Health and Safety Code (H&SC). These include: all hotels, motels, and congregate housing for more than 10 persons, H&SC Section 13146.2; and all public and private schools, H&SC Section 13146.3. Jails and places of detention are inspected on a 2 year cycle, H&SC Section 13146.1.

Additional inspections are performed based on high life safety risk considerations including but not limited to: vulnerable populations such as the elderly and the very young (Residential Care Facilities and Day Care), where people sleep, where people gather (assemblies), institutional facilities, high hazard occupancies (hazardous materials or processes, industrial, automotive, woodworking, and
laboratories), and un-sprinklered buildings that may cause economic or historical degradation to the community like the “old-town,” downtown businesses. Additionally, NFPD receives and responds to public complaints, firefighter observations-concerns, and referrals from other agencies, special requests, license and permit renewal inspection requests, within 24 hours of receiving the request.

NFPD will also be implementing a new pre-fire planning inspection program in order to provide better conformance to the ISO grading elements. This pre-fire planning and inspection program was identified as a service level improvement through the strategic planning process and is numerated in the 2009/2013 Community-Based Strategic Plan.

Currently, the NFPD Engine Companies inspect annually all Group R Division 1 occupancies within the service area. Table 24 shows the number of annual hotel, motel and apartment building inspections by Station zone.

Table 24  Annual Hotel, Motel, Apartment Inspections by Station Zone

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Station 1</th>
<th>Station 2</th>
<th>Station 3</th>
<th>Station 4</th>
<th>Station 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group R-1</td>
<td>107</td>
<td>42</td>
<td>62</td>
<td>26</td>
<td>46</td>
</tr>
</tbody>
</table>

**Major Risk Scenarios**

Novato Fire District has determined that there are eight major risk scenarios within the District. They include earthquake, flooding, hazardous materials, aviation events, wildland interface fires, structure fires including residential and commercial and emergency medical services. We will begin to define the risk scenarios and how the District is prepared to deal with these events. We will provide policies and procedures, timed evolutions whenever appropriate and case studies for those that are recent and applicable.

**Rescue System 1 Level Training**

Currently the NFPD has all personnel trained to the Rescue System 1 level, through the California Fire Service Training and Education Standards. Each apparatus is equipped with a small rescue cache, while the Squad carries the preponderance of tools and equipment for the District to serve as a first responder to areas within the District. The District has nine personnel assigned to the County’s Urban Search and Rescue team, a team that consist of 65 members,
Standards of Cover
Risk Assessment and Risk Levels

several pieces of equipment and has been trained to deal with search and rescue, disasters, natural or terrorism, structural collapse, multi-causality incidents, flood evacuation, swift water rescue, collapsed trench, dam failure and mud slides.

**Seismic Hazards**

Novato is located in one of the most seismically active areas of the nation. The western edge of the continental plates runs along the California shoreline, and the resulting stresses have produced a complex network of faults in California. The only “active” fault in Marin County is the San Andreas Fault located 12-14 miles west of the District; this fault is subject to a maximum credible earthquake of 8.3 (Richter Scale). However, a recent study of earthquake hazard prepared by ABAG (ABAG, 1995) concludes that the chance of a major earthquake on the northern segment of the San Andreas Fault in the next 30 years is only 2 percent. An inactive fault, the Burdell Mountain Fault, crosses the northeastern portion of the District.

**The Hayward Fault**

The Hayward Fault (located about eight miles east of the eastern edge of the Novato Sphere of Influence) and the Healdsburg-Rodgers Creek Fault located northeast of the District are both active faults with maximum credible earthquakes of 7.5 and 7.2 respectively. The ABAG report predicts the probability of an earthquake of a magnitude of 7.1 during the next 30 years on the Healdsburg-Rodgers Creek Fault as 0.22 (i.e. 22 percent chance) and for an earthquake of a magnitude of 7.1 on the northern Hayward Fault as 0.28 (i.e. 28 percent chance). The most severe earthquake effects in Novato would be from the Hayward Fault.

**Bayfront and Marshland Areas of Novato**

The bayfront and marshland areas of Novato are potentially hazardous to buildings. Silt and mud deposits have accumulated over 10,000 years in flat areas with elevations generally below sea level. Formerly much of these lands would flood during high tide. Some of these lands have been “reclaimed” through the construction of levees and drainage channels and used for urban development.

During an earthquake, the sandy soils may become fluid-like, in a process known as liquefaction, greatly increasing the potential damage to buildings. Urban development on bay front areas is thus potentially exposed to a very high level of geologic risk and should be carefully planned in relationship to the geotechnical requirements of the site.

**Earthquake Hazards**

Potential hazards associated with earthquakes include:

- Rupture of the ground surface by displacement along faults.
- Shaking of the ground caused by passage of seismic waves through the earth.
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Risk Assessment and Risk Levels

- Ground failure induced by shaking, such as landslides, liquefaction, and subsidence of unstable ground, with associated effects, including fire and disruption of utilities and transportation routes.
- Tsunamis (often incorrectly called tidal waves) and seiches, which occur in enclosed bodies of water such as reservoirs or lakes. This is an insignificant risk in Novato.

Seismic Effects on Structures and Public Facilities

The severity of damage to buildings from earthquakes is related to the intensity of ground shaking, soils and geologic characteristics, the type of building construction used, and other potential hazards listed previously. The community hospital has been built on a site with fill over Bay mud. The hospital was constructed to a hospital standard set by the Office of State Health, Planning and Development in consultation with the Office of the State Architect, which takes into consideration location and occupancy. The state Building Standards for hospitals are more stringent than the Uniform Building Code used by cities. Seismic risk for these types of structures are resolved consistent with current known design factors prescribed through engineering practices and the applicable regulation of the regulatory authority. The land use pattern that has evolved in Novato has, in general, avoided high-risk areas.

The District is within Seismic Zone 4. The seismic zones are in order of magnitude with Seismic Zone 4 being the area of greatest risk. The California Building Code (CBC) requires a higher safety factor for construction in Seismic Zone 4. The Unreinforced Masonry Law passed by the State Legislature in 1986 (SB 547), requires all cities and counties to identify potentially hazardous unreinforced masonry buildings. The City has complied with this legislation and reported all unreinforced masonry buildings to the State Seismic Commission. Implementation of an inspection and reinforcement program has been completed to mitigate hazards associated with the seismic effects on most structures. Novato has one remaining unreinforced masonry building.

The seismic status of buildings by their seismic classification is summarized as follows:

- Emergency buildings (police and fire stations) have been constructed recently and have been built with earthquake damage mitigating features.
- Many of the high priority buildings (city buildings, schools, limited care facilities) are mostly of recent construction. Many are steel or wood-frame buildings, which are the least susceptible to earthquake damage.
- The majorities of high-use buildings (commercial and office buildings, apartment buildings of 50 or more units and churches) are of recent construction and were designed to Seismic Risk Zone 4 standards.
Duplexes and the majority of housing in Novato have been built with one- to two-story wood-frame construction, which has a high survivability in the event of an earthquake.

Bridges across Highway 101 could be vulnerable in the event of a major earthquake.

Many of the older historical structures have not been retrofitted to meet recent seismic building standards.

The varying levels of seismic and geologic risk within the Novato area posed by a hypothetical earthquake on the Hayward Fault. Earthquake Hazard shows fault traces in Marin County and adjoining areas. A major earthquake would be expected to cause considerable damage to transportation systems. Roads, bridges and highway overpasses are susceptible to damage or failure in the event of a major earthquake. Landslides would be intensified as a result of ground shaking, and could affect portions of the roadway system located in landslide potential areas: Slope Instability. Seismic damage could also occur to treated water and sewage pipelines, gas pipelines, and to telephone and power lines. Effective planning and preparation can significantly reduce the risks and harmful effects of earthquakes and other natural disasters.
Modeled Shaking Intensity Maps for Novato

These intensity maps are not intended to be site-specific. Rather, they depict the general risk within neighborhoods and the relative risk from community to community.

Scenario: 1906 San Francisco Earthquake

![Model of the 1906 San Francisco Earthquake Magnitude 7.9](image_url)

Figure 11 Model of the 1906 San Francisco Earthquake Magnitude 7.9
Scenario: 1989 Loma Prieta Earthquake

Figure 12  Model of the 1989 Loma Prieta Earthquake Magnitude 6.9
Scenario: N. Hayward and S. Hayward Segments of the Hayward-Rodgers Creek Fault System

Figure 13  Entire Hayward Earthquake Magnitude 7.1
Scenario: Rodgers Creek Segment of the Hayward-Rodgers Creek Fault System

Figure 14 Rodgers Creek Earthquake Magnitude 7.1
Scenario: Rodgers Creek + N. Hayward Segments of the Hayward-Rodgers Creek Fault System

Figure 15 Rodgers Creek – North Hayward Earthquake Magnitude 7.2
Scenario: Northern San Gregorio Segment of the San Gregorio Fault System

Figure 16 Northern San Gregoria Earthquake Magnitude 7.3
Scenario: Entire San Andreas Fault System

Figure 17  Model of the 1906 San Francisco Earthquake Magnitude 7.9
Scenario: West Napa Fault

Figure 18  West Napa Earthquake Magnitude 6.5
Liquefaction Hazard Maps for Novato

These maps are not intended to be site-specific. Rather, they depict the general risk within neighborhoods and the relative risk from community to community.

Scenario: 1906 San Francisco Earthquake

Figure 19     Entire Bay Area San Andreas Magnitude 7.9
Scenario: 1989 Loma Prieta Earthquake

Figure 20  Loma Prieta Earthquake Magnitude 6.9
Scenario: N. Hayward and S. Hayward Segments of the Hayward-Rodgers Creek Fault System

Figure 21  Entire Hayward Earthquake Magnitude 7.1
Scenario: Rodgers Creek segment of the Hayward-Rodgers Creek Fault System

Figure 22  Entire Hayward Earthquake Magnitude 7.1
Scenario: Entire San Andreas Fault System

Figure 23  Entire Bay Area San Andreas Magnitude 7.9
Earthquake Policies

NFPD has specific response policies for earthquake incidents. Refer to the Appendix for a listing of Manual of Operations policies.

Flood Hazards

Flood control along major water courses in Novato is the responsibility of the Marin County Flood Control and Water Conservation District. Following the major flood in January 1982, Novato voters approved a program to fund flood control improvements sufficient to prevent flooding during storms up to the 50-year recurrence interval.

Storm Drainage

The City of Novato is responsible for storm drainage within the City boundaries. The City participates in the Federal Flood Insurance Program, which specifies the 100-year flood as the standard for urban communities. The City’s development regulations stipulate the 25-year storm as the design standard for capacity of surface storm water drainage improvements. In 1989 voters approved Measure “F,” which included $4.2 million for storm drains. These improvements have significantly reduced the potential damage from recurrence of a 100-year storm, similar to the one that occurred in January 1982.

Private developers are responsible for construction of storm drainage facilities within their projects. Facilities are dedicated to the City when they are completed and accepted. Developers also pay the City and the Marin County Flood Control and Water Conservation District for storm drainage services.

Reclaimed Marshlands

Much of the bayfront lands are in agricultural, conservation or open space uses and flood frequently. These areas are reclaimed marshlands which had been near high tide level when drained. Since reclamation, the loss of water within the Bay Mud has led to subsidence, and many areas are now below mean sea level and require pumping to drain. If levees and pumps are maintained, flooding in these areas represents minimal hazard to persons or structures. Most of these lands are shown on the Land Use Map for Agriculture, Conservation, or other low-intensity uses.

Impact of Increased Urban Development

The frequency and severity of flooding has increased in recent years partly as a result of increasing urban development. As more land becomes covered with impermeable surfaces such as buildings, parking lots and roads, water cannot drain into the soil and surface runoff increases, thereby causing acute local flooding.

Novato Creek has a long history of flooding and is the main flood hazard to the community. Flooding along Novato Creek usually occurs in three stages; when the water levels rises above storm drains, resulting in flooded roads and lots;
when Warner Creek and Arroyo Avichi rise and overflow their banks at the confluence with Novato Creek; and when Novato Creek itself rises to a level where it overflows at low points in its levees. In addition, localized flooding occurs periodically in certain locations. The frequency and severity of flooding has been reduced as a result of flood control improvements for Novato, Warner, and Avichi Creeks funded in 1985 and storm drainage projects funded in 1989.

Dam failure resulting from earthquakes is another potential source of flooding. Novato Creek Dam, an earth embankment constructed in 1951, is 71 feet high and under the jurisdiction of the California Division of Safety of Dams. This dam creates Stafford Lake, which has a capacity of 4,430 acre-feet of water.

The dam, located upstream of Novato along Novato Creek at Stafford Lake, is designed to withstand an earthquake with a magnitude of 8.25 on the San Andreas Fault with a design epicenter located 10 miles from the dam.

The inundation zone in the hypothetical event of a sudden failure of the dam is on file with the North Marin Water District. The City has implemented a Local Drainage Master Plan to accommodate 25-year storm water flows which have a 4 percent chance of occurrence in any given year. In 1989, the voters approved a bond measure to provide $4.2 million funding for storm drainage improvements. In addition, the Marin County Flood Control and Water Conservation District has implemented major improvements since 1985 to prevent flooding from 50-year storms. These improvements include a detention pond at Deer Island on the lower portion of Novato Creek, and improvements to the channels of Novato Creek, Warner Creek and Arroyo Avichi.
Dam Failure Inundation Hazard Map for Novato

NOTE: If multiple reservoirs are listed in the legend under one color, this indicates that the area shown with that color will be inundated if ANY of those reservoirs fail. It does NOT indicate that all of the reservoirs must fail at the same time in order to inundate the area.

![Figure 24: Dam Failure Inundation Areas](image)

Flood/Water Rescue Scenarios

Currently the Novato Fire District has some personnel trained to basic boat operations and operates a 16-foot inflatable rescue vehicle and a 14-foot aluminum boat. All Station 2 members are trained to the basic water rescue operations level consistent with the Marin County USAR water rescue team training and certification levels. During times of heavy rain or predicted flooding each engine company is equipped with personal floatation devices and rope bags. The boat is equipped with protective equipment to allow three personnel to enter the water and effect rescues. The District is capable of simple water rescue scenarios. The challenge of a complex rescue involves several fire companies and the use of outside assistance including the Marin County Swift Water Rescue Team, the Marin County Sheriff’s Office, and the United States Coast Guard.
Flood/Water Rescue Scenarios Policies

NFPD has specific response policies for flood/water rescue incidents. Refer to the Appendix for a listing of Manual of Operations policies.

Hazardous Materials

The transportation and storage of hazardous materials is clearly a regional issue. Large quantities of hazardous products are transported on highways and railways where the potential for release of this material into the environment represents a potentially significant public health risk. The policies and programs dealing with hazardous materials in this section incorporate and build on the relevant portions of the Safety Element of the Marin Countywide Plan. The County is responsible for:

✓ Regulating hazardous materials over specified quantities.
✓ Developing and implementing Area Plans for emergency response of hazardous materials spills.
✓ Implementing risk management and prevention programs, business plan and inventories of hazardous waste storage and transportation, and implementing procedures for handling of hazardous substances.

Radioactive Materials

Radioactive materials are distinguished from other hazardous materials and specific federal and state regulations address handling and transport of these substances. The use and storage of radioactive materials in Novato is limited to medical facilities, and the Buck Center for Research in Aging, since no other primary users of radioactive materials, such as research laboratories, nuclear power plants or active military facilities, are located within the Area of Interest.

The principal potential danger to Novato residents from these materials is related to the possibility of a truck accident resulting in rupture of containers holding radioactive materials. Asbestos used as an insulating material in public buildings is a potential health hazard. The Novato Unified School District has determined that its public schools are in compliance with the 1986 Federal and State Building Codes for asbestos insulation.

Increase in Hazardous Materials Incidents

In recent years, the number and severity of hazardous materials incidents appears to be increasing on a national level. It is not uncommon for freeways to be closed and even large-scale evacuations to take place due to the discharge or potential of a hazardous material incident.

Hazardous Materials Storage and Emergency Response Regulation

In Novato, the agency that has the overall responsibility and authority to regulate hazardous materials storage and emergency response is the County of Marin. The
administering agency, which is the term used to identify the jurisdiction with which this responsibility lies, has many responsibilities, but basically they are to:

- Regulate materials in excess of 55 gallons of a liquid, 500 pounds of a solid, and 200 cubic feet of a compressed gas.
- Receive Business Plans, providing inventories and 24-hour response contact; 30-day updates; hazardous waste estimates.
- Develop Area Plan for emergency response to actual or threatened releases.
- Send to Fire Departments Business Plan information and notice of unauthorized releases (inspection requirements overlap with Fire Code requirements).
- Receive Risk Management and Prevention Programs, including specific procedures for handling materials and accidental releases.

At this time, Marin County Hazardous Waste Management forwards to the Fire District a hard copy of the new and updated Hazardous Material Management Plans (HMMP) and Hazardous Material Inventory Statements (HMIS) for businesses in the incorporated and unincorporated areas of our District.

Copies of these documents are placed in our property files located at headquarters. The dates of the documents received are recorded in our occupancy inspection database so that at anytime, a list may be produced of businesses that the District has HMMP or HMIS documents for and the most recent date they were received.

Occupancies with special hazards or unique processes are required to have installed a Knox Vault where these documents are kept on site and available to firefighters on scene during an incident.
### Table 25  Hazardous Material Calls by Station

<table>
<thead>
<tr>
<th>Year</th>
<th>Station 1</th>
<th>Station 2</th>
<th>Station 3</th>
<th>Station 4</th>
<th>Station 5</th>
<th>Total Calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>N/A</td>
<td>8</td>
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<td>1</td>
<td>0</td>
<td>7</td>
<td>N/A</td>
<td>10</td>
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<tr>
<td>1999</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>N/A</td>
<td>7</td>
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</tr>
<tr>
<td>2001</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>N/A</td>
<td>9</td>
</tr>
<tr>
<td>2002*</td>
<td>18</td>
<td>7</td>
<td>9</td>
<td>15</td>
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<td>49</td>
</tr>
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<td>2003</td>
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<td>N/A</td>
<td>N/A</td>
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<td>43</td>
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<tr>
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<td>N/A</td>
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<tr>
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<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
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<tr>
<td>2007</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>46</td>
</tr>
</tbody>
</table>

NOTE: In 2002, the District started utilizing the National Fire Incident Reporting System. In this reporting program natural gas leaks are logged as a hazardous material release, which is why the number of responses has grown in 2007.

### Hazardous Materials Training

Currently the Novato Fire District has all personnel trained to the Hazardous Material First Responder Operations level. The District has also designated our truck company as a decontamination unit. We currently have the capability to respond to the incident, assist law enforcement with the role of incident commander (State Law requires that the Law Enforcement Agency with Traffic Jurisdiction assume the role of Incident Commander), isolate and deny entry to the site. We are members of the Marin County Hazardous Materials Response team, which has the ability to do Level “A” entry, product identification, containment, and control.
Hazardous Materials Policies

NFPD has specific response policies for hazardous materials and Weapons of Mass Destruction (WMD) incidents. Refer to the Appendix for a listing of Manual of Operations policies.

Case Study Hazardous Material Incident—Novato Fire Protection District

**Incident Type: Hazardous Material Incident**
Tanker truck spill, July 14, 1999

- Incident Number: 99-2203
- Time of 911 Call: 0742
- Time of Dispatch: 0742
- 1st Unit at Scene: 6111
- Time 1st Unit: 0748

**Sequence of Call**

A full hazardous material response, 6113/6181/6184/6150/6151/R60 & R64, was dispatched to a vehicle accident, semi tractor and trailer on its side, Northbound 101 at Hwy 37. At the time of dispatch Communications Center informed us that a green gaseous cloud was observed across all lanes of the freeway. On arrival 6113 observed a semi tractor and trailer on its side on the Hwy 37 on ramp to US 101 North bound. There was an obvious vapor cloud above the rear of the trailer. The cloud appeared to be approximately 15’ high and 10’ in diameter. Based on these observations 6113 requested all responding units to isolate and deny entry to the scene and to establish the hot zone perimeter around the accident. Along with the CHP, 6113 began to close down Hwy 101 to North and Southbound traffic. They also requested that westbound Hwy 37 be closed as soon as possible.

- **0748 hrs:** 6113 arrived on scene and assumed 101 I.C. 6113 located the Command Post approximately ¼ mile North of the incident in the center divider of Hwy 101 and requested that the County Hazardous Material Team respond to the scene. At the time the wind was from the East at approximately 3-mph.

- **0748 hrs:** 6184 and R64 responded to Northbound 101 at Hwy 37 and began to isolate and deny entry from that location and to evaluate the condition of the truck driver. Initial indications were that the driver had a minor leg injury that did not require transportation. 6184 interviewed the driver of the truck who reported the contents to be Sulfuric Acid and Chlorine, both in large quantities. Initial protective actions were based on the chemical combination. At approximately 0935 hrs R64 was then reassigned to Medical Group in support of the Hazardous Material team. The truck driver was eventually transported by R60 to NCH with a knee injury after being brought to the Command Post by the CHP.
0748 hrs: 6181 and R60 responded to the Command Post location and began the process closing down the freeway to Southbound traffic and IDHA (Identification and Hazard Assessment). Captain Johnston on 6181 became the Hazardous material Tec Spec. At approximately 0930 hrs Captain Johnston contacted the carrier, Sierra Chemical and was able to determine that the actual chemicals on board the truck were Muriatic Acid and Sodium Hypochlorite, the combination of the two producing Chlorine gas. After conferring with the truck driver he agreed that the contents could be as the carrier indicated. Sierra Chemical Company advised us that they would have their cleanup crew in route from both Stockton and Sparks, Nevada. ETA for the Sierra Chemical Company cleanup crew was approximately 4 hours. Captain Johnston was later re-assigned to Incident Safety Officer.

0751 hrs: 6150/51 responded to the Hwy 37 onramp to Northbound 101 to assess the situation from that location. They were able to get close enough to determine that there was chemical on the ground in gutter and observed two tow truck drivers attempting to dike the spill. 6150/51 ordered the tow truck drivers out of the area immediately and then began the process of closing down the on ramp to 101 until CHP could take over. When CHP took over the ramp closure, 6150/51 was reassigned to the Hazardous material Group located just south of the Command Post in the center divider. One of the tow truck drivers walked into Station 4, at 0936 hrs, complaining of respiratory problems and was transported by R63 to NCH.

Assistant Chief Meston arrived and assumed Logistics. At about this time the unified Command and Command Staff functions were established between the Novato Fire District, CHP, and Cal Trans.

0813 hrs: Com Center notified all appropriate agencies of the situation and several sent reps to the scene including EPA, County Health, CHP, Novato Police, Marin County Sheriff, OES and Cal Trans. OES was advised and we received an OES 2948

0845 hrs: Marin County Hazardous material team arrived on scene. Chief Craig was given the responsibility of Hazardous material Group Supervisor.

0934 hrs: Captain Metcho assumed Information Officer along with the CHP at the Media Center at the Park and Ride lot at the Rowland Blvd. overpass. Added message to HAR radio system and activated the info banner on Chambers Cable TV.

1000 hrs: Marin County OES, Lieutenant Foberg arrived as a consultant and to gather data for the County of Marin.

1012 hrs: The Marin County Hazardous material team entered the site as was able to determine that there was still product leaking from the truck however it was not creating an environmental hazard. The product was not entering the storm drains in the area and the dike established by the tow truck drivers was containing the spill. There were not able to observe the contents of the trailer because the rear door of the trailer was closed. They acquired the shipping papers and proceeded back through decontamination. The
shipping papers did indicate that the contents were as the carrier indicated Muriatic Acid and Sodium Hypochlorite. 6113 requested a spot weather forecast for our specific location. The forecast later proved to be extremely accurate.

With the confirmation of the chemicals by the shipping papers and due to the long response time for the carrier’s cleanup crew Cal Trans and CHP decided to use a Cal Trans level B Contractor, Universal Environmental, for the cleanup. CHP Captain Mark Sooy and Cal Trans Rep. Linton Houston made this decision. As a backup plan Cal Trans also requested a level A cleanup crew.

✓ **1054 hrs:** Flight restrictions were placed on the incident due to numerous helicopters flying low in the area.

✓ **1100 hrs:** At approximately this time the City of Novato opened their EOC. Assistant Chief Meston served as a field liaison to Chief Rentz who was at the EOC. The EOC continued to operate until 1500 hrs.

✓ **1228 hrs:** Fred Schwartz, County Health and Dan Suter, EPA, arrived on scene.

✓ **1249 hrs:** Assistant Chief Meston assumed the Incident Command position from 6113 at this time and 6113 became the Operations Section Chief.

✓ **1300 hrs:** At this time the wind began to switch from the East to the Southeast and increase in intensity. Due to the change in wind direction and intensity the Safety Officer recommended that we established a contingency plan in the event that additional off gassing occurred when the cleanup crew opened the rear doors of the semi. The Command Post was moved to a location approximately one half mile North of the incident and the Novato Police Department staged officers in the surrounding neighborhoods with the intent to shelter in place all residents if a vapor cloud developed. Dr. Fred S. Schwartz, M.D., Public Health Officer was involved in this decision and concurred with the plan.

✓ **1330 hrs:** Universal Environmental arrived and was assigned the cleanup project. The EPA monitored the air around the accident site and found very low concentrations of chlorine gas. The cleanup proceeded without incident and the final unit cleared the scene at approximately 2000 hrs.

Additional resources requested for the incident included 4- porta potties, Salvation Army Canteen for food and rehab supplies for the crews and a private ambulance, A-83, to assist with Medical Group rehab functions.

At varying times throughout the incident civilians wandered through the Hot Zone. It us unknown how or why this occurred however none of the individuals appeared to come in contact with the spill or vapor cloud and were quickly removed from the area.
Findings
As with all incidents involving hazardous materials this call presented many and varied problems.

✓ Highways 101 and 37 are the main vehicular arteries through Novato for commute traffic. Highway 101 was closed to all traffic in both North and Southbound directions. Highway 37 was closed to traffic in the Westbound direction. This caused problems with traffic and the moving of resources from one side of the incident to another.

✓ Positive identification of the material involved took time. There was a time at the start of the incident when the chemicals involved were in doubt. The identification was received from the manufacture and confirmed with the bill of laden that was retrieved by the Hazardous Material Team.

✓ Multi-Jurisdictional incident involving Fire, Law, Cal Trans, Health, etc. A joint command was established with CHP, Cal Trans and Novato Fire.

✓ Cleanup delayed because of travel time involved to scene. It took about 3 hours travel time for the cleanup company to arrive.

✓ Isolation was difficult due to multiple access points. With roads from the North, South, East and West and the large containment zone was difficult to maintain.

✓ Automatic Assignments were delayed or reassigned because units responding from their stations or taking different routes were not in a location that allowed them to start their automatic assignments. This was a plus in this situation in that having 6184 on the South and 6151 responding from the West (Novato Blvd.) 6184 was able to isolate and deny entry to North bound traffic. 6151 was able to report a strong odor in the Crossroads area and then proceeded to Westbound highway 37 and was able to isolate and deny entry in that location.
Figure 25 identifies the density of explosions and hazardous material incidents within the District for 2007.
Aviation Hazards

Gnoss Field is an airport within the service area of the Novato Fire Protection District. The Marin County Airport is staffed and maintained by the County’s Public Works Department (DPW) for the benefit of the flying public. With a 3300’ lighted runway, parallel-lighted taxiway and GPS approach Gnoss is ready to serve the needs of the community 24 hrs/day. The airport is attended day, and night security is on duty all nights. Fuel is offered by concession (EMC Petroleum) in both 100LL and Jet A grades.

The airport consists of 120 acres and is home base to over 295 aircraft, from small singles to corporate.

<table>
<thead>
<tr>
<th>Type of Aircraft</th>
<th>#</th>
<th>Aircraft Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single engine airplanes</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>Multi engine airplanes</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Aircraft based on the field</td>
<td>235</td>
<td>Aircraft operations: average 370/day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>77% local general aviation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22% transient general aviation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;1% air taxi</td>
</tr>
</tbody>
</table>

The Novato Fire District does not have any specialized equipment to handle air crash rescue scenarios. Our type one engines carry a reserve of Class B foam and our crews train to fight flammable liquid fires. We are also versed at multi-causality incidents that may occur from a crash landing.

The District has responded to several incidents at the airport including aircraft landing without their landing gear down, aircraft that have overshot the runway and occasional airplane crashes. The airport has an excellent safety record and we do not have any current significant events to demonstrate our capabilities at the airport.
Railroad Hazards

Rail service existed in Novato provided by the California Northern Railroad which had contracted to provide freight service over the lines formerly operated by the Southern Pacific Railroad. The railroad tracks enter the District from the northeast, parallel to Highway 37, and then at the Ignacio “Y” turn north parallel to Highway 101. In 1995 the railroad operated a single round trip freight service through Novato six days a week. The service through Novato started in Napa, passing through Novato around noon, on the way to Petaluma. The return train from Petaluma usually passed through Novato late in the afternoon on the way back to Napa. The Southern Pacific Railroad right-of-way has been purchased for potential future transit use. This right-of-way may be used in the future by diesel buses, electric light rail trains, or diesel electric trains.

The Fire District has responded to fires that were either created by a “hot box” (overheated bearing) within the wheel assembly that creates molten chunks of metal that start wildland fires and a rare engine compartment fire for the diesel locomotives. These were unusual but easily handled incidents by fire service personnel. Currently the rail does not operate nor create a special hazard for firefighting forces. This service will resume however, by the year 2014 for both freight and passenger rail service. This new risk will be incorporated into the District’s operations and planning for incorporation into future updates of the Standards of Cover.

School Risk within the Novato Fire Protection District

In 1995, the Novato Unified School District provided education to 7,775 students at 8 elementary schools, 3 middle schools, 2 high schools, 1 continuation high school, and 1 independent study education school.

The Facilities Use Report states that District schools have capacity for a maximum of 8,446 students. Future development consistent with this General Plan could generate as many as 3,601 additional students if this plan were built out to its maximum. District schools have capacity to absorb an additional 661 students. Once existing capacity
Standards of Cover

Risk Assessment and Risk Levels

is filled, the District will have to change schools to a year-round schedule, add re-locatable classrooms to existing campuses, place more students in each classroom, construct a new school(s), or some combination.

The Indian Valley Campus (IVC) of the College of Marin is located on 333 acres at the western terminus of Ignacio Boulevard. The developed area covers about 50 acres.

At present, IVC has 2,200 students in day and evening programs, 1,200 full-time equivalent students. The campus was built for a projected enrollment of 5,000 students. The campus currently uses 45 percent of the available facilities on the average. Current projections show that the College District anticipates that IVC facilities will be underutilized through the late 1990s. The College of Marin intends to lease several of the vacant buildings at IVC to multimedia technology-based businesses. Currently, the College is undergoing a 200 million dollar bond measure rehabilitation project in which many of the structures are being fully equipped with automatic fire sprinklers and fire-retardant Class A roof coverings.

Fire hydrants have been added, fire access roads widened in some locations, and all bridges have been certified and load tested by structural engineers. An aggressive vegetation management program has been implemented by the college district and fire roads surrounding the IVC campus have been improved, graded and maintained.

Elementary Schools
Novato experienced a large school fire at San Marin High School in 1999. As a result of that fire the Fire Loss Management Division conducted a review of the Fire and Life Safety issues at all of the Educational Facilities in the Novato Unified School District. This report identified significant issues and concerns directly relating to the requirements of the Uniform Fire Code, State Building Code and Title 19, California Code or Regulations. The inspections targeted three specific areas relating to fire apparatus access, and adequate water supply for firefighting purposes and premise identification.

The following information summarizes the deficiencies by school site identified in the 2003 Standards of Cover and which deficiencies were corrected under a multi-million dollar school rehabilitation bond act passed by the voters of Novato.

Charter School, 936 C Street
Access:

- Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the right front of the school with the black top area.
- Widen the existing gate opening to 20 ft.
- Remove tetherball poles at back of school.
Standards of Cover

Risk Assessment and Risk Levels

✓ Limb back trees at the turn around in the back of the school.
✓ Keep turn around clear at back of school.
✓ Red stripe as per fire lane standards.
✓ Remove chains and padlocks from school doors with panic hardware.

Hydrants:

✓ Change existing hydrant at back of school to a “steamer.”
✓ Add “steamer” hydrant to entrance of school on the right hand side.

Premise Identification:

✓ Provide School Street number, on West Kelly Dr, to be visible from either direction on West Kelly Dr.
✓ Provide numbers to buildings and individual classrooms as per standard.

Hamilton School, 1 Main Gate Road

Access:

✓ Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the front driveway of the school with the black top area on the Eastern side by the library.

✓ Provide a curb access and widen access road on west side of school to 20 ft. This will connect the front of the school with the black top in back. The access way should be an all weather surface, able to support 35,000 lbs. GVW

✓ Red stripe fire lane per District standard.

Hydrants:

✓ Change existing hydrant at front and back of school to a “steamer hydrant.”
✓ Add a steamer hydrant to the East side of school in the back by the Library to conform to the minimum fire flow requirements.

Premise Identification:

✓ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

✓ A checkmark indicates this item is complete.
☐ An open square indicates this item is not complete.
Loma Verde School, 399 Alameda De La Loma

Access:

✓ Red stripe fire lane per District standard.

Premise Identification:

✓ Provide numbers to buildings and individual classrooms as per standard.

Lu Sutton School, 1800 Center Road

Access:

✓ Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the games court to the new hydrant in back of school. (Scheduled 8-2003.)

✓ Red stripe fire lane per District standard.

Hydrants

✓ Add one “steamer” hydrant at the entrance to this new fire lane at the front of the school on the right hand side. (Scheduled 8-03.)

✓ Add a second “steamer” hydrant to the back of the school near the portable building. (Scheduled 8-03.)

✓ Replace present hydrant at front of school with a “steamer” hydrant. (Scheduled 8-03.)

Premise Identification:

☐ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

✓ A checkmark indicates this item is complete.

☐ An open square indicates this item is not complete.
Lynwood Elementary School, 1320 Lynwood Drive

Premise Identification:

✓ Provide School Name and Street number, on Sunset and Leafwood, to be visible from either direction on those streets.

☐ Provide numbers to buildings and individual classrooms as per standard.

Olive Elementary School, 629 Plum Street

Access:

✓ Widen existing gate and curb cut-out to 20 feet, to provide access for emergency vehicles by bus loop on the Olive St. side.

✓ Widen existing pavement to 20 feet, connecting bus loop and playground.

✓ Widen existing pavement between the upper and lower playgrounds to 20 feet.

✓ Red stripe fire lane per District standard.

Hydrants:

✓ Add one “steamer” fire hydrant on the Olive Street side, inside the bus zone loop exact location to be determined.

✓ Convert existing fire hydrant fronting Plum Street to a “steamer” hydrant.

✓ Premise Identification

✓ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

✓ A checkmark indicates this item is complete.

☐ An open square indicates this item is not complete.
Standards of Cover

Pleasant Valley Elementary School, 755 Sutro Ave.

Access:

- Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the black top area between the North driveway (next to the baseball field) and the playground at the rear. (Scheduled 8-03.)
- Widen pavement, connecting “primary” and “upper” playgrounds to a minimum of 20 feet where possible. (Scheduled 8-03.)
- Maintain a vertical clearance of 13’ 6” over all designated Fire Lanes.
- Red stripe fire lane per District standard.

Hydrants:

- Add one “steamer” fire hydrant to the backside of the school to meet fire flow requirements. (Scheduled 8-03.)
- Premise Identification.
- Provide numbers to buildings and individual classrooms as per standard.

NOTE:

- A checkmark indicates this item is complete.
- An open square indicates this item is not complete.
Rancho Elementary School, 1430 Johnson St.

Access:

- Widen existing gate 20 feet, to provide access for emergency vehicles to black top. (Scheduled 8-03.)
- Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the left hand side to game courts and then extend it just past classroom 8. (Scheduled 8-03.)
- Red stripe all fire lanes per standard.

Hydrants:

- Add one “steamer” hydrant to the back of school on the East side. (Scheduled 8-03.)
- Add one “steamer” hydrant to the front entrance of school on the west hand side. (Scheduled 8-03.)
- Replace existing hydrant in front of school to a “steamer.” (Scheduled 8-03.)

Premise Identification:

- Provide School Name and Street number, visible from Johnson Street.
- Provide numbers to buildings and individual classrooms as per standard.

NOTE:

- A checkmark indicates this item is complete.
- An open square indicates this item is not complete.
San Ramon Elementary School, 45 San Ramon Way

Access:
✓ Red stripe all fire lanes per standard.

Hydrants:
✓ Provide one “steamer” hydrant at the South driveway, before the gate. This will facilitate firefighting operations, and fire flow requirements.

Premise Identification:
✓ Provide numbers to buildings and individual classrooms as per standard.

Middle Schools
Hill Road Site, 720 Diablo Ave.

Access:
✓ Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the back drive at the Margaret Todd Center beginning at the ballards and extending along the back of the school.
✓ Widen access gate, North side, to 20 feet.
✓ Red stripe all fire lanes per standard.

Hydrants:
☐ Convert existing fire hydrant to a “steamer” hydrant.
☐ Add one “steamer” hydrant to the back of the school.

Premise Identification:
☐ Provide numbers to buildings and individual classrooms as per standard.

NOTE:
✓ A checkmark indicates this item is complete.
☐ An open square indicates this item is not complete.
San Jose Middle School, 1000 Sunset Parkway

Access:

✓ Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the North parking area to the basketball black top area.

✓ Add 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting the South East parking area (off of Ignacio) to the basketball black top area.

✓ Red stripe all fire lanes per standard.

Hydrants:

✓ Convert existing fire hydrants, in parking lot and front corner of school, to “steamer” hydrants. (Scheduled 8-03.)

✓ Add “steamer” hydrant to the parking lot off of Ignacio Blvd. (Scheduled 8-03.)

Premise Identification:

☐ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

✓ A checkmark indicates this item is complete.

☐ An open square indicates this item is not complete.
Standards of Cover

Risk Assessment and Risk Levels

Sinaloa, 2045 Vineyard Road

Access:

✓ Widen field access gate, at upper (rear) parking lot to 20 feet. (Scheduled 8-03.)
✓ Add 16 – 17 ft. wide road, all weather access, able to support 35,000 lbs. GVW, connecting from the upper (rear) parking lot gate down to and including the rear of building 400, to the large tree. Include fire engine turn around if this distance is greater than 150 ft. (Scheduled 8-03.)
✓ Widen the access gate and curb cut-out on Wilson Ave to 20 feet. (Scheduled 8-03.)
✓ Provide 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW from tennis court area to building 400, to provide emergency vehicle access. (Scheduled 8-03.)
✓ Red stripe all fire lanes per standard.

Hydrants:

✓ Add a “steamer” fire hydrant inside the gate near the tennis courts on the Wilson Street side. (This hydrant would provide the only on site water supply from the Wilson Ave. side of the buildings). (Scheduled 8-03.)

Premise Identification:

✓ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

✓ A checkmark indicates this item is complete.
□ An open square indicates this item is not complete.
**High Schools**

*North Marin, 740 Diablo Ave. (See Hill Road, Middle School)*

*Nova, 730 Diablo, Ave. (See Hill Road, Middle School)*

*Novato High School, 625 Arthur*

**Access:**

✓ Provide 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW connecting the existing black top at the “grounds department” to the new gym just past the tennis courts, to provide emergency vehicle access. This road will also require a turn-around area. (Scheduled 8-03.)

✓ Red stripe all fire lanes per standard.

**Hydrants:**

☐ Convert all existing fire hydrants to “steamer” hydrants. (Scheduled 8-03.)

**Premise Identification:**

✓ Provide numbers to buildings and individual classrooms as per standard.

**NOTE:**

✓ A checkmark indicates this item is complete.

☐ An open square indicates this item is not complete.
San Marin High School, 15 San Marin Dr.

Access:

☑ Provide 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW connecting the parking area at the rear of building 600 to the basketball blacktop area.

☑ Provide 20 ft. wide road, all weather access, able to support 35,000 lbs. GVW connecting the parking area at the front of the school by the English and Social Science building and extending to the Gym. If this road is greater than 150 ft, it will require an engine turn around area.

☑ Red stripe all fire lanes per standard.

Hydrants:

☑ Convert all existing fire hydrants to “steamer” hydrants.

☑ Add one steamer hydrant to the parking area back behind the parking area at the student center.

☑ Add one steamer hydrant to the front of the school by the English and Social Sciences building.

☑ Add one steamer hydrant to the front parking area at Novato Blvd. and San Marin Blvd. (The addition of these hydrants will meet the existing fire flow requirement of 6 hydrants for the entire school.)

Premise Identification:

☑ Provide numbers to buildings and individual classrooms as per standard.

NOTE:

☑ A checkmark indicates this item is complete.

☐ An open square indicates this item is not complete.
Figure 26: Risk – Structure Fires

Figure 26 spatially displays all structure fire incidents and their density contours for structure fires in 2007.
Wildland Fire Risk

October 1991 – Oakland and Berkeley Wildland Fires
On October 20, 1991, in the cities of Oakland and Berkeley, California, a wildfire destroyed 1,580 acres, 3,230 structures, killed 25 people, injured another 150 people and caused damage in excess of two billion dollars. More than 790 homes were consumed in one hour. Before and since that time, other firestorms in California and other states have devastated thousands of acres and continue to destroy property in the urban/wildland interface. From 1955 to 1979, 2,408 structures were destroyed by wildfire, but from 1980 to 1993 approximately 7,700 structures were destroyed; more than three times the loss in half the time.

Fall of 1993 – State of California Wildland Fires
During a 10-day period in the fall of 1993, wind-driven wildfires consumed more than 189,000 acres and damaged or destroyed 1,260 structures in the State of California. In the year 2000, the United States suffered from more wildfires than it has seen in decades. Wildland fires present a very real risk to the communities around the country from California to Florida.

October 1995 – Mt. Vision Fire
In Inverness Park a residential subdivision in West Marin County became engulfed in a wildfire destroying 59 homes and consumed 12,000 acres.

October 2003 – Cedar Fire
On October 29, 2003 Engine 6162 experienced a burn over. Novato Firefighter Steven Rucker died and Captain Doug McDonald was critically burned while performing structure protection in the town of Julian, San Diego County, California. The burn over and fatality significantly affected the NFPD members and family, and has changed the structure protection philosophy of the District, see 2004 Cedar Report.

Understanding Wildland Fires
As with any risk, it is important to understand it, in order to know how to best deal with it. Wildland fires produce heat from living and dead vegetation. The amount of heat energy released during a wildland fire is a function of the amount, arrangement and rate of combustion of the fuels. In wildland fires, flame lengths can exceed 100 feet and the radiated heat can ignite materials from distances of 100 feet or more. Winds can carry live firebrands for several miles.
Wildland Fire Defense Planning
The goal of any “Wildland Fire Defense Planning” program is to provide adequate protection in the interface between the natural areas and the developed areas. This is accomplished by developing a comprehensive risk assessment plan to reduce, eliminate and/or control fires in the wildland interface that present a danger to life and property.

Wildland Fire Interaction with Structures in the Interface Area
To understand the risk, it is necessary to understand how wildfires interact with structures in the interface area. A wildfire can ignite a structure through radiation, convection or direct contact of flames or burning materials (firebrands). These three ignition sources need to be understood in order to change the interface environment; making it less susceptible to damage or destruction.

Categorize Occupancies in the Interface Area
Agencies should perform the categorization of the occupancies in the area in a systematic fashion taking into consideration local factors that increase or diminish the risk. The risk assessment model assumes that in every community the ratio of risks will be different. In general, it is anticipated that in most communities the vast majority of the risk will fall into the moderate category with smaller percentages being distributed among the low probability quadrants. The majority of fire service concern should be directed towards the development of fire defense strategies for occupancies that fall into the high probability-high consequence category.

Risk Assessment Distribution of Companies for Initial Response
It is envisaged that fire agencies will continue to send more than the number of apparatus appropriate to a maximum risk at specific locations. Compliance with the basic concepts of the risk assessment distribution of companies for initial response capability concentration of companies for response effectiveness, plus an evaluation of response reliability places a burden upon smaller agencies with large fire flows. Others can meet it readily. The economics of trying to adhere to all of these principles simultaneously can be a burden and problematic to agencies with limited financial resources. Those small agencies with large fire flows or life safety occupancies are even further handicapped in achieving effective use of these principles.

Organizational Strategy to Achieve a Level of Service
The issue is that an organizational strategy to achieve a level of service is very important to the credibility of any fire organization. The risk levels in one community may be based on structural conditions only. However, there is more than one way to assess risk. For example, an agency that has watershed firefighting responsibilities may have to define their risk on the basis of topography, fuel cover, and weather conditions. An area with an urban-wildland interface may have to have risk assessment that combines structural conditions with ground cover area.
NFPD Wildland/Urban Interface Task Force

Background

In October of 1983, a technical report of an evaluation of the vegetation, environmental and fire behavior factors associated with wildland fires and how these fires might impact growth in the Novato Fire Protection District was presented to fire district officials. The report was used as the basis for the formation of a wildland/urban interface task force, which identified initial attack capability in key areas and established priority actions for the District.

The fire district management team and task force have done an excellent job in addressing the wildland fire problem and have greatly reduced the threat of a major wildland/urban interface fire in the District. This was confirmed by a follow-up report commissioned by the NFPD Board of Directors in 1989.

Current Situation

After the disastrous firestorm in the Oakland-Berkeley Hills in 1991, the Legislature required California Department of Forestry (Cal Fire) to identify very high fire hazard severity zone (VHFHSZ) within the Local Response Areas and send the resulting information to the affected cities, counties, and fire districts. Very high fire hazard severity zone means an area designated by the Director of Forestry and Fire Protection pursuant to GC Section 51178 that is not a state responsibility area. The very high fire hazard severity zones are identified on consistent statewide criteria based on the severity of fire hazard that is expected to prevail in those areas. Very high fire hazard severity zones shall be based on fuel loading, slope, fire weather, and other relevant factors.

The NFPD has experienced several devastating interface fires (I-Zone fires) over the years. (I-Zone is defined as the urban/wildland interface) The fuel, weather, and topographic conditions that support the ignition and spread of wildland I-Zone fires are still present within the District. This area is in the High and Very High Hazard rating and the conditions qualifying them as such were updated by Cal Fire and the NFPD in 2005.
Table 27  Demographic Changes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>55,000</td>
<td>58,000</td>
<td>60,000</td>
<td>63,000</td>
</tr>
<tr>
<td>District</td>
<td>71 Sq. Miles</td>
<td>71 Sq. Miles</td>
<td>71 Sq. Miles</td>
<td>71 Sq. Miles</td>
</tr>
<tr>
<td>Fire Stations</td>
<td>4</td>
<td>4*</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Personnel</td>
<td>72</td>
<td>82</td>
<td>86</td>
<td>88</td>
</tr>
<tr>
<td>Responses</td>
<td>2100 +</td>
<td>3000 +</td>
<td>4700 +</td>
<td>4800 +</td>
</tr>
<tr>
<td>Wildland Fires</td>
<td>66</td>
<td>88</td>
<td>92</td>
<td>87</td>
</tr>
</tbody>
</table>

NOTE: Two stations strategically relocated for better response times and future growth.

National Oceanic and Atmospheric Administration (N.O.A.A.) statistics are used for developing a range of summertime conditions that could influence fire behavior. Those factors included:

Table 28  Climatological Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme temperature (2002):</td>
<td>104° F</td>
</tr>
<tr>
<td>Normal temperature (2002):</td>
<td>85° F</td>
</tr>
<tr>
<td>Extreme wind speed (2002):</td>
<td>41 m.p.h.</td>
</tr>
<tr>
<td>Normal wind speed at 1300 hours (2002):</td>
<td>5.2 m.p.h.</td>
</tr>
<tr>
<td>Critical wind direction (2002):</td>
<td>West or SW</td>
</tr>
<tr>
<td>Critical wind direction:</td>
<td>West or SW</td>
</tr>
<tr>
<td>Critical wind speed (average):</td>
<td>15 m.p.h.</td>
</tr>
</tbody>
</table>


Fire Hazard Zoning Planning Observations

While reduction of major destruction of property and loss of life can be achieved partly through proper implementation and enforcement of fire hazard zoning and mitigation laws, it should be noted that there can be no guarantee that a major fire can be prevented from causing major destruction of property or loss of life.

**Interface Fire Hazard Mitigation**

The three methods of interface fire hazard mitigation most often associated with increased structure survival are: ignition resistant building construction, vegetation clearance, and defensive actions during the wildfire exposure. However, it is important to not have unreasonable expectations of mitigation measures. A one-third or two-third reduction in historic loss patterns is reasonable with full implementation of both fuel reduction and improved building construction.

**Structure Ignitability**

Structure ignitability should be tied into Public Resources Code 4290 and Government Code Section 52128 language on “readily transmitting fire” to the building. Structure ignitability should be emphasized, i.e. roofing, decking, fire brand entry, and siding, in addition to vegetation management.

**Vegetation Clearance**

Vegetation clearance beyond 30 feet is supported by the Structure Ignition Assessment Model results, which indicate that crown fire radiant heat exposure will not ignite wooden building siding at distances greater than 120 feet, which supports the requirement that clearance of crown fuels, including shrubs, out to a minimum 100 feet is effective in reducing losses.

**Mitigation Strategy and Priorities**

In selecting priorities for mitigation strategies, planners should carefully evaluate the impact of on-going maintenance needs of mitigation measures (e.g. clearing additional vegetation every few years vs. replacing an untreated wood roof once).

Emphasis should be on the biggest long-term return for the investment, i.e. make the building ignition resistant, and then focus on increased vegetation clearance.

In October 2005, in response to the 2003 Cedar Incident and the Governor’s Blue Ribbon Commission Recommendations the NFPO Board of Directors adopted a Wildland Urban Interface Ordinance that requires ignition resistant building construction, fire retardant roofs, protected eves, attic, roof, foundation vents, protected glass, and fire retardant wood and composite decks. These building
code requirements are in addition to the strict vegetation management requirements.

District code requirements are more restrictive and go beyond state building code requirements adopted by the State of California in 2007. Refer to NFPD Ordinance 2005-1.

**Burning Index Factor**

Novato Fire District is currently using a Burning Index (BI) of 41 to order a “call back” to staff one additional fire engine. The BI is an indicator of difficulty of fire control based on the Flame Length (FL). The FL would be 4’ if the BI were 41. Under these burning conditions most grass fires starting at the bottom of a slope in the NFPD will be at the top of the ridge before the first alarm assignment can arrive at scene. This can be determined by using a fire behavior index called the Spread Component (SC), which predicts the forward rate of spread in feet per minute.

**Spread Component Behavior Index**

The SC using the same data to determine the BI of 41 will be nearly 100 or 100’ per minute, (this FL corresponds to about 80 ft/min ROS in model 1 grass), which is well beyond an engine company’s capability to mobile attack or deploy a progressive hose lay. The SC may be a more appropriate index than the BI for NFPD since the BI is influenced heavily by the wind and the majority of the damaging fires in the District have occurred under low wind speeds. RAWS can assist with this staffing tool.

Rapidly spreading grass fires have been the main concern in the District. From many measurements in live-fire training exercises it has been found that an engine doing mobile attack would advance toward the head at approximately 100 to 120 feet/minute. That means that SC=100 in grass is a significant threshold, indicating poor prospects of catching a grass fire with a mobile attack. However, there is not much mobile attack country in Novato, and uphill hose lays do not catch fast grass fires. Setting significant National Fire Danger Rating System (NFDRS) thresholds will take some thought about what fuel model is used and what aspect of control is being considered.

The District adds extra staffing during times when the BI exceeds 41 and/or the SC exceeds 100.

**Fire Behavior Analysis**

**Fire Modeling**

Fire modeling is a tool utilized to forecast fire behavior and fire potential. An important application is in portraying the nature of the threat to structures exposed to wildland fires. It is also used to evaluate the capability of initial attack response forces to control a fire before it escapes initial attack. A long established goal of the major wildland fire organizations in California has been to control 90
percent of all wildland fires before they reach 10 acres in size. The majority of these wildland fires are controlled under 1/4 acre in size.

Fuel Characteristics
The following brief descriptions are intended to provide a general idea of what the fuel models used in this Standards of Cover report.

Model 1: This model is used for dry grass with an average depth of 1 foot and a fuel loading of .75 tons per acre. Fires in fuel model 1 burn rapidly with flame length averages typically of several feet. This is probably the most common model in our area and it reflects nearly all of the annual grasslands found in the foothills below an elevation of approximately 1000 feet.

Model 2: Like fuel model 1, fires in fuel model 2 spread primarily in dry grass but with shrubs, pine or oak stands covering between one third and two thirds of the area. The material from these plants contributes to the fire intensity. Four tons of fuel is found per acre and the fuel bed depth is 1 foot. Fires in fuel model 2 burn slower but more intensely than fuel model 1.

Model 4: This is a brush model and is characterized by stands of mature brush 6 feet or more in height, with more than 16 tons of fuel per acre. Fires in this fuel model burn intensely (19 foot flame lengths) and spread relatively quickly.

Model 5: Litter cast by shrubs in the understory carries fire in this brush model. The fires do not burn intensely (4 foot flame lengths), nor rapidly since the young shrubs are green and the foliage does not burn. This fuel type is common at about the 2000 to 3000 feet elevation range of the foothills, especially in the early months of summer while moisture is abundant.

Model 6: Unlike model 5, fires in this model will burn in the foliage of standing vegetation, but only when wind speeds are greater than 8 mph. Fires burn with an average flame length of 6 feet and spread at a rate of 2,112 feet/hour. Interior live oak, young Chamise and Manzanita are all associated with this fuel model. In many instances a fuel model 5 will evolve into this model by the latter part of summer.

Model 8: This model reflects slow burning, low intensity fires burning in the leaf or needle litter under a conifer or hardwood canopy. These fires do not pose a threat unless low fuel moisture or high winds allow the fire to spread into the foliage. This model is found locally in areas treated for fuel reduction. It represents the ideal fire behavior to maintain low fuel buildups.

Model 9: Fires in this model also burn in needle or leaf fall under a conifer or hardwood canopy, but at a faster rate than fuel model 8 and more intensely. Concentrations of heavier dead material add to the possibility of the fire spreading to the crowns of trees. This model is found in a wide range of areas under timber stands which have been treated for fuel reduction, or have seen low
intensity fires over the last decade. This fuel type is found in great quantities in the mountains.

**Model 10**: Fires in this timber model burn with greater intensity (several-foot flame lengths) due to the quantities of dead and down fuel accumulations in the form of large limbs and fallen trees (12 tons/acre) than the other timber models. Fire burns at a moderate rate but “torching” of individual trees is common and can cause embers to start fires ahead of the main fire. Crown fires are also a threat in this fuel type. In dry conditions, or with high winds, fires in fuel model 10 can be very difficult to control. This model is found in many areas where stands of ponderosa pines or other conifers are present.

**Behave-Plus Outputs Table**

The Behave-Plus Outputs give ROS in chains/hour, but in the report ROS is shown in feet/minute. Also, representative data in the report were based on only portions of the ranges of raw data shown in Table 29, and the ROS and FL values used in the report for grass fuels were supplemented with CSIRO model outputs.

**Behave-Plus Information Used for Modeling Fires on Grassy Slopes**

**Inputs**

- Fuel model: 1
- 1-hour fuel moisture: 7 percent
- Midflame wind speeds (a range of values): 4, 5, 6, 7, 8, 9
- Direction of wind from upslope: 60 degrees
- Slope steepness: 40 percent

**Outputs**

<table>
<thead>
<tr>
<th>MFWS mph</th>
<th>ROS ch/hr</th>
<th>FLI btu/ft/sec</th>
<th>FL feet</th>
<th>Spread Dir.</th>
<th>Wind Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>73.9</td>
<td>120</td>
<td>4.1</td>
<td>41 deg</td>
<td>not exceeded</td>
</tr>
<tr>
<td>5</td>
<td>104</td>
<td>169</td>
<td>4.8</td>
<td>47 deg</td>
<td>not exceeded</td>
</tr>
<tr>
<td>6</td>
<td>142.1</td>
<td>230</td>
<td>5.5</td>
<td>51 deg</td>
<td>not exceeded</td>
</tr>
<tr>
<td>7</td>
<td>188</td>
<td>305</td>
<td>6.3</td>
<td>53 deg</td>
<td>not exceeded</td>
</tr>
<tr>
<td>8</td>
<td>241.8</td>
<td>392</td>
<td>7</td>
<td>55 deg</td>
<td>not exceeded</td>
</tr>
<tr>
<td>9</td>
<td>242.1</td>
<td>392</td>
<td>7</td>
<td>56 deg</td>
<td>exceeded</td>
</tr>
</tbody>
</table>
Behave-Plus Information Used for Modeling Fires in Closed Stands of Trees

**Inputs**

Fuel models: 8 & 10

- 1-hour fuel moisture: 7 percent
- 10-hour fuel moisture: 8 percent
- 100-hour fuel moisture: 9 percent
- Live woody fuel moisture: 80 percent
- Midflame wind speeds (a range of values): 1, 2, 3, 4
- Direction of wind from upslope: 0 degrees
- Slope steepness: 0 percent

**Outputs**

Table 30: Outputs for Fuel Model 8

<table>
<thead>
<tr>
<th>MFWS mph</th>
<th>ROS ch/hr</th>
<th>FL feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>4</td>
<td>1.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Table 31: Outputs for Fuel Model 10

<table>
<thead>
<tr>
<th>MFWS mph</th>
<th>ROS ch/hr</th>
<th>FL feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>3.2</td>
<td>3.3</td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
<td>4.0</td>
</tr>
<tr>
<td>4</td>
<td>7.1</td>
<td>4.7</td>
</tr>
</tbody>
</table>

The purpose of the preceding fire behavior analysis is to describe the early-stage fire behavior that is expected to pose the most frequent and serious threat to structures, behavior that the Fire District should be prepared to confront with its own resources. Desirable operational capabilities are discussed in light of the fire behavior. The basic outputs of the analysis are:

A timeline of fire spread, which determines the initial-attack control opportunities, and the timing and magnitude of the threat to structures.
An estimate of the flame length of the fire, which suggests the control measures that might be effective and which affects the determination of adequate defensible space around structures.

The analysis is based on the Fire Behavior Prediction System (via the Behave-plus application and nomograms) and on the Australian CSIRO grassfire prediction nomogram. Details of this analysis are contained in the Appendix.

The conditions presumed in the analysis represent a serious structure-threat-wildfire potential, a setting like those that have produced historical damaging fires. The definition of the presumed conditions is based in part on the observed weather that accompanied those fires, and in part on the description of “problem conditions” provided by chief officers of Novato Fire District.

The predicted fire behavior is that of a hypothetical “bad fire,” and it can be viewed as representative of fires that the District must have the resources and operational capacity to handle. A fire behavior prediction can help guide planning decisions, providing approximate measures of the expected fire behavior in an overall sense.

But it cannot provide the complete, unambiguous answer to the threat and controllability of every possible fire.

The NFPD operations staff chose several sites for fire modeling. Many of the sites were previously utilized for modeling in a 1991 report. The sites fall into two main groups, within each the modeled fire behavior would be very similar; those on south-aspect slopes with grass and those with mature woodland or forest canopy. The much more challenging situation is the rapidly spreading grass fire, and the majority of the fire behavior analysis and discussion will pertain to rapidly spreading grass fires.
Figure 27  Typical Southerly Slopes in the Novato Area

Two vegetation types typical of the southerly slopes in the Novato area are grassland and oak woodland, comprising the dominant fuel types grass and litter. Spread rates in the wind-exposed grass can be very high, while spread in the wind-sheltered litter under the tree canopy is relatively slow.

Grass Fuel Settings

Weather

A common situation occurs, following a dry, offshore-wind period, when the onshore flow is re-established and 20-foot winds of approximately 10 to 15 miles/hour blow from the west or southwest. The onshore flow is initially drier than the typical marine air, and commonly has relative humidity in the 50 percent range and temperatures in the 70° F.

The model predictions are based on the following weather conditions (presuming quite warm and dry air for that situation).

Eye-level wind speeds are taken to be 8 miles/hour on lower slopes and 12 miles/hour on upper slopes.

Wind direction is from the west-southwest

Relative humidity is taken as 40 percent and air temperature as 80° F.
**Fuel and Topography**

Fires are easily ignited and spread rapidly on the grass-covered slopes in the District, and such fires have caused destruction of property when they impinged on homes. Those slopes, commonly 35 percent to 45 percent, typically face south or southwest. This setting is typified by the locations at Verissimo Valley, Rebecca Way, and Indian Valley. The fire behavior projections were based on the following fuel and topography inputs.

Fuel model 1 (annual grasses)

Slope 40 percent south to west southwest (which puts the wind direction about 60o to the right of upslope)

Fine-fuel moisture 7 percent

Typical distance from bottom to top of slope along the maximum-fire-spread direction ranges from 700 feet to 1100 feet

**Projecting the Progress of the Fire**

The rates-of-spread (ROS) utilized for the grassfires are:

- For midflame wind-speed = 8 miles/hour: \( \text{ROS} = 280 \text{ ft/min} \)
- For midflame wind-speed = 12 miles/hour: \( \text{ROS} = 520 \text{ ft/min} \)
- Average flame length at the highest ROS would be approximately 9 to 10 feet.

Field studies clearly show that (even when the conditions remain constant) a growing fire will gain speed over time, commonly taking a few 10s of minutes after ignition to reach its ultimate spread rate for those conditions. The ROS values given previously are assumed to be reached by the fire after about 15 to 20 minutes of burning. Tabulated in Table 32, for each minute after ignition, are the predicted ROS and the fire’s spread-length and perimeter. Details of the basis used in the projection, a table of values to the 15-minute point, Behave outputs, and fuel model descriptions are given in the Appendix.
Table 32 provides grassfire projection from ignition at time = 0; fire ROS increases due to growth of the fire and to the increase in wind speed on the upper slope. Perimeter length is tracked only through time = 6 minutes because shortly after that the fire is projected to reach the ridge-top and undergo a significant reduction in ROS.

**Fire-spread projection for Verissimo Valley**

The predicted behavior of a grass fire would be much the same for all of the grass-fuel sites. The Verissimo Valley site is depicted in Figure 28 and modeled in Figure 29 because it offers the longest uninterrupted run for the fire. Successive perimeter locations are shown for each minute after ignition until the fire reaches the ridge-top and slows down (due to changes in fuels, wind, and in some locations in the District roads and residences).
Figure 28  View NE from Ignition Point for the Modeled Verissimo Valley Fire

Figure 29  Verissimo Valley Fire Projection
Standards of Cover
Risk Assessment and Risk Levels

Grass Fire Behavior Predictions

Several sources of fire behavior prediction were utilized. The US Fire Behavior Prediction System (FBPS) can be applied via Behave-Plus or nomograms. For the “annual grass” fuel model (Model 1), Behave will not provide outputs over effective wind speeds of 8 miles/hour, because that system considers such winds to be excessive compared to the fire’s intensity, and therefore unreliably modeled. The FBPS nomograms can be used, and they will give outputs for wind speeds over 8 miles/hour, though they indicate that such outputs are questionable because the “wind limit” has been exceeded. The FBPS outputs for the grass-fuel settings in this study were obtained from nomograms.

The Australian CSIRO (Commonwealth Scientific & Industrial Research Organization) prediction system is based on extensive field tests and observations of wildfires, and is a good system for predicting grass fire behavior. The outputs for the CSIRO system were obtained from the CSIRO nomograms (contained in the publication by Cheney and Sullivan).

Though the two systems provide similar results for the 8-mile/hour midflame winds, they differ more for the higher wind speeds. The FBPS predicts that increases in Rate of Spread (ROS) will exceed the proportional increase in wind speed, while the CSIRO system predicts ROS will increase nearly in direct proportion to wind speed. The results are shown in Table 33. The final ROS values used in this report are the average of those produced (for a given wind speed) by each system.

<table>
<thead>
<tr>
<th>Wind Speed</th>
<th>FBPS ROS</th>
<th>CSIRO ROS</th>
<th>Avg. ROS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 miles/hr</td>
<td>260 feet/min</td>
<td>300 feet/min</td>
<td>280 feet/min</td>
</tr>
<tr>
<td>12 miles/hr</td>
<td>620 feet/min</td>
<td>420 feet/min</td>
<td>520 feet/min</td>
</tr>
</tbody>
</table>

Table 33 provides rate-of-spread predictions for fire in grass, using Fire Behavior Prediction System (FBPS) and Australian CSIRO prediction systems. The averages from the two prediction systems were used in the modeling.

Grass fires do not progress at a constant rate after ignition. They gain speed steadily until reaching a steady-state ROS, after an elapsed time on the order of 10s of minutes. The CSIRO ROS values are considered to represent fire spread after about 15 or 20 minutes. The FBPS does not take account of the time required to reach the predicted ROS.

To get a more realistic projection of fire spread, the pattern of ROS-increase with time was derived from an Australian study (Cheney and Sullivan) and was applied to the final ROS values noted in Table 33. A smooth curve was drawn
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through the reported ROS data, reaching its maximum ROS at the 15 to 20 minute mark.

From that curve a ratio of ROS/ROS maximum was derived for each successive minute of fire spread. Those ratios and the computed values of ROS are reported in Table 34. Weighted averages of the “8 mi/hr” and “12 mi/hr” ROS were used at the 3 to 4 and 4 to 5 minute intervals to represent the transition from the lower-slope to upper-slope wind speeds.

Behave-plus provided flame-length data and maximum-spread-direction data for effective wind speeds up to 8 miles/hour. That data was extrapolated to provide values of flame length and spread direction for the higher wind speed case.

The predicted spread rates contained in Table 34 in the Litter Fuel Settings on page D-63 can be used to estimate fire spread in other similar situations. To apply the results to cases of lower wind speeds consider the ROS to be reduced in proportion to the wind speed. For example, a 6 mi/hr midflame wind is ¾ of the 8-mi/hr values, so a reasonable approximation is that the ROS will be about ¾ of the tabled values for 8-mi/hr winds. The tabled ROS reflects a slope along the direction of fire spread of about 20 percent. Very few, if any, places in the NFPD area would permit a grass fire to spread steadily for even 15 minutes without encountering a significant change in conditions of fuel, wind, or slope, so use caution must be exercised when applying the higher ROS values.

It is important to remember that the spread projections and flame lengths are averages, and deviations about the average will occur, including longer flame lengths and variations in rate-of-spread (ROS) of the fire. As the fire moves into minor drainages the wind influence will decline and the fire will tend to turn more upslope, turning more downwind when it emerges from the drainage. Variations in wind direction and irregularities in the terrain will cause shifts in the portion of the perimeter that is the head of the fire and will broaden the head ward portions overall.

The general features of the representative grass fire modeled here are:

- Within 2 or 3 minutes of ignition the fire would be difficult to access on the upslope side, and would be expanding at a rate that made perimeter control very difficult.

- The fire would reach the ridge-top in approximately 6 minutes (closer to 5 minutes at the Rebecca Way site), and shortly thereafter could have impacted approximately 4 or 5 homes (in those locations where homes line the ridge). Flame lengths would be about 9 or 10 feet.

- In locations where homes line the bottom of the slope, the lower-slope right flank will progress along the backs of several homes while the fire spreads to the ridge-top.
With regard to the initial response to a fire represented here, several basic limitations and needed capabilities can be discerned. It is assumed that the response begins about a minute after ignition.

Unless the initial attack engines arrive within a couple of minutes, fire spread rates and access problems will make initial attack containment unlikely.

Within approximately 5 minute, 5 or more structures could be impacted, at separated locations.

The initial response would need to have the capacity to handle threats to roughly 4 or 5 structures at the ridge-top and, simultaneously, threats to a few more structures at the bottom or other places on the slope.

Given the very narrow roads in some neighborhoods, crews would need to be able to deploy hose-lays within minutes to protect homes that engines could not reach.

**Litter Fuel Settings**

Woodland/forest stands occur throughout the NFPD, especially on north slopes. When fire burns in those stands, the litter fuels on the surface, under strongly wind-sheltered conditions, will carry the fire. Where surface-fuel concentrations and/or ladder fuels exist there will likely be torching of individual or small groups of trees. The most important effect of those torch-outs will be the production of firebrands.

Fuel beds of small-leaf/short-needle litter (under some live oaks, redwood, firs, etc.) are modeled here by Fuel Model 8 (closed timber litter). Fuel beds of larger leaves (under pines, black oaks, etc), with small shrubs and heavy accumulations of downed wood are modeled here by Fuel Model 10 (timber litter and understory).

Midflame wind speeds within the canopy, especially where sheltered by topography, are assumed to be in the 1 to 3-mile/hour ranges. For those conditions and fuels, the expected extremes of rate-of-spread and flame length would be:

- Rate-of-spread from < 1 ft/min to 5 ft/min
- Average flame length from < 1 foot to 4 feet
Where fires move into woodland/forest stands their spread rates will slow greatly, in general offering good control opportunities. Progress of the fire front on initial-attack time scales (5 or 10 minutes) will be minor, on the order of a few feet to a few 10s of feet. Aside from occasional torch-outs or flare-ups in fuel jackpots the fire intensities should be amenable to direct control.

**Litter Fire Behavior Predictions**

The litter fire predictions were made using Behave-plus, for Models 8 and 10, and assuming midflame wind speeds within the canopy are about 1/10 of the 20-foot wind speed in the open. See the attached Behave-plus output tables for representative ROS and flame length in litter under different wind speeds.

Table 34  
Rate of Spread (ROS) Increasing with Time Since Ignition

<table>
<thead>
<tr>
<th>ROS/ROS&lt;sub&gt;max&lt;/sub&gt;</th>
<th>ROS for 8 mi/hr wind</th>
<th>Avg. ROS for previous min.</th>
<th>ROS for 12 mi/hr wind</th>
<th>Avg. ROS for previous min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.18</td>
<td>50</td>
<td>25</td>
<td>94</td>
<td>45</td>
</tr>
<tr>
<td>0.32</td>
<td>90</td>
<td>70</td>
<td>166</td>
<td>130</td>
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<tr>
<td>0.44</td>
<td>120</td>
<td>105</td>
<td>230</td>
<td>200</td>
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<td>0.54</td>
<td>150</td>
<td>135</td>
<td>280</td>
<td>255</td>
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<tr>
<td>0.62</td>
<td>170</td>
<td>160</td>
<td>320</td>
<td>300</td>
</tr>
<tr>
<td>0.68</td>
<td>190</td>
<td>180</td>
<td>354</td>
<td>335</td>
</tr>
<tr>
<td>0.73</td>
<td>200</td>
<td>195</td>
<td>380</td>
<td>365</td>
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<td>0.78</td>
<td>220</td>
<td>210</td>
<td>406</td>
<td>395</td>
</tr>
<tr>
<td>0.83</td>
<td>230</td>
<td>225</td>
<td>430</td>
<td>420</td>
</tr>
<tr>
<td>0.87</td>
<td>240</td>
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<td>0.93</td>
<td>260</td>
<td>255</td>
<td>484</td>
<td>475</td>
</tr>
<tr>
<td>0.95</td>
<td>266</td>
<td>263</td>
<td>494</td>
<td>490</td>
</tr>
<tr>
<td>0.97</td>
<td>270</td>
<td>268</td>
<td>504</td>
<td>500</td>
</tr>
<tr>
<td>0.98</td>
<td>274</td>
<td>272</td>
<td>510</td>
<td>505</td>
</tr>
</tbody>
</table>

Table 34 shows ROS as it increases with time since ignition, based on the final ROS values from Table 33 ROS is in feet/minute. The predicted ROS assumes fire spread under steady winds, constant slope, and uniform fuels. Those kinds of constant conditions do not long prevail in the real world. In general, the
preceding ROS values will probably over predict fire spread over long runs and for the higher ROS cases.

**Applications to Other Sites**
The data developed here can be applied to other sites within the District, assuming similar fuels and weather, to provide a representative (if approximate) picture of the fire behavior. Where fires run in grass, use the tabled values of spread-distance vs. time from Error! Reference source not found. and Error! Reference source not found. (reduce ROS in proportion to the wind speed for lower wind speeds). Where fires move under mature woodland/forest canopy, expect the fire to slow; and within a few tree-heights of the edge of the stand you can apply an average litter-fire ROS thereafter.

**Wildland/Urban Interface**
Wildland/urban interface refers to the geographical areas where formerly “urban structures-mainly residences-are built in close proximity to the flammable fuels naturally found in wildland areas, including forests, prairies, hillsides and valleys. The results can be aesthetically desirable…or disastrous.”

As urban areas expand into wildland areas and as an increasing number of homes are built near wildland areas, the conflicts associated with wildland fire become more commonplace.
Figure 30  Aerial View Showing Wildland Urban Interface Area
Just as wildland fires threaten people and their property, human caused fires threaten wildlands. Thus homeowners and developers benefit by knowing the risks and protection strategies related to home development in wildlands.

A dream home built in an idealistic wildland setting can be razed by fire in a matter of minutes. Likewise, the exemplary scenery that attracted homeowners to the setting can be altered, often because of the inadvertent action of the homeowner.

The NFPD is organized to perform fire prevention and control activities in order to protect life and property from wildfire. The District’s goal is to minimize wildfire loss through the establishment of effective policies, planning, fire prevention, personnel, infrastructure, training, communications, operational systems, safety, and coordination.

A fundamental concept of fire risk is associated with living in the wildland/interface. The NFPD attempts to reduce the risk within the District by taking measures to prevent the outbreak of fires, to limit the extent and severity of those fires that do start, provide for the removal or rescue of endangered persons, control and extinguish fires that occur within the District, as well as to perform other emergency response operations and delivery of emergency medical services.

Figure 31  Aerial and Topographical Map of Novato, CA
Ingress and Egress

Primary roads are defined as the main road or roads leading to or from the subdivision. The primary roads are of importance in a wildfire both for evacuation of people from the subdivision and for access to the subdivision by emergency vehicles. The risk of wildfire is reduced if two or more roads are available because there is less chance of the wildfire blocking roads and limiting access to the subdivision by emergency vehicles. One primary road will still provide two options to enter or exit from the subdivision. The most risk is associated with a one way in or out because should the wildfire close this road, there would be no access to the subdivision or house.

The Challenge

The I-Zone fire issue continues to challenge the NFPD. The Chief and staff agree it is not a question of whether or not NFPD will have major I-Zone fire; it is merely a question of when and where the next major wildland fire will strike, and how well the NFPD will be prepared to respond.

Figure 32 Typical Wildland Interface Slope
Fire Hazard Assessment in the Wildland/Urban Interface

**Evaluation and Assessment**

Living adjacent to a wildland offers spectacular scenery and feelings of serenity. Unfortunately, homes built in wildland/urban interfaces are extremely vulnerable to wildfires. However, using a few simple precautions, homeowners and developers can make homes built in the wildland safer and more likely to survive a wildfire.

**Select the Areas to be Evaluated**

Interface boundary or boundaries have been established and defined on a map adopted by Ordinance. Use a map (preferably a topographic map) of the jurisdictional area and define the known interface areas. After identifying the interface areas on the map, each area has been given a geographic name or number.

**Select the Hazard Components to be Assessed**

The hazard components discussed are divided into three categories—structure hazards, vegetative fuel hazards, and other miscellaneous hazards. The structure hazards include the structure’s location, building materials and design. The vegetative fuel hazards include the vegetative both within and beyond the vicinity of the structure. Miscellaneous hazards included are the structure density (i.e. the number of structures in an area), slope, weather, and fire occurrence.

**Structure Hazards**

The building materials, design and location, and the fuels within the area will all contribute to the ability or inability of the structure to survive a wildland fire situation. By considering the following structural hazards, new developments can be built with an increased chance of surviving a wildland/urban fire. Homeowners should be educated on how to reduce the fire risk of existing structures.
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Structure Location

The structure should be built in a location that will minimize vulnerable design features and maximize its survivability. Structures should be set back at least 30 feet from property lines so that the owners will have control of the adjacent areas.

Structures should be located away from dangerous topographic features such as the top of slopes or adjacent to chimneys (draws and canyons).

Building Materials and Design

Should a building come in contact with heat, flames, or firebrands, the building materials and design should prevent or retard the penetration of the fire beyond the exterior of the structure.

**Roof**

Roofs are less vulnerable to radiation and convection because of their slope, but are more susceptible to ignition by firebrands. Roofs should be covered with nonflammable materials and should be inspected for gaps, which could expose ignitable sub-roofing or roof supports. A major cause of home loss in wildland areas is flammable wood shake roofs.

**Walls**

Walls are most susceptible to ignition by radiation and convection. The edges of flammable wall materials, such as trim materials on casings and facing, will ignite before flat surfaces. The walls should be constructed of fire resistant materials compatible with the surrounding fuels. Wall materials that resist heat and flames include cement, plaster, stucco, and concrete masonry such as stone, brick, or block. Though some materials will not burn, such as vinyl, they may lose their integrity when exposed to high temperature and fall away or melt, exposing interior materials.

**Windows**

Exposure to heat can cause windows to fracture and collapse leaving an opening for flames or firebrands to enter and ignite the interior of a structure. Using glass products that can withstand the potential convective and radiant heat will reduce this risk. Tempered glass will withstand much higher temperatures than plate glass and should be used for large windows, particularly windows overlooking slopes or vegetation. Double pane glass is slightly more resistant to heat than single pane glass.

**Eaves and Overhangs**

Eaves and overhanging features—room push-outs, bay windows, and extensions over slopes—are very vulnerable to convective exposures and have a design that can sustain ignition. Fuels should be eliminated from contact with eaves and overhangs. Eaves and overhangs should be boxed or enclosed with
nonflammable materials to reduce the surface area and eliminate the edges that can trap firebrands.

**Vents**
Vents are a necessary feature of a structure for preventing condensation and subsequent wood decay. However, openings should be screened to prevent firebrands from entering the structure. The screens should prevent passage of objects larger than 1/4 inch (6.0mm). Both vents and screens should be constructed of materials that will not burn or melt when exposed to heat or firebrands.

**Attachments**
Attachments include any structures connected to the residence such as decks, porches and fences. When assessing the ignition potential of a structure, attachments are considered part of the structure. For example, if the ignition potential of the attachment is high, the ignition potential of the entire structure is considered high.

**Additional Considerations**
Additional considerations are:
- Access/Egress
- Bridges
- Building Construction
- Density and Spacing
- Pre-attack Plan
- Resources
- Response Times
- Utilities
- Water Supply

**Vegetative Fuel Hazards**
Vegetative fuels include living and dead vegetation materials. The amount of heat energy released during a wildland fire is defined by the amount, arrangement and rate of combustion of the vegetative fuels. Vegetative fuel flame lengths can exceed 100 feet and the radiated heat can ignite combustible materials from distances of 100 feet or more. Winds can carry live firebrands for several miles.

Fuels within the immediate vicinity can have a significant impact on the potential of a structure to ignite. The size of the “immediate vicinity” will vary depending on the vegetation and characteristics of the land. Fuels within the immediate vicinity of the structure should be fire resistant and maintained in fire resistant
condition. Fuels beyond the immediate vicinity are those that surround the structure but are not immediately adjacent to it.

The concern with these fuels is primarily their ability to produce firebrands, which can indirectly cause ignition of the structure, and their ability to produce long flame lengths and intense radiant energy. Fuels beyond the immediate vicinity of the structure should consist of fire resistant ground cover and trees that are thinned and pruned to prevent ground fires from igniting the crowns, or tops of trees.

**Additional Considerations**

Additional considerations are:

- Building Construction
- Defensible Space
- Fuel Breaks
- Fuel Continuity
- Fuel Loading
- Fuel Type/Models

Through a comprehensive vegetation management plan (VMP) the hazard and potential risk of structure ignition can be significantly reduced. The NFPD Fire Loss Management Division requires VMPs for all new and substantial remodels within the service area. This provision is enforced through Fire Protection Standard 220 and NFPD Ordinance 2005-1.
Structure Density

The density of structures is determined by lot size, structure arrangement and number of structures per lot. This density affects the overall exposure, spread and intensity of wildfires.

Additional Considerations

Additional considerations are:

- Endangered Animal Species
- Endangered Plant Species
- Environmental Impact
- Visual Impact

Slope

Slope is defined as the upward or downward incline or slant of the terrain. All other variables being equal, a fire traveling up a slope will move faster and have longer flames than a fire traveling on flat terrain. A fire on a 30 percent slope can produce flames twice the length and travel as much as one and one half times as fast as a fire on flat ground. In addition to the direct effect of slope on fire spread, upper, windward slopes typically experience significantly higher wind speeds than do the corresponding lower slopes or sheltered lee slopes.

Weather

All aspects of weather can affect the fire assessment. Temperature, humidity, and winds will affect the probability of ignition and the ability to control and extinguish the fire. Weather patterns such as long and short-term droughts need to be considered.

Additional Considerations

Additional considerations are:

- Drought Factor/Index
- Historic Climatological Data
- National Fire Danger Rating System

Fire Ignition Sources

A wildfire can ignite structures through radiation, convection or firebrands. These three ignition sources need to be understood in order to change a home and the surrounding area, making it less susceptible to ignition.
Radiation
Structures can ignite when exposed to very high temperatures even if the flames do not come in direct contact with the structure. This is called radiation heat transfer. Ignition of your home by radiation is more likely when it is exposed to a very large fire within close range for a sustained period of time. By clearing large trees and heavy brush, and choosing building materials that can withstand high temperatures, a home is less likely to ignite by radiative heat transfer. The radiant heat exposure to a structure (and the chance of ignition) will increase under the following conditions:

✓ An increase in the size of the flames
✓ An increase in the structure surface area exposed to the flames
✓ An increase in the duration of the exposure
✓ A decrease in the distance between the flames and the structure

Convection
Ignition of structures by convective heat transfer requires the fire to come in direct contact with the structure. Even a very small flame can ignite a house if it comes in contact with the house for a long enough period of time. By clearing even small amounts of vegetation, choosing nonflammable siding and deck material, and building on a minimal slope, a home is much less likely to ignite by convective heat transfer.

Firebrands
Firebrands are pieces of burning materials that detach from a fire and are carried by the wind. Severe wildland fires can produce heavy firebrand showers that can travel large distances (one mile or more). The chance of a firebrand igniting structures will depend on the size of the firebrand, and the materials, design and construction of a house. Choosing a fire rated roof and ignition resistant siding and deck material, reduces the risk of a house igniting from firebrands. Firebrands and embers are the primary reason and threat to structural ignition.
Figure 33

Risk – Wildland Fire

Figure 33 illustrates the density of all wildland fires incidents and their contour clusters for 2007.
Risk Assessment within the Novato Fire Protection District

**RHAVE**

The Novato Fire Protection District has conducted an assessment of the significant structures that exist within the District. The process used is called RHAVE, a nationally recognized evaluation tool. RHAVE stands for Risk, Hazard, and Value Evaluation. It is a set of tools and methods to help fire service and community leaders make objective, quantifiable decisions about their fire and emergency service needs.

Risk, hazard and value evaluations are performed at the following three levels.

**Occupancy Level**

Occupancy level is defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class.

**Demand Zone Level**

An area used to define or limit the management of a risk situation. Within the Novato Fire District the station response zones as outlines in the census tract information is utilized.

**Community Level**

Defined as the overall profile of the community, it is based on the unique mixture of demographics, socio-economic factors, occupancy risk, census tracts and the level of services currently provided.

The RHAVE process was designed with some specific parameters. Here is some of the criteria used to develop the concept.

- The basic system should be capable of being completed and used by trained personnel.
- The system should be adjustable according to the size and complexity of the community.
- The system should result in results that are understandable by both fire professionals and elected governmental officials.
- The system is not designed to prove preconceived notions.
The RHAVE process was not specifically designed to perform certain tasks, which include:

- It is not a fire spread or fire behavior modeling process.
- It is not a “cost-benefit” or zero-tolerance model. It does not compare one building to another in order to determine which has the lowest cost to protect.
- It does not predict losses or outcomes, but rather it characterizes potential for loss.
- It cannot force an internal assessment of the condition of a structure unless the authority to conduct such assessment already exists.
- It is entirely dependent upon accurate input to be used for decision makers.
- It is not designed to replace “pre-incident” plans or any other job aid used during actual emergency operations.

The RHAVE program has divided the assessment into four major categories:

- **Category 1**, extreme or maximum risk properties. The Novato Fire District does not have any structures that meet this risk category.

- **Category 2** or major risks properties do exist within the Fire District. We have outlined the structures based on station response area. For an area to be classified as high hazard or key risk, it should contain continuously built-up areas of substantial size with a predominate concentration of property presenting a substantial risk of life loss, a severe financial impact on the community or unusual potential damage to property in the event of a fire. Following is a list by station area and census tract of the Fire District’s Category 2 risk hazards.

- **Category 3** or routine or typical risk properties are abundant within the Novato Fire District. For an area to be classified as routine risk, it should contain built-up areas of average size. The risk of life loss or property damage to property in the event of a fire is a single occupancy usually is limited to the occupants, although in certain areas, such as small apartment complexes, the risk of death or injury may be relatively high. These risks are often the greatest factor in the distribution of fire stations.

- **Category 4** or remote or isolated risks do exist within the Fire District and generally are classified as ranches and areas on the perimeter of the District. These generally are isolated from any centers of population and contain few buildings. We have not analyzed these types of structures.
The RHAVE formula: Building Factors (BF) + Life Safety Factors (LS) + Water Demand (WD) + Risk Range Factors (RR) = Occupancy Vulnerability Assessment Profile (OVAP) X Value Function (V) = RHAVE score.

Figure 34 RAVE Formula
Figure 35  Risk – All Incidents
Figure 36  Risk – Fire, Explosion, Hazardous Materials
Figure 37  Risk – All Fires
<table>
<thead>
<tr>
<th>Business Name</th>
<th>Address</th>
<th>Use</th>
<th>OVAP</th>
<th>Fire Flow (gpm)</th>
<th>Census Trac</th>
<th>Station</th>
<th>Sprinklered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Druids Hall</td>
<td>801 Grant</td>
<td>Assembly hall</td>
<td>41.53</td>
<td>1022.01</td>
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<td>Novato Office Bldg</td>
<td>1510 Grant</td>
<td>Office</td>
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<td>2750</td>
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<td>No</td>
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<td>Marin Christian Life School</td>
<td>1370 So. Novato Blvd</td>
<td>School</td>
<td>40.4</td>
<td>2875</td>
<td>1022.01</td>
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<td>Yes</td>
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<tr>
<td>Woodside Office</td>
<td>7250 Redwood</td>
<td>Office</td>
<td>42.03</td>
<td>3250</td>
<td>1041.02</td>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>Buck Center</td>
<td>8001 Redwood</td>
<td>Research center</td>
<td>42</td>
<td>2000</td>
<td>1021</td>
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<td>Yes</td>
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<td>Golden Gate Plaza</td>
<td>101 Rowland</td>
<td>Mercantile</td>
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<td>1750</td>
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<td>2000</td>
<td>1012</td>
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<td>Yes</td>
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<td>2000</td>
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<td>Fireman's Fund</td>
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<td>42.61</td>
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<td>Office/Manufacturing</td>
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Typical Risk Properties Within the Novato Fire Protection District

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<th>Use</th>
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<th>Fire Flow (gpm)</th>
<th>Census Tract #</th>
<th>Station</th>
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## Standards of Cover

### Risk Assessment and Risk Levels

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NOTE: Figure 38 Map V03 provides a spatial view of the parcels within the service area by per square foot valuations.

Figure 38 Assessor Parcels – Value per Square Foot
NOTE: Figure 39 Map H01 provides a spatial view of the parcels within the service area by occupancy use and coincides with the RHAVE risk assessment-target hazards for structures.
NOTE: Figure 40 Map H02 provides a spatial view of the target hazards by fire flow demand.

Figure 40  Hazard Target Occupancies by Needed Fire Flow

**Structure Response Policies**

For structure response policies refer to the Appendix for a listing of Manual of Operations policies.
Emergency Medical Services

**Current Operational System**

The Novato Fire District’s resource deployment strategy is predicated on training as many personnel as possible in all phases of fire protection and emergency medical care. This philosophy provides for a resource deployment that has maximum flexibility and is cost effective.

All uniformed personnel up to and including captain are “dual role” Suppression/EMS personnel. This means that all firefighters have varying emergency medical responsibilities, either as Firefighter/EMT-D-1A (Emergency Medical Technician-Defibrillator) or Firefighter/EMT-P (Emergency Medical Technician-Paramedic).

**EMS Training**

Emergency Medical Technician-1 and Paramedic initial training and scope of practice is defined in the California Health and Safety Code 2.5, Division 9, Title 22. Emergency Medical Technician initial training has a 110 hour requirement and a mandated set of standards as well as basic life support topics to be covered within that time. Courses are available at many local community colleges and several private schools in the San Francisco Bay Area.

An EMT-1 must be accredited by a Local Emergency Medical Service Agency (LEMSA), a branch of local government. The EMT-1 must submit to the LEMSA, a course completion certificate and a copy of a Professional Rescuer CPR card in order to facilitate initial accreditation. The re-accreditation process consists of submitting proof of 24 hours of continuous education over the previous 2 year period and a current CPR card. Every 4 years an EMT-1 must submit proof of successfully showing competence of cognitive and psychomotor abilities by completing a written and skills exam.
Emergency Medical Technician Paramedics are governed by the same statute as mentioned previously. The basic scope of practice is defined in these regulations. The initial training is a minimum of 1,080 hours and broken into 3 distinct phases each with specific minimum time requirements. The didactic phase consists of 420 hours of structured advanced life support training. The clinical phase consists of 180 hours of hands on learning in the hospital setting. The last phase is the field internship phase which consists of 480 hours of working as a paramedic in the field with a qualified preceptor.

Once a paramedic has completed the training and has a course completion certificate, the State of California requires a standard licensure test. The test consists of evaluation of both the cognitive and psychomotor abilities of the candidate. The test is conducted by the National Registry of Emergence Medical Technicians. Once the paramedic has proof of successful completion of this test, and has passed a live scan finger print background check, they are issued a paramedic license from the state of California. The license is good for two years and must be renewed by submitting proof of 48 hours of continuing education to the State Emergency Medical Services Authority.
**Paramedic Accreditation**

A paramedic must be accredited by the Local Emergency Medical Services Agency resident in the service area. This is accomplished by submitting proof of employment, a copy of the state license and a current CPR card. The LEMSA can require an evaluation of the paramedic’s knowledge of local policies and procedure.

The LEMSA employs a Medical Director under whose medical license all of the EMT-1 and EMT-Paramedics are allowed to function at the basic and advanced life support levels. The LEMSA sets the treatment guidelines policies and protocols through a committee process. The Prehospital Medical Care Committee (PMCC) works on policy revision and creation then submits them to the Emergency Medical Care Committee (EMCC) for approval. Once approved and supported by the LEMSA Medical Director, the policies are placed in service for the EMT1 and EMT Paramedics to treat patients. The treatment guidelines and policies are reviewed and approved by committee bi-annually.

**Initial Response**

The initial response to a medical emergency will be the closest engine company and two Paramedic/Firefighters on a transport unit. Engine companies are always sent with the ambulance unless the call is a code 2 medical checkout. If this were to happen, the truck or the closest engine company would respond.

There are two ALS dedicated transport rescue ambulances I the District, Rescue 60 and 64. They respond by designated zone. When both units are committed a third rescue is crossed staffed by the Station 3 personnel, Rescue 63. If a fourth need arises the District relies on the mutual aid of the San Rafael Fire Department. If a fifth need is realized then the District has the ability to cross staff an additional ambulance, Rescue 62. In times of greater need, such as a disaster, the Marin County Disaster Plan would go into affect and agencies both public and private would be dispatched into the District.

**Transportation to Hospitals**

The Novato Fire Protection District Emergency Medical Services Division is bound by patient rights to take a patient to their preferred hospital or the hospital that best meets their medical needs. There are three basic facilities within Marin County, each with a different capability. Marin General Hospital is designated as a Level 3 trauma center with neurosurgery coverage. Kaiser Terra Linda Hospital is an Emergency Department Accepting Trauma (EDAT), and Novato Community Hospital provides emergency medical care through its emergency department, but it does not have a trauma designation. Stable patients that belong to the Kaiser Medical Insurance require transportation to the facility in San Rafael. If a stable patient wishes to go to their physician who has privileges in Marin General, then we transport that patient to Marin General Hospital in Kentfield.
The District also utilizes the services of Level 2 trauma centers outside of Marin County, these patients are generally flown to Santa Rosa Memorial Hospital or John Muir Hospital in Walnut Creek. Children’s Hospital in Oakland is the facility we send very sick youngsters to either by ground or air. These transportation guidelines are adopted at the Marin County Emergency Medical Services offices and the Fire District is held contractually to abide by these rules.

It is obvious that when a paramedic unit responds to a facility outside of the District that unit is no longer capable for response to either a fire or medical emergency. In addition to the long response times, paramedics must put the unit back into service by cleaning and disinfecting, replenishing its supplies, and completing a computer generated patient care report that in most cases takes 20 minutes to complete. In severe cases, one firefighter from the responding engine company may accompany the patient to the hospital adding a total of two paramedics to the unit for patient care and a driver. We place that engine company out of service until staffing reaches three.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novato Community Hospital</td>
<td>1,319</td>
</tr>
<tr>
<td>Kaiser Terra Linda</td>
<td>718</td>
</tr>
<tr>
<td>Marin General Hospital</td>
<td>261</td>
</tr>
<tr>
<td>Out of County Locations</td>
<td>40</td>
</tr>
</tbody>
</table>

**Multi-Casualty Incidents**

When the actual or potential number of victims resulting from major accidents or disasters exceeds the medical capability of our Fire District, the multi-casualty incident response plan is implemented. This plan is a mutual aid plan, bringing additional medical resources into Novato and establishing an emergency organization capable of dealing with major emergencies. Novato maintains four multi-casualty incidents medical caches, one at each station for multi-casualty incidents.
Table 39  EMS Timeframes

<table>
<thead>
<tr>
<th>Type of Report</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult Chest Pain</strong></td>
<td></td>
</tr>
<tr>
<td>Time to Patient</td>
<td>:44</td>
</tr>
<tr>
<td>Primary survey complete</td>
<td>1:06</td>
</tr>
<tr>
<td>Oxygen request</td>
<td>1:17</td>
</tr>
<tr>
<td>Oxygen applied</td>
<td>1:51</td>
</tr>
<tr>
<td>Vital signs obtained</td>
<td>3:36</td>
</tr>
<tr>
<td>Transportation decision made</td>
<td>3:45</td>
</tr>
<tr>
<td>Patient on gurney</td>
<td>7:12</td>
</tr>
<tr>
<td>Patient in ambulance/Transport starts</td>
<td><strong>8:43</strong></td>
</tr>
<tr>
<td>Assess benefits of treatment</td>
<td>9:43</td>
</tr>
<tr>
<td>Re-assess benefits of treatment</td>
<td>14:03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Adult Stroke</strong></th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Patient</td>
<td>:37</td>
</tr>
<tr>
<td>Primary survey complete</td>
<td>:52</td>
</tr>
<tr>
<td>Oxygen request</td>
<td>1:46</td>
</tr>
<tr>
<td>Oxygen applied</td>
<td>3:11</td>
</tr>
<tr>
<td>Vital signs obtained</td>
<td>3:31</td>
</tr>
<tr>
<td>Transportation decision made</td>
<td>4:01</td>
</tr>
<tr>
<td>Patient on gurney</td>
<td>8:52</td>
</tr>
<tr>
<td>Patient in ambulance/Transport starts</td>
<td><strong>9:49</strong></td>
</tr>
<tr>
<td>Assess benefits of treatment</td>
<td>13:26</td>
</tr>
<tr>
<td>Re-assess benefits of treatment</td>
<td>15:15</td>
</tr>
</tbody>
</table>
### Type of Report

<table>
<thead>
<tr>
<th>Adult Multi-system Trauma</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Patient</td>
<td>:44</td>
</tr>
<tr>
<td>Primary survey complete</td>
<td>1:33</td>
</tr>
<tr>
<td>Oxygen request</td>
<td>3:50</td>
</tr>
<tr>
<td>Oxygen applied</td>
<td>4:27</td>
</tr>
<tr>
<td>Vital signs obtained</td>
<td>5:47</td>
</tr>
<tr>
<td>Transportation decision made</td>
<td>6:05</td>
</tr>
<tr>
<td>Patient on gurney</td>
<td>11:09</td>
</tr>
<tr>
<td>Patient in ambulance/Transport starts</td>
<td>13:08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adult Femur Fracture</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Patient</td>
<td>:34</td>
</tr>
<tr>
<td>Primary survey complete</td>
<td>1:33</td>
</tr>
<tr>
<td>Oxygen request</td>
<td>3:07</td>
</tr>
<tr>
<td>Oxygen applied</td>
<td>5:09</td>
</tr>
<tr>
<td>Vital signs obtained</td>
<td>7:02</td>
</tr>
<tr>
<td>Transportation decision made</td>
<td>9:41</td>
</tr>
<tr>
<td>Patient on gurney</td>
<td>10:45</td>
</tr>
<tr>
<td>Patient in ambulance/Transport starts</td>
<td>13:24</td>
</tr>
<tr>
<td>Assess benefits of treatment</td>
<td>18:24</td>
</tr>
<tr>
<td>Re-assess benefits of treatment</td>
<td>23:24</td>
</tr>
</tbody>
</table>

**Cardiac Arrest Response Time Performance**

There is little doubt strict cost-benefit analysis would dictate most cardiac arrest resuscitation efforts be abandoned. Because of the inexorable decline in survivability as time passes, this strategy would be difficult to defend morally given public expectations and the value our society places on each and every life. Nevertheless, the cost of deploying resources capable of meeting clinical response time guidelines is significant. Add in intensive care, rehabilitation, and long-term quality-of-life effects and the cost becomes very significant. However, the hidden costs of not deploying resources to treat cardiac arrest effectively in the field would likely include litigation and political upheaval.
While the basis for eventual changes should be predicated on clinical research, there are societal and operational issues driving designs of EMS systems. As society becomes more specialized and interdependent, for example, the need for standardization grows. Creation of standard operational procedures helps ensure consistency and provides a basis for monitoring and measuring organizational activities. Standards must be the product of scientific research to ensure policies and procedures enhance quality of service.

Response time performance and its relationship to cardiac arrest survival is the result of hundreds of large and small study efforts. Recommendations regarding effective response force have been developed through ongoing analysis of the physical properties of combustion. Recommendations regarding response times and effective response are based on scientific and operational research. Thus, an organization making a commitment to adopt an industry “best practice” can:

- Scientifically defend their position and work toward further refinement of the standards
- Measure and compare outcomes
- Establish accountability: individually, organizationally, and socially
- Provide the basis for incremental improvements through operational performance objectives
- Use probability to determine likelihood of catastrophic system failure as part of cost/benefit analysis

The EMS Division is responsible for our first responder EMTs, paramedic engine companies and paramedic transport. The Division utilizes the services of a part-time medical director and fulltime quality improvement coordinator. Medical emergencies make up nearly 2/3 of our emergency responses.

**Case Study – Suspected Heart Attack/Heart failure**

- **01:43** Rescue 60 and Engine 6181 respond from station 1 to a private residence of a 78 year old male patient complaining of difficulty breathing and chest pain.
- **01:45** Rescue 60 arrives at scene, Paramedics 405 and 320.
- **01:46** 2 person paramedic crew establishes patient contact. The patient is found in bed pale warm and dry speaking 3 word sentences. The patient is I obvious respiratory distress and is placed on the edge of the bed in a sitting position. Paramedic 405 conducts a patient assessment while 320 ascertains medical history from the patients’ spouse.
- **01:48** The patient states that he was awoken from sleep with a sudden onset of difficulty breathing and chest pain. The chest pain is described as a pressure in the mid chest without radiation of pain. He presents with mild jugular vein distension and accessory muscle use while breathing. The patient has a past medical history of a cardiac arrest, stroke, lung cancer,
hypertension, diabetes and congestive heart failure. The patient states the pain is familiar to him, just like when he had a cardiac arrest. The pain is rated by the patient as 9 out of 10 in severity. He has no allergies to medications and has a long list of currently prescribed medications. He is compliant with all of his currently prescribed medications.

✓ **01:50** Engine 6181 arrives at scene and is directed to obtain the patients vital signs, assist with equipment set up and treatment.

✓ **01:52** 302 reports to 405, as per the spouse, the patient has been complaining of difficulty breathing over the last several days, gradually getting worse. The spouse states that the patient is using 2 or more pillows at night in order to facilitate ease of breathing.

✓ **01:53** The patients’ oxygen saturation is measured without the aid of medical oxygen and found to be dangerously low at 79 percent. The patient is then placed on medical oxygen delivered through a mask at 10 liters per minute. The patient presented with noise lung sounds in all fields which is an indicative of fluid in the lungs. The patient also presented with dependent edema noted in the lower legs and ankles.

✓ **01:55** Engine 6181’s crew obtains vital signs of; b/p-190/100 pulse-100 respirations of 32 and a GCS of 15.

✓ **01:56** Nitroglycerin 0.4 milligrams were administered sublingually.

✓ **02:00** An IV of normal saline was established by 405 using an 18 gauge catheter in the left arm. The patient is placed on the gurney.

✓ **02:02** Second dose of nitroglycerin 0.4 milligrams was administered. The patient rates the pain at 8 out of 10. B/P 150/90, pulse-105, respirator rate of 28. The patient presents pale warm and dry with a GSC of 15. The EKG shows a sinus tachycardia. The oxygen saturation reads 97 percent on 10l pm.

✓ **02:05** The patient is loaded in to rescue 60, Engine 6181 is released from the scene and 80 milligrams of Lasix is administered to the patient IV.

✓ **02:07** Patient vital signs repeated B/P-150/80, pulse 102, respirations 24 GSC 15, oxygen saturation 97 percent on 10lpm, chest pain rated as 3 out of 10.

✓ **02:08** Third dose of nitroglycerin 0.4 mg administered under the tongue with no change in rate of pain.

✓ **02:10** Patient reassessed and states he is feeling some relief from the shortness of breath however chest pain is still a 3 out of 10.

✓ **02:15** Fourth dose of nitroglycerin 0.4 mg administered under the tongue.

✓ **02:17** Patient reassessed and found to be pain free, with a substantial decrease in his breathing difficulty. Patient respiratory effort has improved and the jugular vein distension has subsided. Patient is speaking in full sentences.
Standards of Cover

Risk Assessment and Risk Levels

✓ **02:18** Vital signs assessed and found to be B/P 120/60 pulse 102 respiratory rate of 24, oxygen saturation of 97 percent on 10lpm, GSC 15 and clearer much improved lung sounds.

✓ **02:20** Rescue 60 arrives at Kaiser Terra Linda. A full report was given to the medical staff.

Case Study – Vehicle Accident

DATE: April 24, 2003

DISPATCH TIME: 0711 Hrs.

LOCATION: Fronting 1456 South Novato Blvd

DISPATCH UNITS: E6181, SQ6150, R60 and B6112.

REPORT:
Traffic/Motor vehicle accident with one patient unconscious, NPD at-scene indicating extrication will be necessary.

SUPPORT:
REACH-3 Requested at 0714 Hrs from Concord, ETA 0730 Hrs. CALCORD assigned air-to-ground freq.

SIZE-UP:
0716 Hrs. “E6181 at scene, one vehicle with major damage to the drivers’ side, investigating and establishing S. Novato IC.” Requested TAC Channel: RED. Weather up-date to REACH-3 scattered clouds, 3000’ ceiling with no apparent winds.

OBJECTIVE:
Provide a safe working area to begin treatment and extricate patient.

TACTICAL ASSIGNMENTS:
SQ6150 extrication group, R60 Patient care, B6112 Helispot Manager “S. Novato Helispot.”

MILESTONE TIMELINE:

✓ IC declaration 0716 hrs.
✓ Extrication/treatment initiated: 0717 hrs.
✓ Extrication completed: 0725
✓ Patient arrived at h1: 0728
✓ Reach-3 on the ground: 0738
✓ Reach-3 enroute srmh: 0746
NARRATIVE:
E6181 arrived at the scene, established IC and completed a hot-lap, no fuel or fluids were noted to be leaking from the car nor was there airbag deployment. B6112 was assigned to recon the church parking lot directly across S. Novato Blvd. for obstacles that would preclude the landing of REACH-3. A NPD Sergeant was assigned to B6112 as a law enforcement liaison. The Patient was awake but confused; car impacted a pole with at least 15 inches of passenger space intrusion transmitted directly to driver’s area of the car. R60 began patient care early in the extrication process via initial assessment, O2 15L NRB, C-Collar and PE. Extrication group stabilized the vehicle, secured the uninflated steering wheel airbag and removed the roof, drivers door and increased the drivers exiting space with the ram. The patient was extricated at 0725 hrs. and relocated to R60 which was then repositioned to the helispot. REACH-3 landed at 0738 hrs. and departed for Santa Rosa Memorial at 0738 Hrs.

VEHICLE INFORMATION:
2001 Honda convertible. Battery D/Cs by SQ6150.

INJURIES:
Closed head (confirmed by SRMH) and internal organ damage (Spleen).

AFTER ACTION THOUGHTS:
The weather conditions in the greater Bay Area precluded a direct VFR (visual flight rules) response by REACH-3 to the incident location. IRF (instrument flight rules) applied causing REACH-3 to request an instrument flight path to Novato via the FAA (Oakland Center) adding a few minutes to the normal 12 minute flight time. The truck company effortlessly removed the vehicle from around the patient again reinforcing the vital role they play.
Figure 41     Risk Rescue EMS – Retirement Facilities
EMS Transportation Policies

For EMS transportation policies refer to the Appendix for a listing of Manual of Operations policies.
Section E. Historical Perspective and System Performance

Introduction

The Novato Fire District completed a comprehensive review of historical emergency response performance as well as a measurement of the current system performance. In our measurement of system performance factors such as the distribution of our resources, the concentration of our resources and the reliability of our resource’s availability were closely examined.

The scope of the examination includes data from 2005, 2006, and 2007 and covers call counts, call types, turnout times, travel times, response times, committed times, incident duration, unit concentration on fires, and call distributions by certain sub-categories of data, including station/district and mutual and automatic aid status. Additionally, calls for service were analyzed by month of the year, day of the week, and hour of the emergency response. This type of analysis examines data to determine trends in calls for service. The detailed results of the examination are included in the Appendix of this document.

Three years of call data were analyzed. The years 2005, 2006, and 2007 were included in the analysis. A total of 14,596 calls for service were met by the Fire District during this three year period. Calls for service break down by year in the following manner:

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>4,844</td>
</tr>
<tr>
<td>2006</td>
<td>4,885</td>
</tr>
<tr>
<td>2007</td>
<td>4,867</td>
</tr>
</tbody>
</table>

Table 40 Service Calls per Year
Table 41  Calls by Incident Type

<table>
<thead>
<tr>
<th>Incident Type</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>25</td>
<td>24</td>
<td>17</td>
<td>66</td>
</tr>
<tr>
<td>Alarm</td>
<td>459</td>
<td>467</td>
<td>458</td>
<td>1,384</td>
</tr>
<tr>
<td>Cancelled</td>
<td>179</td>
<td>230</td>
<td>223</td>
<td>632</td>
</tr>
<tr>
<td>Fire</td>
<td>458</td>
<td>460</td>
<td>470</td>
<td>1,388</td>
</tr>
<tr>
<td>Hazmat</td>
<td>53</td>
<td>66</td>
<td>46</td>
<td>165</td>
</tr>
<tr>
<td>Medical</td>
<td>2,650</td>
<td>2,652</td>
<td>2,664</td>
<td>7,966</td>
</tr>
<tr>
<td>Motor Vehicle Accident</td>
<td>458</td>
<td>464</td>
<td>468</td>
<td>1,390</td>
</tr>
<tr>
<td>Other</td>
<td>239</td>
<td>218</td>
<td>224</td>
<td>681</td>
</tr>
<tr>
<td>Public Assist</td>
<td>322</td>
<td>303</td>
<td>296</td>
<td>921</td>
</tr>
<tr>
<td>Service</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,844</td>
<td>4,885</td>
<td>4,867</td>
<td>14,596</td>
</tr>
</tbody>
</table>

Distribution

Distribution relays a geographical analysis of first-due resources to prove initial incident intervention to achieve specific benchmarks and goals. Distribution also assures quick deployment in order to minimize and terminate damages.

The Fire District currently staffs five fire stations with 23 personnel on duty each day. Staffing is spread amongst five engine companies, one truck company, two ALS transport ambulances, and one shift Battalion Chief. Specific units and their respective station assignments are identified as follows:

- Station 1: 6150, 6151, 6161, 6181, 6191, M61, Battalion Chief
- Station 2: 6182, M62, 6156
- Station 3: 6183, 6163
- Station 4: 6184, M64
- Station 5: 6165, 6185
Calls were analyzed by station to help analyze current station and apparatus distribution.

Table 42 Distribution of Calls by Station

<table>
<thead>
<tr>
<th>Station</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual/Auto Aid or Unknown</td>
<td>136</td>
<td>87</td>
<td>91</td>
<td>314</td>
</tr>
<tr>
<td>Station 1</td>
<td>2,099</td>
<td>2,127</td>
<td>2,060</td>
<td>6,286</td>
</tr>
<tr>
<td>Station 2</td>
<td>350</td>
<td>304</td>
<td>362</td>
<td>1,016</td>
</tr>
<tr>
<td>Station 3</td>
<td>606</td>
<td>627</td>
<td>559</td>
<td>1,792</td>
</tr>
<tr>
<td>Station 4</td>
<td>1,189</td>
<td>1,176</td>
<td>1,221</td>
<td>3,586</td>
</tr>
<tr>
<td>Station 5</td>
<td>464</td>
<td>564</td>
<td>574</td>
<td>1,602</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,844</td>
<td>4,885</td>
<td>4,867</td>
<td>14,596</td>
</tr>
</tbody>
</table>

A thorough analysis of our response data indicates the Fire District’s call volume is not taxing the District’s ability to deliver appropriate resources to incidents in a timely manner.
Figure 43 illustrates the distribution by Station zone in accordance with ISO 1.5 mile travel distance.
Concentration

Concentration is the careful analysis of the arrangement of multiple resources with particular emphasis on the spacing of available resources in order to provide an “effective response force” at the incident within the specified timeframes. Concentration looks at data such as number of calls per response zone, call density, area served by multiple resources, arrival timing of units, and arrival timing of effective response force.

Concentration analysis provides a detailed look at response times for first due through fifth due resources.
Table 43  Suppression and Medic Code 3 Response Times, All Units, All Years

<table>
<thead>
<tr>
<th></th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0:04:37</td>
<td>0:05:52</td>
<td>0:06:16</td>
<td>0:06:42</td>
<td>0:07:27</td>
</tr>
<tr>
<td>Minimum</td>
<td>0:00:00</td>
<td>0:00:00</td>
<td>0:00:00</td>
<td>0:00:00</td>
<td>0:00:00</td>
</tr>
<tr>
<td>25th</td>
<td>0:03:10</td>
<td>0:04:00</td>
<td>0:03:53</td>
<td>0:04:07</td>
<td>0:04:27</td>
</tr>
<tr>
<td>Median</td>
<td>0:04:25</td>
<td>0:05:22</td>
<td>0:05:58</td>
<td>0:06:47</td>
<td>0:07:37</td>
</tr>
<tr>
<td>75th</td>
<td>0:05:51</td>
<td>0:07:21</td>
<td>0:08:08</td>
<td>0:09:00</td>
<td>0:10:10</td>
</tr>
<tr>
<td>Maximum</td>
<td>0:24:50</td>
<td>0:24:27</td>
<td>0:24:56</td>
<td>0:22:32</td>
<td>0:23:35</td>
</tr>
<tr>
<td>SD</td>
<td>0:02:33</td>
<td>0:03:09</td>
<td>0:03:53</td>
<td>0:04:17</td>
<td>0:04:49</td>
</tr>
</tbody>
</table>

This type of analysis provides data to ensure that resources are placed in strategic locations to provide backup to neighboring response zones and to ensure our ability to provide an effective response force at the scene of an escalating emergency in a timely manner.

The analysis of the Fire District’s response times in order of unit arrival at the incident suggests that the Fire District is achieving concentration of critical resources quickly compared to comparable jurisdictions.
Figure 45  Concentration – 8 Minute Travel, Battalion Chief
Figure 46  Concentration – 8 Minute Travel, Ladder Truck
Figure 47  Concentration – 8 Minute Travel, Engine Density
Figure 48  Concentration – 8 Minute Travel, Medic Unit Density
Figure 49  Concentration – 8 Minute Travel, 1 BC, 1 Ladder Truck, 3 Engines, 1 Medic Unit
Figure 50  Effective Response Force – 8 Minute Travel
Figure 51  Optimized Travel – 12 Minute Travel Maximum
Reliability

Reliability is the study of historical data to analyze the Fire District’s ability to meet performance expectation even if resources are committed on an existing call for service. Reliability analysis tells us how often a resource did not handle a call in its first due area. This analysis simply analyzes the occurrence of a resource’s inability to handle its first due area emergency calls for service.

To accomplish this analysis historical data is examined to analyze previous measures of performance, previous relocation of resources during multiple calls for service, and expectation for future needs. Station reliability was analyzed to determine how often no appropriate unit from a given station responded to a call in that station’s first due area.

Table 44 Statistics of Reliability, All Stations, All Years Aggregated

<table>
<thead>
<tr>
<th>Unit</th>
<th>% Reliable</th>
<th>Calls in 1st Due</th>
<th>Handled by 1st Due</th>
<th>Handled by Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station 1</td>
<td>95.20%</td>
<td>6,046</td>
<td>5,758</td>
<td>288</td>
</tr>
<tr>
<td>Station 2</td>
<td>84.60%</td>
<td>1,161</td>
<td>982</td>
<td>179</td>
</tr>
<tr>
<td>Station 3</td>
<td>87.30%</td>
<td>2,073</td>
<td>1,810</td>
<td>263</td>
</tr>
<tr>
<td>Station 4</td>
<td>92.30%</td>
<td>2,688</td>
<td>2,482</td>
<td>206</td>
</tr>
<tr>
<td>Station 5</td>
<td>88.10%</td>
<td>1,510</td>
<td>1,331</td>
<td>179</td>
</tr>
</tbody>
</table>

Analyzing this data allows the Fire District to analyze and revise response patterns, move up and cover plans, and staffing patterns to ensure maximum coverage levels are maintained during times of multiple calls for service. Again, this data indicates that the District’s call volume and reliability of resources is permitting the Fire District to deliver appropriate resources to incidents in a timely manner.

Comparability

It is necessary to compare the Novato Fire District’s response performance to that of other similar agencies to ensure that the Fire District is employing best practices in emergency response. Firestats, LLC was hired to conduct an in-depth analysis of the Fire District’s historical data and to conduct a comparison against similar agencies. Firestats conducted a comprehensive analysis and reported the following:

- Travel times appear low for comparable jurisdictions
- Response times appear low for comparable jurisdictions
✓ The District’s call volume does not appear to be taxing the District’s ability to deliver appropriate resources to incidents in a timely way.

✓ Analysis of Fire District response times in order of unit arrival at scene for emergency responses suggest that the Fire District is achieving concentration of critical resources quickly compared to comparable jurisdictions.
Section F. Performance Objectives and Performance Measures

Performance Goal

The Novato Fire Protection District shall limit the risk to our communities and our citizens from fire, injury, death, and property damage associated with fire, accidents, illness, explosions, hazardous materials incidents, and other natural or manmade emergencies through prevention and response.

Performance Level Objectives outline the commitment of the Fire District to meet pre-established objectives regarding the timeliness of response to specific risks. The objectives that follow are the result of a thorough evaluation and categorization of our risks. For each risk we have analyzed our historical response to that risk, the outcome of those responses and have analyzed the potential for future risk in each defined category. Specific performance measures have been established based on our analysis and mission.

Benchmark Definition

A benchmark is defined as a standard from which something can be judged. Searching for the best practices will help define superior performance. This Standards of Cover document uses a combination of standards from NFPA 1710, 1221, and ISO for determining best practices for structure, wildland, and EMS response. Political and policy makers use economic indicators and factors that dictate a balance of risk and adequate effective response force. These response resources are enhanced by prevention mitigation intervention; employing enforcement, education, and engineering innovations. Some of these innovations include the District’s AED program, zero-based fire sprinkler system ordinance, and Company inspection programs. Refer to the Data Analysis section in the Annex to the 2009 All Risk Standards of Cover (pages 18 – 24) for Distribution and Concentration historical performance.

Performance Objective: Fire

Benchmark

For all fire incidents, the Novato Fire Protection District shall arrive in a timely manner with sufficient resources to stop the escalation of the fire and keep the fire to the area of involvement upon arrival. Initial response resources shall be capable of containing the fire, rescuing at-risk victims, and performing salvage operations, while providing for the safety of the responders and general public.

✓ Distribution Performance Measure for Fires-All: the first engine company staffed with a minimum of three personnel shall arrive within eight minutes total response time, for 90 percent of all requests for emergency service.
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✓ Concentration Performance Measure for Fire-Low: The second due engine or Truck Company, for a total of six or more personnel, shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service.

✓ Concentration Performance Measure for Fire-Moderate: The second due engine or Truck Company, for a total of six or more personnel, shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including the Battalion Chief, two additional engines and one ambulance, with a total of 15 personnel (representing the balance of a first alarm assignment effective response force), shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency service.

✓ Concentration Performance Measure for Fire-High: The second due engine or Truck Company, for a total of six or more personnel, shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including the Battalion Chief, a combination of engines, trucks, and ambulances, with a total of 23 personnel (representing a second alarm level of response-all on duty resources), shall arrive in 12 minutes total response time, for 90 percent of all requests for emergency service.

Performance Objective: Emergency Medical Services

Benchmark
For all emergency medical incidents, the Novato Fire Protection District shall arrive in a timely manner with sufficiently trained and equipped personnel to provide medical services that will stabilize the situation, provide care and support to the victim and reduce, reverse, or eliminate the conditions that have caused the emergency while providing for the safety of the responders. Timely transportation of victim to appropriate medical facilities, when warranted, shall be accomplished in an effective and efficient manner.

✓ Distribution Performance Measure for EMS-All: the first unit\(^1\) (minimum of BLS capabilities) staffed with a minimum of two personnel shall arrive within eight minutes total response time, for 90 percent of all requests for emergency service.

\(^1\) All District engine companies are equipped with ALS equipment and staffed with one Firefighter/Paramedic. The Truck and Rescue are equipped with BLS equipment and staffed with EMT-1s.
Standards of Cover

Performance Objectives and Performance Measures

✓ Concentration Performance Measure for EMS-Low: Same as distribution performance measure.

✓ Concentration Performance Measure for EMS-Moderate: ALS level care (one ALS engine and one ALS transport ambulance with five personnel of which two are EMTs and 3 are paramedics\(^1\)) shall arrive within 8 minutes total response time, for 90 percent of all requests for emergency service.

✓ Concentration Performance Measure for EMS-High: Multiple victim/incident ALS level care with a minimum of one ALS engine, one Rescue, two ALS transport ambulances and Battalion Chief (12 personnel of which four are paramedics and the remaining personnel are EMT\(^1\)) shall arrive within 10 minutes total response time, for 90 percent of all requests for emergency service.

Performance Objective: Rescue

_Benchmark_

For all incidents where rescue of victims is required, the Novato Fire Protection District shall arrive in a timely manner with sufficient resources to stabilize the situation and extricate the victim(s) from the emergency situation or location without causing further harm to the victim, responders, public or the environment.

✓ Distribution Performance Measure for Rescue-All: the first engine company staffed with a minimum of three personnel shall arrive within eight minutes total response time, for 90 percent of all requests for emergency service.

✓ Concentration Performance Measure for Rescue-Low: Same as distribution performance measure.

✓ Concentration Performance Measure for Rescue-Moderate: ALS level care (one ALS engine and one ALS transport ambulance with five personnel of which two are EMTs and 3 are paramedics\(^1\)) shall arrive within 8 minutes total response time for 90 percent of all requests for emergency services. Remaining units, including the Battalion Chief, first-due Truck Company or Rescue Squad and engines with a total of eight personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency services.

✓ Concentration Performance Measure for Rescue-High: ALS level care (one ALS engine, one Rescue, one ALS transport ambulance of which two are paramedics) shall arrive within 10 minutes total response time for 90 percent of all requests for emergency services. Remaining units, including the Battalion Chief, first-due Truck Company or Rescue Squad and three engines with a total of 15 personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency services.
Performance Objective: Hazardous Materials

Benchmark
For all incidents where hazardous materials have been released that may pose a hazard to people or the environment, the Novato Fire Protection District shall arrive in a timely manner with sufficient resources to isolate the incident, to identify the material released, and to initiate shelter in place or evacuation procedures.

- Distribution Performance Measure Hazardous Materials-All: The first unit, staffed with a minimum of three personnel shall arrive within eight minutes total response time, for 90 percent of all requests for hazardous materials response.
- Concentration Performance Measure for Hazardous Materials-Low: Same as distribution performance measure
- Concentration Performance Measure Hazardous Materials-Moderate: Second due Engine Company or Truck Company, for a total of six or more personnel shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including additional ALS Engine Company, ALS ambulances, and Battalion Chief, with a total of 15 personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency service.
- Concentration Performance Measure Hazardous Materials-High: Second due ALS Engine Company or Truck Company, for a total of six or more personnel shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including additional ALS Engine Company, ALS ambulances, and Battalion Chief, with a total of 15 personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency service. The Marin County Hazardous Materials Response Team (MC HMRT) shall arrive within 60 minutes for 90 percent of all requests for emergency service.

Performance Objective: Special Operations

Benchmark
For all incidents requiring special operations response (water rescue, high angle rescue, urban search and rescue), the Novato Fire Protection District shall arrive in a timely manner with sufficient resources to stabilize the situation and extricate the victim(s) from the emergency situation or location without causing further harm to the victim, responders, public or the environment.

- Distribution Performance Measure for Special Operations-All: The first unit, staffed with a minimum of three personnel shall arrive within eight minutes total response time, for 90 percent of all requests for hazardous materials response.
✓ Concentration Performance Measure for Special Operations-Low: Same as distribution performance measure.

✓ Concentration Performance Measure for Special Operations-Moderate: Second due Engine Company or Truck Company, for a total of six or more personnel shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including additional Engine Company, ALS ambulances, and Battalion Chief, with a total of 15 personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency service.

✓ Concentration Performance Measure for Special Operations-High: Second due Engine Company or Truck Company, for a total of six or more personnel shall arrive within 9 minutes total response time, for 90 percent of all requests for emergency service. Remaining units, including additional Engine Company, ALS ambulances, and Battalion Chief, with a total of 15 personnel, shall arrive in 10 minutes total response time, for 90 percent of all requests for emergency service. The Marin County Urban Search and Rescue Team (CA RTF-1) shall arrive within 60 minutes for 90 percent of all requests for emergency service.
Section G. Compliance Methodology

Introduction

In 2008, the NFPD implemented an additional functional element to the overall organization structure and was based upon the outcome of the March 2008 management retreat. It was identified by the management team that a planning section was needed to oversee and coordinate the strategic initiatives established and be the focal point for tracking and reporting progress of the goals and objectives established on a systematic and scheduled method.

Hence, in April of 2008, the Organizational Resources Division was assigned an additional primary function of Planning, now referred to as the Organization Resources and Planning Division. Several functional responsibilities such as fleet management and purchasing were re-assigned to the Deputy Fire Chief and Station Captains.

NFPD’s ongoing effort to provide analysis and evaluation of the adopted Standards of Cover will be coordinated and managed by the Chief of Organization Resources and Planning Division through the assistance of the Standards of Cover and Accreditation Self-Assessment team.

Strategic Initiatives and Goals

Strategic initiatives and goals established through the Self-Assessment and Community-Based Strategic Planning processes will be prepared annually in the form of an approved “Work Plan.” The work plan will be reviewed and approved by the Board of Directors at their annual planning retreat and incorporated into the annual budgeting process.

Operational Performance Review and Compliance Reporting

Operational performance review and compliance reporting of critical tasks and company evolutions will be coordinated and managed by the Chief of the Training and Education Division with the assistance of the shift Battalion Chiefs and Station 2 Training Captains.

The NFPD’s current records management system is antiquated and is no longer supported by the software manufacturer and was identified and reported on by the IT manager in 2007 and again in 2008. This was well apparent during the data acquisition and analysis portion of this revised Standards of Cover. This deficiency, in addition to the lack of GIS capability was also noted during the support service level gaps that were identified during the strategic planning
process. As such, a primary initiative to be considered in the 2009/2010 Work Plan will be the development and implementation of the RMS strategic goal.

Improvements to the RMS and GIS capabilities of the District will enable managers to frequently and accurately query data fields and incidents to measure current performance against stated goals. Under the current system, this data query and analysis can only be performed by the IT personnel. It is essential that all managers have the appropriate and necessary tools to review their specific performance and report as necessary in order to make improvements or changes that enhance the response system.

A maintenance and compliance methodology system will include reporting quarterly to the Board of Directors each performance goal stated within this revised Standards of Cover Document. Compliance with the stated performance objectives and measurements will be evaluated quarterly. Annually in January, the Standards of Cover and Self-Assessment team will provide the executive and command team with recommendations for improvement where necessary or changes to the stated performance goals within the Standards of Cover Document. This will be presented at the annual management retreat with adequate time to consider and incorporate such recommendations into the annual work plan. This process may need to be modified from time to time but will establish a system by which the organization can use to better evaluate, plan, implement, and monitor its strategic initiatives on an ongoing long term basis.

In order to remain current with the requirements of the CFAI Standards of Cover and Self-Accreditation elements, the NFPD will continue to attend annually the Accreditation Manager’s workshop which provides training to accredited agencies on the newest facets of annual reporting and changes to risk assessment and data analysis methodology. This will ensure a succession management practice within the organization which is consistent with its current professional development policy.
Section H. Overall Evaluation

Introduction

It is recommended that the Novato Fire Protection District (NFPD) Board of Directors adopt by reference the 2009 edition of the All Risk Standards of Cover with the following amendments thereto by Resolution.

The NFPD 2003 Standards of Cover has been reviewed in detail and revised to conform to the 5th edition of the CFAI Standard of Cover guidelines. A critical analysis was conducted of the risk assessment, distribution, concentration and reliability of the District operations. Two services, GIS and the data analysis portion of the revised Standards of Cover were contracted with a third party. This was also done with the 2003 version because the data analysis tools were not available in-house.

Modifications to the 2009 All-Risk Standards of Cover

The following summarizes the significant modifications to the 2009 All-Risk Standards of Cover document.

1. **Review of the historical response data for the past three years 2005-2007**
   In order to analyze whether or not the current response goals are being met, benchmarks needed to be identified and established for the first response areas of the District by Station response zone and first due apparatus. This was accomplished for both medic responses, engine, and truck responses.

2. **Incident responses for each type of response category were also analyzed**
   An Annex to the Novato Fire protection District Standards of Response Coverage was prepared by FireStats™ with input from the NFPD Standards of Cover review team. Fire Stats™ performed the data analysis and processed performance related statistics for all Novato incidents covering the three years between 2005 and 2007. This data analysis specifically was performed to determine benchmarks for:
   - Numbers and types of calls responded to by year, day of week and time of day, and by Station and apparatus
   - Turn-out times
   - Travel times
   - Response times
   - Incident duration(s)
   - Availability analysis
- Reliability analysis

All of the data collected, processed, and analyzed was required under the 5th edition of the CFAI Standards of Cover guidelines. This was not done in the previous SOC adopted by the Board of Directors. This new data substantiates the basis for developing revised distribution and concentration response goals stated in following recommendation.

It is recommended that NFPD utilize the reporting criteria format developed and reported in the (2009) Summary Statistical Study of Emergency Response-Related Operations Annex as the new standard for data analysis to determine if the desired and adopted performance goals are being met.

3. Community-Based Strategic Plan that collected the community’s expectations of the Fire District

Under the 5th edition of the Standards of Cover guidelines, it was necessary to identify community expectations for the NFPD. This was accomplished through the 2009/2013 Community-Based Strategic Plan. The comments and expectations were used in part with the input from members of the District and incorporated into eight goals and subsequent objectives that are designed to be incorporated into the District Annual Work Plan. The Work Plan will be developed based on priority and input from the Board of Directors and be dependent upon fiscal appropriations approved through the annual budgetary process. The community input process developed through the strategic planning process should be incorporated into subsequent versions and revisions of the Strategic plan.

4. Review and validation of critical tasks and times

The Chief of the Training and Education Division and Chief of the Emergency Medical Services Division were asked to validate the critical task associated with various company level structures, wildland, multi-victim and medical incidents responses. Performance indexes dictate specific times needed to accomplish each critical task. This is incorporated into the critical task analysis. Review of each critical task was conducted and confirmed that they are still current. Performance indexes and critical task analysis should be conducted and reviewed at least twice annually. This practice will increase the potential awarded score for ISO grading.

5. Station Distribution and Concentration Study

In October 2005, the NFPD completed the construction and staffed Station 5 located at 5 Bolling Drive. Station 4 is in need of significant capital improvement or replacement. As such, it was necessary to determine if Station 4 was located in the optimum location to provide for adequate distribution of resources and to provide for maximum concentration and delivery of the effective response force.

Through GIS time travel modeling, it is determined that Station 4 located at 319 Enfrente Drive is properly located. It was also identified that Station 5 provides increased concentration to areas of Bel Marin Keys, Pacheco Valle, and Marin Country Club areas of the District. This was not possible with
only Station 4 because on all first alarm assignments prior to Station 5 being constructed and staffed, mutual or automatic aid requested from San Rafael or other fire agencies was necessary.

6. **ISO rating improvement plan**
   The ISO rating of the District can be improved bringing a better insurance classification rating to homeowners and commercial property owners. The District may be re-graded within the next three to six years and can improve its rating by incorporating the following performance improvement measures:
   - Distribution and Company Personnel
   - Reserve Aerial Apparatus
   - Training Facilities
   - Pre-fire Planning and Inspections

7. **Plans to address the re-institution of passenger and freight rail service beginning year 2014**
   Of significant concern to the District will be in re-institution of both commercial and passenger rail service to Marin and Sonoma Counties with the Novato service area being a direct thoroughfare. There is anticipated to be at least two or more rail passenger boarding stations located in the east downtown corridor and in the Hamilton/Ignacio area of the 101 corridor. Emergency response may be impacted particularly with freight service depending on the number of consecutive rail cars.

   Consist configuration and goods transported may include hazardous cargo. The District should establish and assign an interested participant to provide input to the rail service boards and staff as a method of stating concerns and potential impacts this service may have on emergency response.

8. **Current stated response goals**
   The current District response goals as stated in the 2003 Standards of Cover document do not meet minimum guidelines established by the Commission on Fire Accreditation, NFPA 1710, and the Fire & Emergency Self-Assessment guidelines. However, newly defined benchmarks through continuous data analysis and reporting allow the District to form new Distribution performance goals that will work towards a continuous quality improvement process. It is recommended that the District perform regular review of distribution and concentration performance and report quarterly or more frequently as necessary to the Board of Directors.

9. **Revised response goals**
   Based upon the recent risk assessment and revised data analysis with respect to distribution and concentration of District resources, the following performance goals are recommended:

   See Section F Performance Objectives and Performance Measures.
10. **Records Management System (RMS)**

Some although not all data collected can be fully analyzed in a manner that provides the District with information required to determine if optimum distribution and concentration of resources based on calls for service are being provided to the community. In order to strengthen this ability GIS and integrated records management systems are necessary. To minimize use of outside contractors for data analysis required of an accredited agency, and to provide for the highest degree of accuracy and reporting to the Board of directors and the community, it is recommended that a needs assessment for an integrated records management system as identified in the 2009-2013 Community-Based Strategic Plan be implemented.

11. **Specific and scheduled performance review and reporting**

Although quarterly reporting of the District response goal has been incorporated into the quarterly reporting to the NFDPD Board of Directors, many of the recommendations stated within the 2003 SOC were not reported on nor monitored. It is recommended that all data elements used to prepare and revise this SOC document be reviewed quarterly and analyzed and reported to the Board of Directors not less than once annually in February.

12. **Incorporate a continuous quality improvement (CQI) program**

Continuous quality improvement is essential in evaluating the current delivery system and identifying areas where enhanced safety or improved service can be achieved. This is currently being done with the emergency medical services and wildland urban interface response programs.

A similar CQI process should be developed and incorporated to ensure that the response guidelines and objectives established within this SOC are incorporated into a CQI process as well. It is recommended that a CQI process be integrated into the Training and Education Division through the development of the comprehensive training program identified in the goals statement of the 2009/2013 Community-Based Strategic Plan. This will accomplish a higher degree of review which will identify areas that may be deficient as well as provide opportunity for making adjustments to the response delivery model that will provide optimum service delivery and efficiency to the community.

13. **SOC frequency review and revision schedule**

There are three documents that complement one another. Those are the Self-assessment Manual, the Community-Based Strategic Plan, and the All Risk Standards of Cover. No one document is a standalone reference but rather each is interdependent. Each document supports a process for projecting and planning for agency performance improvement according to industry best practices and standards, emergency responder safety criteria, and community expectation. This Standards of Cover and its components should be revised annually as part of an Annual Compliance Report to the Board of Directors; and policy and/or operations modified as necessary to confirm to the adapted emergency response goals of the District.
Conclusion

It is vital that the SOC process be integrated into the NFPD’s strategic and budget planning process. To accomplish this, NFPD will continue to utilize a management process that incorporates team participation and input of its members from all levels both vertically and horizontally within the structure of the organization.

Through this team approach, the 2009 revised Standards of Cover provides a new set of deployment objectives that assure responder and citizen safety, enhances the community service, is fiscally responsible, and provides a method for measurement and reporting.