



**CITY OF PETALUMA, CALIFORNIA**  
**PUBLIC SAFETY FACILITIES STRATEGIC MASTER PLAN**  
Prepared by Laura Blake Architect and MW Studios  
Final Report 14 November 2023



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## B. EXECUTIVE SUMMARY

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Laura Blake Architect and public safety specialist MW Studios were tasked by the City of Petaluma, California, to develop a public safety facilities strategic master plan to help guide the city in its policy-making relative to fire, emergency operations, and police capital improvement project planning. The information contained within this report and the associated exhibits reflect the work conducted between November 2022 and the issuance of this report.

### GOAL

Laura Blake Architect (LBA) and MW Studios (MWS) collaborated with the City of Petaluma to determine its public safety facility needs and develop a plan to meet them. The goal is to provide the city with a comprehensive strategic plan that ensures its public safety facilities are well-positioned and equipped to meet the community's evolving needs for decades.

To achieve this goal, the team facilitated a collaborative and comprehensive process. It assessed the existing facilities to understand their strengths and limitations and reviewed previous studies to identify areas for improvement to build upon past recommendations. Working closely with city stakeholders, the team developed the project objectives, analyzed needs, explored renovation and new construction options, identified the options that best meet the City's vision and needs, and developed realistic fiscal capital planning projections for those options.

### PURPOSE

This study aims to provide the City of Petaluma with the necessary information to make informed decisions regarding fire, emergency operations and police facility needs. This planning tool is meant to help prioritize and inform capital development decisions, which are to be funded, in part, through the recent Measure U initiative. The priorities include the following:

1. Address immediate facility needs to improve safety and operations.
2. Improve operational efficiency and service capability by renovating or replacing public safety facilities to provide adequately sized spaces designed for the needs of 21<sup>st</sup> century first responders.
3. Phase improvements to meet needs logically and efficiently optimize city resource use.

**OBJECTIVES**

Throughout the study, the consultants, fire, police, and public works departments, and city administrators worked collaboratively, holding regular meetings to understand public safety needs, share insights and perspectives, and review and refine facility programs and options as they were developed. These discussions helped the stakeholders understand the study's challenges, opportunities, and recommendations.

The active involvement of the public safety, public works, and city administration officials in establishing the objectives created a strong foundation for the study. Their collective expertise and input helped shape the study's direction, ensuring the decision-making process remained informed, inclusive, and responsive to the community's needs.

The key objectives that informed the process and recommendations are as follows:

**1) SUPPORT EFFICIENT SERVICES AND IMPROVE RESPONSE TIMES:**

The primary goal of the facilities strategic master plan is to enhance the efficiency of public safety services and optimize response times to emergencies by providing the necessary space designed to modern operational and safety standards and organized for operational efficiency.

**2) ADDRESS CURRENT DEFICIENCIES AND IMPLEMENT A FUTURE-PROOF SOLUTION:**

The plan aims to identify and address current deficiencies in the existing public safety facilities and provide a master plan that has adequate space, flexibility, and adaptability to meet the evolving facility needs for the next 50 years.

**3) IMPROVE FIRST RESPONDER HEALTH, SAFETY, AND PHYSICAL AND MENTAL WELLNESS:**

The plan aims to prioritize the well-being of first responders by providing appropriate facilities to enhance their health, safety, and overall physical and mental wellness.

**4) IMPROVE MORALE, RECRUITMENT & RETENTION, AND STAFF SATISFACTION:**

The plan seeks to improve staff satisfaction, job engagement, and retention rates by providing facilities that foster a positive and inclusive workplace culture. Creating a diverse and professional work environment enhances morale, attracts new talent, and retains experienced staff.

### 5) CREATE SAFE COMMUNITY ENGAGEMENT SPACES:

The plan includes safe spaces for community engagement to help strengthen the bond between public safety agencies and their community.

### 6) MEET BEST PRACTICES TO MITIGATE HEALTH, FINANCIAL, AND LEGAL RISKS:

The plan emphasizes adopting best practices to mitigate potential risks, encompassing health, financial, and legal aspects. The plan aims to minimize risks and liabilities associated with public safety operations by providing the necessary spaces and facility organization needed for compliance with industry standards, regulations, and guidelines.

### 7) BE FISCAL RESPONSIBLE:

The plan seeks to be fiscal responsible by including efficient facilities and thoughtfully integrating phasing and shared spaces to optimize resource allocation while considering long-range financial sustainability.

The initiative aims to transform the public safety landscape by addressing these planning objectives, enhancing service delivery, and creating a safe and thriving community for years.

## SITE AND OPTIONS CONSIDERATIONS

The strategic master planning efforts thoroughly explored various options including alternative sites, stand-alone facilities, and co-located facilities with shared spaces. The aim was to identify the most suitable and effective plan for the city's public safety needs.

The following table summarizes alternative sites considered for the Fire Headquarters and Emergency Operations Center and the Police Station. See Section M for more detailed information.

### NEW FIRE HEADQUARTERS AND EMERGENCY OPERATIONS CENTER

Existing Fire Station 1	Too Small, Ladder Truck Does Not Fit
307 S. Petaluma Blvd	Too Small
Lot Next to City Hall	Too Small
Kenilworth Park	Too Small, Displaces Community Amenity
Fairgrounds	Adequate Space, Central Location, Good Response Times

## NEW POLICE STATION

Existing Police Station	Too Small, Not Centrally Located
1221 N Petaluma Blvd	Requires Acquisition, Not Centrally Located, Topography Challenges
Hopper St (Corp Yard)	Access Limitations, Designated for Other Uses
307 S. Petaluma Blvd	Too Small, Alternate Fire Station 1 location
Fairgrounds	Adequate Space, Central Location, Co-Location Reduces Costs

## RECOMMENDATIONS AND ESTIMATED COSTS

Recognizing that the scale and timeline of each proposed capital project directly influence costs, careful consideration was given to the phasing and sequencing of the proposed projects. The team evaluated how best to structure the plan's implementation to ensure a well-planned and coordinated execution that would maximize efficiency, minimize disruptions to ongoing use, and optimize the allocation of resources.

The study recommends implementing a tiered plan with Immediate, Short-Range, and Long-Range Phases.

In the Immediate Phase, the study recommends prioritizing fire personnel safety by mitigating Fire Station 1 seismic risk. Additionally, the study recommends providing equitable toilet, shower, and locker accommodation at Fire Station 1, and adequate office, locker, and fitness accommodations at the Police Station to ensure the well-being and comfort of all personnel.

In the Short-Range Phase, the study recommends constructing a new central fire headquarters and emergency operations center at the fairgrounds. This new headquarters would include administrative space and a fire station that houses the ladder truck and has the capacity to house personnel and equipment during red-flag and winter storm upstaffing. In addition, the study recommends renovating or replacing Fire Station 1, which has significant physical and functional deficiencies and is located within a recently identified sea level rise zone.

In the Long-Range Phase, the study recommends construction of a new police station to address significant overcrowding and functional deficiencies and provide for growth. Collocating the new police station with the new fire headquarters and emergency operations center would allow shared facilities and personnel which would enhance operations and emergency response and reduce capital and operating costs. The study also recommends renovating and expanding or replacing Fire Station 2, which is located within a flood zone, to address space and functional deficiencies and provide for growth. Since Fire Station 2 serves as a training facility, it should receive priority over Fire Station 3, which also should be renovated or replaced to address space and functional deficiencies and provide for growth.

Additional information supporting these recommendations and approach can be found in Section H: Recommendation Synopsis and Section I: Validation and Test Fit.

The estimated construction costs and schedules for the first projects are shown below. These estimates are based on historical cost data and escalation rates. The costs include construction and escalation. An accelerated schedule would reduce costs, whereas an extended schedule would increase them.

PRIORITY	ESTIMATED CONSTRUCTION COST*	START DESIGN DATE	OCCUPY DATE
Fire Station 1 Immediate	\$2,600,000	Q3 2023	FY25 or sooner
Police Station Immediate	\$5,200,000	Q3 2023	FY25 or sooner
New Fire Headquarters & EOC	\$38,300,00	Q3, 2025	Q3, 2028

\*Estimated construction costs include escalation but **exclude soft costs** including environmental entitlements, design, management, and furniture, fixtures, and equipment.

## C. METHODOLOGY

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The strategic facilities master plan was developed through a comprehensive and collaborative process, ensuring that the city's key stakeholders had a voice in the decision-making. The following method was employed to create the plan:

### APPROACH

#### 1) GOAL SETTING CHARETTE:

The process began with a goal setting charette, where key objectives and priorities were identified and established.

#### 2) FACILITY TOURS:

Facility tours were conducted to understand existing facilities and their limitations. A precedent tour of a similarly sized facility provided insights that helped the team refine space requirements.

#### 3) ESTABLISHMENT OF STAKEHOLDERS:

A diverse group of stakeholders, including public safety, public works, and city administration officials, were identified, and engaged throughout the planning process. Their input and expertise were vital in shaping the plan. The implementation of this plan will undoubtedly require additional engagement from community members.

#### 4) STAKEHOLDER INTERVIEWS & NEEDS ASSESSMENT:

In-depth interviews were conducted with the stakeholders to gather their perspectives and assess their needs and requirements. These reviews helped inform the planning team about each stakeholder group's unique challenges and priorities.

#### 5) FACILITY PROGRAMMING & PRELIMINARY COST ESTIMATES:

Based on the needs assessment, the facility programming was developed to outline the required spaces, functions, and capacities. Preliminary cost estimates were also prepared to explain the potential financial implications.

#### 6) RECONCILIATION OF PROGRAMMING:

The programming was then reconciled to identify opportunities for operational efficiency and optimize the allocation of resources. The reconciliation involved careful consideration of space utilization, workflow optimization, and resource allocation.

#### 7) CONSIDERATION OF POTENTIAL SITES & SITE ANALYSIS:

Potential sites for new construction or expansion were evaluated, considering location, accessibility, suitability, and infrastructure availability. A comprehensive site analysis helped identify the most suitable options.

**8) PROGRAM & SITE TEST FIT:**

The programming requirements were tested against potential sites to ensure proper fit and feasibility. These test fits involved assessing the spatial requirements and constraints of potential sites.

**9) OPTIMIZATION & CAPITAL BUDGET DEVELOPMENT:**

The programs were further optimized to ensure efficient use of resources while meeting the identified needs. Capital budgets were developed considering cost escalation and long-range projections to determine the plan's financial implications.

**10) DRAFT REPORT & REVIEW:**

A draft report summarizing the planning process, findings, and recommendations was prepared and a presentation of the findings made to City Council

**11) FINAL REPORT:**

This final report incorporates the city's feedback and provides a comprehensive City of Petaluma Public Safety Strategic Facilities Master Plan.

Throughout the process, a collaborative platform was utilized to facilitate stakeholder input. This digital tool allowed stakeholders to provide feedback, share ideas, and contribute to the planning process transparently and efficiently.

**CONTRIBUTORS**

The following individuals regularly attended meetings and are subject matter experts in their respective fields. Their direct involvement supported the findings and recommendations of this report.

PERSON	ROLE	ENTITY
Peggy Flynn	City Manager	City of Petaluma
Brian Cochran	Assistant City Manager	City of Petaluma
Jeff Schach	Fire Chief	City of Petaluma
Chad Costa	Assistant Fire Chief	City of Petaluma
David Catalinotto	Sr. Management Analyst	City of Petaluma
Ken Savano	Police Chief	City of Petaluma
Brian Miller	Deputy Police Chief	City of Petaluma
Christopher Bolt	Director of Public Works	City of Petaluma
Gina Benedetti-Petnic	Asst. Director of Public Works	City of Petaluma
Diane Ramirez	Public Works Project Manager	City of Petaluma
Laura Blake	Architect	Laura Blake Architect
Rob Manns	Public Safety Specialist	Manns Woodward Studios (MW Studios)

For additional information about the contributors, please refer to the appendix.

## D. STUDY MISSION STATEMENT

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This study aims to support efficient public safety services and enhance response times while prioritizing first responders' health, safety, and well-being and the community they serve. It aims to foster a diverse and professional work environment that improves morale, recruitment, retention, and overall staff satisfaction. This public safety facilities strategic master plan aims to effectively adapt to new mission challenges for the next 50 years by addressing deficiencies and providing flexible space solutions. The plan and strategy extend to creating safe community engagement spaces that foster trust, build meaningful relationships, and give back to the community. The plan incorporates best practices to mitigate health, financial, and legal risks while ensuring fiscal responsibility.

# E. PUBLIC SAFETY AGENCY OVERVIEWS

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## 1) PETALUMA FIRE DEPARTMENT

The Petaluma Fire Department has a rich history dating back to the late 1800s. It has served the City of Petaluma, California, and its surrounding areas, providing essential fire protection services and responding to emergencies.

The origins of the Petaluma Fire Department can be traced to 1857 when the city formed its first volunteer fire company called the "Protection Engine Company No. 1." At that time, Petaluma was a growing city with a thriving agricultural industry, and the need for fire protection became apparent as more structures were built.

Over the years, the fire department underwent several changes and improvements. In 1871 the city purchased its first steam fire engine, a significant technological advancement. This engine could pump water more efficiently and had a greater firefighting capacity.

In 1890, Petaluma transitioned from a volunteer fire department to a fully paid department, providing full-time firefighters. This change allowed for greater professionalism and improved response times. The department continued to modernize its equipment and techniques to keep up with the evolving challenges of firefighting.

The Petaluma Fire Department expanded and adapted to changing times in the following decades. It incorporated technological advancements, such as motorized fire engines and improved communication systems. The department also focused on community outreach and fire prevention education to reduce the occurrence and impact of fires.

The Petaluma Fire Department collaborates with neighboring fire departments and agencies to provide comprehensive emergency response services. Its dedicated firefighters undergo rigorous training and continually update their skills to handle various emergencies effectively.

Through its long and storied history, the Petaluma Fire Department has remained committed to protecting the lives, property, and environment of the Petaluma community. In preparation for the rest of the 21<sup>st</sup> century, the department must enter the next chapter of modernization to continue providing essential services effectively.

The Petaluma Fire Department facilities need to be expanded and modernized to effectively meet the growing demands and challenges of providing emergency services. Several vital statistics highlight the need for these changes:

The number of calls for service has significantly increased over the past two decades. Twenty years ago, the department responded to approximately 4,800 calls per year. However, that number has risen to over 8,000 calls annually in recent years. This substantial increase in call volume reflects the greater demand for emergency services within the community.

Traditionally, the department's role was primarily focused on fire protection. However, in addition to fire protection and prevention, the department manages motor vehicle collisions, emergency medical calls, technical rescues, and other critical incidents. This expanded scope of services reflects the evolving needs and expectations of the community.

Over the past 20 years, the number of personnel within the department has increased. The department had 55 sworn personnel and three civilian staff two decades ago. Today, it consists of 64 sworn staff and five civilians. This increase in personnel indicates the growing workload and responsibilities placed on the department.

There has been a significant increase in female employees within the department. Two decades ago, the department had two female employees; today, there are eight female employees, three first-responders in the Fire Prevention Bureau, and two firefighters who require overnight and shower accommodations. This growth aligns with national trends emphasizing diversity and inclusion within emergency services. As the population becomes more diverse, it is crucial to have a representative and inclusive workforce to serve the community and the facilities to support them effectively.

The department's apparatus (firefighting vehicles) have also increased. Twenty years ago, the department had 20 pieces of apparatus. Today, that number has grown to 30. This expansion indicates the need to enhance the department's facility resources and capabilities to address the rising demand and expanding types of emergency services.

Despite these increased service demands and operational changes, the City of Petaluma's three existing fire stations have not undergone significant capital improvements in the past 30+ years. The Petaluma Fire Department facilities need to be expanded and modernized to keep pace with the increasing demands and expectations of the community. Providing a new headquarters, fire station, and EOC and renovating or replacing its three existing fire stations will allow the fire department to provide efficient and effective emergency services to the Petaluma community well into the 21<sup>st</sup> century.

The planning team reviewed the *Petaluma Fire Department Fire and EMS Operational and Administrative Analysis* prepared by the Center for Public Safety Management (CPSM) in 2022. The CPSM study focused on evaluating the administrative and operational performance of the department relative to meeting national benchmark standards. Amongst other items was a key recommendation to construct a new centrally located fire station to house the department ladder truck. The planning team concurs with this recommendation, acknowledging that a centralized ladder truck would provide better coverage to the entire city and reduce response times, bringing it within the NFPA 1710 standards. As such, building a new centrally located fire station, department headquarters, and emergency operations center is a critical short-range priority.

## 2) PETALUMA POLICE DEPARTMENT

The Petaluma Police Department has a long and eventful history that spans over a century. It has played a vital role in maintaining law and order, ensuring public safety, and serving the community of Petaluma, California.

The origins of the Petaluma Police Department can be traced back to the late 1800s. In 1858, Petaluma was officially incorporated as a city, and by the early 1860s, the need for a dedicated law enforcement agency became apparent.

Over the years, the Petaluma Police Department evolved and adapted to the changing needs of the growing city. In the early days, the department consisted of a few officers responsible for maintaining order, enforcing local ordinances, and addressing criminal activities within the community.

In the mid-20th century, the Petaluma Police Department experienced significant growth and modernization. As the city's population increased, so did the demand for police services. The department expanded its staff, acquired new equipment, and established specialized units to address emerging issues such as traffic enforcement, drug-related crimes, and investigations.

The Petaluma Police Department has also prioritized community engagement and outreach. Implementing community policing strategies has fostered partnerships between law enforcement and the community, promoting trust, cooperation, and mutual understanding. The department has actively participated in community events, educational programs, and crime prevention initiatives to build relationships and enhance public safety.

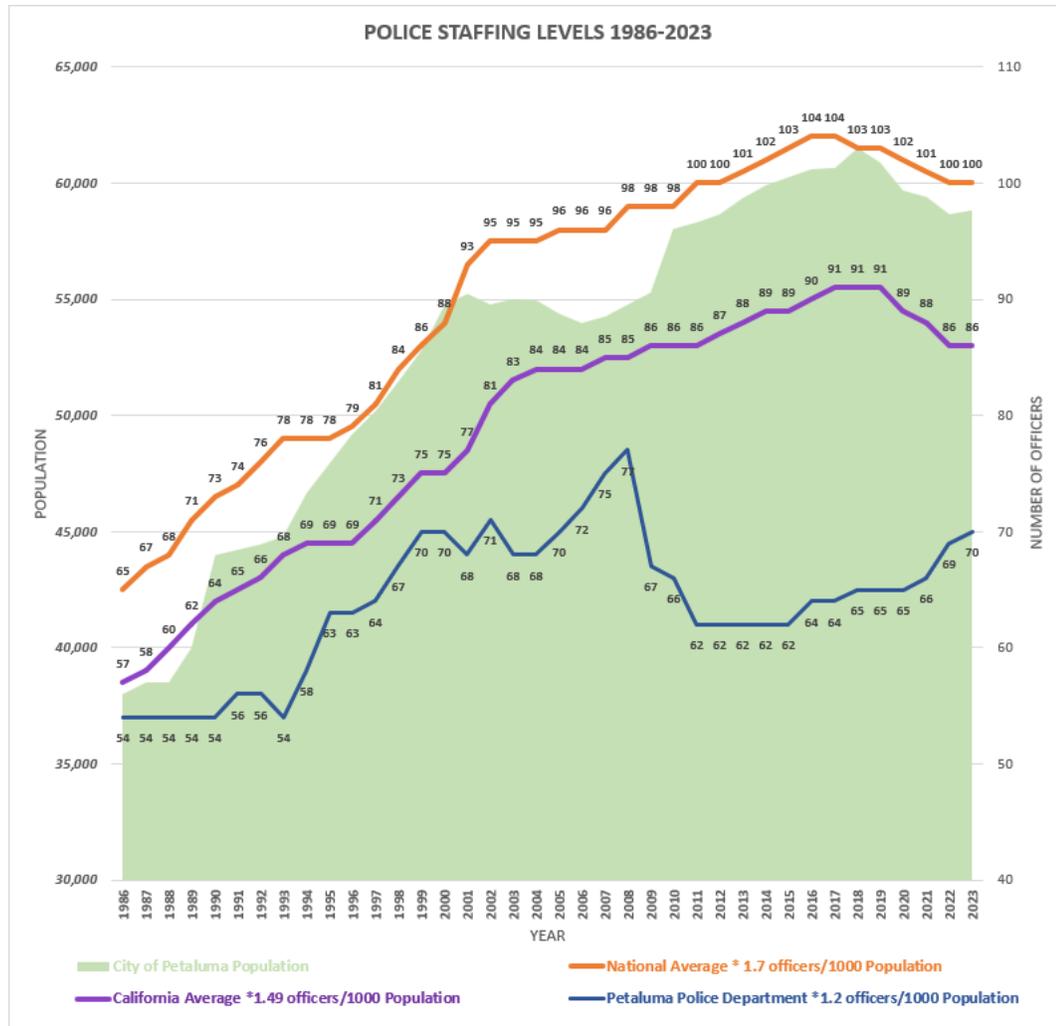
In recent years, the Petaluma Police Department has embraced technological advancements to improve its effectiveness. Modern communication systems, data analysis tools, and surveillance technologies have enhanced the

department's ability to respond to emergencies, investigate crimes, and prevent criminal activities.

While the overall number of calls for service has remained relatively static over the past ten years, at approximately 63,000, the types of calls have become more challenging. The landscape of law enforcement has changed significantly, and legislation has reduced workloads associated with offenses that were once considered minor criminal offenses. Consequently, today's calls for service constitute a much higher percentage of more serious criminal offenses than ten years ago.

The Great Recession resulted in a 22% reduction in the department's full-time equivalent (FTE) positions. Measure "U" revenue has restored 8 of 15 (53%) sworn FTE officer positions that were previously allocated but were not funded.

Methodology regarding addressing future staffing and resource needs for public safety facilities strategic planning has evolved in recent years. Methods for forecasting future facility needs include projections based on growth and service level demands for public safety agencies using national and statewide ratios of officers and population. Based on national averages for cities the size of Petaluma, the officer per 1000 inhabitant's ratio is 1.7. Using the national average Petaluma would have approximately 103 FTE officers. Using the California ratio of 1.49, staffing at the department would be 91 FTE officers compared to the currently funded 70 FTE officers. The graph on the following page illustrates the national and statewide ratios to population growth compared to Petaluma.



In 2018, Department staffing shortages necessitated a reduction in services to the community and many of those services have not been restored or were shifted to on-line reporting.

In 2021 the Police Department completed an organizational workload study with the Center for Public Safety Management (CPSM). The analysis included a methodology referred to as the “Rule of 60” which states that 60% of the Department’s sworn FTE positions should be allocated to patrol and if adequate staffing levels were present, officers in patrol should have 40% or more available time to conduct community policing, crime reduction/prevention, and proactive traffic enforcement to reduce collisions. The CPSM study indicated that in 2021 the department was adequately staffed in their existing staffing model under the current service demands, which included maintaining the service reductions from 2018. The analysis acknowledged that any additional duties or workload taken on would require additional staffing resources. The CPSM study also acknowledged that the department has outgrown its facilities and that any additional future

staffing resources or departmental growth would necessitate further evaluation and investment in additional public safety facility space(s).

Considering population growth and the current demands for services, the city should be prepared to provide space to accommodate an additional 20-40 officers. Additional professional staff employees are also expected due to anticipated demand for future reporting processes consistent with recent legislative mandates and changes.

The City of Petaluma is facing a significant challenge in providing adequate facilities for its police department. The department operates from a facility initially intended to function as a mortuary when it was built in the 1960s. Although renovated in the 1980s to accommodate the police department, the building is very overcrowded and has significant operational limitations. In 2008, the department was forced to create off-site temporary office space for existing staff to meet operational needs. Since that time the city has added storage on site and is leasing additional off-site temporary office space, but these are short-term fixes.

The city must recognize the need for a modern, purpose-built facility of adequate size to accommodate current staffing levels and provide space for future growth. Adequate facilities are essential for the department to effectively serve and protect the community while adapting to the changing landscape of law enforcement.

## F. EXISTING FACILITIES OVERVIEW

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### 1) FIRE STATION 1

Petaluma Fire Department Fire Station 1 is a six-bay station originally built in 1938. The station does not meet modern building standards and operational best practices and needs significant upgrades. It also is located in a recently identified sea level rise zone. Once a new central fire headquarters with a station and administrative space is built, Fire Station 1 could be vacated and renovated or replaced. A full renovation, including hazardous material abatement, seismic, flood protection, and other code and physical upgrades, and programmatic improvements, could revitalize Fire Station 1, ensuring a safer and more efficient environment for fire department operations. However, given the building's location in a sea level rise zone combined with its other deficiencies, replacing Fire Station 1 will likely be more cost effective and functional than renovating it.



*Fire Station 1*

## 2) FIRE STATION 2

Petaluma Fire Department Station 2, a three-bay station constructed in 1982, faces challenges related to its size and aging systems. As the building continues to age, replacing or fully renovating and expanding it should be part of the long-range plan. The existing facility suffers from inadequate space, which fails to meet the evolving needs of the department. Additionally, the undersized bays pose limitations on equipment storage and maintenance. Despite these shortcomings, the site's advantageous position allows for efficient community response times and its larger size is well suited to training. However, the facility is located within a floodplain, necessitating the elevation of occupied spaces per FEMA standards. Given the building's location in the floodplain and the need for expansion, replacing Fire Station 2 will likely be more cost effective and functional than renovating and expanding it.



*Fire Station 2*

### 3) FIRE STATION 3

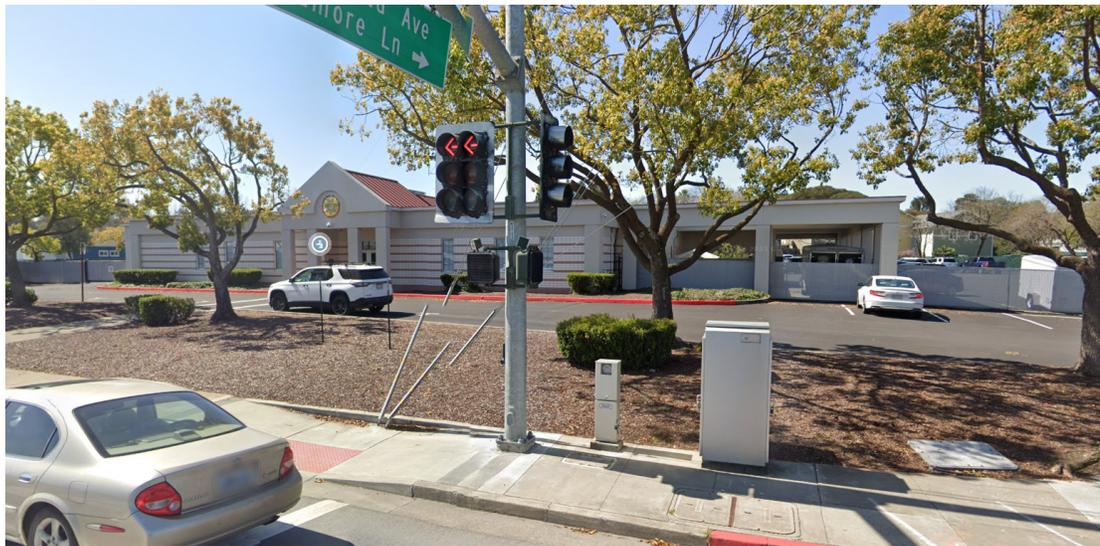
Petaluma Fire Department Station 3, a two-bay station constructed in 1971 is located within a residential community. A small addition was added in the 1990's, but the facility still falls short of meeting the spatial needs of a modernized fire service. Insufficient space and inadequate bay and sleeping facilities for crews are among the primary concerns. Moreover, its smaller site size and the current single-story configuration limits the possibility of horizontal expansion. While renovation and expansion could be an option, it is likely that replacing the station with a more efficient design that addresses these deficiencies and provides for growth while respecting the scale and context of the surrounding residential neighborhoods will be more cost-effective.



*Fire Station 3*

#### 4) POLICE STATION

The existing Petaluma Police Department facility has a unique history, originally constructed in 1968 as a mortuary and later converted into a police station in 1985. While the building has been well maintained, it was never purpose-built as a law enforcement facility. As a result, it faces several challenges that hinder its effectiveness in meeting the department's needs. The building is overcrowded and lacks key program elements that hinder operational efficiency and officer recruitment and retention, the key to today's law enforcement missions. Another issue is the lack of adequate secure parking for officers, impacting their safety and efficiency. Additionally, with almost 40 years of service in its current form, the building falls short in energy efficiency compared to more modern facilities. Given these limitations, there is a pressing need to consider a new facility that is adequately sized and purposefully designed to support the evolving requirements of the Petaluma Police Department, enhancing operational effectiveness and resilience.



*Police Station*

## 5) EXAMPLES OF DEFICIENCIES

The City of Petaluma's existing public safety facilities are aging and have physical deficiencies, space shortfalls and characteristics that do not conform to current public safety best practices. The following list is intended to spotlight only a few of the critical issues facing these facilities. Appendix "R" comprehensively describes the best practices surrounding fire station and police station design, of which most of the facilities fall short of meeting.

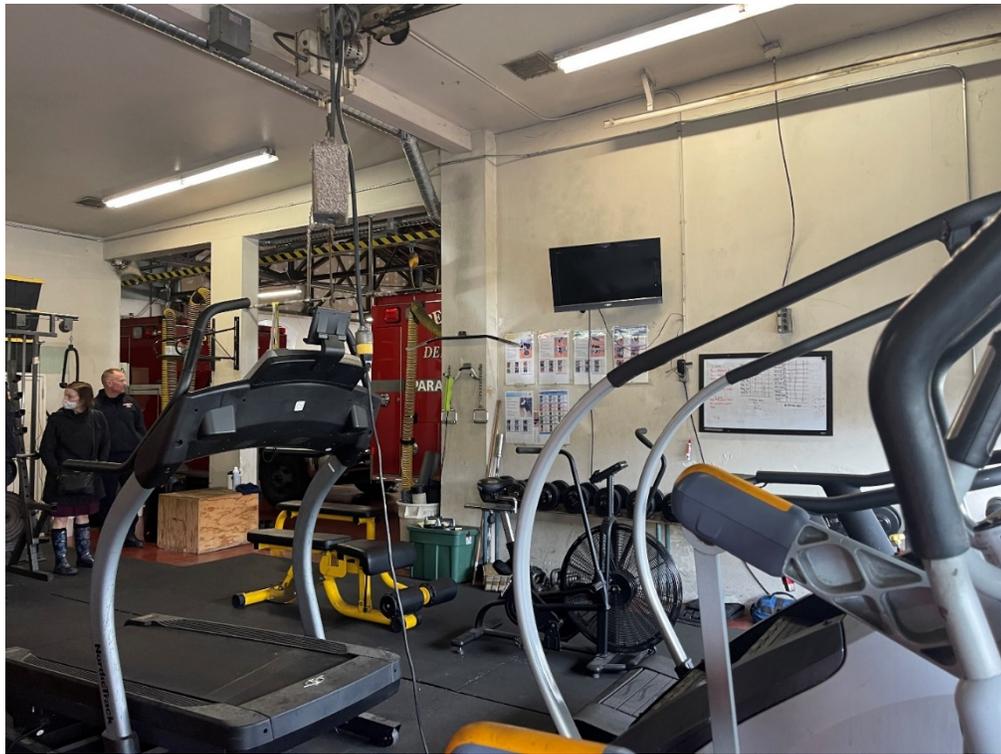
### a) Seismic Capacity and Sub-Grade Issues at Fire Station 1

Previous studies indicate that Fire Station 1 needs to strengthen to improve its seismic resistance. In addition, the floor slab in the apparatus bay shows visible signs of dynamic heaving. It is reported that the floor elevation changes when it rains. While a full seismic upgrade will be required when the building is renovated, engineers should review the building structure, foundations, and soil conditions to determine appropriate improvements that can be undertaken in the near term.



## **b) Carcinogenic Exposure at Fire Station 1**

The photo depicts the fitness equipment placed within the apparatus bays, directly exposed to the fire apparatus. This arrangement raises concerns since apparatus bays, despite having direct source capture exhaust systems, are known to contain cancer-causing diesel particulates. Best practices dictate that occupied spaces, particularly those involving strenuous cardiovascular activities, should be situated in conditioned environments where indoor air quality can be guaranteed. Therefore, it is essential to reconsider the placement of the fitness equipment and prioritize creating a controlled environment that ensures optimal indoor air quality for the safety and well-being of the users.



**c) Insufficient Storage Space at All Fire Stations**

The photo portrays the existing fire station, highlighting the insufficient storage space. With the increasing quantity of calls for service and the expanded range of emergency services provided, there is a pressing need for additional storage space to accommodate specialized tools and equipment. This increased demand emphasizes the necessity for adequate storage facilities. In the case of Fire Station 1, the storage situation is compounded by relegating it to an exit stairwell, potentially creating a life safety issue.



#### **d) Inadequate Sleeping Quarters**

The photo captures the typical sleeping conditions found at all three fire stations, illustrating the evident insufficiency of the spaces. One notable issue is the lack of acoustic separation between individual quarters, which can compromise privacy and hinder quality rest. Furthermore, there is a significant deficiency in providing adequate sleeping and shower facilities for female and gender-neutral firefighters. Many observed conditions highlight a lack of fire separation between spaces and the absence of automatic sprinkler systems, essential for ensuring safety.



**e) Lack of ADA Accessibility**

Most fire stations face accessibility issues that do not comply with the standards set by the Americans with Disabilities Act (ADA). These issues include undersized toilet rooms, narrow corridors, and doors that lack appropriate hardware and are too narrow. Although many of these conditions existed before the enactment of the ADA, these conditions need to be corrected to improve accessibility for individuals with disabilities and comply with the ADA. It should be noted that per the US Department of Justice, public safety facilities are not exempt from the ADA.



**f) Inadequate Apparatus Bay Conditions**

The apparatus bays in fire stations are undersized to meet the demands of a modern fire service. The limited depth of the bays leaves little room for personnel to navigate quickly around the front and rear of the apparatus, potentially impeding response times during emergencies. In addition, the width of modern apparatus has reduced the space between the vehicles, further hindering response times and compromising safety because fire fighters must maneuver around each other when putting on gear and getting into vehicles. The situation is exacerbated by the interference of the direct capture vehicle exhaust system hoses. As apparatus sizes continue to trend towards being larger, the lower overhead clearances within some stations may require the department to order custom chassis, thus incurring additional manufacturing expenses. The recommended door height is 14'-0", which satisfies most standard bridge clearances of 14'-6". Further, many stations lack appropriate trench drain and oil separator conditions, now common environmental protection features. Finally, the lack of adequate bay space has resulted in expensive emergency reserve vehicles being left outside, exposed to the elements.



**g) Inadequate Living Conditions**

While the city has refurbished some kitchens, the fire station kitchen, dayrooms, and fitness spaces are inadequate, compromising the health and well-being of the first responders. Kitchen spaces and dayrooms are undersized for the crews assigned and some dayrooms contain finishes and furnishings that are not anti-microbial, potentially trapping carcinogens that may be brought back from fire scenes. In addition, fitness areas are significantly lacking.



## **h) Insufficient and Inadequate Police Lockers**

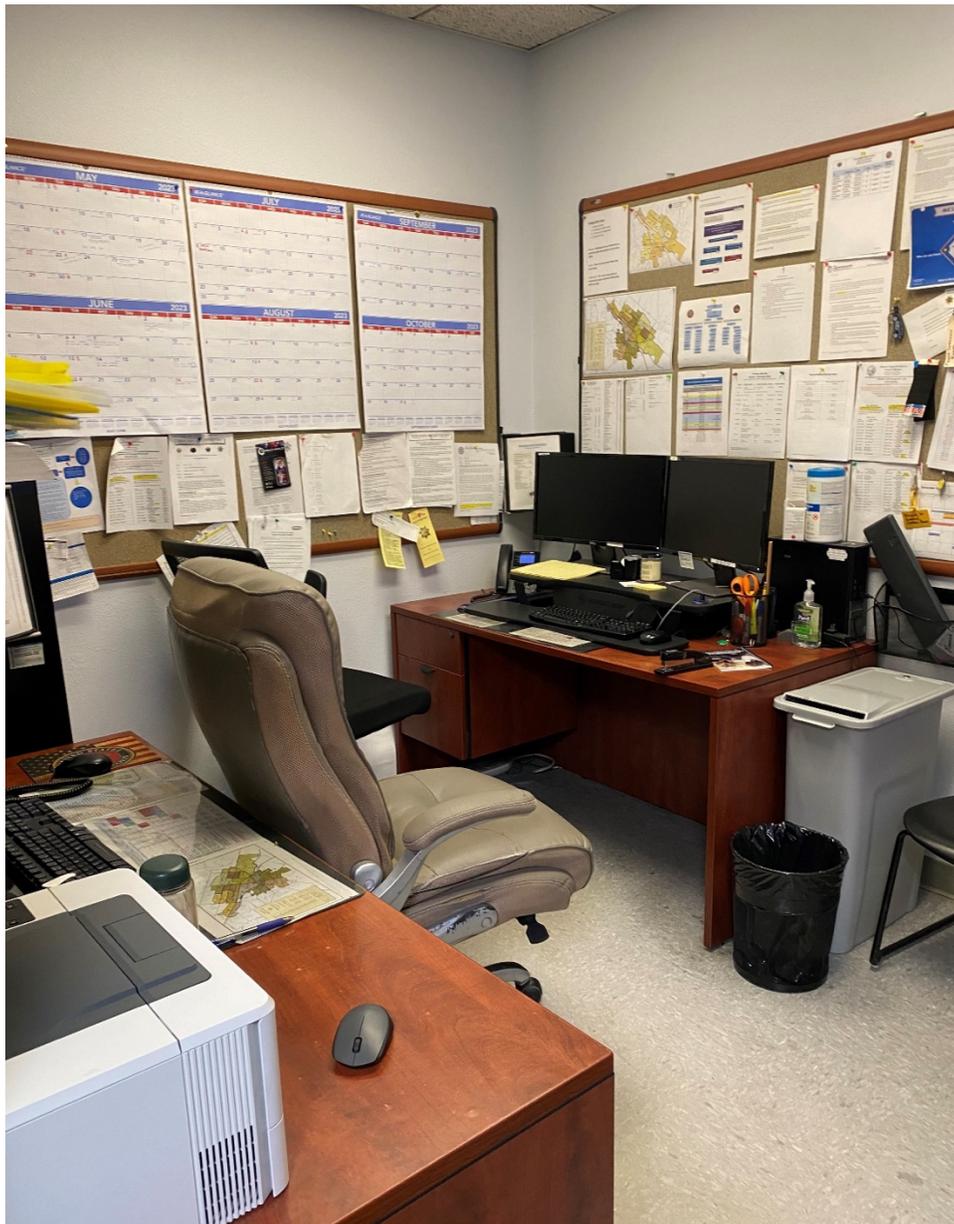
The available number and size of lockers are insufficient to meet modern police officer needs. Officers need to store specialized gear including ballistic vests, in addition to gear belts, shields, protective gear, firearms and uniforms. The department has resorted to utilizing supplemental lockers and gear storage in unconventional locations such as toilet rooms, outside under porticos, and in other non-dedicated changing areas.



**i) Overcrowded Police Office and Meeting Space.**

The photograph depicts an example of an overcrowded office space within the police department. To accommodate its operational needs, the department has repurposed storage rooms and leased space, to meet their office requirements.

In addition, the police briefing room is currently used as the emergency operations center (EOC) which disrupts police operations and impacts police response when used as the EOC.



**i) Insufficient and Inadequate Police Storage**

The photograph highlights the severe shortage of storage space faced by the department. As a result, valuable equipment and sensitive materials are stored in shipping containers and other inadequate facilities. These unconditioned environments shorten the lifespan of the materials and lack the necessary security measures.



**k) Lack of Operational Support Space**

The photograph exemplifies the department's struggle with the lack of dedicated operational support space, including functional evidence entry and processing areas and armory.

**l) Lack of a Secure Entry**

**m)** The department lacks appropriate security provisions at interface points between civilian and sworn personnel and the public.

**n) Lack of Adequate Evidence Entry & Storage**

The department lacks appropriate evidence entry, processing, and storage spaces.

**o) Lack of Fitness Space**

The department lacks dedicated fitness and wellness space. Such spaces are critical to afford officers and staff the opportunity to remain fit for duty.

**p) Inadequate Site Organization & Security**

The current site is organized in a manner that exposes department and staff vehicles to potential threats from outside areas. Further, the site and the building fail to meet several best practices associated with developing secure law enforcement facilities.

## G. NEEDS ASSESSMENT & PROGRAM

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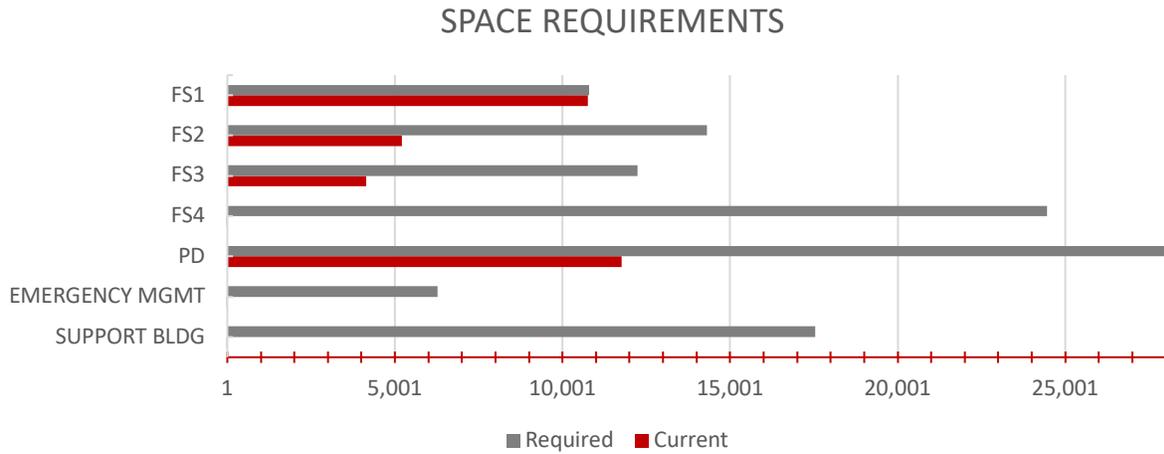
The consultants conducted group workshops to assess fire and police needs and develop an architectural program for each facility. This process was iterative, allowing for information sharing and collaboration between the fire and police departments that led to identifying opportunities for improved efficiency.

The initial version of the program for all facilities indicated a total need of approximately 180,000 gross square feet. However, through seven workshops and a visit to the recently completed San Rafael Public Safety Center, the group refined the spatial requirements, ensuring each facility is appropriately sized to meet current and future needs, striking a balance between being neither too large nor too small. The firsthand experience of visiting the San Rafael facility provided valuable input, validating the benefits of co-locating fire, emergency management, and police functions so that meeting, training, and fitness spaces as well as emergency power and communications infrastructure can be shared. It also helped to ensure that the recommended program aligned with the operational needs and best practices of similar public safety facilities.

The collaborative effort resulted in a significant reduction of space needs and associated capital costs. The recommended program for all facilities of approximately 128,000 gross square feet, which is 52,000 gross square feet less than the initial program is expected to meet the City of Petaluma public safety needs for the next 50 years.

A record of the collaborative process, program development and associated test fits has been documented - on a shared Miro board website archive. The Miro board is an effective tool for memorializing information intake and capturing the various processes defined within this report. Since the Miro board has sensitive information surrounding public safety operations it is only available to authorized individuals.

## 1) EXISTING VS. PROGRAM NEEDS SUMMARY



Facility	Current	Program
<b>New Fire HQ &amp; EOC</b>		<b>33,093 SF</b> Fire Administration, Station, EOC 11-16 Station Personnel, 8 Apparatus
<b>Fire Station 1</b>	9,600 SF + Lease Space 13 Personnel, 6 Apparatus + Street Parking	10,760 SF 5-7 Personnel, 5 Apparatus
<b>Fire Station 2</b>	4,900 SF Training 6 Personnel, 3 Apparatus	14,474 SF Training 5-7 Personnel, 5 Apparatus
<b>Fire Station 3</b>	4,100 SF 5 Personnel, 2 Apparatus	12,396 SF 5-7 Personnel, 5 Apparatus
<b>New Police Station</b>	11,000 SF + Lease Space	40,058 SF
<b>New Public Safety Support</b>		17,542 SF Frontline, Specialty, and Reserve Apparatus & Equipment

The following sections include the programs for each facility included in the master plan. The programs include the required net square feet for each space, add a grossing factor for circulation, shafts, and walls to the total net square footage of all spaces to establish the required total gross square feet of each facility.

## 2) NEW FIRE HEADQUARTERS & EOC

The program for the Petaluma Fire Department Headquarters and Emergency Management assumes that these operations are consolidated into a combined facility. This strategic decision is driven by improving overall efficiency and reducing spatial requirements. Co-locating these departments allows for streamlined communication, coordination, and collaboration, resulting in more effective emergency response and management. The co-location eliminates duplication of meeting, break, utility, and emergency communications spaces and thus minimizes the facility's overall footprint.

The Petaluma Fire Department headquarters has been programmed for a standard crew assignment of 12 personnel, including operational crew members and administrative/command staff. It has the potential to handle a peak capacity of up to 16 individuals. If the police station is co-located with the fire headquarters and a shared fitness center provided, then the fire headquarters fitness facility could be converted into five additional bunk rooms to accommodate future growth and Red Flag and/or special event upstaffing. This adaptive approach allows for planning for the potential expansion needs.

The station will operate on a three-shift structure, ensuring round-the-clock coverage for emergency response. In terms of apparatus, the facility is programmed to house up to eight pieces of equipment, including a ladder truck, a reserve fire engine, a battalion chief vehicle, a reserve medic unit, the BLS ambulance, two type 6 wildland units, and a type 3 wildland unit.

Following modern best practices the station will have dedicated decontamination, disinfection, gear, and fitness space, apparatus bays with adequate clearances, single occupant dorm rooms, and all gender restrooms.

The central lobby is sized to accommodate the Phase 2 Police Station.

<b>FIRE HEADQUARTERS</b>		
	Room Name	Net Square Feet
<b>COMMAND</b>		
1	Admin Tech Office	120
2	Assistant Chief	238
3	Chief	238
4	Emergency Management	120
5	EMS CQI	120
6	Future Command Workstations	270
7	Janitorial	18
8	Command Open Work Area	379
9	Records	80
10	Senior Analyst	120
11	Storage	80
12	Toilet	49
13	Toilet	49
14	Training Officer	120
15	Waiting	120
Sub Total		2,121
<b>STATION OPERATIONS</b>		
16	Battalion Chief	320
17	Captain	192
18	Lieutenant	192
19	Storage	80
20	Study/Conference	264
21	Watch Office	192
Sub Total		1,240

<b>BAYS &amp; SUPPORT</b>		
<b>22</b>	ALS Storage	64
<b>23</b>	BLS Storage	64
<b>24</b>	Apparatus Bays	7,185
<b>25</b>	Decontamination	360
<b>26</b>	Disinfection	360
<b>27</b>	Fire Gear Storage	100
<b>28</b>	SCBA & Compressor Room	180
<b>29</b>	Turnout Gear Storage	1,075
<b>30</b>	Workshop	180
Sub Total		9,568
<b>LIVING &amp; OPERATIONS</b>		
<b>31</b>	Dayroom	305
<b>32</b>	Janitorial	18
<b>33</b>	Kitchen & Dining	1,229
<b>34</b>	Storage	80
<b>35</b>	Toilet room	49
<b>36</b>	Toilet room	49
Sub Total		1,730
<b>PUBLIC ENTRY/ ENGAGEMENT AREAS</b>		
<b>37</b>	Lobby	3,740
<b>38</b>	Mail & Package Processing	220
<b>40</b>	Public Unisex Toilet	49
Sub Total		4,009

<b>CREW LIVING &amp; SLEEPING QUARTERS</b>		
<b>41</b>	Battalion Chief Dorm	202
<b>42</b>	Crew Dorm	120
<b>43</b>	Crew Dorm	120
<b>44</b>	Crew Dorm	120
<b>45</b>	Crew Dorm	120
<b>46</b>	Crew Dorm	120
<b>47</b>	Crew Dorm	120
<b>48</b>	Laundry	132
<b>49</b>	Linen Storage	11
<b>50</b>	Linen Storage	11
<b>51</b>	Main Janitorial	48
<b>52</b>	Officer Dorm	202
<b>53</b>	Officer Dorm	202
<b>54</b>	Reserve Lockers	27
<b>55</b>	Shell & Future Shower & Toilet	99
<b>56</b>	Shell & Future Shower & Toilet	99
<b>57</b>	Shower & Toilet	99
<b>58</b>	Shower & Toilet	99
<b>59</b>	Shower & Toilet	99
<b>60</b>	Temporary Gym / Future Crew Dorm	120
<b>61</b>	Temporary Gym / Future Crew Dorm	120
<b>62</b>	Temporary Gym / Future Crew Dorm	120
<b>63</b>	Temporary Gym / Future Crew Dorm	284
<b>64</b>	Temporary Gym / Future Crew Dorm	120
<b>65</b>	Wellness Room	72
Sub Total		2,886
Total Net Square Feet		21,554
Gross Up Modifier		1.32
<b>Total Gross Square Feet</b>		<b>28,454</b>

<b>OFFICE OF EMERGENCY MANAGEMENT</b>		
	Room Name	Net Square Feet
<b>1</b>	ACS Radio Room	264
<b>2</b>	EOC Food Service	437
<b>3</b>	EOC Storage	89
<b>4</b>	Furniture Storage	159
<b>5</b>	Men's Toilet	188
<b>6</b>	Women's Toilet	188
<b>7</b>	Situation Room 1	334
<b>8</b>	EOC/Training Room	1,392
	Total Net Square Feet	3,051
	Gross Up Modifier	1.52
	<b>Total Gross Square Feet</b>	<b>4,639</b>

### 3) FIRE STATION 1

Fire Station 1 has been programmed to accommodate a standard crew assignment of 5 personnel, with a peak capacity of 7 individuals. Operating on a three-shift structure, the station will house three front-line apparatus pieces, including an engine, a medic unit, and a utility vehicle. Additional space is allocated for a reserve engine and a reserve ambulance, providing flexibility in fleet management.

Due to the unique constraints of the historic structure, the sizes of spaces within the program for Fire Station 1 have been reduced and the gross square footage modifier has been increased compared to Stations 2 and 3. The priority should be to ensure the health, safety, and overall well-being of the personnel working and residing in the station. However, if the architect of record achieves a higher level of efficiency during the design process, it is recommended to allocate additional square footage to sleeping quarters and living areas.

<b>FIRE STATION 1</b>		
	Room Name	Net Square Feet
<b>STATION OPERATIONS</b>		
1	Captain Office	154
2	Study / Conference	223
3	Watch Office	154
4	Public Vestibule	49
5	Public Unisex Toilet	108
6	Lobby	120
Sub Total		808
<b>BAYS &amp; SUPPORT</b>		
7	EMS Storage	64
8	Decontamination	126
9	Disinfection	314
10	Apparatus Bays	2,768
11	Storage & Workshop	280
12	Turnout Gear Storage	641
Sub Total		4,193

<b>LIVING &amp; OPERATIONS</b>		
<b>13</b>	Fitness	371
<b>14</b>	Kitchen & Dayroom	693
<b>15</b>	Storage	61
<b>16</b>	Toilet	49
<b>17</b>	Toilet	49
Sub Total		1,223
<b>CREW LIVING &amp; SLEEPING QUARTERS</b>		
<b>18</b>	Crew Dorm	110
<b>19</b>	Crew Dorm	110
<b>20</b>	Crew Dorm	110
<b>21</b>	Crew Dorm	110
<b>22</b>	Crew Dorm	110
<b>23</b>	Crew Dorm	110
<b>24</b>	Laundry	110
<b>25</b>	Officer	140
<b>26</b>	Toilet & Shower	99
<b>27</b>	Toilet & Shower	99
<b>28</b>	Toilet & Shower	99
Sub Total		1,197
Total Net Square Feet		7,421
Gross Up Modifier		1.45
<b>Total Gross Square Feet</b>		<b>10,760</b>

#### 4) POLICE HEADQUARTERS

The Petaluma Police Station headquarters has been programmed to meet the most up-to-date standards for law enforcement facilities. The facility provides the space needed to support various essential functions of the police department, including command operations, investigations, patrol, forensic analysis, property management, and evidence storage. Each area within the station has been programmed to the specific needs of the respective departmental functions, ensuring optimal functionality and efficiency.

<b>POLICE HEADQUARTERS</b>		
	Room Name	Net Square Feet
<b>COMMAND</b>		
1	Admin Sergeant	120
2	CALEA Coordinator	120
3	Chief	322
4	Chief Admin Support	216
5	Command Toilet Room	176
6	Community Engagement Office	120
7	Deputy Chief	224
8	IT Staff	120
9	Janitorial Closet	18
10	Management Analyst	120
11	Professional Standards Office	120
12	Storage	80
13	Toilet Room	49
14	Toilet Room	49
15	Training Coordinator Office	120
Sub Total		1,974

<b>FORENSICS</b>		
16	Decontamination	64
17	Evidence Bay Equipment Storage	93
18	Evidence Entry Room	157
19	Evidence Storage	988
20	Forensic Lab	858
21	Forensic Tech Workstations	204
22	Firearms Evidence Storage	120
23	Narcotics Storage	102
24	Vehicle Evidence Processing Bay	944
Sub Total		3,530
<b>BAYS &amp; SUPPORT</b>		
25	Operations	731
26	Radio & Equipment Charging Center	139
27	CID/Traffic Lieutenant Office	238
28	CIRT Sergeant Office	120
29	CIRT Work Area	502
30	Crime Analyst Office	181
31	Detainee Toilet	62
32	Detainee Processing	143
33	Investigations Supervisor Office	121
34	Investigations Work Area	979
35	Investigations Briefing Room	395
36	Large Interview	130
37	Lieutenant Office	120
38	Lieutenant Office	120
39	Lobby Soft Interview	144
40	Long Gun Armory	171
41	Multi-Purpose Office	264
42	Staff Toilet – Men's	188
43	Staff Toilet – Women's	201
44	Staff Toilet – Unisex	49

<b>45</b>	Patrol Roll Call	423
<b>46</b>	Patrol Equipment Storage	120
<b>47</b>	Interview Recording Equipment Room	562
<b>48</b>	Sallyport	80
<b>49</b>	Sallyport Storage	705
<b>50</b>	Sergeants	112
<b>51</b>	Small Interview	311
<b>52</b>	Small Interview	77
<b>53</b>	Soft Interview	77
<b>54</b>	Traffic	697
<b>55</b>	Traffic Sergeant Office	120
<b>56</b>	Wellness	120
Sub Total		8,616
<b>PROPERTY &amp; RECORDS</b>		
<b>57</b>	Duty & Property Desk	239
<b>58</b>	Mail & Processing	120
<b>59</b>	Property & Records Storage	418
<b>60</b>	Property Release Area	96
<b>61</b>	Property Supervisor	120
<b>62</b>	Records Work Area	1,059
Sub Total		2,052

<b>PUBLIC SAFETY ANSWERING POINT</b>		
<b>63</b>	Civilian Manager Office	192
<b>64</b>	Communications Equipment	113
<b>65</b>	Dispatch Supervisors	288
<b>66</b>	PSAP Floor & Call Taking Stations	1,376
<b>67</b>	PSAP Locker Area	189
<b>68</b>	PSAP Storage	135
<b>69</b>	PSAP Unisex Toilet	60
<b>70</b>	PSAP Unisex Toilet	60
<b>71</b>	Secure Vestibule	78
<b>72</b>	Wellness	99
Sub Total		2,590
<b>PUBLIC ENTRY / ENGAGEMENT AREAS</b>		
<b>73</b>	Lobby	280
<b>74</b>	Secure Vestibule	126
<b>75</b>	Unisex Toilet	49
<b>76</b>	Unisex Toilet	49
Sub Total		504
<b>SPECIAL OPERATIONS</b>		
<b>77</b>	Rapid Deployment Bays	3,053
<b>78</b>	Quarter Master	406
<b>79</b>	Special Services Gear	244
<b>80</b>	SWAT Armory	224
<b>81</b>	SWAT Gear	224
<b>82</b>	Supply Storage	180
<b>83</b>	Weapons Maintenance	224
Sub Total		4,555

<b>SHIFT CHANGE</b>		
	Staff Flex Locker Area	4,191
	Main Janitorial	48
	Joint Use Fitness (All Agencies)	1,600
Sub Total		5,839
Total Net Square Feet		29,660
Gross Up Modifier		1.35
	<b>Total Gross Square Feet</b>	<b>40,058</b>

## 5) FIRE STATION 2

Fire Station 2 has been programmed to accommodate a standard crew assignment of 5 personnel, with a peak capacity of 7 individuals. The station will operate on a three-shift structure, ensuring continuous coverage for emergency response. The facility will have dedicated space to house three front-line apparatus pieces: an engine, a medic unit, and a utility vehicle. Furthermore, additional space will accommodate a reserve engine, a reserve ladder truck, and a reserve ambulance, ensuring flexibility in managing the fleet.

The programming of Fire Station 2 also includes the provision of practicum-based training functions. Practicum-based training is made possible by the station's location on a larger site, which currently features a training tower. These training facilities allow the station to serve as a hub for hands-on training activities, enhancing the skills and preparedness of the firefighting personnel.

<b>FIRE STATION 2</b>		
	Room Name	Net Square Feet
<b>STATION OPERATIONS</b>		
<b>1</b>	Captain Office	204
<b>2</b>	Study / Conference	264
<b>3</b>	Watch Office	192
<b>4</b>	Public Vestibule	120
<b>5</b>	Public Unisex Toilet	49
<b>6</b>	Lobby	120
Sub Total		949

<b>BAYS &amp; SUPPORT</b>		
<b>7</b>	Apparatus Bays	5,157
<b>8</b>	Decontamination	240
<b>9</b>	Disinfection	360
<b>10</b>	EMS Storage	64
<b>11</b>	Fire Storage	100
<b>12</b>	Turnout Gear Storage	421
<b>13</b>	Workshop	140
<b>14</b>	Grounds/Yard Storage	100
<b>15</b>	Training Tower	256
Sub Total		6,838
<b>LIVING &amp; OPERATIONS</b>		
<b>16</b>	Fitness	400
<b>17</b>	Kitchen & Dayroom	803
<b>18</b>	Storage	80
<b>19</b>	Storage	80
<b>20</b>	Toilet	49
<b>21</b>	Toilet	49
<b>22</b>	Wellness	120
Sub Total		1,581

<b>CREW LIVING &amp; SLEEPING QUARTERS</b>		
<b>23</b>	Crew Dorm	120
<b>24</b>	Crew Dorm	120
<b>25</b>	Crew Dorm	120
<b>26</b>	Crew Dorm	120
<b>27</b>	Crew Dorm	120
<b>28</b>	Crew Dorm	120
<b>29</b>	Janitorial Closet	11
<b>30</b>	Laundry	99
<b>31</b>	Linen Storage	11
<b>32</b>	Officer Quarters	202
<b>33</b>	Reserve Lockers	14
<b>34</b>	Toilet & Shower	99
<b>35</b>	Toilet & Shower	99
<b>36</b>	Toilet & Shower	99
Sub Total		1,354
Total Net Square Feet		10,722
Gross Up Modifier		1.35
<b>Total Gross Square Feet</b>		<b>14,474</b>

## 6) FIRE STATION 3

Fire Station 3 has been programmed to meet the needs of a standard crew assignment of 5 personnel, with the capacity to accommodate a peak capacity of 7 individuals. The station will operate on a three-shift structure, ensuring continuous coverage for emergency response. The facility has been designed to house three front-line apparatus pieces, including an engine, a medic unit, and a utility vehicle. Furthermore, additional space has been allocated to accommodate a reserve engine and a reserve ambulance, allowing for flexibility in fleet management.

<b>FIRE STATION 3</b>		
	Room Name	Net Square Feet
<b>STATION OPERATIONS</b>		
1	Captain Office	204
2	Study / Conference	264
3	Watch Office	192
4	Public Vestibule	120
5	Public Unisex Toilet	49
6	Lobby	120
Sub Total		949
<b>BAYS &amp; SUPPORT</b>		
7	Apparatus Bays	3,874
8	Decontamination	240
9	Disinfection	360
10	EMS Storage	64
11	Fire Storage	100
12	Turnout Gear Storage	421
13	Workshop	140
14	Grounds/Yard Storage	100
Sub Total		5,299

<b>LIVING &amp; OPERATIONS</b>		
15	Fitness	400
16	Kitchen & Dayroom	803
17	Storage	80
18	Storage	80
19	Toilet	49
20	Toilet	49
21	Wellness	120
Sub Total		1,581
<b>CREW LIVING &amp; SLEEPING QUARTERS</b>		
23	Crew Dorm	120
24	Crew Dorm	120
25	Crew Dorm	120
26	Crew Dorm	120
27	Crew Dorm	120
28	Crew Dorm	120
29	Janitorial Closet	11
30	Laundry	99
31	Linen Storage	11
32	Officer Quarters	202
33	Reserve Lockers	14
34	Toilet & Shower	99
35	Toilet & Shower	99
36	Toilet & Shower	99
Sub Total		1,354
Total Net Square Feet		9,183
Gross Up Modifier		1.35
<b>Total Gross Square Feet</b>		<b>12,396</b>

## 7) PUBLIC SAFETY SUPPORT BUILDING

The public safety support building has been programmed as a joint-use facility for fire, police, and emergency management. This facility's primary purpose is to store valuable specialty equipment, reserve apparatus and other public safety equipment. By centralizing the storage of reserve apparatus and equipment the departments can efficiently manage and maintain their resources while ensuring they are readily available when needed. Currently, such equipment consists of a rescue boat, heavy rescue trailer, hazardous material response trailer, and auxiliary police department vehicles. Additionally, the support building has been designed to accommodate storage of large evidence including vehicles, which enhances operational efficiency and helps maintain the integrity of evidence.

Since the public safety support building does not house first responders or front-line pieces of mission-critical equipment, it does not need to be built to essential service and critical operations standards and thus can be constructed more cost-effectively than other public safety projects. The facility could be located remotely. However, it would ideally be located close to the fire and police headquarters for convenience and security.

PUBLIC SAFETY SUPPORT BUILDING		
	Room Name	Net Square Feet
1	Joint Use Fleet & Reserve Fleet Storage	9,064
2	Joint Use General Storage	617
3	Wash Bay	1,450
4	Bike Storage	140
5	Bulk Delivery Reception	188
6	Homeless Property Storage	406
7	K9 Equipment	126
8	K9 Kennel & Wash	99
9	Long-Term Evidence Storage	4,970
10	Quarter Master Overflow	994
11	Vehicle Supply Storage	180
12	Spare Tires	96
	Total Net Square Feet	15,947
	Gross Up Modifier	1.10
	<b>Total Gross Square Feet</b>	<b>17,542</b>

## 8) PETALUMA PUBLIC SAFETY PROGRAM COMPARED TO SAN RAFAEL

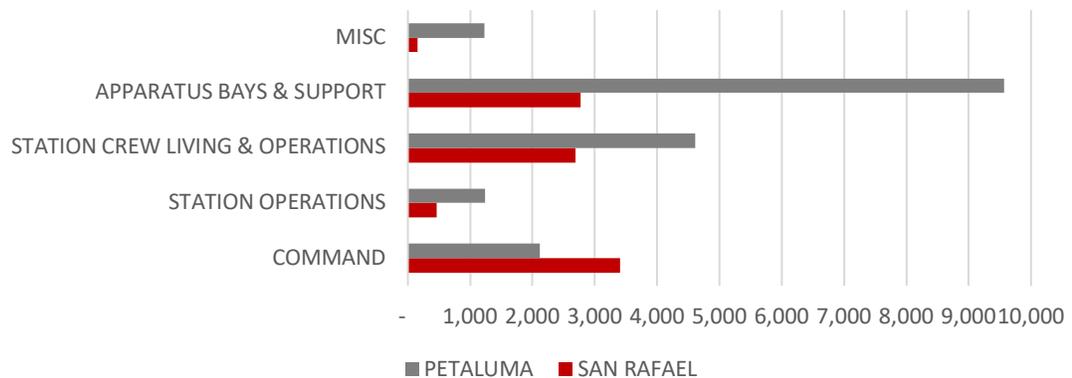
During the programming process, the team visited the recently completed San Rafael Public Safety Building as part of a precedent evaluation. The team observed various successful working models while identifying some areas needing improvement. The visit provided valuable insights that helped guide decisions regarding the size, layout, and adjacencies of spaces to meet needs and optimize workflow in Petaluma's new Public Safety facility.

### PETALUMA FIRE HEADQUARTERS PROGRAM VS SAN RAFAEL

Despite having a similar population size, San Rafael has more fire stations than Petaluma to serve its sprawling district with mountainous terrain and shoreline.

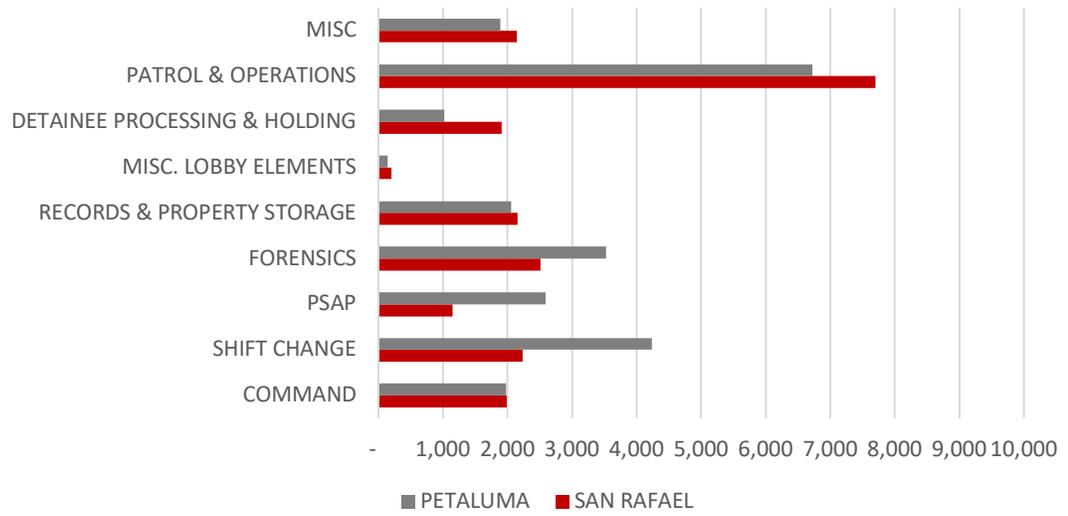
Petaluma needs a new central fire station and additional staffing to meet current deficiencies in an effective response force and to improve response times in light of increasing number of calls for service and out of district responses.

Thus, since San Rafael has double Petaluma's current fire protection resources located throughout its district, its new headquarters station is smaller than what Petaluma needs.



### PETALUMA POLICE PROGRAM VS SAN RAFAEL

The largest difference in police programming between San Rafael and Petaluma is the space allocated for shift change. The Petaluma program has larger lockers to accommodate bulky gear and more staff growth over time.



## H. RECOMMENDATION SYNOPSIS

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The following recommendations have been classified as immediate, short-range, and long-range. Immediate needs refer to the requirements that must be addressed promptly, within the shortest feasible time frame.

Short-range needs encompass a slightly longer timeframe, consisting of the next few years. These efforts will take more time to implement than the immediate recommendations. As such, it is advised that planning for these efforts begin immediately.

Long-range needs encompass a more extended timeframe. They involve strategic planning and preparation for the future, considering anticipated changes, growth, or evolving requirements.

### IMMEDIATE NEEDS

The following immediate recommendations have been put forth to address the pressing needs of the fire and police departments.

#### 1) FIRE STATION 1 – SEISMIC STRENGTHENING AND ALL GENDER FACILITY IMPROVEMENTS

The recommendation is to prioritize the seismic strengthening of and addition of a restroom and shower at Fire Station 1. The aim is to mitigate the risk of potential damage to the 1938 building, its occupants, and fire apparatus in the event of an earthquake. Additionally, the proposed restroom/shower addition will assist with current operational challenges related to gender diversity and adequate accommodations. These improvements will not fully address Fire Station 1's deficiencies. Thus, a full building renovation or replacement is recommended in short range improvements.

#### 2) EXISTING POLICE STATION SELECT RENOVATION AND EXPANSION

The recommendation entails partially renovating and expanding the existing police station to address pressing needs for additional lockers, restrooms, showers, fitness, and office areas. Enhancing locker areas, incorporating gender-neutral spaces and providing a fitness area will help attract and retain officers by accommodating these needs. Moreover, providing additional office spaces will alleviate some of the space constraints, enabling smoother daily operations within the police station.

These improvements do not satisfy the long-range needs of the department. Therefore, a new police station is recommended in the long-term improvements.

**SHORT RANGE NEEDS**

**1) NEW FIRE HEADQUARTERS & EMERGENCY OPERATIONS CENTER**

Constructing a new fire headquarters (with a station and administrative offices) and emergency operations center at a central location is recommended.

As noted in the CPSM study report the development of a central fire station that houses a ladder truck is necessary to meet NFPA 1710 response time criteria and is crucial to providing essential fire protection for the city.

The ideal site should be centrally situated, flat, and offer sufficient space for apparatus maneuvering, and provide easy access to major arterial roadways. Fire truck response times are vital for public safety and can have significant financial implications for a community. Faster response times save lives, minimize property damage, reduce insurance premiums, support economic resilience, and enhance public confidence. Investing in initiatives and infrastructure that improve response times contributes to a community's overall well-being and financial stability.

In addition, consideration should be given to co-locating the police station with fire headquarters and emergency operations center to allow sharing of building space, emergency power and communications infrastructure, and civilian personnel. Sharing space, infrastructure, and personnel would reduce capital and operating costs compared to buildings on separate sites. See section I below for a detailed description of the benefits of co-locating the fire, emergency operations and police facilities at a central location.

The fairgrounds is recommended as the site, because it is a centrally located city owned property that is large enough to accommodate the fire headquarters, emergency operations center and police station along with the city's planned resiliency center and other uses. Specifically, the corner of the fairgrounds near the intersection of Johnson Drive and Kenilworth Drive is recommended because it would have less impact on current fairground uses and would provide good access for emergency response.

**2) RENOVATE OR REPLACE FIRE STATION 1**

The second short range need identified within the study is the need to fully renovate or replace Fire Station 1 to meet current seismic and life safety standards and modernize its facilities and operations.

The full renovation or replacement of Fire Station 1 would yield several benefits. First, it would provide adequate personnel, equipment, and apparatus spaces that facilitate a quicker and more efficient emergency response, prioritize the health and wellness of firefighters, and enhance job

satisfaction, morale, and overall performance and thus positively impact recruitment and retention efforts.

## LONG RANGE NEEDS

### 3) NEW POLICE HEADQUARTERS

The first long-range need identified is the construction of a new state-of-the-art law enforcement facility specifically tailored to the needs of the police department. The current police facility is significantly undersized, resulting in inadequate space for essential functions, cramped working conditions and use of ad hoc facilities under canopies and in Conex boxes. Moreover, the existing site cannot support a full expansion that could address the department's needs. A new facility on a new site would provide the necessary building and secure parking space needed for the department to serve the community effectively and efficiently.

Ideally, the new police facility should be co-located with the fire headquarters to foster collaboration, streamline operations, and share facilities. The site should be thoughtfully configured to provide adequate secure parking for patrol and officer-owned vehicles, ensuring good access for officers and efficient deployment of resources.

In addition to meeting the programmatic and operational needs of the department, a new police station will play a crucial role in fostering positive public relations and strengthening the relationship between law enforcement and the community. Critical community benefits are as follows:

**Accessibility and Approachability:** A well-designed and inviting police station can create a welcoming environment for community members. When the physical space is designed to be open and accessible, it can help break down barriers and encourage residents to visit the station without hesitation. This accessibility fosters a sense of approachability, making it easier for community members to engage with law enforcement personnel.

**Community Spaces:** A new police station can include designated community spaces where residents can interact with officers in a non-confrontational setting. These spaces can be utilized for community meetings, neighborhood watch programs, educational workshops, and other community-oriented events. By providing these spaces, the police station becomes a hub for positive interactions, allowing officers and community members to build relationships and develop mutual trust.

**Collaborative Programs:** A new police station can offer dedicated areas for collaborative programs and initiatives. For example, it can house a community policing unit that builds relationships and addresses community

concerns. It can also provide space for partnerships with local organizations, such as youth clubs, social services, or educational institutions. By facilitating collaboration, the police station becomes a center for community-oriented activities that improve public relations.

**Transparency and Accountability:** A modern police station can incorporate features that promote transparency and accountability. Such features can include public areas where residents can access information about law enforcement policies, procedures, and community initiatives. Technology, such as interactive displays or online portals, can enhance transparency by providing updates on crime statistics, community engagement activities, and public safety initiatives.

**Symbolic Representation:** The physical presence of a new police station can symbolize the commitment of law enforcement to the community's safety and well-being. A well-designed and modern facility demonstrates an investment in the community's needs and conveys that the police department provides effective and professional services. This symbolic representation can positively impact public perception and foster a sense of pride and confidence in the police force.

**Recruitment & Retention:** A new police station can significantly support recruitment and retention efforts within a law enforcement agency. A well-designed police station offers a comfortable and functional workspace for officers. It can include functional offices, well-equipped training rooms, modern equipment, and ergonomic features. A comfortable work environment improves job satisfaction, morale, and overall well-being. When officers feel valued and supported by their workplace, it can positively impact their decision to stay with the agency.

In today's era, attracting and retaining the highest qualified and most professional candidates is essential for any law enforcement agency seeking to maintain positive community relations.

By creating a new police station designed with community engagement and positive public relations in mind, law enforcement agencies can establish an environment that encourages open communication, trust, and collaboration. Thus, a purpose-built law enforcement facility has the strong potential to strengthen the relationship between the police and the community, leading to enhanced public safety and a greater sense of security for all residents.

#### 4) RENOVATE OR REPLACE FIRE STATION 2

Fire Station 2 ultimately requires full renovation and expansion or replacement to correct current deficiencies and provide for growth. The building is in the 500-year floodplain and its surrounding site is in the 100-

year floodplain. Given the amount of additional space needed to meet the long-term needs and the facility's location in the floodplain a new two-story station with occupied living spaces above the apparatus bays will provide the best configuration for efficient operations and emergency response and will likely be more cost-effective than renovating and expanding the existing structure. Fire Station 2 site houses the department's training grounds. The new station design should carefully integrate a training tower, supporting regional training initiatives and contributing to a better-prepared fire department. The new design should also integrate a potential second egress from Corona Road to support faster response when N McDowell Boulevard is congested.

The full renovation and expansion or construction of a new facility would yield several benefits. It would provide adequate personnel, equipment, and apparatus spaces that facilitate a quicker and more efficient emergency response, prioritize the health and wellness of firefighters, and enhance job satisfaction, morale, and overall performance and thus, positively impact recruitment and retention efforts.

#### **5) RENOVATE OR REPLACE FIRE STATION 3**

The full renovation and expansion or replacement of Fire Station 3 is essential to correct current deficiencies and provide for growth. It's important to note that Fire Station 3 is unique as it is located within an established residential community. Therefore, careful consideration should be given to the design and scale of the project to ensure it fits the residential context and maintains a harmonious relationship with the surrounding areas. Given that most spaces in the station need to be expanded to meet best practices and accommodate additional apparatus and crew, a new station will provide the best configuration for efficient operations and emergency response and will likely be more cost-effective than renovating and expanding the existing structure.

A new facility, thoughtfully designed to accommodate apparatus requirements, assigned crews, and the unique challenges of the residential neighborhood, would significantly improve response times, support health and wellness, enhance recruitment and retention efforts, and promote diversity within the department.

# I. CO-LOCATION OPPORTUNITY AT A CENTRAL SITE

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## THE BENEFITS OF CO-LOCATION

When considering the development of public safety facilities, it is highly recommended that agencies explore the possibility of combining them into a common structure or campus. A shared facility or campus promotes interagency cooperation and collaboration among agencies, fostering improved communication and efficiency during emergency response situations. It facilitates joint training and operations, enhancing public safety capabilities. It creates a sense of unity and camaraderie among the agencies, fostering a cohesive and integrated approach to emergency management.

From a logistical standpoint, having public safety facilities together offers advantages in centralizing administrative functions, maintenance, and support services. This streamlines operation, reduces duplication of efforts, and improves overall resource management.

Fire and police stations share similar infrastructure and site security requirements, such as utilities, emergency power and communications infrastructure, parking, and access control systems. By co-locating these facilities, agencies can avoid duplicating these essential components, reducing construction costs.

Combining public safety facilities eliminates the need for duplicate spaces that would otherwise be necessary in separate facilities. Common areas like lobbies, training, conference rooms, fitness, and break rooms can be shared, optimizing space utilization, and minimizing construction expenses.

## THE BENEFITS OF A CENTRAL SITE

The central location of a shared fire headquarters, emergency operation center and police station facility offer both better response time and better visibility and accessibility to all citizens of the city.

Overall, a joint public safety facility promotes collaboration and operational efficiency and presents a practical and cost-effective approach to construction, maintenance, and long-term operational expenses by avoiding unnecessary duplication of infrastructure, spaces, and support staff.

## IMPORTANCE OF CENTRALIZATION FOR PETALUMA FIRE

Fire Department response times are crucial in ensuring public safety and minimizing potential damage during emergencies. The timely arrival of fire apparatus and ambulances to the scene can significantly impact the outcome

of a fire incident or other emergencies. A centralized station is critical to reduce response times for the following reasons.

### 1) LIFE AND PROPERTY PRESERVATION

Swift response times allow firefighters to reach the scene quickly and begin their life-saving work. They can swiftly extinguish fires, provide medical assistance, perform rescues, and mitigate hazards. Reduced response times increase the chances of saving lives and minimizing property damage, preventing fires from spreading and causing more extensive destruction.

### 2) CONTAINMENT AND LOSS REDUCTION

Rapid response times help contain fires and hazmat incidents and prevent them from spreading to neighboring structures. By arriving promptly, firefighters can limit the extent of damage, reducing repair and reconstruction costs. Additionally, quicker response times can help prevent or minimize the loss of valuable assets, equipment, and inventory for businesses, mitigating financial losses.

### 3) INSURANCE PREMIUMS

Insurance companies consider several factors, including fire apparatus response times, when calculating property and business insurance premiums. Communities with faster response times may benefit from lower insurance rates, as insurers recognize the reduced risk of extensive damage due to swift firefighting intervention. Reducing insurance premiums can positively impact the financial burden faced by homeowners, businesses, and the community.

### 4) ECONOMIC IMPACT

Efficient fire apparatus response times can have positive economic consequences for a community. Promptly controlled fires and minimized property damage helped businesses resume operations faster, minimizing downtime and revenue loss. It also contributes to the overall stability and attractiveness of the community for businesses, residents, and potential investors.

### 5) PUBLIC PERCEPTION AND CONFIDENCE

Communities with faster fire and EMS response times instill confidence and safety among residents and businesses. Knowing emergency services can swiftly respond to incidents builds trust and enhances the community's reputation. This confidence can positively influence property values, attract new residents, and support local economic growth.

## IMPORTANCE OF CENTRALIZATION FOR PETALUMA POLICE

Having a police station located in the center of the City offers several benefits that contribute to effective law enforcement and community safety. Several key advantages are as follows:

### **1) ENHANCED RESPONSE TIMES**

A centrally located police station allows quicker response times to incidents throughout the city. Officers can reach different areas more efficiently, reducing the time it takes to address emergencies, enforce laws, and aid residents. This swift response helps maintain public safety and prevent incidents from escalating.

### **2) INCREASED VISIBILITY AND ACCESSIBILITY**

A centrally located police station ensures high visibility within the community. Law enforcement's presence in the city's heart fosters a sense of security and deters potential criminal activities. It also makes the police station easily accessible to residents, businesses, and visitors, encouraging community members to seek assistance or report incidents promptly.

### **3) PROXIMITY TO CRITICAL INFRASTRUCTURE**

Placing the police station in the center of the city often means it is close to critical infrastructure such as government buildings, courts, transportation hubs, and commercial areas. This proximity facilitates efficient coordination between different entities during emergencies, enhances interagency collaboration, and enables a swift response to incidents that may occur in or around these important facilities.

### **4) COMMUNITY ENGAGEMENT AND TRUST-BUILDING**

A centrally located police station provides an opportunity for increased community engagement. Residents have easier access to law enforcement personnel for inquiries, concerns, and community-oriented initiatives. It promotes positive interactions between the police and community members, fostering trust, cooperation, and a stronger partnership in maintaining public safety.

### **5) IMPROVED OPERATIONAL EFFICIENCY**

Centralizing the police station simplifies logistical aspects such as scheduling, resource allocation, and coordination of patrols. It optimizes the deployment of officers across the City, ensuring effective coverage and timely response to incidents. Additionally, it facilitates information sharing and collaboration among officers, enabling more efficient crime prevention and investigation efforts.

### **6) COST-EFFECTIVE RESOURCE ALLOCATION**

Concentrating police resources in a central location allows for better resource utilization and cost management. It minimizes travel time and distances for officers, reducing fuel consumption and vehicle wear and tear. Furthermore, shared facilities and infrastructure in a centralized police station can save costs through economies of scale and streamlined operations.

## J. VALIDATION AND TEST FITS

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### 1) PROCESS

In the evaluation process, the project team considered multiple sites and engaged in test-fitting options to explore how the programmatic needs of the fire department, emergency management, and police department could be effectively met.

Both separate and consolidated facilities were evaluated for the fire headquarters, emergency operations center, and police station. After careful consideration, it was determined that co-location of the fire headquarters with the emergency operations center and the police station in a new public safety headquarters would provide significant operational and space efficiencies. Among the sites considered, the fairgrounds emerged as the most advantageous choice because it is city-owned, centrally located for good emergency response and public access, and is large enough to accommodate the public safety headquarters and other uses.

### 2) NEW PUBLIC SAFETY HEADQUARTERS

The strategic plan proposes the construction, in phases, of a new public safety headquarters comprised of the fire headquarters, emergency operations center and police station on the corner of fairground's property, near the intersection of Johnson Drive and Kenilworth Drive.

The fairgrounds is recommended, because it is a centrally located city-owned property that is large enough to accommodate the fire headquarters, emergency operations center, and the police station along with the city's planned resiliency center and other uses. The public safety facility needs approximately 4.8 acres, about 9% percent of the approximately 55-acre fairgrounds property.

In October 2022, the Healthy Democracy Petaluma Fairgrounds Advisory Panel conducted a charette in collaboration with community participation to explore the redevelopment potential of the fairgrounds site. The project team carefully considered the insights and recommendations presented in the charette report, aiming to propose a public safety location and layout that harmonizes with the current operations and future community space prospects of the fairgrounds.

After studying several different locations on the fairgrounds, the location at the corner of Johnson Drive and Kenilworth Drive is recommended because it would have the least impact on current fairground uses and would provide good access for emergency response. In addition, a resiliency center capable of providing emergency shelter and resources could be located near the

Public Safety Headquarters, fostering coordination of emergency response preparation and services.

Providing an access road off Johnson Drive with a roundabout or other traffic control improvements would provide the fire department quick access to a controlled intersection at East Washington Street, facilitating rapid access onto a major arterial road network.



Existing Fairgrounds



New Public Safety Headquarters at the corner of Johnson and Kenilworth Drives

The proposed public safety headquarters approach includes two-story buildings fronting Johnson Drive that create a welcoming and forward-facing image to the community, affording the opportunity to establish a design that fosters a sense of security and trust while also providing an efficient and highly functional modern public safety facility. To minimize site usage the fire, emergency operations, and police functions that do not need to be on the first floor are located on the second floor and the site circulation and parking is laid out in an efficient manner.

The central building lobby serves as a one-stop-shop where the public can come for public safety information and services. It is flexible space to allow changing exhibits and programs as well as day to day services, thus fostering community engagement.



*New Public Safety Headquarters at the Fairgrounds*

## PHASE I

Phase I includes a new two-story fire headquarters and emergency operations center. A dedicated public parking area could be established along Johnson Drive. Secure parking for fire and emergency management personnel could be located behind the building. To minimize response times, the fire station operations would be located on the first floor. To minimize the building's footprint, fire command and emergency operations center would be located on the second floor.



Phase 1: New Fire Headquarters and EOC

## PHASE II

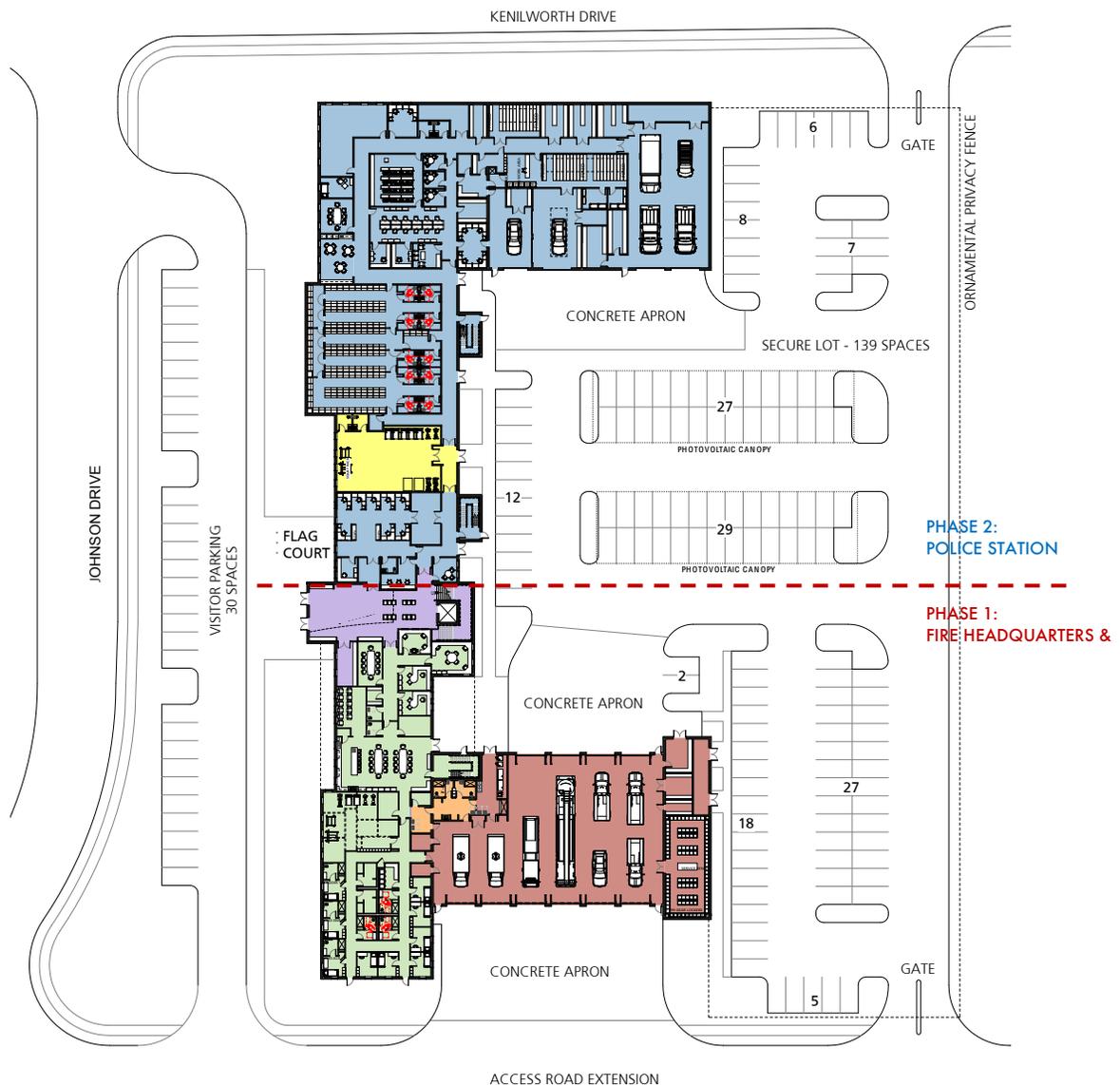
Phase II includes a new two-story police station located adjacent to the fire headquarters and emergency operations center. To support operations while minimizing the building footprint patrol, rapid response and property management would be on the first floor and command, investigations and dispatch would be on the second floor. The co-location allows the fire, emergency management and police to share emergency power and communications infrastructure, public parking, expanded secure parking, public lobby, staff fitness room, and EOC spaces which can be used for training and meeting when not needed for emergency response.



Phase 2: New Police Station (shown in blue)

## PRELIMINARY TEST FIT

Following the completion of the programming phase the project team developed a preliminary test fit to validate the site's suitability and the program's functionality. The test fit plays a crucial role in defining the spatial dynamics, security measures, and overall functionality of the project. While the program and test fit complement each other, the test fit should take precedence in defining the functional aspects of the project. The selected architect of record should use this test fit not as a rigid plan, but rather as a guide regarding size, spatial relationships, and functional requirements, ensuring that the city's needs are met to the highest standards.



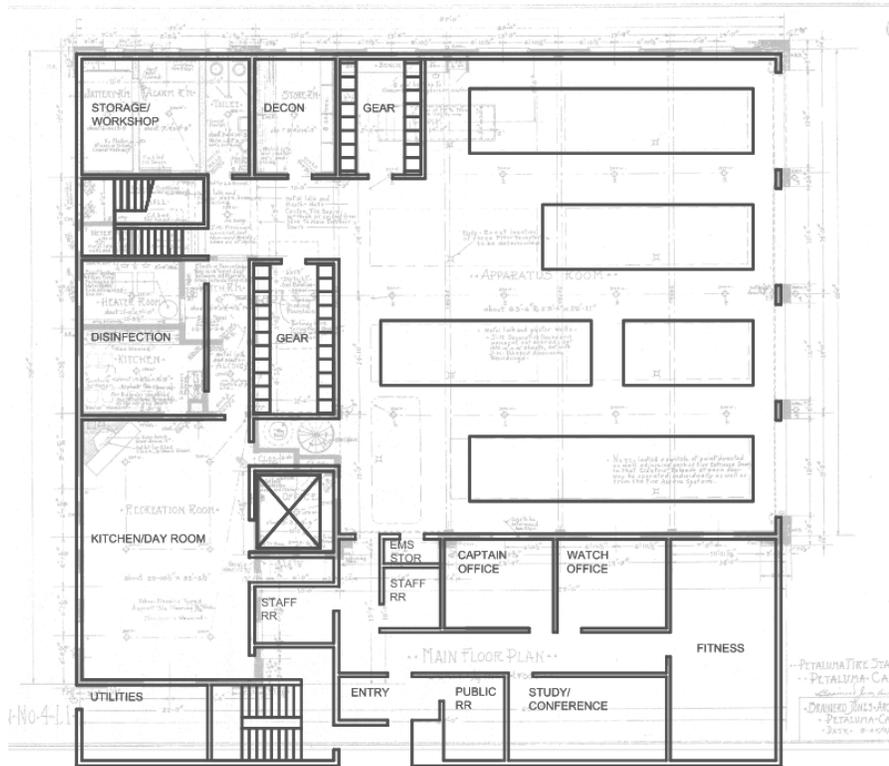
New Public Safety Facility Site Plan Test Fit



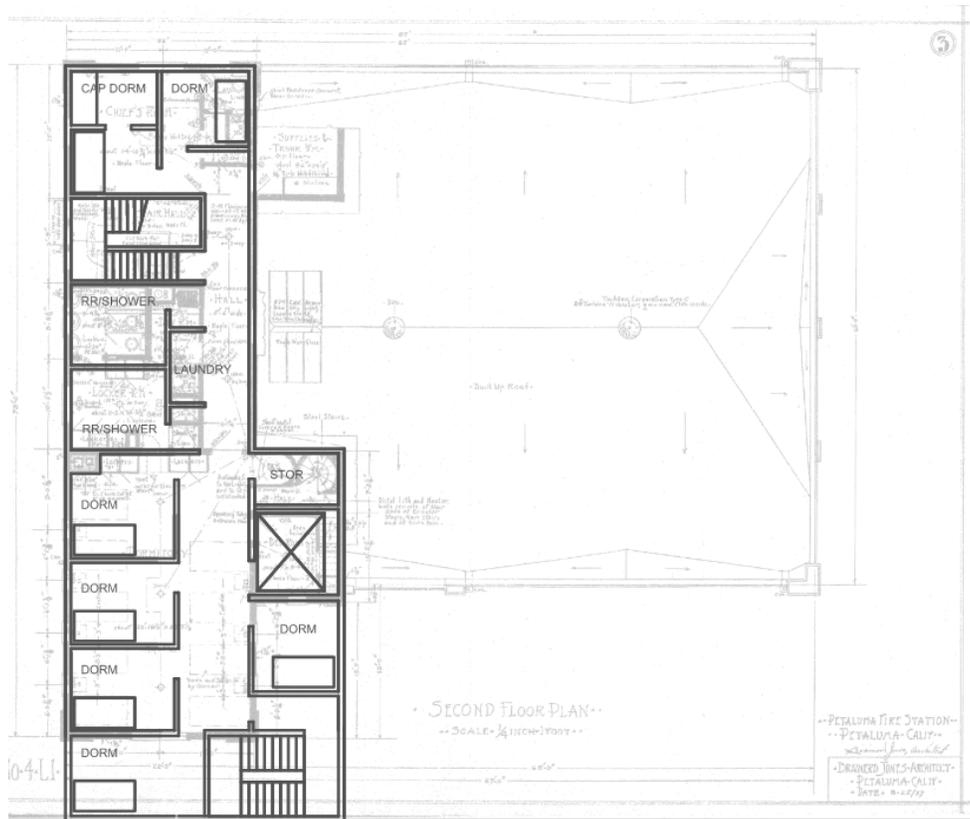
New Public Safety Facility First Floor Test Fit







**Fire Station 1 First Floor Renovation Test Fit**



**Fire Station 1 Second Floor Renovation Test Fit**

#### 4) FIRE STATION 2

The project team evaluated renovating and expanding or replacing Fire Station 2. Due to the amount of additional building area required and the station's location within a floodplain replacement rather than renovation and expansion will likely be more cost effective.

The massing diagrams present a feasible concept for a new two-story station. The ground floor would encompass apparatus bays and related support spaces, designed in compliance with FEMA 543 standards for mission-critical facilities in flood-prone environments. The upper level would include the living quarters, kitchen, dayroom, fitness, and offices. This strategic design approach allows for future operational requirements to be met while mitigating the risk of damage or destruction resulting from potential flooding events.

Known utilities, and presumably easements exist between the property line and Corona Street. Further study is necessary to determine whether a secondary access point can be made onto Corona Street. If feasible, a secondary access should be established at the Southernmost corner of the training pad.

Additionally, the massing study indicates the feasibility of retaining certain training operations on-site, ensuring that the station remains equipped to handle training needs effectively. This consideration allows for a comprehensive redevelopment plan that incorporates both operational functionality and training capabilities, creating a well-rounded facility for the fire department.



*New Fire Station 2 Massing Diagram - Plan View*



New Fire Station 2 Massing Diagram

### 5) FIRE STATION 3

The project team evaluated renovating and expanding or replacing Fire Station 3. Due to the amount of additional building area required replacement is likely more cost effective.

The massing diagrams put forth a concept for a new single-story station. This design approach ensures that the scale of the new station remains compatible with the surrounding residential community. The feasibility of the massing diagrams indicates that a new construction project for Fire Station 3 can meet the future programmatic needs of the fire department while maintaining one story configuration which is contextual to the residential community it serves.



New Fire Station 3 Massing Diagram - Plan View



New Fire Station 3 Massing Diagram

## K. SUMMARY OF PUBLIC BENEFIT & RISK

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Implementing the recommendations of the Strategic Public Safety Facilities Master Plan in the City of Petaluma will bring numerous public benefits.

The city will enhance its emergency response capabilities, preparedness, and resiliency by constructing a new fire headquarters and EOC. The modern facility will provide a centralized hub for coordinating emergency operations, resulting in improved response times, efficient resource allocation, and better coordination among fire and emergency management personnel. A new facility will ultimately reduce the risk to residents and businesses during emergencies.

Renovating or replacing fire station 1 will address the buildings deficiencies. Renovation could preserve the building’s historical use while modernizing it to meet the current building code, sea level rise, and operational needs. However, especially due to the building’s location in a recently identified sea level rise zone, renovation could be more costly than building a new fire station 1 at 307 S Petaluma Boulevard.

Building a new police headquarters co-located with the fire headquarters, and EOC will foster collaboration and synergy between the two essential departments. This shared facility will improve communication, coordination, and joint operations, leading to more efficient and effective public safety services. The co-location will enhance accessibility to public safety entities for residents and provide a unified response system. Co-location also ultimately affords lower construction and staffing costs to maintain and operate the building when compared to that of constructing two separate facilities.

Renovating or replacing fire station 2 and fire station 3 will address their respective limitations and deficiencies. The new stations will provide adequate space for personnel, equipment, and vehicles, improving response capabilities and operational efficiency. Additionally, the new facilities will incorporate modern design and technology, enhancing the health and well-being of the first responders.

Implementing these recommendations will reduce risks, improve resiliency, provide cost savings on insurance premiums, and improve access to public safety entities. The long-range savings associated with efficient maintenance and operations of the new facilities will provide ongoing benefits to the City of Petaluma. By investing in modern and well-equipped public safety facilities, the city can ensure the safety and security of its residents while maximizing the efficiency of its emergency response efforts.

Conversely, neglecting the capital improvement needs of Petaluma's public safety entities poses significant risks to the community and can lead to increased costs in the future. Some key points to consider include:

**1) INADEQUATE INFRASTRUCTURE:**

Aging or outdated facilities may not meet the current needs of public safety agencies. Insufficient space, outdated technology, and compromised

structural integrity can hamper the effectiveness of emergency response efforts. Below-standard facilities place the first responders and the community at risk during critical situations.

## **2) LIMITED OPERATIONAL EFFICIENCY:**

Outdated facilities often lack modern features and systems that optimize operational efficiency. Lack of such features can result in delays, inefficiencies, and decreased effectiveness in emergency response. Limited space, inadequate storage, and outdated equipment can hinder the ability of public safety agencies to fulfill their responsibilities promptly and effectively.

## **3) SAFETY HAZARDS:**

Aging facilities may pose safety hazards to personnel and the public. Structural weaknesses, outdated electrical systems, and inadequate fire safety measures increase the risk of accidents, injuries, and loss of life. Given the age of certain facilities, asbestos containing materials are also likely present. These risks can be mitigated by investing in updated and purpose-built facilities.

## **4) ESCALATING MAINTENANCE COSTS:**

Delaying necessary improvements or repairs can lead to escalating maintenance costs over time. Aging infrastructure requires frequent repairs and upkeep, which can strain limited budgets and divert resources from critical public safety operations. Investing in new and well-designed facilities can reduce long-term maintenance expenses.

## **5) LOSS OF COMMUNITY TRUST:**

Neglecting the capital improvement needs of public safety entities can erode community trust and confidence. The public relies on these agencies to provide prompt and effective emergency services. Failure to address their infrastructure needs may lead to public dissatisfaction, lower confidence in responding to emergencies, and negative perceptions of public safety agencies, the city, its leadership, and elected officials.

## **6) HIGHER FUTURE COSTS:**

Ignoring the capital improvement needs today only postpones the inevitable. As facilities deteriorate, the costs associated with necessary repairs or replacements will likely increase. Deferred maintenance can result in greater financial burdens in the future as emergency repairs or complete replacements become urgent and more expensive.

## L. CAPITAL BUDGET & SCHEDULE RECOMMENDATIONS

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### 1) BUDGETING METHODOLOGY

The method for developing the budgets for the recommended project capital improvement plan involved several steps to ensure a comprehensive and realistic assessment of costs. Here is a breakdown of the process:

- a) **Reconciliation and Adoption of Building Program:** The building program for each facility was carefully reviewed and refined to accurately reflect the specific needs and requirements of the public safety entities. This step ensured that the budget would align with the scope of work for each project.
- b) **Research and Adjust Construction Costs:** Data on construction costs for similar regional public safety facilities was gathered. These costs were then adjusted for factors such as inflation and location to provide a more accurate estimation of the probable construction costs for each facility.
- c) **Determination of Probable Construction Costs:** The 75th percentile of average costs was utilized to determine the probable construction cost for each facility. This approach considered potential cost variations while providing a realistic estimate for similar projects.
- d) **Development of Escalation Matrix:** An escalation matrix was created to consider the escalated construction costs over 25 years. This matrix accounted for potential increases in construction costs due to inflation, market conditions, and other relevant factors. By factoring in long-term escalation, the budget could reflect more accurately future costs.
- e) **Reconciliation of Anticipated Construction Cost:** The anticipated construction cost for each facility was reconciled with the anticipated year of construction. This approach ensured the budget aligned with the specific timeline and accounted for any cost changes over time.
- f) **Consideration of Project Costs:** Soft costs including environmental review, design, permits, inspections, project management, and furniture fixtures and equipment were assigned a percentage of the overall construction costs.

### 2) IMPLEMENTATION SCHEDULE

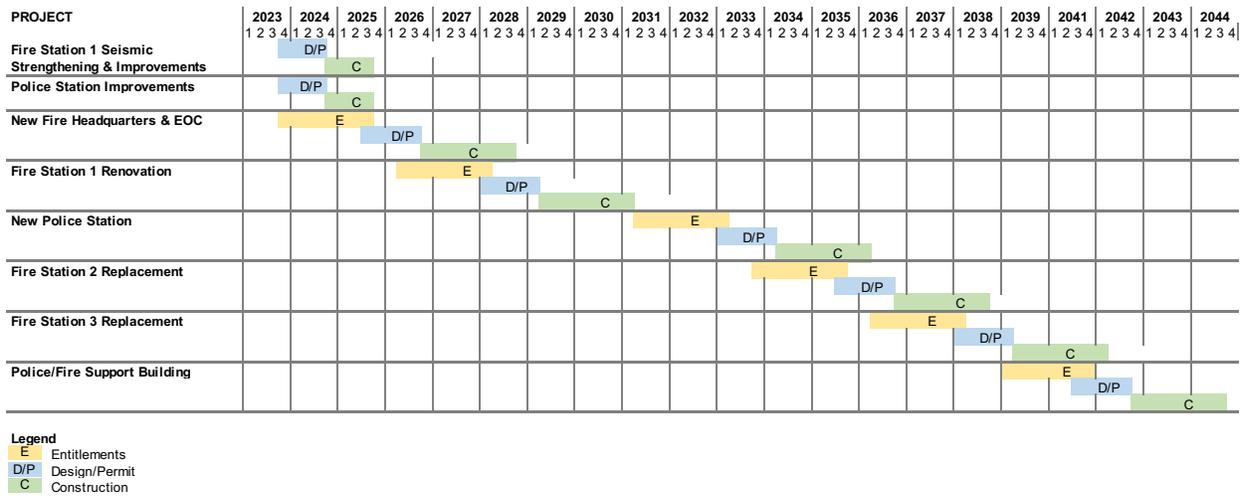
The schedule below shows the recommended project sequencing and schedule. The capital improvement plan is included in the report's Exhibit 7.

The city is already taking steps to address its immediate needs.

It is important to note that processes such as entitlements, procurement of Architectural/Engineering (A/E) services, design, and permitting for the short-range need recommendations will require considerable time. To achieve the study's short-term needs in a timely manner, the city should first reach a

consensus on the Fire Headquarters/EOC location on the Fairgrounds property and proceed with the entitlement process. Subsequently, the procurement and selection of an A/E firm experienced in public safety design should commence.

While implementing the short-range recommendations, the city should also consider funding strategies and approaches to fulfill the long-range recommendations outlined in the report.



# M. ALTERNATIVE SITE CONSIDERATIONS

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## 1) 307 SOUTH PETALUMA BLVD:

During the evaluation process, 307 South Petaluma Blvd was assessed as a potential site for developing a new fire headquarters and emergency operations center as well as a stand-alone Police Station. However, it was determined that this site was unsuitable for several reasons.

The site is too small to adequately meet the Fire Department's Headquarters or Police Department's Station needs. Adjacent residential parcels would need to be acquired to provide adequate space.

Also, locating the Fire Headquarters at 307 South Petaluma Blvd would position it too close to fire station 1 and would not improve fire department response times and fire protection coverage throughout the city.

## 2) KENILWORTH PARK

During the evaluation process, Kenilworth Park, which is adjacent to the library, and the fairgrounds property near the intersection of D Street and Payran Street were considered as a potential site for developing a new fire headquarters, emergency operations center, and/or Police Station. However, it was determined that this site was unsuitable for several reasons.

The area is too small and currently serves several other uses. Adjacent space would be needed to provide adequate space and access which would significantly impact the area and several current uses and roads would need to be relocated.

## 3) NEXT TO CITY HALL

The lawn adjacent to City Hall underwent a preliminary evaluation for the potential development of a new public safety facility. However, this site was deemed unsuitable for several reasons. Firstly, the site is too small to adequately accommodate the required facilities. Additionally, it does not meet the recommended response time criteria outlined in the CPSM study, which is essential for effective emergency response. Moreover, constructing a public safety facility on this site would result in significant disruptions to the operations of City Hall.

## 4) 1221 NORTH PETALUMA BLVD

During the site evaluation process for a new police station, 1221 North Petaluma Blvd, the former Marine Unlimited site, was initially considered but ultimately dismissed as a viable option. Although the site had the capacity to accommodate a new two-story police station, several factors led to its elimination. Firstly, its location was not central to the town, making it less ideal

compared to other potential sites. Additionally, the acquisition of the property and potential environmental remediation could significantly increase project costs. Lastly, the site's sloping topography would introduce complexities in its development and likely add cost.

#### 5) HOPPER STREET (CORPORATION YARD)

The now vacant portion of the corporation yard along the south side of Hopper Street was initially considered for the development of a new public safety headquarters. However, it was ultimately rejected for several reasons. Firstly, the city has already identified the site as a good location for a current and future public works needs and is currently in the master planning process. Additionally, the site's proximity to the channel, river, and train tracks presents several access and egress problems.

# N. PLAN MAINTENANCE

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This public safety strategic master plan is intended to forecast the needs of the city well into the future and create a methodology for implementation. It is a living document that covers six capital projects over the next 20 years and thus should be periodically reviewed and updated.

**1) ALIGNMENT WITH EVOLVING NEEDS:**

Over time city needs and priorities can change due to technological advancements, demographic shifts, regulatory requirements, or emerging trends. Regular updates enable facilities to adapt, innovate, and stay ahead of the curve, positioning them for long-range success.

**2) OPTIMAL RESOURCE ALLOCATION:**

A strategic plan serves as a roadmap for resource allocation and investment decisions. Regularly updating the plan allows the city to reassess its resource allocation strategies, ensuring that limited resources are effectively utilized.

**3) IMPROVED OPERATIONAL EFFICIENCY**

An updated strategic plan provides a framework for streamlining operations and enhancing facility efficiency. Regular updates help the city stay abreast of best practices, technological advancements, and industry standards, enabling them to incorporate new approaches that drive efficiency, productivity, and sustainability.

**4) ENHANCED RISK MANAGEMENT**

The strategic plan serves as a guide for risk management within facilities relative to using public safety entities. By regularly reviewing and updating the plan, the city can identify potential risks, vulnerabilities, and gaps in preparedness. This approach allows them to implement proactive measures to mitigate risks, enhance safety protocols, and ensure public safety continuity in the face of unexpected events or emergencies. Regular updates enable the city to stay current with regulatory requirements, industry standards, and emerging risk factors, fostering a resilient and secure environment.

**5) STAKEHOLDER ENGAGEMENT AND ALIGNMENT:**

Facility strategic plans often involve input from various stakeholders, including employees, customers, community members, and partners. Regular updates allow stakeholders to engage, seek feedback, and ensure their needs and expectations are considered.

In summary, updating a facility's strategic plan ensures alignment with evolving needs, optimizes resource allocation, improves operational efficiency, enhances risk management, and promotes stakeholder engagement and alignment. It allows facilities to stay proactive, adaptive, and responsive in an ever-changing environment, setting a strong foundation for sustainable growth and success.

## O. NEXT STEPS

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The following are recommended immediate next steps to address the needs of the fire and police departments, as well as long-range funding considerations. These steps are as follows:

- a)** The city has already adopted the recommendations to address the immediate needs of the fire and police departments. Request for Proposals (RFPs) were developed to engage professionals in architectural and engineering services for these projects. The city should continue this effort.
- b)** The city should also continue its community engagement process regarding the fairgrounds property, incorporating the building of the public safety headquarters on the identified portion of the property. This process will involve gathering input and feedback from the community to ensure their needs and concerns are considered. Simultaneously, the city should initiate obtaining entitlements and develop an RFP to engage architectural and engineering services to design the project. Selecting a firm with extensive experience in designing fire and police facilities as well as planning for the second phase police station while designing the first phase fire headquarters and emergency operations center are both crucial to ensuring a cost effective, well designed, and long-lasting project.
- c)** The city should also begin strategizing on the best approach to fund the subsequent initiatives. Funding options should be explored and evaluated to ensure sustainable financial support for implementing the master plan's long-term recommendations. This exploration may involve considering various sources such as grants, partnerships, bond measures, or other funding mechanisms available to the city.

By following these next steps, the City of Petaluma can make progress in addressing the needs of its fire and police departments, engage the community in the planning process, and establish a strategy for funding all recommendations of the public safety facilities strategic master plan.

## P. APPENDIX & EXHIBIT SCHEDULE

ITEM	TOPIC
Section Q	Appendix - Contributing Entities
SECTION R	Appendix - Best Practices
Exhibit 1	Fire Station 1 Visual Program and Renovation Test Fit
Exhibit 2	Public Safety Headquarters Visual Program and Test Fit Plans
Exhibit 3	Public Safety Headquarters Test Fit Massing
Exhibit 4	Fire Station 2 Visual Programming
Exhibit 5	Fire Station 3 Visual Programming
Exhibit 6	Project Cost Estimates
Exhibit 7	Capital Improvement Plan

## Q. GLOSSARY

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**CIP** – Capital Improvement Plan

**CPTED** – See Crime Prevention Through Environmental Design

**Crime Prevention Through Environmental Design** – CPTED is an approach to designing and planning the built environment to enhance safety and reduce the likelihood of criminal activity. CPTED principles aim to create environments that discourage criminal behavior and promote community safety. This enhanced security is achieved by employing proper lighting, clear sightlines, natural surveillance, territorial reinforcement, and access control. By incorporating CPTED principles into the design of spaces, buildings, and neighborhoods, it is believed that the potential for crime can be reduced, and the overall safety and well-being of individuals and communities can be improved.

**EOC** – Emergency Operations Center

**FEMA** – Federal Emergency Management Agency

**Gross Modifier** – The modification or percentage increase must be applied to the total net square footage to account for circulation, walls, stairwells, mechanical rooms, and other non-occupiable areas.

**GSF** – See Gross Square Feet

**Gross Square Feet** – A measurement used to determine the total floor area of a building, including all interior and exterior spaces. It represents the sum of the floor areas of all levels within a building, including corridors, wall thickness, stairwells, mechanical rooms, and other non-occupiable areas. Gross square feet provide a comprehensive measurement of the overall size of a structure.

**LBA** – Laura Blake Architect

**MWS** – MW Studios

**NFPA** – National Fire Protection Association

**NFPA 1710** – The NFPA Standard for Career Fire Department Response Times

**NSF** – See Net Square Feet

**Net Square Feet** – The usable floor area measured within a room.

**PSAP** – Public Safety Answering Point (911 Dispatch)

## R. APPENDIX: THE CONTRIBUTORS

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### 1) LAURA BLAKE ARCHITECT

Laura Blake Architect is a San Francisco-based architectural practice. With more than 30 years of experience directing a broad range of public projects with complex programs, multiple stakeholders, and strict budgets, Laura has gained expertise in planning successful projects that have broad support and will serve their communities well for many years. Laura is skilled at developing simple solutions to complex problems. Her approach is thoughtful and collaborative. It entails listening carefully, helping identify needs, developing options, and building consensus for the option that best meets the needs within an established budget or cost-effective range.

### 2) MW STUDIOS

MW Studios is a Maryland Based public safety consulting firm with expertise in the design and construction of public safety facilities. With a keen understanding of law enforcement agencies, fire departments, and emergency service providers' unique challenges, the firm excels in crafting comprehensive, forward-thinking strategies to optimize operations and enhance community safety. MW Studios leverages extensive experience and knowledge to create detailed master plans considering facility layout, site selection, technology integration, and future expansion. By collaborating closely with clients and stakeholders, they ensure that the master plans align with each organization's specific needs and goals, paving the way for efficient and effective public safety services through their expertise, innovation, and commitment to excellence.

### 3) PETALUMA CITY ADMINISTRATION

The City Manager's Office of Petaluma is the administrative hub that oversees the city government's day-to-day operations and strategic direction. Led by the City Manager, the office is responsible for implementing policies and decisions made by the City Council, coordinating, and managing various city departments, and ensuring the efficient and effective delivery of services to the community. The City Manager's Office is crucial in fostering collaboration between different departments, facilitating communication with stakeholders, and representing the City's interests at regional and state levels. Focusing on transparency, accountability, and responsive governance, the City Manager's Office works towards achieving the City's goals, addressing community needs, and enhancing the overall quality of life for residents and businesses in Petaluma.

### 4) PETALUMA FIRE DEPARTMENT

The Petaluma Fire Department is a highly skilled and dedicated team of firefighters and paramedics serving the City of Petaluma, California. Committed to safeguarding lives, property, and the environment, the department provides various emergency services, including fire suppression, emergency medical response, hazardous materials response, and specialized rescue operations. With a strong emphasis on public safety and prevention, the Petaluma Fire Department actively engages in community outreach and education programs to raise awareness about fire safety, disaster preparedness, and the importance of early detection. The department operates from strategically located fire stations equipped with state-of-the-art apparatus and equipment to respond effectively to emergencies. Through their unwavering commitment, professionalism, and bravery, the members of the Petaluma Fire Department work tirelessly to protect and serve the community, ensuring a prompt and efficient emergency response when needed most.

#### **5) PETALUMA POLICE DEPARTMENT**

The Petaluma Police Department is a law enforcement agency dedicated to serving and protecting the community of Petaluma, California. Committed to ensuring public safety and maintaining the peace, the department works diligently to uphold the highest standards of professionalism, integrity, and community engagement. Focusing on community-oriented policing, the Petaluma Police Department strives to build strong relationships with residents, businesses, and community organizations to address local concerns, prevent crime, and enhance the quality of life for all residents. The department comprises dedicated officers, detectives, and support staff who work collaboratively to provide effective law enforcement services, investigate crimes, enforce laws, and respond to emergencies with compassion and efficiency. Through its proactive efforts, the Petaluma Police Department plays a vital role in creating a safe and secure environment for the community it serves.

#### **6) PETALUMA DEPARTMENT OF PUBLIC WORKS**

The Petaluma Department of Public Works is a vital agency responsible for planning, constructing, maintaining, and managing public infrastructure and services in the City of Petaluma, California. Comprising dedicated professionals, the department oversees various areas, including transportation, streets and roads, wastewater and stormwater systems, water supply, parks and recreation facilities, and solid waste management. Their work involves maintaining the City's roadways, ensuring efficient traffic flow, managing utilities, preserving the cleanliness and functionality of public spaces, and implementing sustainable practices to support the overall quality

of life for residents and visitors. With a focus on innovation, environmental stewardship, and community engagement, the Petaluma Department of Public Works plays a crucial role in maintaining and enhancing the City's infrastructure, ensuring a safe, well-maintained, and sustainable environment for all.

# S. APPENDIX: BEST PRACTICES

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## GENERAL MISSION CRITICAL FACILITY DESIGN PRACTICES

### 1) INFRASTRUCTURE & RESILIENCY

The nature of emergency services requires that a public safety facility be operationally prepared to respond to the surrounding community immediately following, and sometimes during, natural disasters. As such, first responders must be able to rely on the essential systems that serve their facility. Stand-by emergency backup generators should ideally be installed for the project with a reliable fuel capacity to meet operational demands for a minimal operation time of 72 hours. Since generators require start-up time, an uninterruptable power supply (UPS) battery system should be provided for mission-critical systems such as computers, servers, communications equipment, access control systems, etc. The UPS will ensure continuity of operation and prevent loss of service during the brief period the facility is without power while the generator comes online.

### 2) ADA ACCESSIBILITY

Fire Stations, Police Stations, and EOCs are considered public buildings, and the entire station, per Federal Laws, must be 100% accessible. Over the years, numerous departments have requested exceptions to this requirement under the premise that firefighters and police officers are able-bodied personnel and must be so to perform their duties. The United States Department of Justice has issued an official interpretation clearly stating that in all cases, public safety facilities must meet accessibility requirements.

### 3) FORCE PROTECTION

Conventional building codes such as IBC and NFPA are requirements that set the minimum standard of care regarding the protection of the life, safety, and wellbeing of the occupants of all types of buildings. When jurisdictions adopt these standards via legislative measures, they become law and establish the design protocols for what can be considered a minimum acceptable risk. These standards of care address a wide variety of building and construction types. And while the umbrella of these codes certainly addresses the general use and occupancies of a public safety facility, they do not address the many unique risks to public safety facilities.

Standards such as Crime Prevention Through Environmental Design (CPTED), UFC Anti-Terrorism, and Force Protection Design Guidelines are authored by panels of experts with significant experience in the design, construction, and operations of similar facilities that are at an elevated risk of being attacked. Given that the design and development of a public safety facility is infrequent,

it is uncommon for legislative bodies to adopt such standards when establishing building code requirements. These standards exist for specific reasons, as there is a long history in this country of public safety facilities that have faced attacks. These guidelines establish a standard of care protecting the occupants of public safety facilities from low-frequency, high-risk events.

Beyond the structural requirements established by IBC, conventional practices in certain communities now strongly encourage careful consideration of ballistic protection from outside threats. Beyond the minimally mandated measures, a careful and thoughtful design must ensure resiliency while controlling project costs. Additional and more stringent standards that may apply to public safety facilities include but are not necessarily limited to FEMA 543, NEC 708, and UFC 04-012-23. Compliance with these codes and standards often drives project costs beyond what one might expect with a traditional building typology.

In short, “Hardening” can mean many different things depending on which standards are applicable. Blast resistance, floodproofing, progressive collapse prevention, and numerous other criteria are further defined within these standards. Often funding sources will dictate which standards apply to a project. Where multiple standards are applicable, the most stringent standards apply.

#### 4) NATURAL & ARTIFICIAL LIGHT

Both natural and artificial lighting plays a large role in sustainability and first responder health and wellness. As referenced later in the narrative on bunkroom design, cardiovascular disease can be directly linked to sleeping and circadian rhythm disorders. As first responders tend to work long shifts throughout their entire careers, it is easy for their bodies to lose the natural sleep-wake cycle. Ensuring that occupied portions of the station have plentiful access to natural daylight is a significant measure the project team can take to help regulate the first responder's circadian rhythm.

Natural light is often provided to the interior of a public safety facility through windows, clerestory assemblies, skylights, and courtyards. Studies have also demonstrated that access to natural light improves morale and productivity. As such, the benefits of natural light cannot be overstated when it comes to combatting first responders' mental health. First responders are regularly exposed to traumatic incidents that can take their toll on an individual's mental health and wellbeing. Statistics have shown that a department is four times more likely to experience a suicide-related death than a line-of-duty death. We must continue to stress the benefits of good design as public safety entities become increasingly more aware and vocal about mental health and PTSD.

In addition to the physical benefits, natural light contributes to energy efficiency and sustainability. Properly designed overhangs can provide the station with natural passive-solar heating and allow the building to capture solar radiation during the winter when the sun is lower. When the sun is high in the summer, overhangs shade the building to mitigate heat gain. Further, implementing natural light can reduce energy use associated with artificial lighting. Spaces equipped with photocells or light monitors can be designed to automatically scale back or turn off artificial lighting when natural light fills a space.

The selection of artificial light fixtures and controls is equally important in sustainability and wellness. Technology now allows the color temperature of artificial lights to replicate real-time outdoor conditions. Light fixtures will produce a bright white (5000–6500 K) color during the daytime. As the day turns to night, the fixtures will gradually adjust to a more relaxing soft or warm white (2700-3000k). This technology has proven beneficial to health and wellness in the healthcare industry as it aids in balancing the circadian rhythm of medical professionals.

## **BEST PRACTICES FOR FIRE STATION DESIGN**

### **1) UNDERSTANDING HISTORY: WHAT MAKES A GOOD FIRE STATION?**

To best understand what makes a “good” fire station, one must first understand its history, origin, and purpose within a community.

Arguably, fire stations are the last remaining type of building that is instantly recognizable. While churches may have spires, today’s era of worship is more likely to occur within an industrial complex or gymnasium at a recreational center. On the other hand, fire stations continue to identify themselves to the surrounding community with the magnificence of tall towers and repetition of large openings that showcase a department’s readiness to serve the community during times of need. Towers that once were homes to crews looking out over their cities for signs of distress transformed into drying towers and have since evolved into state-of-the-art training features that keep the skills of those who live and work there honed.

The profession of firefighting had existed since the days of Roman Emperor Augustus when the Watchman of the City (“Vigiles Urbani”) battled fires within the City of Rome utilizing buckets and horse-drawn pumps. This technology was lost to humanity during the dark ages. It would not reemerge until the mid-17th century in Nuremberg when the Renaissance era pump technology found its way onto the back of horse-drawn carriages. The subsequent advent of leather hoses required drying to prevent rot, thus

leading to the development of the hose drying tower and the image of fire stations as we now know them.

The Second Industrial Revolution sparked rapid changes in both building and firefighting technology. The availability of structural steel and the implementation of modern building materials enabled architects and engineers to design taller and larger buildings. With that came innovations in firefighting technology and equipment, such as longer ladders and apparatus with larger suppression capacities. These technological advancements continue to make fire engines bigger, rendering older facilities obsolete.

The fire stations of today share common ground with their predecessors in that functionality always takes precedence over aesthetics. Modern-day fire stations host a unique blend of residential, office, municipal, and communal duties. They serve the common good of communities and thus carry a symbolic presence rooted in functionality and tradition. A fire station is not merely a garage for fire trucks or a house for firefighters – Instead, they are civic buildings that embody our values as a society.

So, what is it that makes for a “good” fire station? One can confidently resolve this subjective question by understanding the century’s worth of precedent and tradition, coupled with the findings of modern-day science.

- A “good” fire station will ensure that the deployable resources and apparatus are as close as possible to first responders' living and working quarters to provide the briefest, most effective, and safest route.
- A “good” fire station is designed to promote the physical and mental wellness of those who put their lives on the line for their community during routine responses and the darkest of hours.
- A “good” fire station will be inviting and warm for first responders and their community, yet durable enough to withstand decades of demanding service.
- A “good” fire station will stand out as a reassuring beacon, provide a recognizable entrance, and instill a sensation of trust and security across its service area, thus building and improving the value of the community.
- A “good” fire station will be both environmentally and fiscally sustainable and protect the community's resources.
- A “good” fire station will honor past traditions while looking into the future.

## 2) PROGRAMMING - BALANCING WANTS, NEEDS, AND BUDGET

Managing a program in Fire Station design can often be complicated because the building serves the community in many different roles. As part of the cost control process, one should work carefully to evaluate specific needs and wants related to probable construction costs. A department's needs can be met in many ways, each providing distinct advantages and disadvantages.

When determining the number of spaces to be integrated into the design of a fire station, the project team should carefully consider the community and department's short- and long-term needs. What types of apparatus will be housed at the station upon completion? Is there anticipated community growth soon that would necessitate more equipment or staff? If an additional bay was needed, would it be in the near or distant future? Would another station located elsewhere better serve the community instead of an expansion? What is the likelihood of actually needing the extra space? These questions must be answered to determine the appropriate project requirements.

In any case, constructing a fire station is a generational investment for taxpayers. Determining the types and quantity of spaces comes down to value and budget. The apparatus bays usually constitute the most significant chunks of square footage associated with the project. It is a common mistake for some to look at the total project cost and uniformly distribute it across the building area to determine a cost per square foot. As such, due to their size, apparatus bays often become the unfortunate target of budget cuts due to the perceived cost.

However, it is important to note that all square footage is unequal. For example, the square footage costs associated with the kitchen of a fire station are exponentially higher than that of a storage room. When it comes to the apparatus bay, generally speaking, the two end bays are the costliest to construct as they function as the "bookends" for the space. As such, the perimeter end walls consist of the most materials compared to a central bay. On the other hand, central bays are often simple modules by nature that can be easily replicated at a significantly lesser cost than that of the rest of the station.

While possible, adding the bays or limited bunk rooms in the future typically requires more substantial construction efforts when compared to accommodating those needs at the time of original construction. As such, the cost for such efforts is usually at a premium due to the required construction of another "bookend" perimeter wall, site development, integration to existing roofing systems, expanded utilities, disruption to current operations, and more.

### 3) SITE CONSIDERATIONS FOR FIRE STATION DESIGN

Fire stations require the design team to consider unique site planning requirements. All construction projects must account for stormwater management, grading, zoning, setbacks, and environmental concerns. Fire station sites, however, must be designed to address these fundamental concerns along with a series of mission-critical design parameters that ensure operational preparedness. The following site parameters should be properly addressed to create a functional fire station successfully.

- **Response Times:** Orientation of the building on the site should provide the safest and quickest response to the main road. This requirement may necessitate the development of specific access points, signalization control, and sight-line analysis.
- **Visibility:** Site design conditions should mitigate the risks associated with blind corners and excessive vegetation that might hinder the visibility of the apparatus driver and oncoming traffic.
- **Apparatus Maneuvering Considerations:** The site should be designed to support safe and efficient traffic movement from the department's entire fleet of emergency apparatus. The design should ensure that the largest pieces of equipment, such as towers and aerial units, have enough space for turning and pulling into the station without the risk of hitting other vehicles, curbs, or the building itself.
- **Grading:** Site grading should be evaluated against Apparatus break-over and departure angles to ensure that the apparatus won't bottom out or scrape against site features.
- **Safety of Apparatus Response and Return:** The ideal configuration of a site should ensure that pedestrian or non-essential personnel vehicle traffic does not cross the apron or path of apparatus response.
- **Designated Parking Zones:** Marked and convenient areas for parking that correspond to the specific functions of the building should be provided for:
  - **Public Parking** (Near Station Entrance)
  - **Event Parking** (Near Community Room Entrance, If Applicable)
  - **Firefighter Parking** (Near Bunk Room / Back of Station)
  - Apron Dimensions and Clearances:

- Aprons should be of reinforced concrete and capable of withstanding heavy point loads that the outriggers of a piece of apparatus might develop.
- Ideally, it is recommended that the apron be at least 10' - 0" longer than the longest piece of apparatus. This dimension allows for the staging of equipment and simplified cleaning of the bays.
- Ideally, avoid pedestrian traffic and general vehicle traffic across these areas. Pedestrian traffic should be controlled within 20' of the face of the bays.
- **Utilities & Infrastructure:** Attempt to site the building in a location with adequate water, sewer, natural gas, power, and telecommunications. If possible, identify redundant power and communication feeds to improve mission-critical reliability. Identify if stormwater management features can be utilized for drafting purposes on rural sites, or as a rescue training feature. It is important to ensure the location of these utilities are placed in safe and secure locations that mitigate the risk of cross-contamination and disruption from attack.
- **Fueling Stations:** If applicable, fueling stations should be located such that a fueling truck does not block vehicular traffic. Tanks should be protected from terroristic attacks and separated from the building structure.
- **Paving:** Invest in heavy-duty paving where the apparatus will drive.
- **Flood Plains:** When utilizing federal funding, FEMA prohibits stations from being constructed within the 100-year flood plain unless they have been flood-proofed. Flood Proofing requires that all occupied spaces and equipment be located two feet above the design flood elevation and that appropriate measures have been implemented to allow the building to withstand tidal surges.

#### 4) STRUCTURAL & LIFE SAFETY IMPORTANCE

Public safety buildings serve as the backbones of our communities. Their importance is so critical that the building codes have recognized their importance amongst their peers. Since fire stations house specially trained personnel and equipment tasked with serving their community under the most trying conditions, they are held to a higher standard when compared to many other building types. Per commonly adopted building codes, fire stations are considered essential structures. This classification often triggers the

requirement for the station's design to be a “last building standing” in a regional disaster.

Buildings across the region are subject to natural disasters such as flooding, tornados, hurricanes, blizzards, and seismic events. Fundamentally, the essential facilities classification requires a station to be more structurally sound or “hardened” than an office building, retail store, or other common building types.

The spirit of the building codes ensures that “Essential Facilities,” such as fire stations, police stations, 911 call centers, hospitals, and EMS stations, can withstand extreme conditions so that first responders may continue to protect and serve even during the most trying times.

The code defines “Essential Facilities” as buildings that must remain operational during and after an extreme environmental event, such as a hurricane or snowstorm.

## **5) SPRINKLER PROTECTION & DETECTORS**

A study conducted in 2001 by the US Fire Administration concluded that more than 37% of all emergency service facilities' structural fires originate from the departments' apparatus. It is the leading cause of approximately 150 reported structures within fire stations. Other notable reasons have originated from old faulty wiring, cooking equipment, and arson.

Sprinkler systems have proven to be one of the most valuable tools in preserving life and property. Most nationwide departments encourage and promote automatic sprinkler systems within their communities. So, it is required to practice when it comes to the design of emergency service facilities. NFPA 1 – Uniform Fire Code requires that all “New buildings housing emergency fire, rescue, or ambulance services be protected throughout by an approved automatic sprinkler system.” NFPA also requires new and existing fire stations to be equipped with smoke detectors in work, sleeping and general storage areas.

These provisions exist without exception and are a fundamental requirement of stations regardless of size or building construction type.

## **6) ORGANIZATIONAL CONSIDERATIONS WITHIN THE STATION**

The time it takes a first responder to leave the station can be the difference between life and death for a person needing aid. For their safety, responders should not be making up for the time lost in the station on the road. As such, the response path is one of the most sacred functional considerations in the design process. Sound planning strategies should ensure the following:

- Corridors provide a clear and efficient response to the bays with minimal turns, jogs, and corners.
- Most frequently occupied spaces are located the closest to the bays.
- Traffic leads to turnout gear ready zones where responders can safely dress without risk of being struck by moving apparatus.
- Doors from high occupant load zones swing toward the apparatus bays. Doors should be nested into alcoves to prevent them from freely swinging into corridors where other responding personnel might be struck.
- Public access is limited and controlled.
- Acoustical “buffers” should be provided between sleeping areas and other high-noise environments to promote better sleeping habits for first responders, thus mitigating cardiac health risks.
- The station should be free of unnecessary and unexpected steps and tripping hazards.

## 7) FIRST RESPONDER HEALTH: THE INVISIBLE KILLERS

Most first responders enter the profession to serve their community and help others during a time of need. Inherently, they recognize the hazards associated with the job. The most commonly perceived risks are those found on the fire grounds – burns from fire, falls from heights, and the collapse of a structure are just a few of the dangers commonly associated with the profession. Unfortunately, it is not the hazards on the fire grounds that have proven most dangerous to first responders:

### Cancer

After combating the tangible risks on the fire grounds, the public is often shocked to discover that due to prolonged exposure to contaminated materials, firefighters are 2.2 times more likely to be diagnosed with cancer than the average person. Responsible station design can mitigate these risks by implementing functional circulation and contamination containment strategies.

### Cardiac arrest

Furthermore, sudden cardiac arrest is first responders' number one cause of line-of-duty death. Statistically, more than 59% of all first responder deaths are attributed to cardiac arrest. Such deaths have been scientifically linked to overexertion, lack of physical fitness, and sleep deprivation. Responsible station design can mitigate these risks by providing better bunking accommodations, state-of-the-art alerting systems, and fitness rooms.

## Post-traumatic stress

First responders experience constant and relentless exposure to trauma and intense human emotion. Burning buildings, mangled car accidents, suicide attempts, gunshot wounds, and losing a fellow first responder are events one might experience throughout their career. Such tragic events come with the territory of being a first responder. Scientists and mental health experts are intensely studying the effects of such trauma on the psychology of first responders. Still, research reveals that the results are like that of a military service member who has experienced intense and regular exposure to combat.

While some first responders cope well, others do not. Different events may trigger different responses from individuals. Responsible station design can promote mental wellness and mitigate the risks of first responders developing acute PTSD by creating welcoming environments with abundant natural light. Careful selection of materials and intentionally defining spaces for a gathering can induce calming sensations and create opportunities for first responders to open up and seek peer assistance and mentorship.

## 8) HOT ZONE DESIGN APPROACH

Mitigating the risk of cancer and exposure to bloodborne pathogens within the first responder service requires a well-thought-out design approach and perhaps a culture change. First responders are routinely exposed to bloodborne pathogens such as hepatitis, MRSA, and HIV originating from the wounds and other bodily fluids of the people they serve. Exposure to carcinogens and toxic contaminants regularly occurs on the fire ground. A small structure fire from a building constructed in the '60s might expose firefighters to arsenic, asbestos, and many other toxic compounds created from off-gassing materials within the building. These contaminants and pathogens ultimately return to the station via the PPE gear, tools, and equipment used at the scene.

A well-designed station will ensure equipment and gear can be quickly and safely decontaminated at the station without allowing the contaminants to migrate through the building. By employing design strategies and technological equipment, the station design itself can mitigate the risk of these contaminants and pathogens entering the living spaces of the building. While many organizational hierarchies present challenges to designing a successful station, establishing exposure zones is crucial.

Organizing and classifying the station into three primary hazard zones is a proven strategy to mitigate first responder exposure. Fundamentally, the apparatus bays and associated spaces should be classified as the HOT

ZONE. This zone classification should always be assumed to be a contaminated environment. Conversely, the living areas of the station, such as bunks, offices, kitchen, etc., should function as CLEAN ZONES. In practice, personnel returning from a call should never be able to transfer from a Hot Zone to a Clean Zone without having first had the capability to decontaminate themselves and their gear. HVAC systems and flooring materials should be selected and detailed to mitigate cross-exposure risk from one environment to another.

Commonly, DECONTAMINATION ZONES / WARM ZONES serve as a transitional buffer between Clean Zones and Hot Zones and provide spaces for decontamination. Areas usually classified as Warm Zones include turnout gear rooms, decontamination rooms, airlocks, and gear extrication rooms. These spaces must be adequately ventilated, and equipment for personnel sanitation should be strategically located to promote good hygiene and sanitation practices.

#### 9) DECONTAMINATION SPACE

The equipment decontamination space is perhaps one of the most crucial support spaces for the apparatus bay. Full of equipment and fixtures, the practical space must be properly designed to meet the functional demands of a fire station and protect the long-term health and well-being of first responders. MWS fully understands the design requirements associated with the equipment and detailing of these spaces to ensure compliance with NFPA 1581 (Infectious Disease Protocol) and NFPA 1851 (Gear Maintenance).

Functionally, the decontamination space should be assumed to be the most hazardous space within the building. It houses heavy-duty gear extractors designed to clean PPE gear, gear drying cabinets, emergency wash-down areas, and areas to safely store garments exposed to hazardous materials. For easy cleanup, the space should be outfitted with floor drains, trench drains, and hose bibs. Similar to the bays, finishes should be selected to mitigate the risk of construction materials being permeated with hazardous fluids. The HVAC system should also be isolated to prevent the risk of cross-contamination to other areas within the building.

#### 10) VEHICLE EXHAUST REMOVAL

Studies have shown that particulates emitted from diesel combustion engines, such as fire apparatus, are known carcinogens. NFPA requires all fire stations to “address” vehicle exhaust. In addition to vehicle exhaust, first responders should be protected from off-gassing from equipment and gear found in the bays and turnout gear areas. As such, vehicle exhaust removal is only one

of the many components necessary to ensure the proper decontamination and isolation of environmental risks that first responders face.

Maintaining Indoor air quality of the apparatus bay and living areas of the station is essential to the safety and well-being of first responders. It is necessary to mitigate their exposure to diesel exhaust and other air contamination by developing a well-thought-out design solution. Protecting the station's occupants is usually achieved by employing a four-stage protection approach to design mechanical systems. These stages consist of 1.) Source Capture/Treatment; 2.) Environmental Monitoring; 3.) Environmental Purging, and 4.) Fail-Safe Cross-Contamination Prevention.

**Stage 1: Source Capture & Treatment:** Fundamentally, there are three typologies of vehicle exhaust removal systems. It is important to note that despite what manufacturers and vendors promote, no one method is perfect and eliminates the risk associated with exposure. Regardless, each system type has demonstrated its ability to comply with NFPA 1581 and has its merit based on operational requirements. The system selection should be carefully coordinated with the building design goals and departmental policies to ensure maximum effectiveness. The following is a summary of each primary system type:

**Direct Source Capture:** Direct source capture commonly consists of a flexible exhaust hose that attaches directly to a proprietary fitting attached directly to the exhaust system of the apparatus. The system utilizes an independent exhaust fan assembly to pull the apparatus exhaust directly from the source and purge it from the building. The flexible hose is mounted to a traveler rail, usually attached to the ceiling, allowing it to move with the apparatus as it leaves the station. When the apparatus reaches a pre-determined point, the hose will disconnect from the fitting and swing freely. As the apparatus returns, the hose should ideally be reconnected before the apparatus fully enters the building.

Pros:

- Direct source capture eliminates most diesel particulates, provided the department uses the system properly.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- Eliminates CO gas directly emitted by the apparatus.

Cons:

- The exhaust location on the apparatus should be consistent across the entire apparatus fleet, as the rails need to be set for either passenger

or driver side. The exhaust system is rendered useless if a piece of equipment has an exhaust system in an incompatible location or is not equipped with the proprietary fitting. This issue is particularly troublesome when fill-in or mutual aid departments utilize apparatus that does not rely on direct source capture systems.

- The mechanical or magnetic connection can sometimes fail to release, causing the hose to disconnect from the ceiling and trail the apparatus as it leaves the station.
- The hoses should be manually connected upon apparatus return to be fully effective. This practice requires a firefighter to leave the apparatus and connect the hose to a running engine. As such, the firefighter is directly exposed to exhaust and at risk of being accidentally struck by a moving vehicle.
- To ensure proper functionality, travel rails, and their hanging hoses must be carefully coordinated with lighting, sprinkler systems, heaters, and other infrastructure.
- Does not remove other airborne pollutants, VOC, or gaseous contaminants.

**Filtration Systems:** Stand-alone filtration systems usually consist of multiple standalone “air scrubbers” strategically suspended from the ceiling above the apparatus. These air purifiers are designed to run air through multi-stage filtration systems at high volumes to collect various pollutants.

**Pros:**

- Clutter-free and open ceiling environment.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- Universally compatible with all types of apparatus regardless of vehicle exhaust configuration.
- The system treats various airborne pollutants, including VOCs or gaseous contaminants.

**Cons:**

- The system does not capture exhaust at the source. As such, first responders may receive limited direct exposure.
- While contaminants are treated, gases such as CO are not eliminated from the environment. A centralized mechanical exhaust is required if elevated levels are detected.

- The system requires periodic filter replacement.

Vehicle Mounted Source Filtration: Several manufacturers offer “after-market” equipment that mounts directly to the apparatus with a catalytic compound filter to capture hazardous particulates.

Pros:

- Direct source capture eliminates most diesel particulates.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- It does not require mechanical systems integrated into the building.
- It can be utilized on-scene to mitigate exposure outside of the station.

Cons:

- While contaminants are treated, gases such as CO are not eliminated from the environment. A centralized mechanical exhaust is required if elevated levels are detected.
- The system requires periodic filter replacement, which can be costly.
- The station is unprotected from fill-in or mutual aid apparatus that does not utilize the same system.

Stage 2: Environmental Monitoring: As described above, no source capture or treatment system is without vulnerabilities. Therefore, according to mechanical codes, monitoring air quality within the bays is important to ensure levels are safe. Detectors that monitor for hundreds of harmful compounds and gases should be strategically located around the station to sample air continuously. The monitors are then integrated with environmental purge systems to evacuate the air within the bays well before it becomes harmful to the occupants of the building.

Stage 3: Environmental Purge Systems: If indoor air quality within the bays reaches unacceptable levels, an automated air exchange system will activate to quickly replace the air within the bays with fresh outdoor air. Under such conditions, remotely located purge exhaust fans will engage, and dampers on louvers will open, allowing fresh air to be brought in. This system is also commonly equipped with a manual switch allowing personnel to purge and circulate the air on hot days.

Stage 4: Fail-Safe Cross-Contamination Prevention: The “last line of defense” to protect first responders is achieved by carefully designing and balancing the remaining portions of the mechanical systems. Occupied building portions should remain under positive pressure to prevent contaminants from being

“back drafted” from the bays into the living spaces. Turnout gear areas, decontamination rooms, and other areas that function as a buffer between the bays and living spaces should be exhausted under negative pressure to mitigate further the risk associated with off-gassing gear and equipment.

## 11) KITCHEN, DAYROOMS, CULTURE & HOODS

Arguably, the dayroom and the kitchen form the sacred heart of the station. They are the spaces that differentiate a fire station from a firehouse. They are the spaces where mentorship occurs, trust is formed, stories are told, and unbreakable bonds are forged. As such, kitchens and day rooms should be flexible in their function, welcoming in their feel, and durable in their performance. Through the lens of flexibility, it is crucial to recognize that each shift may have its unique culture, which will likely change over time as personnel are reassigned or retire.

Ideally, Kitchens should be located along the exterior with access to an outdoor area that might provide a grill, eating, and gathering area. The kitchen and dining areas should be functional, bright, and inviting yet offer durability and functionality in creating and providing meals.

Dayrooms fulfill a wide range of purposes. After a stressful series of calls, they may serve as an alternative quiet and dark place to rest and decompress. Moments later, they may function as a gathering area for a crew to watch competitive sports or serve as center stage for lively competitive video games. That evening, the same space might be used to teach a life-saving RIT (Rapid Intervention Team) Seminar.

There is an intangible synergy between the relationship between the kitchen, dining, and day-room areas; and how they serve first responders. Departments should consider how these spaces may transform to accommodate a wide range of needs. Can the kitchen and day room transform into a large open area for family dinner nights? Will space need to be periodically used for training? If so, is there sufficient storage for furniture? Does the crew in the kitchen want to hear video game gunfire while trying to watch the news? The design team must understand the cultural importance of this space and work with the department to ensure its sacred nature is not compromised while designing for maximum flexibility and connectivity.

While kitchens are essential to the department's culture, they must still be technically sound to comply with applicable code standards and meet the unique operational demands of the project. Unique to any other building type, fire department kitchens are ambiguous regarding their classification. Are they commercial, domestic, or both? – and does either classification make a difference in the project design requirements? What are the risks of

an improperly designed kitchen, and are there ways to make the space safe for first responder operation? Ultimately, the answer to these questions relies on the interpretation of the authority having jurisdiction (AHJ).

## Hoods & Ranges

Three critical design parameters usually influence a technical requirement of a fire station kitchen. The first critical parameter that must be established is determining the exhaust hood's classification. Fundamentally, fire station kitchens are domestic by nature unless they are to prepare and serve food to the public. However, often the AHJ has determined that this classification does not create an exception to the criteria established by the International Mechanical Code (IMC), which requires that equipment that produces grease-laden vapor be placed under a UL Listed Type I hood (Ansul system).

The second parameter, usually driven by budget and client preference, is determining the type of range equipment. Generally, cooking equipment is classified as commercial or domestic. This simple classification is often misleading to departments, as they might initially assume that the term "commercial" infers that the product is of greater quality and durability. This assumption is not always accurate. Thus, equipment selections should be carefully vetted to ensure functionality and technical compliance.

The third variable directly relates to equipment selection, and hood size determines whether or not a makeup air unit is required. When a kitchen hood is activated, the ventilation system will begin purging air from the occupied space. When the amount of air exhausted is nominal, this air is principally recovered from alternative sources such as excess supply and outside air delivered by voids common to the building envelope. However, when the exhaust rate exceeds 400 CFM, a makeup air unit (MAU) must be provided. Without an MAU, the building will experience negative pressurization that may extinguish mechanical system pilot lights or draw "contaminated air" into the building through the apparatus bay. The MAU is commonly a dedicated unit that delivers tempered air to the kitchen at the same rate the hood exhausts it to ensure a balanced condition. As a rule of thumb, 1 CFM is required for every 100 BTU of equipment output.

Domestic equipment is typically smaller, yields less BTU in total output, does not require a pilot light, and is usually insulated to allow minimal combustibility clearances. Commercial equipment is generally available in a broader range of sizes, may require a pilot light, exceeds 40,000 BTU in output, and contain uninsulated side and rear panels. The omission of insulation in the panels requires that equipment clearances be maintained from combustible materials. Usually, commercial equipment without insulation

economically incentivizes commercial establishments that might establish an array of tightly spaced equipment under a shared hood. Another factor that is often initially incentivizing to departments is the initial cost of equipment. Usually, decent commercial equipment can be purchased at a lower cost when compared to high-quality domestic equipment.

Understanding these basic principles can aid a department in making critical decisions that will affect its station's long-term flexibility and functionality. One or two high-quality 40,000 BTU domestic ranges equipped with dedicated 400 CFM pre-packaged recirculating UL-listed Type I hoods and no required MAU might yield an attractive, flexible, and cost-effective solution for a department. An inexpensive commercial range, custom UL-listed type I hood, and dedicated MAU might quickly add up to more than \$60,000 in cost and result in an institutional space.

Regardless of approach, the technical design requirements of the station kitchen should be designed to meet the department's specific needs. As a matter of safety, the range system should always be integrated with the station alerting system to ensure responders don't accidentally leave cooking unattended when responding to an emergency.

## 12) FITNESS FACILITIES

As previously mentioned, cardiovascular disease presents a significantly higher risk to the first responder community than other occupations. Including fitness facilities is equally essential to providing bunk facilities that promote quality sleep. Often the physical skills performed by first responders are unique to the job. As such, the workout routines and equipment utilized within the space may slightly differ from what might be found in a typical weight room. The design of workout facilities for first responders should be coordinated with a departmental fit-for-duty program. The following principles should be incorporated into the design of first responder fitness facilities where possible:

- Consider incorporating an overhead door or operable wall that allows the fitness room to open directly to the station's exterior, where first responders may work out outdoors.
- Fitness rooms should be located in high-visibility / high-traffic areas with windows allowing other building occupants to monitor exercising individuals. Locating fitness rooms in remote locations, such as above mezzanines, is ill-advised, as a person suffering from a heart attack may go unnoticed for a considerable time.

- All fitness rooms should be equipped with a defibrillator and a duress alarm that can be pressed to alert the station should there be a medical emergency.
- Fitness facilities should be sized to provide sufficient equipment and floor exercise clearances.
- Ceiling heights should be of sufficient height to accommodate stair-climbing machines.
- Fitness facilities should be acoustically isolated from sleeping and dayroom areas to mitigate the risk of disrupting individuals that may be sleeping.
- As private on-demand classes increase in accessibility and popularity, consider including sufficient A/V equipment that allows for content to be displayed.
- Provide sufficient power connections for cardio equipment and electronic timers.
- Fitness facilities should have an independent mechanical zone that allows the space to maintain a cooler temperature than the rest of the facility.
- The floor structure should be isolated from the rest of the building to mitigate vibrations from resonating throughout the rest of the building when weights are dropped. Isolation is particularly important, considering some occupants may be sleeping.
- Carefully select equipment that best aligns with the physical demands of the occupation. For example, Cybex and Life Fitness manufacture equipment tailored explicitly to lifting and carry maneuvers performed by firefighters.
- Select a resilient flooring material capable of withstanding impact loads, mitigating vibration, and deadening sound. Further, ensure all materials are non-organic and antimicrobial to aid in cleaning and mitigate the risk of mold growth.
- Consider the minor details. For example, plan and locate wipe and disposal stations during design.

### 13) SINGLE-STORY VS. MULTI-STORY STATIONS

Fire stations can be classified into three basic organizational typologies: single-story, multi-story (stacked), and hybrid. Each typology offers unique advantages and disadvantages. Regardless, the difference in response times for a well-designed single-story or multi-story station should be negligible.

**Single Story:** Provided sufficient room on the site and the topography is favorable, a single-story station will usually provide the most cost-effective and functional model for design. Single-story solutions do not require vertical circulation elements such as stairs or elevators. They often offer ample frontage for apparatus bay connectivity to other living spaces.

**Advantages & Highlights:**

- The most efficient use of space such as stairs, elevators, and elevated mechanical areas, is often not required.
- Construction costs for the building can be less than that of a multi-story solution since fire ratings are simplified, and apparatus bay walls only need to support a roof structure.

**Challenges:**

- Single Story stations usually require the most site development.
- For large stations (25,000+ GSF), response times may become hindered from some areas as spaces may be more remotely located from the bays.

**Multi-Story:** Multi-story stations are commonly utilized on small parcels, urban environments, or on sites with particularly challenging environmental or topographic features. In principle, multi-story stations usually have occupied space above the apparatus bay. They typically require multiple means of egress and elevators to comply with life safety and accessibility codes.

**Advantages & Highlights:**

- Compact footprint.
- For larger stations (25,000+ GSF), response times can be reduced by allowing personnel to vertically “spill out” into a rapid response-ready area within or immediately adjacent to the apparatus.
- Site development costs may be less than that of single-story construction.
- It is usually the easiest typology to achieve Flood Resistance Compliance with FEMA if necessary.

**Challenges:**

- Fire ratings are often required between floors.
- It generally requires more overall square footage to accommodate stairs and elevators.

- Structural isolation of the fitness room is vital to prevent the vibration of dropping weights.
- The Structural design of walls and frames becomes more complicated than single-story solutions since a two-story station is essentially a three-story volume.
- Clear-spanning apparatus bays can be difficult or costly since the structure must support the floor load above.
- The motors should be isolated if the station utilizes overhead sectional doors to prevent disruptive vibrations during door operation.
- It is usually most cost-effective to build a station where the upper floor and ground floor areas are balanced, allowing the design to be “stacked” economically. Achieving an appropriate balance in the program can sometimes be challenging.

Hybrid stations usually consist of a single-story apparatus bay adjoined by a multi-story occupied structure. They can provide a cost-effective balanced approach to sites with spatial, environmental, or topographical limitations. Hybrid stations are often excellent candidates for sites with a significant cross slope as one might enter from the upper level to access the bays below.

**Pros:**

- Generally, it is more cost-effective than a multi-story station since the structure of the high apparatus bays does not need to support loads of floors above.
- Moderately compact footprint.
- Fire ratings between floors are generally not required.

**Cons:**

- It generally requires more overall square footage to accommodate stairs and elevators.
- The program associated with the occupied portions of the station tends to become fragmented, which results in inefficiency.
- Prioritizing which portions of the operational program will have quick access to the bays can be challenging.
- Like multi-story stations, the program for the occupied portions of the station should be balanced to achieve economic viability.

**14) BUNK, SHOWER & TOILET ACCOMMODATIONS**

The design and organization of bunk rooms and sleeping facilities play a significant role in the culture and effectiveness of a department. The

configuration and design of bunking facilities also directly correlate to health and wellness and response times. There are seemingly endless ways to configure bunks to achieve project goals, but generally, they are categorized into three basic typologies: Open, Semi-Private, and Private. Each typology offers distinct advantages and disadvantages regarding privacy, wellness, square footage requirements, cost, and response times.

With an increase in female first responders joining the profession, there has been a consistent demand to reconsider the living and sleeping environments within the station. Many departments recognize that their demographics are consistently changing and that what is planned for today may not satisfy the needs of tomorrow. Case law surrounding equality issues has continued to rise throughout the public safety legal landscape for the past 20 years. It is only further compounded by the most current issues regarding gender-neutral accommodations. Currently, there are no nationally adopted building codes requiring such accommodation.

While a department's diversity and cultural identity may serve as influencers on bunk-room accommodations, so should responder health, wellness, and response. Recent scientific and medical research further influences the design challenges of bunkroom designs. Studies have shown that nearly twice the number of injuries occur on calls between midnight and 6 am compared to other times of the day. Many of these injuries are directly attributed to sleep deprivation. Sleep deprivation is directly linked to decreased mental performance, depression, cardiovascular disease, obesity, cancer, and immune system deficiency – all health risks to first responder personnel.

Yet the debate over individual dorms, gender-specific dorms, and co-ed dorms rages on. Each solution has inherent advantages and disadvantages related to culture, wellness, and cost. Private and small group bunk rooms are proven to afford first responders a better night's sleep due to the lack of disruption from others. Snoring, coughing, cell phone noises, and door slamming are typically contained in an isolated environment. Alerting systems can be equipped with a selector switch to ensure that only crew members dispatched for a call are alerted. Beyond the functional benefits of separate rooms, large departments have also reported less sick time amongst crew members as infectious diseases such as the flu and colds are far less likely to affect an entire department or shift.

One obvious concern that many raise about private bunk rooms is the impact that they might have on the culture and camaraderie within the station. Worries over a responder sleeping through an alarm might be another issue. Cultural concerns revolving around isolationism can be overcome by limiting the opportunity for televisions within the rooms, implementing good

departmental policies on bunkroom use, and providing quality community spaces in areas such as the kitchen and day room to encourage better social activities.

Similar to the challenges associated with sleeping quarters, toilet rooms and locker facilities face similar challenges. The design of dedicated male and female locker facilities may necessitate a commitment to the fixtures and equipment assigned to each area based upon an assumed trend. Knowing that a station is designed to accommodate a maximum complement of first responders, resources are likely to be inappropriately assigned if the assumed distribution is wrong. For example, if the station is designed for 80% male and 20% female, and the actual complement becomes 95% male and 5% female, there will likely be a shortage of resources for men. At the same time, there is an excess of facilities for women than men cannot utilize because of gender.

One potential solution to this problem is to develop flexible single-occupant toilet rooms accessible from a corridor lined with personnel lockers. Single-occupant toilet rooms allow personnel to retrieve their belongings from their locker and enter a private shower and toilet facility to shower and change. Lockers that line the surrounding shower and bunk room corridors take advantage of circulation space already required by other programmatic areas. This approach can yield a significant reduction in project square footage. This approach ensures that the toilet and shower facilities are designed to satisfy the programmatic mission of providing locker and shower facilities for all personnel cost-effectively and flexibly.

In any case, departments and architects are now faced with the challenge of best preparing for the future while mitigating the risks associated with first responder health and gender equality.

**Open Bunkrooms:** Perhaps the most traditional methodology, open bunk rooms consist of large rooms designed to accommodate multiple beds. Sometimes, the sleeping positions may be separated by partial height walls or screening devices while sharing the same lighting, alerting, and mechanical systems. Even with partial height partitions, Beds are often spaced apart. Thus, these areas require a moderate amount of square footage. An open-style configuration is usually the least costly to build but comes at the expense of the first responder's wellness and privacy.

**Semi-Private Bunkrooms:** Semi-private bunkrooms usually consist of beds or bunks open and accessible to a common access aisleway but separated by full-height partitions. Semi-private style configurations balance open and private bunk rooms as they afford some privacy yet often share lighting,

mechanical, and alerting systems. Utilizing full-height partitions also allows beds to be placed immediately adjacent to the wall on both sides. This approach often yields the most compact footprint.

**Private Bunks:** Private bunks are usually classified as individual dormitory-style rooms with a capacity of one or two occupants. When staffing is assigned to a specific apparatus, these rooms may be larger to accommodate the entire apparatus crew. Private bunk rooms typically require the most space and infrastructure but provide the highest degree of privacy and best mitigate against risks to first responder health and wellness. Cardiovascular disease has been directly linked to sleep deprivation, and in the current pandemic, the ability to isolate and quarantine has never been more important. Individualized sleeping quarters have long been proven to mitigate the spread of viruses and bacteria and afford a better quality of sleep.

**Bunk Room Factors to Decide Upon:** Rendering a decision about which bunkroom configuration is right for the City of Suffolk will require the stakeholders to consider many factors. Below are just a few to consider:

- **Privacy & Gender Neutrality:** In the past, the conversation on gender neutrality mostly revolved around the culture and context of the fire service. Today, the ever-changing landscape of law surrounding gender and discrimination requires departments to strive to achieve a “one-size-fits-all” solution that is inclusive, allows for privacy, and mitigates the risk of litigation.

Gender equality remains a focal point in the design of fire stations as more women enter emergency services. A careful analysis of short- and long-term staffing needs should be performed to ensure appropriate quarters, showers, and locker facilities.

- The traditional gender-specific dorm strategy of one communal bunk area, one locker room, and one bathroom for each sex is usually not the most flexible or cost-effective solution for a department. When multiple shifts of varying demographic composition operate from the same station, this often results in high inefficiency.
- **Case Study Example:** A Department operates (4) shifts, with each shift staffing (4) firefighters and (2) EMTs. The gender composition of each shift varies as follows:

In the-referenced scenario on the previous page, the maximum occupancy for any given shift of each sex is (5) males and (4) females. To accommodate “C Shift,” a female bunk room of (4) beds would be required. To provide for “D Shift,” a male bunk room of (5) beds would be required. In a traditional

segregated configuration, the station must provide a minimum of (9) sleeping positions to accommodate only (6) first responders. This scenario suggests that at any given time, beds are being left empty. This vacancy, in turn, means that valuable square footage and resources are going unutilized on multiple duty days. Conversely, if the demographics shift beyond the pre-determined maximum occupant loads (I.E., 5 Females), there will likely be a shortage of sleeping positions for one gender.

Rather than design large traditional dormitories that can address all possible scenarios, a department should consider providing flexible solutions that optimize preparedness and operational efficiency. In many instances, using private bunkrooms or coed semi-private sleeping quarters will generate flexible and practical solutions that address the privacy needs of all first responders, regardless of gender or sexual orientation.

- **Culture:** “Old Salt” first responders have often cited the bunkroom area as the heart of the station. Traditionally, it is where countless stories are told, and pranks are pulled. This position begs the question, were the bonds and memories formed in these spaces a result of design or adaptation? Had there been a more appropriate space in their career, would those same bonds have been formed there instead? Today, should sleeping facilities be prioritized and looked at as purposely designed spaces supporting a first responder's health and wellness? Can we carry on 200 hundred years of tradition elsewhere in the building more appropriately? It is said that a firefighter’s career both begins and ends at the kitchen table. Perhaps it is the kitchen that is, in fact, the heart of a station.
- **Health & Wellness:** The health and wellness of first responders has become an increasingly important topic in the design of fire and EMS stations. Studies continue to identify the service's challenges of cancer, cardiovascular disease, and mental health. The integration and design of fitness areas, decontamination zones, and bunk rooms can significantly address these issues. Below are but a few designs parameters to consider:
- **Natural Daylight:** Including natural daylight in sleeping facilities is paramount. For first responders, sleep deprivation is often linked to circadian rhythm disorder, which can cause stress, weight gain, and heart disease. Providing first responders with ample natural daylight allows for their bodies to more naturally biologically link with the time of day. When sleeping during daylight hours must occur, light dissipating and total blackout shades can be integrated into the window shades to allow for full light control and flexibility.

- **Alerting Systems:** Integrating modern alerting system technology into the design of the bunk areas is essential to support the goal of promoting first responder wellness. Older-style claxon alarms have been proven to startle sleeping personnel, which can cause stress and cardiac health issues over time. Contemporary alerting systems often gradually increase lighting and sound to awaken a first responder and have proven to be equally, if not more, effective.

If sleeping facilities are separated from one another, an assignment selector switch can be integrated into the design of each room. This approach ensures that only the appropriate crew is signaled for dispatch, allowing the remaining occupants of the building to remain asleep.

- **Sufficient Space:** Allowing sufficient space within each sleeping area provides mental and physical benefits. Ensuring that the response floor area is free of tripping hazards is essential. NFPA 1581 Standard recommends/requires 60 NSF of open floor area for each bed. Given the Covid-19 pandemic today, one might consider even more space if multiple beds share a room.
- **Mechanical Isolation:** When designed appropriately, private bunkrooms are superior to other strategies for isolating contagions that may be transmitted among coworkers. In addition to the physical separation, integrating Ultraviolet (UV) light sterilization and HEPA filtration within the mechanical systems can mitigate the risk of exposure to airborne viruses and bacteria. Even outside the current Covid-19 pandemic, such solutions result in fewer sick days and transmission of infectious diseases among first responders. When comparing the capital construction costs against the human resource costs of paying for medical expenses and overtime, deciding whether to implement these technologies is usually a clear and wise investment.
- **Sleep Quality:** Four key factors that play a role in improving first responder sleep quality; acoustics, thermal comfort, lighting, and personal comfort. Acoustically, the design team should consider how to mitigate sounds originating from CPAP machines, cell phones, snoring, outside traffic, and perhaps even overhead door motors. Thermal comfort can be accomplished by providing each sleeping area with programmable thermostats that allow the user to work within a pre-determined range of setpoints.

Lighting controls should provide maximum flexibility, and consideration should be given to including low-level floor lighting that gently illuminates travel paths during evening hours. This strategy allows first responders to

navigate the station at night without completely dilating their eyes should they need to use the restroom or get a drink. Finally, personal comfort revolves around selecting quality beds and mattresses and ensuring sufficient storage space for personal effects such as pillows, sheets, and blankets.

- **Private Bunk Rooms & Response Times:** Two common critiques of private bunk rooms are 1.) What happens if someone sleeps through a call? And 2.) What happens if someone has a heart attack? Both of these concerns can be resolved through technological innovation. Heart rate mattress monitors can be integrated into alarm and signaling systems. For example, the system detecting a sleeping first responder may relay to a small red light outside the door. A responding crew passing by may take more aggressive measures to awaken that individual should they sleep through the alarm. Similarly, newer technology can now activate a duress alarm if cardiac arrest is suspected of having occurred.
- **Bed Bugs & Vector-Borne Disease:** While bed bugs rarely transmit disease, they are, at best, an annoyance to anyone who must experience living with them. The level of cleanliness of a station does not determine its presence. They have been found at meticulously maintained five-star hotels and resorts.

Bed bug infestations usually occur around or near areas where people sleep. Their bites cause itching and discomfort and, in exceptionally rare instances, may transmit diseases. They tend to hide during the day in places such as the seams of a mattress, box spring, bed frame, or construction cracks and crevices.

Good design and quality craftsmanship can mitigate the risk of infestation, provided that the department maintains well-thought-out standard operating procedures. Some methods to mitigate the risk of infestation include:

- The project team should carefully select furniture with minimal voids and crevices.
- The department covers mattresses with protective covers.
- All gaps, joints, and voids within the locker and sleeping areas should be sealed with expandable foams or continuous sealants.
- First responders should keep all linens and clothing within sealed totes or bins. The project team should then carefully consider storage solutions to accommodate those bins.

- Clothing, cardboard, and other materials should never be left on the floor. The design team should consider how and where dirty laundry will be stored.
- Should infestation occur, bed bugs are commonly exterminated by heating a space to above 115 degrees. It is recommended that all bunk, locker, and shower areas be isolated from one another with frame and sill seals. Further, ductwork serving these areas be equipped with accessible manual dampers. This cost-effective practice allows the department to isolate specific areas of the building, bring in a remote heater, and treat that area without shutting down the entire station.
- Trends & Conclusion: While there is no right or wrong strategy for bunkroom design, there has been a consistent trend toward providing first responders with private facilities. The emotional and fiscal tolls that cancer and cardiovascular disease impose on the municipality, the first responders, and their families are immeasurable. Departments and municipalities generally appear to be more willing to make this investment as they become more aware of the health and wellness benefits of private facilities.

## 15) LOCKER & SHOWER FACILITIES

The same issues surrounding the design of sleeping facilities correlate with showering and locker facilities. Resource utilization, privacy, spatial requirements, and flexibility are a few common threads that impact both spaces. Generally, personnel storage lockers and shower facilities are classified in one of three manners:

**Traditional Locker Rooms & Shower Facilities:** The creation of actual locker rooms has been a staple of fire station design for decades; however, over the past two decades, they have given way to more effective solutions.

Conventional locker rooms usually consist of two variations: Co-Ed and Gender-Specific. Co-Ed locker rooms will provide space for all personnel locker units and immediate access to individualized uni-sex toilet and shower rooms. Staff are expected to take their personal effects with them into the individual shower rooms to change. On the other hand, Gender-Specific shower rooms may have “gang” shower and toilet combinations or individual rooms but afford the option for personnel to get changed within the locker room itself.

Gender-specific locker rooms present space and flexibility challenges similar to the case study previously presented on bed utilization. Without over-designing the number of lockers required for a fully staffed station, gender-

specific locker rooms will often result in vacant lockers being available in one area and a shortage in another. The effectiveness of gender-specific locker rooms is further diminished when accounting for the legal and privacy needs associated with providing equal accommodations for LGBT personnel.

Finally, both variations of traditional locker rooms tend to utilize significantly more square footage than alternative solutions. Lockers placed in a dedicated locker room require aisles and circulation space to access each unit. Establishing even the most compact circulation routes to locker areas consumes considerable square footage. Alternative locker area configurations typically allow the design team to take advantage of access corridors that are naturally present within the design.

**In-Corridor & Private Shower:** Locating locker rooms within natural circulation paths within the bunk and shower room areas is a common practice that provides the highest degree of flexibility with the least impact on building size and cost. In this configuration, lockers are nested within corridor walls, usually outside bunkroom and shower room areas. This approach ensures that the facility provides a precise quantity of lockers for the station, which can be equitably assigned to staff regardless of gender, race, or creed.

Staff are expected to collect their belongings from their locker and utilize an individual shower/toilet room to shower and change. Once complete, the space should be cleaned and available for the next person. Perhaps the only disadvantage that accompanies this solution is the inconvenience of carrying personnel effects back and forth regularly.

Compared to an In-Bunk approach, this solution also allows for less disruption to personnel that may be sleeping or occupying the bunkroom itself – which may be particularly prevalent during shift change. When deciding the best approach, a department will usually evaluate the inconvenience of carrying items vs. the disadvantage of disrupting someone’s sleep.

**In-Bunk Lockers & Private Showers:** Locating lockers inside the bunkroom is usually only feasible for departments that utilize a shift structure where first responders are regularly assigned specific rooms. This approach allows personnel to get changed within the privacy of their bunk area and, depending on the configuration of shower facilities, complete hygiene routines at remotely located individual toilet/shower rooms. This solution also has the highest potential for flexibility and privacy, especially if the toilet and shower rooms are connected to the bunk rooms in a jack-and-jill configuration. It should be noted that depending on the number of bunk rooms, a jack-and-jill configuration may result in a design with more toilet and shower facilities than is otherwise required by code.

The disadvantage that accompanies this locker design approach is the risk of sleep disruption. Usually, across all shifts, multiple personnel will share a bunkroom. When an individual has completed a particularly hard day, they may choose to sleep at the station a little longer rather than risk falling asleep while driving home. As the next shift arrives for duty, they risk disrupting an individual's sleep as they gain access to their locker.

Finally, hybrid solutions are always available. In the past, some departments have utilized pass-thru lockers in an attempt to achieve the best that both solutions have to offer. When considering this approach, the design team should carefully select lockers to maintain fire ratings and acoustic separation.

**Design Considerations:** The design of locker and shower facilities should be organized to maximize flexibility and improve operational efficiency while controlling project costs. Regardless of the approach, the project team should ensure lockers are sufficient to house boots, uniforms, linens, and other large items that first responders will utilize. When selecting a locker system, one should also consider how noisy they are when closing, how they are ventilated, and how they will be properly secured. Finally, the project team should consider whether or not to include charging ports and whether or not night lighting should be integrated with the toe-kicks.

## 16) APPARATUS BAY SYSTEM DETAILS & TECHNOLOGIES

A wide array of mechanical systems tailored to fit project requirements and the owner's budget are available. Fire stations carry many unique requirements when compared to other building types. Often the building systems (mechanical, electrical, plumbing) require careful integration with one another to optimize their performance. A list of best practices surrounding the system selections and design of bays are listed below:

**Bay Slab Conditions:** The structural slab must support the load of the fire apparatus and is largely dependent upon the site's soil conditions. Geotechnical engineering analysis should be performed early in the design process to ensure soils can support loads of the apparatus, foundation, etc. In-floor radiant heat requires careful coordination with structural elements, slopes, and drains. Slabs should be sloped to optimize water drainage.

**Natural Daylighting:** Clerestory windows and skylights can flood the apparatus bay with natural light, significantly reducing the costs of providing artificial light. Light fixtures can be wired to dimmers and control devices that monitor the amount of natural daylight entering the space. When sufficient natural light is available, the lights will be dimmed or turned off. Such a system can be zoned to address darker areas of the bay.

**Bay Trench Drain Systems:** Trench drains collect water and snow runoff from the apparatus. Ideally, they should slope to the center of the door line to ensure water drains away from walking paths, and that apparatus is parked with all-wheel points at the same elevation. Trench drains should connect to a sand and oil separator to prevent environmental contamination.

**Artificial Lighting:** Artificial lighting has made tremendous strides in the past ten years. Studies have proven that LED fixtures provide a short-term return on investment and can instantly illuminate. Lights should be carefully located between the apparatus to ensure the parked apparatus does not cast shadows on walking surfaces. If the project requires overhead infrared radiant heaters, the design will require careful coordination to keep the fixtures away from the heater combustibility zone.

Further, the lighting control systems within the building can be integrated into the alerting system so that lights are automatically turned on when a call is received.

**Bay Industrial Fans:** Large industrial fans can be utilized during heating and cooling seasons to achieve occupant comfort in the bays. High bay structures such as apparatus bays tend to experience air stratification. Low-speed, high-volume fans help to de-stratify the air and improve air quality and overall comfort. During the winter months, the fans can work to mix high temperatures found at the ceiling with the lower temperatures on the floor, rendering the heating system more efficient.

**Bay Heating:** The apparatus bay is crucial to maintain occupant comfort and equipment functionality. Radiant heat is ideal as it allows the building to recover efficiently from the cold air that may rush in from an open bay door. Radiant energy is stored in objects or “thermal mass” (concrete slab), which then “radiates” heat into the surrounding space, thus warming the environment. The energy is stored in the slab, not the air, and may be generated from in-floor radiant heat systems or overhead gas fire infrared heaters.

**Apparatus Bay Door Operations:** Apparatus bay doors play a significant role in the building's functionality, aesthetics, and thermal performance. As a mission-critical component of the structure, they must be designed to function with reliability and stand up to storms and abuse. Sectional doors, coiling doors, and four-fold are all viable options, each with qualities and challenges. While sectional doors generally provide a lower initial cost, they typically lack thermal performance, have a reduced life span, and require a taller structure to operate compared to a four-fold system. Four-fold systems have a higher initial cost but operate faster, generally have a significantly

longer life span, and can be a good candidate for lower structural clearances. Four-fold doors also provide better thermal performance and can be designed to be hurricane resistant.

**Rainwater Collection Systems:** Most municipalities require construction projects to manage stormwater. Consider capturing rainwater from the roof and storing it in cisterns for reuse. Some municipalities may provide a stormwater “credit” for this approach, thus reducing site development costs associated with stormwater management facilities. Collected rainwater can be utilized for Filling Apparatus, Washing Apparatus, and Non-Potable Water Functions such as irrigation, toilets, etc.

## 17) TRAINING ELEMENTS & PROPS

In many instances, regional training centers require reservations months in advance and will take units out of service for extended periods. The integration of training elements within the design of fire stations can be incorporated into the design of all modern stations, if for no other reason than to reduce the wear and tear on expensive fire apparatus and to take units out of service less frequently. Including physical training props within a station allows departments to hone life-saving skills and showcase their role in the community, all while maintaining operational readiness.

When appropriately planned, training props, towers, and mezzanines can be incorporated into the natural design of a station where the cost is so marginal that it would be detrimental to omit them. For example, a training tower that functions as a required means of egress from a storage mezzanine or an upper level would be a wise investment with insignificant cost implications.

In new construction, the project team should strive to identify common architectural and structural elements that may double for training opportunities. If planned correctly from the start, the cost of integrated training solutions should be marginal at best. Below is a sampling of considerations that you may wish to consider for the design of your station:

- Utilize Mezzanine structures to simulate parapet walls and window openings, allowing first responders to practice laddering, rappelling, and bailout techniques during all weather conditions.
- Use utility holes and other covers through mezzanine floors to practice technical rescue skills such as confined space training.
- Consider placing exit stairs near apparatus aprons so that they can be used for training purposes. Be sure to provide a sufficient staging area for the apparatus that is clear of electrified utilities.

- Contemplate designing the stairs so that the first responder can flow water and manipulate hose lines without damaging the interior finish spaces of the building.
- Consider integrating a vertical standpipe that the apparatus can charge from the exterior.
- Consider integrating piping to distribute water-based artificial smoke from a centralized smoke machine. Further, be sure to include signage that alerts the public to training exercises that are in progress so that they don't think your station is burning down.
- The exterior training towers should be finished with durable materials to allow ladders to be thrown against the building.
- If the exterior of the building is being utilized for laddering and rappelling, be sure to design a robust parapet and roofing system that will prevent first responders from accidentally damaging essential waterproofing systems.
- Strategically place NFPA-compliant anchor points on the outside of the building and inside of the apparatus bays to allow for laddering and rappelling exercises. Be sure to include ladder tie-offs.
- If exercises are occurring on the bays' interior, consider the finishes of walls and floors to mitigate footprints on walls and marring that may occur from ladders.
- Consider setting up high-line rescue training opportunities if the station consists of two or more remote mezzanine structures.
- Consider providing robust frames that allow for the construction of temporary wall and floor assemblies that firefighters can use for roof ventilation and forced entry training.
- Provide sufficient storage for standalone props such as forced entry door systems and homemade entanglement systems.
- Consider developing an elevator shaft prop that can simulate an elevator cab struck between floors for areas with elevator rescue challenges.
- Consider including a workshop with a table saw and similar tools that allow instructors and other departmental personnel to fabricate temporary and sacrificial/consumable elements.
- Consider incorporating a "sprinkler lab" into the station's design to train firefighters to shut off various sprinkler heads.

- Consider providing a remote dedicated pad where vehicle extrication training can occur. Be sure to locate the pad in an area where debris will not impact regular station operations.

## 18) UTILIZATION OF MEZZANINES

Apparatus bays, by default, are high-volume spaces that require tall doors capable of accommodating emergency vehicles. These bays are commonly served by a wide range of lower-volume spaces that support the fleet's operations. Such spaces may include but are not necessarily limited to Turnout Gear Storage, Decontamination Areas, Grounds Storage, SCBA and Compressor Rooms, and Workshops. Generally, the area above these support spaces is ideally supported for mezzanines.

Mezzanines can be a cost-effective way to provide for various departmental functions. They can be utilized for storage, training, mechanical equipment, and in some cases, general occupancy. Regardless of function, a good mezzanine design will usually offer some training as a secondary benefit. Some concepts for consideration regarding the design of mezzanines are as follows:

- Carefully consider placing mission-critical infrastructure such as generators and air handling within ventilated mezzanine environments. This approach may be cost-effective to protect these features from natural disasters or terrorist-like activities. Hardening of facilities has become increasingly important, especially as public safety agencies continue to become more of an at-risk target.
- As previously mentioned, consider integrating training elements into the design of storage areas that allow for all-weather training.
- Utilize mezzanine space for storage of less frequently accessed supplies and materials. Be sure to consider how materials and pallets of supplies will be stocked and unloaded from the mezzanine.
- Consider integrating a small gantry crane into the structure's design, allowing department personnel to transport large loads to higher elevations safely.
- Where possible, avoid locating habitable spaces above mezzanines as it becomes challenging to maintain both visual oversight and acceptable air quality.
- If utilizing back-in-bays, consider integrating an elevated loading dock leveler, allowing personnel to unload and load hose from engines easily.

- Consider providing an “out of service” storage area where all tools and equipment from a piece of apparatus may be temporarily stored when a unit must leave the station for outside mechanical service.

## BEST PRACTICES FOR POLICE STATION DESIGN

Police Stations are critical, long-term investments that ensure the wellbeing of our communities and the officers and civilians who protect them. They need to be flexible enough to meet the demands of future standards yet durable enough to withstand some of the most extreme abuse conditions. They must also convey the core values of the agency and the communities they serve.

Above all else, a law enforcement facility should provide a secure, efficient, and safe environment for all occupants. The design of the facility must address a wide range of user groups and functions that are likely to occupy and take place within the building. As such, plans must be carefully organized to isolate, and secure various spaces to address the issues associated with holding cells, evidence processing, and domain awareness. Police departments often face numerous operational challenges when it comes to processing juveniles, adult men, adult women, and competing gang members within the same building. Duties such as processing suspects, securing and processing evidence, conducting interviews, and writing reports are just a few of the responsibilities an officer has when within the building.

The multi-functional nature of this mission-critical facility requires a deep understanding of relationships associated with a wide range of program elements. The blending of spaces related to the station requires a thoughtful design solution to ensure both functionality and security are maintained. The law enforcement programs must accommodate several diverse functions, including public and media interaction, community education, detention, processing, officer training, dispatch, administration, record keeping, and long and short-term evidence storage.

A law enforcement facility must also consider the emotional state of officers, staff, victims, and those detained. Police work is a stressful occupation. According to the National Alliance on Mental Illness, up to 19% of those in law enforcement exhibit symptoms of PTSD, compared to 3.5% of the general population. While combating PTSD requires a multi-faceted approach, the built environment can play a unique role in addressing the mental health and wellness of people. Extensive research has been conducted, studying the relationship between mental health and the built environment within public safety facilities. Research clearly indicates that natural light, exterior views, access to fresh air (naturally or mechanically) play a significant role in

improving health, morale, and productivity – and align with sustainability goals.

Finally, it is crucial to design the facility with an eye towards the future. The challenges and political landscape surrounding law enforcement are changing faster than ever before. It will be critical to implement a design strategy that allows the needs of emergency services personnel to be continually addressed. Possible strategies to achieve flexibility include pre-planning for future additions and utilizing modular space planning strategies that allow adaptive reuse of existing spaces without construction.

### **1) INTERNAL FUNCTIONS & SECURE ZONING:**

Law enforcement facilities require a spatial organization that provides an appropriate degree of security and separation amongst the various functions of the building, all while balancing operational efficiency. It is common to classify the interior program into one of three primary zones. 1.) Semi-Secure Zones; 2.) Secure Zones; 3.) Elevated Security Zones. Naturally, the building and site itself should be largely secure and hardened to protect occupants from those who wish to harm others.

- Semi-Secure Zones are typically those areas where the public will have frequent interaction with law enforcement personnel. Such programming areas may consist of community meeting rooms, duty desks, command officers, records division, etc. The organization of these spaces should provide law enforcement personnel with sound “domain awareness” to afford them adequate time to respond to a potential threat. Typically, the initial interface points, such as lobby walls, vestibules, and transaction windows, are hardened. Except for Juveniles, detainees are rarely, if ever located, within this zone of the station.
- Secure Zones are typically areas where the public has limited interaction with law enforcement personnel. Such engagements are usually appointment-based or conducted by escort through the station. Typically, spaces associated with this zone are dedicated to law enforcement personnel who are performing their everyday work in a secure and private environment.
- Elevated Security Zones are typically areas within buildings that require heavy monitoring and force protection. Such programming areas might consist of holding cells, evidence storage, sally ports, evidence processing, armory, patrol units, etc. Rarely, if ever, will members of the public enter these spaces. These areas usually consist of hardened construction since the spaces house sensitive materials, equipment, or are at risk of being accessed by unauthorized personnel through forced entry.

- This classification method is an effective way to ensure that the design and organization of the building mitigate the risk of “population contamination.” In short, the design should never require the public or civilian employees to be in direct contact with detainees. Similarly, the public should never have uninhibited access to law enforcement personnel. And finally, law enforcement personnel should be free to work within their respective areas of the building without unnecessary detainee interaction. Segregating and securing these environments is essential to the development of a highly functional law enforcement facility.

## 2) BUILDING PRESENCE & COMMUNITY POLICING:

- d) Only in recent history have law enforcement agencies across the country become subject to an unprecedented rate of relentless physical and verbal assault. Ill-informed social media posts, often made by individuals who feel they’ve been wronged by police, degrade the role and responsibility of law enforcement in our communities. The political climate and demands on law enforcement personnel within the 21st century often call for the design of police stations that present conflicting fundamental design approaches. Community policing concepts suggest the design of law enforcement facilities that are visually accessible and inviting to the public. Conversely, threat conditions call for a design that is hardened, durable, and defensible – much like a fortress. As such, one of the significant challenges associated with this project will be to design an “Accessible Fortress” that engages the community and keeps departmental personnel safe.
- e) Police departments, while secure, should also afford a degree of transparency and transmit a sense of invitation to the community. In today’s era, it has never been more important for police to project and maintain a positive image in front of the communities they serve. Proper presentation is one of the fundamental principles of Community Policing and helps citizens to feel as if they can connect with their law enforcement agency on a personal level. While nearly impossible to quantify the impact, this practice, in theory, will have a positive effect on the reduction of crime.

## 3) SIGHT & SOUND SEPARATION:

- f) Under the Juvenile Justice and Delinquency Prevention Act and CALEA standards require sight and sound separation from males, females, and juveniles when detaining individuals. When placing children in a holding cell, jail, or lock-up, “sight and sound” contact with adults is prohibited. This provision seeks to prevent women and children from threats, intimidation, or other forms of psychological abuse and physical assault. Under “sight and sound,” children and women cannot be housed next to “open” adult cells, share dining halls, recreation areas, other common spaces, or be placed in any circumstance that could expose them to threats or abuse.

- g) It is important to note that a careful analysis should occur to determine whether the holding cells are to be considered a lock-up or a detention cell. If prisoners are held for less than 10 hours, the cells may be regarded as a lock-up per code. Lockups have far less stringent building life safety criteria associated with them when compared to detention facilities.

#### 4) SITE ORGANIZATION PRINCIPLES FOR LAW ENFORCEMENT FACILITIES:

- h) Best design practices for public safety facilities suggest a site and building that are married together functionally and cost-effectively to promote crime prevention through environmental design (CPTED). The relationship between architecture, site design, and security must be natural and symbiotic, not forced. Thoughtful architectural site planning will need to occur early in the design process. This approach will ensure that the technical requirements of the site are satisfied while simultaneously allowing police vehicles and the public to circulate throughout the site safely and securely. Some items that are specific to law enforcement site design for consideration are:
- **Response Access:** Organize the plan and site to provide the safest and quickest response to the main road for departmental vehicles.
  - **Sight Lines:** Avoid site conditions with blind corners and excessive vegetation that may hinder a driver's visibility or create concealed ambush opportunities for criminals.
  - **Vehicle Turning Radius:** Make sure larger police vehicle units have enough space for turning and pulling into the site without risk of hitting other vehicles, curbs, or the building itself. Ensure that there is sufficient room for tow trucks to access the site and collect/deliver impounded vehicles.
  - **Vehicle Response and Return:** Configure the site such that any pedestrian or non-essential personnel vehicle traffic does not cross the sally port.
  - **Driveways & Approaches:** Strive to provide access routes to the building that meander or are parallel to the building structure. Avoid extended, perpendicular access routes that enable vehicles to build up substantial speeds and crash into the building.
  - **Standoff Distances:** Where possible, establish standoff distances from public lots and rights-of-way to ensure vehicles laden with explosives cannot park adjacent to the structure.

- **Sallyport:** Sallyports should be included in most law enforcement facilities to mitigate the risk of escape and detainees assaulting law enforcement personnel. Further, the area can be a critical interface point between supply vehicles and the building during inclement weather. The sallyport should ideally be isolated from public view to assist both the sheriff's and detainees from the scrutiny of the civilian population and media.
- **Designated Parking Zones:** Provide convenient areas for parking that correspond to the specific areas of the building.
  - Public Parking should be located near the station entrance, but outside of the standoff zone. Ideally, the approach to the building would allow the Duty Officer to maintain visual contact with people approaching the facility.
  - Law Enforcement Vehicles should be parked and stored separately from the public areas of the site. Ideally, locate dedicated parking for these vehicles close to the building to improve access, and response should rapid deployment from the station be necessary.
  - Officer POV's (Personally Owned Vehicles) should be secured from the public areas of the site and safely parked while law enforcement personnel are on duty. This approach ensures their vehicles are kept safe from sabotage.
- **Utilities & Infrastructure:** Attempt to site the building in a location that has adequate water, sewer, natural gas, power, and telecommunications. If possible, provide dual electric services fed from separate substations to improve power reliability and reduce dependence on generators.
- **Stormwater Management: Ideally,** stormwater management features should be integrated into the site security solution to establish standoff distances and serve as vehicle barriers.
- **Fueling Stations:** Locate fueling stations in such a manner that a resupply truck or fueling vehicle does not block site traffic. When possible, consider utilizing fueling tanks as reserves for standby generators.
- **Paving:** Integrate heavy-duty paving sections throughout the site, especially in areas where large vehicles will drive. Be sure to consider the impact of trash trucks, tow trucks, and fuel supply trucks will have on the site.
- **Flood Plains:** FEMA will not provide funding to public safety projects built within the 100-year flood plain unless the design is floodproof compliant. Floodproofing requires occupied spaces and equipment to be located two feet above the flood elevation. Appropriate relief measures must also allow for quick restoration.

- **Communications Towers: Communications** towers must be carefully planned with zoning requirements. Furthermore, when possible, buildings should be kept clear of the fall distance of the tower. When feasible, keep parking areas and roof assemblies kept clear of the tower to avoid damage that may be caused by falling ice.

#### 5) SERVICE WEAPON STORAGE:

Most law enforcement agencies have strict procedures in place when it comes to the handling and storage of firearms. Officers are prohibited from carrying weapons into holding facilities and interrogation areas. As such, pistol lockers should be strategically located throughout the station to ensure compliance and officer safety. Lockers should be ballistically rated to protect surrounding occupants from accidental discharge.

#### 6) WEAPONS CLEANING:

Weapons cleaning is an essential part of a law enforcement officer's routine and can be dangerous if not performed correctly. Hazards range from lead and agent contamination to accidental discharge. Weapons cleaning stations should be adequately cross ventilated across the workbench to ensure airborne particulates do not enter the respiratory system. Gun clearing tubes should be located and utilized to ensure officers have cleared the chamber of their weapons. Additionally, if possible, the room should be protected with ballistically rated carbon panels or solid filled masonry. This approach protects occupants in other areas of the building from being struck by a round in the event of accidental discharge.

#### 7) HARDENING & FORCE PROTECTION:

Conventional building codes such as IBC and NFPA are requirements that set the minimum standard of care regarding the protection of the life, safety, and wellbeing of the occupants of all types of buildings. When jurisdictions adopt these standards via legislative measures, they become law and establish the design protocols for what can be considered a minimum acceptable risk. These standards of care address a wide variety of building and construction types. And, while the umbrella of these codes certainly addresses the general use and occupancies of police stations and laboratories, they do not address the many unique risks to law enforcement facilities.

Standards such as the IACP Design Guidelines and the UFC Anti-Terrorism and Force Protection Design Guidelines are authored by panels of experts with significant experience in the design, construction, and operations of similar facilities. Given that the design and development of a police station is an infrequent occurrence, it is uncommon for legislative bodies to adopt such standards when establishing building code requirements. These standards exist for specific reasons as there is a long history in this country of law enforcement facilities that have faced attack. These guidelines establish a standard of care protecting the occupants of a law enforcement facility from low-frequency high-risk events.

Beyond the structural requirements established by IBC, conventional practices in police station design now strongly encourage careful consideration of ballistic protection from outside threats. Beyond the minimally mandated measures, a careful and thoughtful design must take place to ensure resiliency while controlling project costs. Additional and more stringent standards that may apply to law enforcement facilities include but are not necessarily limited to FEMA 543, NEC 708, UFC 04-012-23. Compliance with these codes and standards often drives project costs beyond what one might expect with a traditional building typology. In short, the term “Hardening” can mean many different things depending upon which standards are applicable. Blast resistant, flood-proofing, progressive collapse prevention and numerous other criteria are all further defined within each of these standards. Often funding sources will dictate which standards apply to a project. Where multiple standards are applicable, the most stringent standards apply.

**8) CODES & STANDARDS:**

Police stations are far more complex than the typical commercial or institutional building when it comes to code and operational constraints. CALEA Standards, Ballistic Resistance Requirements, Homeland security guidelines, and HIPA protocols are only a few of the additional standards to which these facilities may require compliance. Facilities utilizing grant funding can also be subject to specific requirements that require integration with the management process and design solution.

In addition to the International Building Codes, Accessibility Codes, and NFPA Life Safety Codes, the following standards may apply:

CALEA	The Commission on Accreditation for Law Enforcement Agencies
Standards for Law Enforcement Agencies	The standards manual for the CALEA law enforcement accreditation program.
Recognition Standards for Law Enforcement Agencies	The standards manual for the CALEA Recognition program.
Standards for Public Safety Training Academies	The standards manual for the CALEA public safety training academy accreditation program.
International Association of Chiefs of Police	Police facility planning guidelines.