

NEW FIRE STATION WORK GROUP'S SUMMARY OF RECOMMENDATIONS AND FINDINGS

November 14, 2014

EXECUTIVE SUMMARY

The New Fire Station Work Group was established to review the Town's current requirements for fire and emergency services, examine the current state of the existing Fire Station on Sparks Avenue, and advise the Board of Selectmen on how best to either renovate or replace the existing Fire Station. The Group has met over the past year to focus on this near-term issue. During the course of its work, the Group also identified long-range opportunities worthy of further consideration in the future.

The Group concludes unanimously that the existing Fire Station is *functionally obsolete* and therefore must be replaced. The facility is unsuited to meet the Fire Department's present and anticipated future workload, which has been driven by the Town's growing year-round and seasonal population. That workload, compounded by growing expectations for high-quality fire and emergency services, requires a larger and functionally modernized facility.

The Group further agrees unanimously that the most expedient and cost-effective replacement is a new adequately staffed fire and emergency services facility constructed at 4 Fairgrounds Road. The new facility should be based on a carefully considered update of the design originally contemplated in 2008, scaled to support continued strong emergency response capabilities Island-wide for the foreseeable (20- to 25-year) future.

A new facility at 4 Fairgrounds will cost approximately \$14 million, based on the 2008 design. That estimated cost could be lowered in several ways—through cost engineering and by dedicating any proceeds from a potential future sale of land where the existing facility is situated to retiring debt incurred to construct the new 4 Fairgrounds facility.

Looking beyond the immediate problem of functional obsolescence, the Group foresees opportunities for the Fire Department to improve its response time metrics and maintain

its resilience as the Island continues to evolve and change. Those opportunities may entail future satellite locations or deployment strategies, to better position equipment and personnel. Doing so could make more effective use of equipment and personnel as land uses and traffic patterns across the Island continue to change.

I. RECOMMENDATIONS TO THE BOARD OF SELECTMEN

NEAR TERM

1. Work with Town Counsel to develop an article for the 2015 Annual Town Meeting that seeks approval to fund the \$14.74 million design and construction costs for the recommended new facility, for a construction start date of Spring 2016. Add 4% escalation per year for any delay beyond Spring 2016.
2. Promptly fund the necessary architectural and engineering studies to update the 2008 plan, seeking potential cost savings by using alternative structural materials.
3. Charge the Work Group to assist in public education and outreach, to inform voters of the need to endorse its recommendations. Such assistance can include participation in two forthcoming Civic League-sponsored forums (scheduled for January 26 and February 23, 2015) on major forthcoming capital expenditures ([Forum I](#)) and ways the Town could pay for them ([Forum II](#)).
4. Form an inclusive committee to advise on space needs in the new facility.

LONG RANGE

1. Identify options for maintaining and improving the Nantucket Fire Department's response time metrics and resilience as the Island grows and evolves.
2. Draw on the analytic capabilities of Worcester Polytechnic Institute's Nantucket Project Center to delineate long-term options for the Fire Department and inform its future decisions. This fall a student team is exploring potential adaptive deployment strategies and other operational changes and identifying hypothetically optimal locations for any future satellite facility.
3. Retain the land where the existing facility is now situated as an asset, pending further consideration as to whether and when it is in the Town's interest to liquidate this asset.

If this asset ever is liquidated, use the proceeds to retire the debt incurred to construct the new 4 Fairgrounds facility.

II. SUPPORTING INFORMATION AND DATA

INTRODUCTION

To deliver fire protection and other emergency services, the Nantucket Fire Department (NFD) must scale its available resources to demands that have changed over time. It must deploy its resources to meet those demands, the most pressing of which arise at times not of its own choosing. NFD has continually strived to meet established standards for fire protection and emergency services, and its efforts have established a commendable record of progress in prevention. That record speaks well of the Department and its management over the years and has served to moderate local property insurance rate increases.

Given Nantucket's isolation from other communities, NFD must rely exclusively on locally available personnel and equipment to accomplish its mission. Unlike most fire departments, NFD cannot call upon neighboring fire departments in times of need.

NFD's present-day mission has broadened considerably in the 35 years since the Pleasant St. fire station opened in 1979. Factors that have expanded and reshaped service demands include:

- The Island's subsequent growth: more structures, people on island, and vehicles on the road;
- Fire departments' expanding responsibilities for implementing government-mandated fire prevention measures;
- The broader array of emergency services that new life-saving technologies have made possible and that citizens now expect.

As detailed below, NFD's ongoing efforts aimed at *preventing* fires have paid off. In FY13, the number of fires on Nantucket was only a quarter of the number NFD dealt with in FY04—a noteworthy record, considering how many more structures and people are here compared with nine years ago. Fires on Nantucket are now remarkably infrequent. That

success carries on ongoing cost: NFD must maintain its readiness to respond immediately to occasional waves of fire alarms and other emergency calls received at any minute of any day.

NFD faces an immediate need for more space, to accommodate equipment presently stored outdoors and to meet mandated training requirements. These space needs are detailed in a 2008 study by Mitchell Associates Architects (see Appendix A).

Beyond these immediate needs, the Department faces two ongoing future challenges: (1) meeting nationally accepted service standards—getting to emergencies quickly enough; and (2) resilience—maintaining its readiness to respond to multiple simultaneous emergency calls. These challenges became apparent from the Group’s analyses and figured prominently in our final recommendations.

We have identified opportunities to address these challenges. NFD’s internal data cast new light on the minute-to-minute demands it will likely face in future years. They point to potential new strategies for deploying equipment and personnel more effectively, honoring NFD’s promise to “continue to provide the Town with the assurance that we will be there when needed.” (quoting Chief Watts in 1990).

WHY THE PLEASANT STREET STATION IS OBSOLETE

Why does the Town need a new fire station? The short answer is: The existing Pleasant St. station is *functionally obsolete*. Specifically, the station is incapable of housing all of the Department’s equipment and staff in accordance with legal requirements, and the station lacks necessary training space for meeting today’s mandatory requirements for a community’s fire department. This functional obsolescence stems from several long-term changes since the facility first opened in 1979.

First, NFD’s present *workload* far exceeds what it was 35 years ago and will continue to expand in the future. The Island’s growth since 1979 has meant more structures, people on the Island, and vehicles on the road.

Second, NFD's *mission* has broadened substantially since 1979. Now, fire departments everywhere are responsible for implementing a vast array of fire prevention and detection measures that have been mandated over the past 35 years. These include, for example, enforcing new fire code building requirements; performing fire safety inspections for certificates of occupancy; enforcing new sprinkler laws; inspecting propane tank installations; and providing fire safety education. All in all, NFD now performs hundreds of separate nonemergency inspections annually. It does so with a level of staffing that hardly differs from staffing levels decades ago.

Third, NFD deploys more *specialized and technologically advanced equipment* than before. These include multipurpose vehicles, such as a fire truck capable of attacking both structural fires and wildfires; and computerized ambulances with extrication equipment for use at automobile crashes. NFD will soon deploy a fourth ambulance and a new brush breaker. Over time, the sheer number of apparatuses that must be housed at the ready has risen over time, paralleling taxpayers' rising expectations for high quality fire and emergency services.

Lastly, new modes of *mandatory training* are necessary for any fire department to fully realize the benefits of these new life-saving apparatuses and technologies as they come into service.

HIGHLIGHTS OF MITCHELL ASSOCIATES' REPORT

In 2008, Mitchell Associates Architects (MAA) undertook an evaluation of the existing Pleasant Street fire station. Their evaluation (detailed in Appendix A) underscores the following critical space needs and deficiencies:

- An apparatus bay too small to safely house current apparatus;
- A building that violates current local, state, and federal code regulations;
- A kitchen that violates current fire and health codes;

- No adequate storage rooms for turnout gear, supplies, hose, equipment or contaminated items;
- Lack of a modern cardiac training room to mitigate cardiac arrest (the cause of most firefighter deaths);
- The hazardous hose drying tower;
- No sprinkler system
- No proper security system;
- No EMS office to accommodate EMS staff;
- No proper decontamination facility meeting mandated requirements for handling blood borne pathogens;
- Secure records storage rooms that are too small and fail to meet mandated requirements;
- No bathrooms complying with codes or ADA standards.

The photographs below illustrate these space needs and deficiencies:

Improper Hose Storage:



Inadequate Storage for Turnout Gear



INDICES OF NFD's EXPANDING WORKLOAD

[NOTE: Data to be updated to reflect FY14]

The Work Group notes that NFD's workload now far exceeds what it was 35 years ago and will likely continue to expand in the future. The Island's growth since 1979 has meant more structures, people on the Island, and vehicles on the road. Table 1 below shows one global metric for comparing *all* the demands imposed on NFD over the years: the annual number of emergency and non-emergency service calls to which the FD responded. That number has increased more than six-fold over the past 34 years. On a daily average basis, the increase has been from 1.6 calls/day to 10.3.

Table 1. Annual Calls for Emergency and Non-Emergency Service: 1979-2013

Year	No. of calls annually	Daily average (1/365 of annual)	Growth in demand (1979=100)
1979	570	1.6 calls	100
1990	1,322	3.6 calls	232
2000	2,444	6.7 calls	429
2013	3,773	10.3 calls	662

Table 2. Annual Emergency and Non-Emergency Calls: FY04 – FY13

Annual 12 month totals											
	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY13/FY04
FIRE	217	206	188	86	63	56	40	66	41	52	24%
EMS	1,324	1243	1449	1354	1254	1405	1142	1110	1255	1231	93%
HAZARD CAL	140	248	266	460	245	292	292	284	324	339	242%
ALARM	884	827	850	970	1009	1071	968	1017	990	1104	125%
SERVICE	441	540	423	386	650	669	687	559	358	345	78%
INSPECTION	1,625	1367	1476	804	738	635	694	667	713	702	43%
Total	4,631	4,431	4,652	4,060	3,959	4,128	3,823	3,703	3,681	3,773	81%

Source: Nantucket Fire Department annual run stats.

FIRE	5%	5%	4%	2%	2%	1%	1%	2%	1%	1%
EMS	29%	28%	31%	33%	32%	34%	30%	30%	34%	33%
HAZARD CAL	3%	6%	6%	11%	6%	7%	8%	8%	9%	9%
ALARM	19%	19%	18%	24%	25%	26%	25%	27%	27%	29%
SERVICE	10%	12%	9%	10%	16%	16%	18%	15%	10%	9%
INSPECTION	35%	31%	32%	20%	19%	15%	18%	18%	19%	19%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

The data in Table 2 trace this expanding workload in detail, based on consistent data available since FY2004. As can be seen, the two major drivers of expanding workload in these recent years have been two types of emergency calls: hazard calls (up 142%), alarm calls (up 25%). Together, they accounted for 38% of all 3,773 calls in FY2013 (vs. 22% of the 4,631 calls in FY2004). Fire calls, by contrast, have been reduced to just 24% of the earlier level, reflecting the thousands of inspections conducted over this period.

Figure 1. Annual Emergency (only) Calls: FY04 – FY13

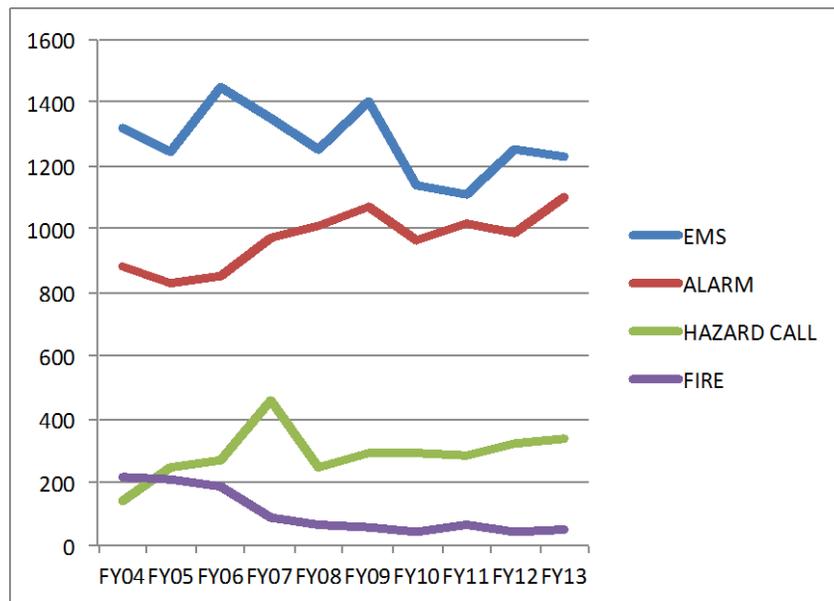
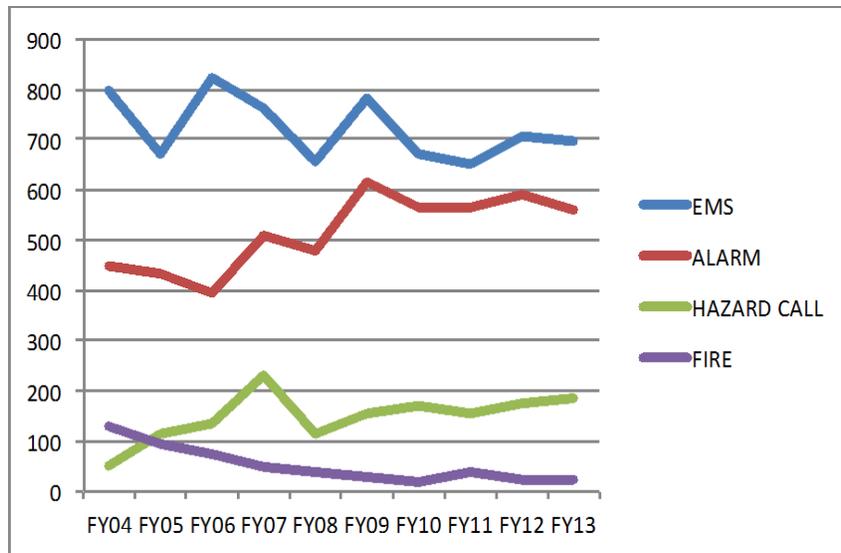


Figure 2. May-September Emergency (only) Calls: FY04 – FY13



Figures 1 and 2 focus on just the emergency calls, where response times are critical. Both annually (Fig. 1) and during the peak May-September months (Fig. 2), alarm calls and hazard calls have increased in frequency, whereas fire calls are now remarkably infrequent.

INDICES OF NFD's BROADENED MISSION

These same data show how the mix of calls to which NFD responds has changed, which reflects the Department's broadened mission in today's world. Now, actual fires account for just one of every 100 calls, and NFD devotes its fixed resources and personnel to meeting what have become its primary responsibilities: preventing fires and saving lives. As seen in Table 2 above,

- **Fires:** Frequency has declined sharply from 217 (FY04) to 52 (FY13). The latter number is fewer than the 66 fires Chief Watts reported for 1979. This dramatic reduction can be credited to prevention: the strictly enforced use of technologies not widely in use several decades ago. Note that inspection calls accounted for over one-third of NFD's call activities during FY04 –FY06. This investment of effort in prevention gradually tapered off in subsequent years but still accounts for about one-fifth of all calls today.
- **Alarms:** Frequency has risen 25% since FY04. With all structures now alarmed to prevent fires and asphyxiations, NFD receives many more alarms than in earlier years.

Many prove to be false alarms—a reminder of the continuing price of success through prevention.

- **EMS calls:** These account for one-third of all calls NFD responds to. These reflect a broad spectrum of emergencies: ambulances responding to various life threatening situations as well as facilitating MedEvac flights.

In short, NFD devotes its fixed resources and personnel to meeting what have become its primary responsibilities: preventing fires and saving lives. About a third of NFD's emergency responses are EMT calls, almost always to save lives. A further 38% are for other emergencies (mostly alarms). Actual fires account for just one of every 100 calls.

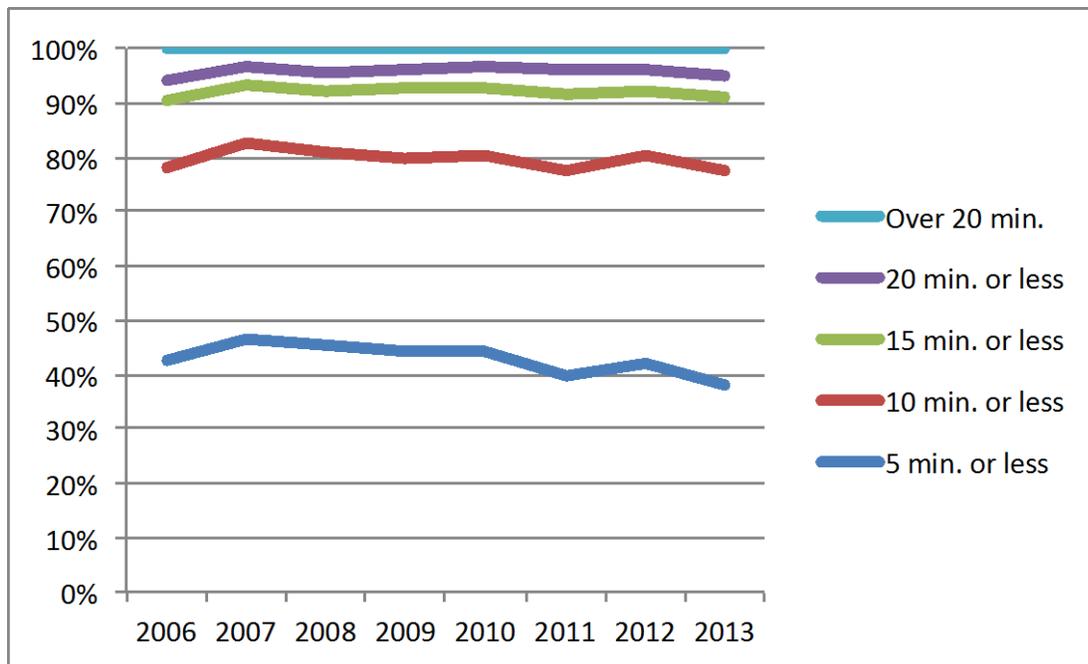
RESPONSE TIME MEASURES

[NOTE: Data to be updated to reflect June-August 2014 peak summer months]

Response times are a key metric of a fire department's performance--"When you need them, do they arrive within 5 minutes?" In practice, no fire department ever attains the established 5-minute response threshold on 100% of the calls it responds to. Responding to many calls within 5 minutes and most calls within 10-minutes has earned NFD a superior grade on performance (see Fig. 3). This performance, in turn, moderates property insurance rates for taxpayers.¹

Figure 3. Annual Response Thresholds Attained: 2006-2013

¹ Insurance companies use PPC information (which reflect response times) to help establish fair premiums for fire insurance, generally offering lower premiums in communities with better protection. See Appendix ___.



Source: Appendix Table __.

Since 2006, the data in Fig. 3 record a slight downward trend in meeting the key five-minute standard, from around 45% (2006-2010) to around 40% (2011-2013). This troubling trend may be partially attributable to an increasing frequency of higher-order concurrent calls during July and August, detailed below in the section on “Resilience.”

MEASURES OF RESILIENCE

A further important aspect of performance is *resilience*—a fire department’s ability to respond to multiple concurrent emergencies without exhausting its capacity to respond to yet another call.

Fire departments maintain resilience in two ways: By temporarily drawing upon resources (equipment and/or personnel) from neighboring communities (“borrowing” size) or by maintaining a reserve pool of locally available “call” personnel who can be summoned when the department’s full-time personnel are otherwise unavailable. Either approach affords a “shock absorber” to manage the rare instances when a department becomes overwhelmed by long-duration emergency calls.

NFD’s “shock absorber” has two distinct limitations. First, NFD lacks the redundancy of a neighboring community that most fire departments enjoy, owing to the island’s geographic

isolation. Second, its reserve pool of locally available “call” personnel has shrunk over the years. Nantucket “call” personnel once numbered ___ dozen; today, their ranks include only ___ dozen. There simply are fewer able-bodied individuals now who can drop what they are doing at a moment’s notice and rush to an emergency.

We devised a metric for assessing resilience: the frequency of high-order concurrent emergency calls. Simply put, this shows how often NFD’s resources are stretched to a limit that voters and taxpayers may regard as ominous or even unacceptable.

A “concurrent calls” episode arises whenever NFD must respond to multiple emergency calls simultaneously—for example, an ambulance responding to a 911 call, followed by a fire alarm reported only minutes later, and then a hazard call to a fuel spill from a vehicular collision. Together, all three responding units comprise an episode of “three concurrent calls” during whatever period all three cannot respond to a fourth emergency call. Once any one of the three units frees up, the episode scales down to a “two concurrent call” episode.

High-order concurrent call episodes—instances of three or more concurrent calls—are rare, but they strain NFD’s available resources and poses threats to its response times. Simply put, the response to any 4th concurrent emergency call could be delayed.

To explore resilience, we analyzed NFD’s call data from the entire period for which consistent data exist (2008 through 2013). We focused on just two peak summer months (July and August) during which NFD’s resilience is most severely tested. We documented all concurrent emergency call episodes.

Table 3

Summary Comparison: 2008-10 vs. 2011-13				
Concurrent calls	2008-2010		2011-2013	
	July	August	July	August
Six	0.1%	0.0%	0.1%	0.1%
Five +	0.2%	0.1%	0.4%	0.6%
Four +	2.0%	0.9%	2.0%	1.6%
Three +	7.8%	7.1%	7.7%	8.6%
Two +	34.3%	31.5%	35.2%	36.8%
None	65.7%	68.5%	64.8%	63.2%
Total calls	100%	100%	100%	100%

Source: Morrison's tabulation of NFD official incident reports. Note: August 2008 data are incomplete.

How often does NFD encounter episodes of four (or more) concurrent emergency calls? Such episodes are rare: they involve only one to two percent of all emergency calls during the busiest summer months (see Table 3).

Concurrent episodes also are fleeting: on average, they endure for about 6 minutes, and most episodes do not exceed 15 minutes (see Table 4).

Table 4

EPISODE DURATION SUMMARY STATS: 35 episodes		
Minimum:	1 minute	
Median:	6 minutes	
Maximum:	181 minutes	
Episodes of 15+ min.	9 of 35	

Although rare and ephemeral, such high-order concurrent call episodes underscore the unavoidable tradeoff the Town and its voters face: how many response units the Town can afford to have at the ready 24/7 vs. the risk of a non-immediate response to a life-threatening emergency. “Non-immediate” may mean arriving 3 minutes later (half the median duration of a concurrent call episode); a 3-minute delay, though, leaves but 2 minutes to meet the recognized 5-minute response goal.

The Town and its voters should recognize this tradeoff as a deliberate public choice, which

can be informed by the data in Tables 3. These data suggest that higher-order (3+ concurrent call) episodes have become more frequent during August in recent years. (Comparing 8.6% during August in 2011-2013 with 7.1% during August 2008-2010.) This comparison suggests that NFD may be nearing the limits of its capacity to sustain response times at the superior levels the Town and its residents want. An increasing fraction of emergency calls unavoidably delayed by several minutes would adversely affect the metrics displayed in Figure 3 above.

III. FUTURE OPTIONS

Consistent with its charge, the Work Group considered long-range opportunities for NFD to improve its response time metrics and its resilience as Nantucket continues to evolve and change. These opportunities may involve future satellite locations to better position equipment and personnel, thereby making more effective use of them as land uses and traffic patterns across the Island continue to change. They may involve adaptive deployment strategies and other operational changes to fortify resilience during peak periods.

These opportunities can be refined and evaluated by drawing upon the analytic capabilities of Worcester Polytechnic Institute's Nantucket Project Center. This fall, for example, a student team will identify and evaluate possible adaptive deployment strategies and other operational changes, including hypothetically optimal locations for any future satellite facility.

Appendix A

MITCHELL ASSOCIATES ARCHITECTS • EMERGENCY SERVICES FACILITIES•

May 22, 2008

Some Nantucket Fire Station Talking Points Highlights of Existing Problems

- The apparatus bay is too small. It cannot safely house the current apparatus.
- The tight space and poor layout of the apparatus bay mean that it is harder to quickly and efficiently get the firefighting apparatus back into service after a fire call.
- There are no adequate storage rooms for turnout gear, supplies, hose, equipment or contaminated items. Currently, equipment is stored under the rafters of the attic, in the hose tower, the mechanical room and on the floor of the apparatus bay.
- Storing materials in the hose drying tower makes it hazardous to hoist & hang hose.
- The overfilled and cluttered apparatus bay results in a trip and slip hazards.
- There is no proper decontamination or laundry facility. The station does not meet mandated requirements for handling blood borne pathogens.
- The secure records storage rooms are too small and do not meet mandated requirements.
- None of the bathrooms comply with codes or ADA.
- The building violates current local, state and federal code regulations and does not provide for safe exiting or accessibility for the handicapped.
- The current kitchen violates fire and health codes.
- Cardiac arrest causes 54% of all firefighter deaths. The firehouse lacks a modern cardiac training room. The exercise equipment is on the apparatus bay floor between the fire trucks.
- Environmental/Health problems.
- There is no a sprinkler system
- There is no proper security system
- The plan review officer is located on the 2nd floor, which is not handicapped accessible.
- There is no EMS office.
- The existing station is energy in-efficient.

Highlights of Proposed Solutions

- The apparatus bay is sized to meet current and future equipment needs, with adequate room to maintain and train on the apparatus.
 - The Fire Department makes 4,600 calls per year, 3,200 of which are emergency response. Every feature of the apparatus bay is configured to enhance response time; apparatus turn around time as well as firefighter training and safety.
 - The building makes a very serious commitment to facilitating ongoing training of the firefighters and EMT's, including:
 - o A proper classroom.
 - o A training library adjacent to the apparatus bay
- 29 Thacher Park Road Voorheesville, NY 12186 E-mail: Bob@Mitchell-Architects.com
 (518) 765-4571 fax 765-2950
 Web Site: Mitchell-Architects.com
- Some Nantucket Fire Station Talking Points, page 2
- o A training/hose tower that allows ladder evolutions, hose evolutions, rappelling, emergency escape practice and confined space extrication practice. These exercises can mean the difference between life and death for residents and firefighters.
 - o Ongoing physical exercise and strength training is essential to allow the responder to undertake the difficult

exertion required to extricate a full sized resident trapped in a dangerous and difficult situation.

- Issues of accessibility and gender equity are being addressed:
 - Accessibility will be provided throughout the administrative and bunking portions of the station to comply with current laws and best practices.
 - The bunking, toileting and administrative facilities allow for any mix of male and female personnel.
- The building makes a commitment to personnel safety in the building:
 - A Decon/Laundry is provided with ANSI recommended direct exterior access, and NFPA 1500 mandated laundry equipment
 - Correctly functioning breathing air equipment is essential for firefighter safety. The SCBA compressor, fill station and mask maintenance rooms are configured to minimize the risk of harm to the personnel in the event of a rupture of a breathing air bottle or equipment failure. The layout minimizes the risk of hearing loss by isolating the compressor, and venting off and high pressures resulting from a rupture. In addition, a clean work area is provided for breathing mask maintenance.
 - The apparatus bay is laid out to minimize trip and slip hazards for the firefighters during rapid response. This includes having nothing on the floor except tires and feet, floor drains that collect & dispose of water beneath the apparatus out of foot traffic patterns, controlled floor traction and adequate, glare free lighting.
- The Fire Department is responsible to maintain the fire alarm system on the island. Currently these materials are crammed into space in the Sconset fire station. The new facility will provide proper storage for pull stations, pedestals, wire and accessories. A workroom will allow for repair, sandblasting and repainting of the equipment.
- The Fire Department is responsible to fill and maintain the Departments fire extinguishers. Additionally, they provide a convenient drop off location for residents for privately owned extinguishers that are to be taken off island for service. There is currently no space designated for this. And the extinguishers are part of the overflow of material that represents a trip hazard. The new facility will have a work room designated for this purpose. Additionally, an extinguisher filling device will be provided to minimize exposure of the workers to air born chemicals that result from the hand filling that is currently done.
- The fire station currently has the capability of storing less than 1/2 of the quantity of firefighting foam that is needed. The new facility will have adequate space that is laid out to allow the 55 gallon drums to be handled with OSHA mandated procedures, rather than the current practice of rolling and wiggling them across the floor and into place for storage in the base of the hose tower.
- A plan review office will be provided that is readily accessible where members of the public can meet with the department's plan review officer.
- EMS calls represent 60% of the emergency response of the Department. An EMS office is provided where paperwork can be processed confidentially in private.
- An appropriate records storage room will be provided.
- The new facility will be fully sprinklered, will have a modern security system and will be energy efficient.