

Running head: EVALUATING OPERATIONS OF THE DVFD

Evaluating Operations of the Duck Volunteer Fire Department

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed _____

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Abstract

The Duck Volunteer Fire Department Inc. (DVFD) functions in a unique coastal town (population 520) that serves 20,000 people during its peak seasonal months. During the time that the Town of Duck experienced such tremendous growth, the DVFD has not objectively evaluated its operations. As such, increased service demands have occurred without the consequent increase in volunteers. This disparity has seriously challenged its most limited resource -- personnel. This research evaluated the DVFD's deployment and response and identified community expectations in order to formulate an appropriate strategic plan.

Descriptive and evaluative research was used to determine trends and to compare these results to nationally recognized standards. Surveys were designed and disseminated to both community stakeholders and responding firefighters in order to assess external and internal perceptions and expectations about the DVFD's level of service and response. Results showed that current trends in call volume as well as deployment and response will necessitate increased resources in order to meet anticipated service demands. A comprehensive strategic plan -- one that forecasts resource needs -- is necessary to ensure consistent and effective service delivery. This will require that the organization give priority to continuous evaluation of its operations while concurrently communicating its findings to the community in order to gain the necessary political support for future changes.

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Evaluating Operations of the Duck Volunteer Fire Department

The Duck Volunteer Fire Department Inc. (DVFD) provides first responder/EMT level response to emergency medical calls and fire protection for the Town of Duck. The Town of Duck is a unique coastal town with a small year round population (520) and a seasonal population of over 20,000 (that of a small city). This tourist destination has seen tremendous growth over the last ten years and with that the DVFD has seen increased service demands. In its 26 years of operation, at no time has the department objectively evaluated its operations. To ensure the safety of its population (both resident and visitor), protect against property loss, and adequately respond to the changing demographics of the community, the DVFD must assess its current operations. This assessment is an initial step in developing a strategic plan that will guide the operations of the department over the next 10 years.

The purpose of this research was to evaluate the DVFD's deployment and response and identify community expectations in order to formulate a strategic plan. A literature review was conducted to identify acceptable standards and processes for implementation of a strategic plan. This research addressed four questions. The first question was "What are the trends in call volume, deployment (personnel and apparatus), and response times of the DVFD over the last four years?" The second question was "How does the staffing, deployment, response times and operations of the DVFD compare to recognized standards? Third, "What are community perceptions and expectations of current DVFD service delivery?" Lastly, "What are the responding firefighter's perceptions and expectations of the DVFD's service delivery?" Data analysis was used to determine trends and compare performance with recognized standards. Surveys were distributed to determine perceptions and expectations of various stakeholders in

the community including those of the firefighters. Collectively the data was analyzed to help identify priorities for a strategic plan.

Background and Significance

Town of Duck History

The Town of Duck is a small coastal town on the northern Outer Banks of North Carolina. Duck was a designated fire district until its Incorporation in May 2002. This 2.32 square mile town serviced by only one principal road, experiences great shifts in population. The year round population of approximately 520 steadily rises to over 20,000 in the summer months. Duck has experienced a surge in growth and building over the last ten years. The majority of the properties are second homes, maintained as vacation properties for rent. In Dare County, values for both residential and commercial property are highest for the Town of Duck where the average cost of a home is \$764,242 (Dare County, 2008).

History of the DVFD

Incorporated in 1982, the DVFD played a central role to the community while at the same time protecting its fire district for two decades. When Duck municipally incorporated, the DVFD was identified in the municipal charter to provide contracted service for fire protection (North Carolina General Assembly, 2001). The DVFD has one station located central to its six-mile long district. The budget for fiscal year 2008/2009 is \$517,500 (Town of Duck, 2008).

For several years, the fire department paid a volunteer member to be its Chief. In 2003, the membership of the DVFD changed its by-laws to state that any paid employees for the fire department would be employed and managed by the Town (Duck Volunteer Fire Department, 2004). The number of volunteers has remained constant over the last three years at 27 members. As of July 2008, in addition to the 27 members, three career positions exist -- Chief, Deputy

Chief (added in 2007), Captain (2008). Both the Deputy Chief and Captain positions were added to supplement the existing volunteer membership.

The DVFD responds to a variety of emergency incidents from medical calls, motor vehicle accidents, brush fires, structure fires, and hazardous conditions, to assisting with surf rescue. Operationally, in most cases the career officer on duty or a designated volunteer officer will respond direct to all calls. Once a small town with only a slight demand for emergency services, Duck has evolved to a burgeoning tourist destination with a mounting number of emergency incidents. Total call volume in 1998 was 241 and through October 2008, the total calls were 416.

The year round population of Duck is staying constant in spite of the increasing growth in tourism. The Town demographics present challenges to the fire department regarding recruitment and retention of volunteers. The pool is limited with most residents at or above retirement age. Those of firefighting age and with the financial means to live in Duck, have families and jobs that are often dependent upon tourism that restricts their ability to volunteer their time. Increasing demands on training requirements are making it difficult to prepare and maintain fully capable volunteer firefighters.

The DVFD needs to develop a strategic plan to address the issues of growing service demands with limited resources. With the inception of a new town in 2002, the demands on the budget are far-reaching. A strategic plan would allow objective data to be used in future budget planning for personnel, equipment, and space. Analyzing the current status of the department and comparing its operations to those of nationally recognized standards, and expectations of the community will help to optimize operations and formulate a plan to have the DVFD provide a realistic and acceptable level of service.

Rapid growth, increased service demands, plateaus in the numbers and response of volunteer firefighters, and competing budget requests are all affecting the operations of the DVFD. This research paper relates to the Executive Development Course in regards to the units on: (a) leadership; (b) change management; (c) research; and (7) organizational culture and change. In addition, this research project supports several of the United States Fire Academy's (USFA) operational objectives. These objectives are as follows: (a) reduce the loss of life from fire in the age group 14 years old and below; (b) reduce the loss of life from fire in the age group 65 years old and above; (c) reduce the loss of life from fire of firefighters; and (d) to respond appropriately in a timely manner to emerging issues.

Literature Review

Strategic Planning

One aspect of the literature review was to investigate best practices in developing a strategic plan. As recommended by Bruegman and Smith (2006), service delivery and community expectations are important aspects to consider when developing a strategic plan. Granito (2008) suggests that in order to develop a plan, an organization must analyze the past, assess the present, and project the future needs of the organization. There is agreement among many sources that a need assessment and hazard analysis is necessary in determining operational priorities. According to Jenway (2008), "a needs assessment is an analysis to determine the shortfall between expected performance and current performance. A hazard analysis determines the potential impact of a fire scenario when the hazard is involved in fire" (p. 43). Granito (2008) concurs that in addition to an evaluation of current services, a needs assessment and hazard analysis are necessary. Resources can be determined once current conditions are evaluated and potential hazards identified (Jenway, 2008).

Deployment of Personnel and Apparatus

Several sources recommend performance levels in regards to personnel and apparatus deployment. Determining the minimum number of personnel and apparatus is a challenging task. On-scene tasks vary from incident to incident and the proficiency of crews often differs. Water supply and demand may affect operations; with the severity of an event affecting critical resource requirements. In an effort to decrease line of duty deaths and injuries, organizations such as the U.S. Occupational Safety and Health Administration (OSHA), the National Fire Protection Association (NFPA), and the National Fallen Firefighters Foundation, has emphasized the need for safety officers, incident command, and rapid intervention crews. These needs add to the number of personnel required for an incident. Granito (2008) lists recommended apparatus and personnel for low-hazard occupancies (one, two, and three family dwellings, small business and industrial occupancies). Low-hazard occupancies are congruent with the make-up of the Town of Duck. A minimum of 16 personnel plus a rapid intervention crew with two engines and a ladder truck are suggested for a fire response. The Commission on Fire Accreditation International (CFAI) (2003) suggests 13 to 17 personnel as a guideline for moderate to high-risk occupancy fires. In 1995, OSHA introduced the two-in/two-out rule for an interior fire attack: this rule established a minimum standard of four firefighters (OSHA, 2008; NFPA, 2007). The Federal Emergency Management Agency (FEMA) and the National Fire Protection Association (NFPA) published a follow-up study from one in 2002 to evaluate the fire service. The comprehensive study evaluated aspects of the fire service from personnel to equipment to code enforcement. It revealed that many fire departments could not respond with four firefighters on the first arriving apparatus. In addition 53% of the departments had not properly trained firefighters to engage in structural firefighting (Jenway, 2008). Granito (2008) further states the

importance of identifying the “capability” of a fire department; can trained personnel responding to an emergency incident, perform rescue operations or confine a fire in an acceptably short period of time?

Nationally Recognized Response Standards

Nationally recognized standards are available to assist fire departments in determining performance objectives and operating guidelines to ensure safe and efficient emergency operations. Three established and recognized standards will receive special attention. For the purpose of this research paper, the information gathered from the standards will be that specifically addressing resource deployment and response times.

The first standard identified is that of the ISO-Fire Suppression Rating Schedule. The purpose of the schedule is to assess a fire department’s fire suppression facilities, equipment, and programs to determine its fire insurance rating. These elements are rated and tallied to determine a public protection classification between one and ten; the lower the classification number, the better the potential capability for fire suppression. The ISO rating system is complex. The focus for the purpose of this research is on minimum standards for personnel and apparatus. A structure fire response should have a minimum of one fire apparatus and four members responding to the incident (ISO, 2003).

NFPA 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments (NFPA 1720) was approved as an American National Standard on August 5, 2004. Released in 2001, it was “the first organized approach to defining levels of service, deployment capabilities, and staffing levels for substantially volunteer fire departments” (NFPA, 2004, p. 1). The intent of NFPA 1720 is to provide fire departments with guidelines to ensure

that fire operations are conducted safely and efficiently. The guidelines for staffing and response times vary depending on the population density of the area, generally referred to as demand zones. An area with less than 500 people per square mile is considered a rural demand zone. A suburban zone is 500 to 1000 people per square mile, while an urban demand zone is considered a population of at least 1000 people per square mile. Table 1 shows the recommended staffing and response times outlined by NFPA 1720 and its recommended performance standard.

Table 1

NFPA 1720 Staffing and Response Time Criteria

	Rural	Suburban	Urban
Staffing (#)	6	10	15
Response Time	14 min	10 min	9 min
Percentage Met	80 %	90 %	90 %

NFPA 1720 provides general provisions for emergency medical calls; however, specific response times and deployment are not listed. The DVFD provides first responder/basic life support assistance to the established countywide EMS delivery system. DVFD personnel consistently arrive on scene first in spite of the EMS unit located three miles south of Duck’s town line.

CFAI takes the approach of self-evaluation versus certification. It combines acceptable practices, community involvement, and fire protection engineering to incorporate both subjective values from the community and quantifiable measures (CFAI, 2006). The accreditation process assesses 10 categories that are further broken down into specific criteria. A common theme when developing a strategic plan is hazard/risk assessment. The self-assessment process focuses on

comparing the fire department against performance indicators, identifying performance baselines, and then using the information to determine goals or benchmarks for service improvement. The goal is to evaluate service delivery in order to determine the resources required to ensure staffing, response time, and performance for emergency incidents. CFAI uses population density to define a service area and appropriate staffing and response times. Rural areas are those with a population of less than 10,000 or 1,000 people per square mile. A population of 10,000 to 29,999 or any area with a population density of 1,000 to 2,000 people per square mile is considered suburban. Urban areas are those with over 30,000 in population or 2,000 people per square mile. An area with a population of over 200,000 or a density of over 3,000 people per square mile is considered metropolitan. Urban and metropolitan areas are assigned the same response times. For the purpose of this research paper the metropolitan area will be used. Table 2 is a matrix of rural, suburban, and metropolitan area response times and performance standards.

Table 2

CFAI Response Time Criteria

	Rural Response Times	Suburban Response Times	Metropolitan Response Times
1 st Unit Benchmark	10 min	5 min	4 min
1 st Unit Baseline	13 min	6 min 30 sec	5 min 12 sec
2 nd Unit Benchmark	14 min	8 min	8 min
2 nd Unit Baseline	18 min 12 sec	10 min 24 sec	10 min 24 sec
Performance Met	90 %	90 %	90 %

The time criteria are defined as either benchmarks or baselines. Baseline performance represents 70 percent of the ideal benchmark values. The CFAI accreditation process emphasizes the fact that not all calls are going to meet the criteria. CFAI stresses the importance of determining service level objectives that are specific to the agency. Fire departments will find they have a variety of deployment needs based on the severity of calls and the various hazards within the fire district. It is the intent of CFAI to allow the fire agency to go through the assessment process to determine the specific needs of its jurisdiction.

In regards to medical emergencies, “the six minute time frame is used as a means of service level measurement, as brain damage is very likely in cardiac/respiratory arrest patients after six minutes without oxygen flow to the brain” (CFAI, 2006, p 58).

Community Expectation and Perception

When determining service delivery for a community, all stakeholders need to be acknowledged, especially if service level objectives or budgeting will change. Jenway (2008) states that input from the community is an important source of information in developing a strategic plan. Granito (2008) further states that firefighters and community expectation are aspects that need to be considered when determining requirements for resources. In addition, Bruegman and Smith (2006) support that in order to determine a strategic plan previous service demands as well as the expectation of the community must be considered.

Most sources concur on the need to analyze the current state of operations as a starting point to strategic planning. NFPA and CFAI provide guidelines for quantifiable assessment of operations. Current service delivery, identifying risk hazards, and determining community and firefighter expectations are all factors that affect the planning for operational goals and strategies.

Procedures

Descriptive research was used to determine the trends in call volume, deployment (both personnel and apparatus), and response times. Specific reports were generated using Fire Programs™ reporting software and direct data was gathered from incident reports. Data representing a four-year period (January 2005 through October 2008) was analyzed.

For the purpose of this study, emergency incidents are defined as medical calls, station calls, or first alarm calls for service. Medical calls also include dispatch to surf ocean rescue calls though actual water rescue is not a function of the DVFD. Station calls include all calls for service including actual fires, fire alarm activations, hazardous conditions, motor vehicle accidents, and general public service calls. First alarm calls are defined as those calls that were actual fires or the incident posed a fire threat. Items analyzed for the four-year period include: number of total calls; number of medical calls; number of station calls; average response time from dispatch to first arriving personnel for medical calls; average response time for first arriving personnel for all station calls; average response time from dispatch to first responding fire apparatus; and average number of personnel on medical, station, and first alarm calls.

An evaluative research method was used to compare the DVFD data with those of nationally recognized standards developed and prescribed by ISO, NFPA 1720, and CFAI. Matrixes were designed to graphically depict the standards versus the results from DVFD data. The DVFD data used for comparison was both yearly data and average data over four years.

Two surveys were designed to capture both community and firefighter perceptions and expectations of current DVFD service delivery. To achieve realistic and coherent survey questions, the researchers used a small group to pilot test the survey, as well as consult and advise on the topics. A doctoral student, an emergency services consultant, the Duck Town

Manager, the Duck Public Relations Coordinator, and two fire service personnel served as the committee. The goal was to create questions germane to established criteria and standards without using quantitative numbers but perceived condition. The established website survey organization, Survey Gizmo™ was used to administer and analyze data. Appendix A and B contain the community and firefighter survey questions, respectively.

The community survey was disseminated on-line via the Town of Duck website and directly sent to the subscriber email list. The subscriber list consisted of 594 email addresses. An on-line survey was chosen based on the results of a previous survey conducted by the Town of Duck. It revealed that the majority of stakeholders preferred to receive information through the website and email. A series of four emails to subscribers of the Town of Duck email list were sent out over the course of six weeks to advertise for the survey. In addition, an advertisement was placed on the home page for the Town of Duck promoting the survey. The survey was available for six weeks. Survey results were analyzed, and matrixes were created to show how respondents answered questions regarding response times. In addition, respondent's perception of firefighter competency and quality of service received were identified.

The firefighter survey was advertised through direct email. The survey was sent to current members of the DVFD and its automatic aid department Southern Shores Volunteer Fire Department (SSVFD). A total of 79 members were solicited to complete the survey. These two departments, though in separate districts, rely heavily on each other for coverage and response. Three reminders were sent and the survey was made available for six weeks. Again, matrixes were created to show how the firefighters answered questions regarding response times. Respondents were also asked questions regarding staffing and qualification of firefighters.

Other questions posed in both the community and firefighter survey generated data to be used internally by the DVFD; discussion of the other data is outside the scope of this research project. Limitations existed in distribution of the surveys and are further discussed in the results.

Results

The data presented in this research paper reflect only the emergency response of DVFD personnel and apparatus. This was intentional in order to determine the effectiveness of the department independent of automatic or mutual aid. A four year time period was used as the comparison frame based on trends in call volume, changes in data management software, and changes in Chief Officers. For comparison purposes, the author divided a 12 month period into demand zones based on year-round population, call volumes, and tourism. The following assumptions are made: a) the year round population of 520 was used for January, February and December in determining demand zones; b) March, April, October and November are the shoulder seasons for tourism; c) a population of 5,000 was used for estimation purposes of the shoulder season; d) peak season with a population of 20,000 was estimated for May through September. Service area/demand zones were designated based on the above population estimates. The following densities were assigned to correspond with established service areas/demand zones: a) January, February and December was considered rural at 224 persons per square mile; b) March, April, October, November was considered suburban at 2,155 persons per square mile; and c) May through September (peak tourist season) was considered urban/metropolitan at 8,620 persons per square mile. Data from each of the four years was used for comparative purposes with recognized standards.

The first step in evaluating the DVFD was to determine the current trends in call volume, response time and personnel responding. The data for total emergency calls and the breakdown

of medical and station alarm calls are presented in Table 3. A steady increase in call volume is depicted over the four year time period. The largest increase is seen between 2006 and 2007. Most significantly was the 59% increase in station calls. The 12% increase seen between 2007 calls through October and 2008, would suggest that total call volume for 2008 will be approximately 451. Trends in medical calls are staying relatively constant whereas station calls are increasing.

Table 3

DVFD Call Volume

Year	Total Calls / % Change	Medical Calls / % Change	Station Calls / % Change
2005	333	205	125
2006	336 + 1 %	216 + 5 %	120 + 4 %
2007	397 +18 %	206 - 5 %	191 + 59 %
2007* (Oct.)	368	182	186
2008* (Oct.)	416 + 12 %	218 + 20 %	198 + 6 %
Avg.	371	211	159

Note. Totals for 2007 and 2008 through October are included so that the most recent data from 2008 could be analyzed.

Average response times were analyzed for medical and station calls. Table 4 represents the average response time for the first DVFD personnel on scene at a medical related call and average number of total personnel responding. Over the four years personnel on scene has stayed constant. Most noticeable is the increase in response time from 2007 to 2008.

Table 4

DVFD Medical Call Response Time and Personnel

Year	Avg. Response Time/ % Change	Avg. Personnel Response
2005	4 min 28 sec	3
2006	4 min 42 sec - 2 %	3
2007	4 min 25 sec - 6 %	3
2008* (Oct.)	4 min 56 sec +12 %	3
Avg.	4 min 38 sec	3

Table 5 reflects response times for DVFD personnel first on scene and average number of responding firefighters for station calls. Similar to medical calls, 2008 shows a 13% increase in response time. At the same time, the average number of personnel is indicating a decline with an average of 8 to 7 persons. Using 2007 as the comparative year, removing the career Chief and Deputy Chief’s response, 74% of the 27 person roster responded to less than 20% of the calls.

Table 5

DVFD Station Call Response Time and Personnel

Year	Avg. Response Time/ % Change	Avg. Personnel Response
2005	5 min 25 sec	8
2006	5 min 4 sec - 6 %	8
2007	5 min 5 sec ---	7
2008* (Oct.)	5 min 46 sec +13 %	7
Avg.	5 min 20 sec	8

Average response time for the first responding apparatus and average number of personnel on a first alarm assignment is depicted in Table 6. There is a striking increase in response time from 2005 to 2006. Over the four years, trends show an increase in calls with a decrease in responding firefighters. Using 2007 for a comparison, 11% of the first alarm calls were not answered with four suppression firefighters. A suppression firefighter is defined by the DVFD Bylaws as a member certified for SCBA use and interior firefighting (DVFD, 2004).

Table 6

DVFD First Alarm Response Time and Personnel

Year	Avg. Response Time First Apparatus / % Change	Avg. Personnel Response
2005	9 min 13 sec	10
2006	11 min 10 sec +21 %	9
2007	10 min 36 sec - 5 %	8
2008* (Oct.)	10 min 54 sec + 3 %	8
Avg.	10 min 28 sec	9

With DVFD data collected and tabulated, the next step was to compare this data to that of nationally recognized standards. The minimum ISO standard requires a response of one apparatus and 4 members. In 2006 only 1% of the time did the DVFD not meet the minimum of four members responding, however, 7% of the time there were fewer than four suppression firefighters. In 2007 6% of the time there were less than four members and 11% of the time there were less than four suppression firefighters. In 2008, 8% of the time four members did not respond and 10% of the time four suppression firefighters did not respond. It is important in a

combination department to identify number of personnel on scene, as well as those personnel “capable” of meeting the two-in/two-out rule.

Table 7 reflects the staffing and response times for NFPA 1720 in regards to rural, suburban, and urban demand zones. The DVFD closely meets the rural performance standard of 80% for all years with the exception of response time in 2005 and 2006. Percentages are low in comparison to the suburban and urban demand zones.

Table 7

Comparison of DVFD to NFPA 1720

1720	Rural	Suburban	Urban
Staffing (#)	6	10	15
2005 % Met	---	---	---
2006 % Met	86 %	50 %	7 %
2007 % Met	81 %	31 %	10 %
2008 % Met	81 %	25 %	7 %
Response Time	14 min	10 min	9 min
Performance	80 %	90 %	90 %
2005 % Met	58 %	33 %	54 %
2006 % Met	50 %	33 %	36 %
2007 % Met	89 %	52 %	41 %
2008 % Met	83 %	51 %	39 %

Tables 8 through 11 represents the DVFD data by year as it is compared to CFAI response time standards. Table 8 shows DVFD data from 2005. With the exception of the second

unit benchmark, the DVFD meets the rural standards. However, response time performance decreases greatly compared to the suburban and metropolitan values.

Table 8

Comparison of 2005 DVFD to CFAI

2005	Rural	Suburban	Metropolitan
1 st Unit Benchmark	10 min	5 min	4 min
2005 % Met	96 %	58 %	42 %
1 st Unit Baseline	13 min	6 min 30 sec	5 min 12 sec
2005 % Met	100 %	79 %	50 %
2 nd Unit Benchmark	14 min	8 min	8 min
2005 % Met	83 %	38 %	38 %
2 nd Unit Baseline	18 min 12 sec	10 min 24 sec	10 min 24 sec
2005 % Met	96 %	58 %	58 %
Performance	90 %	90 %	90 %

Table 9 shows 2006 values. Trends are similar to those seen in 2005. The DVFD meets or almost meets standards for the rural service area criteria, but falls significantly below suburban and metropolitan criteria.

Table 9

Comparison of 2006 DVFD to CFAI

2006	Rural	Suburban	Metropolitan
1 st Unit Benchmark	10 min	5 min	4 min
2006 % Met	86 %	48 %	31 %
1 st Unit Baseline	13 min	6 min 30 sec	5 min 12 sec
2006 % Met	93 %	64 %	50 %
2 nd Unit Benchmark	14 min	8 min	8 min
2006 % Met	88 %	29 %	29 %
2 nd Unit Baseline	18 min 12 sec	10 min 24 sec	10 min 24 sec
2006 % Met	93 %	48 %	48 %
Performance	90 %	90 %	90 %

Table 10 shows 2007 response times. Again, trends are consistent with previous years in that the DVFD scores well against the rural standards, but falls well below performance levels for suburban and metropolitan standards.

Table 10

Comparison of 2007 DVFD to CFAI

2007	Rural	Suburban	Metropolitan
1 st Unit Benchmark	10 min	5 min	4 min
2007 % Met	100 %	59 %	41 %
1 st Unit Baseline	13 min	6 min 30 sec	5 min 12 sec

2007 % Met	100 %	82 %	54 %
2 nd Unit Benchmark	14 min	8 min	8 min
2007 % Met	91 %	34 %	34 %
2 nd Unit Baseline	18 min 12 sec	10 min 24 sec	10 min 24 sec
2007 % Met	96 %	52 %	52 %
Performance	90 %	90 %	90 %

Statistics for 2008 depicted in Table 11 showed an increase in response times and thus a decrease in performance in regards to the standards. Meeting the rural standard remains achievable; the suburban and metropolitan standards consistently challenge the DVFD resources.

Table 11

Comparison of 2008 DVFD to CFAI

2008	Rural	Suburban	Metropolitan
1 st Unit Benchmark	10 min	5 min	4 min
2008 % Met	87 %	31 %	24 %
1 st Unit Baseline	13 min	6 min 30 sec	5 min 12 sec
2008 % Met	96 %	47 %	37 %
2 nd Unit Benchmark	14 min	8 min	8 min
2008 % Met	83 %	24 %	24 %
2 nd Unit Baseline	18 min 12 sec	10 min 24 sec	10 min 24 sec
2008 % Met	83 %	51 %	51 %
Performance	90 %	90 %	90 %

The first survey attempted to quantify the community’s perception and expectation of current DVFD service delivery. There were 199 completed surveys. A limitation of the study is that the sample size is an unknown. It is unclear how many respondents received an email versus seeing it on the website. In a previous study conducted by the Town of Duck, 156 responded. Of the survey responses, 60% were from non-resident property owners and 26% resided in Duck. Twenty five percent of the respondents reported that they had an experience with calling 911 in the Town of Duck. All but one of those respondents felt that they had received service in a timely manner and that they received the expected quality of service. Two questions were asked to try to get at perceived and expected response times. The first question asked was “If you were to have an emergency in Duck, **how long do you think it would take** for the DVFD to respond?” The results are listed in Table 12.

Table 12

Community Perceived Response Time

Response Time	Total Number Respondents	% of Respondents
4 - 8 min	111	56 %
8 - 12 min	46	23 %
< 4 min	20	10 %
> 12 min	9	4.5 %
I don’t know	13	6.5 %

The DVFD average response time was five minutes and 20 seconds. The majority (56%) of community members responding were accurate in their perception of the response time for the

DVFD. Twenty three percent of the respondents perceived slower times and 10% thought the DVFD responded quicker.

A second question was asked “If you were to have an emergency in Duck, **what do you think is a reasonable time period** for the DVFD to respond?” This question was trying to get at expectation of response. Table 13 depicts the results. The majority of the responses (56%) indicated that they thought 4-8 minutes was a reasonable time period for the DVFD to respond. The numbers increase slightly to faster times than the previous question. This would indicate that the expectation is for a quicker response.

Table 13

Community Expected Response Time

Response Time	Total Number Respondents	% of Respondents
4 - 8 min	112	56 %
8 - 12 min	54	27 %
< 4 min	24	12 %
> 12 min	3	2 %
I don't know	6	3 %

The second survey looked at firefighter perception and expectation of current DVFD service delivery. The second survey was distributed to firefighters from Duck and their automatic aid department of SSVFD. Of the total of 79 surveys distributed, 24 or 83% of the DVFD and 29 or 53% of the SSVFD completed the survey. A limitation of this survey is that the total number of respondents fell short of the 65 responses needed for a 95% confidence level. The same two questions were asked of the firefighters regarding perception and expectation of response time.

Table 14 depicts the results of the perceived response times. The perceived response times in the four to eight minute range were similar to the results from the community survey. A larger percentage of respondents thought response was quicker than four minutes as compared to the eight to twelve minute range.

Table 14

Firefighter Perceived Response Time

Response Time	Total Number Respondents	% of Respondents
4 - 8 min	30	55 %
8 - 12 min	9	16 %
< 4 min	11	20 %
> 12 min	---	0
I don't know	5	9 %

Table 15 reflects the results to the question regarding response time expectation. The majority of the firefighters responded with the four to eight minute range. The eight to twelve minute range ranked second in expectation. With the average response time of five minutes and 20 second, the DVFD is meeting expectation of 62% of the firefighters.

Table 15

Firefighter Expected Response Time

Response Time	Total Number Respondents	% of Respondents
4 - 8 min	34	62 %
8 - 12 min	14	25 %

< 4 min	6	11 %
> 12 min	---	0
I don't know	1	2 %

The majority of respondents answered 4-8 minutes as an expected response time. NFPA 1720 has a range of 9-14 minutes depending on demand zone. CFAI has a range of 4-13 minutes depending on service area. The DVFD average of 5 minutes 20 seconds falls within the expectation and meets the standards. However, the data reveals deficits when looking at each individual incident against the standard.

In addition, three questions were asked of the firefighters regarding staffing at the DVFD. The first question asked “Is the level of volunteer staff at the DVFD sufficient to meet service demands?” Fifty-three percent (29) agreed or strongly agreed, 29% (16) disagreed, and 18% (10) said “I don’t know.” The second question asked was if “the level of career staff at the DVFD was sufficient to meet service demands?” Fifty six percent (31) agreed or strongly agreed, 29% percent (16) disagreed, and 15% (8) said “I don’t know.” The third question was if “there are enough suppression firefighters in the DVFD?” Thirty six percent (20) of respondents agreed or strongly agreed, 36% (20) disagreed or strongly disagreed and 27% (15) stated “I don’t know.” The above data would suggest that there are staffing concerns, especially as it relates to suppression firefighters.

Table 16 outlines results from both the community and firefighter survey for the following three questions: “I am confident that the DVFD will respond quickly”; “I am confident that the DVFD will respond with people qualified to help me”; and “Does the quality of service provided by the DVFD meet expectations?” The data show that there is a high level of

satisfaction with DVFD service delivery. However, an interesting statistic is that 67 respondents (34%) from the community survey reported “I don’t know” when asked if the DVFD was meeting expectations. This may reflect a lack of understanding or lack of thought about what realistic expectation should be.

Table 16

Firefighter and Community Survey Comparison

	Respond Quickly	Qualified Personnel	Service Expectation
	Agree	Agree	Meet or Exceed
Firefighter			
# of Respondents	55	53	50
% of Respondents	100 %	96 %	91 %
Community			
# of Respondents	176	172	128
% of Respondents	88 %	86 %	64 %

At the end of both surveys, there was a chance for respondents to openly comment. The majority of the 66 comments on the community survey spoke very highly of the DVFD. Nine respondents expressed that they did not know much about the operations of the DVFD. Only 12 firefighters of 55 provided open comments. Five expressed concern regarding sufficient staffing.

Discussion

This research attempted to evaluate the Duck Volunteer Fire Department’s performance and the public’s perception of it. The salient question asks how best to use the data for operations and strategic planning. Trends in call volume suggest that emergency incidents will continue to

increase over time. With a 12% annual increase over the next 3 years, the DVFD could be faced with an increase in calls from 456 in 2008 to potentially 692 calls for service in three years.

While medical related calls remain steady, station calls that require more manpower are increasing. Over the last three years, the volunteer roster has remained at 27 members. Yet given the statistical projections, the DVFD personnel at its current level will be challenged to manage the increased demands on service delivery.

Response times and the average number of personnel on medical-related calls have remained consistent over the last four years. The DVFD standard operating procedure allows for direct response of a volunteer firefighter to the scene of a medical call or the on-duty career officer answers the call. Three career personnel cannot logistically provide round the clock coverage. Therefore, as long as volunteer personnel are available to supplement three career personnel, little variation in response times or number of personnel on scene would occur. However, of the three career personnel, both the Chief and Deputy Chief, have other administrative responsibilities to the organization.

While the average response time for station calls has remained relatively consistent over a four-year period, a pattern of decreased number of personnel responding has emerged. When further dissected, first alarm responses also reflect a pattern of decreased personnel per call. The continued pattern of decreased personnel response is of great concern. If the total number of suppression firefighters continues to decrease, with the continuous increase in call volume, additional personnel would be critical for safe and efficient operations.

The DVFD response times and personnel were compared to recognized national standards. In evaluating the DVFD against the minimum ISO standard, there is an emerging trend of more incidents where four suppression firefighters were not on scene. However, the

DVFD normal operations put an officer on scene ahead of DVFD resources. The downgrading of an emergency to a lesser severity may be decreasing volunteer response. The service areas of the DVFD were explored and evaluated with respect to the demographics of the Town in concert with the fluctuating visiting population. Comparisons with NFPA 1720 revealed that the DVFD most often meets the requirements for a rural demand zone. However, the service demands of the DVFD increase with the increase in population. It should be an operational goal of the DVFD to improve service delivery towards the more stringent standards of suburban and urban demand zones. Staffing performance is significantly below recommended numbers for the urban service area. Though the Town hosts a steady presence of visitors throughout the year, the bulk of visitors are present during the months May through October. Given the small square footage of the town, the demand zone is well within the urban standard at least six months out of the year. Again, the unrelenting concern is personnel response. Response times have remained relatively constant despite standards being met less than 50 percent of the time. Response times are greatly affected by traffic and the availability of personnel. Duck's geographic location, coupled with its infrastructure, most likely mask a greater deficit in response times.

The DVFD used the definition of total populations to determine comparisons between the CFAI standards for rural, suburban, and metropolitan areas. For the purpose of this research analysis of response times for the first and second units were the focus. Given the operational procedures of the DVFD, the officer on duty or designated volunteer officer may respond direct to emergency calls. Thus the time reflected for first unit on scene is that of the first responding personnel. The second unit on scene is the average response time for the first apparatus. Comparing the yearly data, the DVFD consistently and significantly fell short in meeting the response standards for a suburban and metropolitan area. The DVFD met the response standards

for a rural area consistently over the four years. As stated above the tourism population warrants recognition of service demands of a metropolitan area at least six months out of the year.

Operationally, it is imperative to acknowledge that the DVFD's first unit on scene the majority of time is NOT a fire apparatus, but a command type vehicle.

Using Granito's (2008) figures for response at low-hazard occupancies, a minimum of 18 firefighters is typical to fulfill all the duties on a fire ground. As previously stated, the intent of this paper was to evaluate the DVFD resource response specifically. The typical first alarm assignment cannot be completed solely by the DVFD. The DVFD first alarm generates an automatic response of two additional engines and personnel from neighboring departments. A usual response from the districts is a minimum of 8 -10 personnel. Additional personnel and apparatus providing mutual aid help achieve standards of response. However, response times due to travel distance delay operations. The first 10 -15 minutes have the greatest bearing on an emergency incident. As addressed in the literature determining an acceptable level of response is critical in prioritizing resource allocation.

Assessing operations is the first step in strategic planning. If the assessment of operations leads to the need for changes in the current operations, it is important to get buy in from all community stakeholders. This especially holds true in a small community comfortable with its volunteer fire department. It is not always clear to people in a community that service demands have changed unless they are directly involved with public safety. The community survey was used to determine perceptions and expectations; it also provided insight to stakeholder knowledge of the fire service. When assessing perceptions and expectations regarding emergency response time, the majority of respondents identified a 4 to 8 minute time period. The DVFD meets that time frame for an initial unit on scene. Nevertheless, that does not reflect the

time for an actual fire apparatus. To achieve a fire apparatus response in that time, a crew would have to be stationed around the clock at the firehouse.

In asking if the quality of service provided by the DVFD met expectations, approximately one third of the respondents replied “I don’t know.” Does the majority of the community really understand the operations of a volunteer fire department? Or is there an assumption that when called, there will be a quick response with an adequate number of qualified firefighters? In order to gain stakeholder buy in for the costs of additional personnel, a critical first step must be improved comprehension and appreciation of the demands of the fire department.

Another stakeholder group is firefighters, the majority of which are volunteers. Their participation, training, and understanding of the operations vary. Their backing is essential for retention and continuity of service. Of note, their perceptions and expectations regarding response time were the same as community members. This, in spite of that fact that these firefighters are aware of their own response times to the station, to then board the responding apparatus. Again to meet that time frame with a fire apparatus requires a crew positioned and ready at the station.

Over 90 percent of the firefighters agreed that the DVFD provides quality service and adequate response time. However, once respondents were asked about staffing, opinions varied. A slim majority of the firefighters agreed that staffing was adequate with both the existing volunteers and career staff. A third of the respondents disagreed. When asked about adequate numbers of suppression firefighters, 36 percent agreed, 36 percent disagreed, and 27 percent said, “I don’t know.” Based on the perceptions of those doing the work, the results indicate that more suppression personnel are desired.

Trends in service demands and resource deployment reveal the need for a staffing plan. For comparing resource deployment with recognized standards, NFPA 1720 provides standards focusing on suppression; CFAI addresses standards of response that consider multiple elements such as budgetary costs, risk assessment, and performance. Data collected regarding response times reveals that in order to improve response times, personnel need to be readily available at the firehouse with the apparatus.

CFAI (2006) defines level of service as “the resources needed to meet stated service level objectives” (p. 25). This research paper attempted to address standards criteria, community expectations, along with firefighter expectations in regards to the DVFD. Before committing to a staffing plan, a critical step is defining an acceptable level of performance as defined by the community. Is the performance objective to contain a fire to a room and prevent flashover or, is it to provide an exposure level of service? Exposure level of service is defined as “a defensive tactical objective to only protect exposures or fire spread to other buildings” (CFAI, 2006, pg. 65). Service determination will affect resource priorities and costs. What other aspects of fire prevention shape resource allocation? Residential sprinklers, a proactive fire prevention program, building and zoning standards are all avenues to explore. The challenge for this researcher is to “find the balance between effectiveness, efficiency and reliability that will keep risk at a reasonable level and at the same time yield the maximum savings of life and property at the least cost” (CFAI, 2006, pg. 63).

A clear direction for this researcher is to reassess these aspects in three to five years. However, limitations exist. Comparing DVFD data to established criteria is easily reproducible. The main aspect that could affect this analysis is if standards used to compare in this research were to change. Regarding the unique surveys, did the questions accurately assess perceptions

and expectations? Would re-administration of the surveys yield the same results irrespective of changes to service delivery or demand? In addition, the community survey sample was not randomly distributed nor was it disseminated to a finite number of respondents. Given that the vast majority of responses were favorable, it bears acknowledging that the sample may not be representative.

Recommendations

The initial evaluation of the DVFD's deployment and response would indicate the need for increased personnel at emergency incidents. Determining adequate response and the number of personnel required to fulfill this demand will require further review.

The first priority of the DVFD should be to hire career personnel in order to guarantee round the clock coverage of at least one career officer at all medical calls and consistent initial response to all station calls. Through the budgetary process, the Chief will need to work with the Town Manager to secure the necessary funding.

Second, the literature consistently confirms that comprehensive risk assessment is necessary to adequately gauge the resource needs of the community. The DVFD, through review of pre-plans and coordination with Town of Duck Inspections, should evaluate the following as outlined in CFAI (2006): occupancy risk, fire flow determination, target hazards, probability and consequence of an incident (i.e., economic, environmental, life safety). This in turn will determine accurate deployment of resources.

Third, the DVFD should evaluate itself against the NFPA 1720 standard in its entirety. This would allow for an appraisal of all aspects of fire department service delivery. A systems approach will identify the aspects of the organization that may require improvement or change.

Fourth, it is important to continue to educate stakeholders -- Town staff, Town Council, community members, and firefighters about the demands of the DVFD and its service delivery. Stakeholder knowledge and understanding are crucial when determining level of service objectives and the resulting economic impact. Community engagement and support will be necessary when demands impose changes to current operations.

Fifth, the DVFD needs to evaluate its volunteer personnel. Not all volunteers are certified to enter a burning building. Some can perform extrication; others can operate apparatus. Fully qualified and trained personnel are necessary, whether career or volunteer status. The implications for staffing will be greatly affected by the percentage of fully qualified volunteers.

Lastly, comparing the DVFD and the Town of Duck to other fire departments and communities with similar demographics, geography, and characteristics may provide alternative strategies to meet service demands.

This research paper objectively evaluated the operations of the Duck Volunteer Fire Department. Issues raised through this research need to be considered as the organization develops its comprehensive strategic plan. In order to consistently and effectively provide present and future services, the organization must continually evaluate its operations for quality improvements in the context of service expectations defined by its own community.

Appendix A

Community Survey Questions

1. I am a (choose up to 3): *

Full time residential property owner in Duck
Full time resident renting a property in Duck
Non-resident property owner in Duck
Duck commercial property owner
Duck business owner
Visitor
Other

2. Have you, a family member, or a close friend worked in the emergency services field (fire, police, EMS)? *

Yes
No
I don't know

3. Have you ever had to call 911 for an emergency in Duck?

Yes
No

4. If YES to Question 3, how long ago? *

Within 6 months
Within 1 year
Within 2 years
Greater than 2 years
I don't know
Does not apply

5. If YES to Question 3, did you receive the quality of service you expected? *

Yes
No
I don't know
Does not apply

6. If YES to Question 3, did you receive service in a timely manner? *

- Yes
- No
- I don't know
- Does not apply

7. If you were to have an emergency in Duck, how long do you think it would take for the DVFD to respond?

- Less than 4 minutes
- Between 4 and 8 minutes
- Between 8 and 12 minutes
- Greater than 12 minutes
- I don't know

8. If you were to have an emergency in Duck, what do you think is a reasonable time period for the DVFD to respond? *

- Less than 4 minutes
- Between 4 and 8 minutes
- Between 8 and 12 minutes
- Greater than 12 minutes
- I don't know

9. I think the DVFD presents itself professionally and represents the Town of Duck well. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

10. When there is an emergency, I am confident that the DVFD will respond quickly. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

11. When there is an emergency, I am confident that the DVFD will respond with people qualified to help me. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

12. The quality of service provided by the DVFD: *

- Meets my expectations
- Exceeds my expectations
- Falls below my expectations
- I don't know

13. The DVFD is made up of: *

- All volunteer personnel
- All paid personnel
- Mostly volunteer with some paid personnel
- Mostly paid with some volunteer personnel
- I don't know

14. Comments

Appendix B

Firefighter Survey Questions

1. I am a (choose up to 3): *

Full time residential property owner in Duck

Full time resident renting a property in Duck

Non-resident property owner in Duck

Duck commercial property owner

Duck business owner

Visitor

Other

2. Have you, a family member, or a close friend worked in the emergency services field (fire, police, EMS)? *

Yes

No

I don't know

3. Have you ever had to call 911 for an emergency in Duck?

Yes

No

4. If YES to Question 3, how long ago? *

Within 6 months

Within 1 year

Within 2 years

Greater than 2 years

I don't know

Does not apply

5. If YES to Question 3, did you receive the quality of service you expected? *

Yes

No

I don't know

Does not apply

6. If YES to Question 3, did you receive service in a timely manner? *

- Yes
- No
- I don't know
- Does not apply

7. If you were to have an emergency in Duck, how long do you think it would take for the DVFD to respond?

- Less than 4 minutes
- Between 4 and 8 minutes
- Between 8 and 12 minutes
- Greater than 12 minutes
- I don't know

8. If you were to have an emergency in Duck, what do you think is a reasonable time period for the DVFD to respond? *

- Less than 4 minutes
- Between 4 and 8 minutes
- Between 8 and 12 minutes
- Greater than 12 minutes
- I don't know

9. I think the DVFD presents itself professionally and represents the Town of Duck well. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

10. When there is an emergency, I am confident that the DVFD will respond quickly. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

11. When there is an emergency, I am confident that the DVFD will respond with people qualified to help me. *

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- I don't know

12. The quality of service provided by the DVFD: *

- Meets my expectations
- Exceeds my expectations
- Falls below my expectations
- I don't know

13. The DVFD is made up of: *

- All volunteer personnel
- All paid personnel
- Mostly volunteer with some paid personnel
- Mostly paid with some volunteer personnel
- I don't know

14. Comments

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