BONITA SPRINGS FIRE CONTROL AND RESCUE DISTRICT

Facilities and Operations Plan

2007

Emergency Services Consulting inc.

Bonita Springs Fire Control and Rescue District

Facilities and Operations Plan - 2007

Prepared by
Phil Kouwe
Bob McNally
Donnie Hall
Gary Frazier

25200 SW Parkway Ave. Suite 3
Wilsonville, OR 97070
503-570-7778
800-757-3724
fax: 503-570-0522
www.esci.us

Table of Contents

EXECUTIVE SUMMARY ***1***

Purpose of this Report 1
Methodology 1
Report Information 2
Summary of Significant Recommendations 2

FACILITY AND OPERATIONS PLAN ***5***

Community Baseline and Organizational Overview **5**

Responsibilities and Lines of Authority 6
Organizational Structure 7
Finance 8
System Benchmark Comparisons 9
Current Population Information 14

Current Staffing Evaluation **20**

Administration and Support Staff 20
Field Operations 22
Emergency Services Staff 23
Current Staffing Observations 25
Incident Staffing Performance 27

Current Capital Assets Evaluation **31**

Current Facility Evaluation 31
Current Resource Evaluation 37
Capital Resource and Support Equipment Preservation 43

Current Deployment Strategies and System Performance **45**

System Performance Objectives 45
Demand Analysis 50
Distribution Analysis 62
Concentration Analysis 68
Reliability Analysis 69
Recorded System Response Performance 73
Firefighter Turnout Time 81

Future System Demand Projections **85**

Census-based Growth Projections 85
Development-based Growth Projections 86
Community Risk 87
Workload Projections 90
Future Planning Considerations 92

Future Deployment Strategies **95**

Current Deployment - Future Performance 95
Redundancy and Overlap 97
Short-Term Strategy: Close Station Two 98
Short-Term Strategy: Move Aerial Truck to Station 5 102
Short-Term Strategy Considerations: Facility Relocation Options 104
Short-Term Strategy Considerations: Automatic Aid 105
Short-Term Strategy Considerations: Street Connectivity 110

Long-Term Deployment Strategy A – Coastal Fire Station 111
Strategy A Projected Performance 112
Strategy A Cost Projections 113
Long-Term Deployment Strategy B – Spring Creek Station 114
Strategy B Projected Performance 115
Strategy B Cost Projections 116
Long-Term Deployment Strategy C – East Bonita Station 117
Strategy C Projected Performance 118
Strategy C Cost Projections 119
Findings and Conclusions 121
APPENDIX A: APPARATUS CONDITION MEASURES 125
APPENDIX B: STATION COST ANALYSIS 127
APPENDIX C: MAP APPENDIX 131

Table of Figures

Figure 1: Budget by Category 9
Figure 2: Comparative Analysis - Resources 10
Figure 3: Comparative Analysis - Firefighters 11
Figure 4: Comparative Analysis - All Incidents 12
Figure 5: Comparative Analysis - Fires 13
Figure 6: Comparison of Fire Loss Per Capita 13
Figure 7: Population History 14
Figure 8: Population Growth by Year 15
Figure 9: Bonita Springs Population by Age 16
Figure 10: Seasonal Population 17
Figure 11: Bonita Springs Housing by Occupancy 18
Figure 12: Bonita Springs Population Density 19
Figure 13: Administrative and Support Personnel Organizational Chart 21
Figure 14: Administrative and Support Staffing Summary 21
Figure 15: Field Operations Personnel Organizational Chart 23
Figure 16: Field Operations Staffing Summary 23
Figure 17: Combat/Operations Staffing Deployment (per shift) 25
Figure 18: Apparatus Cross-Staffing 26
Figure 19: Critical Task Staffing Needs by Risk 28
Figure 20: BSFCRD Current Standard of Response Coverage Summary 28
Figure 21: Summary of Facility Conditions 37
Figure 22: BSFCRD Apparatus Replacement Funding 38
Figure 23: Correlations Between Fire Extension and Event Outcomes 45
Figure 24: Fire Growth vs. Reflex Time 46
Figure 25: Cardiac Arrest Event Sequence 48
Figure 26: Workload Historical Data 50
Figure 27: Monthly Workload by Year 51
Figure 28: Fire Workload by Month of Year 52
Figure 29: EMS Workload by Month of Year 52
Figure 30: Calls Other than Fire & EMS Workload by Month of Year 53
Figure 31: EMS Workload by Day of Week 54
Figure 32: Fire Call Workload by Day of Week 54
Figure 33: Calls Other than Fire or EMS Workload by Day of Week 55

Figure 34: EMS Workload by Hour of Day....56
Figure 35: Fire Calls Workload by Hour of Day....56
Figure 36: Calls Other than Fire & EMS Workload by Hour of Day....57
Figure 37: Service Demand - BSFCRD Incident Density....58
Figure 38: Peak Service Demand....59
Figure 39: Off-peak Service Demand....60
Figure 40: Service Demand - BSFCRD Fire Call Density....61
Figure 41: Workload by Station Area....62
Figure 42: Bonita Springs Fire Station Deployment....63
Figure 43: Current Response Time Capability of Fire Stations....64
Figure 44: 1.5 Mile Engine Coverage (ISO)....65
Figure 45: 2.5 Mile Ladder Truck Coverage (ISO)....67
Figure 46: ISO Rating to Insurance Cost Comparison....68
Figure 47: Current Effective Firefighting Force Area....69
Figure 48: Total Unit Responses....70
Figure 49: Unit Hour Utilization....71
Figure 50: Unit Failure Rate....72
Figure 51: Call Concurrency Table....73
Figure 52: Response Time Frequency....76
Figure 53: Three-Year Response Time Trends....77
Figure 54: Average Response Time by Hour of Day....78
Figure 55: 90th Percentile Response Time by Hour of Day....79
Figure 56: Response Time Performance by Station District....80
Figure 57: Geographic Response Performance....81
Figure 58: Firefighter Turnout Time Performance by Unit....82
Figure 59: Census-based Population Forecast....85
Figure 60: Development-based Population Forecast....86
Figure 61: Seasonal Population Forecast....87
Figure 62: Community Risk Assessment by Zoning Designation....88
Figure 63: Community Risk by City Future Land Use Designation....89
Figure 64: Workload Projection by Type and Year....90
Figure 65: Projected Service Demand....91
Figure 66: Six-minute Response Capability from Current Stations....96
Figure 67: Modeled Future Performance Capability of Current Deployment at Six Minutes....96

Figure 68: Station Coverage Redundancy/Overlap 98
Figure 69: Six-minute Response Capability without Station 2....99
Figure 70: Six-minute Response Capability without Station 2 using North Naples....100
Figure 71: Four-Station Deployment Performance Projections....100
Figure 72: Effective Firefighting Force Coverage without Station 2 102
Figure 73: EFF Performance Projections without Station 2 102
Figure 74: Proposed Truck Company Deployment Strategy....103
Figure 75: Truck Company Location Comparison 104
Figure 76: Mutual Aid Six-minute Response Areas 105
Figure 77: Development at North End of Estero Boulevard 106
Figure 78: Fort Myers Beach *Closest Unit Response* Boundary....107
Figure 79: Estero Closest Unit Response Boundary 108
Figure 80: Long-Term Deployment Strategy A - Coastal Station Added....112
Figure 81: Strategy A Performance Analysis....113
Figure 82: Cost Projections - Strategy A 114
Figure 83: Deployment Strategy B - Spring Creek Substation....115
Figure 84: Strategy B Performance Analysis....116
Figure 85: Cost Projections - Strategy B 117
Figure 86: Deployment Strategy C - East Bonita Station....118
Figure 87: Strategy C Performance Analysis....119
Figure 88: Cost Projections - Strategy C 120
Figure 89: Deployment Strategy Performance and Cost Summary 121

This page left blank

Executive Summary

Purpose of this Report

This facilities and operations evaluation is offered in response to a request from the Bonita Springs Fire Control and Rescue District (District). The request was to review and analyze the current deployment of emergency resources in the District, and to assess the future needs of the department specific to fire station locations and company resources. In addition, this report is utilized to satisfy the state requirements under Florida General Statute 189.415 for the Public Facilities and Operations Report.

Emergency Services Consulting inc. (ESCi) wishes to thank the staff and elected officials of the District, as well as the fire department, for the excellent cooperation we received. All involved were candid in their comments and provided a large amount of information and data in a short amount of time.

Methodology

The approach used by Emergency Services Consulting inc. in performing the evaluation included utilization and analysis of statistics, review of documents, interviews with key staff and various agency representatives, and direct observation of facilities and apparatus. Information was collected on a variety of topics of importance on providing quality fire and emergency services.

This information was used to develop specific recommendations for the District and its fire department. The recommendations represent opportunities to improve or maintain the quality of service provided to the community.

Contrary to popular belief, these types of evaluations are not normally conducted on organizations that are suffering serious problems. Instead, evaluations of this type are primarily directed at organizations that may be experiencing growth or are looking for creative and innovative ways to handle the challenges of the future. Such is the case for the Bonita Springs Fire Control and Rescue District.

Report Information

This report includes a detailed review of the resource deployment and staffing systems of the Bonita Springs Fire Control and Rescue District (BSFCRD).

The criteria used to evaluate the department have been developed over many years. These criteria include relevant National Fire Protection Association standards, national accreditation criteria, health and safety requirements, federal and state mandates relative to fire protection and emergency medical services (EMS), fire protection standards of the property insurance industry, and generally accepted practices within the fire and emergency services.

Each report objective provides the reader with general information about that element, as well as specific observations and analysis of any significant issues or conditions that are pertinent. Observations are supported by data collected as part of the survey and interview process.

Finally, specific findings and conclusions are included to resolve identified issues and concerns, or to take advantage of opportunities that may exist.

Summary of Significant Recommendations

The following is a summary of significant findings of the report.

The Bonita Springs Fire Control and Rescue District will be unable to reach a response time performance objective for first-due company response time of six minutes or less to 90 percent of emergency calls through continued use of its existing deployment scheme. BSFCRD can reach some improved levels of emergency service delivery through the adoption of a new deployment strategy, options for which are provided in this report.

In the short-term, the BSFCRD can achieve response time performance and effective firefighting force assembly performance that is nearly identical to the current performance by closing Station 2 and relocating the aerial unit from Station 2 to Station 5. This represents an opportunity for cost savings for BSFCRD.

In the short-term, BSFCRD can benefit from the addition of automatic aid agreements to accommodate all areas that are closer to a North Naples or Fort Myers Beach station,

particularly on the northern end of the beach area along Estero Boulevard. This will improve target response time performance by nearly two percent.[1]

Three long-term deployment strategies are provided:

- Strategy A: Close Station 2, others remain; new station constructed on coastal Estero Boulevard; automatic aid with North Naples.
- Strategy B: Close Station 2, others remain; add Coastal Fire Station and substation near Spring Creek Road.
- Strategy C: Close Station 2, others remain; add Coastal Station and Eastern Bonita Station

A summary of response time performance projections and projected cost for each of the major deployment strategies provided in this report is shown in the figure below.

Deployment Strategy Performance and Cost Summary

Strategy Summary- Performance and Cost Projections				
Deployment Strategy	Percent of Road Miles <6:00	Percent of Service Demand <6:00	Capital Cost Projections	Annual Operating Cost Change
Current Facility Deployment	67%	80%		
Short-Term Strategy-Close Station 2, use auto aid	67%	80%	Surplus Value Unknown	$ (1,013,944)
Deployment Strategy "A"	68%	86%	$ 3,709,067	$ 1,308,678
Deployment Strategy "B"	71%	90%	$ 7,418,134	$ 2,617,356
Deployment Strategy "C"	74%	88%	$ 7,418,134	$ 2,617,356

Of the deployment strategies provided, only Strategy B provides projected performance at the 90th percentile, as requested by BSFCRD. This is due to the new station specifically targeted at the secluded neighborhood area around Spring Creek Road, near the back of Pelican Landings. One conclusion of ESCi's analysis is that **street connectivity issues play a more significant role here than any lack of facilities** in the inability to achieve the 90th percentile performance objective. Many communities that face significant road connectivity problems that lengthen travel times for secluded neighborhoods consider relaxing their performance standard from the 90th percentile to some level below that to accommodate for the hard-to-reach pockets of service demand.

[1] The District is currently working with Lee County Fire Chief's Association to develop closest unit response automatic aid plans

Lowering the performance objective from 90th percentile to the 85th percentile would bring Strategy A into compliance, thus leading to a conclusion that the District could adopt a long-term plan to close one existing station and build one new station along the coastal area. At this 85th percentile objective, there would be insufficient service demand projected in the eastern area of the District to require the addition of an eastern station under current land use planning. However, this plan could be revisited in five to ten years to determine whether any significant change in land use plans for the eastern area of the District would increase the service demand projections for that area, thus making the eastern Bonita station a necessity.

For these reasons, ESCi recommends that the District adopt an 85th percentile performance objective for a six-minute first-due unit arrival. In addition, ESCi recommends that Deployment Strategy A be selected for long-term implementation, with Strategy C providing an additional location for a new station in the event land use planning for the eastern regions of the District are altered to provide for more aggressive and concentrated development.

Facility and Operations Plan

Community Baseline and Organizational Overview

The Bonita Springs Fire Control and Rescue District is an independent fire district providing fire protection and emergency medical first response services. The department's jurisdiction encompasses the entire municipal limits of the City of Bonita Springs along with portions of unincorporated Lee County. The response area includes densely populated urban areas as well as suburban residential areas of Lee County and is situated on the Gulf of Mexico between Naples and Fort Myers. The department began providing fire protection services in 1965.

BSFCRD provides emergency services to a population of 45,107[2] in an area of roughly 77 square miles[3]. An additional seasonal population, estimated as high as 21,200, is served during the peak tourism periods. Services are provided from five facilities located within the jurisdiction. The department maintains a fleet of vehicles including five fire engines, one mini-pumper, one aerial truck, one rescue truck, two wildland firefighting vehicles, and a small boat. Three vehicles are available in a reserve fleet, not typically used for front-line service.

There are 129 individuals[4] involved in delivering these services to the jurisdiction. The department has a Fire Chief, Assistant Chief, three Deputy Chiefs, Fire Marshal, Assistant Fire Marshal, Finance Director, Human Resource Director, and Administrative Services Coordinator. Primary staffing coverage for emergency response is through the use of career firefighters operating on 24-hour shifts.

The department provides a variety of services including fire suppression, victim rescue from entrapment, ALS-level emergency medical first response, hazardous materials response, code enforcement, and public fire safety education.

BSFCRD provides for an initial response to EMS calls from its fire apparatus with paramedic-firefighters that can provide advanced life support functions until the arrival of, or in conjunction

[2] This population estimate is comprised of the 2005 estimate in Table 1-2 of the City of Bonita Springs Comprehensive Plan along with the U.S. Census Bureau, 2000 Census data for the unincorporated sections of the District.
[3] Square mileage of district measured from dry land mass as indicated on Lee County GIS data.
[4] Current number at time of field research.

with, the Lee County transport ambulance. This fire-based EMS response is a nationally accepted practice that is used in countless communities across the United States in an effort to use the fire station distribution to best advantage to gain quicker response times for a trained EMS responder. In these systems, the number of transport units can be balanced to the workload without compromising geographic distribution of the initial response or lengthening first-care on scene arrival times. Two-tiered EMS response systems such as this typically provide an efficient balance of response time and overall system cost.

The Lee County Division of Communications (Lee Control) provides emergency call receipt and dispatch service. Enhanced-911 telephone service, computer-aided dispatch, and a multi-channel radio system are in place

Responsibilities and Lines of Authority

The Bonita Springs Fire Control and Rescue District is an independent special services district, formed under the laws of the State of Florida, and operates as a fire district that is provided the authority to levy taxes for operating a fire protection system.

The District operates under a Chief-Commission form of government. The Fire Chief, appointed by the Fire Commission, is provided with broad power and authority to govern the provision of fire protection and emergency services within the District including organizing a fire protection system, appointing officers and members. The Fire Commission is responsible for purchasing land and equipment, entering into contracts, issuance of bonds, and levying of taxes.

The role and authority of the Fire Commission and the Fire Commission Chairman is clarified within special district charter and written policy documents describing their function and tasks. The Commissioners maintain strictly policy-level involvement, avoiding direct management and hands-on task assignment, an arrangement established within written policy.

The Fire Chief is an at-will employee and is not provided with a formal personal services contract. The Fire Commission Chairman provides an annual formal written evaluation of the Chief's services as a means of documenting performance and establishing personal objectives.

Organizational Structure

A review of this agency's organizational chart reveals that they are organized in a typical top-down hierarchy. The organizational structure of the department demonstrates a clear unity of command, in which each individual member reports to only one supervisor (within the context of any given position) and is aware to whom he or she is responsible for supervision and accountability. This method of organization encourages structured and consistent lines of communication and prevents positions, tasks, and assignments from being overlooked. The overall goals and objectives of the organization can be more effectively passed down through the rank and file members in a consistent fashion.

Exceptions to this are the shift captains, who receive direction from various chief officers during the workday. Department officers generally acknowledged that, despite the captains being assigned to one primary deputy chief, most chief officers feel comfortable giving direct orders or directions to the any of the on duty captains as needed. This disrupts unity of command for these individuals and can create the potential for conflicting priorities.

The organizational structure is charted with clear, designated operating divisions that permit the core functions of the organization to be the primary focus of specific supervisors and assigned members. While some task-level activities may carry over from division to division, the primary focus of leadership, management, and budgeting within the division are clarified by the division's key function within the mission statement. Those individuals supervising or operating within a specific division are positively clear as to the role of the division and its goals and objectives.

The department has sufficiently analyzed its mission and functions such that a resulting set of specific agency programs have been established. Organized, structured programs permit better assignment of resources, division of workload, development of future planning, and analysis of service delivery. Those departments that have clarified their programs with titles, assigned leadership, resources, budget appropriations, performance objectives, and accountability are among the most successful.

The chief executive officer (Fire Chief) directly supervises five other individuals, including the Administrative Service Coordinator, Assistant Chief, Finance Officer, Human Resource Director, and Fire Marshal. The Chief's span of control falls within the range typically considered normal

and acceptable. This is a positive reflection on the agency's organizational structure, since many times chief officers accept or encourage a span of control that greatly exceeds their ability to maintain good communication and leadership, often with good intentions but just as often to the detriment of the department.

The Fire Chief has been provided with the authority up to and including termination, with right to appeal.

The department maintains a thorough and up-to-date set of job classifications and descriptions that accurately reflect the typical responsibilities and activities of the positions. The documents adequately describe the primary functions and activities, critical tasks, and levels of supervision and accountability, as well as reasonable qualifications.

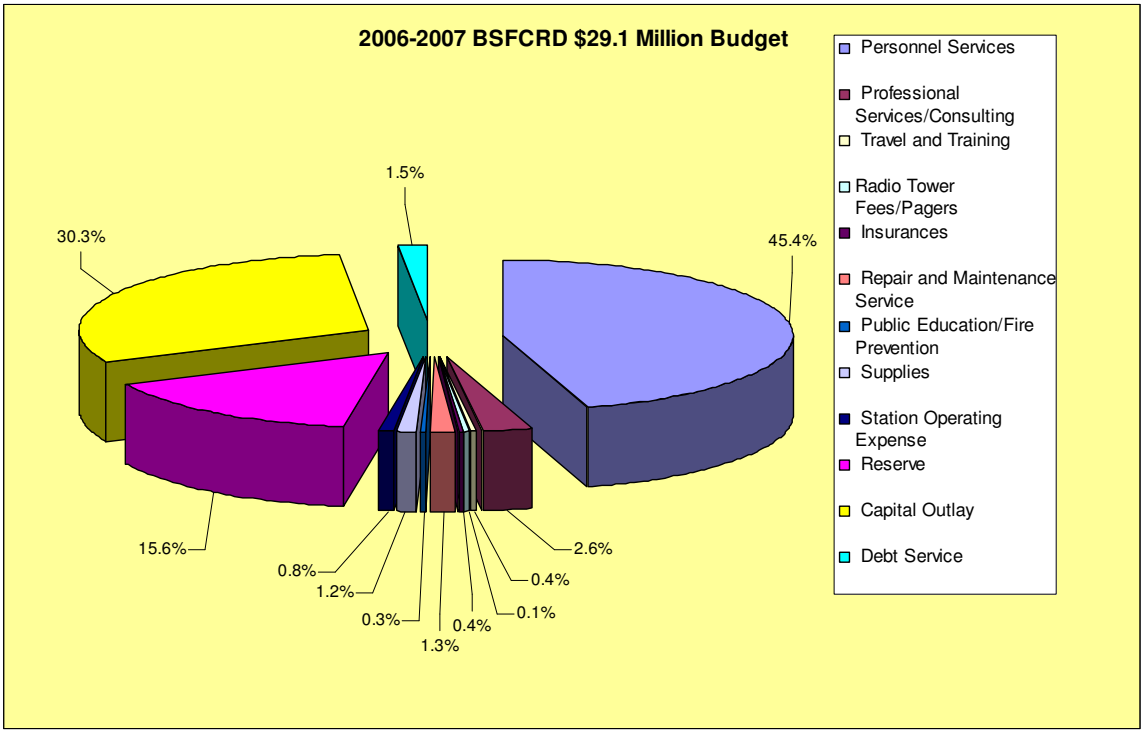
The department currently maintains collective bargaining agreements (CBAs) with certain classifications of employees within the organization that clarify the salary, benefits, and many of the working conditions under which the employees in that classification will operate. Currently, the lieutenants, firefighters, inspectors, and training lieutenants, as well as certain classes of civilian employees are covered by a CBA.

Finance

The assessed value of the BSFCRD is approximately $7.7 billion, with a total 2005-2006 fiscal year tax rate for operations of $2.30 per $1,000.00 assessed. This rate will drop to $1.98 per $1,000.00 for the upcoming 2006-2007 fiscal year, the lowest since 2001.

The budget for the upcoming fiscal year is $29.1 million. The following figures provide an overview of the 2006-2007 fiscal year budget.

Figure 1: Budget by Category

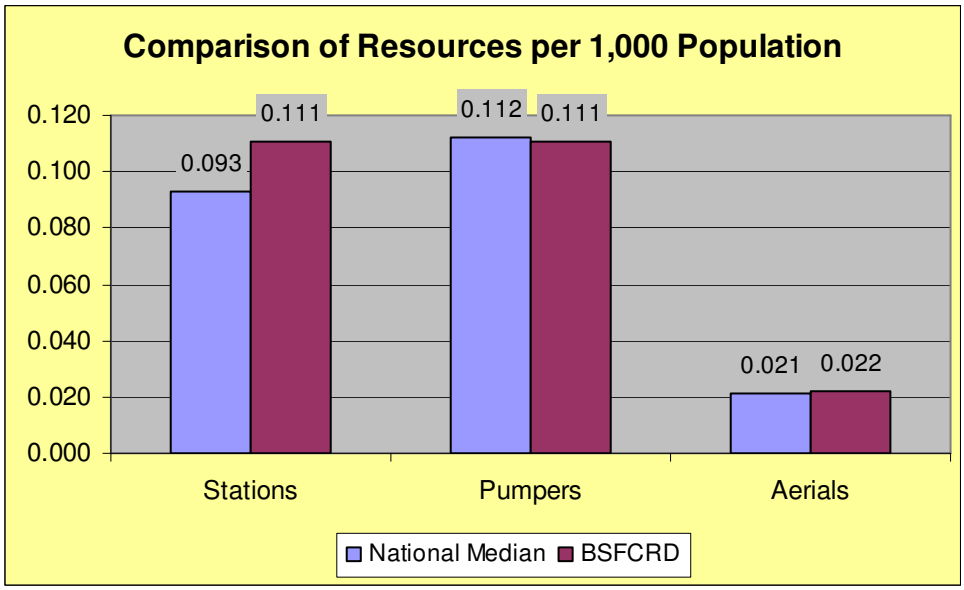


System Benchmark Comparisons

The scope of work for this study included a request to conduct comparative analysis of the Bonita Springs Fire Control and Rescue District with other agencies, in order to compare levels of service and resources against peer fire service organizations. It should be noted that the comparisons contained herein do not reflect any specific recommendations or standards provided to the fire service industry. Rather, they are simply the provision of comparative data from available sources of validated statistical information on fire departments at the regional or national level, adjusted for population.

The following chart compares the number of resources, by type, of the department to other communities of similar size in the southern region of the United States.[5] The chart indicates that BSFCRD is operating with a normal ratio of both pumpers and aerial trucks when compared to population served, but a slightly higher ratio of stations. Comparison data is from the National Fire Protection Association (NFPA) *2004 Fire Department Profiles* publication.

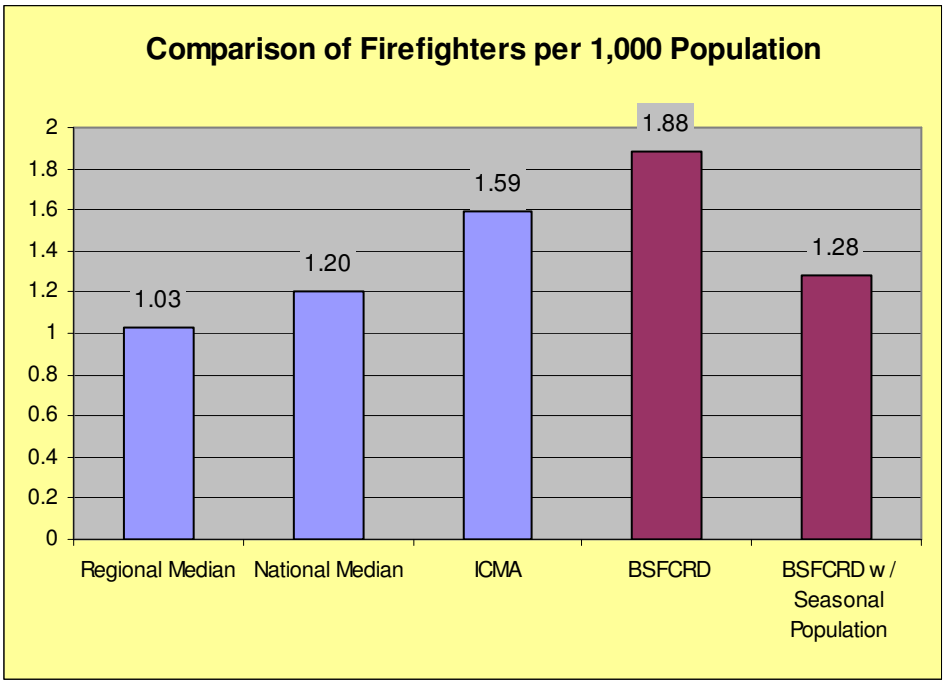
Figure 2: Comparative Analysis - Resources



The following chart compares the number of firefighters in the BSFCRD to other communities of similar size in the same region of the United States. Again, this comparison data is from NFPA *2004 Fire Department Profiles* as well as the International City Managers Association's (ICMA) public service data tables. In this table, a ratio is also provided when comparing to a population number that includes the seasonal population estimated for the District.

[5] The NFPA statistical data breaks the U.S. into four regional areas: northeast, southeast, north central, and west. Florida falls into the southeast region and comparison data is taken from that group.

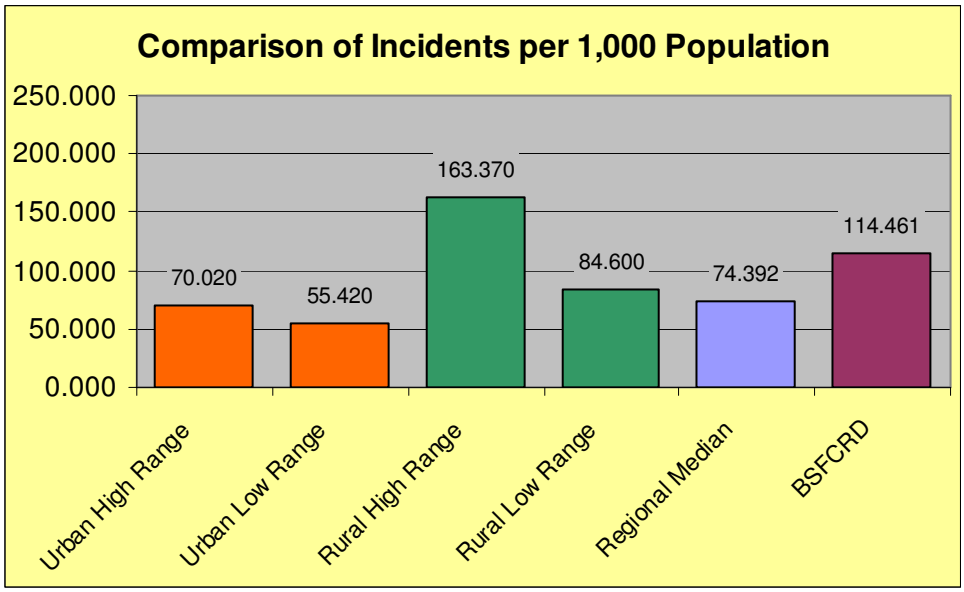
Figure 3: Comparative Analysis - Firefighters



The chart demonstrates that BSFCRD has a slightly higher ratio of firefighters to population served when compared to the national median figures from NFPA and data from the ICMA if only the full-time resident population is considered; but just between these two comparison figures if seasonal population is included. However, there are mitigating circumstances that must be considered. In the case of Bonita Springs, significant focus has been placed on the compliance with recent industry standards and recommendations that relate to staffing levels. Another even more important factor is actual workload, which is higher in volume in the District. The next chart will compare the number of emergency incidents in BSFCRD to other communities of similar size in the same region of the United States. Additional comparisons are shown for the range of all urban communities studied.[6]

[6] For purposes of this comparison chart, urban refers to municipalities with populations in excess of 25,000. Rural refers to populations in smaller communities of less than 24,999.

Figure 4: Comparative Analysis - All Incidents

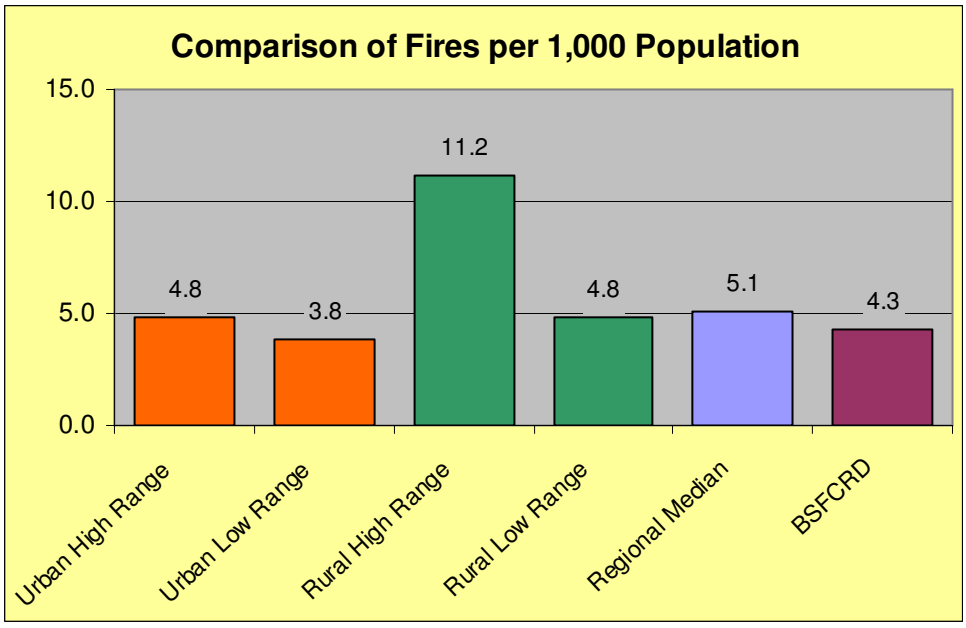


The comparison shows BSFCRD with a **much higher** figure than the median benchmark, though it must be remembered that the benchmark study includes departments that do not provide emergency medical services[7], and would be expected to have a lower incident workload. Still, ESCi considers the overall ratio of emergency incidents to population to be **higher than normal**. This is most likely due to Bonita's position as a center for tourism, transient population, and a community with a higher than average population of senior citizens, a condition that generates high volumes of service demand.

The following chart compares the number of actual fire incidents in BSFCRD's response area to other communities of similar size in the same region of the United States. Additional comparisons are shown for large urban communities and smaller rural communities. The data indicates that, in contrast to its overall incident volume, BSFCRD experiences a reasonably typical number of actual fire incidents.

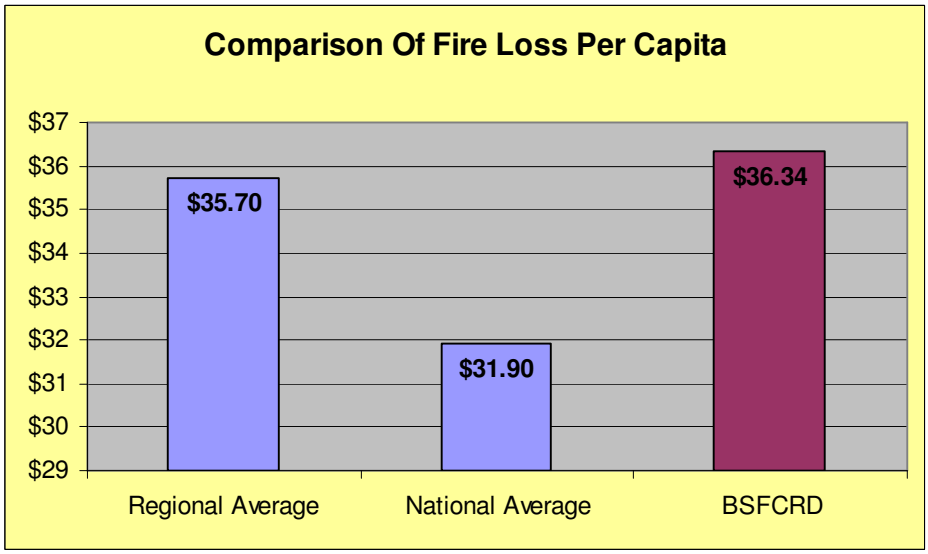
[7] The available *validated* statistical sources, in this case the NFPA Annual Fire Department Survey, do not distinguish between departments providing EMS and those which do not. Thus, direct comparison of data with agencies providing only identical services is impossible.

Figure 5: Comparative Analysis - Fires



An examination of the five-year fire loss average for the community shows a slightly higher level when compared to other similar communities in the region. This is in contrast to the lower actual number of fires, indicating that BSFCRD experiences a higher ratio of fires with larger dollar loss, an expected condition given the value of many of the protected properties.

Figure 6: Comparison of Fire Loss Per Capita

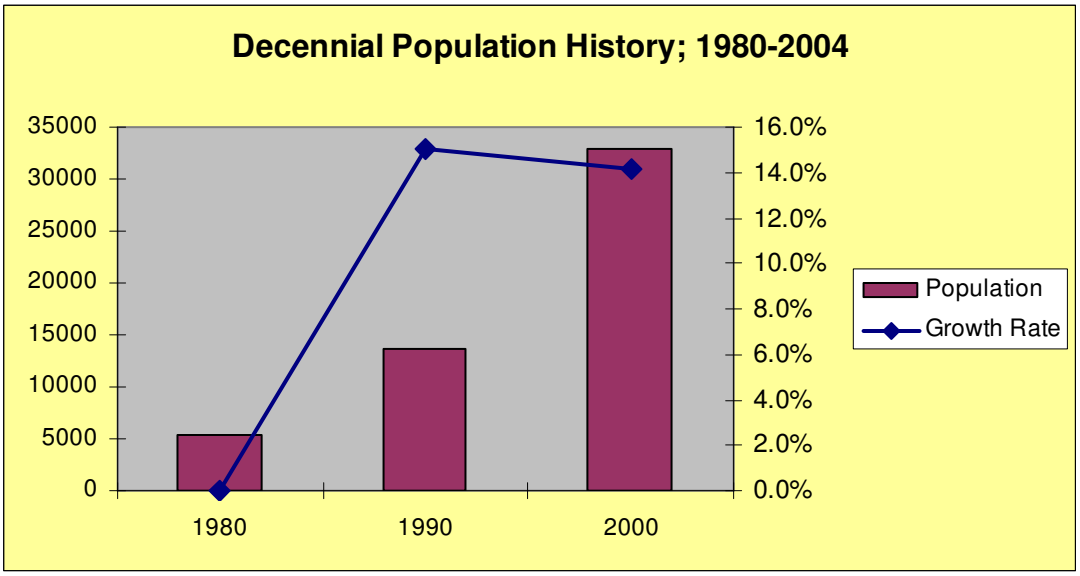


Current Population Information

The Bonita Springs Fire Control & Rescue District provides primary fire protection and first responder emergency medical services to the City of Bonita Springs, Florida, and additional unincorporated areas of Lee County. The population of the city was 32,797 in the 2000 U.S. Census. However, the Census Bureau has estimated an increase in population since the 2000 Census, and the City of Bonita Springs population was estimated at 37,992 in 2005.[8] For the city, this population figure represents a 179 percent increase over the 1990 Census, when the population of Bonita Springs was 13,600. Due to this significant growth in population, an equally impressive growth rate has occurred in additional housing development, since over 294 percent of the total housing in Bonita Springs has been built since 1990.[9] It should be noted that the planning department for the City of Bonita Springs currently estimates the city's population higher than the U.S. Census Bureau at 43,657.[10]

The following figures provide demographic information on population and housing for Bonita Springs.[11]

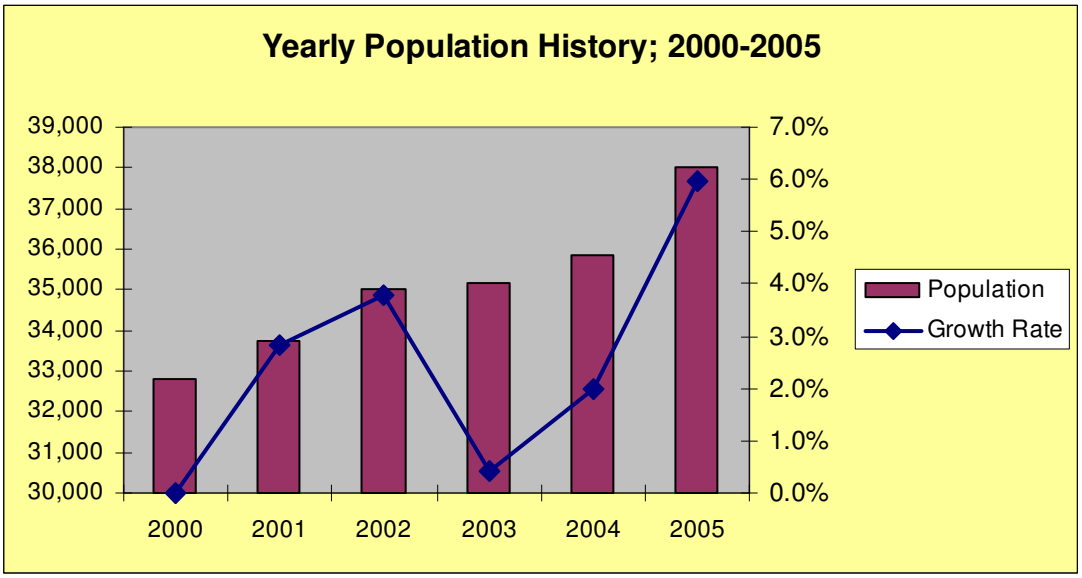
Figure 7: Population History



[8] Population estimate for 2005 is from the U.S. Census Bureau Population Estimates Program.
[9] Data from the 2000 U.S. Census Bureau Table SF-3.
[10] 2005 Evaluation and Appraisal Report of the City of Bonita Springs Comprehensive Plan Table 1-2.
[11] Data from the 2000 U.S. Census Bureau Table SF-1.

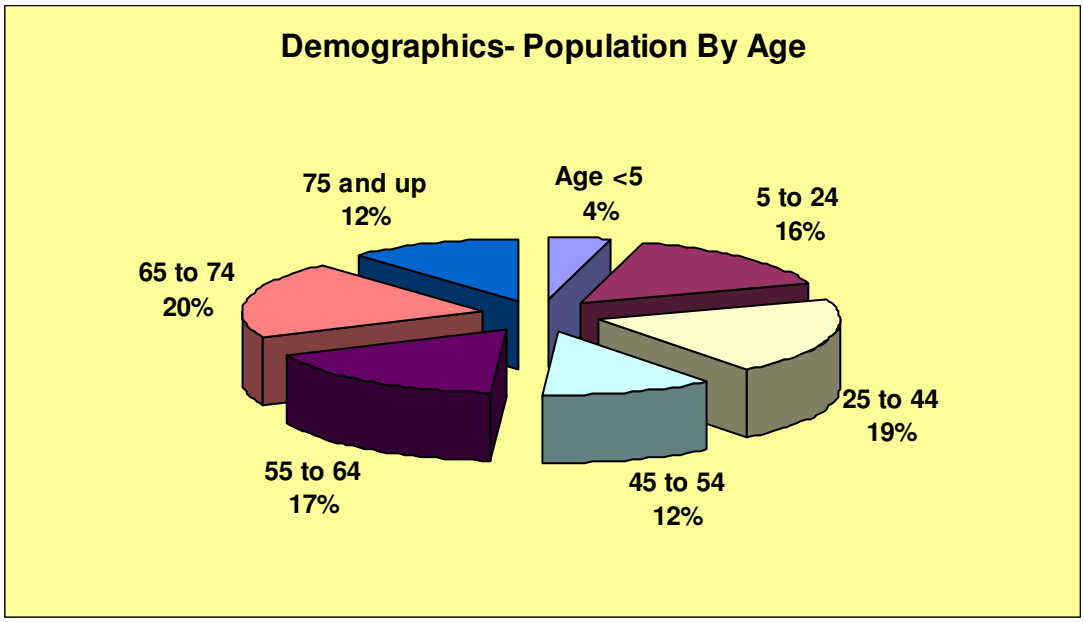
Total population has experienced double-digit growth over the last several decades. Recent population estimates from the U.S. Census Bureau indicate the population of Bonita Springs has been growing between 0.4 - 6 percent per year, as seen in the following figure. Notable is the 2005 growth figure, despite a difficult hurricane season the prior year and the resulting rise in insurance costs.

Figure 8: Population Growth by Year



As one of the factors that influences emergency service demand, this growth in population and its composition with regards to age and socioeconomic characteristics will need to be examined.

Figure 9: Bonita Springs Population by Age



Selected Demographic Information- 1990 to 2000								
	Total Pop	Age <5	5 to 24	25 to 44	45 to 54	55 to 64	65 to 74	75 and up
2000	32,797	1,340	5,134	6,493	3,789	5,649	6,521	3,871
1990	13,600	709	2,465	3,448	1,306	1,837	2,492	1,343
change	141%	89%	108%	88%	190%	208%	162%	188%

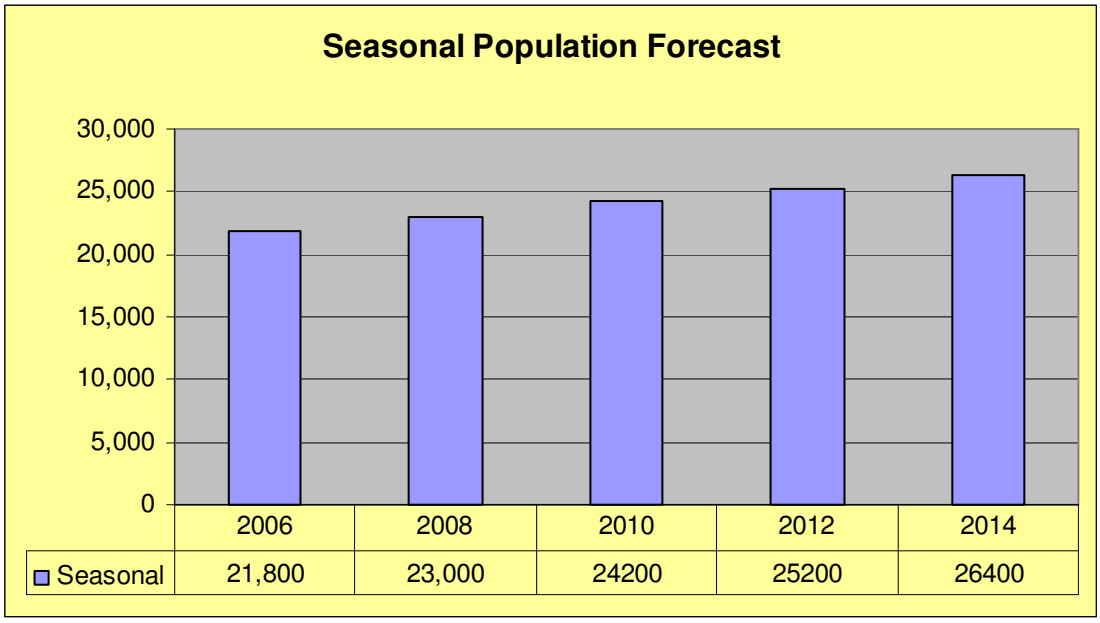
As seen in the figure, 32 percent of the population is 65 years of age or older and four percent of the population is under five years of age, placing a total of 36 percent of the area's population within the significant target age groups that pose the highest fatality risk in residential fire incidents. Although the bulk of the population is aged 25 to 44 years, the rate of growth over the decade in the 55 and older categories will present unique challenges to the fire service.

For instance, the number of residents over the age of 65 has increased by 158 percent since 1990. Nationally, persons over age 65 represent 12 percent of the population. In Bonita Springs, nearly 32 percent of the population is over the age of 65, and is expected to be near 50 percent by the year 2025. This change will create a significant increase in service demand for emergency medical incidents.

In addition to the resident population growth in southwest Florida in general, the Bonita Springs area has a significantly increased transient population during the more temperate times of the year due to its beaches along the gulf coast. Vacationers and second-home owners who are not

tabulated in the census data pose additional demand to the community's fire control and rescue services. Estimation and the projected growth[12] of this population are detailed in the following figure.

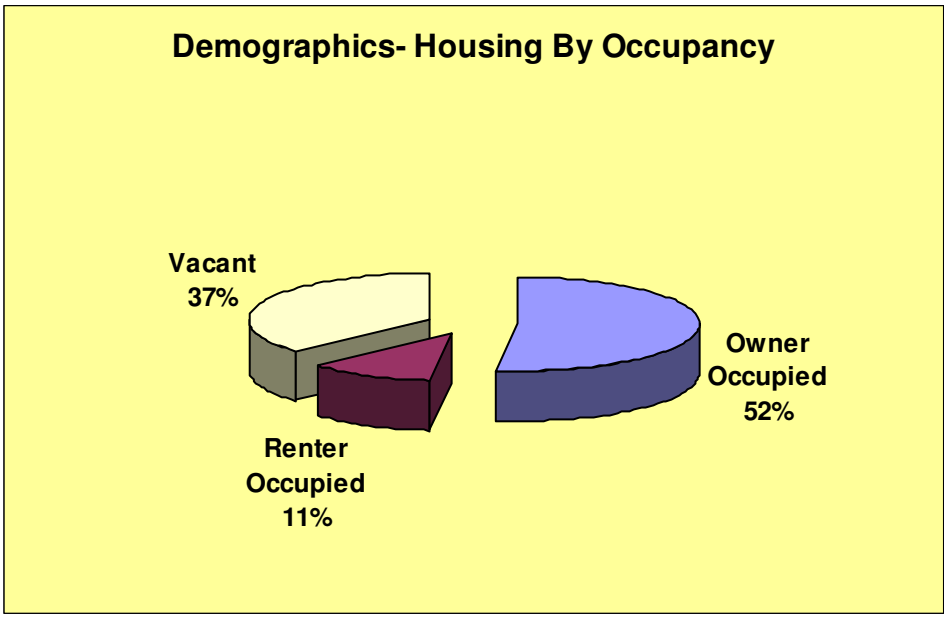
Figure 10: Seasonal Population



The rapid growth in population and the attraction to Bonita Springs and Southwest Florida for vacationers and second home owners reflects on the housing figures for the community. The following chart and table detail the housing profile for Bonita Springs.

[12] University of Florida, Bureau of Economic & Business Research.

Figure 11: Bonita Springs Housing by Occupancy



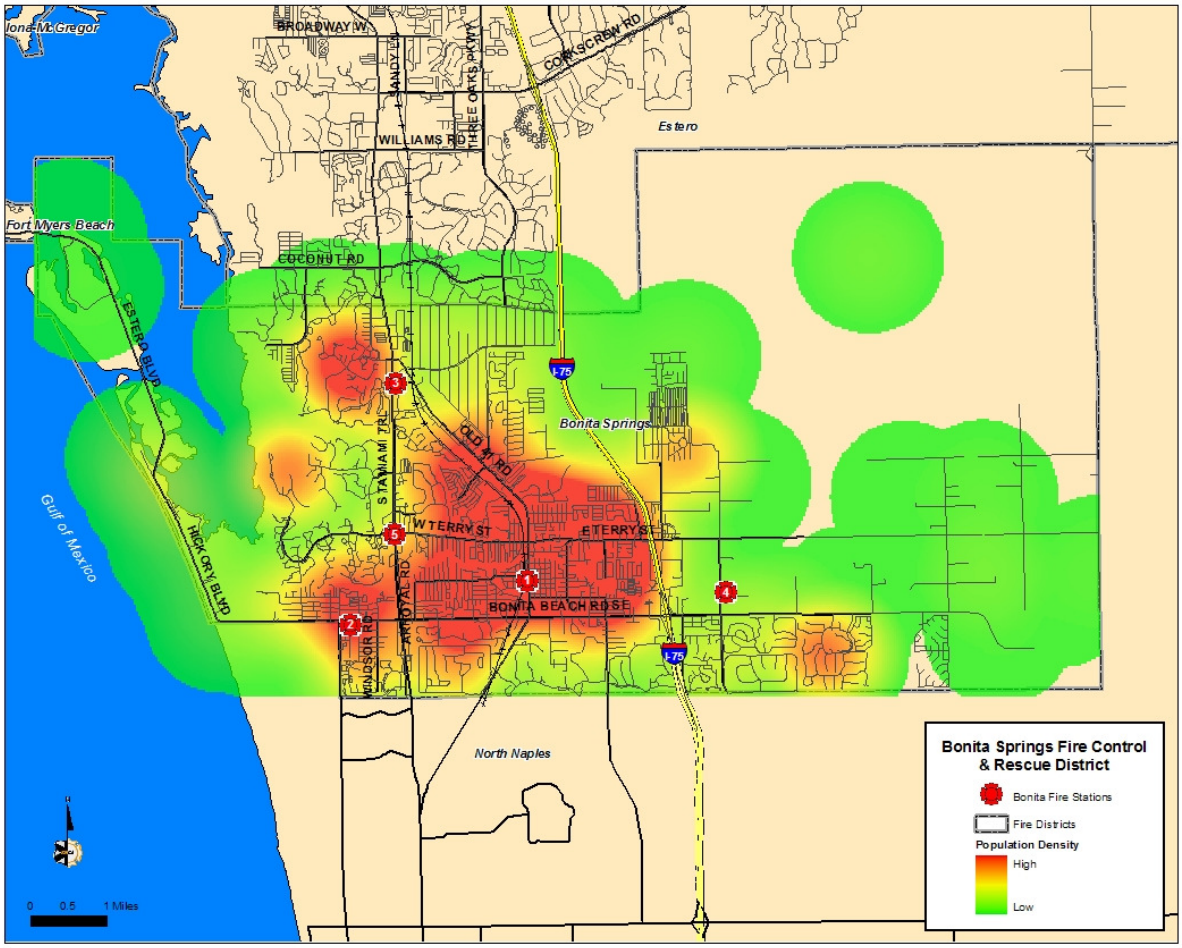
Selected Housing Information- 1990 to 2000				
	Housing Units	Owner Occupied	Renter Occupied	Vacant
2000	23329	12142	2665	8522
1990	8813	4335	1590	2888
change	165%	180%	68%	195%

As a percentage of total housing, owner occupied housing increased from 49 percent in 1990 to 52 percent in 2000. An increase in total housing percentage was experienced in rental properties; however vacant properties have also increased. The increase in vacant properties is usually a negative economic indicator; however this may reflect the increased availability for seasonal population.

Based on the examination of population and housing demographics and projections, it is anticipated that Bonita Springs will likely experience a higher than normal demand for emergency services in comparison with other communities of its size.

It is also useful to assess the distribution of the population within the fire district, since there is a direct correlation between population density and service demand. The following map displays the population density of the fire district, based on information from the 2000 U.S. Census.

Figure 12: Bonita Springs Population Density



The population of the fire district is mostly concentrated in areas along Bonita Beach Road, W. Terry Street, and Old Highway 41. Locations of the fire stations are within and surrounding these areas of higher population density.

Current Staffing Evaluation

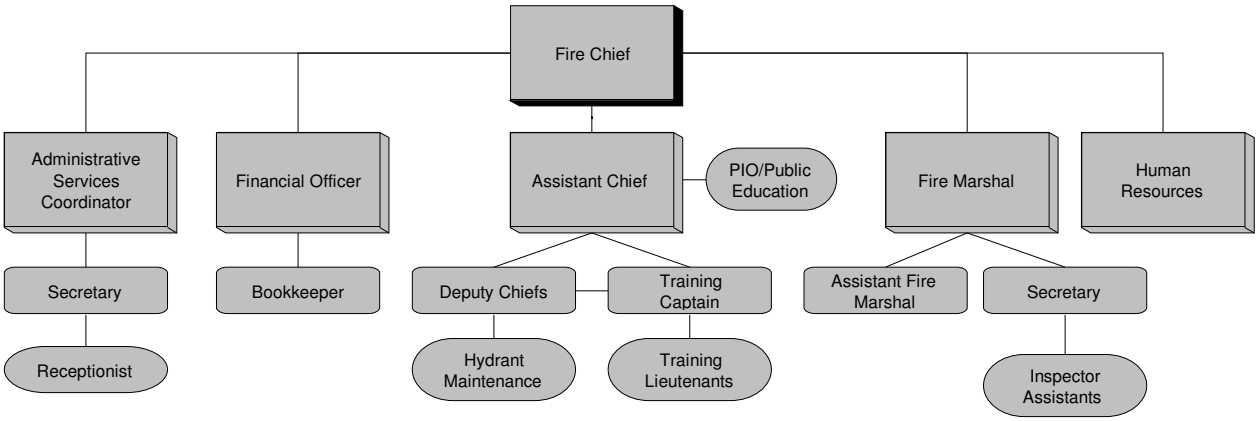
Bonita Springs Fire Control and Rescue District (BSFCRD) utilizes full-time career personnel to accomplish its mission and responsibility to citizens in the fire district. Administrative functions are generally the responsibility of the fire district's staff officers with support provided by administrative personnel. Staffing for emergency response to fire, emergency medical situations, hazardous materials incidents, technical rescues, and other incident types are provided by career personnel working a 24-hour, rotating shift.

Administration and Support Staff

One of the primary responsibilities of the fire district's administration and support staff is to ensure that the organization's operational entities have the ability and means to accomplish their responsibilities during an emergency incident. Efficient and effective administration and support are critical to the fire district's success. Without sufficient oversight, planning, documentation, training, and maintenance, the operational entities of the district may perform poorly or fail an operational test. Just like the other functional areas of the fire district, administration and support also require appropriate resources to function properly.

Analyzing the ratio of administration and support positions to the total positions of the District facilitates an understanding of the relative number of resources committed to this important function. The appropriate balance of personnel assigned to administrative and support function in relation to the operational component is crucial to the success of the fire district's mission and responsibilities. The administration staff of the BSFCRD is comprised of the Fire Chief, Assistant Chief, three Deputy Chiefs (who serve a dual role in operations), Administrative Services Coordinator, Financial Officer, Human Resource Officer, Fire Marshal, Assistant Fire Marshal, Training Captain, and two Training Lieutenants. Support functions are provided by three clerical positions, three inspector assistants, and a hydrant maintenance position.

Figure 13: Administrative and Support Personnel Organizational Chart



The following chart summarizes the personnel FTEs (full-time equivalents) assigned to administration and support.

Figure 14: Administrative and Support Staffing Summary

Administrative / Support Personnel	
Position Title	***Number (FTE)***
Fire Chief	1.00
Assistant Chief	1.00
Deputy Chief (Adm. credited 75%)	2.25
Fire Marshal	1.00
Assistant Fire Marshal	1.00
Training Captain	1.00
Training Lieutenants	2.00
Admin Services Coordinator	1.00
HR Director	1.00
Finance director	1.00
Bookkeeper	1.00
Clerical	7.00
Hydrant Maintenance	1.00
TOTAL	**21.25**

The administration and support staff for BSFCRD is comprised of an authorized complement of 19.25 FTEs. The three Deputy Chiefs were credited 75 percent for administration due to their dual responsibilities. Statistically, BSFCRD maintains a ratio of 16.7 percent of administration and support staff to total personnel.

Based on experience, ESCi has determined that emergency service departments usually maintain 10 to 15 percent ratio of administration and support. However, independent fire

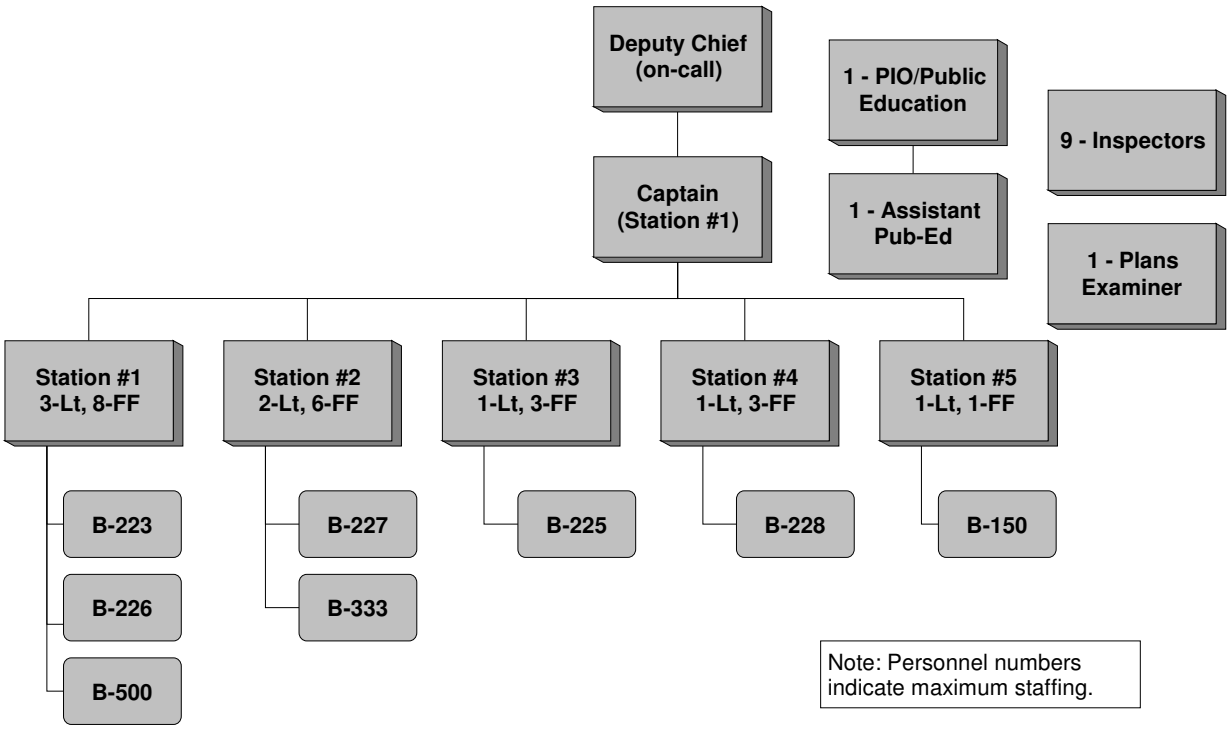
districts typically maintain a higher ratio in the range of 15 to18 percent. Independent fire districts normally do not have the support from municipalities in areas such as human resources, finance, bookkeeping, and other functions, and therefore must provide the services internally.

Each organization should determine the proper ratio of administration and support staff to operations positions based on the local need. Based on the current information, the ratio of administration and support to total department personnel for BSFCRD falls within the normal range for fire districts.

Field Operations

The following chart summarizes the personnel assigned to street-level service delivery, which includes emergency response personnel. Even though the fire inspectors, plans examiner, and the Public Information Officer/Public Education Officer may not be included in an emergency response, they are included in this section since they do provide direct service to the public. Partial credit is given to the Deputy Chiefs who are on call for 24 hours during their respective shift.

Figure 15: Field Operations Personnel Organizational Chart



The following chart summarizes the personnel FTEs assigned to field operations personnel.

Figure 16: Field Operations Staffing Summary

Operations / Field Personnel	
Position Title	***Number (FTE)***
Deputy Chief	0.75
Shift Captain	3.00
Lieutenant	24.00
Firefighter	63.00
Inspector	9.00
Plans Examiner	1.00
PIO/Public Education Officer	1.00
Assistant Pub Education Officer	1.00
TOTAL	**102.75**

Note: 1. All positions added in August 06 are included in the figures.

Emergency Services Staff

It takes an adequate and well trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing

at an operational scene decreases the effectiveness of the response and increases the risk and potential for injury to all individuals involved. Regardless of the number of personnel available to a department, the key factor is the actual number of emergency responders the agency is able to produce at an emergency scene. This almost always relates to the actual number of emergency responders available for immediate deployment.

While the BSFCRD staffing system distributes up to 30 personnel on each of three shifts, not including the deputy chief, it is important to note that this number is not necessarily reflective of the actual number of personnel on-duty. Due to sick leave, vacation, injuries, and other circumstances, the actual number of on-duty personnel often falls below the number assigned to the shift. The current BSFCRD policy on minimum staffing allows the shift staffing to fall to a minimum of 22 (not including the deputy chief). Six additional firefighters are expected to be hired in late 2006, which will increase the maximum staffing per shift to 30.

BSFCRD personnel, assigned to combat/operations, work a 24-hour on/48-hour off rotating work schedule involving three shifts. This results in an annual average of 56-hours per week. The following chart summarizes the assignment of combat/operations personnel by station and position per shift.

Figure 17: Combat/Operations Staffing Deployment (per shift)

Station	Apparatus	Type	Maximum Staffing	Minimum Staffing
Station #1	Shift Captain	Command	1	1
	B-223	Engine	3	2
	B-226	Engine	4	3
	B-500	Heavy Rescue	4	3
Station #2	B-227	Engine	4	3
	B-333	Ladder	4	3
Station #3	B-225	Engine	4	3
Station #4	B-228	Engine	4	3
Station #5	B-150	Mini-pumper	2	2
Total Staffing			30	23

Note: 1. Deputy Chiefs are not included in these figures.

Current Staffing Observations

The District provides a consistent, career staffing for all assigned apparatus. Engine and ladder trucks are staffed with a minimum of three personnel, with the exception of Engine B-223 and Mini-pumper B-150, which are staffed with two. At times, three person crews may be staffed with four personnel, when there are no absences due to leave time.

As indicated earlier, BSFCRD provides a non-transport advanced life support (ALS) service utilizing paramedic/firefighters that respond in tandem with Lee County EMS. County ALS units are assigned to Station 1 and 3. Some EMS systems, primarily those without fire suppression responsibilities, use workload-based staffing, since the number of responders necessary to deal with a medical emergency is relatively consistent. This permits variations in the number of available responders based on the likelihood of multiple, concurrent EMS incidents occurring at a specific time of day. In workload-based staffing, the response force tends to match the temporal variations of the workload.

BSFCRD uses risk-based staffing, in which shift staffing levels do not vary by time of day. This is normal and appropriate for a fire suppression force, since the number of firefighters needed tends to be related to the fire protection risks within the community, which do not vary. This is known as risk-based staffing. Though the likelihood of a fire may be higher at certain times of the day, the number of firefighters necessary to deal with a fire once it does occur does not change. Varying the workforce based on time of day can lead to responses being understaffed

for the fire risks in a community. This can result in unsafe response conditions. Since BSFCRD is not currently staffing transport units and is using its staff for both EMS response and fire suppression responsibility, the consistent risk-based staffing system is preferable. Temporal variation of workforce is not recommended at this time.

In addition to fire and EMS response, the fire district is responsible for providing emergency response (operations level) to confined space, trench rescue, high angle rescue, water rescue, and hazardous material incidents (technician level). BSFCRD participates with the regional (eight agencies) Type II Urban Search and Rescue (USAR) team with 13 members involved. Most of the resources for these services have been consolidated on the Heavy Rescue unit (BS500), a truck with assigned staffing by operations level rescue personnel. This unit is also available for dispatch to fire incidents as an assigned company.

BSFCRD does maintain some formal written mutual aid agreements with neighboring Lee and Collier County fire/rescue departments and does make verbal requests of other neighboring departments for additional resources. Collier County responds on automatic aid through Lee County's 9-1-1 computer aided dispatch (CAD) system. Because of the responsibility of emergency response to a variety of calls requiring specific types of equipment, cross staffing of apparatus does occur at times as shown on the following chart.

Figure 18: Apparatus Cross-Staffing

Station	Normal Unit	Minimum Staffing level	Unit Cross/staffed
Station #1	B-223	2	B452 (brush unit)
Station #2	B-227	3	B-600 (boat)
Station #3	B-225	3	B-451 (brush unit)

The following are response standards for Bonita Springs Fire and Rescue District:

- Structure Fire: Calls received reporting smoke or fire are responded to with a task force of two engines, a ladder/service truck, a heavy rescue (B-500), and a shift captain for a minimum staff total of 12 personnel. A second alarm assignment will respond an additional engine, and a deputy chief.
- Brush Fire: Calls received for a report of a brush fire are initially responded to by a single brush truck.

- EMS, Vehicle Accidents, and Low Risk Situations: Calls received reporting a medical emergency, vehicle accident, or low risk situations are responded to with a single engine company unless conditions warrant additional response. Incidents where medical treatment/transport is required will receive an EMS transport ambulance from Lee County.
- Hazardous Material Incidents: Calls received for a significant hazardous material incident respond with a task force of two engines, ladder/service truck, heavy rescue, a shift captain, and a deputy cheif.
- Special Operations: Calls for special operations such as mass causality, trench rescue, high angle rescue, building collapse, and confined space incidents respond a task force of two engines, ladder/service truck, heavy rescue, shift captain, a deputy chief, and potentially the Type II USAR Team.

Incident Staffing Performance

Tasks that must be performed at a fire can be broken down into two key components - life safety and fire flow. Life safety tasks are based on the number of building occupants, their location, status, and ability to take self-preservation action. Life safety related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

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

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

The Commission on Fire Accreditation International (CFAI) of the International Association of Fire Chiefs (IAFC) has sample critical tasking analysis for the number of personnel required on scene for various levels of risk. This information is shown in the following chart.

Figure 19: Critical Task Staffing Needs by Risk

Minimum Firefighting Personnel Needed Based On Level of Risk				
Critical Task[13]	**Max. Risk**	**High Risk**	**Mod. Risk**	**Low Risk**
Attack line	4	4	2	2
Search and rescue	4	2	2	
Ventilation	4	2	2	
Backup line/rapid intervention	4	3	2	2
Pump operator	1	1	1	1
Water supply	1	1	1	
Utilities support	1	1	1	
Command/safety	2	2	2	1#
Forcible entry	*			
Salvage	*			
Overhaul	1*			
Communication	1			
Chief's aide	1	1		
Operations section chief	1			
Logistics	1			
Planning	1*			
Staging	1*			
Rehabilitation	1			
Division/group supervisors	2*			
High-rise evacuation	10*			
Stairwell support	10*			
Total	**49**	**17**	**13**	**6**

 # Can often be handled by the first due officer.
** At maximum and high-risk fires, additional personnel may be needed.*

Figure 20: BSFCRD Current Standard of Response Coverage Summary

General Incident Type	Risk	Critical Tasking	Engines	Ladder/ Service	Comm. Staff	Special OPS	Response Staff	First Unit Arrival	Full Alarm Arrival
Low-rise Residential	Mod	12	2	1	1	1	13	6:00	9:00
High-rise Residential	High	12	2	1	1	1	13	6:00	9:00
Mod-risk Commercial	Mod-High	12	2	1	1	1	13	6:00	9:00
High Risk Commercial	High	12	2	1	1	1	13	6:00	9:00
Grass/Brush	Low	2	1				2	6:00	
Vehicle Fire	Low	3	1				3	6:00	
EMS	Low	2					2	8:00	
Motor Vehicle Accident	Low-Mod	3					3	6:00	
Hazardous Material	High	11	2	1	1	1	12	6:00	9:00

*Note: 1. Critical tasking deployment is based on **minimum** staffing.*
2. Based on informal performance standards for first alarm and full alarm assignment, NFPA 1710[14] standards were used.

[13] All tasks may be functional during the early moments of firefighting, but sometimes certain duties take place in sequence depending on the situation, thus reducing the total number of people needed.
[14] *NFPA 1710: Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* 2004.

In determining an effective standard of coverage and deployment strategy, a clear set of performance objectives should be developed based on the risk to the community and response area. Performance objectives should include time, risk, response, personnel and apparatus.

Critical tasks are those activities that must be conducted by firefighters during the initial stages of an emergency to control the situation, stop loss, perform necessary tasks, and establish a safe working environment. Critical tasking for emergency operations is the minimum number of personnel required to perform the tasks required to support the determined strategy and mitigate the incident. Major fires and or large scale incidents will require additional personnel and apparatus.

Staffing for most non-structure fire and service calls is typically averaging less than four personnel. Current procedures may provide sufficient personnel consistent with four-person company staffing as outlined by *NFPA 1710* at periods of full staffing, however during periods of minimum staffing, the four-person company can only be assembled by combining the crews from multiple units. This meets the critical tasking analysis for many low-risk incident types as established by BSFCRD, but does not necessarily meet the low-risk critical tasking examples provided in the CFAI example.

The critical tasking analysis provided by BSFCRD, which is illustrated by the standard of coverage summary, identifies the minimum staffing deployment of three persons for a vehicle fire and certain other low-risk incidents, while the CFAI model recommends five. The CFAI model may anticipate the use of a self-contained breathing apparatus (SCBA) due to the potential for an atmosphere considered “immediately dangerous to life and health” (IDLH). In such cases, OSHA regulations (CFR 1910.132 *two-in, two-out*) would require the presence of at least four persons in air packs. BSFCRD may wish to consider the use of more than one company in such incidents when at minimum staffing of three on the initial company.

The minimum staffing assignment for structure fires (typically representing moderate-risk occupancies) for BSFCRD is twelve personnel. In the CFAI critical tasking example, the recommended response is thirteen when no aerial ladder is in use. In most cases, the task of the rapid intervention team (which is required by OSHA to meet CFR 1910.132, *two-in, two-out*) is not included by BSFCRD in the initial critical tasking analysis. However, BSFCRD follows a written Rapid Intervention Crew (RIC) Protocol that uses personnel from B-500 as the RIC or

requires the deployment of additional resources, where necessary, to accommodate a designated RIC team. This would increase the assignment on a structure fire to a level comparable with, or even exceeding, the CFAI example.

The staffing assignment by BSFCRD for high-rise residential and high risk commercial structure fires is low in comparison to the CFAI example. In most cases, however, additional companies are probably provided through a second alarm or mutual aid.

Overall, any discrepancies between BCFCRD resource assignments levels shown in the CFAI example can be accommodated either by a change in standard response procedures or the addition of mutual aid companies where necessary. The department can send an additional unit on low-risk fire incidents when initial company staffing is down to three in order to assemble sufficient personnel to meet two-in two-out requirements. As an alternative, the department could reassign personnel from the heavy rescue (BS500) to cover a short-staffed engine in order to maintain four responders and meet two-in two-out requirements during periods of leave absences.

Current Capital Assets Evaluation

Current Facility Evaluation

The Bonita Springs Fire Control and Rescue District has several million dollars worth of capital assets in its apparatus and facilities. These assets are necessary to provide service, and must be maintained and replaced as needed. Maintenance and replacement plans should be created for facilities, apparatus, and other high value equipment. A funding mechanism should be established to ensure money is available to cover the cost of this effort.

The Bonita Springs Fire Control and Rescue District has five stations, the newest built in 2006 and the oldest built in 1984. The district is underway with a considerable capital investment in remodeling Station 1 and establishing a permanent Station 5 from its temporary location on South Bay Drive.

Aside from the above mentioned projects, the District does not maintain a formal capital facilities improvement plan. Through discussions, it is understood that impact fees will most likely be used to fund any new facilities. It appears that the District would benefit from additional mid-range planning for improvements. Renovations should be considered for Station 3, located on South Tamiami Trail that will help meet the needs of the District well into the future.

The overall facility operations include more than walls and ceilings. Staff accommodations, support space, and apparatus housing all have specific needs that prolong the useful life of the facility. Often, sufficient attention to these items can be directly associated with staff morale. The District has proven to be proactive in addressing many of these concerns. The heating, ventilation, and air conditioning systems are on a maintenance program that includes scheduled filter replacement. Fire sprinkler system, lawn maintenance, garage doors, station generators, trash collection, pest control, copy machines, and computers are also covered by maintenance and repair plans.

The following pages contain detailed evaluation of each fire station as observed at the time of the field research by ESCi's project team.

Station One
27490 Old 41 Road
Built in 1984, this 10,461 square foot facility consists of three and one half apparatus bays. The facility had served as the department's headquarters up until the time of the inspection. The administrative and living areas of the building are scheduled to be demolished in October 2006 and existing bays will be reconnected to the renovation, with an anticipated reopening in 2008.
Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The project team observed design drawing for the renovation and determined many of the design deficiencies will be corrected with the renovation.*
• **Construction:**	*The existing bays that will remain are of masonry construction and appear to be in good shape. The roof is a Twin T design with a rubber overlay that was recently replaced and shows no signs of water infiltration.*
• **Safety:**	*Building is protected by a wet sprinkler system that services the entire building. Local smoke detection is present in the building. Consideration should be given to install collision protection for the sprinkler riser. The facility is equipped with a back-up generator and an auto transfer switch that operates the entire facility. Combustible storage was noted under the stairs leading to the storage mezzanine. Access was blocked to the electrical disconnect for the air compressor.*
• **Environment:**	*Building is outfitted with an exhaust filtration system. Ward's No-Smoke devices are included on all apparatus. Exterior combustible and flammable liquids are stored above ground in a system that provides secondary containment. No other environmental concerns were noted.*
• **Code Compliance:**	*Building is not fully ADA compliant however that should be corrected with renovation.*
• **Staff Facilities:**	*Bay space, work space, tool room, and storage appear to be adequate for the portions of the building that are remaining. During renovations, one engine company will remain and operate out of the bay and utilize an existing residence in the rear for housing.*

Station Two
28055 Mango Drive
Built in 2005, this newly constructed suburban station, 7325 square foot facility consists of two apparatus bays. This modern facility illustrates several safety conscious features that set the point for future fire station designs. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*Aesthetically designed with a modern curb appeal, the station features adequate space for most facility operations. The design provides for separation from public and private areas that would allow for multi-use. Future growth of the facility would impact adjacent properties.*
• **Construction:**	*The building features Class IV masonry construction with steel trust and a solid seam metal roof. The construction components should provide sufficient longevity and adequate protection for storm events.*
• **Safety:**	*Building is protected by a wet sprinkler system that services the entire building. Local smoke detection is present in the building. Consideration should be given to install collision protection for the sprinkler riser. The facility is equipped with a back-up generator with an auto transfer switch that operates the entire facility. Well noted was the safe room designed in the middle of the facility. Secure pass badge system for access to the facility will provide security and controlled access.*
• **Environment:**	*Building is outfitted with an exhaust filtration system. Ward's No-Smoke devices are included on all apparatus. Exterior combustible liquids are stored above ground in a system that provides secondary containment. No other environmental concerns noted.*
• **Code Compliance:**	*Building is ADA compliant.*
• **Staff Facilities:**	*All spaces appear to provide sufficient room for standard operations with the exception of the physical training room. Additional square footage should be added to future designs.*
• **Efficiency:**	*Motion sensors were included on light switches to increase energy efficiency. Master cleaning concentrate center was present that eliminated additional solution containers present. Portable cooking grills were present with hard piped gas, that eliminated the need for spare or portable gas cylinders. Concerns that were noted in the kitchen were the fresh air return and exhaust ducts are side by side.*

Station Three
25001 South Tamiami Trail
Built in 1993, this contemporary style, 9295 square foot facility consists of two apparatus bays. This two story facility provides adequate bay space for equipment housed. Interior portions of the facility would benefit from undergoing renovations that would prolong the useful life of the facility.
Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The current square footage of the building is adequate. The interior flow appears fragmented and not well designed for public access. If renovated, focus should be made on entrance flow and staff spaces.*
• **Construction:**	*The building features masonry construction with a flat system roof. The facility blends nicely with the surrounding area and provides adequate parking for staff and visitors.*
• **Safety:**	*Building is protected by a wet sprinkler system that services the entire building. The system is not monitored for water flow nor are there heat or working smoke detectors present. The facility is equipped with a back-up generator with an auto transfer switch that operates the entire facility. The generator is fueled by an underground propane tank.*
• **Environment:**	*Building is outfitted with an exhaust filtration system. Ward's No-Smoke devices are included on all apparatus. Exterior combustible liquids are stored above ground in a system that provides secondary containment. It appears that the apparatus floor drains to the sewer system are without oil separators.*
• **Code Compliance:**	*Building is not ADA compliant. Public access to the second floor can only be accomplished by stairs. Combustible storage was observed in the electrical closet.*
• **Staff Facilities:**	*The bays appear to have adequate space for apparatus and staff movement. Service areas off to the side of the bay space appear cramped. Turnout gear storage room doubles as the physical fitness area. The sleeping dorm does not provide any separation for two gender staffing. Cardboard and trash bags were observed covering the windows for shade and night light blocking in the sleeping dorm. Considerations should be given to remodeling the kitchen with commercial appliances.*
• **Efficiency:**	*Renovation of the living area which includes the second floor, could provide an opportunity to implement additional efficiency measures, such as repairs to the bathroom ventilation fans, and installation of a direct vent system for the kitchen hood.*

Station Four
27701 Bonita Grand Drive
Built in 2006, this newly constructed, 29,960 square foot facility consists of three apparatus bays. This one story station opened prior to our visit and was constructed to become the department's headquarters station that housed all administrative offices. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*This facility appears to be well designed to meet the needs of the community for years to come. The front entrance is easily navigated for citizen flow.*
• **Construction:**	*The building features Class IV masonry construction with steel truss and a solid seam metal roof. The construction components should provide sufficient longevity and adequate protection for storm events.*
• **Safety:**	*Building is protected by a wet sprinkler system that services the entire building. Local smoke detection is present in the building. The facility is equipped with a back-up generator with an auto transfer switch that operates the entire facility. Secure pass badge system for access to the facility will provide security and controlled access.*
• **Environment:**	*Building is outfitted with an exhaust filtration system. Ward's No-Smoke devices are included on all apparatus. Exterior combustible liquids are stored above ground in a system that provides secondary containment. No other environmental concerns noted.*
• **Code Compliance:**	*Building is ADA compliant.*
• **Staff Facilities:**	*All spaces appear to provide sufficient room for standard operations.*
• **Efficiency:**	*Staff were moving into the facilities during the field inspection and an active punch list was being worked on for the contractor. No significant efficiency concerns were noted.*

Station Five
26890 South Bay Drive
Built in 2003, this temporary station, 656 square foot facility consists of one apparatus bays. This single story, modular station provides basic living quarters for service extensions within the fire district while procurement and development is pending on a permanent facility adjacently located.
Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The modular nature of this building limits its functional ability, however, staff appears to be very upbeat regarding the arrangements that it does provide.*
• **Construction:**	*Modular construction features are present with a metal roof. Facility would not provide any structural protection during a storm event. The building's appearance is neat, compact, and sensible for its intended purpose. Evidence of window leaks were present near the officers' desk.*
• **Safety:**	*Building is protected by a wet sprinkler system that services the entire building. Local smoke detection is present in the building.*
• **Environment:**	*The exterior storage building provides a safe location for combustible and flammable storage.*
• **Code Compliance:**	*Building is ADA compliant.*
• **Staff Facilities:**	*Temporary accommodations are provided for staff including a physical fitness area at the adjacent property.*
• **Efficiency:**	*No efficiency issues noted.*

The following table summarizes the overall condition of the current District stations.

Figure 21: Summary of Facility Conditions

Station	Year Built	Condition	General Appearance
# 1	1984	Good, staff in process of moving to new headquarters	Good
# 2	2005	Well maintained, minor concerns with mechanical exhaust system and fitness space	Excellent
# 3	1993	Maintained, needs updating, serious smoke detector concern was corrected promptly, housekeeping needed	Good
# 4	2006	New facility, well-suited for today's fire service	Excellent
# 5	2003	Modular, small concern with window leaks	Good

Current Resource Evaluation

The District maintains a fleet of response vehicles that range from new to moderately aged. Average age of primary response apparatus is 9.2 years. Average condition is considered good. The department will need to keep apparatus replacement as a significant priority in the long term to ensure continued reliability for emergency service use.

The following chart lists all primary heavy apparatus used by the District, excluding smaller commercial-style utility or staff vehicles. It includes the year of manufacture and roughly estimated replacement-funding requirements based on life expectancy.

Figure 22: BSFCRD Apparatus Replacement Funding

UNIT	YEAR	REPLACEMENT COST	ANNUAL FUND CONTRIBUTIONS	CURRENT CASH REQUIREMENTS
Engine 223	2001	$400,000	$26,667	$133,333
Engine 224	1988	400,000	26,667	400,000
Engine 225	1993	400,000	26,667	346,667
Engine 226	1995	400,000	26,667	293,333
Engine 227	2001	400,000	26,667	133,333
Engine 228	2004	400,000	26,667	53,333
Ladder 333	1989	900,000	45,000	765,000
Rescue 150	2003	150,000	15,000	45,000
Rescue 500	2004	400,000	26,667	53,333
Rescue 550	1998	150,00	15,000	120,000
Rescue 557	1995	50,000	NA	50,000
Brush 451	1992	145,000	9,667	135,333
Brush 452	1992	145,000	9,667	135,333
Boat 600	2000	50,000	5,000	30,000
TOTALS			***$286,000***	***$2,694,000***

This chart shows that, in order to meet apparatus replacement needs of current resources, $286,000 should be contributed to a reserve fund each year. Also, based on the age and replacement schedule of apparatus in use today, there should be $2,694,000 available in an apparatus replacement fund. This is based on a continuation of the current number and type of apparatus that the District maintains.

It should be noted that the chart represents funding levels needed for a capital replacement fund that is both adequate and up-to-date, assuring cash is available for purchase at the expected time of replacement. This is not meant to exclude other funding methods from consideration. For instance, during time periods when the market provides low rates, municipal lease-purchase programs can be financially efficient.

Each apparatus was given a basic review for condition and safety. The following paragraphs describe any notations made during this review.

Engine 223

2001 Pierce Contender ALS/ Engine

Seating Capacity: **Six**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Good**

Additional Comments or Observations: Compact design enhances maneuverability. Clean and well organized apparatus.

Engine 224

1988 Pierce Dash ALS/ Engine

Seating Capacity: **Four**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Poor**

Additional Comments or Observations: Loose equipment in the cab. SCBA locks needed.

Engine 225

1993 Pierce Dash ALS/ Engine

Seating Capacity: **Five**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Fair**

Additional Comments or Observations: Loose equipment in the cab. Gear stored in same compartment as fuel burning equipment and auxiliary fuel tanks. Turbo for diesel just replaced. Officer's view obstructed by MDC.

Engine 226

1995 Pierce Dash ALS/ Engine

Seating Capacity: **Five**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Fair**

Additional Comments or Observations: Interior cab space limited. MDC blocks view of officer.

Engine 227

2001 Pierce Quantum ALS/ Engine

Seating Capacity: **Four**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Good**

Additional Comments or Observations: SCBA locks need to be used. Very organized.

Engine 228

2004 Pierce Quantum ALS/ Engine

Seating Capacity: **Four**
Pump Capacity: **1250**
Tank Capacity: **750**
Condition: **Excellent**

Additional Comments or Observations: Well designed truck. Additional side warning should be considered. Cab equipment blocks officer's view.

Ladder 333

1989 Pierce Lance BLS/ Ladder

Seating Capacity: **Four**
Pump Capacity: **1250**
Tank Capacity: **500**
Condition: **Fair**

Additional Comments or Observations: This apparatus was not available for inspection during field visit. It is noted that this unit was scheduled for replacement in 2004 in accordance with the adopted Apparatus Replacement Plan.

Rescue 150

2003 Ford F-550 ALS/ Rescue

Seating Capacity: **Two**
Pump Capacity: **250**
Tank Capacity: **250**
Condition: **Excellent**

Additional Comments or Observations: Clean truck. Well equipped for primary function.

Rescue 500

2004 Pierce Quantum ALS/ Rescue

Seating Capacity: **Six**
Pump Capacity: **0**
Tank Capacity: **0**
Condition: **Excellent**

Additional Comments or Observations: Clean and well organized. Size prohibits access to some areas. Unit has been in service for six months.

Rescue 550

1998 Chevrolet Step Van Haz-Mat

Seating Capacity: **Two**
Pump Capacity: **0**
Tank Capacity: **0**
Condition: **Good**

Additional Comments or Observations: Equipment area is organized well for the primary function of this apparatus.

Rescue 557

1995 Ford Bronco Utility Truck

Seating Capacity: **Four**
Pump Capacity: **0**
Tank Capacity: **0**
Condition: **Fair**

Additional Comments or Observations: Minor surface rust noted, otherwise appears well maintained. Staff vehicles should be rotated to service as vehicle for boat prior to retirement.

Brush 451

1992 International Brush Master

Seating Capacity: **Two**
Pump Capacity: **500**
Tank Capacity: **750**
Condition: **Fair**

Additional Comments or Observations: Minor throttle repair needed. Hose bed design presents concerns regarding open space to pump motor below. Unit would benefit from injection foam system.

Brush 452

1992 International Brush Master

Seating Capacity: **Two**
Pump Capacity: **500**
Tank Capacity: **750**
Condition: **Fair**

Additional Comments or Observations: Hose bed design presents concerns regarding open space to pump motor below. Unit would benefit from injection foam system.

Boat 600

2000 Apex Rib Boat

Seating Capacity: **Three**
Pump Capacity: **0**
Tank Capacity: **0**
Condition: **Good**

Additional Comments or Observations: Boat appears small for the predicted coastal use. Consideration should be given for a larger boat.

Capital Resource and Support Equipment Preservation

The ability to respond to service calls directly impacts the organization's customer service. Protecting capital resources goes beyond simply budgeting for preventive maintenance or a contract for third party service. It requires that department staff be thoroughly familiar with the requirements of the specialized equipment in use in the fire service.

Bonita Springs Fire Control and Rescue District has identified several operational programs to ensure the service life of its fleet of emergency response vehicles and support equipment. The District follows a vehicle replacement schedule that places all apparatus on a fifteen year replacement cycle from primary service. The plan also includes a seven year replacement cycle for emergency staff vehicles and a nine year replacement for non-emergency staff vehicles.

This replacement schedule should keep the District's fleet well up-to-date. The blanket approach to fifteen year replacement cycle for apparatus could be viewed very conservative, since most major manufacturer's market custom apparatus to last longer than fifteen years. However, this replacement cycle would allow for several serviceable years in a reserve status.

Consideration should be given to rotation of apparatus that would allow for mileage and hours to accumulate equally.

The fire department ensures that response readiness checks are conducted daily. Chassis and pump preventive maintenance is conducted semi-annually. The in-house repair and maintenance work, such light bulb replacement, is handled by on-duty personnel. This same officer, who is Emergency Vehicle Technician trained, is on call for apparatus failures. Third party vendors that utilize certified Emergency Vehicle Technicians perform most repairs and scheduled maintenance, as well as all heavy work.

Parts considered by the fire department to be critical for apparatus operation are kept on hand, such as alternators, water pumps, tires, and belts. Other major components are available from stock vendors by next day service. Pump test, hose test, ground ladder test, and aerial device testing are all completed annually in-house or through outside vendors. Apparatus air conditioning units are serviced bi-annually.

Current Deployment Strategies and System Performance

System Performance Objectives

According to tests conducted by the National Institute of Standards and Technology (NIST), flashover is likely to occur as early as five minutes after the appearance of flame in typically furnished and ventilated buildings.[15] Flashover is the point at which the surface temperature of combustibles is rapidly increasing toward their ignition point. Sufficient hot vapors and gasses build up and ignite, bringing other combustibles simultaneously to ignition. At this point, the intense pressure from the production of hot gasses and smoke push the fire quickly beyond the room of origin and begin involving other rooms or the structural members of the building itself. Smoke quickly extends to distant parts of the building.

Since flashover has such a dramatic affect on the outcome of a fire event, the goal of any fire agency is to be able to apply water to a fire before flashover occurs, containing the fire to the room of origin.

The following table uses data from the National Fire Incident Reporting System (NFIRS) and examines fire extension in residential fires over a five year period. It clearly demonstrates the dramatic increase in overall damage, loss of life, and civilian injuries as a fire spreads. In fact, a fire that spreads beyond the room of origin, on average, will produce almost seven times the dollar loss and is over eight times as likely to result in a civilian death, even if contained to the same floor of the building.

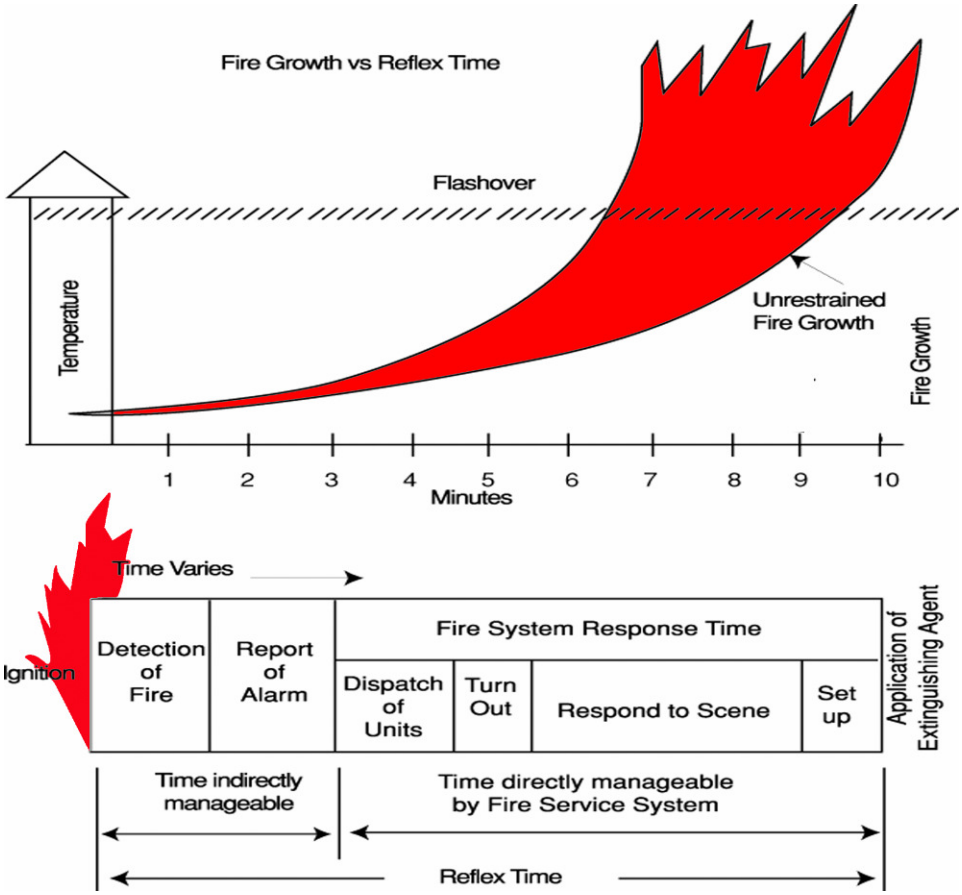
Figure 23: Correlations Between Fire Extension and Event Outcomes

Fire Extension in Residential Structure Fires 1994 - 1998			
Extension	*Rates per 1,000 Fires*		
	Civilian Deaths	*Civilian Injuries*	*Dollar Loss Per Fire*
Confined to room of origin	2.32	35.19	$3,385
Beyond room of origin; confined to floor of origin	19.68	96.86	$22,720
Beyond floor of origin	26.54	63.48	$31,912

However, a number of things must happen quickly in order to make it possible to achieve fire attack prior to flashover. The chart below illustrates this process.

[15] Source: National Fire Protection Association; National Institute of Standards and Technology.

Figure 24: Fire Growth vs. Reflex Time



First, the fire must be detected. This can happen immediately if someone is in the space where the fire occurs, or it can be delayed significantly if no one is around. Automatic fire alarm systems can take the place of human eyes in unoccupied areas.

Next, the fire must be reported to the dispatch center. People reporting emergencies must be well trained so that needed information can be passed from the caller to the dispatcher quickly. Then, the dispatcher must select the correct units to send to the fire, notify them, and provide needed information. This is referred to as call processing time and there are a number of technology opportunities that can speed this step up.

Next, firefighters must respond from their respective fire station, first by donning firefighting equipment, assemble on the response vehicle, and begin their response. The time (turnout time) required for this step is minimized through good training and proper station design.

Next, and potentially the longest phase, is the response to the scene (travel time). This period is most influenced by the distance between the fire station and the location of the emergency, but can also be influenced by the quality and connectivity of streets, traffic, driver training, and other conditions.

Finally, once firefighters have arrived they must position their apparatus, lay out hose lines, don additional equipment, and perform various other tasks before they can make entry into the building and begin applying water.

As can be seen, a fire department is seriously challenged to achieve water application prior to flashover. However, it is reasonable to use this as a response and station location planning criteria.

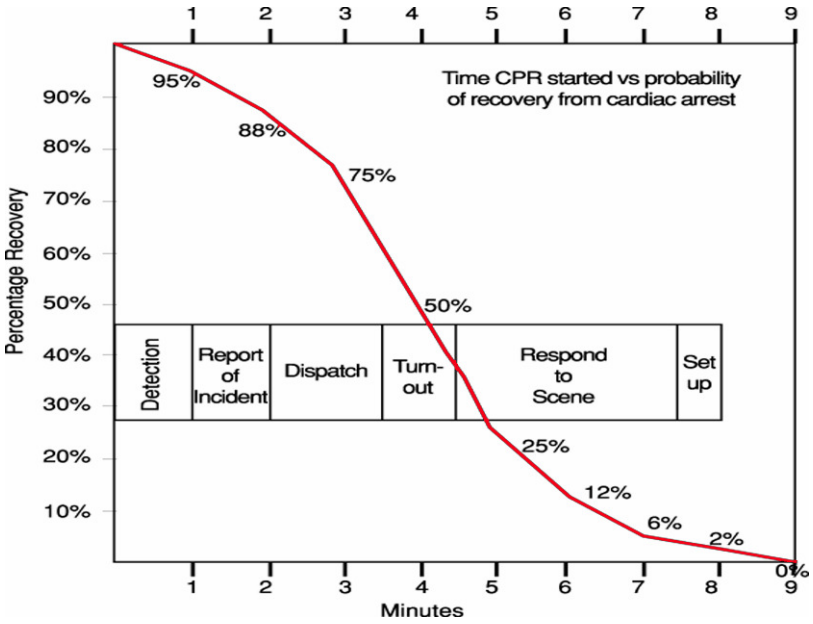
Cardiac arrest is the most significant life threatening medical event. A victim of cardiac arrest has mere minutes in which to receive definitive lifesaving care if there is to be any hope for resuscitation.

Recently, the American Heart Association (AHA) issued a new set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include new goals for the application of cardiac defibrillation to cardiac arrest victims.

Heart attack survival chances fall by seven to ten percent for every minute between collapse and defibrillation. Consequently, the AHA now recommends cardiac defibrillation within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be visually shown, as in the following figure.

Figure 25: Cardiac Arrest Event Sequence



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

Numerous peer-reviewed scientific studies have validated the linkage between lower response times and more desirable medical outcomes and, ultimately, patient survival. This is of the greatest importance in the case of critical life-threatening medical trauma conditions where the rapid provision of experienced medical care is likely to have a beneficial impact on improving patient outcomes. These conditions also include sudden cardiac arrest, respiratory arrest, obstructed airway, and uncontrollable bleeding.

J. P. Pell published, *"The Effect of Reducing Ambulance Response Times on Deaths From Out Of Hospital Cardiac Arrest: Cohort Study"* which reviewed 10,554 cardiac arrest patients. In Pell's study, it was clearly demonstrated that reducing ambulance response times from 15 minutes at 90th percentile to five minutes at 90th percentile was responsible for doubling the rate of patient survival to hospital discharge. K. B. Kern, in *"New Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care"*, published "…an out of hospital goal of early defibrillation within five minutes of a telephone call is now recommended."

Well-published and researched EMS physician Mickey Eisenberg published a study entitled *"Predicting Survival from Out Of Hospital Cardiac Arrest: A Graphic Model?"* in which he reviewed 1,667 cardiac arrest patients. Utilizing multiple linear regression analysis, his study became a foundation for community-based EMS planning and how longer arrival times affect community survival. His conclusion was simple: without timely intervention of CPR, defibrillation and advanced cardiac life support, the decline in survival is 5.5 percent per minute. B. D. Jermyn, in *"Response Interval Comparison Between Urban Fire Rescue Departments and Ambulance Services"*, linked the impact on response to survival as decreasing between 7-10 percent per minute without defibrillation.

It is clear that the longer it takes for properly trained and equipped emergency responders to arrive at a fire or medical call, the more negative the impact on successful intervention. This is why it is critical to establish response time performance objectives from which resource deployment can be planned.

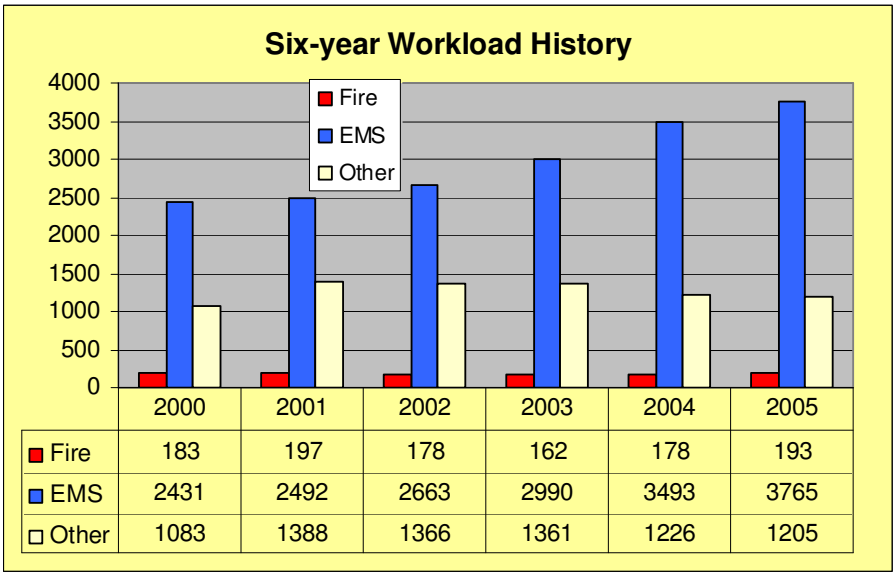
NFPA 1710 provides a benchmark for career fire departments of first unit arrival in five minutes or less, 90 percent of the time for fire suppression incidents with arrival of the full first alarm in eight minutes. The benchmark set in *NFPA 1710* for emergency medical service is arrival of an advanced life support unit in nine minutes, while the American Heart Association recommends arrival of initial EMS in six minutes. Though these standards are not mandatory, they provide targets against which to benchmark response time performance. Another common response time objective for more rural and suburban departments providing fire and emergency medical response is to arrive within six minutes or less to 90 percent of the calls within the jurisdiction.

The District has informally established a response time objectives of six minutes or less to 90 percent of all incidents, inclusive of turnout time. This initial response time performance figure is considered reasonable and generally supported by the available data as presented above. This performance objective will be used throughout this report. In the absence of a performance objective for full effective firefighting force, the *NFPA 1710* objective of eight minutes will be used.

Demand Analysis

The District has experienced a stable number of fire responses, while other non-medical responses have decreased. Emergency medical responses, however, have increased consistently and with larger rates of change recorded annually. The following chart shows how response volume has changed over the last six years.[16]

Figure 26: Workload Historical Data



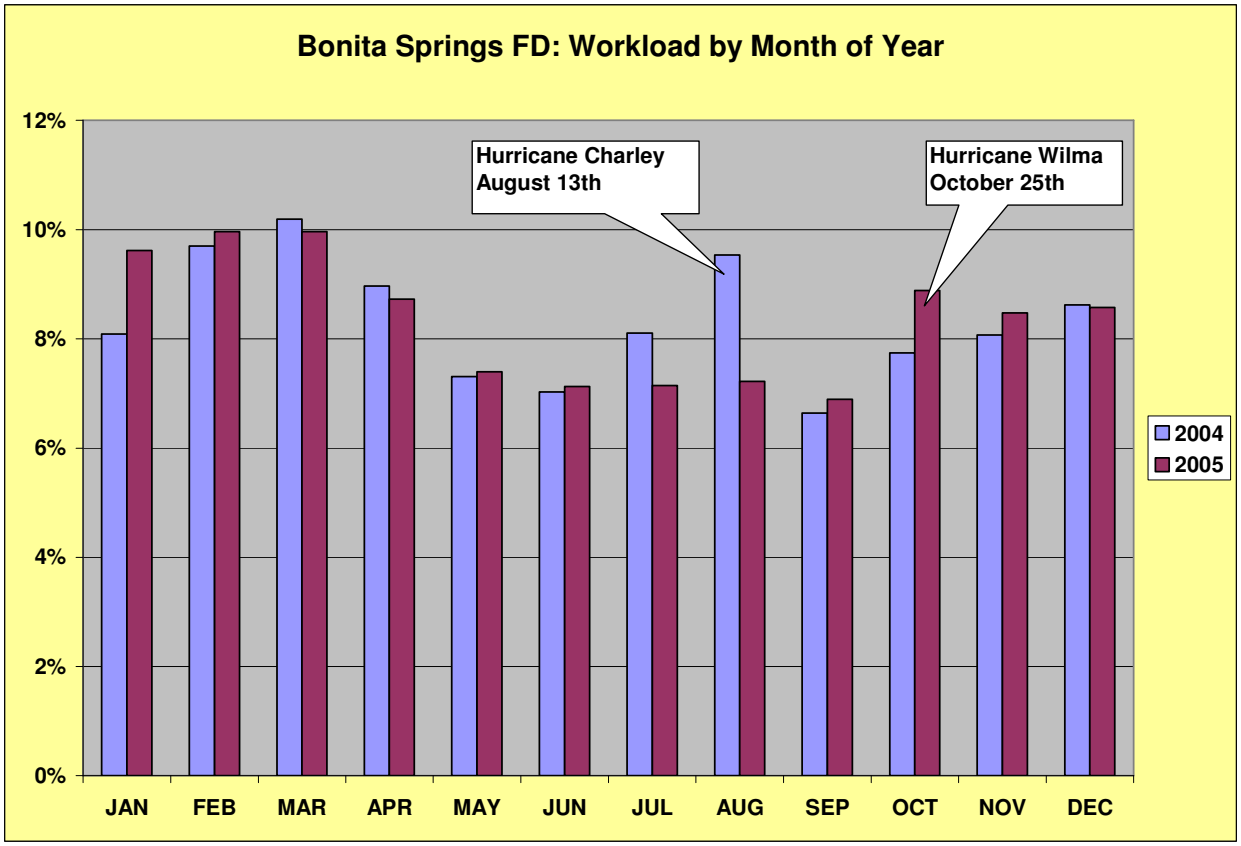
	2000	2001	2002	2003	2004	2005
Fire	183	197	178	162	178	193
EMS	2431	2492	2663	2990	3493	3765
Other	1083	1388	1366	1361	1226	1205

The bulk of BSFCRD's workload is handling requests for emergency medical aid. This is not unusual for departments who participate in either first responder or transporting capabilities. In analysis to follow, ESCi considered structure fires, emergency medical incidents, and all other fire and service calls separately in order to permit closer analysis of trends affecting a particular type of response.

A review of incidents by time of occurrence also reveals when the greatest response demand is occurring. The following charts show how activity and demand changes for BSFCRD based on various measures of time. ESCi began by breaking down yearly workload into monthly increments.

[16] The chart includes mutual aid responses provided to areas outside the limits of the District.

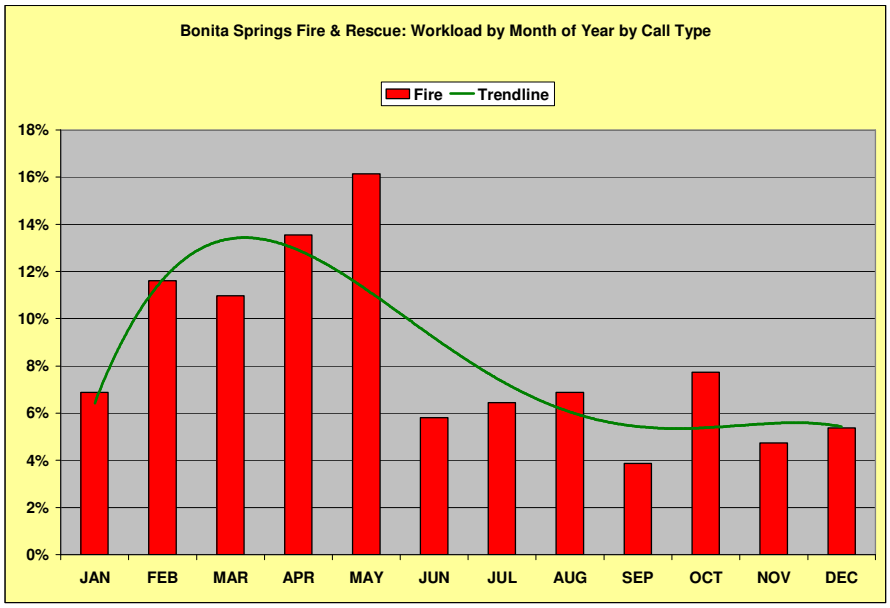
Figure 27: Monthly Workload by Year



Monthly workload appears to relatively constant over the last two years with the notable exception of August 2004 when Hurricane Charley struck the west coast of Florida. Hurricane events and other disasters strain emergency services - at times beyond capacity. It is important to recognize such anomalous events within the context of the following analysis of monthly workload by call types.

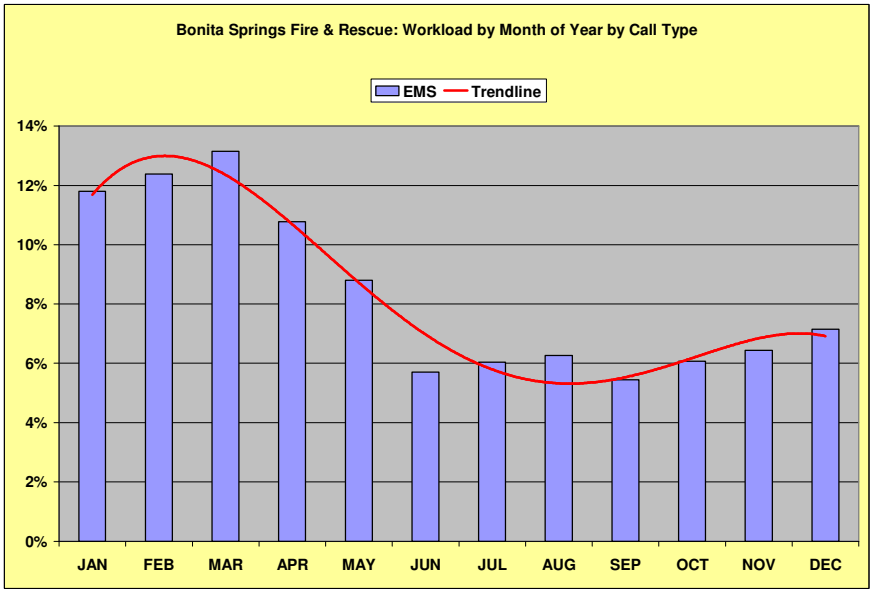
The following chart illustrates the frequency of fire related incidents over the months of year for the past two years.

Figure 28: Fire Workload by Month of Year



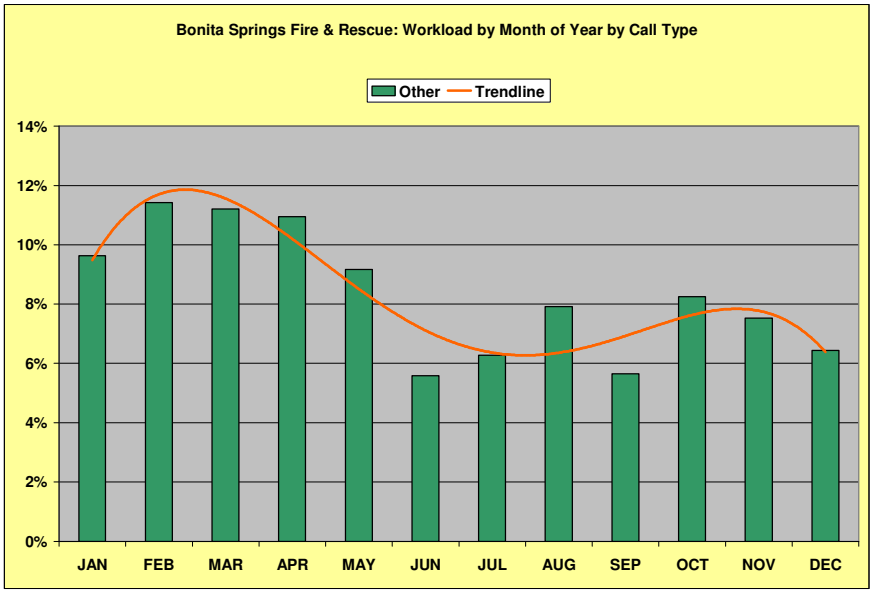
Fire calls are most prevalent in May, but exhibit an increased frequency in the winter and early spring months. This pattern is in contrast to EMS calls, which have an increase early in the year and decline into the late spring. This correlates with the typical seasonal migration of winter homesteaders and vacationers.

Figure 29: EMS Workload by Month of Year



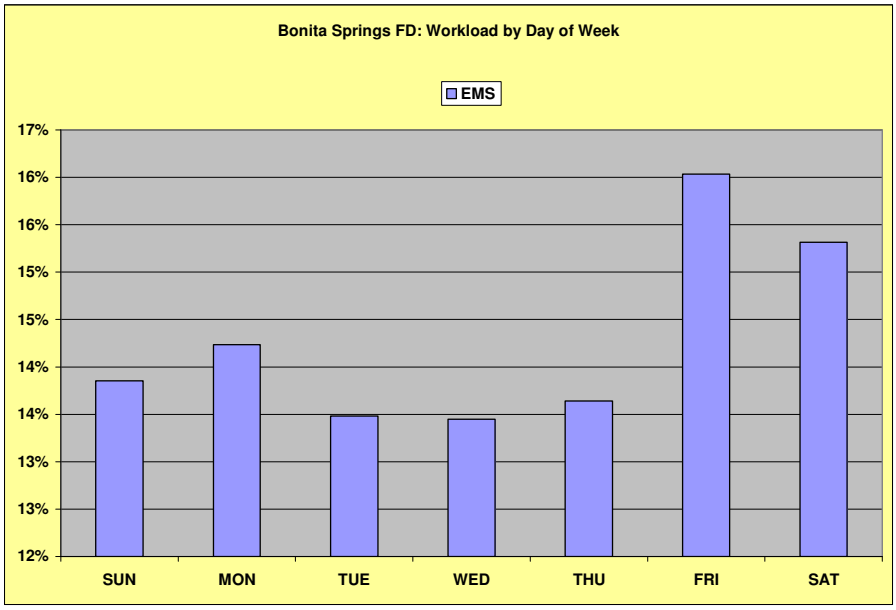
Calls other than fire or EMS have yet a different pattern; increasing in winter, decreasing briefly in the peak summer, only to rise again and remain stable through the fall. The peak in August could be in relation to the 2004 hurricane and doesn't reflect into other call-type graphs due to a lack of an actual fire or to evacuation efforts or patients requiring medical aid. This graph is illustrated in the following figure.

Figure 30: Calls Other than Fire & EMS Workload by Month of Year



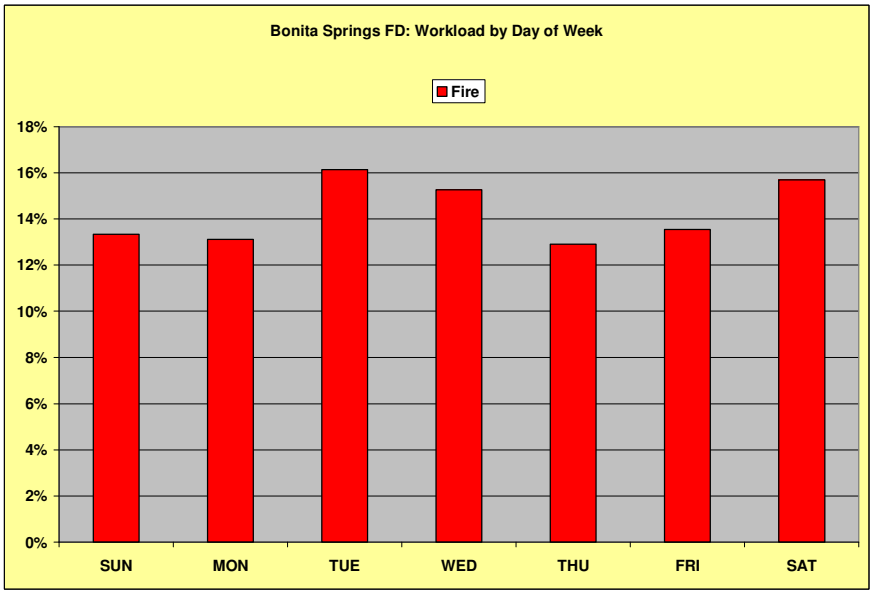
In further analysis, workload is examined by day of the week. Because the majority of calls are categorized as EMS, it is important to analyze call types separately to evaluate any unique patterns that exist. The following depicts the department's workload by day of week for EMS calls.

Figure 31: EMS Workload by Day of Week



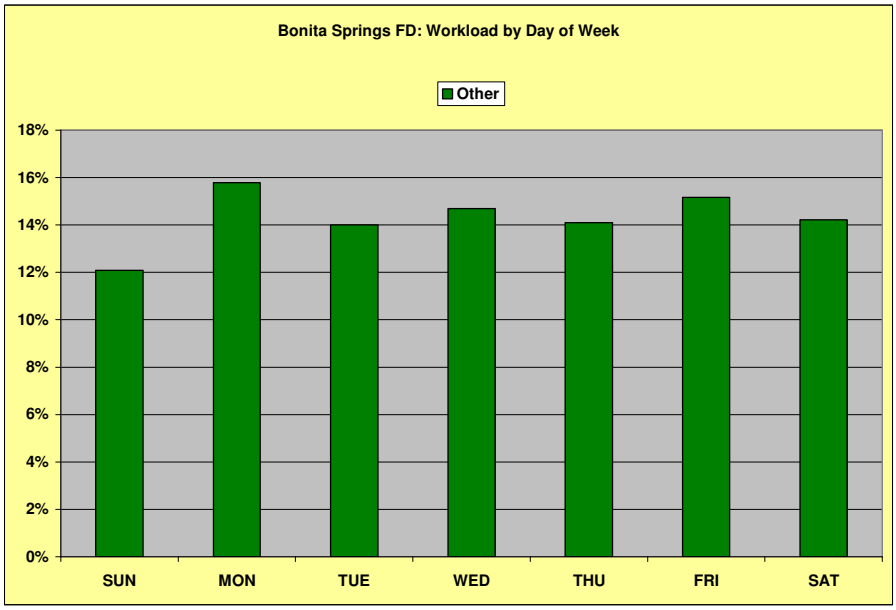
It can be seen that EMS calls exhibit a relatively constant workload throughout the week, increasing more dramatically on Fridays and Saturdays. Conversely, incidents of actual fires increase mildly during the midweek and again on Saturdays. Fire incidents overall are more stable than EMS requests on a day to day basis. The following figure details fire incidents by the day of the week.

Figure 32: Fire Call Workload by Day of Week



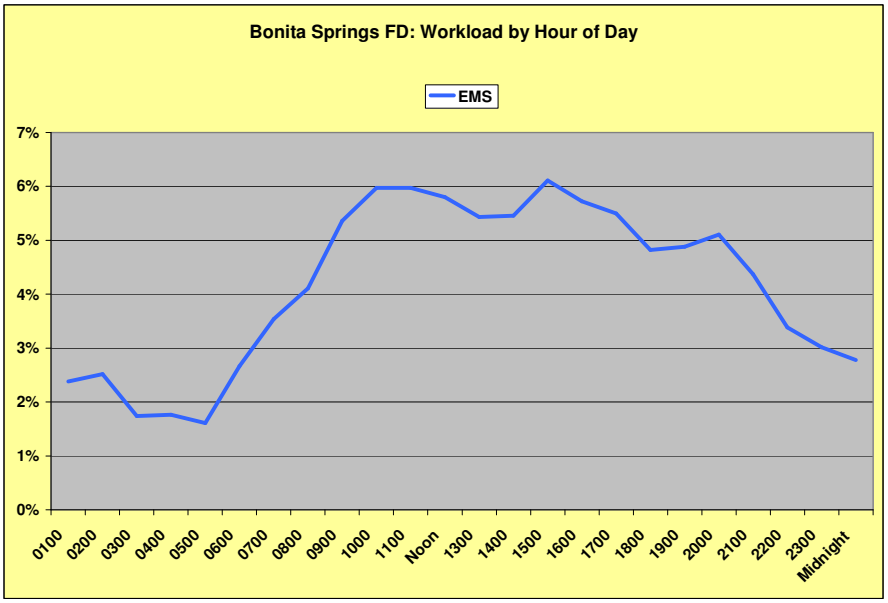
Requests for fire department services not categorized as fire or EMS follow a pattern throughout the week in which activity increases early in the week and remains stable as the week progresses. The following figure illustrates the workload for calls other than fire or EMS by day of the week.

Figure 33: Calls Other than Fire or EMS Workload by Day of Week



The final analysis of historical workload concludes with examination of call types by hour of day. The hours of peak activity can strain an under-equipped or under-staffed department. Understanding when peak activity occurs begins the process of developing deployment strategies and needs assessment. ESCi will examine each call type so that EMS workload does not overshadow unique patterns of other call types. As such, ESCi begins with EMS calls in the following figure, as this type of call is most frequent.

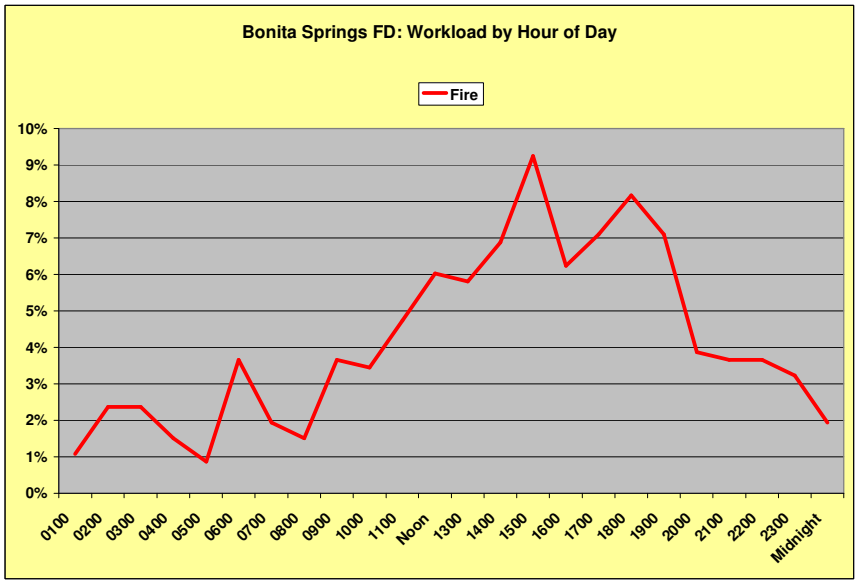
Figure 34: EMS Workload by Hour of Day



Activity for EMS calls begins to climb by 6:00 AM reaching peak by 10:00 AM, it begins to decrease at 4:00 PM. This pattern follows the typical active hours of most people's daily lives.

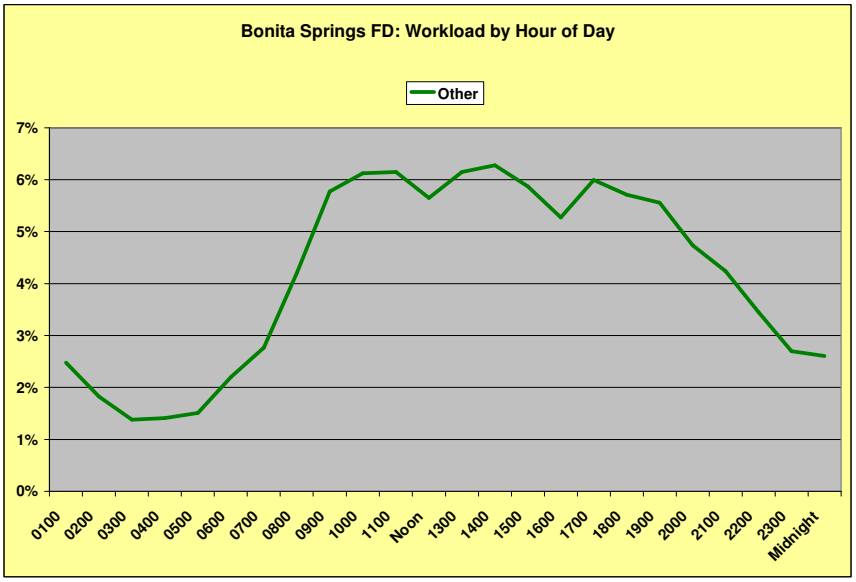
Fire incidents demonstrate a different pattern in relation to the hour of day. Beginning earlier in the day at 5:00 AM, fire incidents steadily rise during the day, but not as suddenly as EMS calls do. Fire calls peak in the afternoon and gradually decrease in frequency until about 9:00 PM.

Figure 35: Fire Calls Workload by Hour of Day



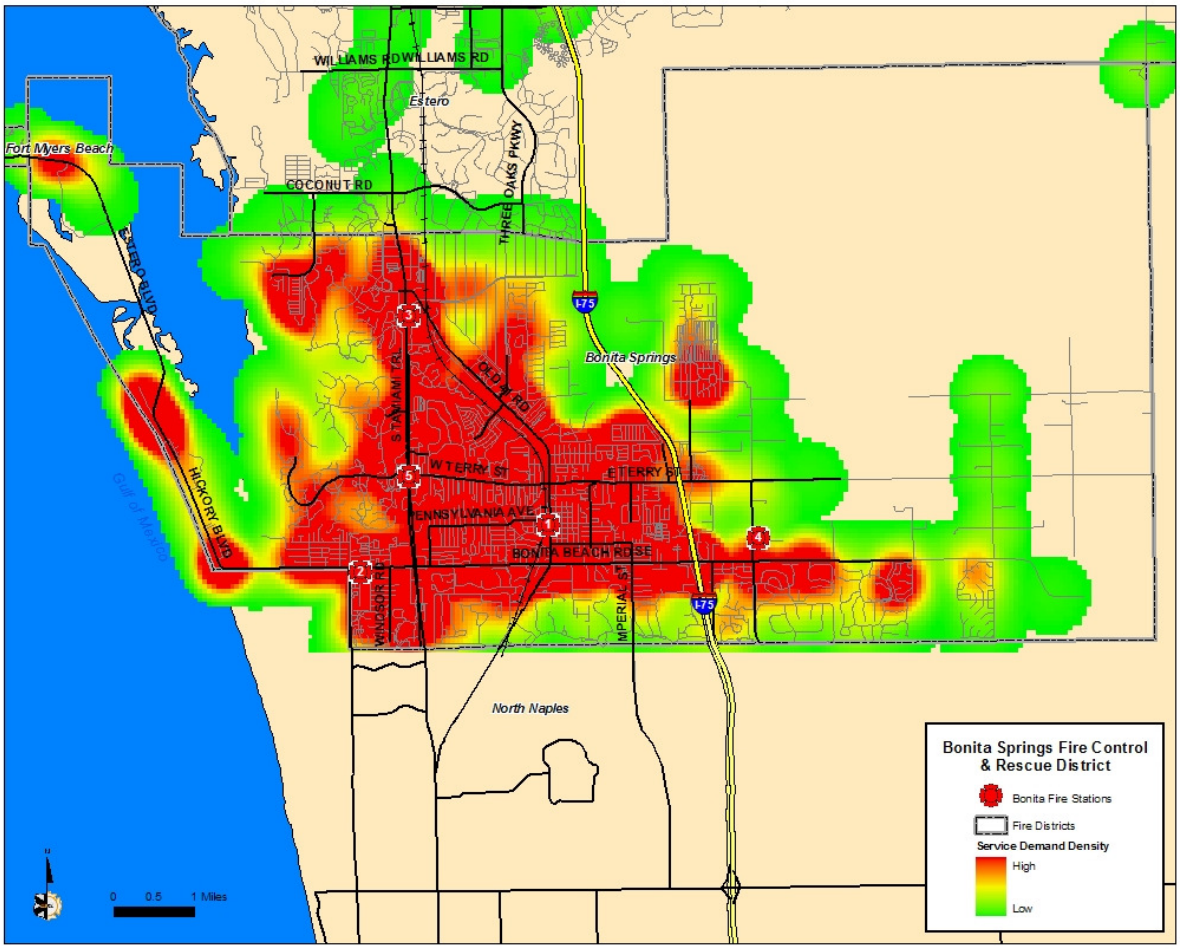
Calls other than actual fire and EMS requests follow a similar hourly pattern to the previous graphs in that, activity begins to increase in the morning at 5:00 AM, rises quickly to peak by 11:00 AM, remaining relatively stable until a gradual decrease begins at 7:00 PM.

Figure 36: Calls Other than Fire & EMS Workload by Hour of Day



In addition to the temporal analysis of the current service demand, it is useful to examine geographic distribution of service demand. Later in this study, this will allow for assessing the location of stations in comparison to the actual service demand within the area. The following maps indicate the distribution of emergency incidents responded to by the department over the last two and a half years.

Figure 37: Service Demand - BSFCRD Incident Density



Given the seasonal population influx, variations in service demand can be expected in areas in which vacationers and second homesteaders may congregate such as the beach front. The following maps illustrate the service demand during peak and off-peak months.

Figure 38: Peak Service Demand

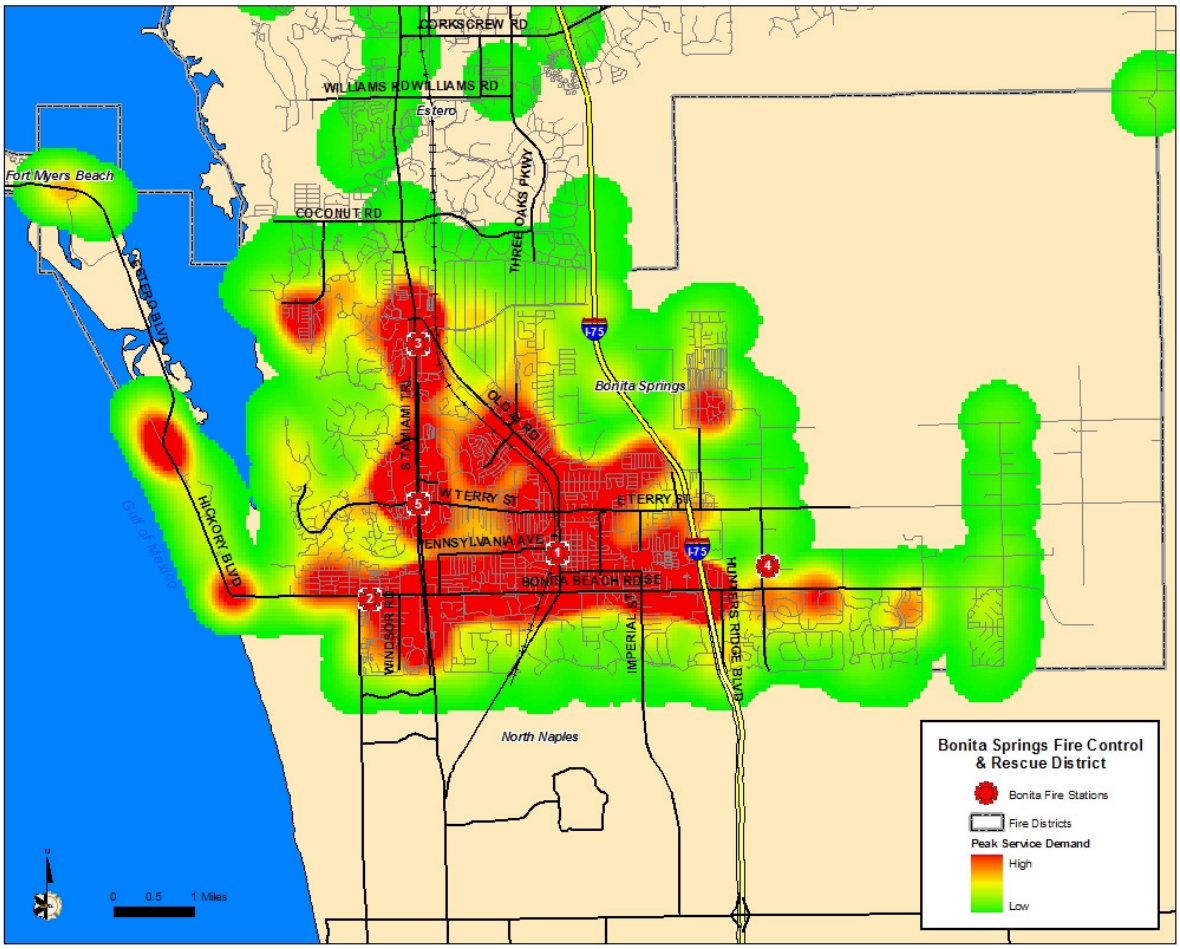
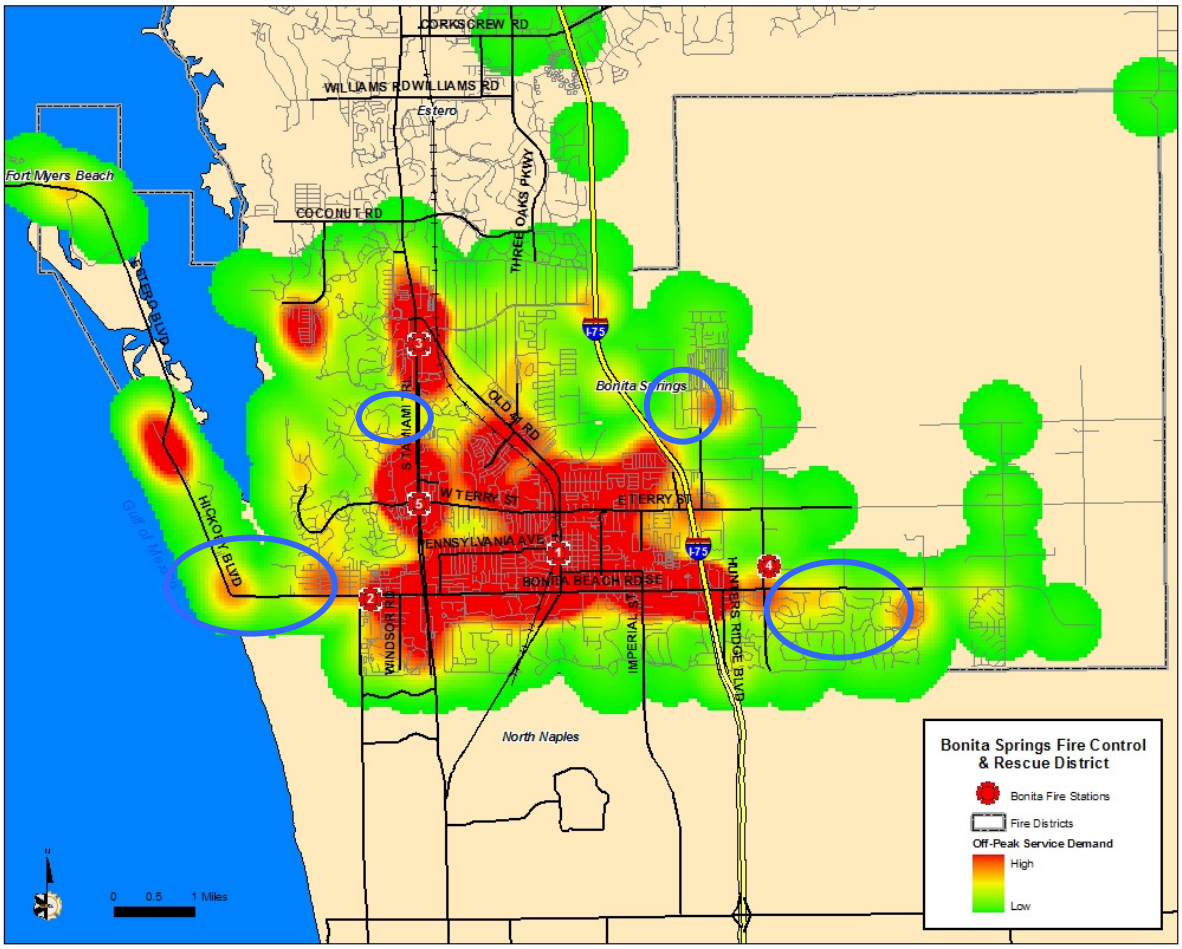


Figure 39: Off-peak Service Demand

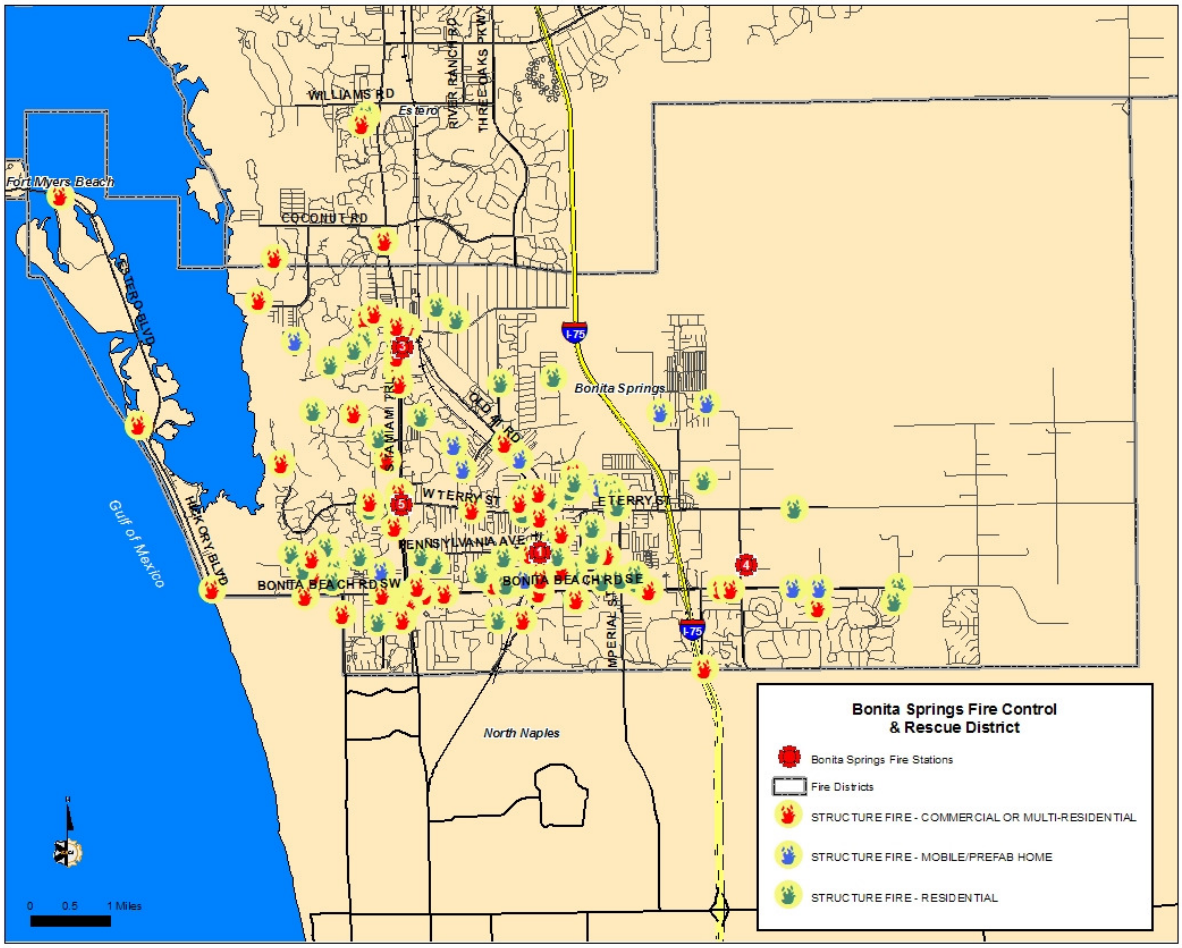


Variation in service demand from peak to off-peak can be seen in the coastal region, between Stations 3 and 5, and as well as southeast of Station 4. These are illustrated in the previous map by a blue circle. Other areas that ease in demand include an area west of Station 2 and Northeast of Station 4.

While the above map reflects all calls for service for the agency, it can be influenced by the prevalence of medical requests. It can be seen that most of the areas with highest service demand are located in areas of high residential population density and near the District's fire stations.

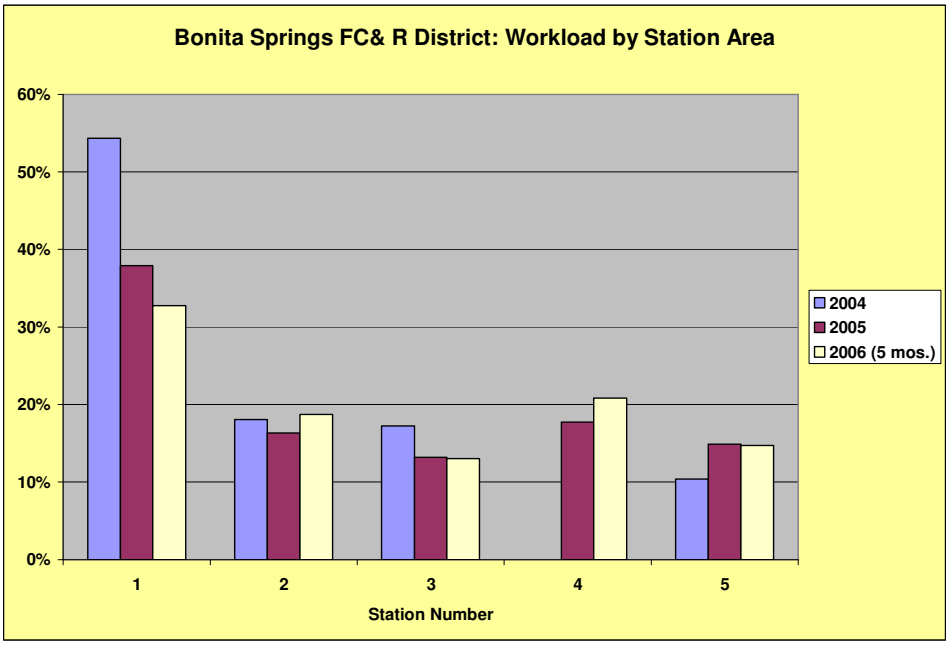
The following map illustrates the location of actual structure fires that were handled by Bonita Springs Fire Department over the same time period. It illustrates that the majority of fire incidents occur near the populated areas and within the response capability of the fire stations.

Figure 40: Service Demand - BSFCRD Fire Call Density



In analyzing workload distribution, the following chart indicates workload share for each fire station. It can be seen that Station 1 is the busiest station in the district. The workload for station one has been decreasing however, due to the addition of Stations 4 & 5.

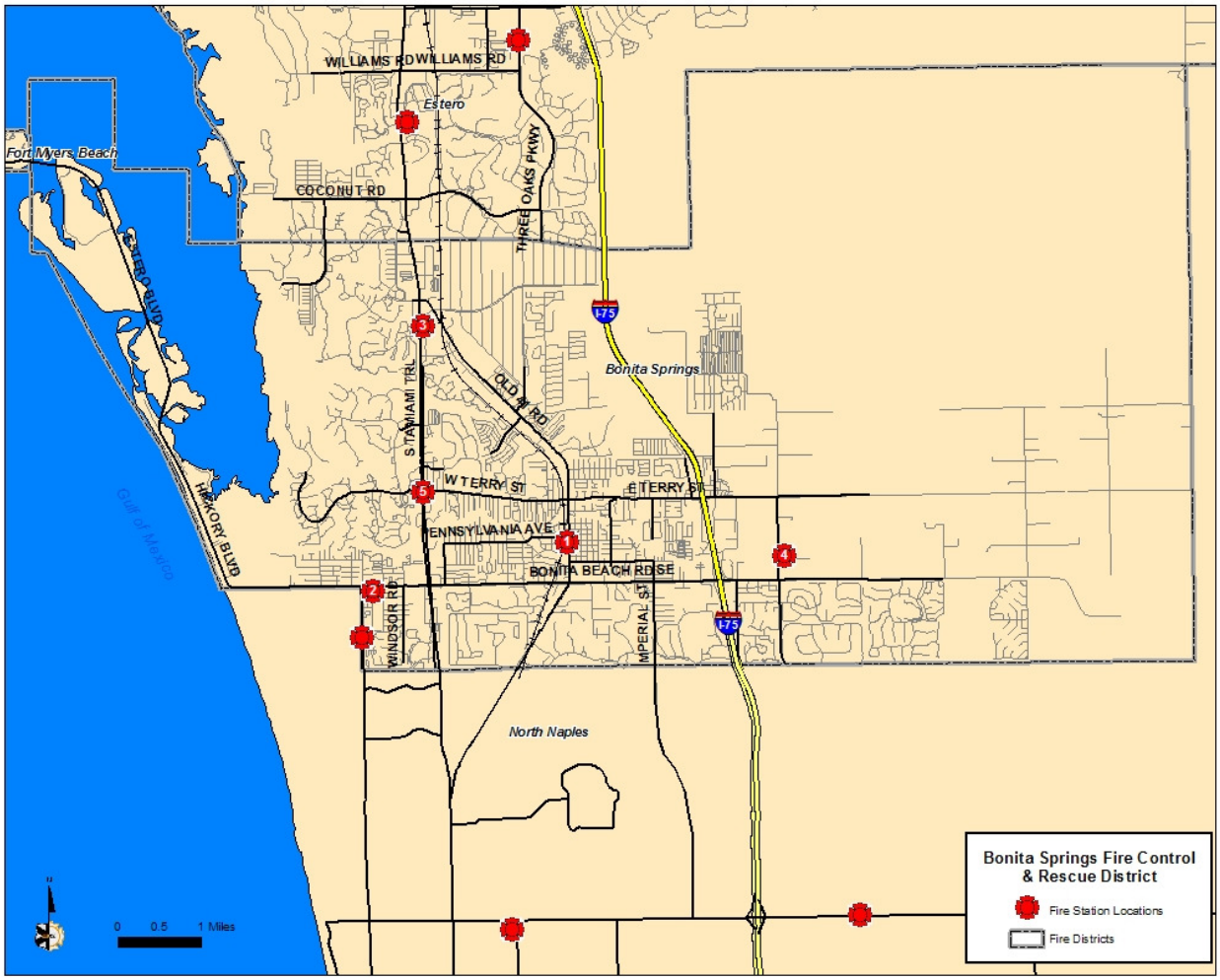
Figure 41: Workload by Station Area



Distribution Analysis

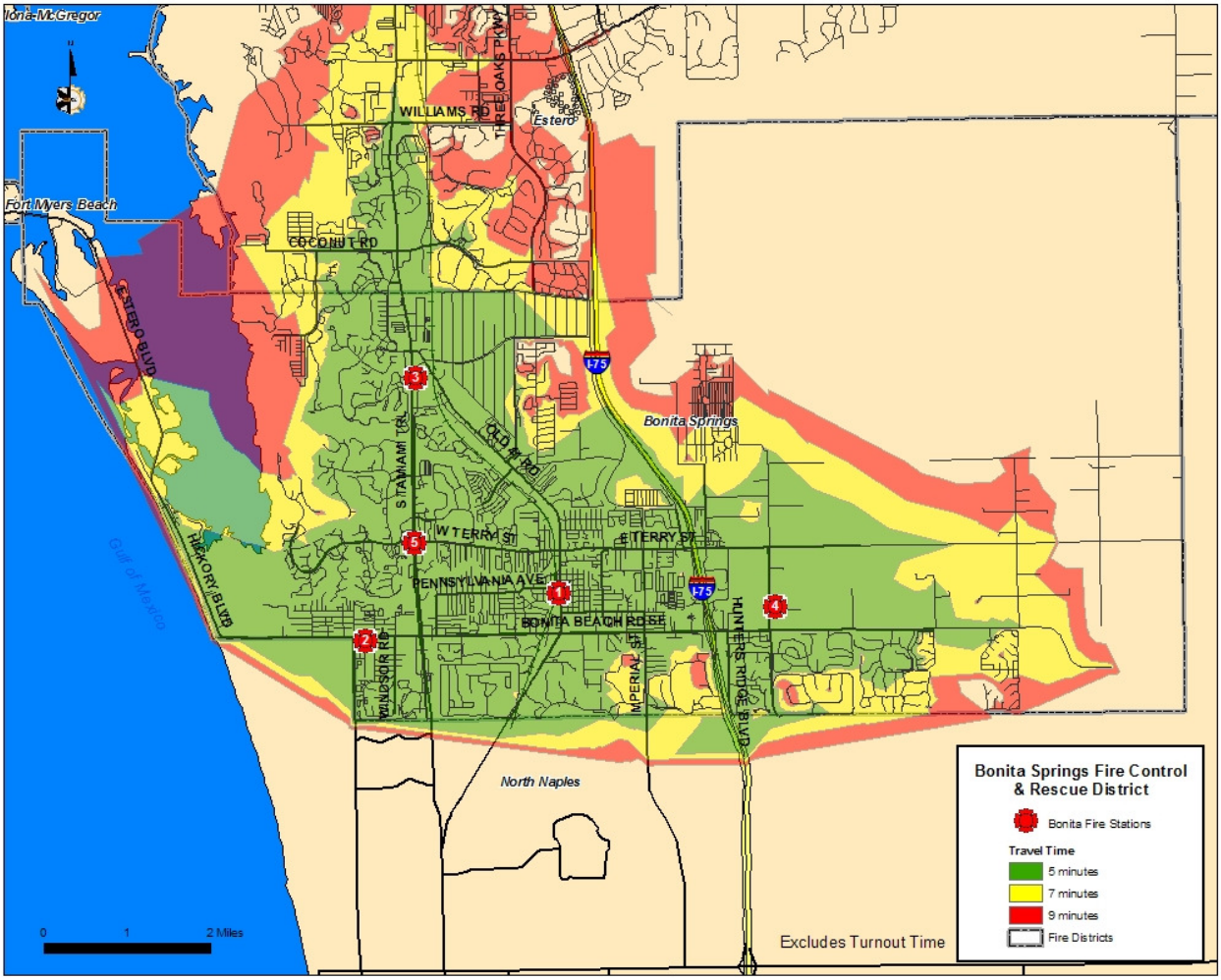
Bonita Springs Fire Department operates out of five facilities. The following map depicts these locations. District stations are numbered, neighboring stations are outside of the District, and included in the map for reference purposes. Station 5 is planned for a location near the intersection of S. Tamiami Trail and W. Terry Street as shown. Currently, Station 5 operates out of a nearby temporary location.

Figure 42: Bonita Springs Fire Station Deployment



In order to visualize response time capabilities, the following map demonstrates those areas within a six-minute response time of these stations. The response time is modeled using a one-minute turnout time and five minutes of travel time on the actual roadway network. Areas shown with a green overlay are within the six-minute response profile of a district fire station. The yellow area indicates modeled response capability between six and eight minutes, while the red overlays highlight areas of response capability from eight to ten minutes.

Figure 43: Current Response Time Capability of Fire Stations

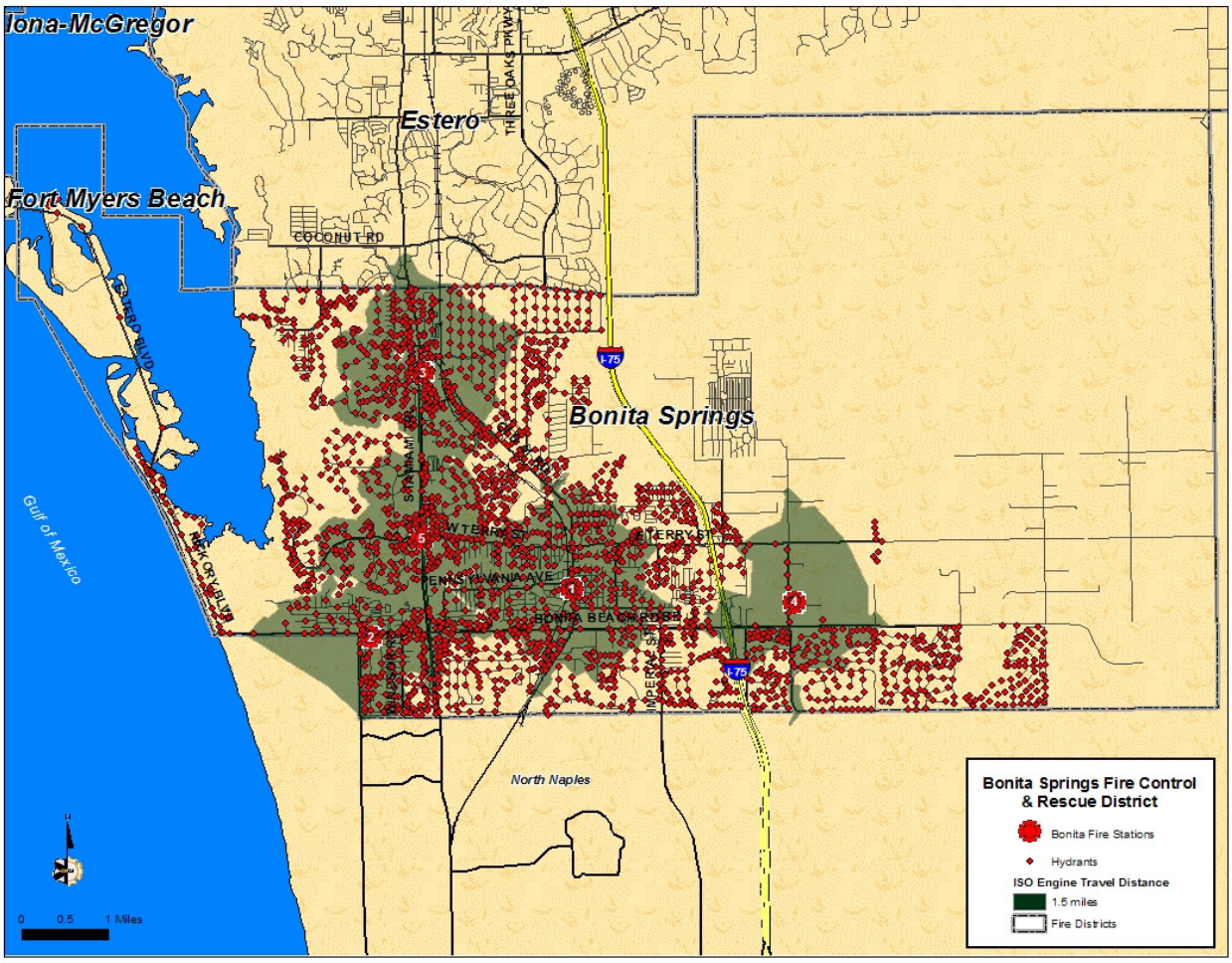


BSFCRD has used a response time performance objective of six minutes or less to 90 percent of all incidents for the first arriving apparatus. A detailed service demand analysis indicated that the current station deployment strategy is capable of reaching approximately 88 percent of the District's emergency incidents within a six-minute modeled response time. However, actual system performance will be analyzed in a later section of this report.

BSFCRD maintains a fleet of fire vehicles including five fire pumpers, a mini-pumper, a heavy rescue vehicle, one aerial truck, and two wildland vehicles. There are also several smaller utility, specialty or staff vehicles, as well as reserve apparatus. In reviewing the apparatus fleet in comparison to target levels established by the Insurance Services Office (ISO) for optimum rating, BSFCRD likely operates sufficient pumpers as required at this time. The last ISO survey

provided was dated October, 1996 and provided high marks for the amount of engine companies. However, continued growth of the District has occurred since that evaluation. The following map displays District areas that are within 1.5 miles of an existing engine company and the engine company proposed for Station 5.

Figure 44: 1.5 Mile Engine Coverage (ISO)



In order to achieve optimum credit for the number of engine companies, ISO reviews the response areas of each existing engine and identifies the number of fire hydrants within those response areas. ISO analyzes whether there are additional geographic areas of the district outside of the existing station response areas where at least 50 percent of the number of hydrants served by the largest existing response area could be served by a new engine, if one were to be added. If so, additional engine company deployment is recommended. For ISO review purposes, the response area of a station is measured at 1.5 miles of travel distance on existing roadways.

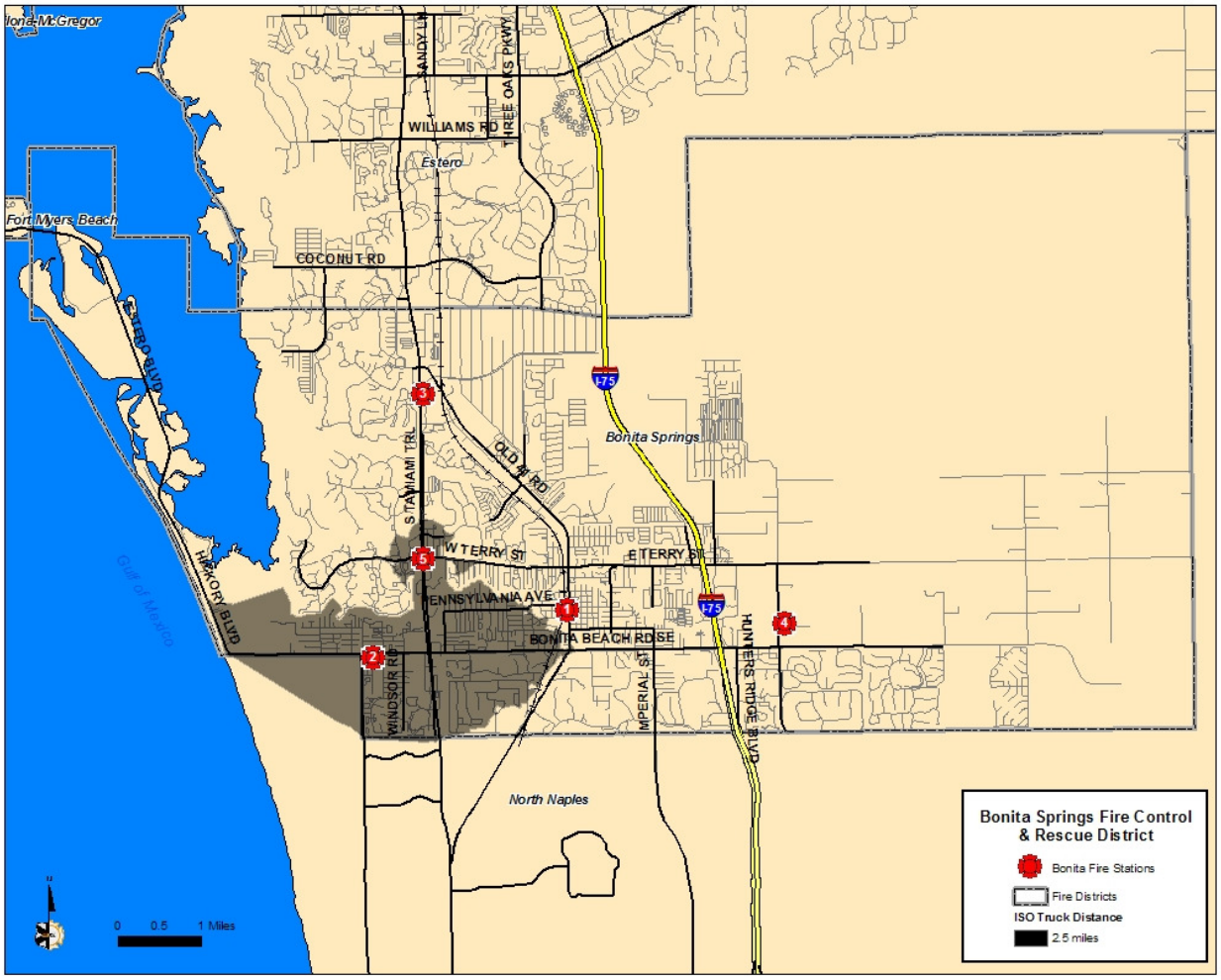
In analyzing hydrant location data, it indicates that the percentage of the hydrants within 1.5 miles of an engine is 52%. If a full Class A engine were not placed in the proposed Station 5, that figure would fall to 41%. Therefore, some of the areas outside current 1.5 mile coverage of a station are, individually, large enough to contain more than 50 percent of the hydrants within the average engine company coverage and would require additional engine companies.

In similar fashion, to achieve optimum credit for the number of truck companies, ISO reviews the response areas of each existing truck and identifies the number of fire hydrants within those response areas. ISO analyzes whether there are additional geographic areas of the district outside of the existing truck response areas where at least 50 percent of the number of hydrants served by the largest existing response area could be served by a new truck were one to be added. If so, additional truck company deployment is recommended. For ISO review purposes, the response area of a station is measured at 2.5 miles of travel distance on existing roadways.

A truck company is not required to have an elevating ladder or aerial device unless there are a sufficient number of buildings that would meet the three story height and square footage limits. Other areas can receive credit for a truck company without the requirement of an elevated device and can even receive partial credit if other apparatus, such as an engine, carries a complement of truck company equipment. Of the 171 buildings that met the criteria according to the fire department, 26.9% were within 2.5 miles of a truck company.

BSFCRD does not appear to operate sufficient ladder trucks as recommended for optimum ISO distribution credit at this time. The 1996 ISO survey recommended two ladder companies in their analysis. The following map displays the areas of the District that are within 2.5 miles of an existing truck company.

Figure 45: 2.5 Mile Ladder Truck Coverage (ISO)



It is possible that additional apparatus in reserve status may provide some increase in credit for reserve companies, but it is not likely to be sufficient to affect the overall community insurance rating. The location of the single ladder company may not be optimal for the community risk and geographic coverage. Relocation considerations will be discussed in later sections.

The ISO rating is important to a community. Many property insurance companies base the fire risk portion of property insurance premiums on the community's ISO grade. The table below shows an example of how fire insurance rates change based on the ISO rating that is assigned.

Figure 46: ISO Rating to Insurance Cost Comparison

Fire Department ISO Class Compared to Insurance Premium Cost								
ISO Class	**Annual Insurance Premium Based on Home Value in Thousands**[17]							
	$100	**$150**	**$200**	**$250**	**$300**	**$350**	**$400**	**$500**
10	$894	$1,358	$1,856	$2,341	$2,826	$3,311	$3,844	$4,918
9	$806	$1,224	$1,674	$2,112	$2,549	$2,986	$3,468	$4,436
7	$430	$652	$892	$1,125	$1,359	$1,592	$1,848	$2,365
6	$399	$607	$829	$1,046	$1,262	$1,479	$1,717	$2,196
5	$373	$566	$744	$976	$1,046	$1,380	$1,603	$2,051
4	$373	$566	$744	$976	$1,046	$1,380	$1,603	$2,051
3	$373	$566	$744	$976	$1,046	$1,380	$1,603	$2,051

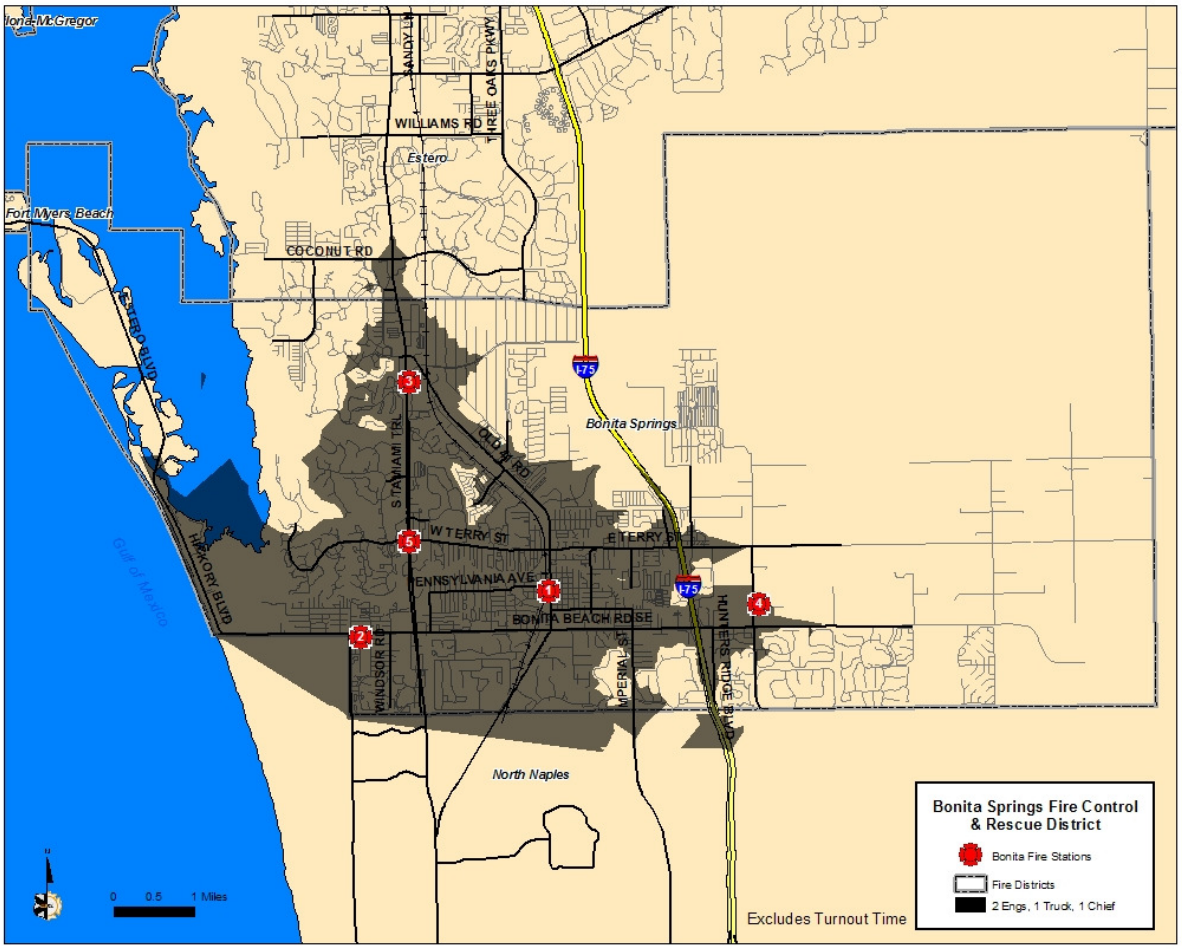
As the ISO class improves, fire insurance rates for homes decrease dramatically until reaching a class 5. Businesses generally benefit from reductions all the way to insurance Class 1. While it is good to want to design a fire protection system to take advantage of the low-cost insurance premiums for the community, it is very important to remember that the grading schedule is merely a tool of the insurance industry. As such, the ISO schedule only measures the risk of fire to the insured *structures* of a community. The schedule does not evaluate the safety, security, or personal services that a fire department provides to the *citizens* of the community. Municipalities should consider the grading schedule when designing local fire protection systems, but should never make a decision based solely on the ISO class. Officials should try to make improvements to fire and emergency medical services that are best for the community first; but if during the process insurance classifications are improved, so much the better.

Concentration Analysis

The NFPA standard calls for the arrival of the entire initial assignment (sufficient apparatus and personnel to effectively combat a fire based on its level of risk) within eight minutes, 90 percent of the time. This is to ensure that enough people and equipment arrive soon enough to be effective in controlling a fire before substantial damage occurs.[18] In the Bonita Springs Fire Control & Rescue District, this consists of twelve to sixteen firefighters, two engine companies, one truck company, the heavy rescue unit, and a deputy chief within eight minutes. The following figure depicts the current effective firefighting force coverage for BSFCRD.

[17] Source: Survey of insurance companies in the southeastern United States
[18] See previous discussion about time/temperature curve and the effects of flashover.

Figure 47: Current Effective Firefighting Force Area



The effective firefighting force coverage map presumes that the deputy chief may be responding from anywhere in the District, as their duties are not limited to a station area. The amount of coverage is most dependent upon the location of the truck company, which is currently operating out of Station 2 as seen in the ISO truck travel distance map (Figure **Error! Not a valid link.**). Any relocation of the current truck company, or the addition of truck/service companies, would alter the effective firefighting force coverage. Opportunities for positive improvement will be discussed in the strategy section of the report.

Reliability Analysis

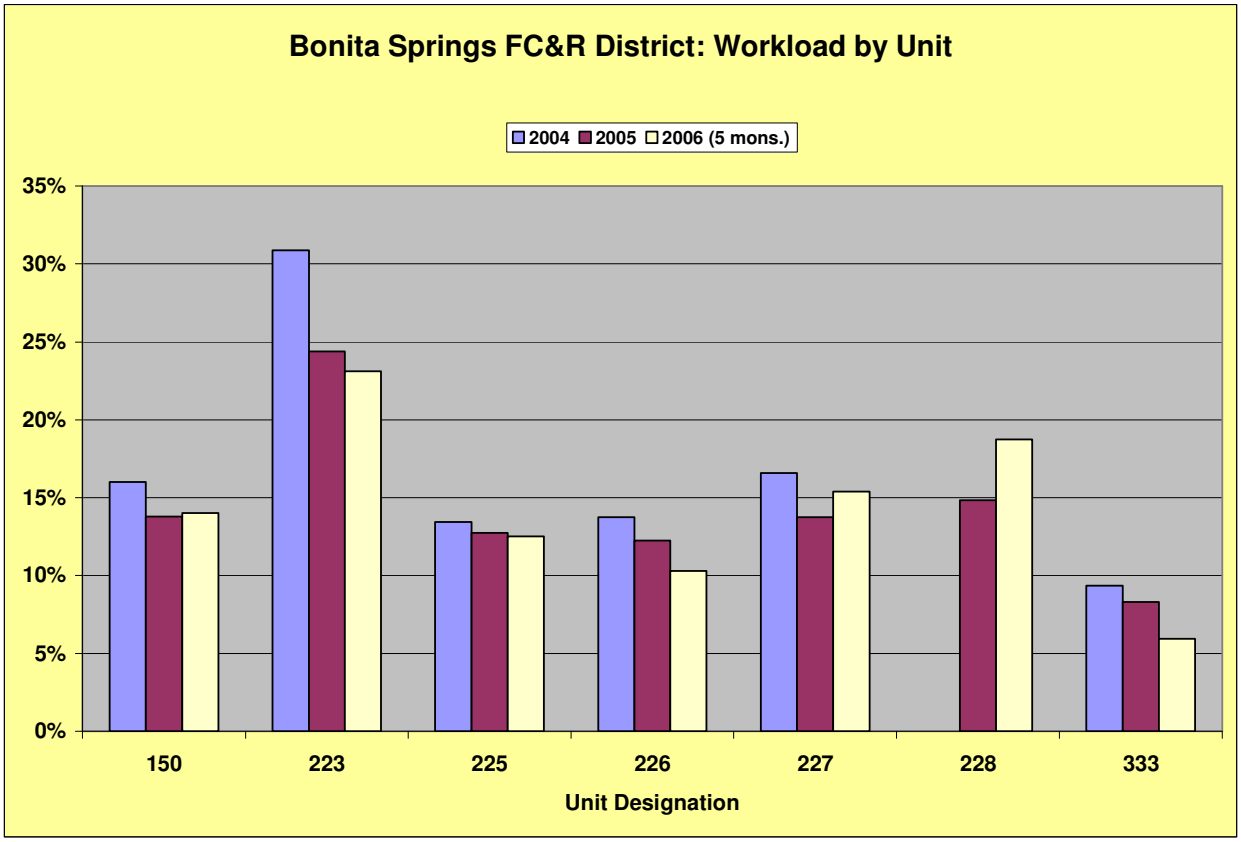
Workload and Failure Rates

The workload on emergency response units can be a factor in response time performance. The busier a given unit, the less available it is for the next emergency. If a response unit is unavailable, a unit from a more distant station must respond, increasing overall response time.

A cushion of surplus response capacity above average values must be maintained due to less frequent, but very critical times, when atypical demand patterns appear in the system. Multiple medical calls, simultaneous fires, multi-casualty events, or multiple alarm fires are all examples.

The following chart shows response activity by unit. This chart describes total response activity for each unit in 2005. Total unit responses exceed total incidents for the year since many calls for service require more than one unit to respond.

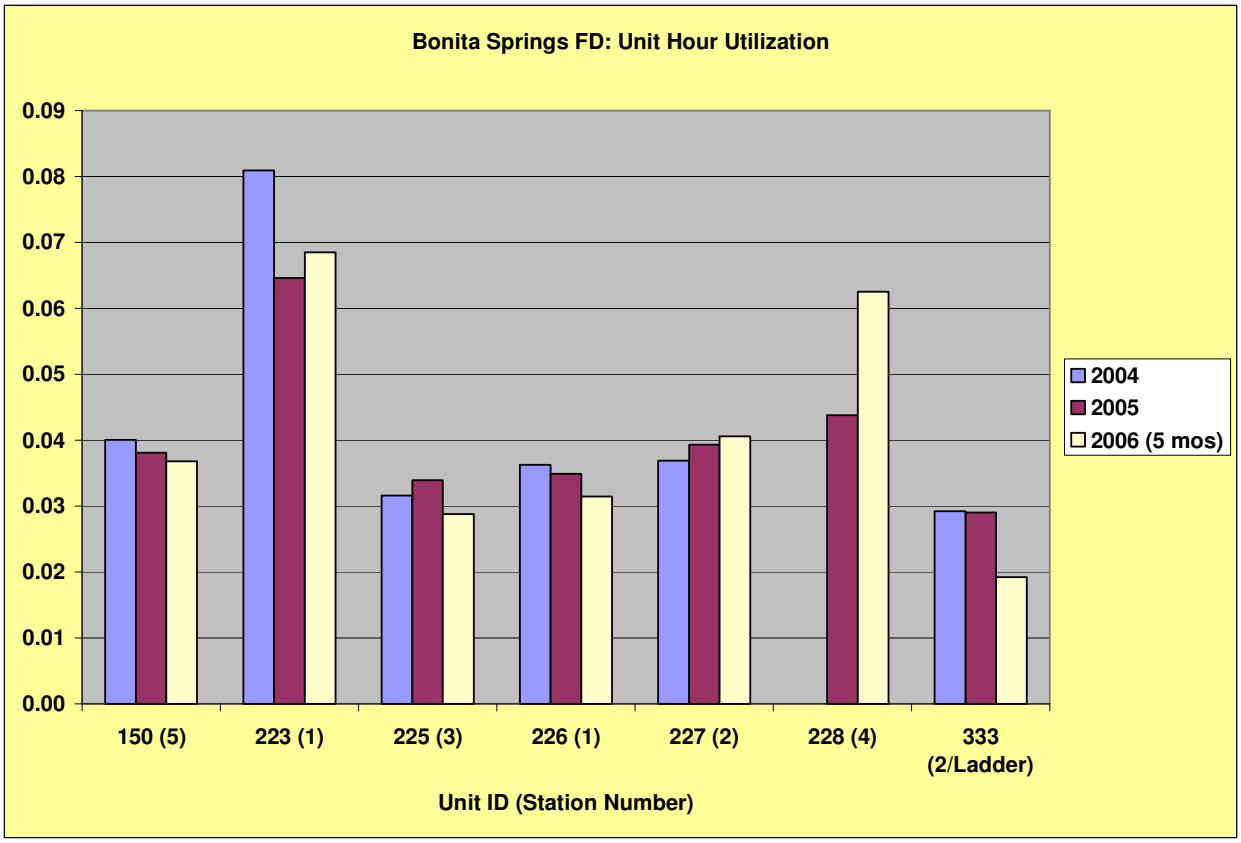
Figure 48: Total Unit Responses



Using the total time on incident, unit hour utilization is also calculated for each response unit. Unit hour utilization is an important workload indicator because it describes the amount of time a unit is already committed to an incident and not available for response. The larger the number, the greater its utilization and the less available it is for assignment to an incident. High unit hour utilization (UHU) figures for fire department suppression units are typically around 0.20 with

some studies indicating that unit failure rates[19] at this workload will often begin to hit 10 percent. The following figure indicates that all BSFCRD response units are currently well below that level, indicating unit workload is not likely a factor in achieving improved response times.

Figure 49: Unit Hour Utilization



	2004			2005			2006 (5 mos)		
Unit (station)	Calls	Time	UHU	Calls	Time	UHU	Calls	Time	UHU
150 (5)	865	21043	0.04	816	20032	0.04	364	7892	0.04
223 (1)	1669	42525	0.08	1444	33976	0.06	600	14701	0.07
225 (3)	726	16610	0.03	754	17842	0.03	325	6185	0.03
226 (1)	743	19074	0.04	724	18348	0.03	267	6754	0.03
227 (2)	896	19375	0.04	813	20668	0.04	399	8715	0.04
228 (4)				878	23020	0.04	486	13412	0.06
333 (2/Ladder)	506	15358	0.03	492	15263	0.03	154	4121	0.02

The following table details the failure rates by station. This table indicates the percentage of calls in a particular district where no unit assigned to that district's station responded. Not included are the heavy rescue and brush units.

[19] The unit failure rate is the percentage of calls for which a unit is unavailable due to handling an existing call where it otherwise would have been dispatched as the primary unit.

Figure 50: Unit Failure Rate

Station Failure Rates	
Station	**Failure Rate**
One	**15.0%**
Two	**7.7%**
Three	**15.0%**
Four	**12.6%**
Five	**15.4%**

Several stations had high indicated failure rates. However, the workload for stations shown in the unit hour utilization chart in Figure 48 is not high enough to provide an explanation for the high failure rates. Since the calculations were performed using Unit IDs as they are currently assigned to stations, it is possible that some reassignment of apparatus among stations during the course of the year from which data was used, may have caused the calculations to be incorrect.

Failure rates over 10 percent would typically become cause for concern. If the calculations are correct, there are other factors which can cause high failure rate such as:

- Out of service for mechanical reasons
- Out of service for training exercises
- Out of area on move-up deployment
- Lack of staffing
- Concurrent calls

The fire department should review these additional factors to ascertain any administrative or scheduling efforts that could have a positive effect on reducing existing unit failure rates.

Call Concurrency and Resource Drawdown

Another way to look at resource workload is to examine the amount of time multiple calls happen within the same time frame on the same day. ESCi examined the last full year's worth of data to find the frequency that BSFCRD apparatus is handling multiple calls within any time frame. This is important because more calls occurring simultaneously can stretch available resources and extend response times from distant responding available apparatus.

Figure 51: Call Concurrency Table

	All Calls		Fire Calls	
	Percent	Count	Percent	Count
Single	78.45%	4146	92.90%	170
2 concurrently	17.18%	908	6.01%	11
3 concurrently	3.31%	175	1.09%	2
4 concurrently	0.44%	23		
5 concurrently	0.17%	9		
6 concurrently	0.11%	6		
7 concurrently	0.02%	1		
8 concurrently	0.08%	4		
9 concurrently	0.04%	2		
10 concurrently	0.08%	4		
11 concurrently	0.02%	1		
12 concurrently	0.02%	1		
13 concurrently	0.02%	1		
14 concurrently	0.06%	3		
15 concurrently	0.02%	1		

Time Period: 6/1/05 - 5/31/06

As in most communities, the majority of calls happen one at a time. However, as communities grow the propensity for concurrent calls increase. When the concurrency reaches a level at which it stretches resources to near capacity, response times begin to extend. Although multiple medical calls will cause drawdown, especially as concurrency increases, they usually occupy only one unit at a time. Concurrent fire calls however, are of more concern as they often require multiple unit responses for each call depending upon the dispatch criteria.

Given its available resources, Bonita Springs should have the capability to handle one confirmed structure fire (or other moderate-risk fire incidents) and two low-risk single-company incidents simultaneously, or five low-risk incidents simultaneously. At that point, its resources would be nearing depletion and the use of mutual aid would be recommended. The likelihood of this occurring is somewhere between one and three percent.

Recorded System Response Performance

Throughout this document, certain descriptive statistical measures are utilized which may not be familiar to all readers. In an effort to reduce confusion or the drawing of inaccurate conclusions, this section seeks to provide a brief explanation of these measures. The measures most often used which require clarification are the use of *average* and *percentile* measures.

Average

The *average* measure is a commonly used descriptive statistic, also called the mean of a data set. It is a measure to describe the central tendency, or the center of a data set. The average is the sum of all the points of data in a set divided by the total number of data points. In this measurement, each data point is counted and the value of each data point has an impact on the overall performance. Averages should be viewed with a certain amount of caution because the average measure can be skewed if an unusual data point, known as an outlier, is present within the data set. Depending on the sample size of the data set, the degree to which such data skews the analysis can be either very large or very small.

As an example, assume that a particular fire station with a response time objective of six minutes or less had five calls on a particular day. If four of the calls had a response time of eight minutes, while the other call was across the street and only a few seconds away, the average would indicate the station was achieving its performance goal. However, four of the five calls, or 80 percent, were beyond the stated response time performance objective.

The opposite can also be true where one call with an unusually long response time can make otherwise satisfactory performance appear unacceptable. These calls with unusually short or long response time have a direct impact on the total performance measurements and the farther they are from the desired performance, the greater the impact.

The reason to compute average is because of its common use and ease of understanding that is associated with it. The most important reason for not using averages for performance standards is that it does not accurately reflect the performance for the entire data set. As illustrated above, one extremely good or bad call skewed the entire average. While it does reflect all values, it does not really speak to the level of accomplishment in a strong manner.

Percentile

With the average measure, it is recognized that some data points are below the average and some are above the average. The same is true for a median measure which simply arranges the data set in order and finds the value in which 50 percent of the data points are below the median and the other half are above the median value. This is also called the 50th percentile.

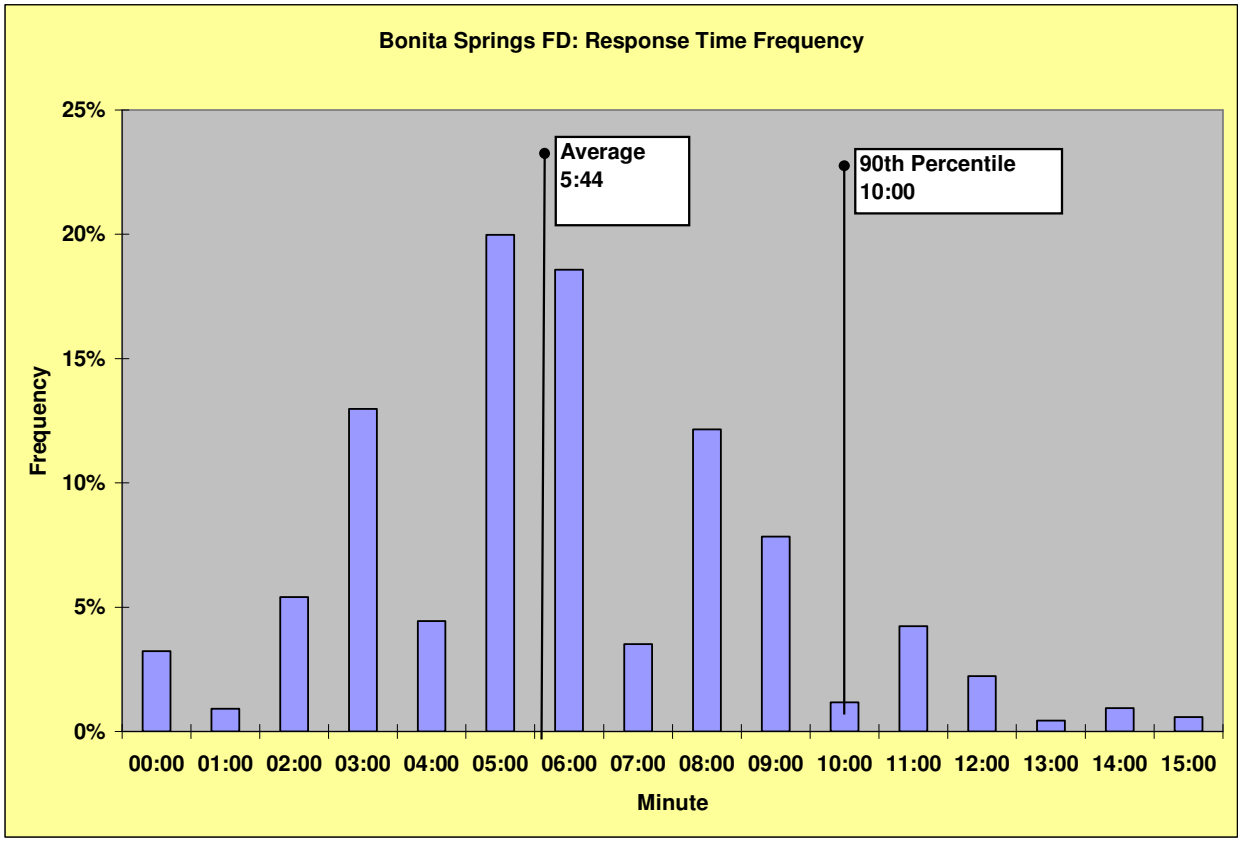
When you deal with fractiles or percentages, the actual value of the individual data does not have the same impact as it did in the average. The reason for this is that the fractile is nothing more than the ranking of the data set. The 90th percentile means that 10 percent of the data is greater than the value stated, and all other data is at or below this level.

Higher fractile measurements are normally used for performance objectives and performance measurement because they show that the large majority of the data set has achieved a particular level of performance. This can be compared to the desired performance objective to determine the degree of success in achieving the goal.

The following chart illustrates the overall response time frequency for the Bonita Springs Fire Control & Rescue District over the last two and a half years[20]. Both average and 90th percentile response time performance is illustrated. The most frequently recorded response time was within the five minute range.

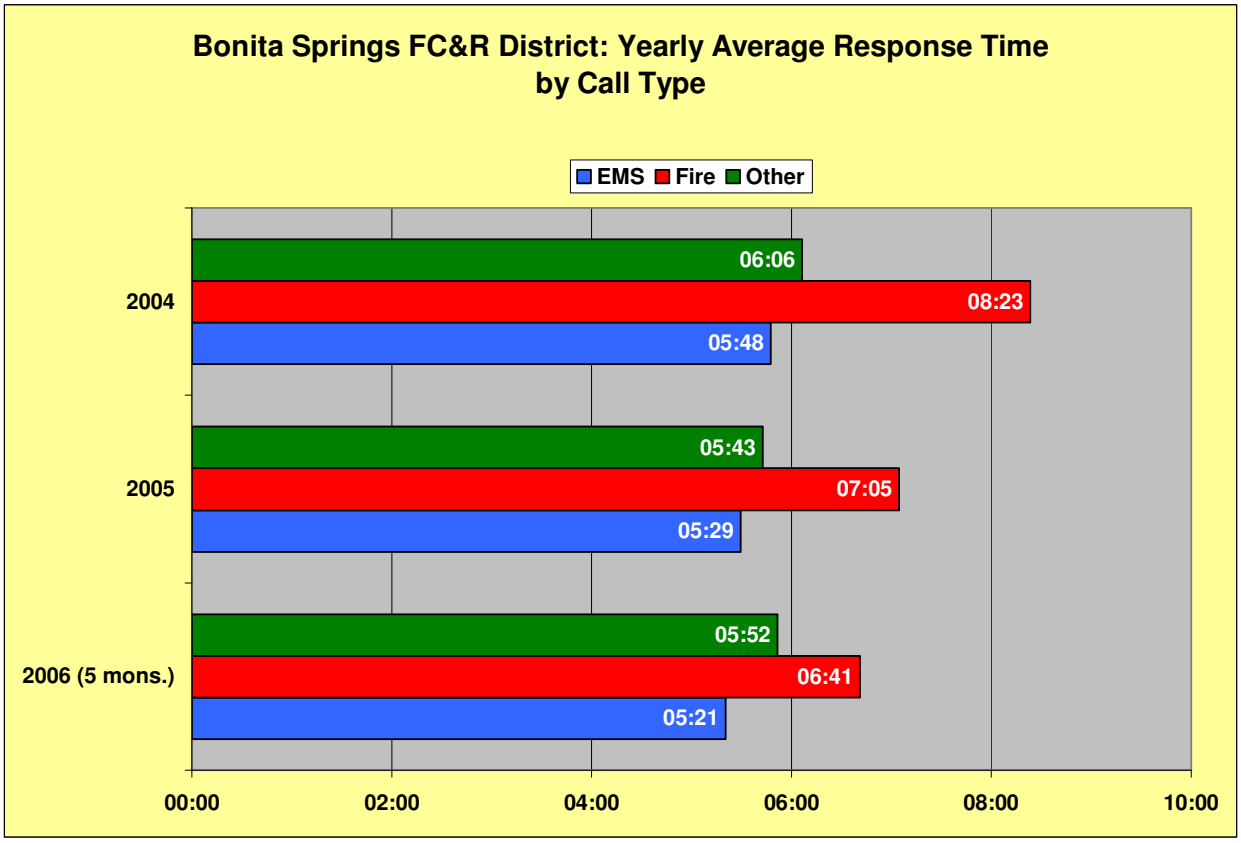
[20] Mutual aid calls and non-emergent calls were removed from response time analysis wherever those calls could be identified through incident types or other designations.

Figure 52: Response Time Frequency



In order to examine response times more closely, ESCi examined yearly average response time trends as a guidepost for further analysis.

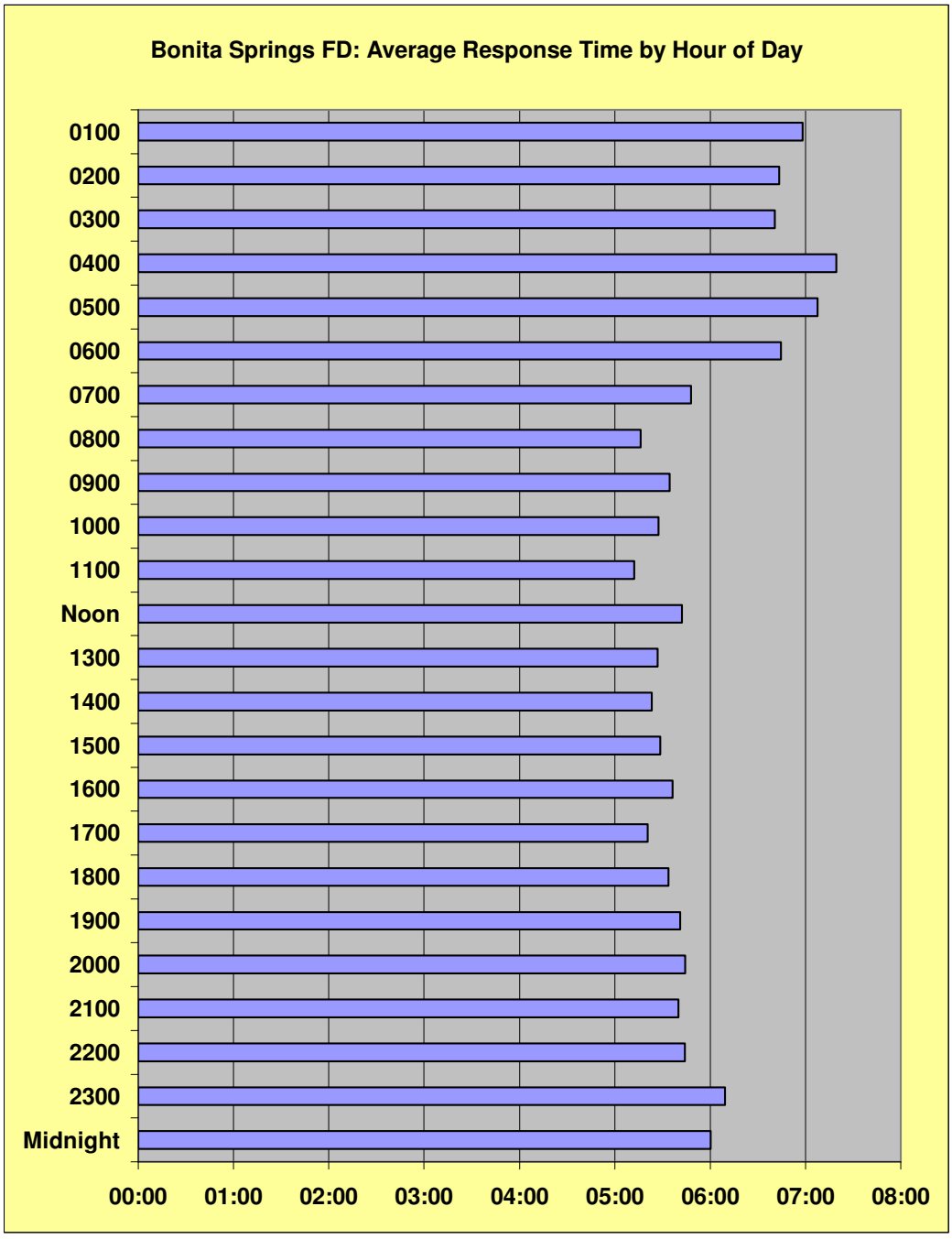
Figure 53: Three-Year Response Time Trends



There has been a decrease in average response times over the past two and a half years, for all call types. Despite perhaps lengthy response times during the 2004 hurricane season, average EMS response times decreased 27 seconds over 2004, one minute and forty-one seconds for fire calls, and 14 seconds for other call types. Though perhaps a seemingly insignificant amount, it is a positive trend that should be appreciated when evaluating the changing nature of service to the community.

Response times can vary by time of day in reflection of service demand workload and when the firefighters are at rest. The *average* response time for emergency incidents ranged from a high average of seven minutes and 19 seconds for calls between the hours of 4:00am and 5:00am, to a low average of five minutes and twelve seconds for incidents between the hours of 11:00am and 12:00pm. The overall average response time of the department within its primary jurisdiction was five minutes and 44 seconds for all call types.

Figure 54: Average Response Time by Hour of Day

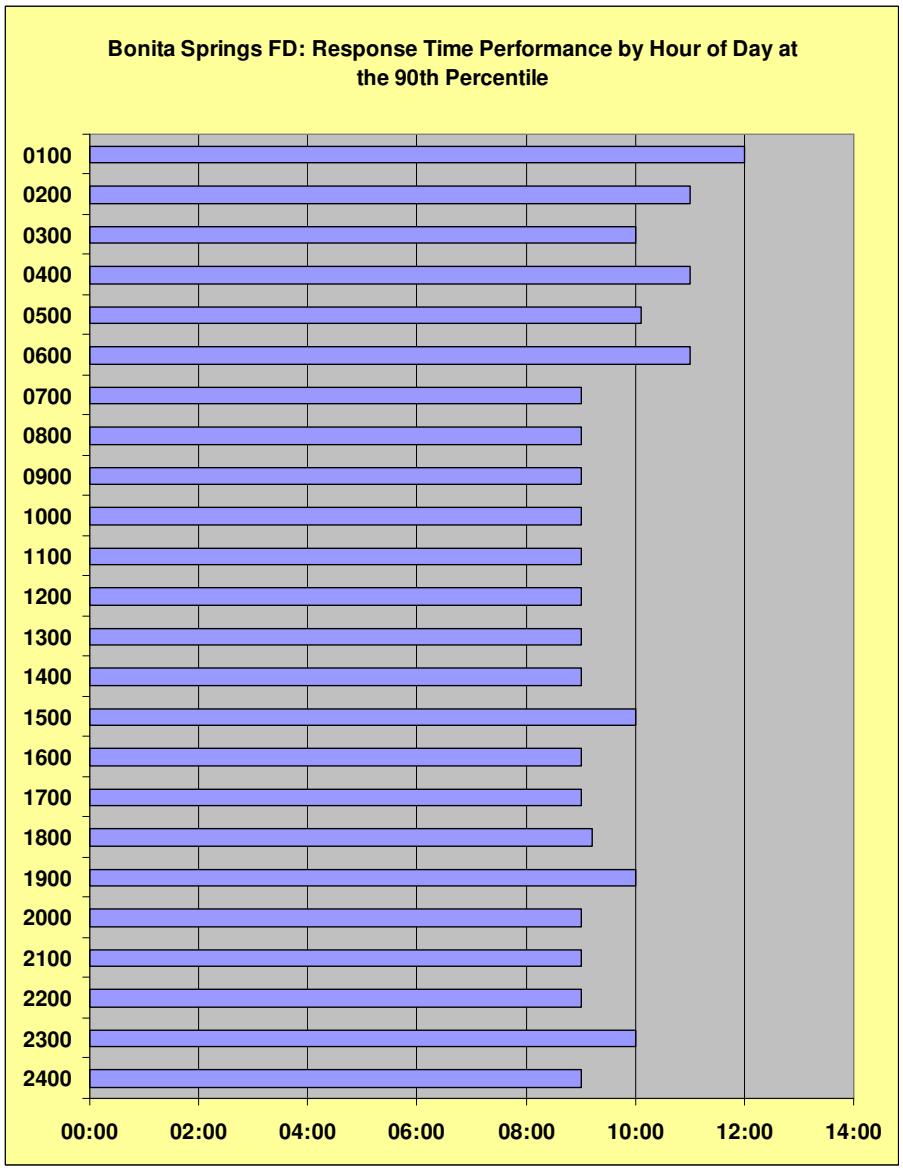


Average response time is one useful measure to determine how well geographic-based coverage is achieved. As discussed previously, more significant is how well the majority of emergency response demand is being serviced. One useful way to determine how well

demand-based coverage is achieved is by determining maximum response time to a larger percentage of the incidents, in most cases 90 percent.

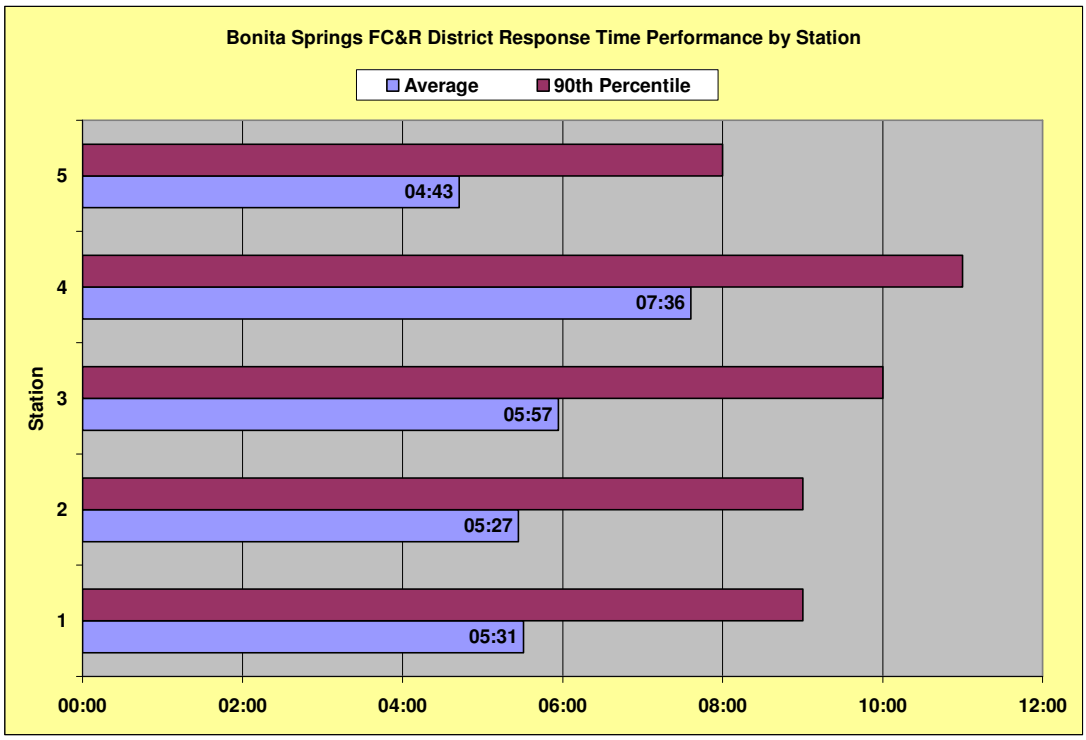
The *90th percentile* response time for emergency incidents occurring within the primary response area of BSFCRD ranged from a high of twelve minutes during the 1:00am to 2:00am hours to a low of nine minutes during most of the daylight hours. The overall 90th percentile response time of the department within its primary jurisdiction was **ten minutes** for all call types.

Figure 55: 90th Percentile Response Time by Hour of Day



Since BSFCRD has established a target response time performance standard of six minutes or less to at least 90 percent of all incidents, ESCi is able to graphically display the stations and the work shifts in which this performance objective is being met.

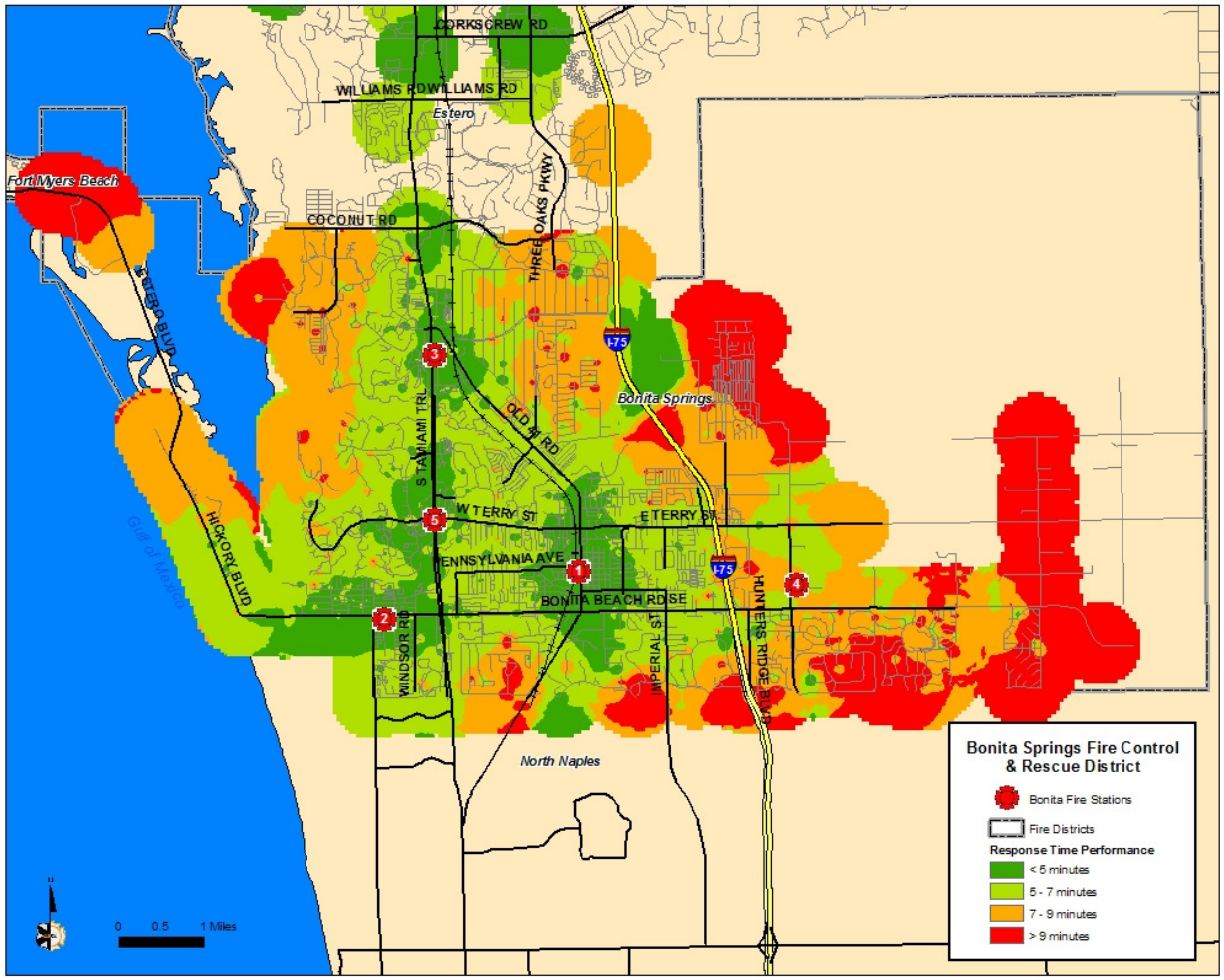
Figure 56: Response Time Performance by Station District



According to the data provided, none of the stations met the objective 90 percent of the time. Station 4 had the longest response times; however its geographical range of coverage is much more extensive than the others, which will cause response times to increase.

In addition to viewing temporal changes in response time, it is also of value to view the impact of location on response times. In order to accomplish a geographical analysis of current response time, ESCi evaluated actual response time performance in each station area. The following map illustrates the actual recorded response time performance of the department.

Figure 57: Geographic Response Performance



The areas of longest response time are clearly visible through this map and, as expected, the actual response time performance is best in area closest to the fire stations. The areas of green and light green correspond with the modeled five-minute travel time in Figure 43. The area immediately surrounding Station 4 is shown with longer response time performance than the travel time model indicates, however this station only recently came into operation and limited data was available for its responses.

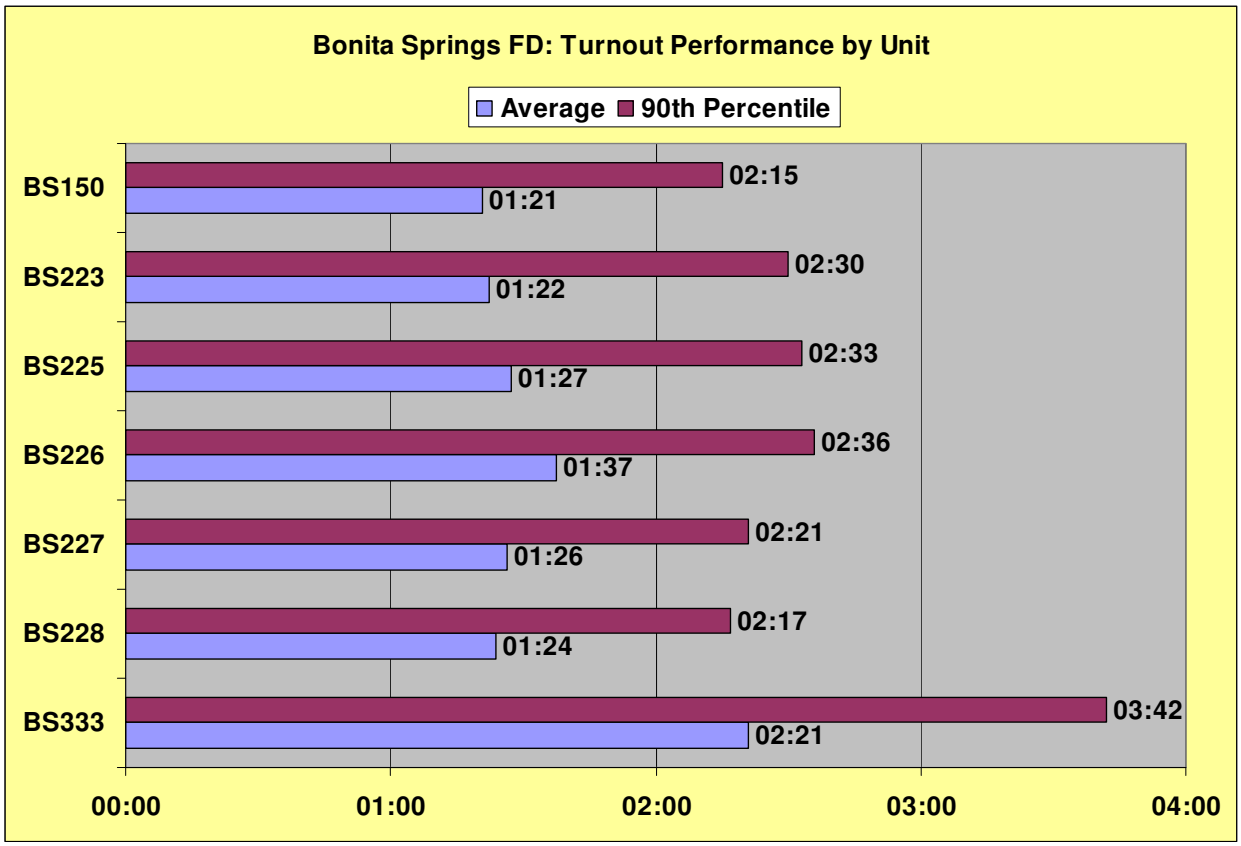
Firefighter Turnout Time

Response time is measured from point of dispatch to the arrival on scene by the first apparatus. It is made up of two components - turnout time and travel time. Many variables can affect travel times which are not controllable by the fire department, such as weather, traffic, and speed limitations. Turnout time, however, is very much in control of the firefighters who are assigned to

an apparatus or station. Turnout time is the interval from notification to apparatus response. As stated earlier, in career departments such as BSFCRD, *NFPA 1710* provides a benchmark for firefighter turnout time of 60 seconds or less, at least 90 percent of the time.

For the year 2005, the turnout time performance of the department was two minute and 36 seconds at the 90th percentile. The following figure displays the 90th percentile turnout time for each of the seven primary units in Bonita Springs.

Figure 58: Firefighter Turnout Time Performance by Unit



In order to achieve the performance objective found in *NFPA 1710*, the department will need to reduce its 90th percentile firefighter turnout time by 96 seconds. While some reduction may be able to be accomplished through changes in procedure, a 96 second reduction may be difficult to achieve without at least some changes in certain station's layout, design, or hygiene facilities.

The District should again be reminded that *NFPA 1710* is not a mandatory standard, nor is it a regulation. The District is free to adopt a performance objective for firefighter turnout time that differs from this standard.

This page left blank

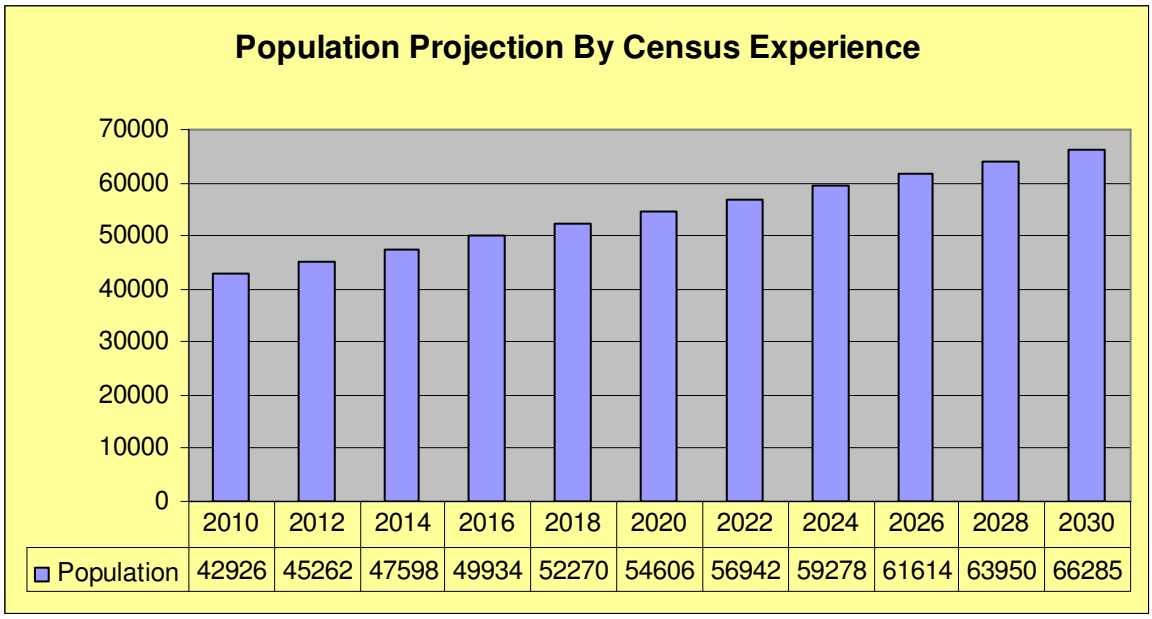
Future System Demand Projections

Census-based Growth Projections

The population of the Bonita Springs area has increased significantly in the last two decades. Based on interviews with planning officials and observation of data, ESCi anticipates additional growth will continue into the future.

In preparing forecasts for population growth, ESCi typically develops a forecast based on several decades of census experience. In the case of Bonita Springs, we used decennial census figures from 1980 through 2000, along with official estimates from 2001 through 2005. A mathematical forecast is created through the year 2030. The resulting population forecast appears as follows.

Figure 59: Census-based Population Forecast

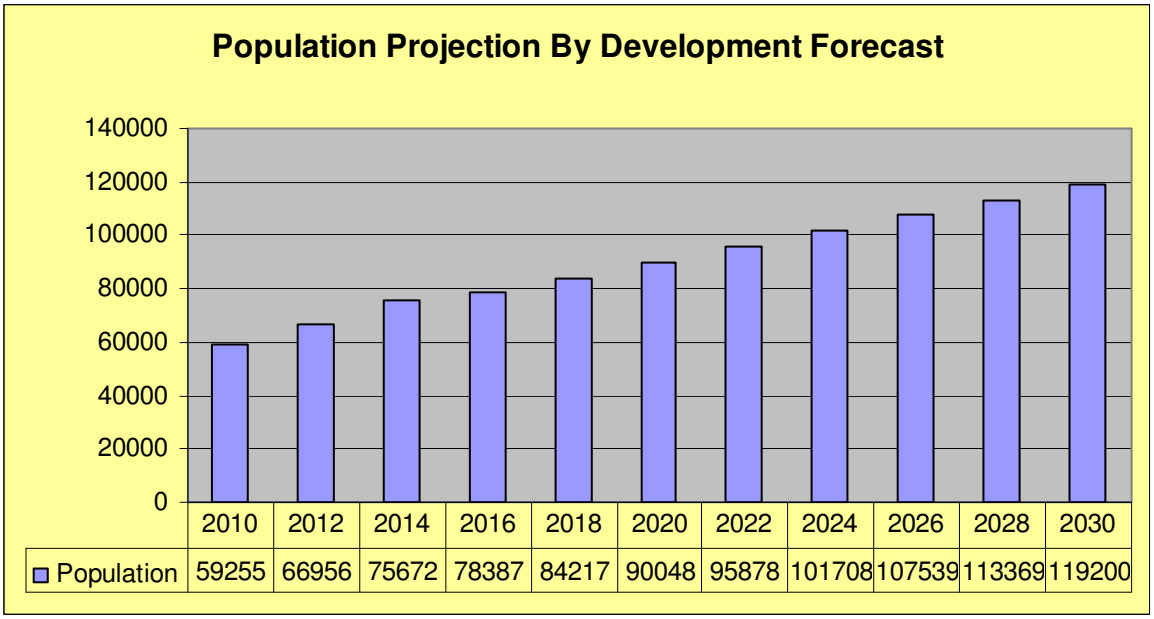


Development-based Growth Projections

While census-based population projections provide a mathematical estimate of future population based on historical data, they often fail to account for expected trends in the growth rate of an area. These changes often result from redevelopment, area buildout, changes in employment capacity, or other socio-economic factors not reviewed in a census-based projection. In addition, census projections fail to take into account non-residential population such as seasonal or commuting employees. For this reason, ESCi also offers population projections based on review of available local development and business information.

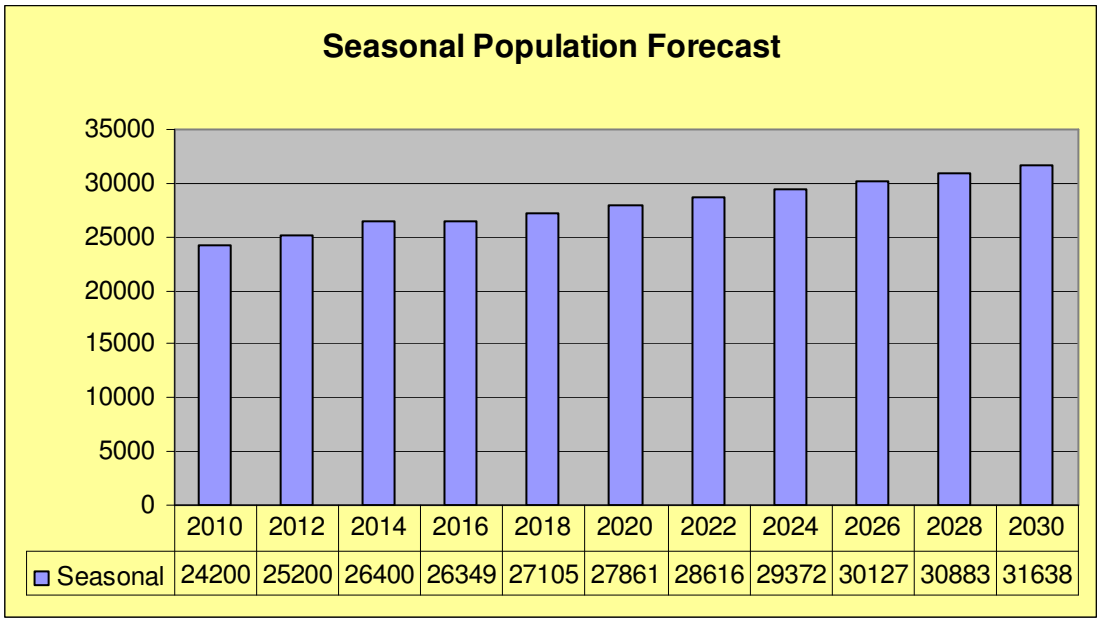
In this case, ESCi reviewed information available from the 2005 Evaluation and Appraisal Report of the Bonita Springs Comprehensive Plan regarding population projections for the community. The population estimate for the years 2005-2014 was used to forecast population projections for the City of Bonita Springs through 2030. The resulting population forecast appears as follows.

Figure 60: Development-based Population Forecast



In addition to these projections, which focus primarily on residential population forecasts, the City of Bonita Springs has estimated seasonal population. The table below extends these projections into 2030. These figures should be considered, in addition to residential population forecasts, as it will impact future service demand for the fire district.

Figure 61: Seasonal Population Forecast



It is not the intent of this study to be a definitive authority for the projection of future population in the service area, but rather to base recommendations for future fire protection needs on a reasonable association with projected service demand. Since service demand for emergency agencies is based almost entirely on human activity, it is important to have a population-based projection of the future size of the community. While variation in the population projections is discussed here, one thing that can be certain is that the Bonita Springs Fire Control & Rescue District will continue to be an emergency services provider to a growing residential and seasonal population, likely reaching as high as 150,000 by 2030 in high range projections. Planning should begin now to maintain the resources needed to meet the continuing demand for services.

Community Risk

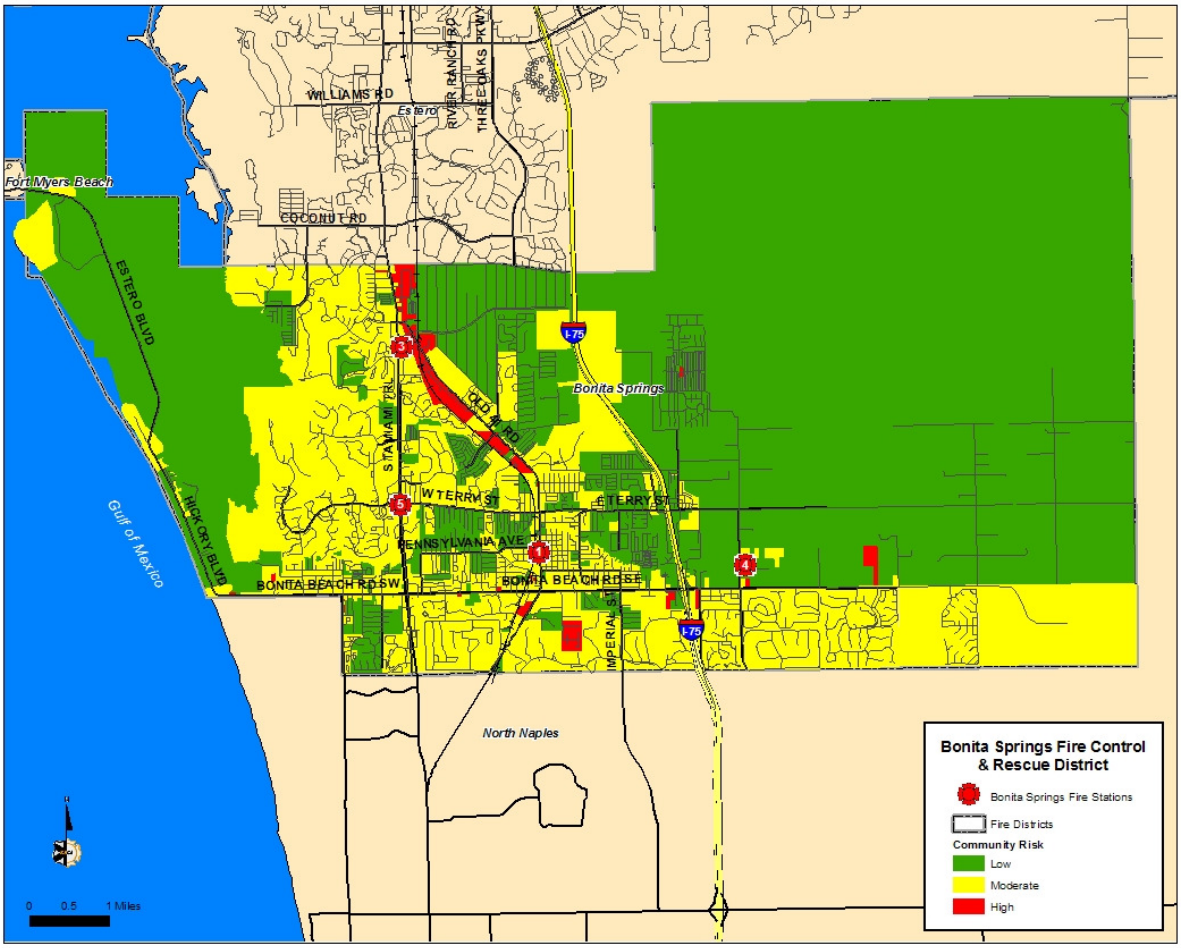
The fire service assesses the relative risk of properties based on a number of factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk within geographic sub-areas of a community.

The community's risk assessment has been developed based on potential land use within its boundaries. These potential uses are found in the District's development code and zoning

designations. The following map translates zoning (potential scale and type of development within geographic sub-areas) to categories of relative fire and life risk.

- Low risk – Areas zoned and used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- Moderate risk – Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High risk – Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.

Figure 62: Community Risk Assessment by Zoning Designation

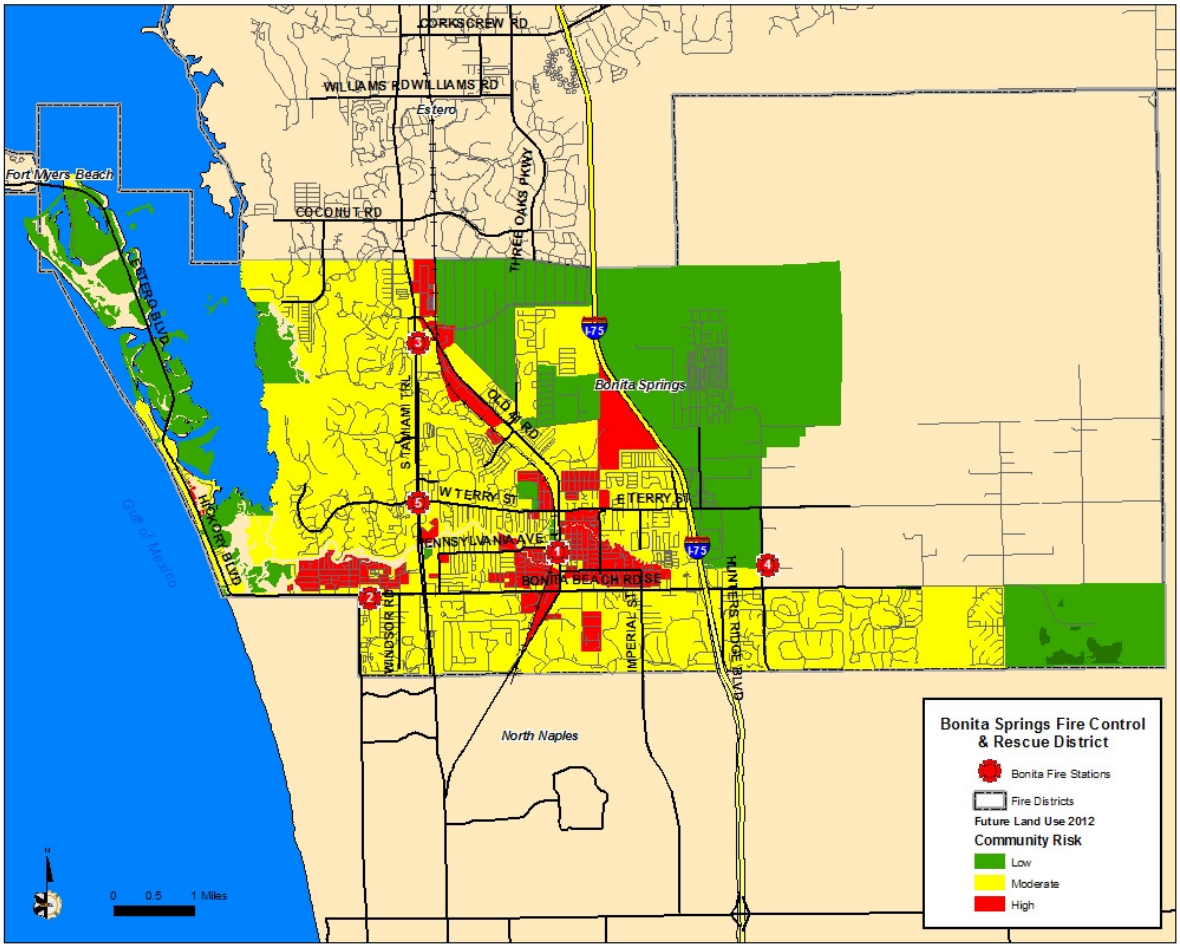


The community has been zoned for mostly low and moderate risk properties. The predominance of highest risk is located on the city's central area near Old Hwy 41 an industrial area north of Station 4. There are, of course, high-risk occupancies elsewhere in the community that include

multi-family dwellings and assembly occupancies. The central area of higher risk properties provides a guidepost for future deployment configurations within the District.

Although zoning is the intended use of land, variances and previous uses which are exempt from new zoning regulations can occur. The following figure displays the relative community risk of potential future land uses. The categorization of risk level is the same as described above and the land use designations were assigned by the City of Bonita Springs. This differs from the zoning map, especially in the areas of Stations 1 and 2, where a higher risk level can be seen. In addition, risk is more prevalent along the coastal region than specified in zoning.

Figure 63: Community Risk by City Future Land Use Designation

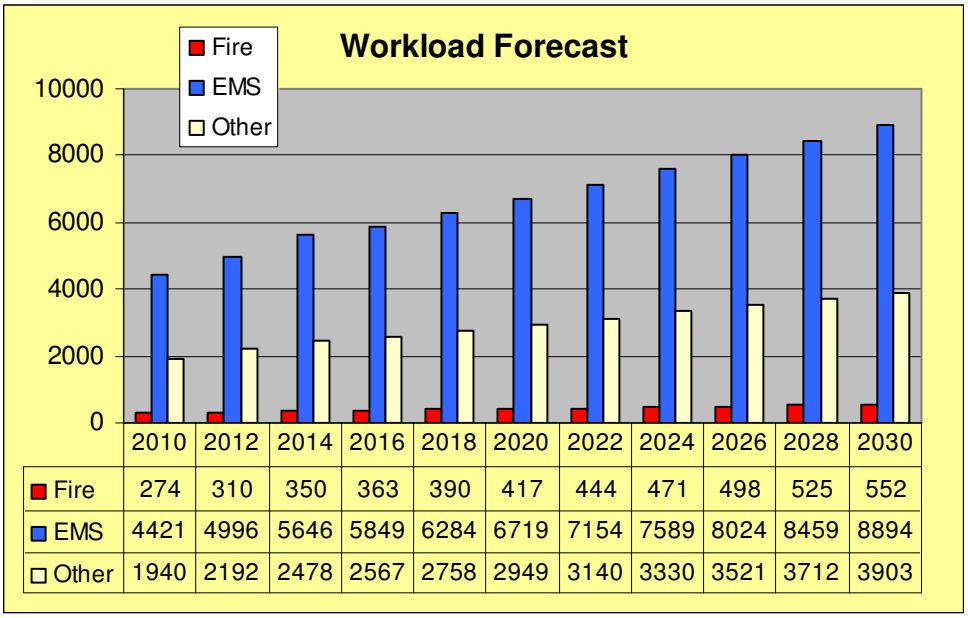


Workload Projections

In evaluating the deployment of facilities, resources, and staffing, it is imperative that consideration be given to potential changes in workload that could directly affect such deployment. Any changes in service demand can require changes and adjustments in the deployment of staff and resources in order to maintain acceptable levels of performance.

The planned land use and population growth within this area are two of the factors used in calculating projections of future service demand. For purposes of this study, ESCi utilized population projections obtained through community development data and multiplied these by six-year average incident per capita rates to identify workload potential through the year 2030. The results of the analysis are shown, by year and type of call, in the following chart and table.

Figure 64: Workload Projection by Type and Year



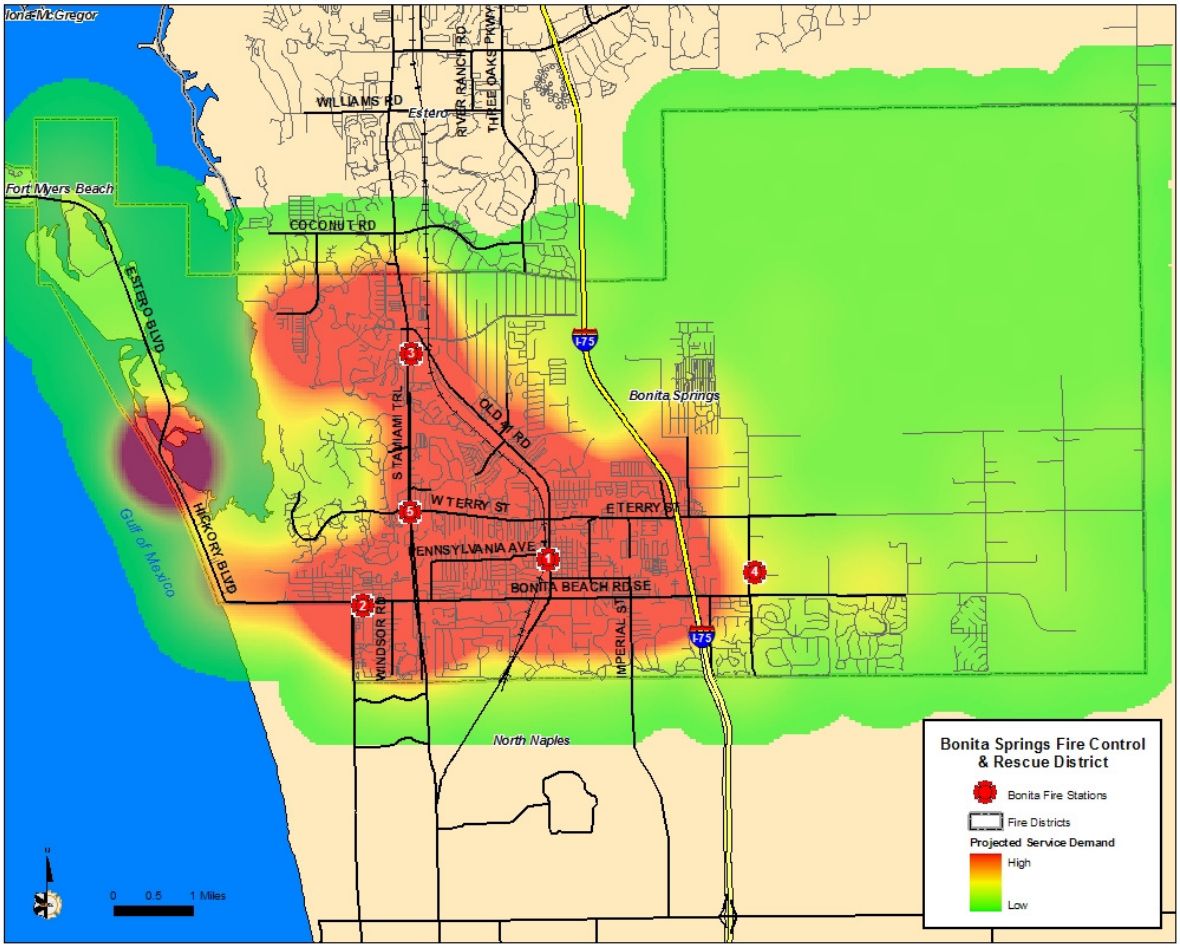
	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030
Fire	274	310	350	363	390	417	444	471	498	525	552
EMS	4421	4996	5646	5849	6284	6719	7154	7589	8024	8459	8894
Other	1940	2192	2478	2567	2758	2949	3140	3330	3521	3712	3903

The increase in actual fire incidents is forecast to be relatively low during the study period, but this is a reflection of national trends for fire incident rates per capita and is believed to be a result of improvements made in building codes and public fire education during the last three decades. EMS and other emergency service calls not involving actual fires are expected to continue to rise significantly.

In projecting where, geographically, this additional service demand is most likely to occur, future land use planning documents and data files were examined. This is an important effort in determining the density of the additional service demand and how it may affect workload distribution and resources. Changes intended to compensate for future demand can be planned through station relocations, closures, and resource additions where appropriate based on this future perspective of workload.

The following figure illustrates the projected service demand based upon future land use plans and zoning designations and the historical experience of service demand related to parcel land use designations.

Figure 65: Projected Service Demand



The geographic service demand closely resembles current service demand patterns. No significant concentrated demand is expected in the far eastern section of the District, due primarily to its planned agricultural and resource (groundwater) protection zones. There are also no plans for public water and sewer in that area, which can impede development, especially in resource conservation areas. Thus, much of the service demand will remain in the City of Bonita Springs as major thoroughfares and development of commercial and residential properties increase. The exception is the housing development occurring and planned to occur primarily south of East Bonita Beach Road. The coastal area remains an area of high demand, especially in the seasonal peak months.

Future Planning Considerations

There are some hindrances to fire response capability typical to urban and suburban environments. In any environment, an increased daytime traffic load can create obstacles that must be maneuvered, especially if the road capacity has exceeded its design. Road construction, while improving capacity in the long run, often limits movement during the improvement process. Motorists with loud radios, closed windows, or using cell phones often panic when they realize a fire apparatus is approaching. This can result in sudden stops, and apparatus operators are forced to slow down and react safely.

The more urban the setting, the greater number of turns necessary to arrive at a destination, reducing the ability of a heavy fire apparatus or ambulance to maintain speed. Urban areas also have a higher number of signalized intersections, which can often cause *choke points* for traffic, causing additional response delays. Signal preemption devices, such as *Opticom*™ and other similar systems, have the beneficial effect of recognizing a fire apparatus approaching in emergency mode and can change the signal to green to benefit the flow into the intersection. However, if a turn must be made across traffic lanes, delays can still occur.

A trend has emerged over the last several decades in suburban areas, as well as urban infill developments. In an effort to reduce daily traffic speeds through neighborhoods, these developments have been constructed with traffic calming devices. These include narrow street sections, road humps, speed bumps, and, to a lesser extent, roundabouts. Gated communities force the emergency vehicle to stop to gain access, and are often designed with the aforementioned narrow streets and speed humps. Many developments have limited access points, and make extensive use of cul-de-sacs to limit the connectivity within the neighborhood.

In some cases, this lack of connectivity is further aggravated by numerous small ponds and waterways, which are necessary for proper drainage in developed lowland areas. Although effective for their purpose, all these features can impede an emergency vehicle from responding as quickly as possible and significantly impact the response performance of an otherwise acceptable fire station distribution.

Additionally, limited access highways often require circuitous routes to reach emergency scenes due not having to utilize interchanges but also lack of median crossovers for emergency vehicles.

These obstacles to efficient emergency service response should be kept in mind when new developments or neighborhood plans are reviewed. Accurate time studies should be undertaken to assess the effect before the construction of any of these potential barriers is approved by government authorities.

This page left blank

Future Deployment Strategies

During the course of this study, ESCi has extensively utilized geographic information systems (GIS) software to analyze response times of both apparatus and personnel by modeling this response against the actual roadway network. This process allows us to create and model various deployment strategies with surprising accuracy. In addition, the use of geographic placement of data relating to actual incident service demand allows ESCi to summarize the modeled performance of these deployment strategies with great detail.

In this section, ESCi describes various strategies that can be applied to future deployment based upon projected service demand within the District using benchmark response time standards that BSFCRD seeks to maintain. ESCi began by assessing current deployment and making short term recommendations.

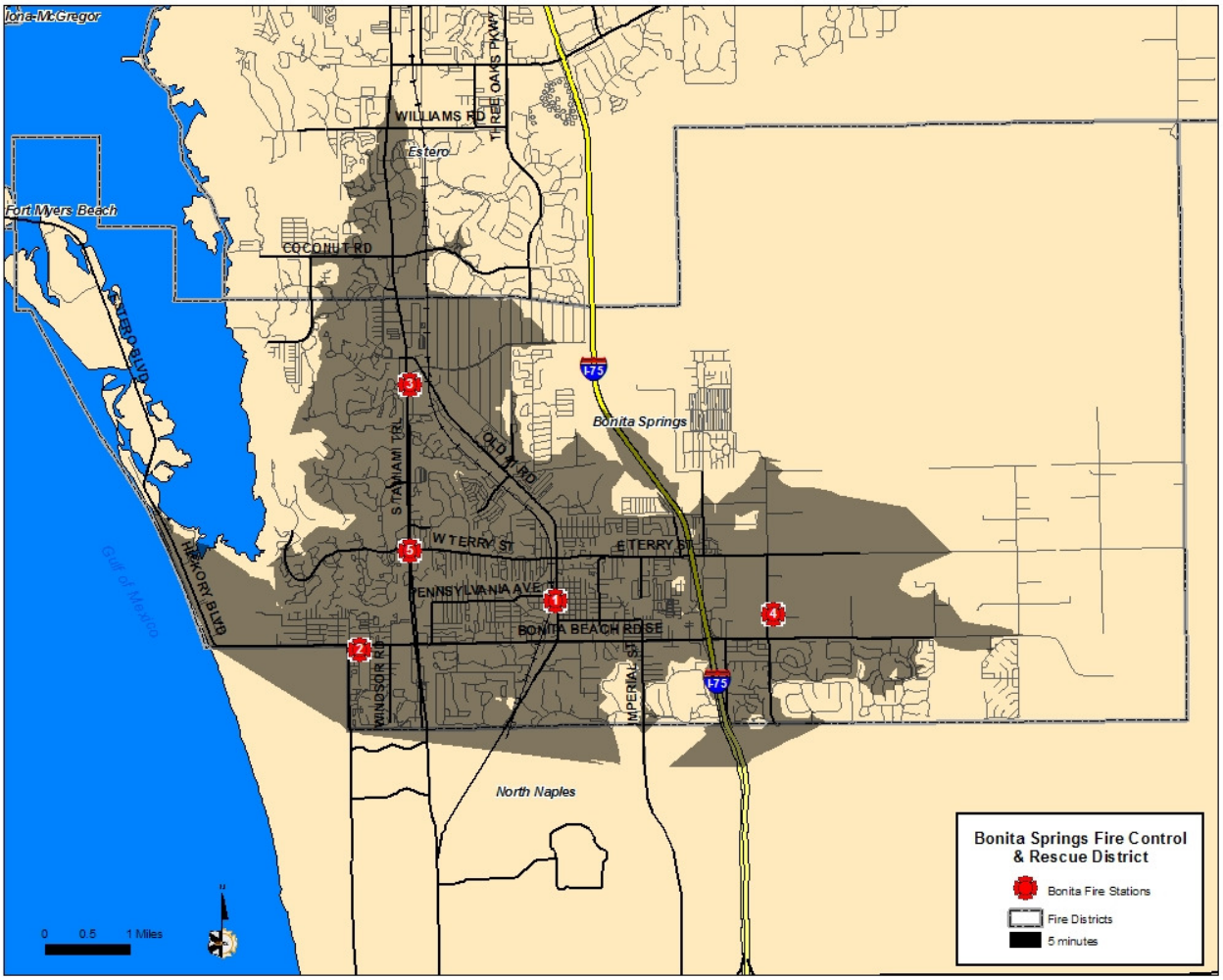
Current Deployment - Future Performance

In the case of BSFCRD, the stated response time goal is for the arrival of the initial emergency unit within six minutes or less to at least 90 percent of all emergency incidents. Therefore, the driving factor in developing facility deployment strategies are projected service demand and its geographic distribution or intensity.

The following table indicates that, under the current deployment, the existing service demand is well covered when modeled for first-due unit response using a five-minute travel time and allowing one minute for firefighter turnout. However, as development within Bonita Springs continues and the population increases, higher service demand can be expected not only in the core of the City of Bonita Springs, but along the southern border and the coastal areas of the District. As this additional service demand develops, the current performance level will not be able to be maintained. The following figure illustrates the six minute response time[21] capability of the existing District station deployment.

[21] Five minute travel plus a one minute turnout.

Figure 66: Six-minute Response Capability from Current Stations



The following table provides performance projections indicating that, if the projected development and population increases continue, the percentage of incidents within six minutes of a responding company would fall from its current level of 88 percent to 80 percent if no changes or improvements were made in apparatus deployment.

Figure 67: Modeled Future Performance Capability of Current Deployment at Six Minutes

Facility Deployment Strategy	Current Service Demand Coverage	Projected Service Demand Coverage
Current Deployment	88.00%	80.00%

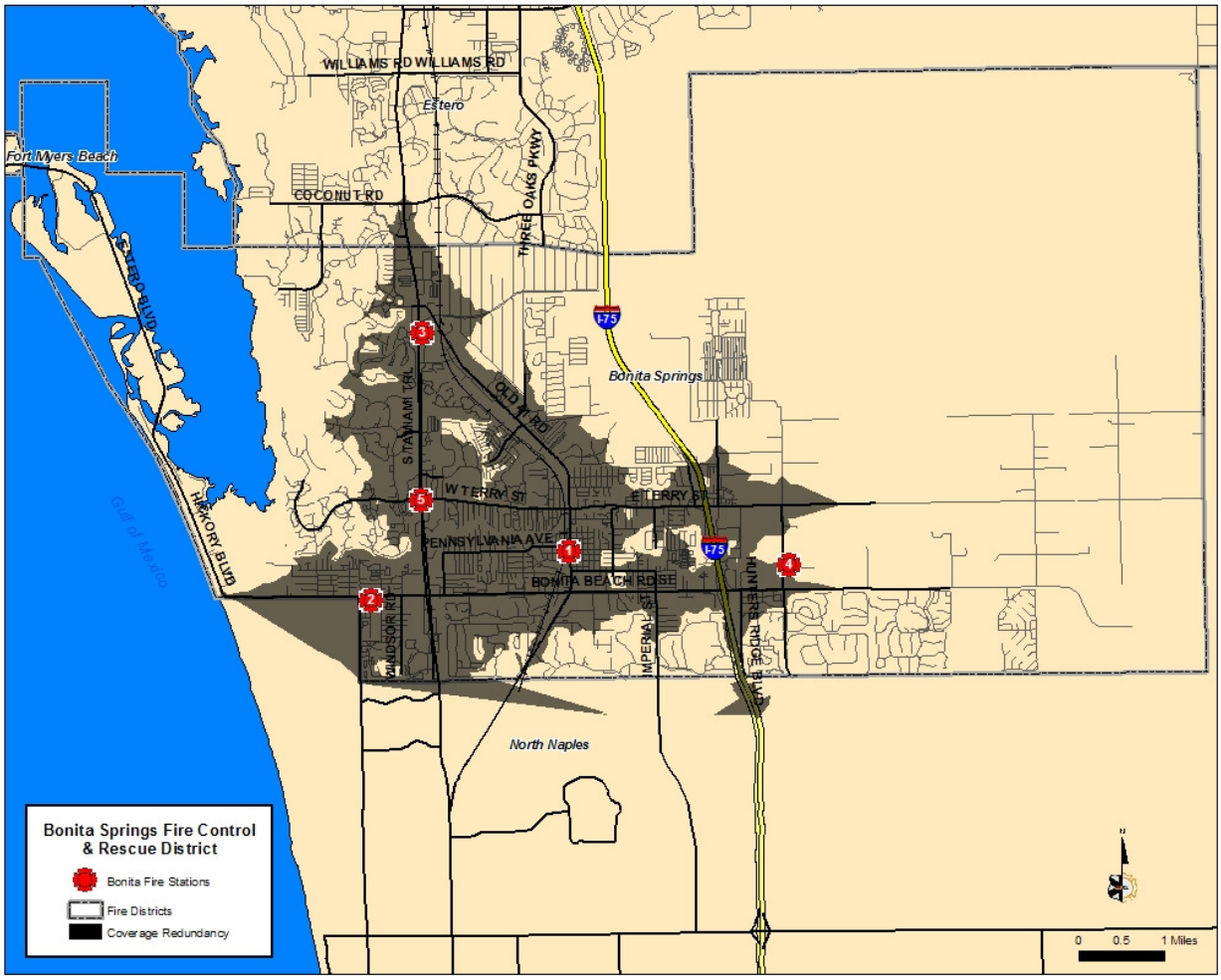
In the following sections, short-term or long-term future deployment strategies are formulated with the intent of developing the best service coverage at or near the specified performance objective within the District.

Redundancy and Overlap

ESCi begins the formulation of facility deployment strategies by reviewing areas where gaps exist in the capability of the system to deliver target level performance. In addition, the analysis examines areas where there is overlap and redundancy in the capability of two or more stations. Resulting deployment strategies are developed in an effort to eliminate service gaps in those areas projected to have high service demands through the relocation of stations or reallocation of specific resources, if possible.

Often, any unnecessary redundancy in coverage by stations located too close together can also be eliminated. However, not all service redundancies or overlap discovered in the distribution analysis are necessarily undesirable. In areas of high service demand or high risk, the probability of resource-intensive incidents, as well as the rate of concurrent incidents, often increases. In such cases, a higher concentration of apparatus in an area can be desirable. The following figure illustrates areas of service redundancy within the district, where more than one station can achieve a six-minute response time, indicating overlap in deployment.

Figure 68: Station Coverage Redundancy/Overlap



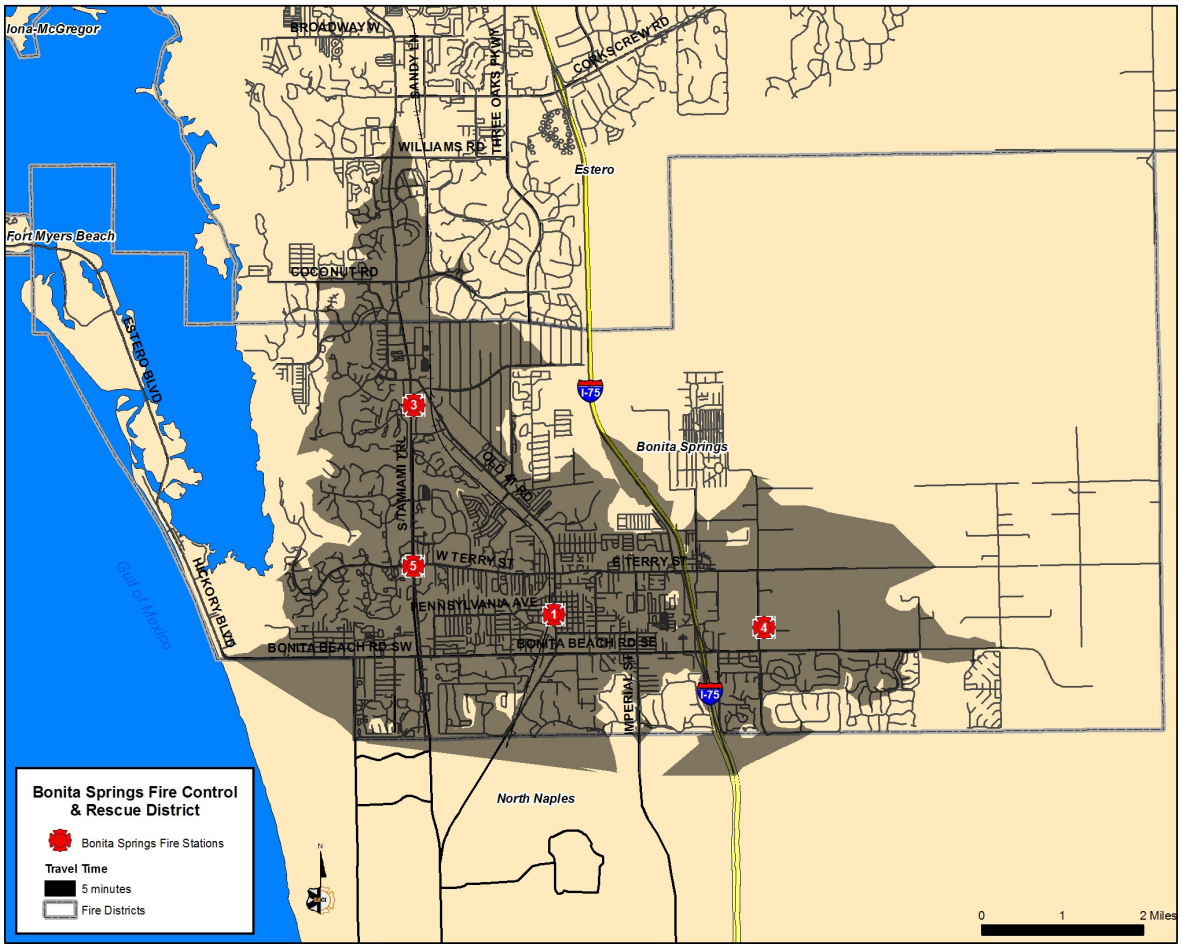
Short-Term Strategy: Close Station Two

The analysis continues by examining the effect on service demand coverage when one or more stations are eliminated from the deployment configuration. This analysis is performed for the areas of most significant service redundancy or overlap, in this case the areas around Stations 1, 2, and 5.

In conducting this analysis, it was found that Station 2 could be eliminated from the deployment configuration by relying on the coverage provided by both Station 1 and Station 5. Elimination of Station 1 would create unacceptable service gaps that would significantly reduce target-level coverage. Station 5 is a well-located facility with an ability to provide coverage to a large area of high intensity service demand.

The following figure illustrates the six-minute response capability from all fire stations except Station 2, utilizing a five-minute travel time.

Figure 69: Six-minute Response Capability without Station 2

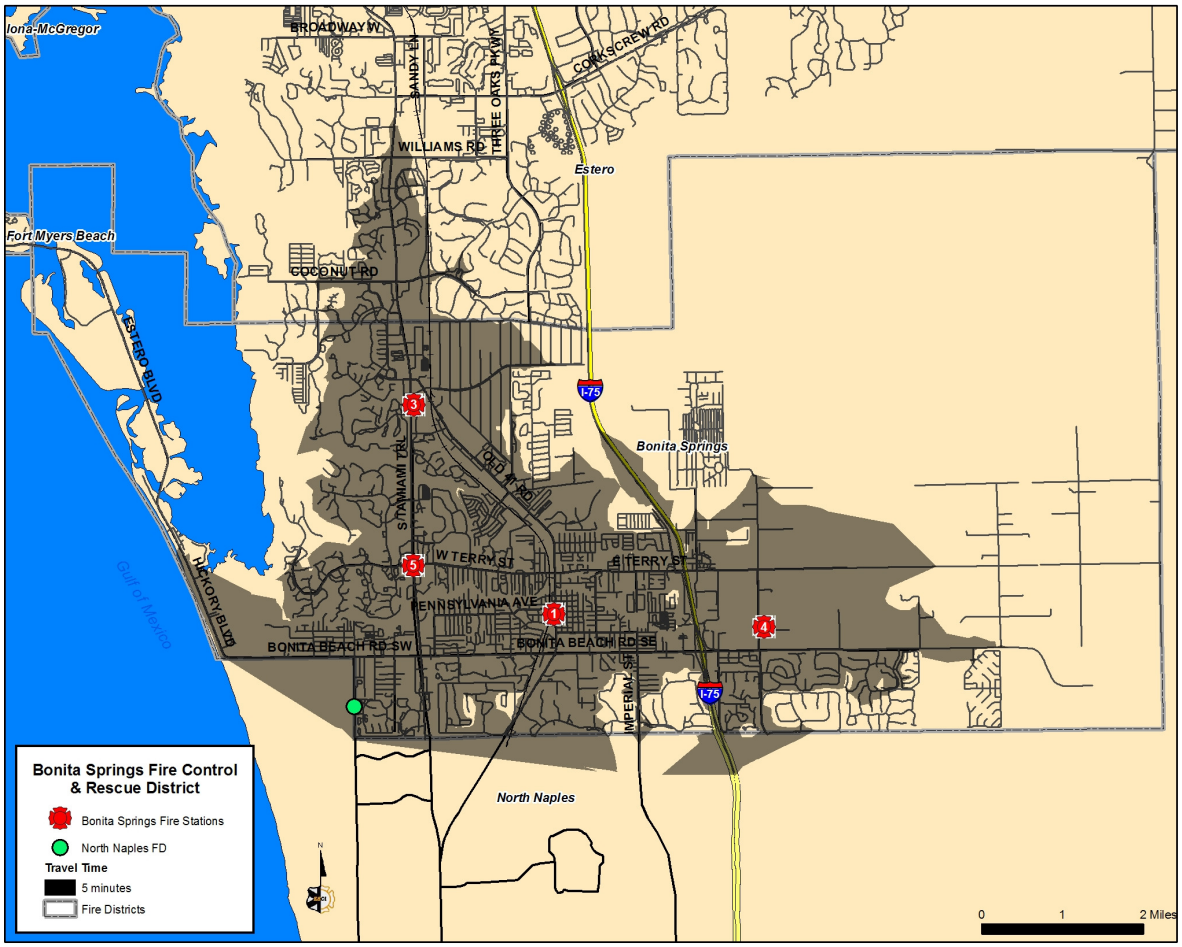


By analyzing the resulting coverage of the District's service demand, a resulting drop of only 2.5 percent in target-level performance is projected. Station 2 is a prime candidate for elimination, due to its poor location on the extreme edge of the District's service area and the addition of the new Station 5.

In addition, Station 2 is within close proximity to a North Naples fire station less than a mile to the south. An automatic aid agreement with North Naples would provide additional coverage in the area formally served by Station 2, with little loss in service demand. The following figure shows the elimination of Station 2's coverage with the North Naples Station assuming initial first-due response in the area through an interlocal agreement (currently North Naples responds

only on structure fires through an existing automatic aid agreement). The analysis illustrates that there is virtually no change in the coverage between this map and the coverage provided by the current five-station deployment shown in Figure 44.

Figure 70: Six-minute Response Capability without Station 2 using North Naples



The projected performance of these four-station deployment strategies is shown in the following table.

Figure 71: Four-Station Deployment Performance Projections

Facility Deployment Strategy	Current Service Demand Coverage	Projected Service Demand Coverage
Current Deployment	88.00%	80.00%
Eliminate 2	86.50%	77.50%
Eliminate 2, NNFD	87.00%	78.90%

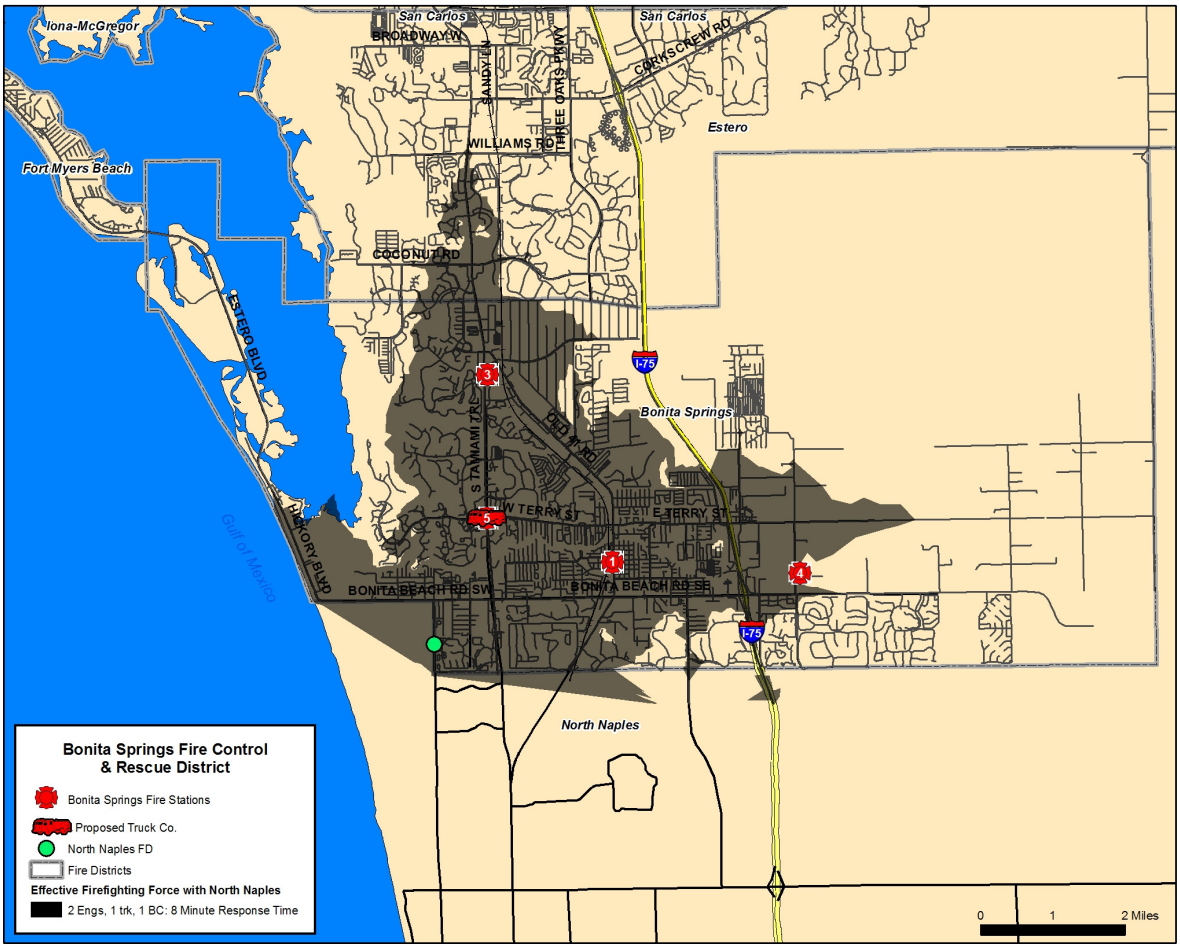
It should be noted, however, that despite the potential cost savings of Station 2's elimination, the projected service demand will not be fully covered at the target performance level of six-minutes or less, 90 percent of the time without additional future station deployment in areas of higher demand or areas where gaps in service are anticipated as discussed earlier.

When considering a reduction in the number of facilities. Maintaining effective distribution of resources is a primary consideration. However, additional consideration must be given to the reduction in the number and type of available resources that currently operate from these facilities. This is because a reduction can affect the concentration of resources in a given system, thus affecting the ability of that system to obtain an effective firefighting force (EFF) within target time objectives.

In the case of Station 2, both an engine and aerial truck operate from the facility. ESCi's analysis indicates that the aerial truck from Station 2 could be relocated to the new Station 5 (upon completion) with a resulting positive effect on the percentage of calls that could receive an effective firefighting force within the eight minute target. Even with the elimination of the engine at Station 2, this improvement would be maintained. The addition of the North Naples station into the structure fire response for that area would further improve the EFF coverage by nearly three percent over current performance.

The following map demonstrates the effective firefighting force eight-minute coverage with Station 2 eliminated, the aerial truck relocated to Station 5, and North Naples providing automatic aid into the lower area.

Figure 72: Effective Firefighting Force Coverage without Station 2



The changes in EFF performance are shown in the following table.

Figure 73: EFF Performance Projections without Station 2

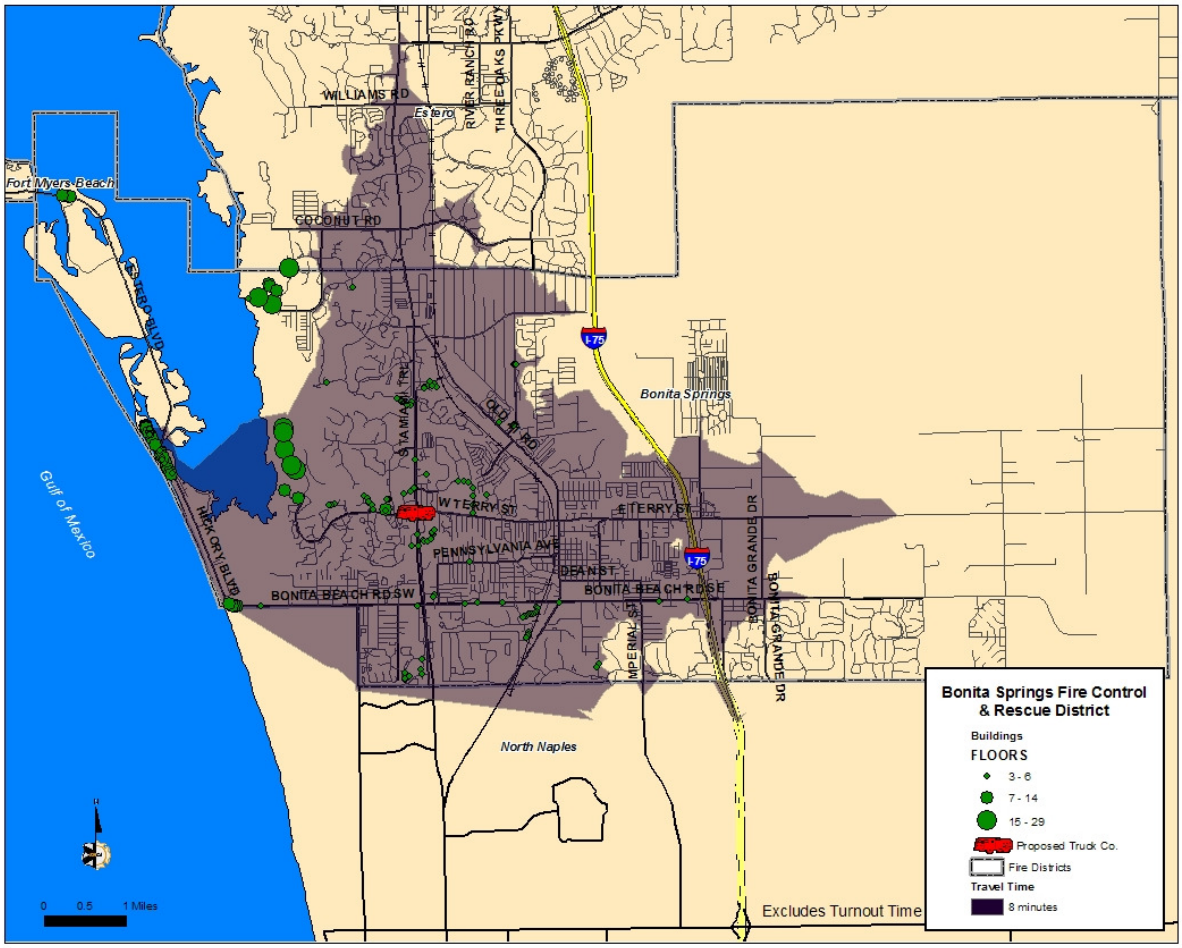
Comparison of Effective Firefighting Force Deployments		
Deployment Description	**Area Coverage**	**Projected Service Demand Coverage**
Current	28.03%	75.96%
Station 2 closed, aerial relocated to Station 5	31.73%	76.81%
Same as above, with North Naples	33.18%	78.38%

Short-Term Strategy: Move Aerial Truck to Station 5

As stated earlier, the single truck company within the District is currently housed in Station 2. Even if it is determined that Station 2 will remain in service, it is recommended that this truck be relocated to the more centrally-located Station 5, which should be constructed to accommodate

this additional company. This single truck company would be able to respond to all of the areas of highest community risk, as well as the majority of the moderate-risk properties. As shown, the central location will improve the response time performance of the effective firefighting force. The result of this relocation also creates adequate truck company coverage that a recommendation for any additional truck companies is avoided. The following figure illustrates the proposed truck company relocation and its response capability of eight minutes (including a one minute turnout) within the fire district.

Figure 74: Proposed Truck Company Deployment Strategy



The relocation of the truck company improves the 2.5 mile ISO coverage as measured by buildings within the fire district that are three stories or higher. There is no degradation in coverage when comparing the location of the truck company between Station 2 and Station 5 as can be summarized in the following table.

Figure 75: Truck Company Location Comparison

	Building Coverage	
Truck Co. Location	ISO 2.5 mile	8 minute Travel
Station 2	26.90%	78.36%
Station 5	40.94%	78.36%
Stn 5 & N. Naples 43	41.52%	85.96%

Additional coverage can be appreciated if the truck company from the North Naples Fire Station 43 (near Station 2) were utilized in an automatic aid agreement to cover additional buildings along the coastline.

Short-Term Strategy Considerations: Facility Relocation Options

Fire departments, municipalities, and districts often seek to place facilities on land that they already own or land that is relatively inexpensive and available. However, the capital cost of a fire station is not nearly as significant as the ongoing cost of its operation. Over the course of twenty or thirty years, a fire station can cost as much as 15 to 20 million dollars when staffing costs are considered. For this reason, poorly located stations are often a bad investment, even if the up-front capital costs seem lower. Therefore, ESCi always considers the benefit of relocating existing resources or facilities that may be in less advantageous locations before any recommendation regarding the addition of new facilities. Though this involves the capital cost of facility construction, it usually results in negligible changes in operational costs because existing resources and staff are being reallocated.

For Bonita Springs, this can be especially difficult in light of newly constructed facilities such as Station 4 that represent significant recent investments. Though it was noted in the previous study performed by ESCi that a station further east should be considered prior to the construction of Station 4, the facility is now complete at its originally proposed site and relocation to the east is unlikely. Stations 3 and 5 are considered good locations for facilities within the District. To relocate them would create service gaps in other areas.

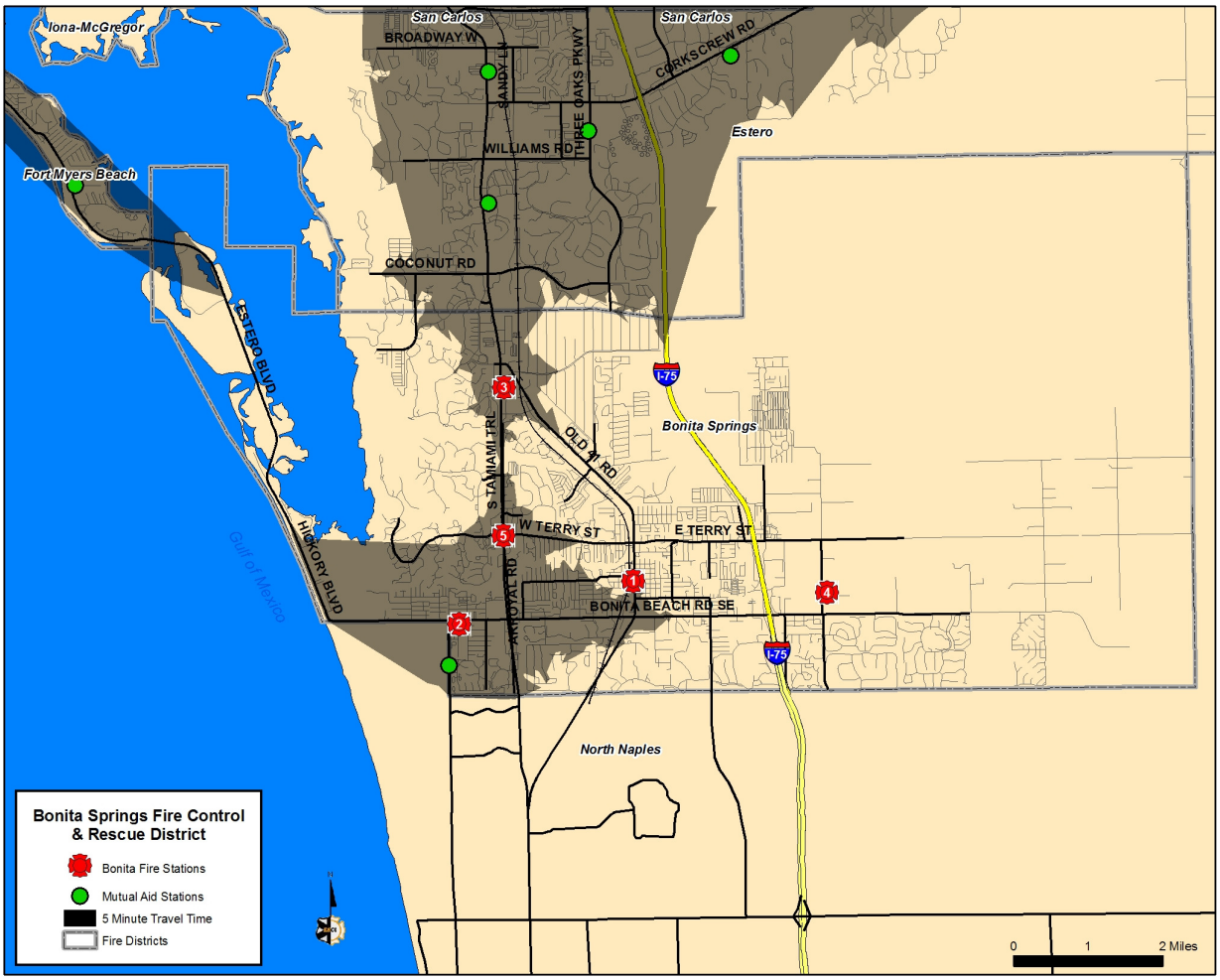
Given the current circumstances, Station 1 is considered to be in an acceptable location. However, coverage could have been improved if Station 1 had been relocated as recommended in the previous report, but only minimally so (less than one percent). That improvement would occur north of the station, since those areas outside of the modeled coverage to the south would continue to be so due to circuitous street layout and limited access. The relocation of Station 1 was primarily recommended for the purpose of permitting Station 4 to move further

east, reducing or eliminating the potential need for a new facility in the far eastern section of the District. Again, with the recent construction of Station 4 and the current reconstruction of Station 1 at its existing site, these potential improvements are far less viable options. As a result of these analyses, no further relocation of existing facilities is recommended at this time.

Short-Term Strategy Considerations: Automatic Aid

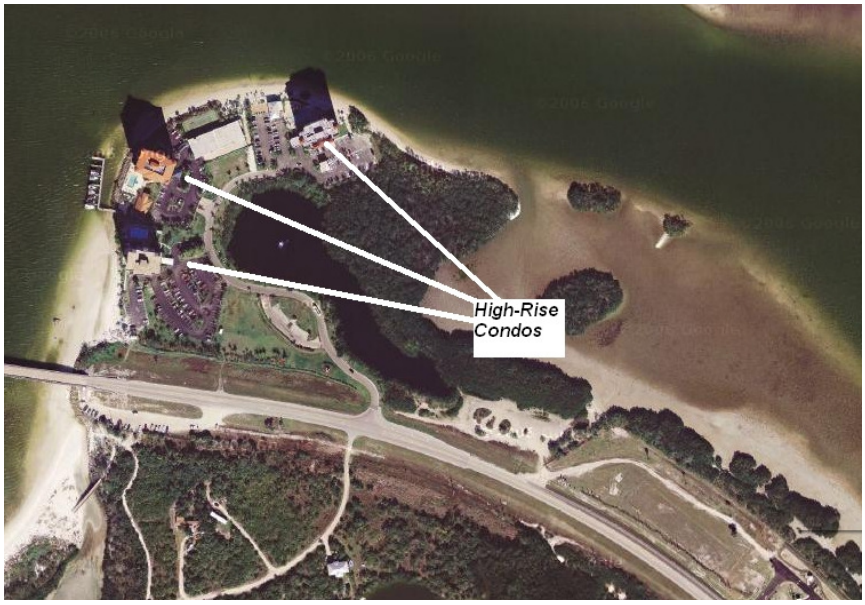
In addition to relocation, the capability of mutual aid departments such as North Naples, Estero, and Fort Myers Beach were considered in the event that their existing stations may be able to offer BSFCRD service demand coverage within the stated response goal. The following map demonstrates the six-minute response capability of all neighboring fire stations in the Bonita Springs area.

Figure 76: Mutual Aid Six-minute Response Areas



The ability of North Naples to provide coverage in the area around Bonita Station 2 has already been discussed. A recommendation is included in this report to close BSFCRD Station 2 and use North Naples for the remaining small areas to which it would be closer. Most of the District that is within six minutes of an Estero station is already within Bonita's coverage as well and no significant advantage in *response time performance capability* is seen by the first-due agreement that exists with that agency. However, the Fort Myers Beach station planned for Lennel Road and Estero Boulevard could provide six minute coverage into the extreme northern end of the beach area, where several target risks in the form of high-rise condominium projects have been built, as shown in the following photograph.

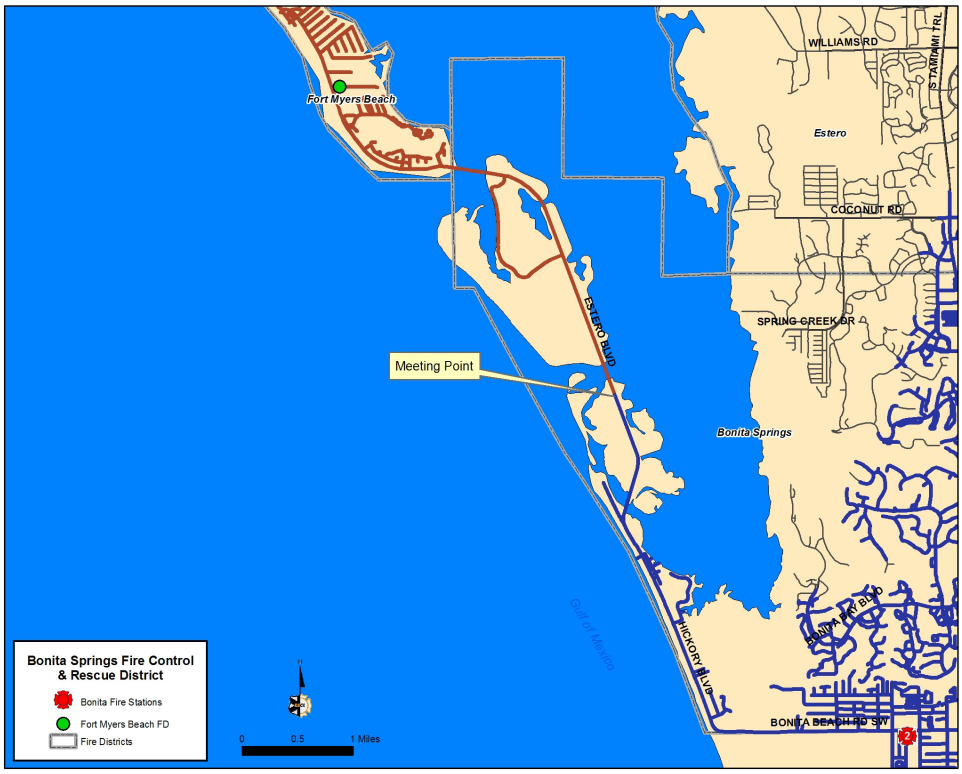
Figure 77: Development at North End of Estero Boulevard



Given the absence of any Bonita station along the beach area, ESCi recommends that BSFCRD initiate discussions with the Fort Myers Beach Fire Control District to establish an interlocal agreement for first-due response from the new Fort Myers Beach station to those areas of the Estero Boulevard beach strand to which their unit would be closest response. This agreement should continue in place until such time as BSFCRD places a station in service along the beach area on Estero Boulevard. Analysis indicates that this agreement would improve the projected performance of the current deployment of BSFCRD without Station 2 to 79.7 percent of service demand, an improvement of 1.3 percent.

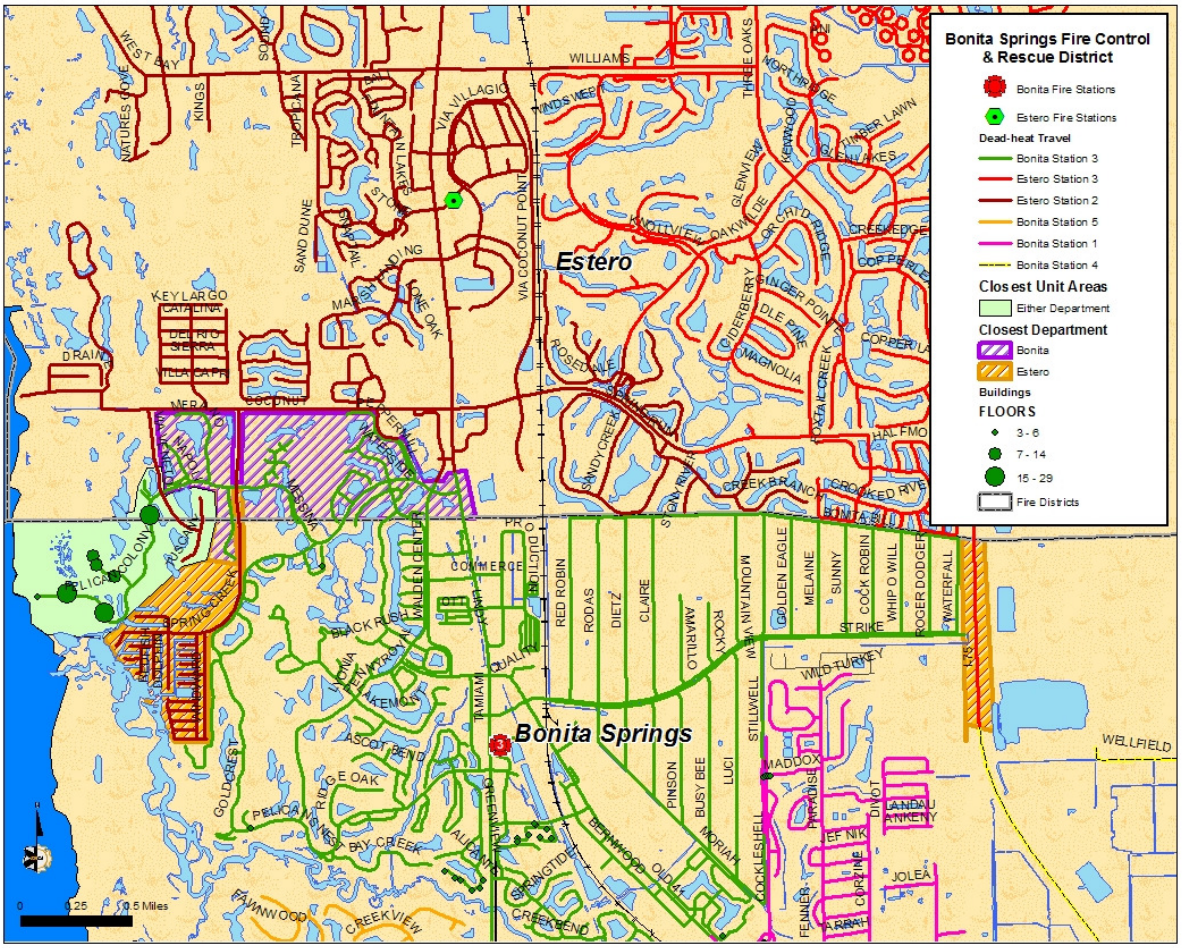
The following map in Figure 76 provides the response time model that indicates where this *closest unit response* boundary should be established.

Figure 78: Fort Myers Beach *Closest Unit Response* Boundary



Although a first due automatic aid agreement exists with the Estero Fire District for the Farm Worker's Village neighborhood in the extreme northeast corner of the district, this agreement should be revisited and expanded based upon the following analysis. The travel time model was utilized in the following figure to determine which station's apparatus would be able to respond into an area if they were dispatched simultaneously. In addition, this model also determines where these two apparatus would meet in a 'dead heat' run against each other. Each apparatus' paths are color-coded to reflect from which station they had responded from. In addition, areas in which a unit is able to respond to quicker outside of it's current district boundaries have been uniquely shaded to reflect which department it has originated from. This may be utilized to adjust response borders or establish automatic aid response agreements.

Figure 79: Estero Closest Unit Response Boundary



There are areas in which Bonita Springs Fire Units are able to reach in the Estero Fire District quicker (Purple Hashed Areas), while there are also areas in which Estero Fire Units would be able to respond into the Bonita district faster (Orange hashed areas). The Estero Fire Unit from Estero Station 3 can access southbound I-75 from Corkscrew Road and able to be the first on the scene for incidents until it reaches the point on the map. There were two median crossings on aerial photography between the Estero and the Bonita interchanges. If these are not maintained, then Estero's quicker response extends to the Bonita interchange. Conversely, the Bonita Springs Fire Unit from Station 4 has quicker northbound access until the median crossing near the current end of Southern Pines Drive. If the median has been removed, Bonita's quicker response extends to the Estero interchange.

Where the closest unit response boundaries intertwine near Pelican Colony Blvd. and Spring Creek Road is due to several factors. One is the lack of street connectivity between these

neighborhoods which allows an out of district unit into the area faster than the one primarily assigned. The may be due to a physical barrier such as a river, pond, forestry which hasn't been mitigated to allow for a connection, or simply due to the desire of cul-de-sac development by residents and developers. These developments, however limiting to emergency services, are ultimately approved by local government which bears the burden of providing adequate services. In one case in particular, the Spring Creek Road bridge over Pelican Colony Blvd. lacks an interchange which would allow for access between these roads. The result is that an Estero Fire Unit is able to access the "Spring Creek" neighborhood quicker than a Bonita Springs Fire Unit. Coincidentally both units arrive at the Via Veneto traffic circle with Pelican Colony Blvd. at the same time, which allows the light green shaded area in the figure to be serviced by either department. The reason the streets are shaded differently is that the model will defer to the apparatus which does not have to negotiate a turn for which it is assessed a time penalty.

The *First-Due Automatic Aid Agreements* analyzed in this strategy differ from the current mutual aid used by BSFCRD in that it would call for a neighboring community's resources to be dispatched as the first-due response unit to all incidents within the defined area, including EMS calls. In essence, the resource would deploy as if it were one of BSFCRD's own companies and would operate independently until arrival of the District's own resources. Under the current agreements, neighboring resources are dispatched only on specific types of fire calls and are intended to complement the resources of BSFCRD on incidents involving higher risk occupancies and structures.

Like standard mutual aid agreements, First-Due Automatic Aid Agreements are often able to be negotiated as reciprocal agreements without a direct payment for services. This occurs when the department receiving the services is able to reciprocate by providing similar first-due response of resources that it has that might benefit its neighbors. However, the agreements may, in certain instances, require other contractual exchanges for first-due services when these services are not found to be reciprocal. However, many communities enter such agreements and base any eventual financing on analysis of historical response data.

This *closest unit response* concept is common in the fire service in many areas of the country and is used successfully to allow communities to develop deployment strategies that avoid too much redundancy and overlap in available services while sharing some costs.

Short-Term Strategy Considerations: Street Connectivity

Another method employed to avoid unnecessary facility construction is to evaluate areas where the lack of street connectivity prohibits emergency response by forcing apparatus to make circuitous routes to reach areas of high service demand. The lack of street connectivity results in a higher response time performance often followed by a predictable failure to reach the 90 percent service demand coverage target and, thus, the consideration of additional stations.

As discussed previously, Florida topography has many small natural or manmade ponds and requires an engineered canal system for storm water run-off. These ponds, inlets, bays, marshes, and canals act as physical barriers to street connectivity. Additional barriers discussed previously, such as gated communities and cul-de-sac residential development contribute to the problem.

A case in point is a cluster of predicted high service demand in a neighborhood west of Station 3 off Spring Creek Road. Though relatively close *as the crow flies*, an apparatus from Station 3 would not be able to reach this area (which will contain an estimated 4.1 percent of the total projected call volume) within the stated six-minute response time objective, primarily due to the extended route that it must take to get there from Station 3. However, any direct extension from Lakemont to Spring Creek Road would traverse through a golf course. It is questionable whether a fire access road would be approved through the center of a popular golf course. The result of this development plan approval, with its lack of connectivity for emergency response vehicles, is the alternative of an expensive fire station on Spring Creek Road that will be limited in its ability to service anything other than this specific area and its four percent of district-wide call volume.

The Bonita Golf & Country Club neighborhood east of Station 3 and west of the interstate, currently illustrated as outside of Station 3's target response time coverage (see figure 69), could be served better if an extension into this area from Strike Lane to near Paradise Road were constructed, although this would yield less than one percent of additional projected service demand coverage. Other individual areas of service demand outside of current station coverage average about 1.5 percent of total service demand each and are pocketed throughout the District. No individual station locations will collectively service the bulk of these gaps, many of which are issues of street connectivity, rather than geographic land mass.

The only current exception is the coastal area which, as explained in the previous report by ESCi, extends beyond the reach of existing facility coverage, but contains more significant percentages of overall district service demand. In addition, coverage of any future development in the eastern portions of the District will not be solved by street connectivity, due to extended distances from existing facilities.

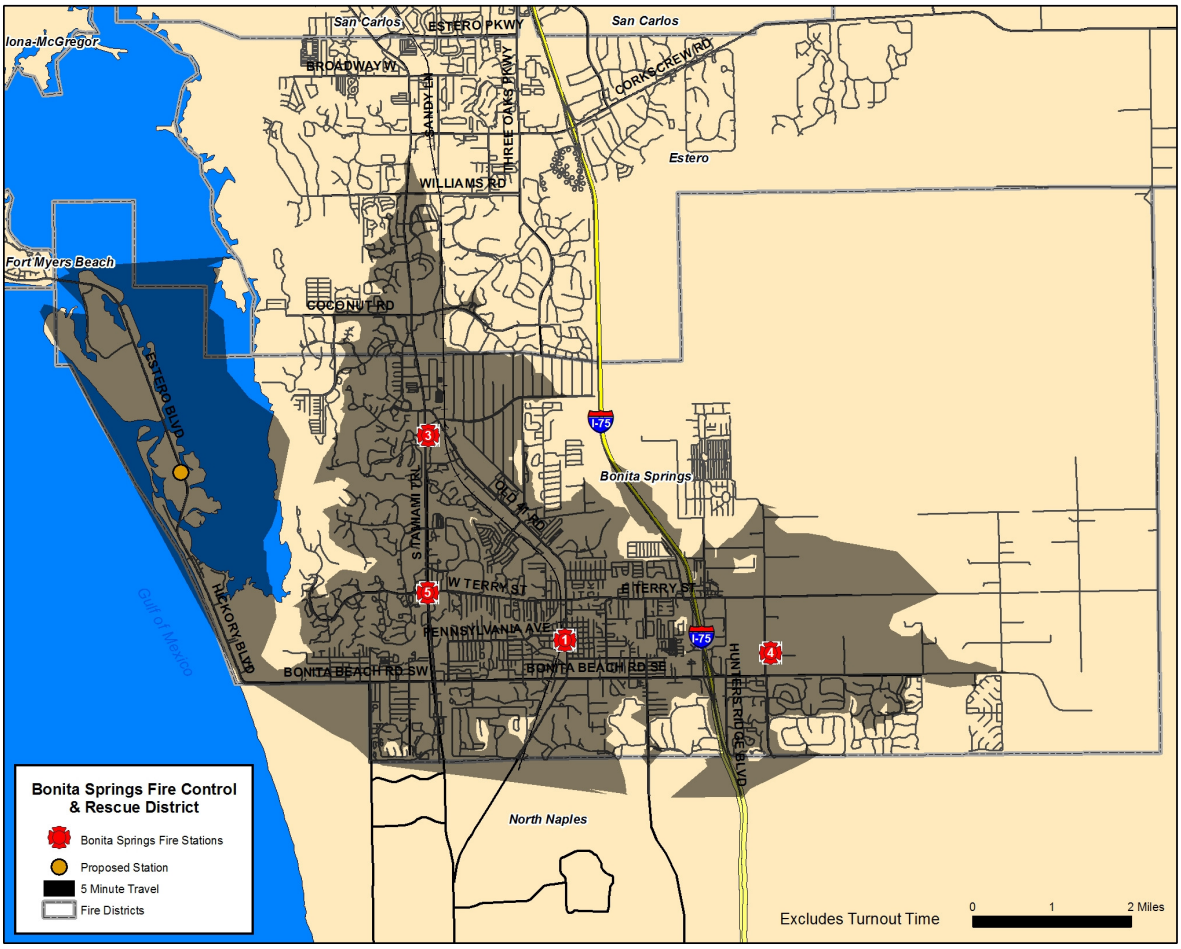
Given that relocation options that would avoid additional facility construction were extensively analyzed, the following strategies for future facility deployment configurations are offered.

Long-Term Deployment Strategy A – Coastal Fire Station

Close Station 2, others remain; new station constructed on coastal Estero Boulevard; automatic aid with North Naples.

The coastal region of the District offers unique challenge to the deployment of fire protection and rescue services. Limited access leaves the area well outside the six-minute response capability, despite the fact that it is one of Bonita Springs' most sought after tourist destinations and an area of intense land use. A new station located on the main coastal roadway, as shown in the following figure, would provide target-level response coverage from one end of the coastal strand to the other. This would leave no lapse in target-level coverage, especially when combined with automatic aid from the North Naples Station. The following figure illustrates the recommended coastal region station location and its six-minute response capability in relation to the other stations. Station 2 and North Naples Fire Department response capability are not shown in this figure.

Figure 80: Long-Term Deployment Strategy A - Coastal Station Added



Strategy A Projected Performance

This deployment strategy demonstrates a significant improvement in projected target-level service performance when compared to the current deployment system. Performance models for the strategy, along with comparison figures of the current levels of response time capability experienced by the community, are provided. Performance projections are shown for the amount of the District's road miles covered within the six-minute target response time, a good indication of overall geographic coverage. Performance projections are also shown for the amount of the projected emergency incidents covered within the target response time, a good indication of service demand coverage.

Figure 81: Strategy A Performance Analysis

Facility Deployment Strategy	Current Service Demand Coverage	Projected Service Demand Coverage	Road Coverage
Current Deployment	88.00%	80.00%	67.40%
Eliminate 2, Add Coastal Stn	90.60%	86.00%	68.40%

As can be seen in the table, response time performance would be at or below six minutes for about 86 percent of all incidents. This still would not fully achieve the target objective of six minutes or less to at least 90 percent of the incidents, but is significantly closer than the current deployment.

Strategy A Cost Projections

This deployment plan calls for the closing of one station, continuing use of the remaining four existing stations, and the construction of one new station. For purposes of cost projection, ESCi used the following additional assumptions:

- The new fire station is estimated at 10,500 square feet. This includes three-drive-through bays and living space for up to ten personnel. Cost is estimated at $206.86 per square foot,[22] plus seven percent for design fees and $1,000,000 for land acquisition and site preparation on an estimated 1.5 acres.
- The new fire station would require at least one engine company with three personnel on duty, 24 hours per day. All staffing costs[23] are estimated at $97,875 annually for each firefighter[24] and $131,731 for each lieutenant.[24] Any new engine company consists of one lieutenant and two firefighters per shift. Additional FTE's are added to accommodate the need to fill in for vacation and leave time at an estimated 30 percent leave ratio. A total of 3.9 lieutenants and 7.8 firefighters are included in this strategy cost projections. It should be noted that there would also be some initial costs at hiring for new equipment, uniforms, and training.
- Annual operating costs for new facilities (maintenance, supplies, and utilities only) are estimated at $3.00 per square foot.

[22] Square footage costs are detailed in the station cost addendum of this report and are derived from the D4 Cost Estimating System produced by DCD "Design Cost Data Magazine".
[23] All staffing costs include city pension and benefit contributions, worker's comp, and disability insurance.
[24] Amount used was average cost of all existing positions in the classification.

- Although some redistribution of existing apparatus may occur, additional apparatus would be needed to meet the proposed number of fire stations. One new engine is estimated at $385,000.[25]

The following table projects capital and operating costs for Strategy A without any calculation for savings from the closing of Station 2, or any residual value received for the surplus of that facility. These costs are in addition to current operating costs of the department and, thus, would represent new funds needed to support the strategy, were Station 2's closing to be delayed. The capital and operating cost projections from Station 2's closing are shown in the strategy summary table later in this report.

Figure 82: Cost Projections - Strategy A

Strategy "A" Capital Costs	
Coastal Station Construction	$ 3,324,067
Apparatus Additions	$ 385,000
TOTAL CAPITAL COSTS	**$ 3,709,067**
Strategy Annual Operating Cost Increases	
Annual Staffing	$ 1,277,178
Annual Operating Costs	$ 31,500
TOTAL ANNUAL OPERATING COSTS	**$ 1,308,678**

Long-Term Deployment Strategy B – Spring Creek Station

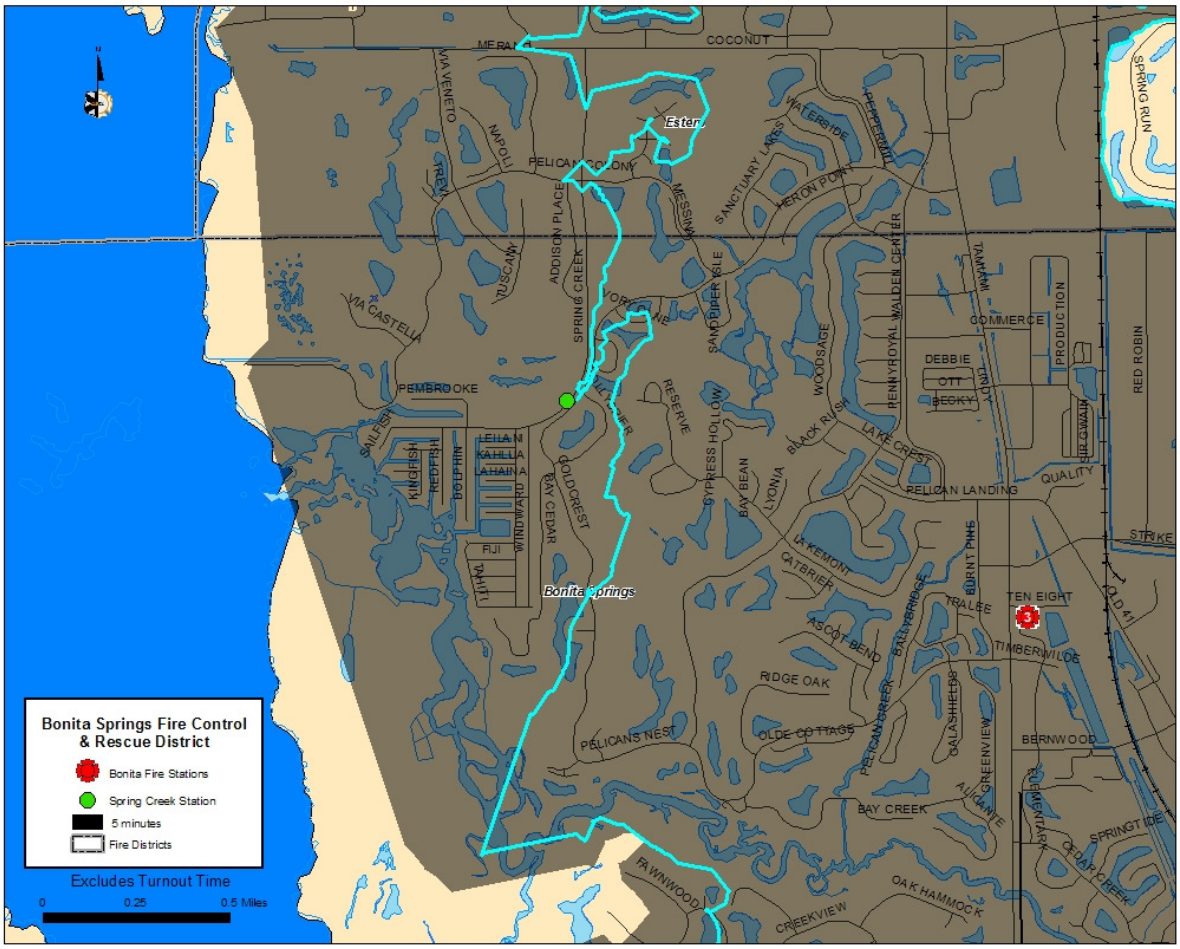
Close Station 2, others remain; add coastal fire station and substation near Spring Creek Road.

The Spring Creek Station near the 24000 block would be necessary in order to serve the area of high demand that is currently inaccessible within five minutes of travel time, particularly given the low probability of any extension of Lakemont Road. The following figure demonstrates this deployment strategy. The best advantage for this substation would be experienced by the addition of an emergency access road from Spring Creek Road to Goldcrest Drive near Hollybriar Lane, as displayed in the following figure. All street segments within a five-minute

[25] If Station 2 is closed, as recommended, the engine from that Station could be reallocated to the new station, eliminating this capital cost.

modeled travel time of a BSFCRD fire station are shown with grey overlays to provide graphic depiction of immediate service areas. The highlighted blue line indicates Station 3's travel time extent currently.

Figure 83: Deployment Strategy B - Spring Creek Substation



Strategy B Projected Performance

This deployment strategy demonstrates an improvement in projected target-level service performance when compared to the current deployment system. Performance models for the strategy, along with comparison figures of the current levels of response time capability experienced by the community, are shown in the following table.

Figure 84: Strategy B Performance Analysis

Strategy ID	Facility Deployment Strategy	Current Service Demand Coverage	Projected Service Demand Coverage	Road Coverage
	Current Deployment	88.00%	80.00%	67.40%
A	Eliminate 2, Add Coastal Stn	90.60%	86.00%	68.40%
B	Eliminate 2, Add Coastal & Spring Creek	90.90%	90.10%	70.72%

As can be seen in the table, travel time performance would be at or below six minutes for about 90 percent of all incidents. This would meet the target response time objective of six minutes or less to at least 90 percent of the incidents utilizing five minutes for travel and one minute for firefighter turnout.

Strategy B Cost Projections

This deployment plan also calls for the closing of one station, continuing use of the remaining four existing stations, and the construction of two new stations. For purposes of cost projection, the following additional assumptions were used:

- The new fire station is estimated at 10,500 square feet. This includes three-drive-through bays and living space for up to ten personnel. Cost is estimated at $206.86 per square foot,[26] plus seven percent for design fees and $1,000,000 for land acquisition and site preparation on an estimated 1.5 acres.
- Each new fire station would require at least one engine company with three personnel on duty 24 hours per day. All staffing costs[27] are estimated at $97,875 annually for each firefighter[28] and $131,731 for each lieutenant.[24] Any new engine company consists of one lieutenant and two firefighters per shift. Additional FTE's are added to accommodate the need to fill in for vacation and leave time at an estimated 30 percent leave ratio. A total of 7.8 lieutenants and 15.6 firefighters are included in this strategy cost projections. It should be noted that there would also be some initial costs at hiring for new equipment, uniforms, and training.
- Annual operating costs for new facilities (maintenance, supplies, and utilities only) are estimated at $3.00 per square foot.

[26] Square footage costs are detailed in the station cost addendum of this report and are derived from the D4 Cost Estimating System produced by DCD "Design Cost Data Magazine".
[27] All staffing costs include city pension and benefit contributions, worker's comp., and disability insurance.
[28] Amount used was average cost of all existing positions in the classification.

- Although some redistribution of existing apparatus may occur, additional apparatus would be needed to meet the proposed number of fire stations. Two new engines are estimated at $385,000.[29]

The following table projects capital and operating costs for Strategy B without any calculation for savings from the closing of Station 2, or any residual value received for the surplus of that facility. These costs are in addition to current operating costs of the department and, thus, would represent new funds needed to support the strategy, were Station 2's closing to be delayed. The capital and operating cost projections from Station 2's closing are shown in the strategy summary table later in this report.

Figure 85: Cost Projections - Strategy B

Strategy "B" Capital Costs	
Coastal Station Construction	$ 3,324,067
Spring Creek Station Construction	$ 3,324,067
Apparatus Additions	$ 770,000
TOTAL CAPITAL COSTS	**$ 7,418,134**
Strategy Annual Operating Cost Increases	
Annual Staffing	$ 2,554,356
Annual Operating Costs	$ 63,000
TOTAL ANNUAL OPERATING COSTS	**$ 2,617,356**

Long-Term Deployment Strategy C – East Bonita Station

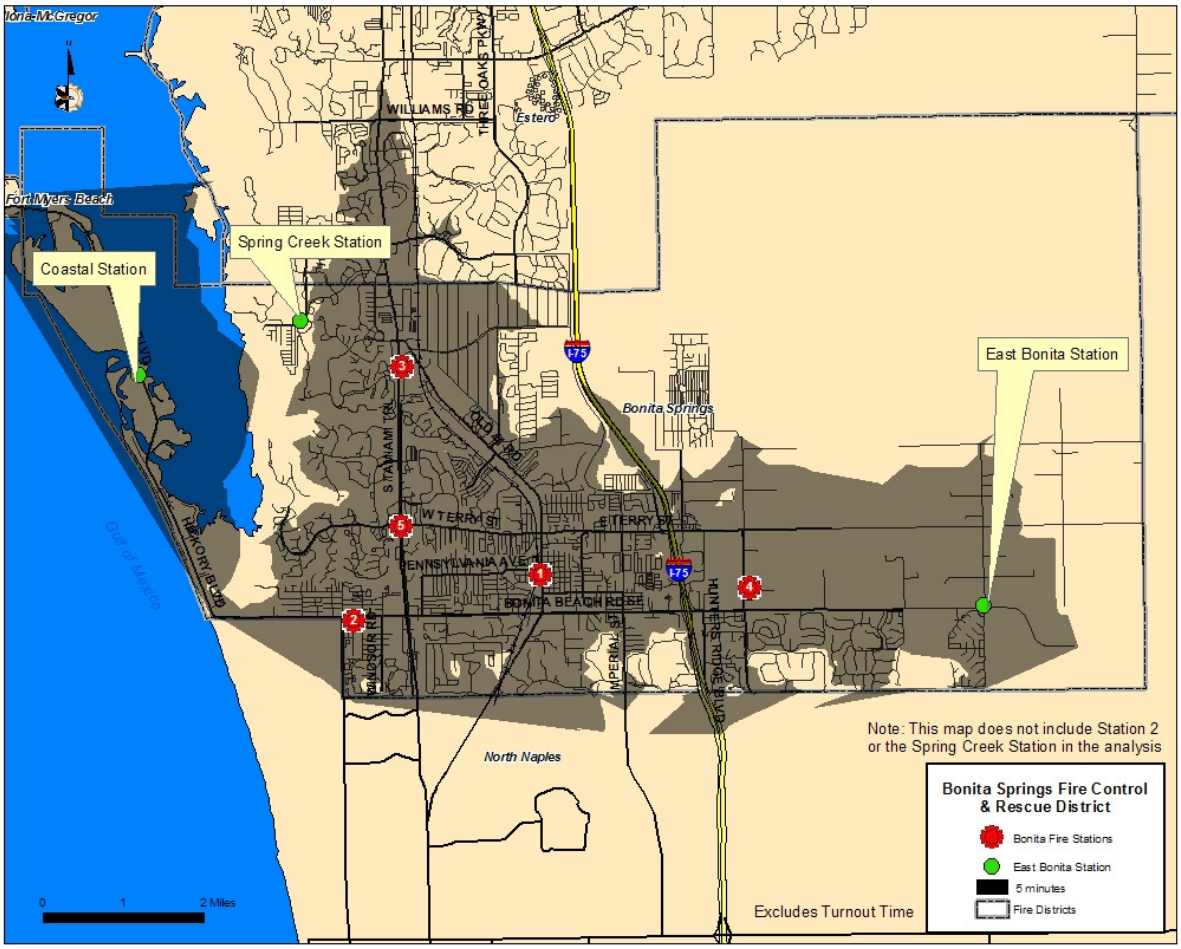
Close Station 2, others remain; add Coastal Station and Eastern Bonita Station

An optional strategy would be to build a station east of Station 4 to improve the projected coverage beyond that found in Strategy A to those areas that hold potential for future development in the far eastern sections of the District. Some portions of this area are zoned for continued development, but much of it is beyond the reach of Station 4's target response time capability. The new station is proposed in the vicinity of **Bonita Beach Road and Vincent Road** on the east side of the District.

[29] If Station 2 is closed, as recommended, the engine from that station could be reallocated to one of the new stations, eliminating the capital cost of one engine.

The following figure demonstrates this deployment strategy. All street segments within a five-minute modeled travel time of a BSFCRD fire station are shown with gray overlays to provide graphic depiction of immediate service areas. For purposes of this analysis, the substation on Spring Creek Road is not activated.

Figure 86: Deployment Strategy C - East Bonita Station



Strategy C Projected Performance

This deployment strategy demonstrates a modest improvement in projected target-level service performance when compared to Strategy A. Performance models for the strategy, along with comparison figures of the current levels of response time capability experienced by the community, are shown in the following table. Performance projections are shown for the amount of the District's road miles covered within the target response time, a good indication of overall geographic coverage. Performance projections are also shown for the amount of the District's

emergency incidents covered within the target response time, a good indication of current service demand coverage.

Figure 87: Strategy C Performance Analysis

Strategy ID	Facility Deployment Strategy	Current Service Demand Coverage	Projected Service Demand Coverage	Road Coverage
	Current Deployment	88.00%	80.00%	67.40%
A	Eliminate 2, Add Coastal Stn	90.60%	86.00%	68.40%
B	Eliminate 2, Add Coastal & Spring Creek	90.90%	90.10%	70.72%
C	Eliminate 2, Add Coastal & East Bonita	89.69%	87.80%	74.00%

As can be seen in the table, response time performance (turnout plus travel time) would be at or below six minutes for about 88 percent of projected service demand. This falls short of the target objective of six minutes or less to at least 90 percent of the incidents. However, this strategy covers the most road mileage, providing some indication of its ability to handle additional future development. It is possible that the target performance would be reached with this deployment strategy if additional efforts were employed, such as reduced call processing or turnout time, traffic delay mitigation, increased street connectivity, or alternate management of peak service users.

Strategy C Cost Projections

This deployment plan also calls for the closing of one station, continuing use of the remaining four existing stations, and the construction of two new stations. For this reason, the cost projections are identical to Strategy B, but will be restated for consistency of presentation. For purposes of cost projection, ESCi used the following additional assumptions:

- The new fire station is estimated at 10,500 square feet. This includes three-drive-through bays and living space for up to ten personnel. Cost is estimated at $206.86 per square foot,[30] plus seven percent for design fees and $1,000,000 for land acquisition and site preparation on an estimated 1.5 acres.
- Each new fire station would require at least one engine company with three personnel on duty 24 hours per day. All staffing costs[31] are estimated at $97,875 annually for each firefighter[32] and $131,731 for each lieutenant[24]. Any new engine company consists of one

[30] Square footage costs are detailed in the station cost addendum of this report and are derived from the D4 Cost Estimating System produced by DCD "Design Cost Data Magazine".
[31] All staffing costs include city pension and benefit contributions, worker's comp, and disability insurance.
[32] Amount used was average cost of all existing positions in the classification.

lieutenant and two firefighters per shift. Additional FTE's are added to accommodate the need to fill in for vacation and leave time at an estimated 30 percent leave ratio. A total of 7.8 lieutenants and 15.6 firefighters are included in this strategy's cost projections. It should be noted that there would also be some initial costs at hiring for new equipment, uniforms, and training.

- Annual operating costs for new facilities (maintenance, supplies, and utilities only) are estimated at $3.00 per square foot.
- Although some redistribution of existing apparatus may occur, additional apparatus would be needed to meet the proposed number of fire stations. Two new engines are estimated at $385,000.[33]

The following table projects capital and operating costs for Strategy C without any calculation for savings from the closing of Station 2 or any residual value received for the surplus of that facility. These costs are in addition to current operating costs of the department and, thus, would represent new funds needed to support the strategy, were Station 2's closing to be delayed. The capital and operating cost projections from Station 2's closing are shown in the strategy summary table later in this report.

Figure 88: Cost Projections - Strategy C

Strategy "C" Capital Costs	
Coastal Station Construction	$ 3,324,067
East Bonita Station Construction	$ 3,324,067
Apparatus Additions	$ 770,000
TOTAL CAPITAL COSTS	**$ 7,418,134**
Strategy Annual Operating Cost Increases	
Annual Staffing	$ 2,554,356
Annual Operating Costs	$ 63,000
TOTAL ANNUAL OPERATING COSTS	**$ 2,617,356**

[33] If Station 2 is closed, as recommended, the engine from that Station could be reallocated to one of the new stations, eliminating the capital cost of one engine.

Findings and Conclusions

In both the short and long-range future, the Bonita Springs Fire Control and Rescue District will be unable to reach a response time performance objective for first-due company response time of six minutes or less to 90 percent of emergency calls through continued use of its existing deployment scheme. BSFCRD can reach some improved levels of emergency service delivery through the adoption of a new deployment strategy, options for which are provided in this report.

The following is a summary of significant findings of the report:

- In the short-term, the BSFCRD can achieve response time performance and effective firefighting force assembly performance that is nearly identical to the current performance by closing Station 2 and relocating the aerial unit from Station 2 to Station 5. This represents an opportunity for cost savings for BSFCRD.
- In the short-term, BSFCRD can benefit from the addition of automatic aid agreements to accommodate all areas that are closer to a North Naples or Fort Myers Beach station, particularly on the northern end of the beach area along Estero Boulevard. This will improve target response time performance by nearly two percent.
- A cluster of significant service demand will likely develop in the Spring Creek area, where street connectivity will impede target response time performance from any existing station. Seclusion features planned by this community resulted in this condition. Target response time service to this cluster of demand would require an additional station there.
- Existing demand does not warrant an additional station in the eastern area of the District, however long-range planning indicates there is a potential for sufficient demand in the future to warrant such a facility.
- The summary of response time performance projections and projected cost for each of the major deployment strategies provided in this report is shown in the figure below.

Figure 89: Deployment Strategy Performance and Cost Summary

Strategy Summary- Performance and Cost Projections				
Deployment Strategy	Percent of Road Miles <6:00	Percent of Service Demand <6:00	Capital Cost Projections	Annual Operating Cost Change
Current Facility Deployment	67%	80%		
Short-Term Strategy-Close Station 2, use auto aid	67%	80%	Surplus Value Unknown	$ (1,013,944)
Deployment Strategy "A"	68%	86%	$ 3,709,067	$ 1,308,678
Deployment Strategy "B"	71%	90%	$ 7,418,134	$ 2,617,356
Deployment Strategy "C"	74%	88%	$ 7,418,134	$ 2,617,356

Of the deployment strategies provided, only Strategy B provides projected performance at the 90th percentile, as requested by BSFCRD. This is because of the new station specifically targeted at the secluded neighborhood area around Spring Creek Road near the back of Pelican Landings. One conclusion of the analysis is that street connectivity issues play a more significant role here than any lack of facilities in the inability to achieve the 90th percentile performance objective.

Serving this or any similar small area of service demand that is in a remote area with extremely limited access will prove to be very expensive and will require more stations than would be necessary in a community with more street connectivity. In similar situations, ESCi has seen communities choose to target a lower percentile in their response time performance objectives. This permits them to focus their resources on serving the bulk of their demand, while avoiding the high cost of *chasing* small clusters of one or two percent of secluded service demand necessary to achieve a higher percentile performance.

For instance, lowering the performance objective from 90th percentile to the 85th percentile would bring Strategy A into compliance, thus leading to a conclusion that the District could adopt a long-term plan to close one existing station and build one new station along the coastal area. At this 85th percentile objective, there would be insufficient service demand projected in the eastern area of the District to require the addition of an eastern station under current land use planning. However, this plan could be revisited in five to ten years to determine whether any significant change in land use plans for the eastern area of the District would increase the service demand projections for that area, thus making the eastern Bonita station a necessity.

For these reasons, ESCi recommends that the District adopt an 85th percentile performance objective for a six-minute first-due unit arrival. In addition, ESCi recommends that Deployment Strategy A be selected for long-term implementation, with Strategy C providing an additional location for a new station in the event land use planning for the eastern regions of the District are altered to provide for more aggressive and concentrated development.

Emergency Services Consulting inc. believes that good master planning decisions are best made by informed local elected officials and have endeavored to provide adequate data and

analysis in this report to support the decision-making effort. The Bonita Springs Fire Control and Rescue District can use the information and performance projections in this report to confidently select an appropriate future deployment strategy, knowing that the decision is based on sound principles of data analysis.

This page left blank

Appendix A: APPARATUS CONDITION MEASURES

The apparatus of the district was reviewed and a basic inspection was performed to assess the condition and the life expectancy of the heavy apparatus. Below is a chart used to determine the condition and safety status of the fire apparatus.

Excellent:	Like new condition. No body or paint defects. Clean compartmentation. Interior cab complete and in full working order with no modifications. No significant defect history. Age is less than 25% of life expectancy.
Good:	Body and cab have good appearance with no rust and only minor cosmetic defects or dents. Clean compartmentation with no visible rust or corrosion. Interior cab is in full working order and good appearance. Normal maintenance history with no significant defects or high downtime. Age is less than 75% of life expectancy.
Fair:	Body and cab have weathered appearance with minor surface rust and some cosmetic defects or dents. Unimpeded compartmentation with only surface rust or corrosion. Interior cab is in reasonable working order and appearance. Only repairable tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Age is less than 100% of life expectancy.
Serviceable:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and minor rust-through of non-structural metals (body panels). Unimpeded compartmentation with significant surface rust or corrosion and/or minor rust-through (not affecting use). Interior cab is in rough but working order, often with local repairs or modifications to compensate for problems. Occasional or intermittent tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Most service parts still available. Age is greater than 100% of life expectancy.
Poor:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and visible rust-through of non-structural metals (body panels). Significant rust or corrosion is present in structural or support members. Use of compartmentation is impeded with significant corrosion and rust-through. Interior cab is in rough condition with defects impeding safe and proper use. Unrepairable tank or plumbing leakage. Problematic age-related maintenance, major defects, or unreasonable downtime are evident. Service parts difficult or impossible to obtain. Age is greater than 100% of life expectancy. Vehicle exceeds its GVWR.

This page left blank

Appendix B: STATION COST ANALYSIS

Bonita Springs Fire Station Cost Projection

Project Information			
Projected Size	10500	Projected Location	FL – Naples Market
Building Height	36.8	Projected Date	Jan 2008
Building Use	Civic/Gov.	Foundation	CON
Number of Buildings	1	Exterior Wall	MAS
Site Size	217156	Interior Wall	GYP
1st Floor Size		Roof Type	MEM
1st Floor Height		Floor Type	CON
Number of Floors	1	Project Type	NEW

Building Costs				
Division #	**Label**	**Projected %**	**Projected Sq. Cost**	**Projected**
01	General Requirements	13.64 %	$26.25	$275,671.23
	General Conditions	13.64 %	$26.25	$275,671.23
03	Concrete	7.78 %	$14.97	$157,218.75
	Cast-in-place	7.10 %	$13.67	$143,578.77
	Misc Laborer	0.14 %	$0.27	$2,871.58
	Pre-cast	0.53 %	$1.03	$10,768.41
04	Masonry	15.13 %	$29.13	$305,822.77
	Mason	0.07 %	$0.14	$1,435.79
	Unit	15.06 %	$28.99	$304,386.99
05	Metals	11.37 %	$21.88	$229,726.03
	Structural Steel/Misc Metal	11.37 %	$21.88	$229,726.03
06	Wood & Plastics	3.13 %	$6.02	$63,174.66
	Architectural Woodwork	0.78 %	$1.50	$15,793.66
	Misc Carpenter	0.21 %	$0.41	$4,307.36
	Rough Carpentry	2.13 %	$4.10	$43,073.63
07	Thermal & Moisture Protection	10.48 %	$20.17	$211,778.68
	Roofing	10.30 %	$19.83	$208,189.21
	Sealants	0.18 %	$0.34	$3,589.47
08	Doors & Windows	4.33 %	$8.34	$87,583.05
	Glass & Glazing	2.06 %	$3.97	$41,637.84
	Sectional Overhead Doors	0.78 %	$1.50	$15,793.66

	Steel Doors & Frames	1.49 %	$2.87	$30,151.54
09	Finishes	8.31 %	$16.00	$167,987.16
	Acoustical Ceilings	0.36 %	$0.68	$7,178.94
	Carpet & VCT	0.57 %	$1.09	$11,486.30
	Ceramic Tile	0.78 %	$1.50	$15,793.66
	Metal Stud & Gypsum Board	5.54 %	$10.67	$111,991.44
	Misc Painter	0.14 %	$0.27	$2,871.58
	Painting	0.92 %	$1.78	$18,665.24
10	Specialties	1.28 %	$2.46	$25,844.18
	Specialties	1.28 %	$2.46	$25,844.18
11	Equipment	0.82 %	$1.57	$16,511.56
	Food Service	0.11 %	$0.21	$2,153.68
	Misc Equipment	0.71 %	$1.37	$14,357.88
15	Mechanical	15.10 %	$29.06	$305,123.55
	Above Ground DWV	0.63 %	$1.20	$12,634.93
	Ductwork, Connectors, Liner	1.66 %	$3.19	$33,453.85
	Fans, Heat Exchangers	2.02 %	$3.90	$40,919.95
	Heat Pumps, Electric Heaters	2.49 %	$4.79	$50,252.57
	Outside & Ug. Geothermal Wells	3.48 %	$6.70	$70,353.60
	Plumbing	1.03 %	$1.98	$20,818.92
	Pre- construction planning	0.72 %	$1.39	$14,645.03
	Start-up of the HVAC	0.60 %	$1.16	$12,222.86
	Underground DWV	1.12 %	$2.16	$22,685.45
	Water, Air & Gas Piping	1.34 %	$2.58	$27,136.39
16	Electrical	8.64 %	$16.62	$174,517.12
	Conduit & Rough-in	1.71 %	$3.30	$34,658.48
	Hookups to Equipment	0.57 %	$1.10	$11,536.55
	Lighting	3.32 %	$6.39	$67,117.33
	Mobilization	0.43 %	$0.82	$8,614.73
	Paging	0.53 %	$1.02	$10,721.03
	Switchgear & Panel Boards	1.36 %	$2.62	$27,489.59
	Wire & Wire Pulling	0.71 %	$1.37	$14,379.41
	Total Building Costs	100 %	$192.47	$2,020,958.73

Site Costs				
Division #	**Label**	**Projected %**	**Projected Sq. Cost**	**Projected**
02	Site Work	100.00 %	$0.70	$151,066.60
	Bituminous Paving	38.65 %	$0.27	$58,383.23
	Earthwork	30.92 %	$0.22	$46,706.58
	Landscaping	15.46 %	$0.11	$23,353.29
	Septic Tanks	6.76 %	$0.05	$10,217.07
	Water Production Well	8.21 %	$0.06	$12,406.44
	Total Site Costs	100 %	$0.70	$151,066.60

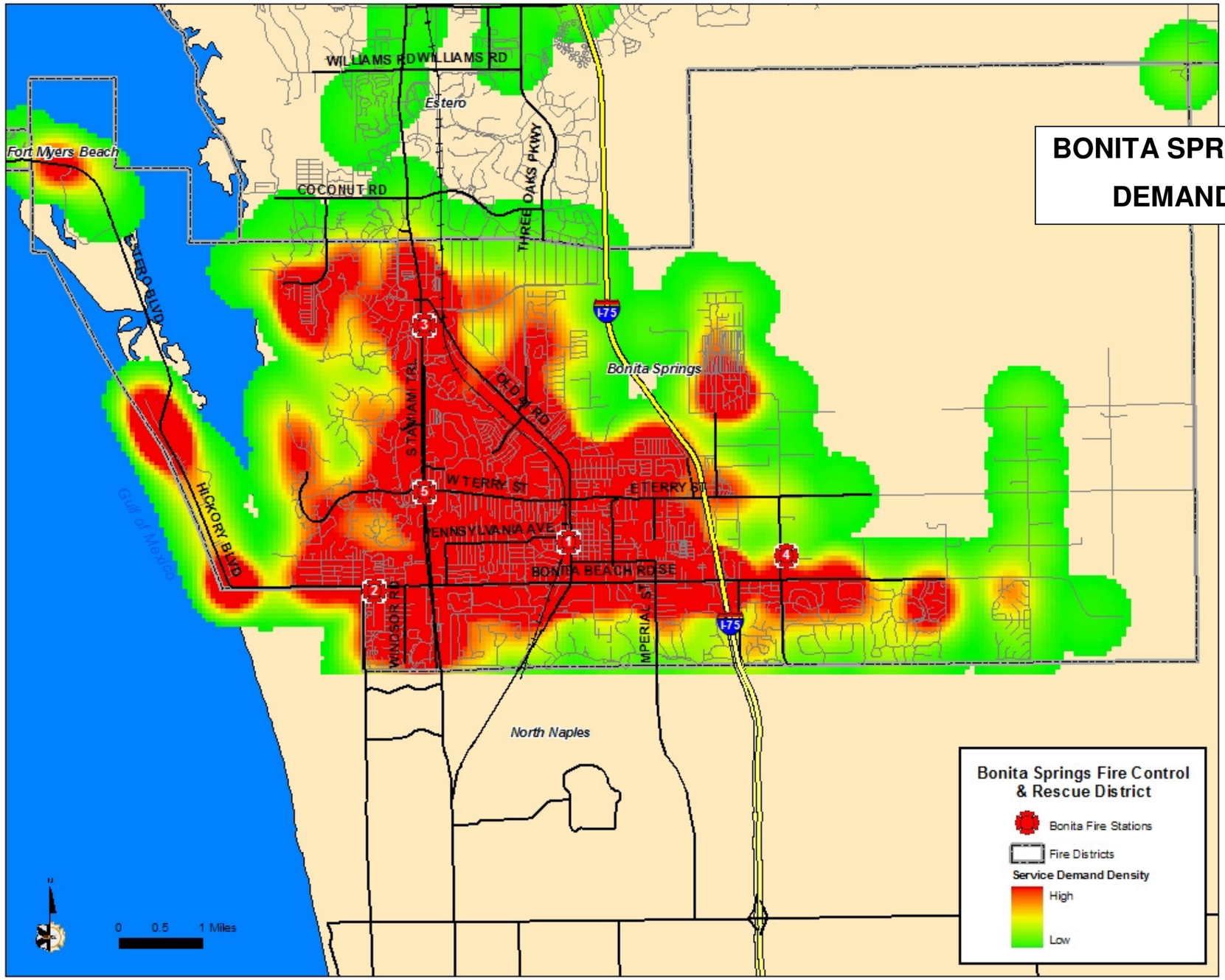
Total Project Costs				
		Projected %	**Projected Sq. Cost**	**Projected**
	Total Project Costs	--	--	$2,172,025.33

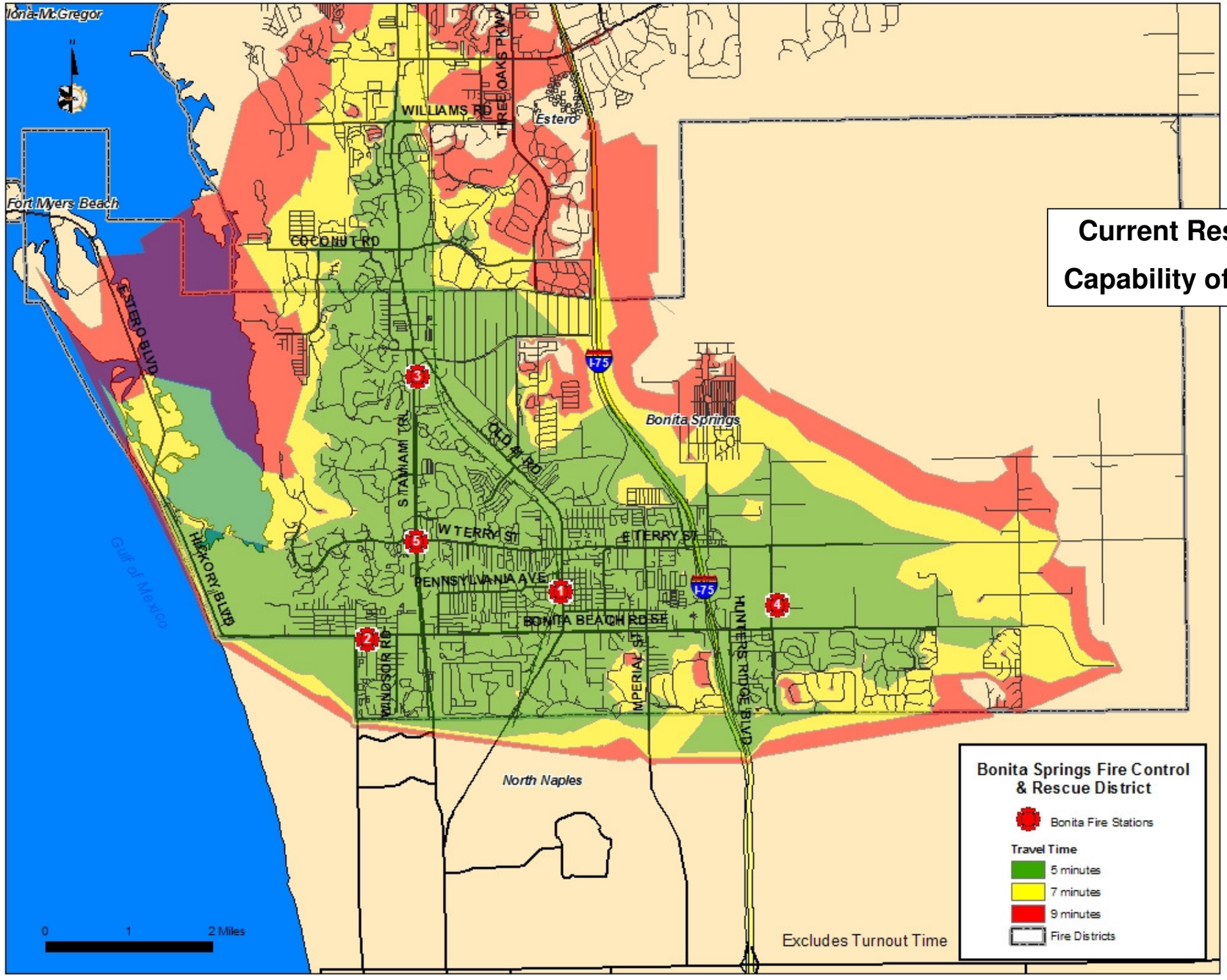
Project Notes
* Ramsey, Minnesota * Construction Period Apr 2000 to May 2001 Special Project Notes The site is located in a predominately residential area with open fields to the west and south of the building, which is zoned for future single family housing. The design challenge was to provide an emergency response service in a quiet, residential neighborhood. The mechanical system consists of geothermal heating and cooling units. The city received a rebate and a reduced per-kilowatt-rate for installing units from the local electric company, Connexus Energy. A vertical loop field located on the site was installed at an average depth of 150 feet in sand, before hitting bedrock. The payback for installing the slightly more expensive geothermal system was in less than a year. MANUFACTURERS/SUPPLIERS DIV 03: Glazed Brick: Stark Ceramics. DIV 07: Metal Roofing: Copper Sales; Fascia: Alcan Composite Aluminum Panels; Membrane Roofing: Firestone. DIV 08: Aluminum Doors, Entrances & Storefronts: United States Aluminum; Interior Glass Wall Partitions: Stylmark Wallmaker; Overhead Doors: Overhead Door Corporation. DIV 09: Carpet: Mohawk; Resilient Flooring: Armstrong; Base: Johnsonite.

This page left blank

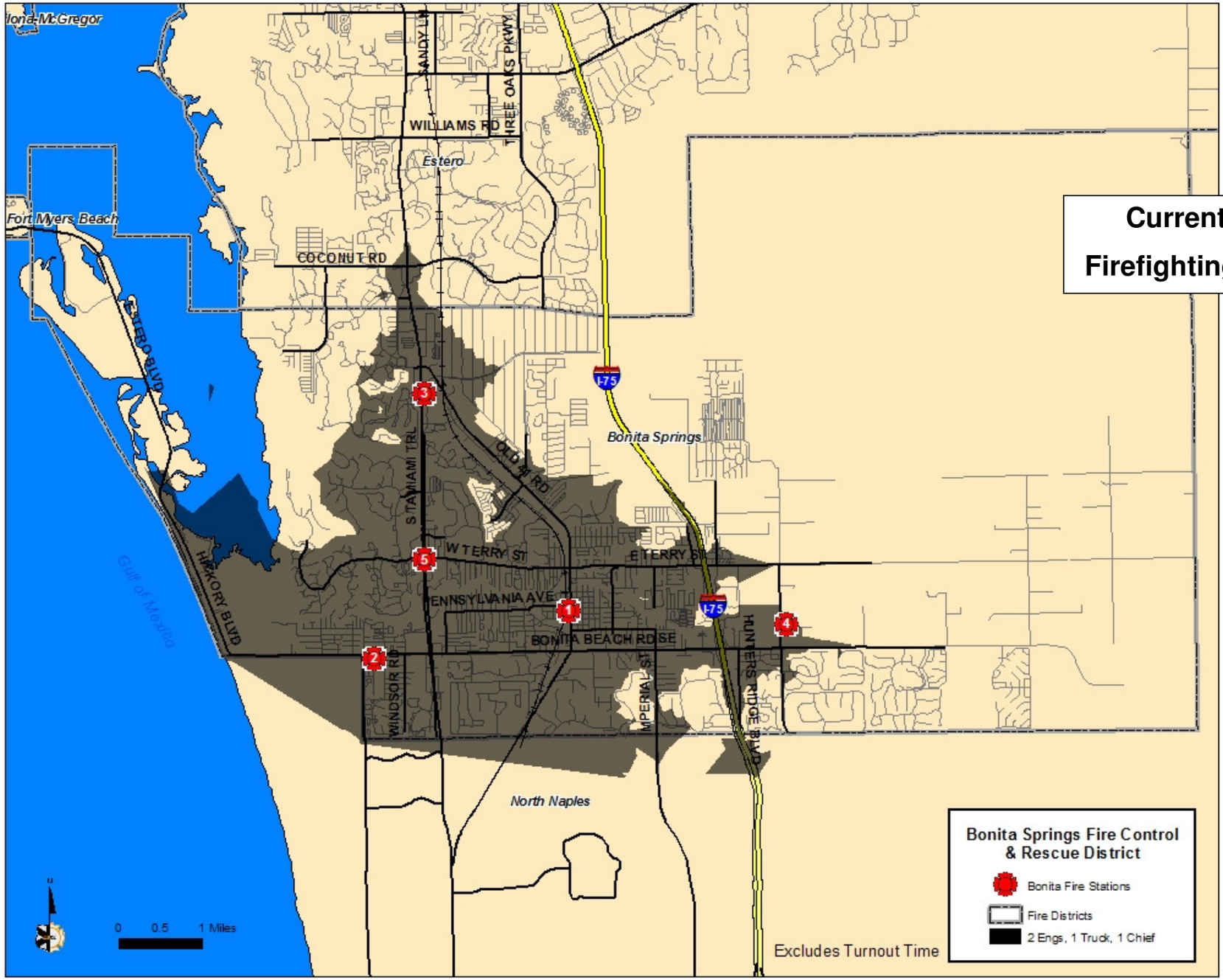
Appendix C: MAP APPENDIX

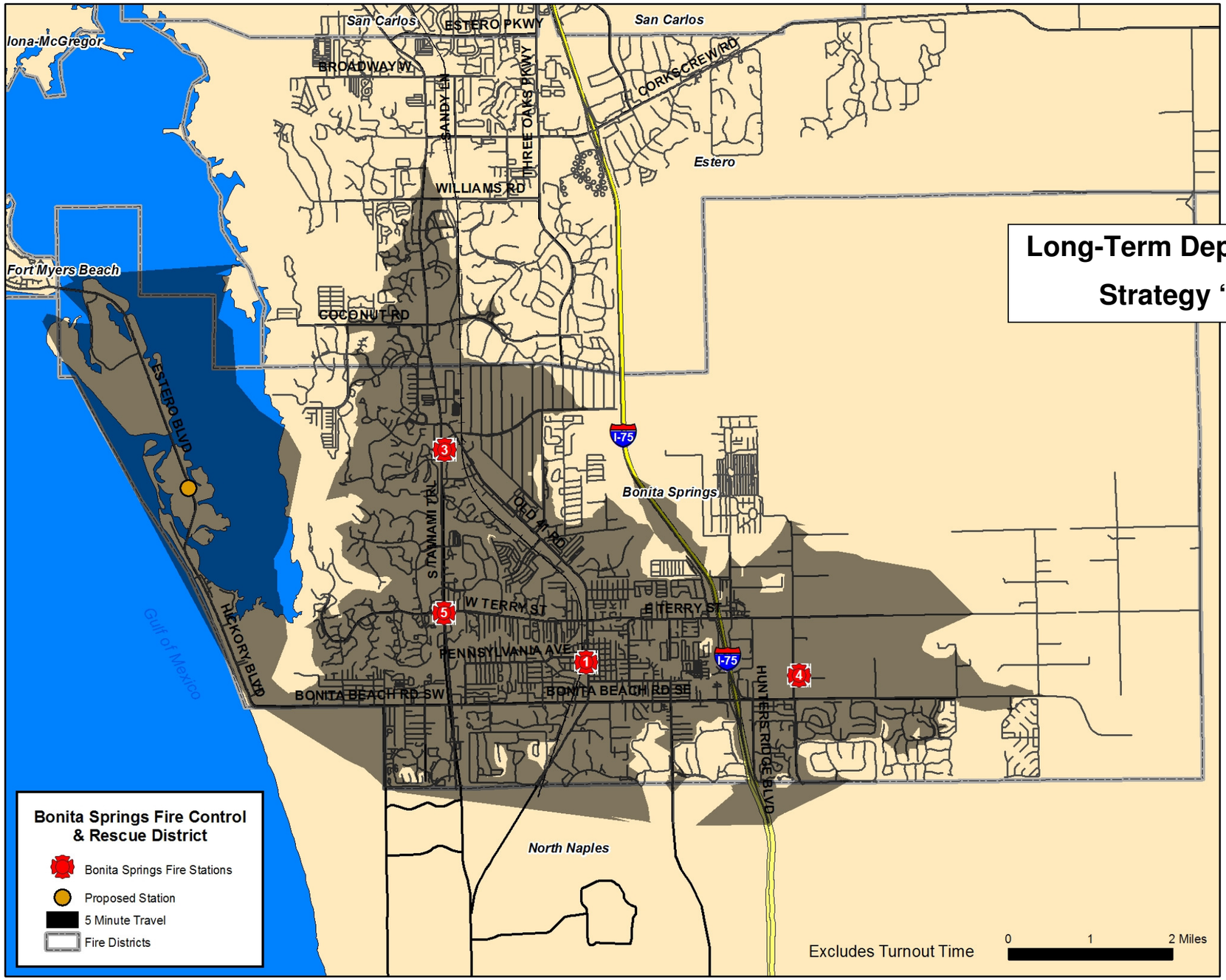
This page left blank

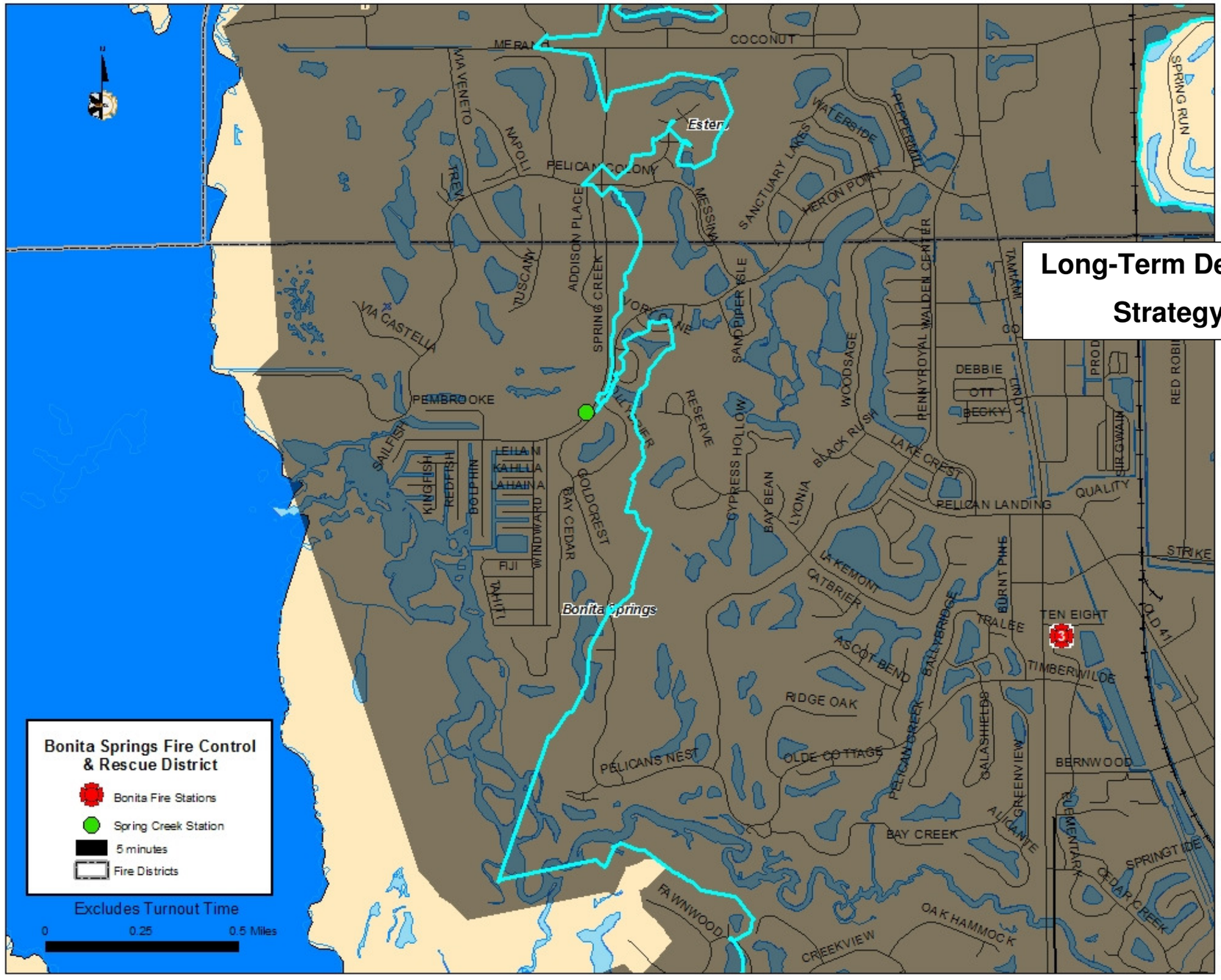

BONITA SPRINGS SERVICE DEMAND DENSITY
WILLIAMS RD
WILLIAMS RD
Estero
Fort Myers Beach
COCONUT RD
THREE OAKS PKWY
ESTERO BLVD
HICKORY BLVD
Gulf of Mexico
I-75
Bonita Springs
STAMIAMI TRL
OLD 41 RD
W TERRY ST
E TERRY ST
PENNSYLVANIA AVE
BONITA BEACH RD SE
WINDSOR RD
IMPERIAL ST
I-75
North Naples
0 0.5 1 Miles
Bonita Springs Fire Control & Rescue District
Bonita Fire Stations
Fire Districts
Service Demand Density
High
Low

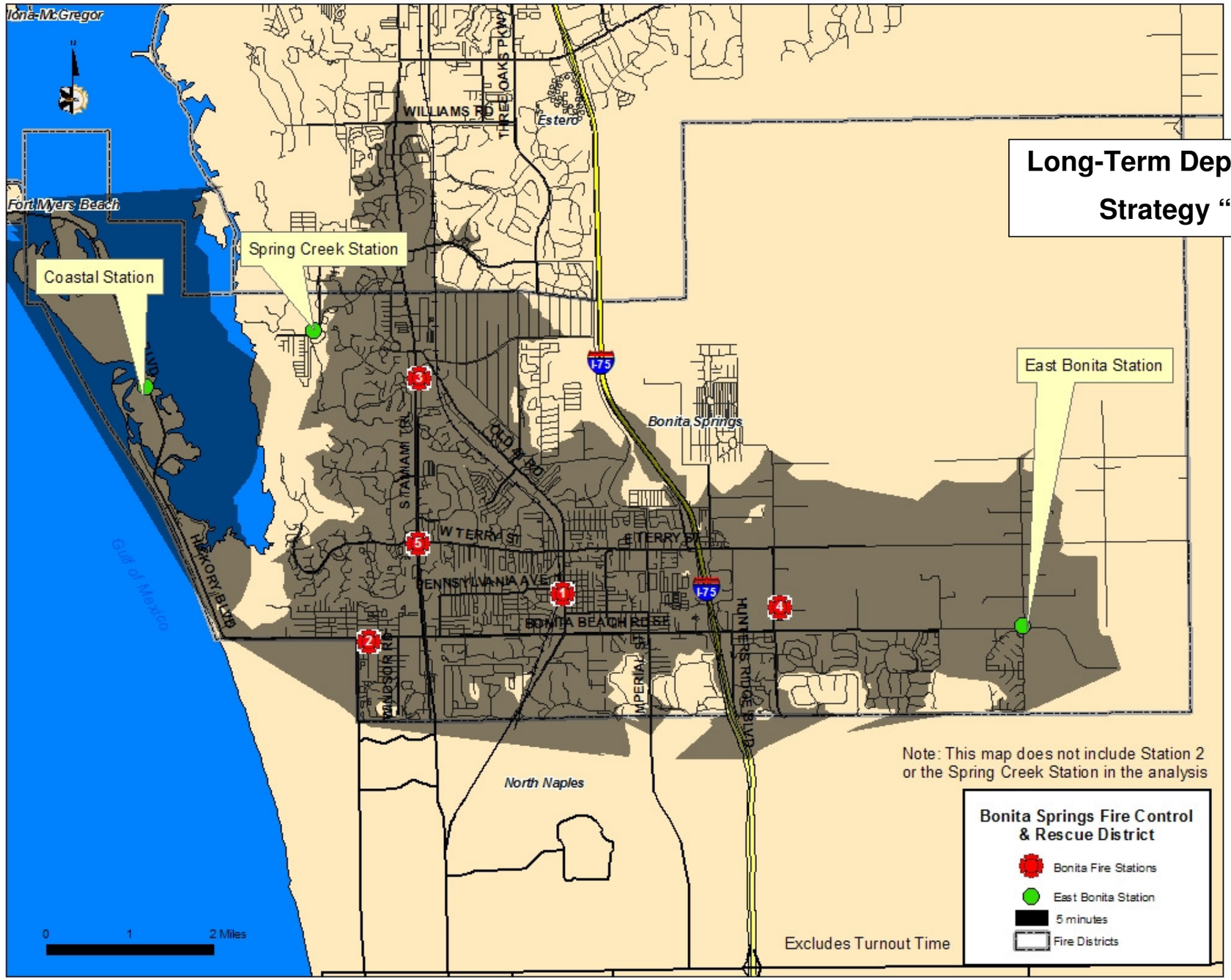


Current Response Time Capability of Fire Stations


Current Effective
Firefighting Force Area
Iona-McGregor
Fort Myers Beach
Estero
Bonita Springs
North Naples
Gulf of Mexico
SANDY LN
THREE OAKS PKWY
WILLIAMS RD
COCONUT RD
ESTERO BLVD
S TAMIAMI TRL
OLD 41 RD
W TERRY ST
E TERRY ST
PENNSYLVANIA AVE
BONITA BEACH RDSE
HICKORY BLVD
WINDSOR RD
IMPERIAL ST
HUNTERS RIDGE BLVD
I-75
0 0.5 1 Miles
Excludes Turnout Time
Bonita Springs Fire Control & Rescue District
Bonita Fire Stations
Fire Districts
2 Engs, 1 Truck, 1 Chief


Long-Term Deployment
Strategy "A"
Iona-McGregor
San Carlos
ESTERO PKWY
San Carlos
BROADWAY W
SANDY LN
THREE OAKS PKWY
CORKSCREW RD
Estero
WILLIAMS RD
Fort Myers Beach
COCONUT RD
ESTERO BLVD
I-75
Bonita Springs
OLD 41 RD
STAYMIAMI TRL
W TERRY ST
E TERRY ST
PENNSYLVANIA AVE
HICKORY BLVD
Gulf of Mexico
BONITA BEACH RD SW
BONITA BEACH RD SE
HUNTERS RIDGE BLVD
North Naples
Bonita Springs Fire Control & Rescue District
Bonita Springs Fire Stations
Proposed Station
5 Minute Travel
Fire Districts
Excludes Turnout Time
0
1
2 Miles


Long-Term Deployment
Strategy "B"
Bonita Springs Fire Control
& Rescue District
Bonita Fire Stations
Spring Creek Station
5 minutes
Fire Districts
Excludes Turnout Time
0
0.25
0.5 Miles
COCONUT
MERANO
VIA VENETO
NAPOLI
PELICAN COLONY
ADDISON PLACE
SPRING CREEK
MESSINA
SANCTUARY LAKES
WATERSIDE
PEPPERMILL
HERON POINT
SPRING RUN
VIA CASTELLA
TUSCANY
SANDPIPER ISLE
WOODSAGE
RENNYROYAL WALDEN CENTER
DEBBIE
OTT
BECKY
PEMBROOKE
SAILFISH
KINGFISH
REDFISH
DOLPHIN
LEHANI
KAHLUA
LAHAINA
WINDWARD
FIJI
TAHITI
GOLDCREST
BAY CEDAR
RESERVE
CYPRESS HOLLOW
BAY BEAN
LYONIA
BLACK RUSH
LAKE CREST
PELICAN LANDING
QUALITY
SIR GWAIN
RED ROBIN
STRIKE
Bonita Springs
LA KEMONT
CATRIER
TEN EIGHT
TRALEE
BURNT PINE
OLD 41
TIMBERWILDE
ASCOT BEND
BALLYBRIDGE
RIDGE OAK
PELICANS NEST
OLDE COTTAGE
PELICAN CREEK
GALASHIELS
GREENVIEW
BERNWOOD
ALICANTE
BAY CREEK
ELEMENTARY
SPRINGTIDE
CEDAR CREEK
FAWNWOOD
CREEKVIEW
OAK HAMMOCK


Long-Term Deployment
Strategy "C"
Iona-McGregor
Fort Myers Beach
Coastal Station
Spring Creek Station
East Bonita Station
WILLIAMS RD
THREE OAKS PKWY
Estero
I-75
Bonita Springs
OLD 41 RD
STATIAM TRL
W TERRY ST
E TERRY ST
PENNSYLVANIA AVE
BONITA BEACH RD SE
HICKORY BLVD
IMPERIAL ST
HUNTERS RIDGE BLVD
Gulf of Mexico
North Naples
Note: This map does not include Station 2
or the Spring Creek Station in the analysis
Bonita Springs Fire Control
& Rescue District
Bonita Fire Stations
East Bonita Station
5 minutes
Fire Districts
Excludes Turnout Time
0
1
2 Miles

"Closest Unit Response" Analysis- Ft. Myers Beach and Estero