City of Santa Cruz
Fire Department
Santa Cruz, California

Community Risk Assessment
Standards of Cover & Deployment Analysis

May 2025

AP TRITON

Contents

Acknowledgments

AP Triton Consulting wishes to extend its sincere appreciation to each of those individuals whose contributions and assistance made this project possible.

Our sincere appreciation is extended to each of you…

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…and each of the firefighters, apparatus operators, & officers, who daily serve the citizens and visitors of the City of Santa Cruz and the surrounding communities they serve.

Overview & Executive Summary

AP Triton was contracted by the City of Santa Cruz, California (City) to produce this Community Risk Assessment and Standard of Cover report for the Santa Cruz Fire Department (SCFD). This is a specialized foundational report detailing the extent of risks and deployment the SCFD employs to meet the severity and volume of historical incidents. This study will give SCFD detailed information to help them make sound operational decisions. It is designed using the Center of Public Safety Excellence's (CPSE) *Community Risk Assessment: Standards of Cover (6th Ed.)* template.

The project was initiated in April 2024 with a complete data load and official start on June 24, 2024. Using data compiled from SCFD and other sources, the report was completed over several months in cooperation with the SCFD and City of Santa Cruz staff. This report is a point-in-time study with incident data from January 2019 through December 2023. In addition, it contains other administrative information provided through August 31, 2024. It is expected that some changes were not captured in this report during the intervening time.

This comprehensive analysis, organized into five sections, examines the department's current conditions (Section 1), community risk assessment (Section 2), and standards of cover and deployment analysis (Section 3) to evaluate service delivery effectiveness. Section 4 includes the conclusion and recommendations, while Section 5 is the appendices, which contain additional detail, explanatory information, and the details of community and stakeholder surveys. What follows is a summary of each section, its intent, and key elements of the report.

The Current Conditions

The Santa Cruz City Fire Department (SCFD) has provided emergency services to the City of Santa Cruz for over 130 years. The department operates within a Council/Manager form of government, with the Fire Chief reporting to the City Manager. The SCFD serves approximately 63,000 residents plus seasonal visitors across a 16-square-mile area. Operating from four fire stations with a minimum staffing of 16 personnel on three shifts, the department provides all-hazards emergency services including:

- Fire suppression
- Emergency medical services at the Advanced Life Support level
- Technical rescue
- Hazardous materials response

- Marine safety services with lifeguard operations
- Prevention and public safety

In addition, the SCFD will operate as the first response during a disaster. The City's Office of Emergency Services (OES) falls under the purview of the fire department. This office coordinates the planning, preparedness, response, and recovery from a disaster.

The department employs 70 full-time staff, including 67 operational personnel and administrative staff. The Marine Safety Division employs approximately 70 seasonal lifeguards. It actively participates in the Santa Cruz County Mutual Aid Plan and the California Master Mutual Aid System. The SCFD staffing level is 0.88 firefighters per 1,000 population served, within the average range for communities over 25,000 people (0.84 to 1.30). Any fire event demanding more than a first alarm assignment requires mutual aid assistance. The department does not have rapid access to an all-hazards fire response boat, even with the mutual aid component.

In 2022, the Insurance Services Office assigned the SCFD a Public Protection Classification (PPC®) Class 02/2X grade. During that review, the department improved its ISO credits for its training and community risk reduction programs but experienced a reduction in its inspection and flow testing practices.

The SCFD operates primarily through the City's General Fund. Annual recurring expenditures increased by 34% from approximately $19.3 million in FY 2020 to $25.8 million budgeted in FY 2024. Approximately 90% of operating expenses are personnel-related. However, a 13% increase in the 2024 "Services" line item in the budget is due primarily to a new City Service Cost Allocation model (CSAP). The department maintains a five-year capital improvement plan. Still, significant capital needs remain underfunded, including $66.75 million identified in 2024 for facility and apparatus requirements. It should be noted that the SCFD staff reported an increase of $97 million in subsequent budgets to capture the rising costs of identified projects and capital equipment replacement. The fire department regularly recovers 18% of its expenditures through service contracts, service and impact fees, and cost recovery efforts.

The SCFD operates from four stations, an administration building, and a marine safety division headquarters. All the facilities need updating, and the deferred maintenance at each facility is beginning to accumulate. It will likely become more urgent and potentially more costly. The frontline apparatus is in good condition, and the department is trying to improve its reserve fleet. Due to an extreme delay between apparatus orders and delivery, the planning and funding for apparatus placement should be done well before replacement needs.

The Community Risk Assessment

This section provides an overview of the community and a technical review of the community demographics, risk classifications, land use, assets protected, community threats, and critical infrastructure. Classification of risk is one of the more complex processes. Risks are grouped using the CPSE methodology, including responses to fire, medical, technical rescue, and hazardous materials. These are then categorized by the severity of the risk, as detailed in Appendix B. They are scored by probability, consequence, and impact. These scores are then calculated to allow the fire department to visualize the magnitude of each risk category and classification.

During the research for this report, it became clear that there were two distinct fire prevention processes and risk management within the SCFD response area. The SCFD is responsible for emergency response and fire prevention activities within city limits but only response on the University of California at Santa Cruz property. A designated campus fire marshal oversees the university's Fire and Life Safety Program and is responsible for enforcing the California Fire Code.

Without being a part of campus fire prevention efforts, the SCFD response crews lose some situational awareness and effectiveness. Likewise, the response crews are not as valuable for prevention programs and code enforcement. Separating these mutually beneficial duties can create challenges unless the response crews and fire prevention officers work with effective information exchange and well-understood policies and procedures.

The barriers to information exchange became apparent while trying to gather specific information about the buildings and risks on campus. Therefore, some campus property information was unavailable for risk evaluation in this report.

Santa Cruz faces various risks due to its coastal location, wildland-urban interface areas, demographic profile, and built environment:

Geographic Risks: The city is susceptible to wildland fires, flooding, tsunamis, earthquakes, and marine incidents. The Wildland and Urban Interface fire hazard is identified as high and moderate, primarily in the northern regions, including the UC Santa Cruz campus.

Demographic Risks: The population includes several vulnerable groups. While the percentage of children under 5 (3%) and adults over 65 (12.7%) is lower than state averages, the poverty rate (18.7%) exceeds the state average (12.1%). 68% of the housing was built before 1980, and 70% is single- or two-family dwellings. The city is experiencing a high construction volume focusing on multi-family and single-room occupancy buildings. There are 1,446 residential units under construction or in the building permit process and an additional 2,087 in the planning process.

Infrastructure Risks: Critical infrastructure includes the municipal wharf, government facilities, transportation networks, communications systems, and essential utilities. The city also contains numerous target hazards, including educational facilities, healthcare facilities, places of assembly, and multi-family dwellings.

The Standards of Cover & Deployment Analysis

The Standards of Cover and Deployment Analysis section is dedicated to the technical evaluation of how the SCFD is deployed and how it has performed. This section provides an overview of the fire department, evaluates the staffing resources deployment, reviews the financial assets available, evaluates the facilities and equipment, and analyzes historical performance. In addition, the section reviews what the SCFD identified as its needed response to specific risk categories and classifications based on the critical task analysis and alarm assignments. In conjunction with the community risk section, the SCFD can use this information to identify gaps in performance and potential improvements to service delivery as described in the compliance methodology subsection.

Analysis of five years of service data (2019–2023) revealed:

Service Demand: The department responded to over 42,800 incidents, approximately 56% being medical emergencies. Annual incident volume increased 28% from 2020 to 2023.

Workload Distribution: Engines 3110 and 3112 have the highest workload, handling approximately 30% of engine responses. These units approached cautionary Unit Hour Utilization (UHU) percentages in 2023.

Response Time Performance: The department's overall response times (from call to arrival) were 8:45 (90th percentile) in urban areas, 9:18 in suburban areas, and 13:20 in rural areas. These times largely meet the department's established response standards.

Critical Tasking: Analysis of the personnel required for various emergency types identified staffing needs ranging from 3–4 personnel for low-risk incidents to 37–71 personnel for maximum-risk incidents. The most probable incidents are within the staffing capabilities of the department. In contrast, less frequent but more severe incidents require mutual aid to provide enough resources.

Key Findings and Challenges

Section 4 reviews several industry and SCFD-specific concepts for executives to consider. The first is to develop a comprehensive compliance methodology and a continuous improvement plan. A program example is provided utilizing SCFD information. Alternative operational models are also identified, and those AP Triton felt may be most appropriate for SCFD are also identified. Finally, key findings and recommendations are provided for leadership to consider. The findings and recommendations revolve around the following concepts.

Aging Facilities: Most fire stations are over 70 years old and do not meet contemporary requirements for modern fire service operations, decontamination, and gender accommodation. Additional facilities or a rearrangement of current facilities are needed to improve coverage.

Marine Safety Program: The program faces staffing challenges, particularly in the early summer months. Most water rescue incidents occur between Memorial Day and Labor Day. There is an identifiable need for the department to have rapid access to a fire rescue boat in the response area.

Training Program: The training division has only a one-person permanent staff and little access to training grounds.

Increasing Service Demand: Based on population projections, service demand may increase by 22% by 2034, requiring potential adjustments to deployment strategies. The City reports approximately four million annual visitors, which has increased since 2020.

Response Performance: While meeting most response standards, improvements are needed in dispatch call processing (currently 2:51 vs. 73-second standard) and turnout times (currently 2:05 for EMS vs. 60- to 120-second incident type-specific standard).

Performance Data: The Marine Safety Division's incident recording and reporting system is separate from the rest of the fire department. The 2020 COVID-19 pandemic affected the incident trend analysis. Unit identity, EMS clock-stopping, and comparative information between the dispatch system and department records created some gaps in performance evaluation.

This assessment provides a foundation for strategic planning to ensure the Santa Cruz Fire Department continues to meet the community's emergency service needs effectively and efficiently.

Section I:
CURRENT CONDITIONS

Department Overview

This report section describes the history and composition of the Santa Cruz Fire Department (SCFD).

City of Santa Cruz

The City of Santa Cruz (City) is in Northern California, located at the base of the Santa Cruz Mountains and at the northern tip of Monterey Bay. It is about 80 miles (130 km) south of San Francisco and is the largest city and county seat of Santa Cruz County. As of the 2020 census, the city population was 62,956.[1]

The city has a rich history. Founded by the Spanish in 1791 when Fermín de Lasuén established Mission Santa Cruz. Before the arrival of Europeans, the area was inhabited by the Awaswas nation of Ohlone people, who lived in the region for at least 12,000 years. The City was officially incorporated in 1866 as a town under the laws of the State of California, and it received its first charter as a city in 1876.[2]

Today, Santa Cruz is a lively coastal city known for its natural beauty, including beaches and coastline, which attracts many visitors. The city has a laid-back beach culture with notable attractions, such as the Santa Cruz Beach Boardwalk, which dates back to 1904, and the Municipal Wharf. The city evolved into a vibrant college town with the opening of the University of California, Santa Cruz, in 1965, supported by its proximity to local and nearby high-tech industries.

History of the Santa Cruz Fire Department

The Santa Cruz Fire Department (SCFD) has a long and rich history spanning more than 130 years. In the 1850s, as the city began developing more commercial buildings, a group of citizens formed a volunteer fire department and acquired a hand-drawn hook and ladder. However, this initial organization was short-lived, and by the 1860s, it had ceased operations.[3]

[1] https://www.census.gov/quickfacts/fact/table/santacruzcitycalifornia/POP010220#POP010220.

[2] https://www.cityofsantacruz.com/government/about-us/history-of-santa-cruz.

[3] https://www.cityofsantacruz.com/government/city-departments/fire-department/about/history.

A fire at the San Lorenzo House in 1865 underscored the need for organized firefighting services, leading to the creation of the Santa Cruz City Volunteer Fire Department in 1877. Over time, hose companies were established, and intercompany competitions became popular social events.

On April 14, 1894, a fire broke out on Pacific Avenue, destroying an entire city block between Front Street and Pacific Avenue and Cooper Street to the Flatiron Building. Firefighters and equipment from Watsonville and San Jose, transported by special train, assisted in extinguishing the fire.[4] This incident led to the establishment of a paid fire department in October 1894.

Embracing this progress, The City invited bids for the first piece of motorized fire equipment and, in 1912, purchased an American LaFrance chemical wagon. This engine shared quarters on Church Street with the hook and ladder from the volunteer era.[5] Around this time, the department expanded its workforce, with firefighters working 24-hour shifts, seven days a week.

In 1915, the fire department began responding to medical emergencies, primarily providing transportation to doctor's offices or hospitals.[6] By the 1970s, all firefighters were trained as emergency medical technicians (EMTs), and in 1999, the department began offering Advanced Life Support (ALS) Services in the form of Firefighter/Paramedics.

In 2005, the fire department introduced its firefighter-rescue swimmers to respond to water emergencies. In 2007, the fire department took over the responsibility of providing lifeguard and water rescue services. This included seasonal lifeguard operations, 24-hour marine rescue, and junior lifeguard instruction.

In 2015, the University of California, Santa Cruz (UCSC) Fire Department merged with the SCFD, expanding coverage to include the university campus and adding another station and nine additional firefighters.[7]

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[4] https://www.cityofsantacruz.com/government/city-departments/fire-department/about/history.

[5] *Ibid.*

[6] *Ibid.*

[7] *Ibid.*

For over 130 years, the SCFD has been an essential part of the community, responding to structure fires, floods, wildfires, water rescues, medical emergencies, and even rare tornadoes. Dedicated to public safety, the SCFD continues to protect lives and property throughout the city.

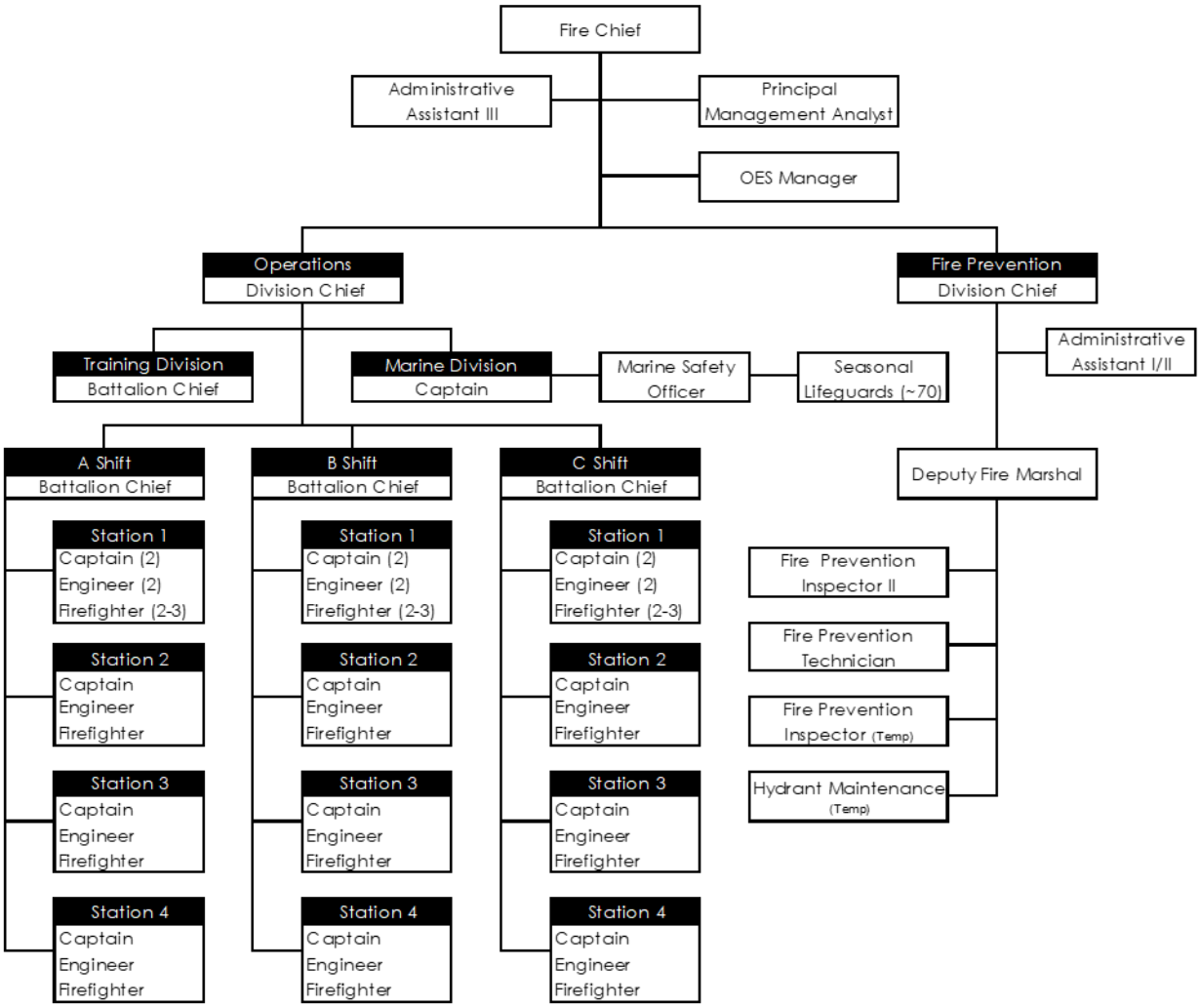
Governance & Lines of Authority

The SCFD operates under a Council/Manager form of government. A directly elected mayor and six district-elected council members establish City policies in this structure. The City Manager serves as the chief administrator, responsible for implementing those policies. The Fire Chief reports to the City Manager and oversees the fire department's policies, administration, and operations. The City provides additional administrative, maintenance, and other support to the department.

Fire Department Organizational Structure

The Santa Cruz Fire Department is managed by the Fire Chief, who oversees the leadership of the Operations Division, Fire Prevention Division, and an Office of Emergency Services Manager. The Fire Chief directs the administrative assistant and a management analyst who supports the department. The number of direct reporting staff for the Fire Chief is within the generally recognized manageable span of control. The department's current organizational structure is illustrated in the following figure.

Figure 1: Fire Department Organizational Structure



As shown in the preceding figure, the Division Chief of Operations oversees the shift Battalion Chiefs, the Battalion Chief of Training, and the Marine Safety Captain. The shift Battalion Chief manages the fire companies. These companies are supervised by a Captain and include Engineers and Firefighters. The Battalion Chief of Training directs the department's training program. The Marine Safety Captain oversees a Marine Safety Officer and the seasonal lifeguards. The operations division personnel deliver emergency services such as fire suppression, emergency medical services, hazardous materials response, technical rescue, and water rescue. They also assist the community with other non-emergency public services.

The Division Chief of Prevention, the City's designated Fire Marshal, is supported by an Administrative Assistant and leads the Fire Inspectors and Technicians. The division is dedicated to fire inspections, investigations, public education, and code enforcement.

The Office of Emergency Services Manager is responsible for disaster preparedness and emergency management issues. The role is multifaceted and dedicated to coordinating efforts to prepare for, respond to, mitigate, and recover from disasters.

Review of Services Provided

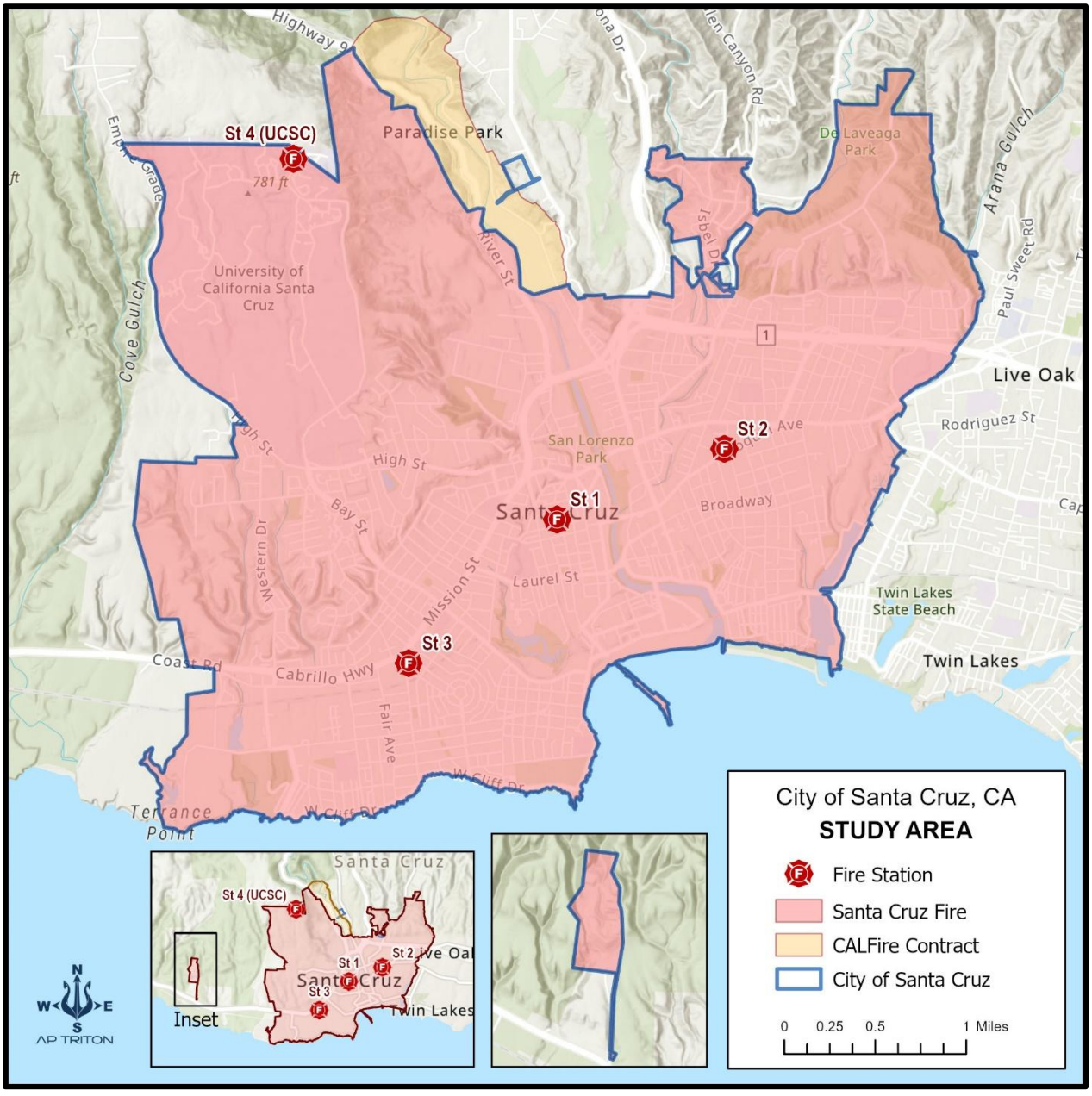
The SCFD is an all-hazards public safety organization. The department provides traditional fire department services such as structural fire suppression, wildland firefighting, medical first response at the ALS level, technical rescue, and hazardous materials response. The department also responds to natural and human-made disasters, marine safety operations, and other public service requests.

In addition, the SCFD provides emergency management, fire inspections, code enforcement, plan reviews, fire-cause investigations, public education, and prevention programs.

Service Area

The SCFD responds to a primary service area of about 16 square miles, encompassing nearly 63,000 residents, including the UCSC population. In addition, as a tourist destination, Santa Cruz is impacted by a large visitor population. The following figure shows the SCFD service area and the location of its fire stations.

Figure 2: Study Area Map



Operations & Deployment

The SCFD deploys its personnel and apparatus from four fire stations. It has a minimum staffing of 16 full-time firefighters (1 Battalion Chief, 5 Captains, 5 Engineers, and 5 Firefighters) on three shifts (A, B, and C) with a 48/96 rotation. Additionally, the Marine Safety Division has a Marine Safety Captain and a Marine Safety Officer on a 40-hour schedule and a seasonal staff of approximately 70 lifeguards.

The following figure lists the apparatus and staffing assigned to each fire station.

Figure 3: The SCFD Apparatus & Minimum Staffing by Fire Station

Unit	Schedule	Staffing
Station 1—711 Center Street, Santa Cruz, CA 95060		
Engine 3110	24/7	3
Truck 3170	24/7	3
Battalion 3103	24/7	1
Rescue 3160	As needed	cross-staffed
Station 2—1103 Soquel Drive, Santa Cruz, CA 95062		
Engine 3112	24/7	3
Engine 3111	Reserve	0
Station 3—335 Younglove Avenue, Santa Cruz, CA 95060		
Engine 3113	24/7	3
Engine 3115/Truck 3171	Reserve Quint	0
Engine 3116	Reserve Engine	0
Station 4—701 Chinquapin Road, Santa Cruz, CA 95064		
Engine 3114	24/7	3
Engine 3137	Type III Engine	cross-staffed
Utility 3199	UTV w/pump	cross-staffed

The preceding figure shows that each station is staffed with at least a three-person engine company. Station 1 also houses a truck company and battalion chief. Crews cross-staff to operate additional apparatus based on the type of response required. Reserve apparatuses are designated to replace frontline units during maintenance or repair and can be staffed by off-duty personnel during emergencies or planned events.

Review of Services

The following section assesses the services provided by the SCFD by type. These services are organized in programs that follow the Center for Public Safety Excellence (CPSE) programs.

Emergency Medical Services

The SCFD provides emergency medical services (EMS) as part of its comprehensive public safety program. All on-duty firefighters are certified as emergency medical technicians (8) or paramedics (54). To ensure advanced life support (ALS) care for medical emergencies, the department staffs at least one paramedic on each fire apparatus. However, when staffing is necessary, the truck can be downgraded to basic life support (BLS) services. While the Battalion Chief may be a certified paramedic, it is not a requirement of their position, and their response vehicle is equipped with BLS-level equipment.

The SCFD's EMS program aligns with industry standards by providing immediate ALS care, adhering to established protocols, implementing quality assurance measures, and monitoring performance metrics. Patient care is transferred to American Medical Response (AMR), a private ambulance company contracted with the Santa Cruz County EMS Agency (EMSA), which provides ambulance transport for all of Santa Cruz County.

EMSA allows the SCFD first responders to "stop the clock" for AMR response times. This benchmark requires transparency regarding personnel and response data, close collaboration between stakeholders, and a comprehensive evaluation of patient care beyond simple response duration metrics. Without a system-wide approach, this type of metric can be misused, potentially resulting in longer on-scene times and reduced unit availability.

Fire Suppression

The SCFD can deploy 15 firefighters and a battalion chief from four stations for an initial structure fire response. This deployment includes four engines, a truck, and a command vehicle to perform fire suppression, rescue, ventilation, forcible entry, salvage, and overhaul operations under the direction of a Captain and/or Battalion Chief. Additional automatic and mutual aid firefighters are available as needed.

To ensure effective, efficient, and safe fire protection, adherence to established standards, such as the National Fire Protection Association (NFPA) Standard 1710, is recommended. This standard outlines the minimum initial response requirements for resource deployment for fire suppression based on occupancy type:

- **Single-Family Dwelling:** An initial full alarm assignment to a structure fire in a typical 2000 ft2 (186 m^2), two-story, single-family dwelling without a basement or exposures requires a minimum of 16 members (17 if an aerial device is used).
- **Garden-Style Apartment:** For a structure fire in a typical 1,200 ft2 (111 m^2) apartment within a three-story, garden-style apartment building, a minimum of 27 members (28 if an aerial device is used) is required.
- **Open-Air Strip Mall:** For a fire in an open-air strip shopping center ranging from 13,000 ft^2 to 196,000 ft^2 (1,203 m^2 to 18,209 m^2), a minimum of 27 members (28 if an aerial device is used) is required.
- **High-Rise:** For a fire in a building with the highest floor greater than 75 ft (23 m) above the lowest fire department vehicle access level, a minimum of 42 members (43 if the building is equipped with a fire pump) is required.

In 2022, the Insurance Services Office (ISO) assigned the SCFD a Public Protection Classification (PPC®) Class 02/2X grade.[8] This rating, which primarily impacts business insurance costs, ranges from Class 1 (the highest) to Class 10 (the lowest). Since the 2015 ISO evaluation, the SCFD has improved its scores in training and community risk reduction. However, the department experienced reduced credit for inspection and flow testing.

Hazardous Materials

The SCFD hazardous materials program is designed to ensure a safe and effective response to hazardous substance incidents. The program operates at the First Responder Operations Level, with at least two Hazardous Materials Technicians per shift.

Currently, 59 SCFD personnel are trained at the First Responder Operational level. These responders analyze incidents, determine if additional resources are required, implement a strategy (offensive, defense, or nonintervention), and evaluate the progress of the incident. Responders typically adopt a defensive strategy unless specifically trained in a mission-specific offensive skill.

Hazardous Materials Technicians are certified personnel capable of performing advanced mitigation and decontamination operations. The SCFD provides awareness and operations-level training to all firefighters as part of its hazardous materials training program.

[8] Public Protection Classification (PPC®) Summary Report, March 2022, Insurance Services Office, Inc.

For incidents that exceed the SCFD's capabilities, the incident commander may request mutual assistance from nearby fire departments. The Scotts Valley Fire Protection District manages the Santa Cruz Hazardous Materials Interagency Team (SCHMIT), a FIRESCOPE Type III team composed of personnel from the SCFD, Central Fire District, Watsonville Fire Department, Scotts Valley Fire Protection District, Boulder Creek Fire District, and Santa Cruz County Environmental Health.

The closest Type I teams available through mutual aid are the Santa Clara County Fire Department and the San Jose Fire Department.

Because hazardous materials incidents occur less frequently but pose higher risks than other emergencies, skills in this domain are more perishable, making regular and high-quality training essential.

Technical Rescue

The SCFD trains firefighters at the operations level in rescue systems. In addition to rope rescue, the department possesses capabilities in trench rescue, confined space rescue, structural collapse rescue, and vehicle extrication.

Marine Division

The Marine Safety Division is managed by a Fire Captain and a Marine Safety Officer (MSO). They oversee a year-round on-call 15-member Marine Rescue Unit, an average of 70 seasonal beach lifeguards, and the training of 12 fire department rescue swimmers.

Collaboration is a cornerstone of the division's operations. Partnerships with organizations such as the United States Lifesaving Association (USLA) help maintain high standards in rescue preparedness. The Marine Safety Division also works closely with local stakeholders, such as the state and federal agencies like the U.S. Coast Guard, to develop integrated response strategies for emergencies, including oil spills, marine fires, and natural disasters.

The Marine Safety Division participates in the United States Lifesaving Association (USLA) Lifeguard Agency Certification Program. The United States Lifesaving Association is recognized nationally and internationally for its programs that set minimum recommended standards for the training, equipping, and preparedness of those assigned to prevent drowning and other injuries in the open water environment. Lifeguards and rescue personnel are trained by the department using USLA programs. Lifeguards attend a 40-hour department course and must meet a swimming standard. The Marine Rescue Unit members and firefighter rescue swimmers are based on USLA's Aquatic Rescue Response Team (ARRT) Certification, which includes a more stringent swimming standard. The Marine Safety Officer must meet these certifications and possess a personal rescue watercraft certification before their 12-month probationary period ends. [9]

The department does not provide divers or a fireboat. Non-safety City Wharf staff have non-emergency commercial diving capabilities primarily for maintenance responsibilities. Various stakeholders have expressed the need for an all-risk boat capable of providing firefighting, rescue, and spill response services. Such an asset would significantly enhance the division's capability to respond to incidents on the water, especially in areas where current resources fall short, like the Santa Cruz Wharf. Additionally, a multipurpose vessel could better address complex rescue scenarios and extreme environmental conditions. The USCG Monterey exceeds one hour for responses, and USCG lacks the capabilities to provide adequate fire protection for the historic wharf.

The Santa Cruz Harbor Patrol operates A 2013 Zodiac 20' patrol vessel and a 2022 Moose Boat 36' patrol vessel. While these boats are practical for routine patrols and emergency responses within the harbor and nearby waters, they have limitations, including firefighting, extended open water response, and use on marine spills.

Ocean Rescue Personnel

The Marine Rescue Unit and the fire department's rescue swimmers respond to water rescue scenarios, such as ocean, surf, or flood. Rescue swimmers are trained in the use of personal flotation devices, rescue tubes, throw bags, rescue boards, and the department's four personal watercraft vehicles. Training includes advanced water safety, swimming skills, victim assessment, and first aid. Rescue swimmers can operate under rigorous conditions in extreme weather, rough seas, and hard-to-reach areas.

[9] Santa Cruz City Fire Department, Marine Safety Division, Policy and Procedural Manual (8/15/2023). Article 3, #3-3.

The Marine Rescue Unit personnel are trained paid-on-call. This unit provides 24-hour response to ocean-related emergencies and rescues throughout the year. While on duty, employees must remain within a 10-minute response zone to the Santa Cruz Municipal Wharf from 7 a.m. to 7 p.m. Employees must live within the Santa Cruz city limits from 7 p.m. to the following 7 a.m. The fire department rescue swimmers are firefighters with additional training and paid a shift differential to maintain certification and participate in the ocean rescue program. There is no standard for maintaining a minimum staffing level for rescue swimmers on duty. However, efforts are made through policies to keep at least two rescue swimmers or a combination of rescue swimmers, Marine Rescue Unit members, and automatic aid with Central Santa Cruz Fire District on call at any given time.[10] Training for these individuals and those with rescue watercraft certifications begins in March.

Although resources may respond outside the primary area at the duty chief's discretion, there are two distinct areas of operation for the Marine Safety Division responses. The first is the ocean area for water rescue. Even though the entire area is not within the city boundaries, the SCFD has assumed responsibility for this area and water rescues. This rescue response may be accomplished by the fire department, fire department swimmers, the Marine Rescue Unit, or the lifeguards. It should be noted that the map is not a legal boundary but rather an outline based on the description of the water rescue area of responsibility. This area is described as a place where rescues occur between approximately Dimeo Lane and Santa Cruz Harbor. Much of the primary response area lies west of the SCFD legal boundaries. The following illustrates the entire primary area of operation for ocean and water rescues.

[10] Santa Cruz Fire Department, Marine Safety Division, Policy and Procedure Manual, Article 5 #5-31: Rescue Swimmer Coverage, January 28, 2008.

Figure 4: Ocean Rescue Area of Operation

In addition to the listed primary response, the SCFD acts as the primary mutual aid partner for the entire north coast of Santa Cruz County. This significantly impacts the fire department's wear and tear on equipment and personnel use and exposure to dangerous situations. Very little technical expertise is rapidly available for most of the county, and the SCFD actively participates in this aid component.

The rescue swimmer program is a valuable asset to the community and the region, enhancing the department's capability to respond to water emergencies and save lives. The program fosters collaboration and coordination with agencies such as the Coast Guard, Central Fire, State Parks, CAL FIRE, CHP air resources, and the department's lifeguards and Marine Rescue Unit. The collaboration with the Santa Cruz Harbor patrol and Central Fire's rescue swimmer program and personal watercraft is also extremely valuable and a lifesaving asset.

Lifeguard Program

The lifeguard program comprises Marine Safety Division officers, and seasonal workers hired to work at the city beaches during the more active summer months. The lifeguards are engaged and operational typically from Memorial Day through Labor Day. The lifeguards also supervise and train future lifeguards through the City of Santa Cruz Parks & Recreation Department Junior Guard program.

The lifeguards are divided into levels 1, 2, and lifeguard lieutenants. The Level 1 lifeguards provide beach watch and protection and must maintain lifeguard certifications and basic first aid and CPR. Mandatory training for level 1 lifeguards starts in early May. Level 2 and Lifeguard Lieutenants are required to maintain an EMT certification with AED and CPR certification. These lifeguards provide breaks, provide lifeguard central communications at headquarters, and perform patrol duties. The level 2 lifeguards are considered leads, while the lieutenants are considered supervisors.[11] Training for these positions starts in April.

When the lifeguard service is in operation, the vehicle patrols are dispatched to emergency medical situations as a response unit. This patrol unit will respond on the ocean side of Beach Street from Cowell Street to the east end of the jurisdiction. The area where the Marine Safety Division, primarily the lifeguards, are dispatched to provide first responder care for medical calls is around the city beach. These boundaries are also a general description and not a legal area. This is described as the ocean-side area along Beach Street from Cowells Street on the west to the end of the city beach on the east. The following figure shows where Marine Safety Division personnel will be dispatched for responses within their capabilities, equipment, and training.

[11] City of Santa Cruz, Marine Safety Division: www.cityofsantacruz.com/government/city-departments/fire-department/marine-safety-division.

Figure 5: EMS Dispatch Area for the Marine Safety Division

Lifeguarding standards, such as those recommended by the USLA, emphasize the importance of establishing a manageable span of control to ensure vigilance and rapid response capabilities. Effective spans of control are essential for preventing accidents and ensuring a swift reaction when incidents occur, safeguarding all water users' well-being. Given the program's size and complexity of the aquatic environment, the current spans of control and role classifications should be reviewed.

The lifeguard program recognizes the importance of public awareness in preventing emergencies. To enhance safety, the SCFD lifeguards use educational outreach to promote water safety among residents and tourists. Therefore, public education skills are essential for the job. One example of this public education includes the "Know Before You Go" campaign, a cooperative effort between mutual aid partners and local businesses and hotels.

The lifeguard program is defined and appears effective when fully operational. However, SCFD's Marine Safety Division's heavy reliance on temporary, limited-term lifeguards has resulted in inconsistent coverage and training difficulties. Restrictions on hours and the nature of a part-time workforce have led to critical staffing gaps, particularly in the early summer months. These issues and others were documented in a memorandum identifying the need for a second Marine Safety Officer to the City Manager from the Fire Chief in January of 2023.[12] The agency also indicated a similar request for two marine safety officers in October 2024.

Vehicle Extrication

The SCFD maintains a high level of vehicle extrication ability, with most of its personnel trained in this skill. The department has the capability to respond to vehicle accidents such as rollovers, collisions, or entrapments, utilizing different tools and techniques to safely remove the victims from the vehicles.

The department's ladder truck is equipped with electric rescue tools, hand tools, airbags, stabilization cribbing, rams, spreaders, and cutting tools, which can cut through metal, glass, plastic, or other materials. The department's engines are also equipped with basic cribbing and a combination cutter-spreader, which are effective for smaller or simpler extractions. The department's vehicle extrication capability enhances its ability to provide EMS and save lives.

[12] Memorandum to the City Manager from the Fire Chief, January 16, 2023, Marine Safety Officer Needs Assessment.

Other Emergency Services Resources in the Region

Mutual & Automatic Aid Resources

The department collaborates with other local, state, and federal agencies to provide effective and coordinated emergency responses. The department is a member of the Santa Cruz County Mutual Aid Plan, which allows for sharing of resources and personnel among neighboring fire agencies.[13] The department also participates in the California Master Mutual Aid System, which assists other jurisdictions during major incidents or disasters.

The following figure shows local resources for mutual aid (MA) and automatic aid (AA) responses through the operational area or county.

Figure 6: Mutual & Automatic Aid Resources Available to the SCFD

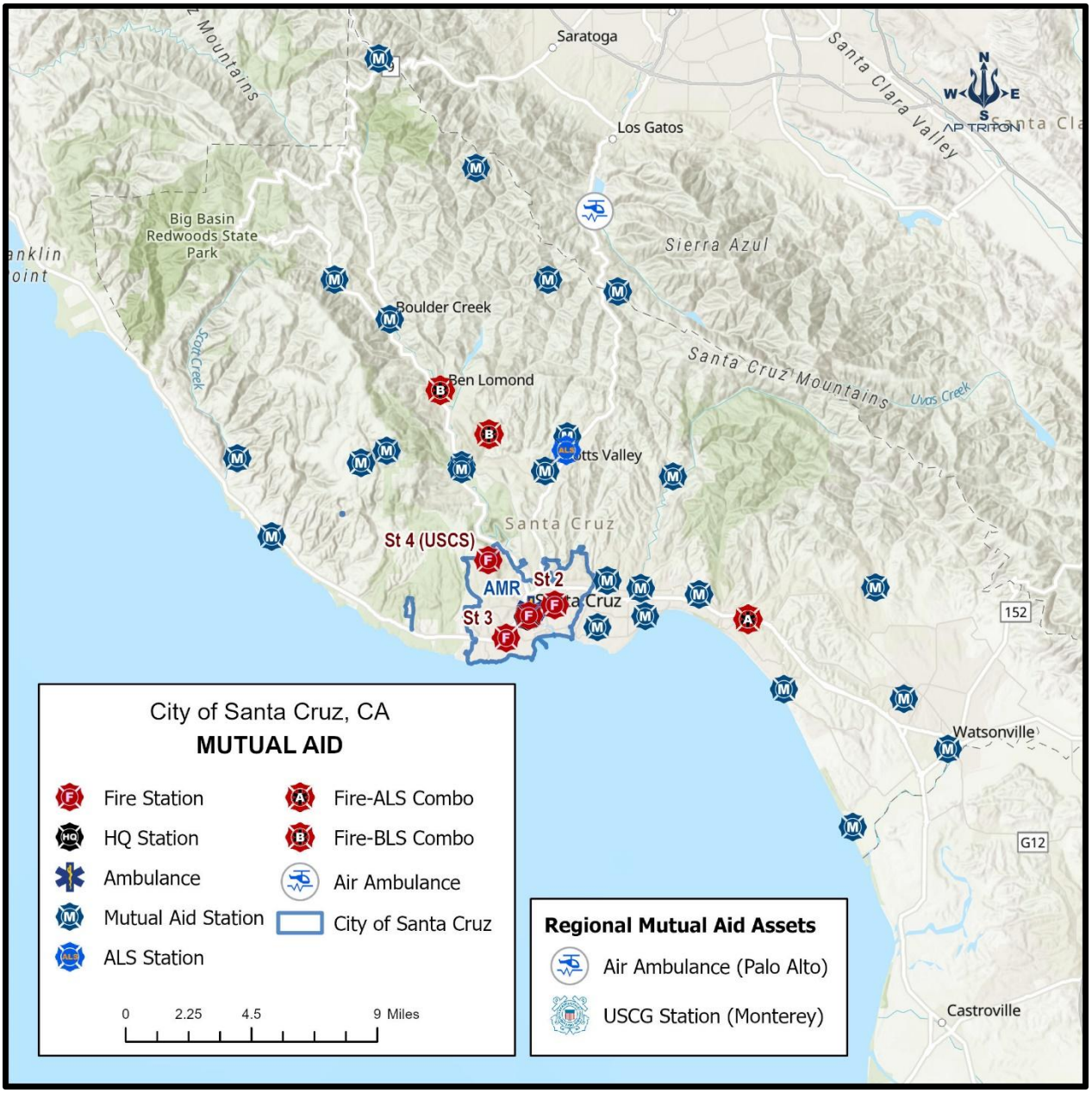
Department Name	MAC ID	Engines	Trucks	Staffing	Type
Central Fire District	CTL	7	1	25	MA/AA
Scotts Valley Fire District	SCO	2	0	6	MA/AA
CAL FIRE	CZU	8/10	0	24/30	MA/AA*
	CZU	5	0	V	MA/AA
Felton Fire Protection District	FEL	3	0	V	MA/AA
Ben Lomond Fire Department	BEN	4	0	V	MA
Zayante Fire Department	ZAY	3	0	V	MA
Boulder Creek Fire Department	BOU	5	0	V	MA/AA
Watsonville Fire Department	WTS	2	1	10	MA
North Monterey County Fire Dept.	NCF	1	0	3	MA
Staffed Mutual & Automatic Aid		18	2	68/74	
Volunteer Mutual Aid		20	0	V	

*AA = Automatic Aid, MA = Mutual Aid, and V = Volunteer, *-CalFire provides automatic aid to mutual threat zones (MTZ)*

The following figure illustrates the locations of the various aid fire stations adjacent to the Santa Cruz Fire Department.

[13] https://www.santacruzcountyca.gov/Portals/0/County/OES/pdfs/SCC_EOP-Base%20Plan_021024_v.76_REVSubmitted.pdf.

Figure 7: Mutual Aid Map



Emergency Communications & Dispatch

The Santa Cruz Consolidated Emergency Communications Center JPA, also known as Santa Cruz Regional 9-1-1, is the Public Safety Answering Point or dispatch center that receives and routes 911 calls to the appropriate emergency services, such as law, fire, and EMS.

Santa Cruz Regional 9-1-1 provides the SCFD with the closest unit dispatch based on Automated Vehicle Location technology.

Santa Cruz Regional 9-1-1 provides public safety and 911 dispatch services to its Joint Powers Authority (JPA) members, which include the Santa Cruz County Sheriff's Office, Santa Cruz Police and Fire Departments, Watsonville Police and Fire Departments, and Capitola Police Department. In addition, the centers serve all the Fire Districts in Santa Cruz County, Hollister Police, San Benito County Sheriff's Office, Hollister Fire, and American Medical Response in Santa Cruz and San Benito Counties.

Ground Emergency Medical Transport

Ground Emergency Medical Transport (GEMT) services are provided by American Medical Response (AMR), which delivers ALS services under an exclusive operating area agreement with the County of Santa Cruz Emergency Medical Services Agency. When necessary, the area fire department's surge ambulances are deployed to supplement ambulance services during periods of high demand.

Air Medical Transport

Air medical transport is provided by helicopter from CalStar in Watsonville, Gilroy, Salinas, and Stanford Life Flight in Palo Alto. The helicopters are staffed with a Registered Flight Nurse and a certified Paramedic. Both organizations have been accredited by the *Commission on Accreditation of Medical Transport Services* (CAMTS).

Hospitals & Tertiary Care Facilities

- **Dominican Hospital** (1555 Soquel Dr, Santa Cruz, CA 95065) maintains a 24-hour Emergency Department for patients who need immediate care for urgent and life-threatening conditions. The hospital maintains a catheterization lab and has a STEMI Center Designation.
- **Watsonville Community Hospital** (75 Nielson St, Watsonville, CA 95076) is about 15 minutes away in Watsonville. It maintains a 24-hour Emergency Department.
- **Trauma Centers:** Specialized centers are needed for patients suffering from major traumatic injuries such as a fall, motor vehicle collision, or gunshot wound. The nearby trauma centers include the Santa Clara Valley Medical Center (L1), Stanford Medical Center (L1), and Natividad Medical Center (L2).

Santa Cruz County Office of Response, Recovery, and Resilience
The Office of Response, Recovery, and Resilience (OR3) coordinates and conducts emergency planning, response, and recovery in collaboration with local, state, and federal partners. OES is the primary local coordination agency for emergencies and disasters affecting residents, public infrastructure, and government operations in Santa Cruz County.

Fire Safe Council of Santa Cruz County
The Fire Safe Council serves as a forum for implementing the Community Wildfire Protection Plans (CWPP), promoting community fire-safe planning and coordination, linking fire-prevention programs, and supporting the local fire service.

United States Coast Guard
Through Station Monterey, the U.S. Coast Guard Sector San Francisco provides valuable services in Monterey Bay and along California's Central Coast. During peak boating periods, Station Monterey also operates a substation in Santa Cruz to enhance local coverage. The Station Monterey crew works closely with numerous federal, state, and local partners, including the NOAA, Fish and Wildlife, Monterey Bay National Marine Sanctuary, and local fire and police departments.

Fire Boat
One unique resource required for a seaside community, especially one with a harbor and a wharf with buildings, is the availability of a fire boat. The closest fireboat resource is from the Monterey Fire Department. It may take significant time to arrive if requested to assist with a hard-to-reach fire, water supply, or rescue during an emergency. The next closest water-born resource is from the San Francisco area. Additional trailered boats from CalOES Region II in Redwood City may be available.

Staffing & Personnel

The greatest asset for any organization is its personnel. Effective human capital management is essential to achieving optimal productivity and fostering high job satisfaction. Job satisfaction often results from several factors, including consistent management practices, a safe working environment, recognition of positive workforce practices, inclusion and equitable treatment, and the encouragement of workforce input.

The size and structure of an organization's staff depend on its specific needs, which should align with its priorities and the community in which it serves. National organizations such as the Occupational Health and Safety Administration (OSHA), the National Fire Protection Association (NFPA), and the CPSE provide staffing guidance and recommendations.

This section provides an overview of the Santa Cruz Fire Department's staffing configuration.

Fire service organizations typically have two distinct groups of personnel.

- The Administrative and Support Staff directly services internal customers by providing operations personnel the management and support needed to deliver effective and efficient emergency services. They also provide support to external customers, such as residents and business owners.
- The Operational Staff provides emergency response and fire prevention services to external customers. They are typically the most visible and recognized members of the organization.

Achieving a balance between these two groups is essential to ensure effective and efficient emergency services and high-quality customer service.

The SCFD employs nine full-time equivalent (FTE) employees who provide support, administrative, and fire prevention services. The Fire Chief, as the most senior executive administrator, reports directly to the City Manager and oversees the Operations Division Chief, Fire Prevention Division Chief/Fire Marshal, Principal Management Analyst for business, Principal Management Analyst for emergency management, and an Administrative Assistant III. With five direct reports, the Fire Chief's span of control aligns with established best practices. Most administrative staff work regular business hours, 8:00 a.m. until 5:00 p.m., Monday through Friday. The following figure lists each full-time equivalent (FTE) position and the staffing count for the administrative functions.

Figure 8: SCFD Staffing by Position with Group/FTE

Position	Group	FTE
Administrative Assistant I/II	A	1
Administrative Assistant III	A	1
Deputy Fire Marshal	A	1
Fire Battalion Chief	O	4
Fire Captain	O	16
Fire Chief	A	1
Fire Division Chief	A/O	2
Fire Engineer	O	15
Fire Prevention Inspector II	A	1
Fire Prevention Technician	A	1
Firefighter	O	24*
Marine Safety Officer	O	1
Principal Management Analyst	A	2
Totals:		**70**

* 3.0 FTE Firefighter positions are unfunded, leaving 21 positions staffed

Administrative & Support

The administrative and support functions are diverse, and the list of tasks can be extensive, from general office and clerical support to management of major programs and projects. Since the SCFD is part of the City, it has some administrative support outside its listed employees. It is common for fire departments within a municipality or other larger government agencies to share support functions such as finance, payroll, human resources, and legal.

Fire Prevention Division

The SCFD Fire Prevention Division is responsible for preventing loss and injury through code enforcement, investigation, and education. A fire marshal, deputy fire marshal, fire prevention inspector, fire prevention technician, and two part-time fire prevention inspectors complete most state-mandated inspections for assembly, educational, hazardous facilities, institutions, high-rise buildings, and residential structures.

The SCFD Fire Prevention Division works closely with its state partners to mitigate wildland-urban interface fires. Several community members noted the success of the "camping ordinance," which prohibits camping, campfires, and barbecues except within designated recreation sites.

Operations Staffing

Operations personnel are assigned various duties consistent with fulfilling emergency response objectives. They are also responsible for additional collateral duties to support the response mission. The Division Chief of Operations supervises three shift Battalion Chiefs, the training Battalion Chief, and the Marine Division. The span of control of five subordinates is within established best practices.

Training Division

The Training Division is a critical component of any fire department, dedicated to firefighters' continuous education and skill development. It encompasses a broad range of activities, from basic training for recruits to advanced courses for seasoned professionals. The goal is to ensure that all firefighters have the knowledge, skills, and abilities necessary to perform their duties effectively and safely, reflecting the latest advancements in firefighting and emergency response. The SCFD has a Battalion Chief assigned to a traditional work schedule as the designated training officer. Several department members noted that the single Battalion Chief, with other duties, struggled to keep up with the evolving demands of an all-risk fire department, potentially compromising the quality and frequency of training programs.

Marine Safety Division

The Marine Safety Division is managed by a Fire Captain and a Marine Safety Officer (MSO). They oversee a year-round on-call 15-member Marine Rescue Unit, an average of 70 seasonal beach lifeguards, and the training of 12 fire department rescue swimmers.

Collaboration is a cornerstone of the division's operations. Partnerships with organizations such as the United States Lifesaving Association (USLA) help maintain high standards in rescue preparedness. The Marine Safety Division also works closely with local stakeholders, such as the state and federal agencies like the US Coast Guard, to develop integrated response strategies for emergencies, including oil spills, marine fires, and natural disasters.

The Marine Safety Division participates in the United States Lifesaving Association (USLA) Lifeguard Agency Certification Program. The United States Lifesaving Association is recognized nationally and internationally for its programs that set minimum recommended standards for the training, equipping, and preparedness of those assigned to prevent drowning and other injuries in the open water environment. Lifeguards and rescue personnel are trained by the department using USLA programs. Lifeguards attend a 40-hour department course and must meet a swimming standard. The Marine Rescue Unit members and firefighter rescue swimmers are based on USLA's Aquatic Rescue Response Team (ARRT) Certification, which includes a more stringent swimming standard. The Marine Safety Officer must meet these certifications and possess a personal rescue watercraft certification before their 12-month probationary period ends.[14]

The department does not provide divers or a fireboat. Non-safety City Wharf staff have non-emergency commercial diving capabilities primarily for maintenance responsibilities. Various stakeholders have expressed the need for an all-risk boat capable of providing firefighting, rescue, and spill response services. Such an asset would significantly enhance the division's capability to respond to incidents on the water, especially in areas where current resources fall short, like the Santa Cruz Wharf. Additionally, a multipurpose vessel could better address complex rescue scenarios and extreme environmental conditions. The USCG Monterey exceeds one hour for responses, and USCG lacks the capabilities to provide adequate fire protection for the historic wharf.

The Santa Cruz Harbor Patrol operates A 2013 Zodiac 20' patrol vessel and a 2022 Moose Boat 36' patrol vessel. While these boats are practical for routine patrols and emergency responses within the harbor and nearby waters, they have limitations, including firefighting, extended open water response, and use on marine spills.

Ocean Rescue Personnel

The Marine Rescue Unit and the fire department's rescue swimmers respond to water rescue scenarios, such as ocean, surf, or flood. Rescue swimmers are trained in the use of personal flotation devices, rescue tubes, throw bags, rescue boards, and the department's four personal watercraft vehicles. Training includes advanced water safety, swimming skills, victim assessment, and first aid. Rescue swimmers can operate under rigorous conditions in extreme weather, rough seas, and hard-to-reach areas.

[14] Santa Cruz City Fire Department, Marine Safety Division, Policy and Procedural Manual (8/15/2023). Article 3, #3-3.

The Marine Rescue Unit personnel are trained paid-on-call. This unit provides 24-hour response to ocean-related emergencies and rescues throughout the year. While on duty, employees must remain within a 10-minute response zone to the Santa Cruz Municipal Wharf from 7 a.m. to 7 p.m. Employees must live within the Santa Cruz city limits from 7 p.m. to the following 7a.m. The fire department rescue swimmers are firefighters with additional training and paid a shift differential to maintain certification and participate in the ocean rescue program. There is no standard for maintaining a minimum staffing level for rescue swimmers on duty. However, efforts are made through policies to keep at least two rescue swimmers or a combination of rescue swimmers, Marine Rescue Unit members, and automatic aid with Central Santa Cruz Fire District on call at any given time.[15] Training for these individuals and those with rescue watercraft certifications begins in March.

Although resources may respond outside the primary area at the duty chief's discretion, there are two distinct areas of operation for the Marine Safety Division responses. The first is the ocean area for water rescue. Even though the entire area is not within the city boundaries, the SCFD has assumed responsibility for this area and water rescues. This rescue response may be accomplished by the fire department, fire department swimmers, the Marine Rescue Unit, or the lifeguards. It should be noted that the map is not a legal boundary but rather an outline based on the description of the water rescue area of responsibility. This area is described as a place where rescues occur between approximately Dimeo Lane and Santa Cruz Harbor. Much of the primary response area lies west of the SCFD legal boundaries. The following illustrates the entire primary area of operation for ocean and water rescues.

[15] Santa Cruz Fire Department, Marine Safety Division, Policy and Procedure Manual, Article 5 #5-31: Rescue Swimmer Coverage, January 28, 2008.

Figure 9: Ocean Rescue Area of Operation

In addition to the listed primary response, the SCFD acts as the primary mutual aid partner for the entire north coast of Santa Cruz County. This significantly impacts the fire department's wear and tear on equipment and personnel use and exposure to dangerous situations. Very little technical expertise is rapidly available for most of the county, and the SCFD actively participates in this aid component.

The rescue swimmer program is a valuable asset to the community and the region, enhancing the department's capability to respond to water emergencies and save lives. The program fosters collaboration and coordination with agencies such as the Coast Guard, Central Fire, State Parks, CAL FIRE, CHP air resources, and the department's lifeguards and Marine Rescue Unit. The collaboration with the Santa Cruz Harbor patrol and Central Fire's rescue swimmer program and personal watercraft is also extremely valuable and a lifesaving asset.

Lifeguard Program

The lifeguard program comprises Marine Safety Division officers, and seasonal workers hired to work at the city beaches during the more active summer months. The lifeguards are engaged and operational typically from Memorial Day through Labor Day. The lifeguards also supervise and train future lifeguards through the City of Santa Cruz Parks & Recreation Department Junior Guard program.

The lifeguards are divided into levels 1, 2, and lifeguard lieutenants. The Level 1 lifeguards provide beach watch and protection and must maintain lifeguard certifications and basic first aid and CPR. Mandatory training for level 1 lifeguards starts in early May. Level 2 and Lifeguard Lieutenants are required to maintain an EMT certification with AED and CPR certification. These lifeguards provide breaks, provide lifeguard central communications at headquarters, and perform patrol duties. The level 2 lifeguards are considered leads, while the lieutenants are considered supervisors.[16] Training for these positions starts in April.

When the lifeguard service is in operation, the vehicle patrols are dispatched to emergency medical situations as a response unit. This patrol unit will respond on the ocean side of Beach Street from Cowell Street to the east end of the jurisdiction. The area where the Marine Safety Division, primarily the lifeguards, are dispatched to provide first responder care for medical calls is around the city beach. These boundaries are also a general description and not a legal area. This is described as the ocean-side area along Beach Street from Cowells Street on the west to the end of the city beach on the east. The following figure shows where Marine Safety Division personnel will be dispatched for responses within their capabilities, equipment, and training.

[16] City of Santa Cruz, Marine Safety Division: www.cityofsantacruz.com/government/city-departments/fire-department/marine-safety-division.

Figure 10: EMS Dispatch Area for the Marine Safety Division

Lifeguarding standards, such as those recommended by the USLA, emphasize the importance of establishing a manageable span of control to ensure vigilance and rapid response capabilities. Effective spans of control are essential for preventing accidents and ensuring a swift reaction when incidents occur, safeguarding all water users' well-being. Given the program's size and complexity of the aquatic environment, the current spans of control and role classifications should be reviewed.

The lifeguard program recognizes the importance of public awareness in preventing emergencies. To enhance safety, the SCFD lifeguards use educational outreach to promote water safety among residents and tourists. Therefore, public education skills are essential for the job. One example of this public education includes the "Know Before You Go" campaign, a cooperative effort between mutual aid partners and local businesses and hotels.

The lifeguard program is defined and appears effective when fully operational. However, SCFD's Marine Safety Division's heavy reliance on temporary, limited-term lifeguards has resulted in inconsistent coverage and training difficulties. Restrictions on hours and the nature of a part-time workforce have led to critical staffing gaps, particularly in the early summer months. These issues and others were documented in a memorandum identifying the need for a second Marine Safety Officer to the City Manager from the Fire Chief in January of 2023.[17] The agency also indicated a similar request for two marine safety officers in October 2024.

Firefighter Staff Allocation

The SCFD has an operational staffing level of 0.88 Firefighters per 1,000 population served. Comparing the SCFD staffing levels against regions and the nation shows that the staff levels are within the average for communities of over 25,000 people. For mostly-career or all-career fire departments, the rates of career firefighters per 1,000 people protected have remained in the range of 1.54 to 1.81.[18] Fire departments protecting communities of 25,000 people or more had median rates of 0.84 to 1.30 career firefighters per 1,000 people.[19] It is important to note that the rates of firefighters per 1,000 population are based on data reported to NFPA and do not reflect recommended rates or some defined fire protection standard.

[17] Memorandum to the City Manager from the Fire Chief, January 16, 2023, Marine Safety Officer Needs Assessment.

[18] U.S. Fire Department Profile 2020 Rita Fahy, Ben Evarts and Gary P. Stein September 2022.

[19] *Ibid.*

Firefighter Staff Distribution

The operations staff is allocated evenly throughout the three shifts except for the operations division chief, training battalion chief, and marine division, who work on an administrative schedule. On-duty fire suppression personnel staff five primary apparatus at the four fire stations. Additional units can be cross-staffed depending on the type of incident and need. Engine and truck company minimum staffing levels are a Captain, an Engineer, and a Firefighter.

At least one Battalion Chief is on duty, operating a command vehicle from Station 1. In addition, the fire chief, division chief of operations, training chief, and marine captain are fully qualified to respond to and provide additional incident command and control support.

Determining apparatus staffing levels is challenging. Leaders must decide what risks their crews are likely to face and what level of risk the community is willing to accept. Several noteworthy publications help agencies determine adequate staffing, including NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. This NFPA standard recommends staffing and deployment of career organizations.

The National Institute of Standards and Technology field studies on fire-ground and EMS incidents may also provide direction. Occupational health standards typically consider crew entry into a hazardous environment unsafe without an equal number of equipped and capable personnel outside the hazard zone. Therefore, no one person goes in alone. However, this rule may be suspended if an emergency rescue is required.

Firefighter Scheduling Methodology

The SCFD staffs four stations, 24 hours per day, every day of the year, with a minimum of one Battalion Chief, five Captains, five Engineers, and five Firefighters. Each apparatus is equipped and staffed to provide advanced life support medical care. However, the truck company may be downgraded to BLS based on staffing needs. The Santa Cruz Fire Department utilizes a three-shift system, A-Shift, B-Shift, and C-Shift, and the shifts work a 48/96-hour schedule on a 24-day FLSA cycle. The work shifts begin at 7:00 a.m. and end at 7:00 a.m., forty-eight hours later.

The 48/96 work schedule for firefighters consists of two consecutive 24-hour shifts followed by four days off. This pattern offers firefighters a block of time for rest and recovery, which can benefit their physical and mental health. However, concerns have been raised about the potential health risks associated with such long shifts, including sleep deprivation and its effects on cognitive and physical performance. Despite these concerns, many fire departments have adopted this schedule, finding it a viable option for their personnel.

Financial Analysis

Sound fiscal health is imperative to ensuring the effective operation of local governments. Analyzing historical trends provides valuable information about current and future fiscal health. To understand the SCFD's historical and projected financial position, Triton reviewed and analyzed the fire department's historical budgeting documents, schedules, and independent auditor reports for the four years of FY 2020 through FY 2023 and the adopted FY 2024 budget.

The SCFD functions as a municipal fire department and operates through the City's General Fund to manage the fire department's operations, capital requirements, and debt service. The SCFD maintains a workforce of around 70 full-time personnel, including administrative and response personnel operating from one administrative building, four fire stations, and one lifeguard headquarters building that houses an additional 70 part-time/seasonal lifeguards.

Accounting and Budget Governance

The City prepares its budgets and financial statements using the accrual method for enterprise and fiduciary funds and modified accrual basis of accounting for governmental funds; therefore, the SCFD's modified accrual method recognizes resources when they're measurable and available, and expenditures are recognized when the fund liability is incurred, measurable, and expected to be paid within 12 months. The SCFD operates on a calendar year, from July 1 to June 30. Annual budgets are prepared and adopted per the City's Charter.

The City Manager is responsible for preparing and submitting the annual budget to the City Council. However, the Fire Chief develops strategic priorities and various long-range planning strategies to assist in preparing the SCFD's annual operating budget and then submits budget requests/recommendations to the City Manager.

As the City Charter requires, the City Manager presents a balanced budget to the City Council with public hearings occurring in May and budget adoption no later than the first regular council meeting in June.

Resources and Expenditures

Typical of most governmental entities, the City employs funds to account for its financial operations. The SCFD operates utilizing three funds: the General Fund, the Municipal Wharf Fund (the Marine Program), and the Capital Investment Program Projects Fund.

Each fund is a fiscal and accounting entity that includes cash, financial resources, liabilities, and balances related to specific activities or objectives. A brief description of each of the three funds is detailed below:

- **General Fund:** This fund functions as the City's general operating fund. The Fire Department's operating budget exists within this fund.
- **Municipal Wharf Fund:** This fund functions in part as the fire department's marine program fund. The municipal wharf fund resources are derived via inter-fund transfers from the City's General Fund.
- **Capital Investment Program Fund:** This fund serves as a capital projects fund designated for accumulating and deploying resources for constructing, acquiring, and improving capital assets.

For historical comparison and analysis, the following figures in the next section reflect resources and expenditures net of inter-fund transfers.

Figure 11: Historical SCFD Budget Summary

Resources/ Expenditures	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Recurring Resources	3,040,353	3,182,629	3,343,591	3,861,694	3,725,615
Non-recurring Resources	636,313	2,655,777	1,178,113	456,558	923,446
Total Resources:	**3,676,666**	**5,838,406**	**4,521,704**	**4,318,252**	**4,649,061**
Salaries & Wages	10,798,944	10,736,685	12,529,731	12,935,462	12,909,238
Benefits	6,155,706	6,334,357	6,903,673	7,655,521	8,306,965
Strike team	252,919	899,634	310,686	72,849	750,000
Salaries & Benefits:	**17,207,569**	**17,970,676**	**19,744,090**	**20,663,832**	**21,966,203**
Services	1,501,416	1,501,402	1,760,505	1,637,614	3,280,823
Supplies	382,063	234,509	315,944	322,069	303,480
Other	175,977	162,859	128,825	127,811	244,937
Total Recurring Expenditures	**2,059,456**	**1,898,770**	**2,205,274**	**2,087,494**	**3,829,240**
Capital Outlay	541,157	0	49,637	98,147	0
Total Non-recurring Expenditures	**541,157**	**0**	**49,637**	**98,147**	**0**
Total Expenditures	**19,808,182**	**19,869,446**	**21,999,001**	**22,849,473**	**25,795,443**
Net Funding from GF:	**(15,611,308)**	**(13,187,986)**	**(16,813,173)**	**(17,747,966)**	**(20,266,827)**

Fire Resources

The City's major revenue sources include property taxes, sales and use taxes, transient occupancy (hotel) taxes, and service fees. As with other charter cities in California, the City of Santa Cruz has limited ability to set tax rates. Under the provisions of Proposition 13, passed by the voters in 1978, the State constitution establishes a maximum rate for property tax of 2% and limits the growth of assessed value.

The SCFD receives resources through the City's General Fund, which is derived primarily from property taxes. However, the SCFD also receives revenue through other sources, such as fire protection contracts for services, cost recovery for strike team deployments, fire prevention fees, and grants.

For analysis purposes, AP Triton classifies resources as recurring or non-recurring. Recurring resources can be reasonably anticipated annually. The SCFD's recurring resources include operational service contracts, prevention fees, public safety impact fees, etc.

On the other hand, non-recurring revenues, such as strike team cost recovery, event fees, one-time grant awards, or proceeds from the disposal of assets, may not occur annually or are not easily quantifiable. While these amounts may be estimated with a reasonable degree of accuracy, the frequency of their receipt places them in the non-recurring category.

The following figure depicts the SCFD's total combined resources received from fire department activities and services between FY 2020 and FY 2023 and the resources anticipated in FY 2024.

Figure 12: SCFD Historical Resource Summary

Resources	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Operations Service Fees	68,604	49,777	30,036	40,096	45,000
UCSC Contract for Service	2,814,554	2,986,640	3,114,823	3,523,617	3,435,615
Paradise Park Contract for Service	15,180	15,681	15,948	16,458	15,000
Prevention Service Fees	142,015	128,015	166,470	193,743	150,000
Public Safety Impact Fee	0	2,516	16,314	87,780	80,000
Recurring Resources	**3,040,353**	**3,182,629**	**3,343,591**	**3,861,694**	**3,725,615**
Grants	346,028	843,467	95,412	66,278	0
Strike Team Cost Recovery	196,575	1,807,260	987,007	78,475	750,000
Office of Emergency Services (OES)	0	0	0	15,598	173,446
Lifeguard Srvs. – Capitola Contract	84,667	0	91,119	110,119	0
Marine Safety Services	7,775	2,800	3,975	4,000	0
Interagency	0	0	0	172,787	0
Sale of Assets	0	2250	0	8576	0
Other	1,268	0	600	725	0
Non-recurring Resources	**636,313**	**2,655,777**	**1,178,113**	**456,558**	**923,446**
Total Resources	**3,676,666**	**5,838,406**	**4,521,704**	**4,318,252**	**4,649,061**

The SCFD's combined recurring resources for the period FY 2020 through FY 2023 averaged $4,255,531 derived from service contracts for the University of California Santa Cruz and Paradise Park (approximately $2.5M), and cost recovery fees such as inspection fees, recovery calls outside of jurisdiction via Strike Team OES, and event stand-by charges via marine safety program.

Fire Expenditures

Like revenue, AP Triton classifies expenditures as either recurring or non-recurring. Recurring expenditures can be reasonably anticipated annually and are generally quantifiable. The SCFD's recurring expenditures include personnel, services, and operating supplies.

Non-recurring expenditures may not occur annually or are not easily quantifiable. Examples of non-recurring expenditures include capital outlay and equipment purchases, non-capitalized equipment purchases, and other minor costs that are not considered ongoing. As a rule, these categories are easily predictable.

The following figure is a consolidation of all the fire expenditures.

Figure 13: SCFD Historical Combined Expenditures Summary

Combined Expenditures	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Personnel	17,207,569	17,970,676	19,744,090	20,663,832	21,966,203
Services	1,501,416	1,501,402	1,760,505	1,637,614	3,280,823
Supplies	382,063	234,509	315,944	322,069	303,480
Other	175,977	162,859	128,825	127,811	244,937
Recurring Expense	**19,267,025**	**19,869,446**	**21,949,364**	**22,751,326**	**25,795,443**
Capital Outlay	541,157	0	49,637	98,147	0
Non-recurring Expense	**541,157**	**0**	**49,637**	**98,147**	**0**
Total Expenditures	**19,808,182**	**19,869,446**	**21,999,001**	**22,849,473**	**25,795,443**

Recurring Expenditures

Recurring expenditures reflect the fire department's operating budget and are vital for day-to-day operations. The following section considers the SCFD's recurring or operating expenditures.

These expenditures are divided into three main categories: Personnel, Services, and Supplies. A concise overview of these recurring expense categories follows.

- **Personnel** comprises salaries, wages, and employee-related benefits, such as health insurance, payroll taxes, and retirement.
- **Supplies** include various operating expenditures such as fuel, medical supplies, training materials, and non-capital equipment.
- **Services** include expenditures for travel, utilities, apparatus and facility services, dispatch services, IT expenditures, legal services, and administrative support services. In the FY 2024 budget, the City adopted a new intracity services cost-sharing plan. This cost-sharing allocation plan spreads the City overhead services to the various departments by a percentage designed to represent their estimated need for those services.

The SCFD's recurring expenditures have increased approximately 34%, or $6,528,418, from $19,267,025 in FY 2020 to an anticipated $25,795,443 budgeted in FY 2024. The fire expenditure fund and the Municipal Wharf fund utilize 19% of the City's General Fund.

As expected, with a growing organization shouldering an increasing service demand, nearly $4.8 million of the $ 6.5 million increase in recurring expense has been due to increased personnel expenditures, equating to 90% of the fire department's operating budget.

There are five divisions within the fire department, each tracking its expenditures. The following is a brief description of each division and the typical costs associated with each.

- **Administration Division**: Handling the daily affairs of the department, the Administration Division ensures service delivery in line with the City Manager's and City Council's directives, supporting the services of the fire department's operations. Its expenditures comprise salaries, professional services, office supplies, insurance premiums, training, retirement and life insurance.
- **Operations Division**: The Operations Division provides 24/7 response to all 911 requests within the city, UCSC Campus, and Paradise Park. In addition, it responds to mutual aid requests within the county and state. Operations Division expenditures cover personnel costs, equipment, apparatus, vehicles, and the maintenance of tools and equipment vital for delivering emergency services.
- **Prevention Division**: The Prevention Division provides plan reviews, permits, safety inspections, construction inspections, vegetation management, fire investigations, and public education. The Prevention Division's expenditures cover salaries, supplies for public education, fire prevention tools, vegetation management, travel expenses, books and periodicals, and program services.
- **Office of Emergency Services**: The OES provides 24/7 support to the City Emergency Operations Center in the event of disasters and emergencies, assists in managing the budget, acts as the fire department's Climate Action Coordinator and its Public Information Officer, and manages fire department grants. The OES division expenditures cover personnel, outside professional services, small tools and equipment, and operating supplies.
- **Fire Strike Team**: The overtime costs for personnel services during strike team deployments are captured here.
- **Marine Division**: The Marine Division provides year-round service with on-call lifeguards during the off-season and daily lifeguard services from Memorial Day weekend to the weekend of Labor Day. The Marine Division expenditures cover personnel costs, repair, vehicle and facility services, medical supplies, uniforms, and non-capital equipment purchases.

The following figure reflects the SCFD's recurring expenditures by division. It provides a helpful understanding of how the fire department's resources have historically been allocated.

Figure 14: SCFD Expenditures by Division

Expenditures by Division	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024[20]
Administration	811,981	830,303	895,212	1,130,010	2,834,136[21]
Operations	16,353,023	15,863,672	18,441,473	19,517,261	20,016,677
Prevention	906,287	1,208,278	1,123,680	887,189	1,017,693
OES	371,311	216,816	206,816	150,287[22]	217,382
Strike Team	252,919	902,006	312,325	72,849	750,000
Marine Division	571,504	848,371	969,858	993,729	959,555
Recurring Expenditures	**19,267,025**	**19,869,446**	**21,949,364**	**22,751,325**	**25,795,443**

Personnel Expense

Typical of most public safety agencies, personnel-related expenditures account for the largest portion of the fire department's recurring and total expenses. These expenditures include salary, wages, benefit and retirement costs, overtime, and workers' compensation.

Historically, the SCFD personnel-related expenditures account for approximately 90% of recurring expenditures for FY 2020–FY 2023. Personnel costs are expected to total $21,966,203 for the FY 2024 budget year, an increase of $1,302,371 from FY 2022. The following figure shows the SCFD expenditures between wages, benefits, and strike team costs.

[20] CSAP Central Services Allocation Plan started FY 2024.
[21] PMA positions added.
[22] OES Manager salary moved to admin budget; position vacant FY 2021—FY 2024.

Figure 15: SCFD Wages and Benefits Summary

Wages & Benefits	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Salaries	10,798,944	10,736,685	12,529,731	12,935,462	12,909,238
Benefits	6,155,706	6,334,357	6,903,673	7,655,521	8,306,965
Strike Team	252,919	899,634	310,686	72,849	750,000
Total Personnel Expenditures	**17,207,569**	**17,970,676**	**19,744,090**	**20,663,832**	**21,966,203**

The following figure summarizes the trend of wages and benefits by division for FY 2020 to FY 2024. The wage spikes are primarily attributed to a CalPERS retirement unfunded liability expense increase.

Figure 16: SCFD Wages and Benefits Summary by Division

Wages & Benefits	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Administration	660,040	651,836	716,547[23]	929,729	1,115,589[24]
Operations	14,997,296	14,629,462	16,985,622	18,050,190	18,446,394
Prevention	757,199	1,033,217	891,134	762,897	837,123
OES	84,951	47,190	705[25]	2,878	0
Strike Team	252,919	899,634	310,686	72849	750,000
Marine Division	455,164	709,335	839,396	845,289	817,097
Total Wages & Benefits	**17,207,569**	**17,970,674**	**19,744,090**	**20,663,832**	**21,966,203**

Services Expense

Following personnel expenses, services expenditures account for the second most significant component of the fire department's recurring operating expenses. Services expenditures include liability insurance, travel expenses, maintenance and repair, service contracts, utilities, etc., which are not considered capital items. Historically, this expense category has accounted for approximately 8% of the department's recurring expenditures.

[23] EOC Manager position moved to Administration Budget in FY 2022.
[24] Principal Management Analyst position added in FY 2024.
[25] Temporary Staffing for EOC activations.

Figure 17: SCFD Services Expense Summary

Service Expense	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Services	1,501,416	1,501,402	1,760,505	1,637,614	3,280,823

The SCFD services expenditures have remained relatively stable, increasing $136,190, or about 9%, from FY 2020 through the end of FY 2023. FY 2024's adopted budget anticipates the largest single year-over-year increase of $1,643,209, from $1,637,614 in FY 2023 to $3,280,823 budgeted in FY 2024; this is due to the City's change in process of accounting for internal services--fire department share of HR, IT, Finance, Legal, etc.—which resides in the fire department budget(s)n accordance with the published central services allocation plan.

Supplies Expense

Supplies and "Other" materials and service expenses represent the smallest recurring expenditures for the fire department. The SCFD supplies expenditures have remained relatively stable from FY 2020 to FY 2023. The FY 2024's adopted budget anticipates a significant increase of $98,537, from $449,880 in FY 2023 to $548,417 budgeted in FY 2024 for OEM medical supplies and operation non-capital equipment purchases.

Figure 18: SCFD Supplies Expense Summary

Supplies Expense	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Supplies	382,063	234,509	315,944	322,069	303,480
Other	175,977	162,859	128,825	127,811	244,937
Total Supplies Expenditures	**558,040**	**397,368**	**444,769**	**449,880**	**548,417**

Non-recurring Expenditures

The SCFD's operating budget occasionally has one-time expenses and capital outlays for special projects and special procurements identified during the budgeting process. These outlays are typically less than $100,000 and include expenses for special tools, telecommunications, vehicle equipment, vehicles, or other machinery and equipment.

Figure 19: SCFD Non-Recurring Expenditures Summary

Non-recuring Expenditures	Actual FY 2020	Actual FY 2021	Actual FY 2022	Actual FY 2023	Budget FY 2024
Capital Outlay	541,157	0	49,637	98,147	0

Capital Planning

The SCFD maintains a 5-year capital improvement plan for FY 2025 to FY 2029 with special projects identified. The SCFD's CIP is funded through the City's General Capital Investment Program fund. However, no new monies were allocated to the City's CIP budget for FY 2024 and FY 2025; therefore, no fire department CIP projects were approved.

Because capital needs exceed the available budget, the SCFD and the City maintain a General Fund Unfunded and Underfunded CIP Projects list. The following figure outlines the CIP projects that currently have a net project cost that is either unfunded or underfunded:

Figure 20: SCFD FY 2025 Budget CIP Unfunded or Underfunded Projects

Unfunded and Underfunded CIP Projects[26]	Amount Unfunded or Underfunded
Fire Engine Type I Pierce Pumper	900,000
Fire Station 1 & Fire Admin Replacement	19,000,000[1]
Fire Station 2 Replacement	17,000,000^
Fire Station 3 Front Driveway	100,000
Fire Station 3 Rear Expansion – Apparatus Bay/Rear Apron	750,000
Fire Station 5	17,000,000[1]
Lifeguard Headquarters Replacement	5,000,000
Fire Engine Type I Pierce Pumper	1,000,000
Fire Boat	2,000,000
Santa Cruz Regional Fire Training Center	2,000,000
Fire Engine Ladder Pierce Tiller 100'	2,000,000[2]
Total Fire Department Unfunded and Underfunded Projects:	**66,750,000[3]**

[1] Facility costs have spiked dramatically; these funds are likely insufficient to replace stations and should be reevaluated. Land costs should be included if the stations are to be moved.

[2] Listed as unfunded on page 260 and is expected to help the SCFD improve the reserve ladder apparatus.

[3] The agency is taking steps to prepare the City for cost increases and indicated it raised the capital expenditures to approximately $97 million in more recent budget requests.

Based on recent fire station buildings, the estimated costs for new buildings listed, Station 1 and Administration, Station 2, and the new Station 5, may be significantly below actual costs. Building and tear-down costs have dramatically increased over the past five years. Kitchell Construction provided a summary of projects in California, and their cost per square foot was an average of $1,427.71 for an average of 8,095 square feet, not including land costs. By 2027, they estimate the average cost per square foot will rise to $1,597.47. A simple evaluation of their provided information shows a remarkable 8–9% annual increase, with the most significant cost increases per square foot between 2020 and 2023. The average square foot cost in 2020 was $878; in 2023, that rose to $1,781. A more reasonable recent growth estimate is 5% per year, which appears to have leveled off slightly from 2021 through 2024.[27] This trend can be found in apparatus costs as well. Since the COVID-19 pandemic in 2020, apparatus costs have risen significantly, doubling in many cases. At the same time, deliveries have extended to multiple years.

The SCFD uses the NFPA to guide recommendations for apparatus replacement schedule. However, funding is not secured as it is funded through the CIP request process, as mentioned above. The FY 2025 budget included estimated budget requests for Station 1/Administration, Station 2, and Station 5.

The City has made significant capital investments for the fire department in the past four years. These include:

- C212305 Fire engine ladder (Pierce Tiller 100'), $1,782,080, was ordered in 2023 and is expected to be delivered in 2027.
- C212201 Fire Engine Type 1 (Pierce Pumper 1250 GPM), $800,000, ordered in 2022 and delivered in 2023.
- C212315 Fire Engine Type I (Pierce Pumper), $850,000, ordered in 2023 and delivered in 2024.
- C212303 Station 3 Generator; the project cost is estimated at $100,000, and as of 2023, capital funds of $24,623 have been used. Completion expected in 2025.
- C212302 Fire Station 2 Expansion; the estimated project cost is $750,000, and in 2023, capital funds of $100,000 have been applied. Completion expected in 2027.
- C212306 Fire Station 3 Butler Building, $144,000, began in 2023 and is expected to be completed in 2025.
- C212301 Paging system; the estimated project cost is $150,000, and in 2023, capital funds of $130,252 have been applied. The system was ordered in 2023 and installed in 2024.
- C212203 Rescue Unit, $455,150, ordered 2022 and scheduled to be delivered in 2025.
- C212403 Type 6, budgeted $400,000 in FY 2025 – Federal Earmark Funding.

The Butler building at Station 3 and the Station 2 expansion highlight the volatility of building costs. Both projects have significantly increased in cost since this budget. The City has approved the extra capital funds.

[26] Reference FY 2025 Budget (P. 260).
[27] Kitchel Construction, Fire Station Rough SF Estimates & Cost Projections, 10/24/2024.

Capital Facilities & Equipment

Apparatus and other vehicles, trained personnel, firefighting and emergency medical equipment, and fire stations are the essential capital resources necessary for a fire department to carry out its mission. No matter how competent or numerous the firefighters are, if appropriate capital equipment is unavailable for operations personnel, it would be impossible for the SCFD to perform its responsibilities effectively. The essential capital assets for emergency operations are facilities, apparatus, equipment, and other emergency response vehicles. This report section assesses the department's fire stations, frontline apparatus, and ambulances.

Facilities

Fire stations play an integral role in delivering emergency services for several reasons. A station's location will largely dictate response times to emergencies. A poorly located station can mean the difference between confining a fire to a single room and losing the structure or survival from sudden cardiac arrest. Fire stations must also be designed to adequately house equipment and apparatus and meet the organization's and its personnel's needs.

Fire station activities should be closely examined to ensure the structure is adequate in size and function. Examples of these functions can include the following:

- Kitchen facilities, appliances, and storage
- Residential living space and sleeping quarters for on-duty personnel (all genders)
- Bathrooms and showers (all genders)
- Training, classroom, and library areas
- Firefighter fitness area
- The housing and cleaning of apparatus and equipment, including decontamination and disposal of biohazards
- Administrative and management offices, computer stations, and office facilities
- Public meeting space

In gathering information from the SCFD, Triton asked the department to rate its fire stations' condition using the following criteria. The results will be seen in the figures following the criteria description.

Figure 21: Criteria Utilized to Determine Fire Station Condition

Excellent	Like new condition. No visible structural defects. The facility is clean and well-maintained. The interior layout is conducive to function with no unnecessary impediments to the apparatus bays or offices. No significant defect history. Building design and construction match the building's purposes. Age is typically less than ten years.
Good	The exterior has a good appearance with minor or no defects. Clean lines, good workflow design, and only minor wear on the building interior. The roof and apparatus apron are in good working order, absent any significant full-thickness cracks, crumbling of the apron surface, or visible roof patches or leaks. Building design and construction match the building's purposes. Age is typically less than 20 years.
Fair	The building appears structurally sound with a weathered appearance and minor to moderate non-structural defects. The interior condition shows normal wear and tear but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building's purposes well. Shows increasing age-related maintenance but with no critical defects. Age is typically 30 years or more.
Poor	The building appears cosmetically weathered and worn with potential structural defects, although not imminently dangerous or unsafe. Large, multiple full-thickness cracks and crumbling concrete on the apron may exist. The roof has evidence of leaking and has been repaired multiple times. The interior is poorly maintained or showing signs of advanced deterioration with moderate to significant non-structural defects. Problematic age-related maintenance and major defects are evident. It may not be well-suited to its intended purpose. Age is typically greater than 40 years.

Santa Cruz Fire Stations, Lifeguard Headquarters, and Administrative Office

The following section lists the features of Santa Cruz's four fire stations, lifeguard headquarters, and administrative office.

Station Name/Number:	Santa Cruz Fire Department Fire Station #1
Address/Physical Location:	711 Center Street, Santa Cruz, CA 95060

General Description:
Fire Station 1 was built in 1939 and renovated several times, the latest in 2011. The apparatus floor was lowered to accommodate the ladder truck in 2011. Individual sleeping areas and gender-neutral bathrooms were added in 2001. Surface street flooding is a district issue; flooding inside the building has been a consistent problem. The building is between the Civic Auditorium and an AT&T facility, with the fire department's headquarters located across the rear parking lot.

Structure							
Date of Original Construction	1939						
General Condition	Fair						
Seismic Protection	Completed in 2001						
Auxiliary Power	Yes						
ADA Compliant	Completed in 1997						
Number of Apparatus Bays	Drive-Throughs	1	Back-Ins	2	Total Bays:	3	
Total Square Footage	9,880						
Facilities Available							
Sleeping Quarters	Bedrooms	7	Beds	14	Dorm Beds	0	
Maximum Staffing Capability	14	(Total number of staff that can be housed at the station)					
Bathroom/Shower Facilities	Yes						
Gender Segregation (Yes)	Bathrooms	3	Showers	3	Bedrooms	7	
Exercise/Workout Facilities	Yes						
Kitchen Facilities	Yes						
Individual Lockers Assigned	Yes						
Training/Meeting Rooms	No						
Washer/Dryer/Extractor	Yes						
Safety & Security							
Station Sprinklered	Yes						
Smoke & CO Detection	Yes						
Decon & Biological Disposal	Yes						
Security System	No						
Apparatus Exhaust System	Yes, Plymovent System						

Station Name/Number:	Santa Cruz Fire Department Fire Station #2
Address/Physical Location:	1103 Soquel Drive, Santa Cruz, CA 95062

General Description:
Fire Station 2 was built in 1947. It has been renovated several times. An extensive remodel with accessibility upgrades and seismic strengthening of the existing structure occurred in 2001. The station lacks dedicated areas for cleaning equipment and firefighter fitness, with both functions occurring within the apparatus bay. The station does provide for gender segregation in bathrooms and dormitories.

Structure						
Date of Original Construction	1947					
General Condition	Poor					
Seismic Protection	Completed 2001					
Auxiliary Power	Yes					
ADA Compliant	Completed 2013					
Number of Apparatus Bays	Drive-Throughs	2	Back-Ins	0	Total Bays:	2
Total Square Footage	4,000					
Facilities Available						
Sleeping Quarters	Bedrooms	3	Beds	5	Dorm Beds	0
Maximum Staffing Capability	5	(Total number of staff that can be housed at the station)				
Bathroom/Shower Facilities	Yes					
Gender Segregation (Yes)	Bathrooms	2	Showers	2	Bedrooms	3
Exercise/Workout Facilities	No					
Kitchen Facilities	Yes					
Individual Lockers Assigned	Yes					
Training/Meeting Rooms	No					
Washer/Dryer/Extractor	Yes					
Safety & Security						
Station Sprinklered	Yes					
Smoke & CO Detection	Yes					
Decon & Biological Disposal	Yes					
Security System	No					
Apparatus Exhaust System	Yes, Plymovent System					

Station Name/Number:	Santa Cruz Fire Department Fire Station #3
Address/Physical Location:	335 Younglove Avenue, Santa Cruz, CA 95060

General Description:
Fire Station 3 was constructed in 1954. The station has two detached buildings that are used for storage and programs. The yard also has some props for training. Over the years, several interior improvements have taken place, including seismic and accessibility upgrades. The station does provide for gender segregation in bathrooms and dormitories.

Structure						
Date of Original Construction	1954					
General Condition	Fair					
Seismic Protection	Completed in 2001					
Auxiliary Power	Yes					
ADA Compliant	Completed 2000					
Number of Apparatus Bays	Drive-Throughs	2	Back-Ins	0	Total Bays:	2
Total Square Footage	6,202					
Facilities Available						
Sleeping Quarters	Bedrooms	4	Beds	6	Dorm Beds	0
Maximum Staffing Capability	6	(Total number of staff that can be housed at the station)				
Bathroom/Shower Facilities	Yes					
Gender Segregation (Yes)	Bathrooms	3	Showers	2	Bedrooms	4
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers Assigned	Yes					
Training/Meeting Rooms	No					
Washer/Dryer/Extractor	Yes					
Safety & Security						
Station Sprinklered	Yes					
Smoke & CO Detection	Yes					
Decon & Biological Disposal	Yes					
Security System	No					
Apparatus Exhaust System	Yes, Plymovent System					

Station Name/Number:	Santa Cruz Fire Department Fire Station #4—UCSC
Address/Physical Location:	701 Chinquapin Road, Santa Cruz, CA 95064

General Description:
Fire Station 4, constructed in 1975 and owned by UCSC, is located on the upper portion of the campus. Grading and poor drainage around the station have led to water intrusion during winter storms, and it does not meet current accessibility or kitchen standards. There is a single bathroom that does not provide for gender segregation beyond the primary entry door.

Structure							
Date of Original Construction	1975						
General Condition	Poor						
Seismic Protection	Unknown						
Auxiliary Power	Yes						
ADA Compliant	Unknown						
Number of Apparatus Bays	Drive-Throughs	0	Back-Ins	2	Total Bays:	2	
Total Square Footage	3,457						
Facilities Available							
Sleeping Quarters	Bedrooms	3	Beds	6	Dorm Beds	0	
Maximum Staffing Capability	6	(Total number of staff that can be housed at the station)					
Bathroom/Shower Facilities	Yes						
Gender Segregation (No)	Bathrooms	2	Showers	1	Bedrooms	3	
Exercise/Workout Facilities	No						
Kitchen Facilities	Yes						
Individual Lockers Assigned	Yes						
Training/Meeting Rooms	No						
Washer/Dryer/Extractor	Yes						
Safety & Security							
Station Sprinklered	Yes						
Smoke & CO Detection	Yes						
Decon & Biological Disposal	Yes						
Security System	No						
Apparatus Exhaust System	Yes, Plymovent System						

Station Name/Number:	Santa Cruz Fire Department Lifeguard Headquarters
Address/Physical Location:	#1 Municipal Wharf, Santa Cruz, CA 95060

General Description:
Santa Cruz Lifeguard Headquarters, located at the #1 Municipal Wharf, is vital to the City's Marine Safety Division. The building has seen several additions over the years but is generally in poor and weathered condition. Accessibility compliance is limited. The building and its facilities are undersized for the seasonal staff. While separate, the restroom facilities are not equal in size.

Structure						
Date of Original Construction	1960					
General Condition	Poor					
Seismic Protection	No					
Auxiliary Power	No					
ADA Compliant	Yes					
Number of Apparatus Bays	Drive-Throughs	0	Back-Ins	2	Total Bays:	2
Total Square Footage	1,626					
Facilities Available						
Sleeping Quarters	Bedrooms	0	Beds	0	Dorm Beds	0
Maximum Staffing Capability	0	(Total number of staff that can be housed at the station)				
Bathroom/Shower Facilities	Yes					
Gender Segregation (Yes)	Bathrooms	2	Showers	2	Bedrooms	0
Exercise/Workout Facilities	No					
Kitchen Facilities	No					
Individual Lockers Assigned	Yes					
Training/Meeting Rooms	No					
Washer/Dryer/Extractor	No					
Safety & Security						
Station Sprinklered	Yes					
Smoke & CO Detection	Yes					
Decon & Biological Disposal	Yes					
Security System	No					
Apparatus Exhaust System	No					

Station Name/Number:	Santa Cruz Fire Department Fire Administration
Address/Physical Location:	230 Walnut Avenue, Santa Cruz, CA 95060

General Description:
The Santa Cruz Fire Department administration building, built in 1936, is essential for managing the department's day-to-day operations. It has several offices and meeting rooms. The staff was unaware of the building's seismic safeguard status. The windows and some doors do not meet current energy efficiency standards.

Structure							
Date of Original Construction	1936						
General Condition	Fair						
Seismic Protection	Completed 2000 uncertain whether it was to essential facility standards						
Auxiliary Power	Yes						
ADA Compliant	Completed 2000						
Number of Apparatus Bays	Drive-Throughs	0	Back-Ins	0	Total Bays:	0	
Total Square Footage	5,375						
Facilities Available							
Sleeping Quarters	Bedrooms	0	Beds	0	Dorm Beds	0	
Maximum Staffing Capability	0	(Total number of staff that can be housed at the station)					
Bathroom/Shower Facilities	The building has bathrooms only.						
Gender Segregation (Yes)	Bathrooms	3	Showers	0	Bedrooms	0	
Exercise/Workout Facilities	No						
Kitchen Facilities	Yes						
Individual Lockers Assigned	No						
Training/Meeting Rooms	Yes						
Washer/Dryer/Extractor	No						
Safety & Security							
Station Sprinklered	Yes						
Smoke & CO Detection	Yes						
Decon & Biological Disposal	No						
Security System	Yes						
Apparatus Exhaust System	N/A						

Summary of the Fire Station Features

The following figure summarizes some primary features of the four SCFD fire stations, lifeguard headquarters, and administrative office.

Figure 22: Summary of the SCFD Fire Department Buildings

Station	Square Footage	Apparatus Bays	Maximum Staffing	General Condition	Station Age
Station 1	9,880	3	14	Fair	85 years
Station 2	4,000	2	5	Poor	77 years
Station 3	6,202	2	6	Fair	70 years
Station 4	3,457	2	6	Poor	49 years
Lifeguard	1,624	2*		Poor	64 years
Administration	5,375	N/A		Fair	88 years
Totals:	**30,538**	**9**	**30**		

*Not for fire apparatus

Fire Stations Discussion

The fire stations were evaluated utilizing a checklist based on the National Fire Protection Association's Standard on Fire Department Occupational Safety, Health, and Wellness Program. A walkthrough inspection of each facility was completed during AP Triton's onsite visits in July 2024.

Generally, the SCFD stations are older and do not meet the requirements of today's fire service. As the firefighting environment has changed, technology, equipment, and safety systems have evolved to meet new demands. Older buildings do not typically have space or engineered systems to meet that new environment. Modern living also requires much more access to electrical outlets than was expected in older buildings. While the City has undertaken significant improvements in the past, those upgrades are dated, and space remains an issue.

For example, older buildings do not meet the requirements due to the need to decontaminate personnel and equipment after responses. Every crew member should have access to facilities to decontaminate immediately after a fire event, and showers should allow for gender separation. The SCFD has incorporated sauna decontamination units into their post-fire routines to help firefighters expel toxins. Firefighters are exposed to hundreds of chemicals that can enter the body in different ways, be stored for different lengths of time, and be excreted differently. As more data and research emerge, the use of saunas should be continuously evaluated. In addition, there needs to be enough partitioned space to allow for gear and equipment to be thoroughly washed and designed to control contamination in the station's living and working spaces.

While all structures require routine maintenance, fire stations require even more maintenance due to the continuous occupancy by a minimum of three adults. Multiple departures and returns of heavy apparatus also affect these structures. While there is an active maintenance program, and updates were in progress during the visit, there was evidence of ongoing maintenance deferral. The deferred maintenance is beginning to accumulate and will become a more urgent concern.

The stations were generally clean and uncluttered. The crews AP Triton encountered during the station tours demonstrated ownership of their facilities. While some shared concerns about the facilities' ages and ongoing maintenance needs, they were proud of their stations. Each station was provided with auxiliary power reported to be periodically maintained and inspected. Particular attention should be paid to properly storing SCBA and oxygen bottles and inspecting their respective fill stations. In addition, all stations were supplied with a Plymovent exhaust removal system that appeared to be in use and operable.

Facility Replacement

There did not appear to be a long-range facility replacement or repair plan from the City. While the City has undertaken significant improvements and seismic upgrades in the past, those upgrades are dated, and space remains an issue at most fire stations and the lifeguard headquarters. With construction costs being significant, long-range capital planning is necessary.

It was not apparent if a maintenance schedule was in place in the City. Ensuring the stations are in good repair requires regular maintenance and scheduled replacement of specialized equipment. Plans for updating and repairing systems such as heating and air conditioning (HVAC), generators, roofs, driveways, parking areas, security gates, painting, carpet replacement, and small appliances can keep costs down and buildings in service longer. In addition, establishing a facility replacement and maintenance plan will enable the City to plan for ongoing service from each station more efficiently.

Apparatus & Vehicles Fleet Inventory

Fire apparatus and other emergency response vehicles must be sufficiently reliable to transport firefighters and equipment rapidly and safely to an incident scene. In addition, such vehicles must be properly equipped and function appropriately to ensure that the delivery of emergency services is not compromised.

As a part of this study, Triton requested that the SCFD provide a complete inventory of its fleet (suppression apparatus, command units, support vehicles, specialty units, etc.). For each vehicle listed, the SCFD was asked to rate its condition utilizing the criteria described in the following figure.

Figure 23: Criteria Used to Determine Apparatus & Vehicle Condition

Components	Points Assignment Criteria	
Age:	One point for every year of chronological age, based on the date the unit was originally placed into service.	
Miles/Hours:	One point for every 10,000 miles or 1,000 hours.	
Service:	1, 3, or 5 points are assigned based on the service type received (e.g., a pumper would be given a 5 since it is classified as severe duty).	
Condition:	This category considers body condition, rust, interior condition, accident history, anticipated repairs, etc. The better the condition, the lower the assignment of points.	
Reliability:	Points are assigned as 1, 3, or 5, depending on the frequency a vehicle is in for repair (e.g., a 5 would be assigned to a vehicle in the shop 2 or more times per month on average, while a 1 would be assigned if in the shop on average once every 3 months or less.	
Point Ranges	**Condition Rating**	**Condition Description**
Under 18 points	Condition I	Excellent
18–22 points	Condition II	Good
23–27 points	Condition III	Fair (consider replacement)
28 points or higher	Condition IV	Poor (immediate replacement)

The following figures list the inventory of Santa Cruz's current frontline apparatus and other vehicles.

Figure 24: The SCFD Fleet Inventory (2024)

Response Apparatus					
Unit #	**Manufacturer & Type**	**Year**	**Condition**	**Status**	**Assigned Station**
E3114 (770)	Pierce Type 1 Engine	2012	Fair	Frontline	4
E3171(771)	Sutphen Ladder Truck	2005	Poor	Reserve	3
E3112 (772)	Pierce Type 1 Engine	2023	Excellent	Frontline	2
E3113 (773)	Pierce Type 1 Engine	2023	Excellent	Frontline	3
E3137 (774)	Pierce Type 3 Engine	2020	Good	Frontline	4
E3110 (788)	Pierce Type 1 Engine	2015	Good	Frontline	1
E3116 (775)	Pierce Type 1 Engine	2012	Fair	Reserve	3
E3111 (777)	Pierce Type 1 Engine	2012	Fair	Reserve	2

Response Apparatus					
Unit #	**Manufacturer & Type**	**Year**	**Condition**	**Status**	**Assigned Station**
T3170 (778)	Pierce Ladder Truck	2011	Good	Frontline	1
U3199 (781)	Polaris Ranger Side-by-Side	2018	Good	Frontline	4
U3198 (787)	Polaris Ranger Side-by-Side	—	Excellent	Frontline	LGHQ
PWC3168	Yamaha Jetski	2022	Excellent	Frontline	LGHQ
PWC 3166	Yamaha Jetski	2022	Excellent	Frontline	Harbor
PWC 3167	Kawasaki Jetski	2018	Poor	Frontline	Wharf
PWC 3169	Kawasaki Jetski	2018	Poor	Frontline	Corp Yard
	Weis Type 6 Engine	2025	Excellent	*On Order*	
	Road Rescue Type 1 Rescue	2026	Excellent	*On Order*	
	Pierce Ladder Truck	2027	Excellent	*On Order*	
	Pierce Pumper Engine	2027	Excellent	*On Order*	

Command, Staff & Utility Vehicles					
Unit #	**Manufacturer & Apparatus Type**	**Year**	**Condition**	**Status**	**Assigned Station**
C3101 (168)	Toyota Tundra	2017	Good	Frontline	Admin
U3197 (170)	Toyota Tacoma	2017	Good	Frontline	Admin
L3163 (182)	Toyota Tacoma	2015	Good	Frontline	LGHQ
P3180 (183)	Toyota Tacoma	2018	Good	Frontline	Admin
L3161 (563)	Hyundai Santa Cruz	2022	Excellent	Frontline	LGHQ
L3162 (562)	Hyundai Santa Cruz	2022	Excellent	Frontline	LGHQ
JG 1 (561)	Hyundai Santa Cruz	2022	Excellent	Frontline	LGHQ
JG 2 (564)	Hyundai Santa Cruz	2022	Excellent	Frontline	3
U3193 (779)	Ford F-150	2006	Fair	Frontline	1
R3160 (780)	Chevrolet	1993	Poor	Frontline	1
B3103 (782)	Ford F-250 XL	2020	Good	Frontline	Admin
C3102 (783)	Toyota Tundra	2013	Fair	Frontline	Admin
U3191 (784)	Ford Expedition	2008	Poor	Frontline	Admin
U3190 (785)	Ford F-450 Utility Body	2017	Good	Frontline	3
C3100 (786)	Ford Explorer	2021	Good	Frontline	Admin

Command, Staff & Utility Vehicles					
Unit #	**Manufacturer & Apparatus Type**	**Year**	**Condition**	**Status**	**Assigned Station**
B3109 (885)	Ford F-250 XL	2020	Good	Frontline	Admin
P3181 (445)	Ford Ranger	2021	Good	Frontline	Admin
L3108 (450)	Toyota Tacoma	2016	Good	Frontline	LGHQ
L3164 (479)	2013 Toyota Tacoma	2013	Fair	Frontline	LGHQ
B3107 (535)	2015 Toyota Tundra	2015	Good	Frontline	Admin
L3165 (560)	2016 Toyota Tacoma	2016	Good	Frontline	LGHQ
U3192 (520)	2006 Ford F-150	2006	Poor		

Apparatus Maintenance & Replacement Planning Discussion

Mechanical equipment and vehicles are not designed to last forever. As they age, they need more frequent and complicated repairs. Parts may become more challenging to find, and the time spent fixing and maintaining them increases. Since fire protection, EMS, and other emergencies are vital for a community, one of the main reasons for replacing apparatus is to reduce downtime and ensure response performance.

Fire apparatus and vehicles are costly, so most communities plan to replace them. Agencies of similar size to the SCFD in northern California are reporting that engines exceed one million dollars, and trucks are in the two-million-dollar range. The SCFD did not have a long-range apparatus replacement fund. The City has undertaken apparatus purchases as part of its annual budget process. Fire departments often use the common practice of setting a life cycle for apparatus that gives an expected date for replacing each vehicle.

It may be better to use a life cycle for planning purposes, such as creating replacement funds for different kinds of apparatus, but use a different method (such as a maintenance and performance evaluation) to decide the actual replacement date to achieve more cost-efficiency when possible.

Economic Theory of Apparatus Replacement

The Economic Theory of Vehicle Replacement tool helps fleet managers determine when to replace vehicles to minimize total costs. As a vehicle ages, the theory states that the cost of capital diminishes, and its operating costs increase. The combination of these two costs produces a total cost curve. The model suggests that the optimal time to replace any apparatus is when the operating costs begin to exceed the capital costs. This optimal time may not be a fixed point but a time range.

Shortening the replacement cycle to this window allows an apparatus to be replaced at optimal savings to the fire department. However, if an organization does not routinely replace equipment promptly, the overall reduction in replacement spending can quickly increase maintenance and repair expenditures. Therefore, fire officials who assume that deferring replacement purchases is a good tactic for balancing the budget need to understand two possible outcomes that may occur because of that decision:

- Costs are transferred from the capital budget to the operating budget.
- Deferrals may increase overall fleet costs.

Despite its net effect on current apparatus and vehicle costs, deferring replacement purchases unquestionably increases future replacement spending needs. In addition, the deferral may also impact operational capabilities, including the safe and efficient use of apparatus.

Future Apparatus Serviceability

An important consideration for fire departments is the cost associated with replacing major equipment in the future. Apparatus service life can readily be predicted based on vehicle type, call volume, age, and maintenance considerations.

NFPA 1901: Standard for Automotive Fire Apparatus recommends that fire apparatus 15 years or older be placed into reserve status and that apparatus 25 years or older be replaced. This is a general guideline, and the standard recommends using the following objective criteria in evaluating fire apparatus lifespan:

- Vehicle road mileage.
- Engine operating hours.
- Quality of preventative maintenance program and replacement parts availability.
- Quality of the driver-training program.
- Whether the fire apparatus was used within its design parameters.

- Whether the fire apparatus was manufactured on a custom or commercial chassis.
- Quality of workmanship by the original manufacturer.
- Quality of the components used in the manufacturing process.

It is important to recognize that age alone does not determine the need for vehicle serviceability or replacement. Mileage and engine hours are also critical factors. For instance, an engine with high mileage and extensive pump hours may require replacement sooner than an older apparatus with minimal use.

The City provides minor maintenance with in-house staff for emergency vehicles, while other maintenance is outsourced. The three fire department members and City mechanics are not qualified as Emergency Vehicle Technicians (EVT) as recommended by NFPA 1071.[28] The fire department conducts regular preventative maintenance, keeps maintenance records, and performs annual pump tests as recommended in NFPA Standard 1911.[29] The City provides complete mechanic services for staff vehicles with some outsourcing to qualified local vehicle mechanics. Fire apparatus maintenance is outsourced to the Central Fire District Vehicle Maintenance Facility, which provides EVT-level fleet maintenance to the SCFD and other area fire districts and county agencies.

Other Capital Equipment

The large capital items such as facilities, apparatus, and vehicles are easily identified and accepted as capital expenditures. However, much of the equipment used in the fire service is so expensive it easily meets the jurisdictional definition of capital items. What follows is a description of the likely additional capital equipment the SCFD maintains.

Extrication & Other Equipment

The fire department maintains extrication systems that include cutters, spreaders, and rams. Complete sets of extrication gear can be found on the trucks, while combination tools can be found on the engines.

[28] NFPA 1710: Standard for Emergency Vehicle Technician Professional Qualifications.

[29] NFPA 1911: Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Emergency Vehicles.

Medical Equipment

The department maintains five Life Pack 15s v1, seven Life Pack 15s v4, thirteen Life Pack 1000s, and 12 - Heartstart Automatic External Defibrillators. The department has no chest compression devices. However, they are pursuing grant funding for LUCAS® Chest Compression systems for all department-staffed apparatuses.

Hose, SCBAs, and Ladders

The fire department employs certified third-party firms to conduct tests and maintain service records in compliance with NFPA and industry standards. The department performs bi-annual internal testing for ladders, while the third-party firm conducts annual evaluations.

Lifeguard Towers

The Marine Safety Division of the fire department has identified the five (5) lifeguard towers as a capital expense. The towers cost roughly $55,000 with board lockers and are replaced about every 5-years. Only one manufacturer in the United States makes the type of fiberglass towers used by the City. This tower type is also used by the State of California and several coastal cities with beach lifeguards.

Given the high quality of the towers, most agencies have utilized a sole sources procurement process. The bases are made of stainless steel square stock, which provides a more durable and sturdier base for the towers. The extra strength better supports the structure of the tower during relocation.

Section II:
COMMUNITY RISK ASSESSMENT

Community Characteristics

Population

The population and demographics can influence the type of services provided in a community. Social conditions such as poverty, the locations of high-risk areas, and housing types can impact the service delivery provided by the SCFD.

The city's population can directly affect the service delivered by the SCFD. Data from the California Department of Finance (CDoF) shows a population of 63,486 in 2014, decreasing to 62,776 in 2023. The highest population occurred in 2020 at 65,547. A significant downward revision occurred in 2021 to 57,122 but rebounded to 62,809 in 2022. These estimates include the population of UCSC students. The CDoF utilizes other statistical methods to calculate population but bases its population information on the U.S. Census.[30] The Census Bureau counts college students in their population estimates.[31] The City estimates that approximately four million people visit Santa Cruz annually.

The 2024 Point-in-Time Count, listed by the City of Santa Cruz, estimated the number of people experiencing sheltered or unsheltered homelessness to be 659. Of these, 384 were unsheltered, and 275 were sheltered.[32] The number of unsheltered decreased significantly from 2023, when the estimated population was 749.

This decreasing population trend follows the state, which has seen its numbers decline by more than half a million people since 2021.[33] The U.S. Census 2022 5-year estimate is 61,376. The following figure shows the population estimates from 2014 to 2024 from the California Department of Finance.[34]

[30] California Department of Finance, dof.ca.gov/Forecasting/Demographics/estimates-e1/

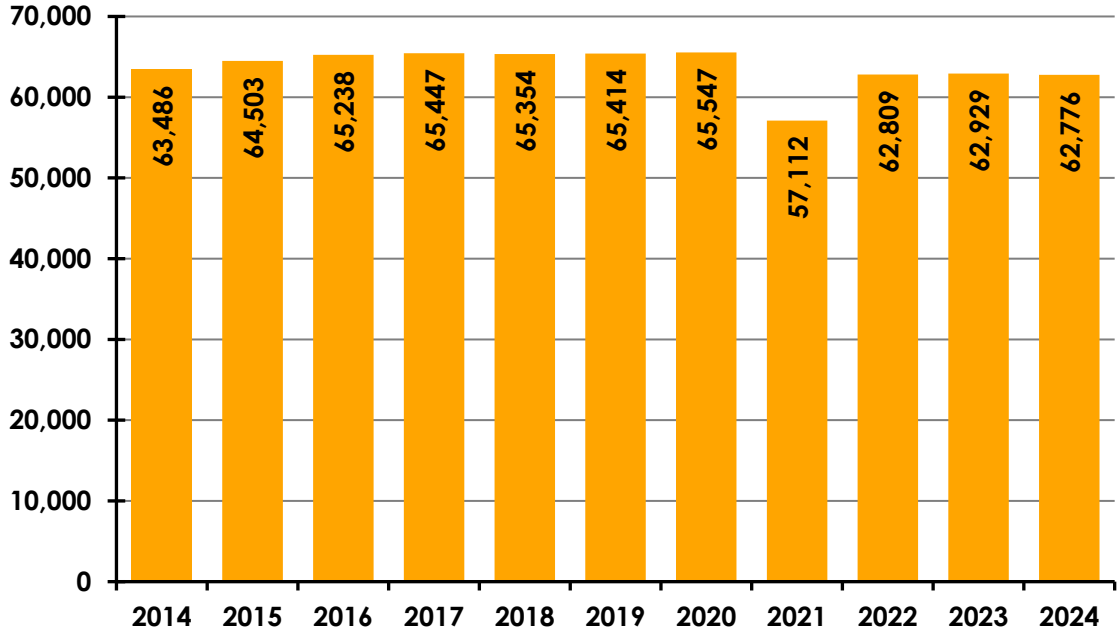
[31] United States Census Bureau, www.census.gov/library/fact-sheets/2020/dec/counting-college-students.html

[32] City of Santa Cruz, www.cityofsantacruz.com/community/homelessness/2024-pit-count.

[33] California's population keeps shrinking, https://ktla.com/news/california/californias-population-keeps-shrinking.

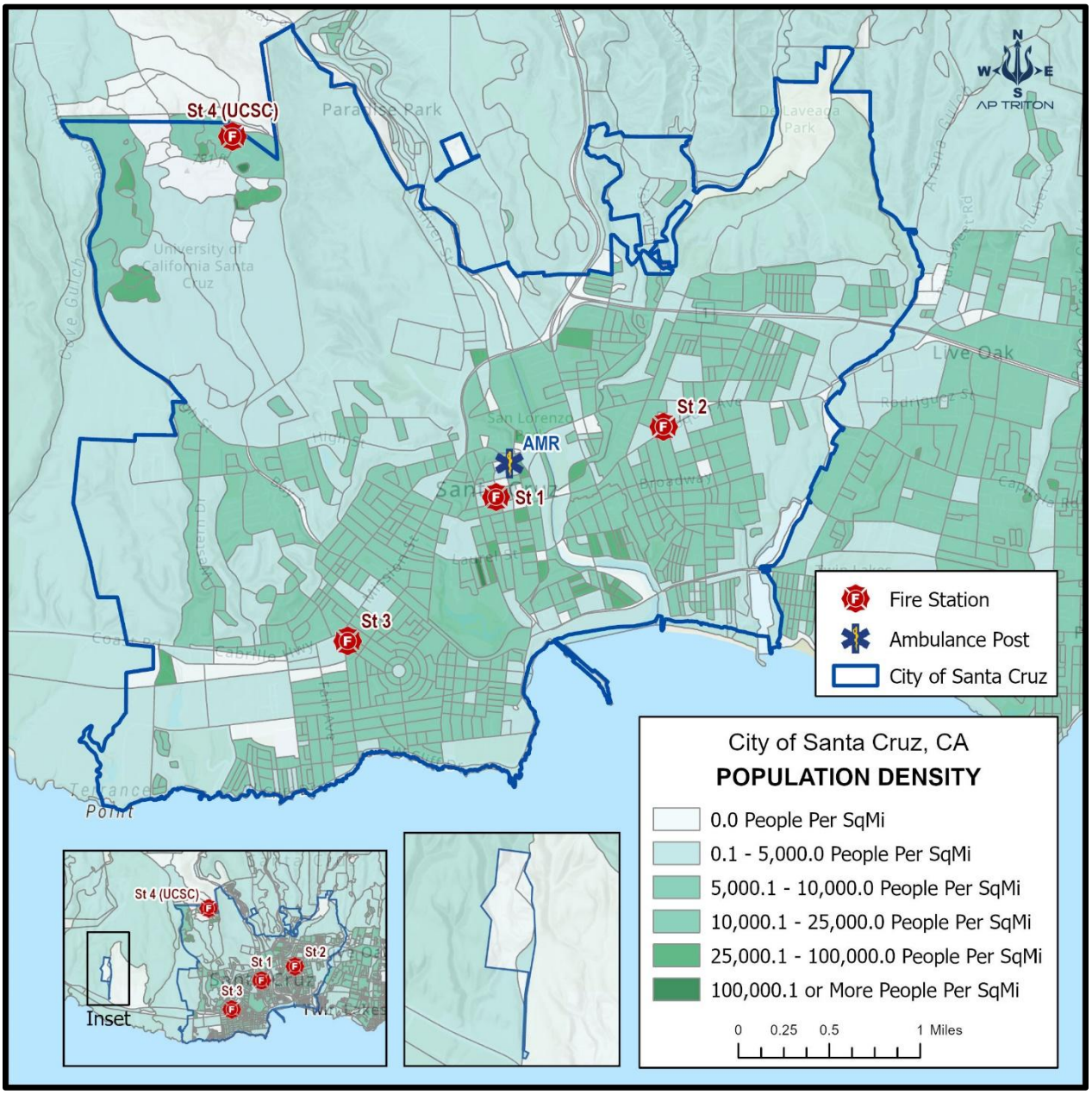
[34] California Department of Finance Website, https://dof.ca.gov/Forecasting/Demographics/ Estimates/.

Figure 25: Population Estimates (2014–2024)



The following figure shows the population density of Santa Cruz.

Figure 26: Population Density



At-Risk Populations

At-risk populations can place additional workloads on an organization, thus increasing service demands. The National Fire Data Center has identified them as groups at a higher risk of being injured or killed in a fire.[35]

- Children under 5 years of age
- Adults over 65 years of age
- Adults over 85 of age (highest risk)
- Gender

Data from the 2022 U.S. Census American Community Survey five-year estimates identified several groups in these categories that are more likely to need emergency services, specifically EMS, than other populations.[36]

Age

A person's age in a high-risk population directly relates to an increase in unintentional injuries and death or injury from a fire. Older adults are 2.6 times more likely to die in a fire than the overall United States population. These age risks increase service demand, specifically for older adults needing additional medical care.[37]

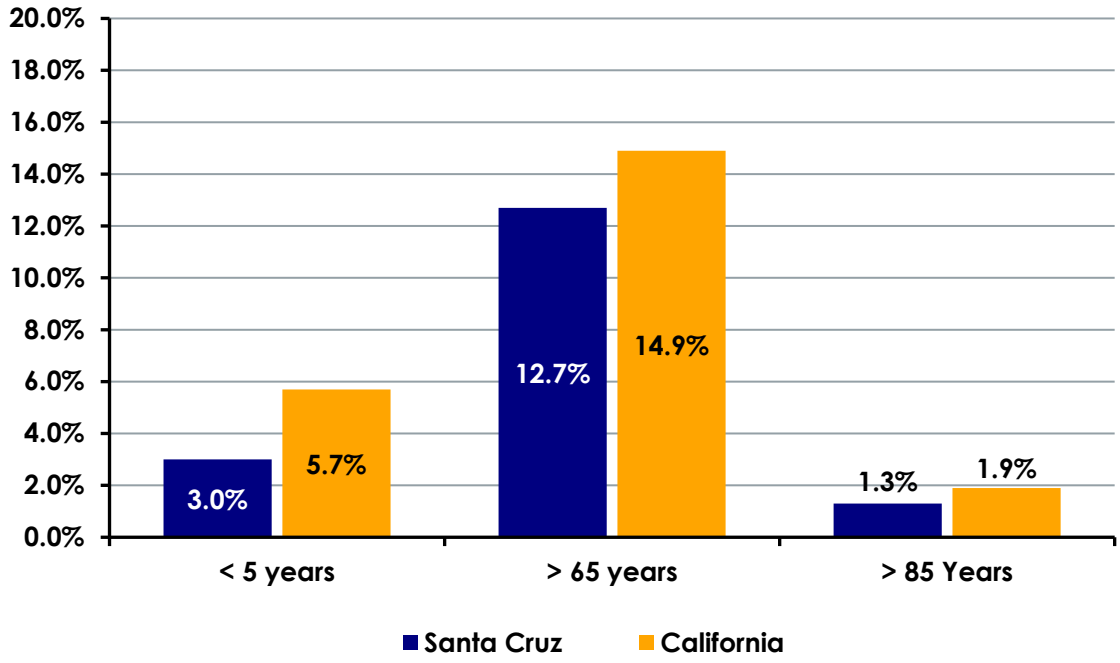
Children under the age of five are at more risk because of their inability to care for themselves and their need for additional assistance during an emergency. Recent trend data (2018) from the U.S. Fire Administration indicates that this age group's relative risk of dying in a fire has dropped 30% in the last ten years and is credited to increased fire prevention and education. The percentage of children under five in the city is 3%, compared to the state at 5.7%. Adults over 65 are 12.7%, less than the state at 14.9%. Those 85 and older are 1.3%, compared to the state at 1.9%. The following figure shows the percentage of children under five years, 65 years and older, and those aged 85 and older.

[35] United States Fire Administration, National Fire Data Center, Fire Risk in 2019.

[36] U.S Census Bureau.

[37] U.S. Fire Administration website.

Figure 27: Age Risks



Gender

The U.S. Census Bureau states that 51% of the city's population is female. The NFPA reports that 57% of the fire deaths and 55% of injuries were male between 2015 and 2019. This means males are 1.3 times more likely than females to be involved in fire deaths or injuries. Based on fire department reports, 12% of males were impaired by alcohol, compared to 6% of females. Twenty percent of females with a disability died in home fires compared to males at 16%. Middle-aged males had a higher rate of deaths from intentionally set fires. Additionally, females 75 and older were more likely to be injured in cooking fires than males.[38] The following figure shows the city's gender percentages by age.

[38] National Fire Protection Association, Home Fire Victims by Age and Gender, December 2021.

Figure 28: Gender by Age

Age Groups	Male	Female
Under 5 years	3.1%	2.9%
5 to 9 years	3.9%	3%
10 to 14 years	3.8%	2.9%
15 to 19 years	12.9%	14%
20 to 24 years	19.5%	21%
25 to 29 years	8.6%	5.8%
30 to 34 years	5.6%	5.4%
35 to 39 years	5.2%	4.8%
40 to 44 years	5.4%	5.9%
45 to 49 years	5.8%	5.7%
50 to 54 years	5.1%	4.5%
55 to 59 years	5.5%	4.5%
60 to 64 years	4.2%	5.6%
65 to 69 years	4%	3.8%
70 to 74 years	4.1%	4.5%
75 to 79 years	2%	2.2%
80 to 84 years	0.7%	1.5%
85 years and over	0.7%	2%

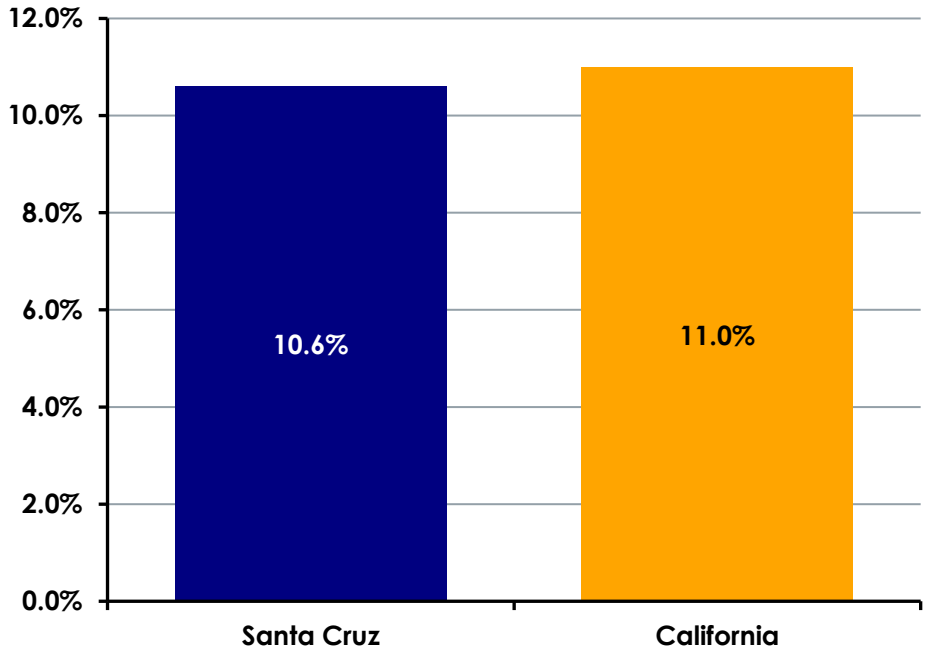
Additional Demographics

There are several definitions of what the fire service industry considers at-risk populations. However, several other demographics must be evaluated from a fire and life safety perspective.

Disabilities

The residential population with disabilities is 10.6% in the city compared to the state at 11%. This population group may be unable to self-evacuate from a building during an emergency or need additional medical services because of their disability. This may create additional demand for medical services, specifically as they age. The following figure depicts the percentage of households with a disability.

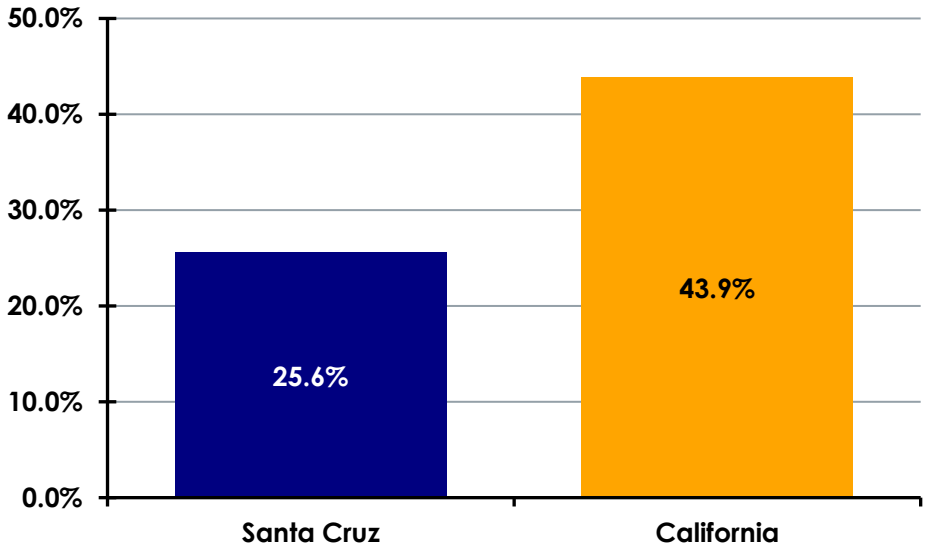
Figure 29: Population with a Disability



Language Barriers

The SCFD may encounter someone who needs another type of communication. The number of people over five speaking a language other than English is approximately 25.6%, which is lower than the state at 43.9%. This population may not understand smoke alarm technology designed to provide early warning during a fire, increasing the risk of injuries or death in their home. The following figure provides the percentage of people with a language barrier.

Figure 30: Language Barriers



Poverty & Income

Low wages or income create challenges in a community that can lead to poverty. Meeting a person's basic needs can reduce the increased risk of fires or medical incidents. People living below the poverty level are considered at the highest risk when combined with other factors such as education levels, disabilities, or unable to work. Low incomes impact families with children, lead to lower educational scores, and create mental health issues. The COVID-19 pandemic has adversely affected these families because schools were closed, and childcare was unavailable. Low income has been linked to higher rates of mental health issues in the community. A report from the World Economic Forum states that depression and anxiety are nearly three times as likely in people with low incomes.

In the city, 18.7% of the population is in poverty, higher than the state's rate of 12.1%. The higher poverty levels typically correspond with lower median incomes. However, the city's median household income of $105,491 is higher than the state's at $91,905. The following figures show the poverty rate and median household income.

Figure 31: Population in Poverty

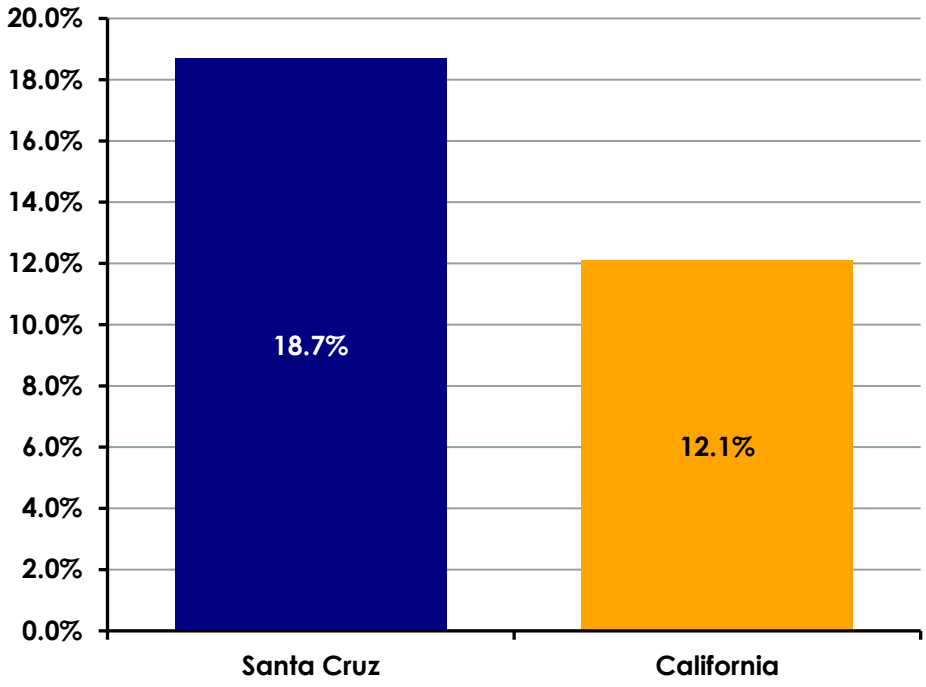
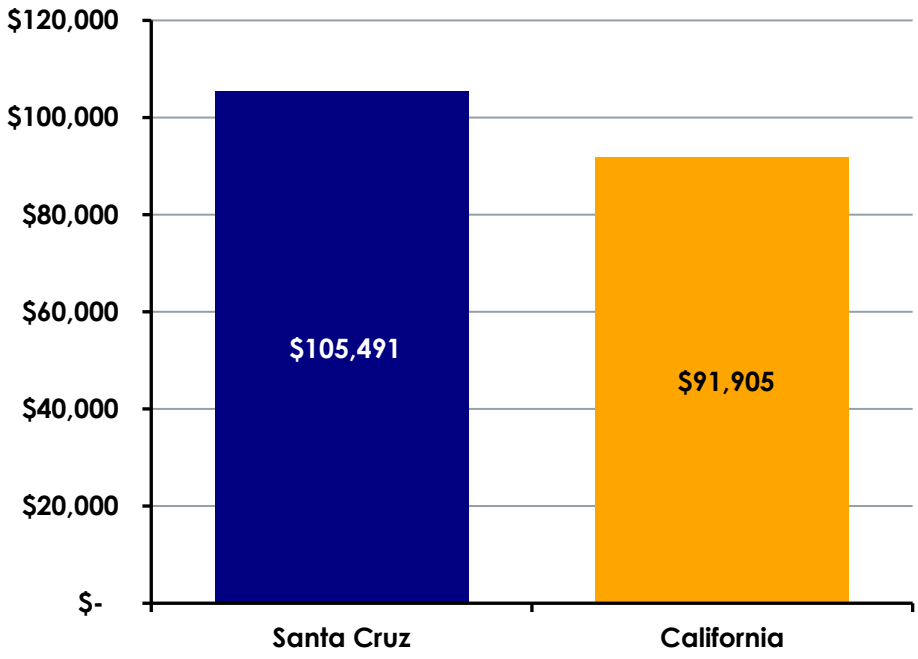


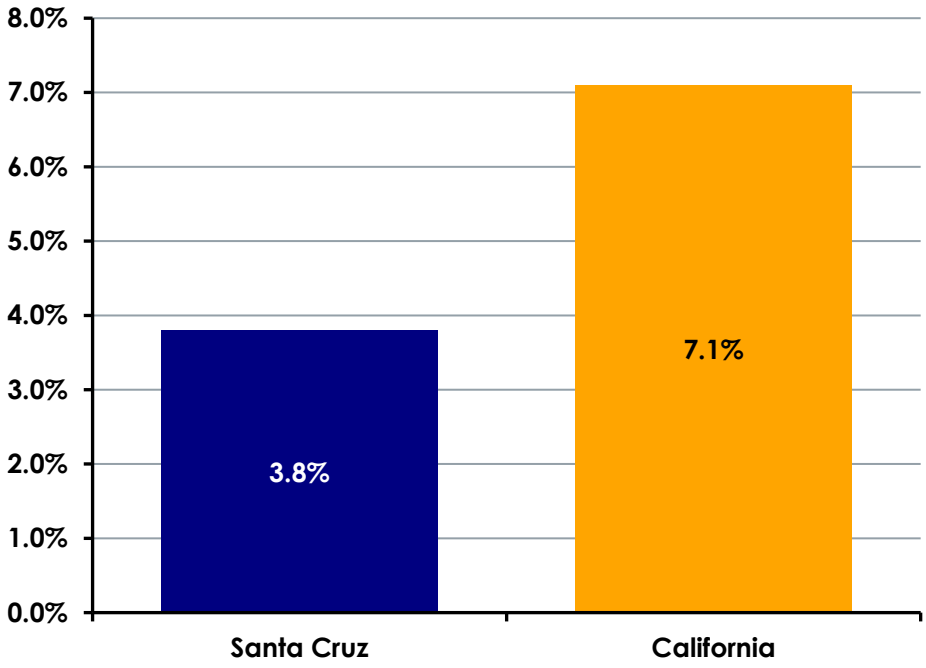
Figure 32: Median Household Income



Persons without Health Insurance

Populations without adequate health care can burden service delivery and increase the rate of medical incidents. Lack of health insurance may affect lower-income populations at a higher rate since they cannot pay for medical visits. In the city, 3.8% of the population is without health insurance, which is lower than the state average of 7.1%. The following figure provides the percentage of people without health insurance.

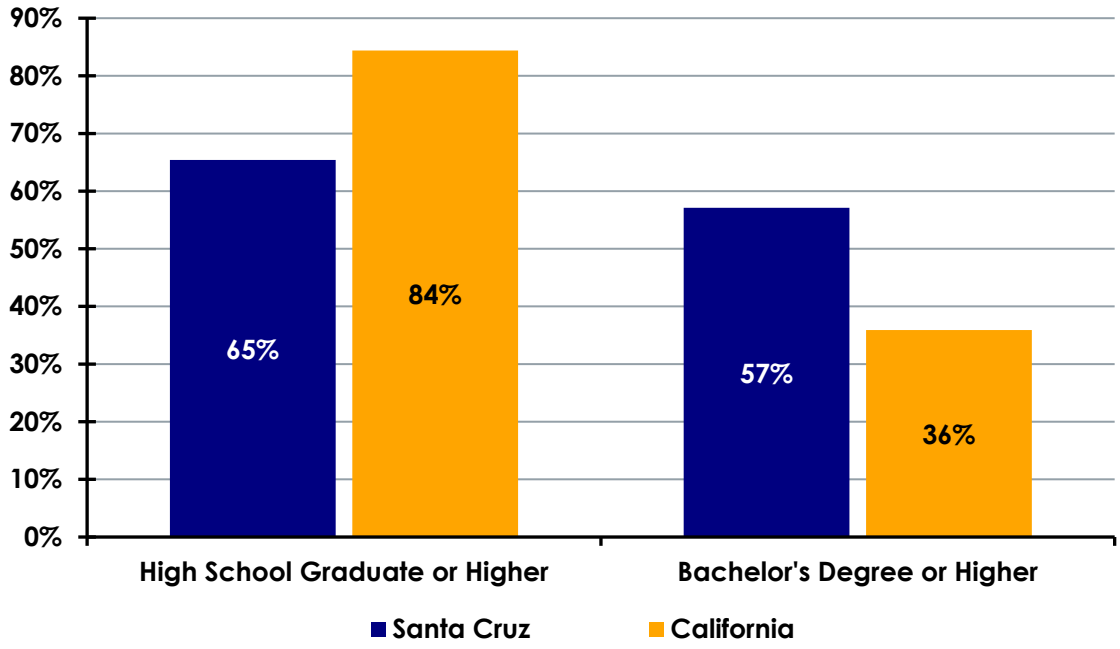
Figure 33: Population without Insurance



Education Levels

Educational attainment is not considered one of the at-risk populations. Still, it is recognized as another risk group when developing fire and life safety education programs. In the city, 65% of the population has a high school diploma, less than the state. Those with a bachelor's degree or higher are 57%. That is higher than the state at 36%. The following figure provides information on the levels of education in Santa Cruz.

Figure 34: Education Levels



Race & Ethnicity

Race is considered a person's identification with a social group, such as White, Black, African American, and Asian. At the same time, ethnicity identifies someone based on nationality, religion, language, or culture. The percentages do not total 100% because of multiple responses and separate questions where someone may identify as Hispanic (ethnicity) and select a race category. The Census allows for detailed write-in responses, which can be categorized into multiple racial groups. The following figure shows how race and ethnicity are represented in the city compared to the state.

Figure 35: Race and Ethnicity

Race and Ethnicity	Santa Cruz	California
White alone*	67.7%	70.4%
Black or African American alone	2.2%	6.5%
American Indian & Alaskan Native alone	1.0%	1.7%
Asian alone	10.1%	16.5%
Native Hawaiian & Other Pacific Islander alone	0.1%	0.5%
Two or more races	11.4%	4.3%
Hispanic or Latino (of any race)	21.2%	40.4%
White alone, not Hispanic or Latino	61.0%	34.7%

*White alone, not Hispanic or Latino, are individuals who responded "No, not Spanish/Hispanic/Latino" and who reported "White" as their only entry in the race question. Data were sourced directly from the U.S. Census QuickFacts page.

Housing Characteristics

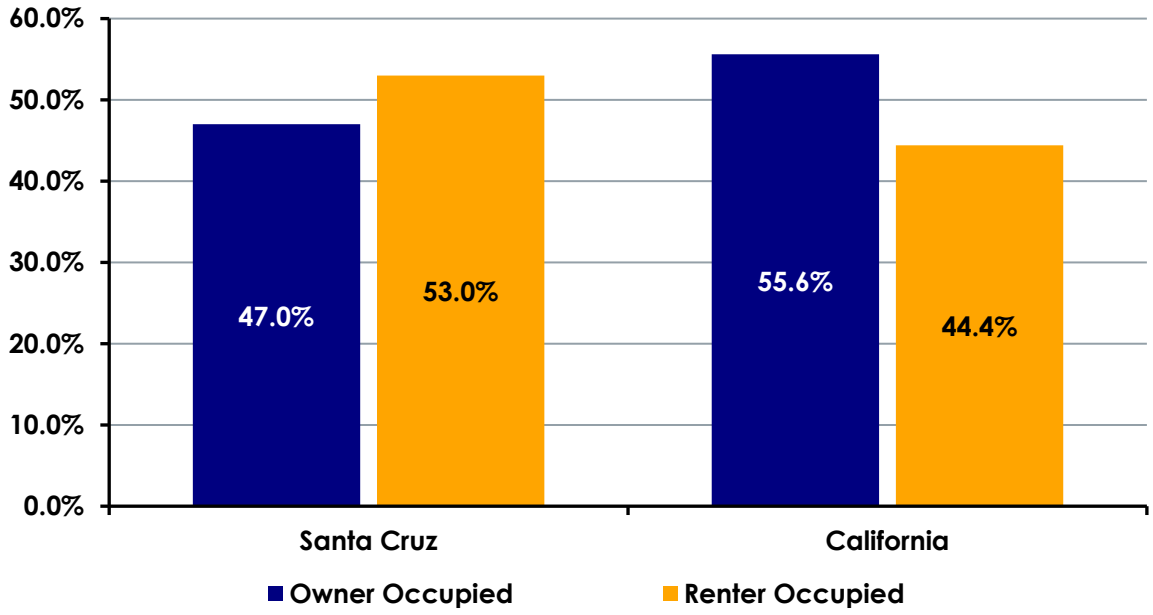
Housing types can vary in a community and provide insight into ownership, the age of the home, and the number of units in the building. The city has approximately 23,749 housing units, while 2,155 are vacant. Vacant structures can pose a risk for the fire department and community if the building is not secured to prevent entry. If the building is not maintained, the structural integrity can degrade and present problems during a fire. Vandalism may create additional problems for the fire department and law enforcement.

Data from the NFPA states that from 2015 to 2019, 75% of fire deaths occurred in homes, and 57% were male.

Housing Ownership

Homeownership in Santa Cruz is 47%, less than the state at 55.6%. The following figure shows the percentage of owner and renter-occupied housing in the city and the state.

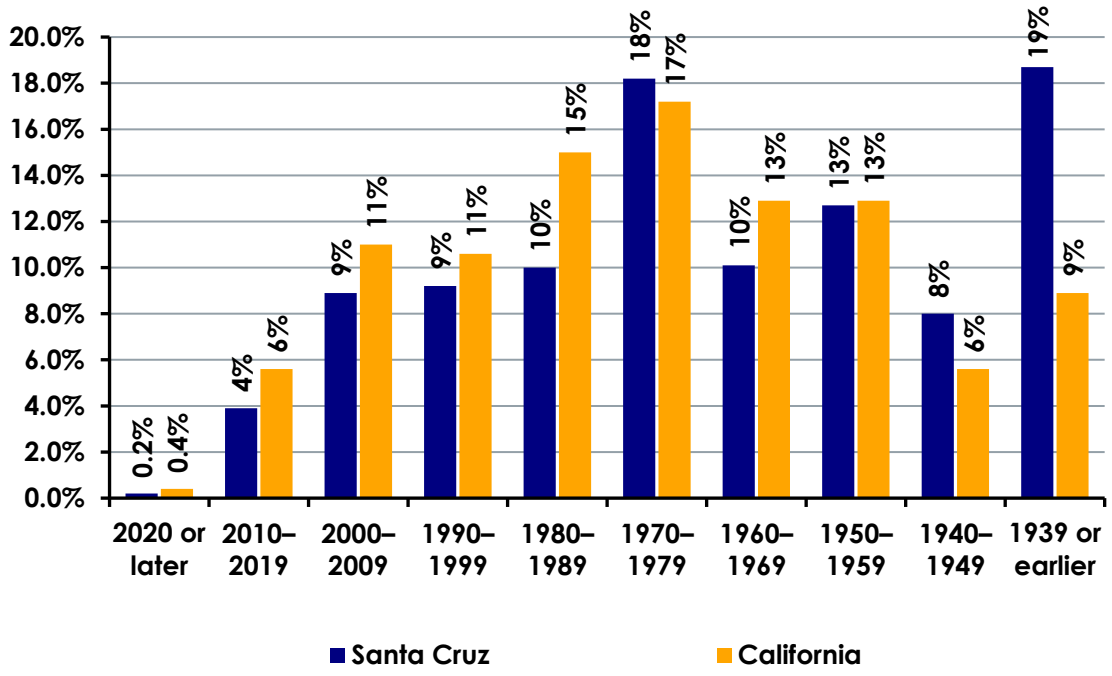
Figure 36: Owner and Renter Occupied Housing



Age of Housing

As buildings age, the cost of maintaining the structure increases over time. Homes built before smoke alarm installation requirements create a higher risk if none are present. The number of homes built before 1980 is 68%, before most building code requirements for smoke alarm installations. Working smoke alarms have reduced fire death and provided an early warning during the event of a fire. New codes now require smoke alarms for all residential properties in each bedroom, hall, and floor. The following figure provides the housing age by a decade.

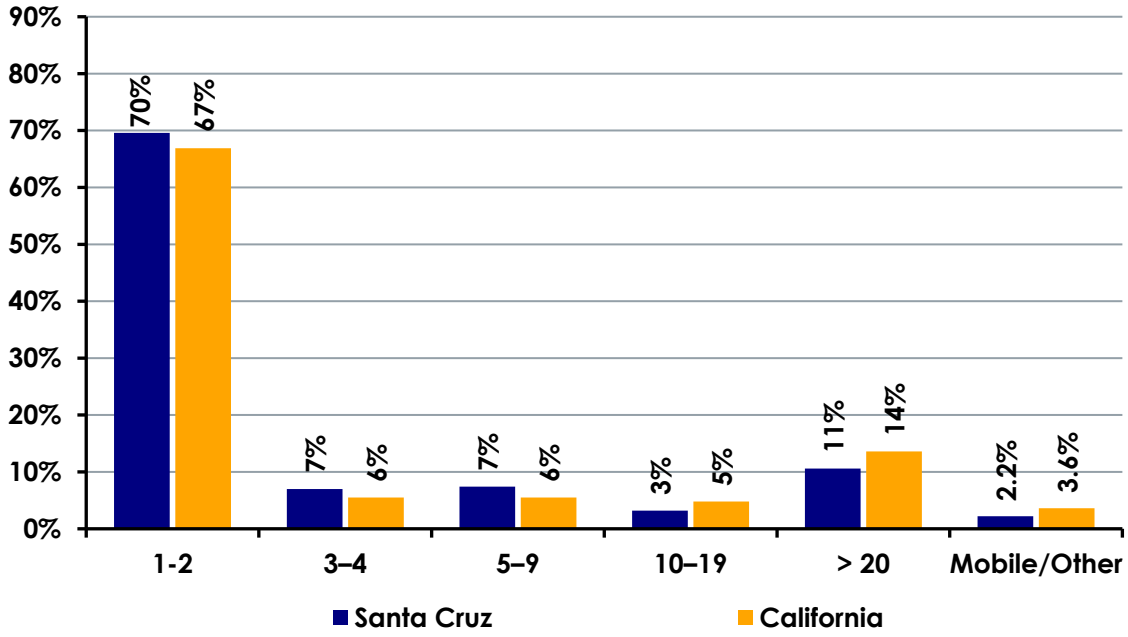
Figure 37: Age of Housing



Housing Units

The number of people living in one- or two-family dwellings is 70% compared to the state at 67%. The following figure lists the percentage of housing units by building.

Figure 38: Housing Units per Building



Environmental Hazards

All communities are continually threatened by physical hazards daily. Hazards can range from wildfires, earthquakes, flooding from heavy rains, or droughts. Mitigation plans provide public and emergency responders with information to understand the risks and prepare for an event.

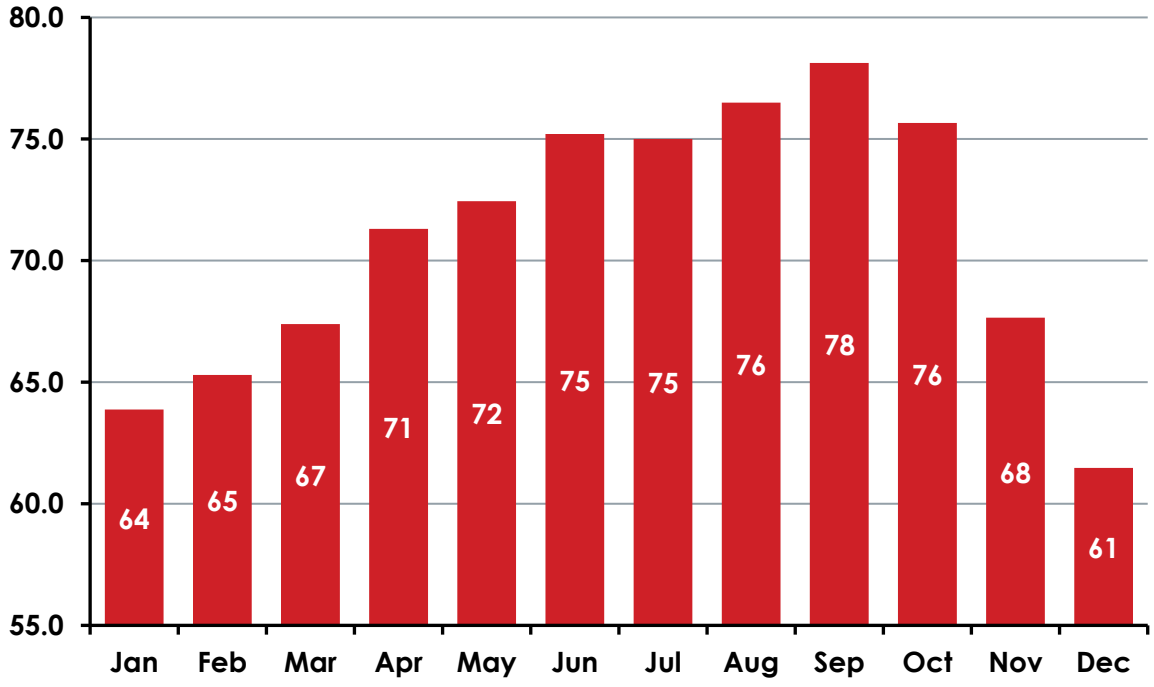
Weather Conditions

The climate can affect the city year-round and may impact emergency response. Whether it is a thunderstorm or other weather event, the fire department must respond when requested.

Temperature

The weather conditions in an area can impact the fire department and the entire community during the year.[39] When temperatures are high, they affect firefighters during extended incident operations and require rehabilitation to prevent heat exhaustion. The average high temperatures range from a low of 61°F during December to a high of 78°F in August. The following figure provides the average monthly high temperature.

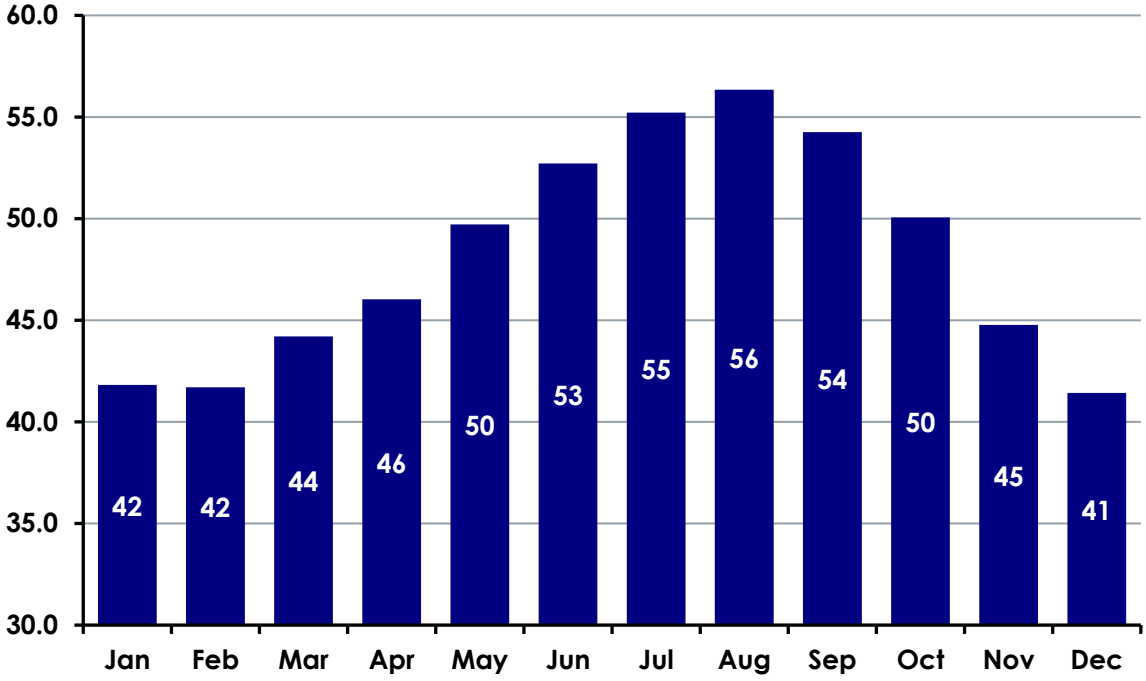
Figure 39: Average Monthly High Temperatures (2011–2023)



[39] Iowa Environmental Menoset website, Napa County Airport.

The average daily low temperature occurs between December and February at 41°F, and the warmest is during August at 56°F. The following figure shows the average daily low temperatures.

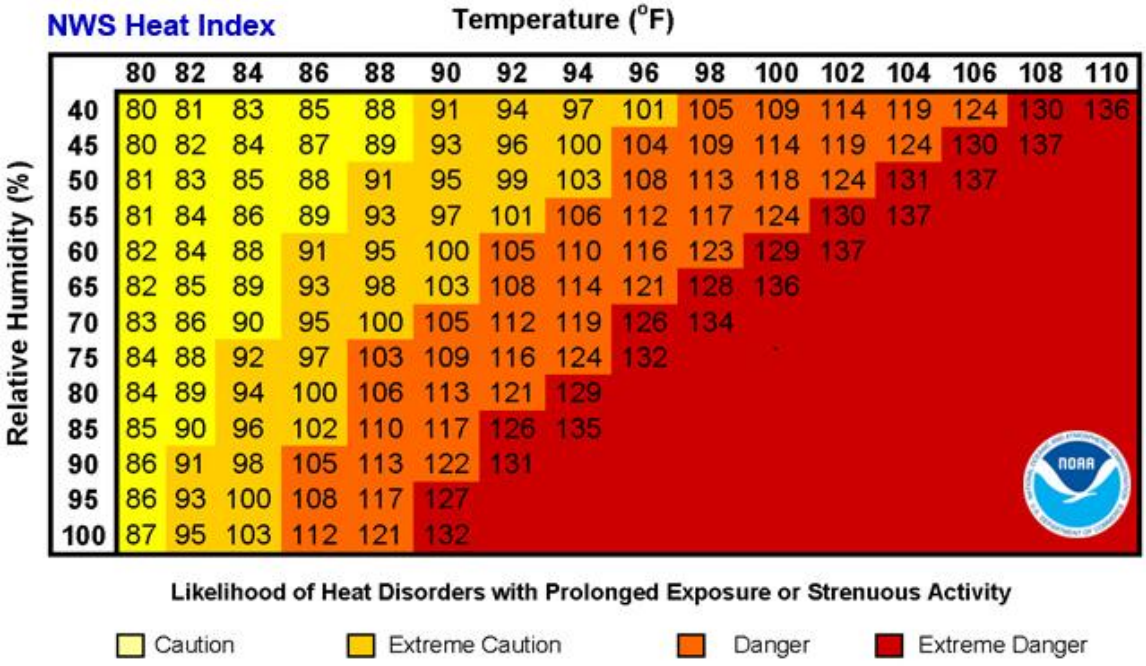
Figure 40: Average Monthly Low Temperature (2011–2023)



Heat can affect fireground operations, and when combined with high humidity, the temperature may feel much higher and require rehabilitation for firefighters. The below figure shows the National Weather Service's Heat Index chart.[40]

[40] National Weather Service website.

Figure 41: National Weather Service Heat Index Chart

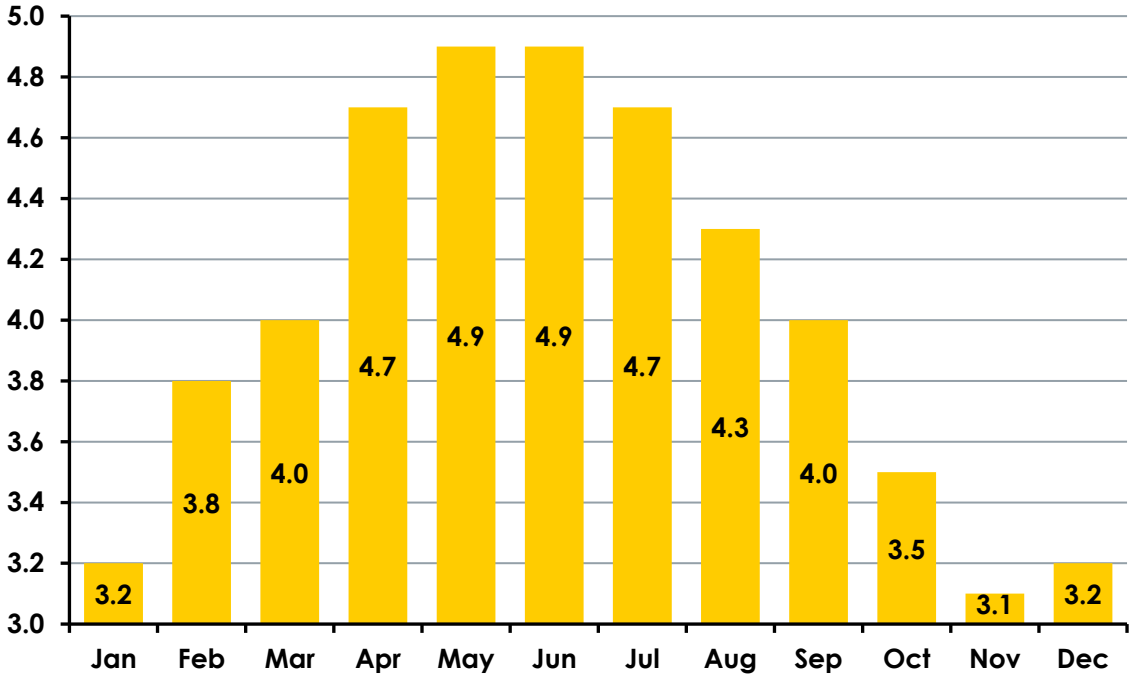


Winds

Wind speed and direction influence how the SCFD manages events like wildfires or hazardous materials incidents. The highest average winds occur between April and July of each year.[41] The following figure shows the average monthly wind speeds.

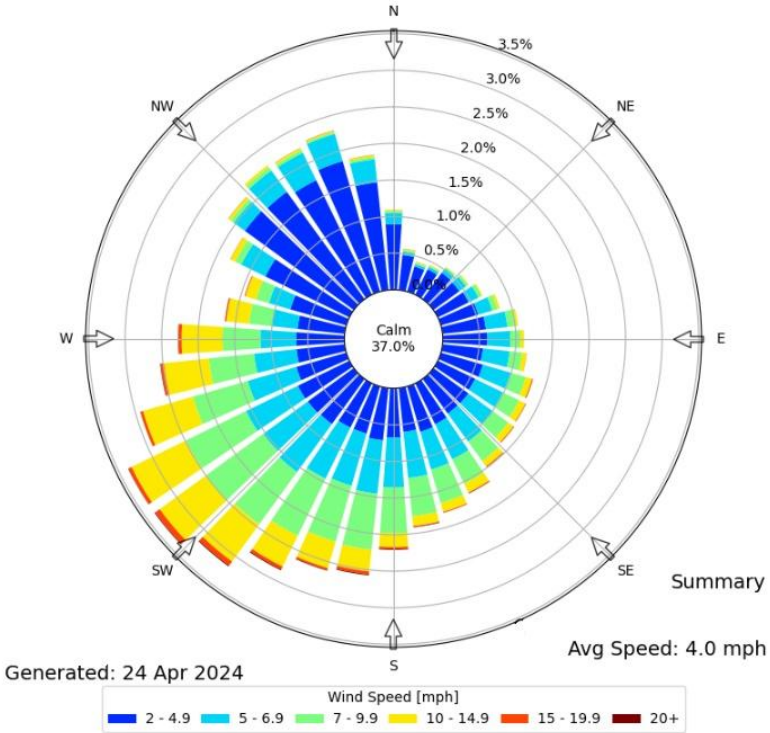
[41] Ibid.

Figure 42: Average Monthly Wind Speeds (2011–2023)



The prevalent winds are from the west, as shown in the following figure from the wind rose from the NWS at the Watsonville Airport reporting station.

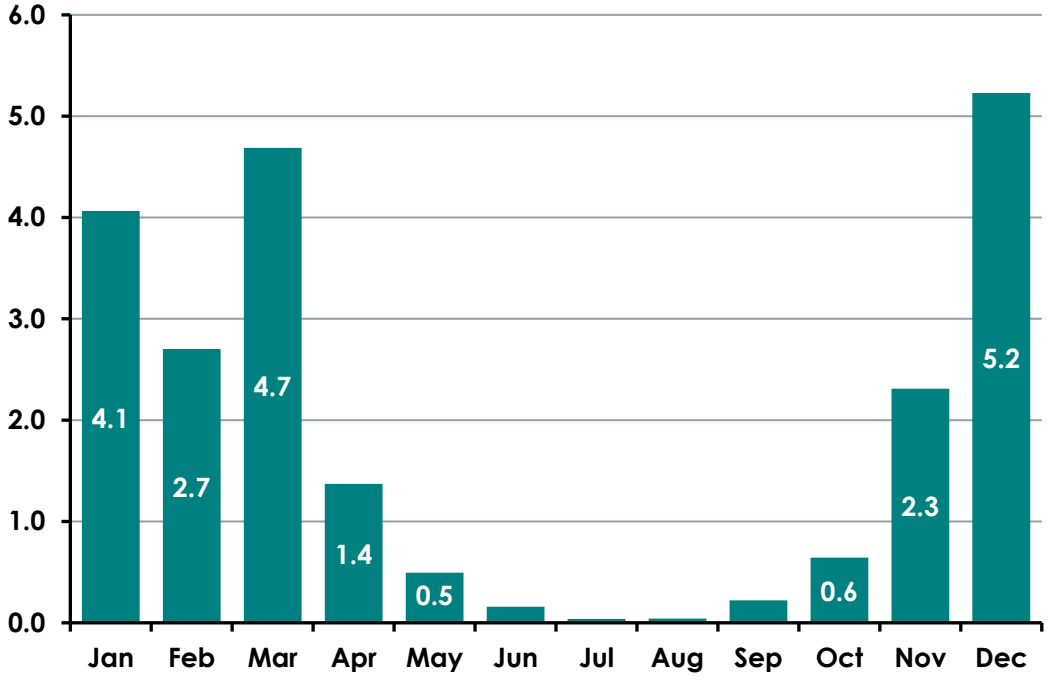
Figure 43: Wind Rose



Precipitation

The lack of precipitation for an extended period creates problems in a community. Drought increases the hazards of wildland fires as the vegetative moisture content decreases and generates higher combustible fuels. Insufficient rainfall affects the ability to grow crops and maintain landscaping. The months with the highest precipitation occur between December and March, as shown in the following figure.

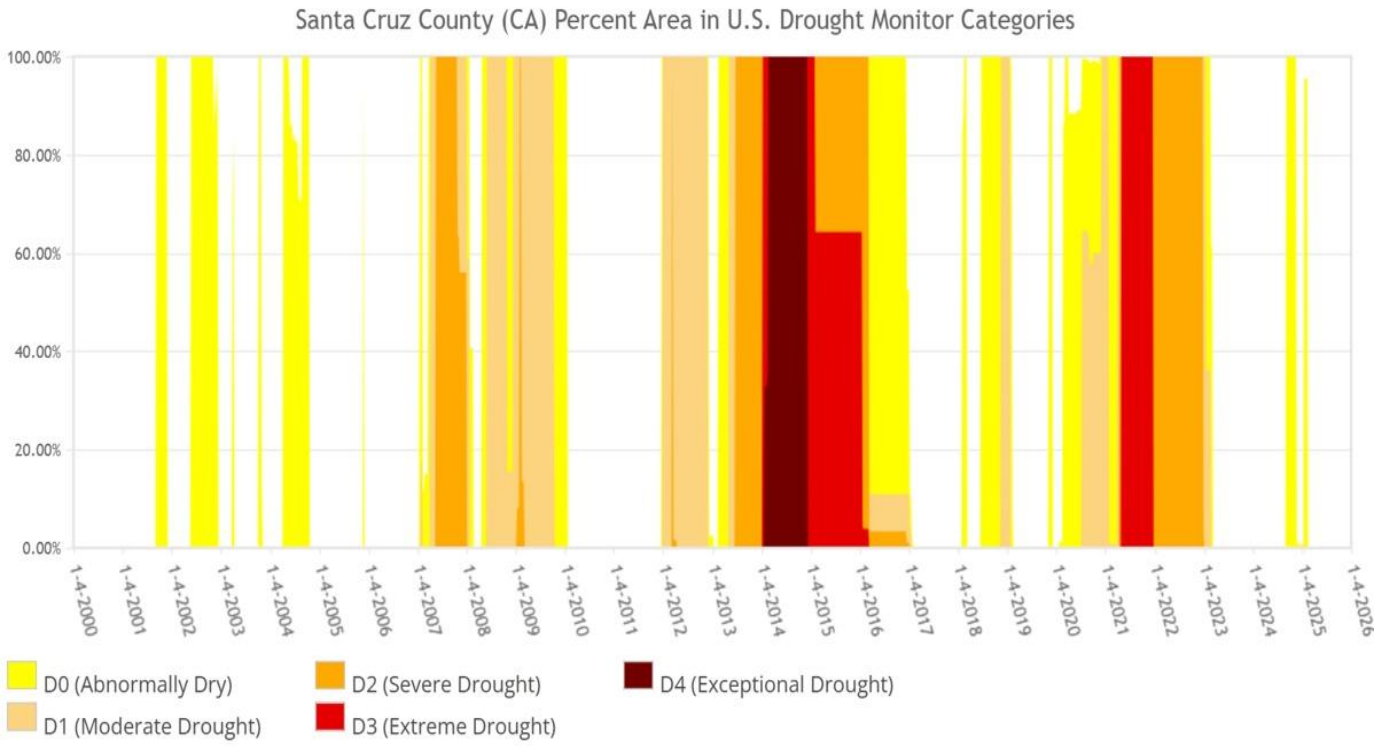
Figure 44: Average Monthly Precipitation (2011–2023)



Drought Conditions

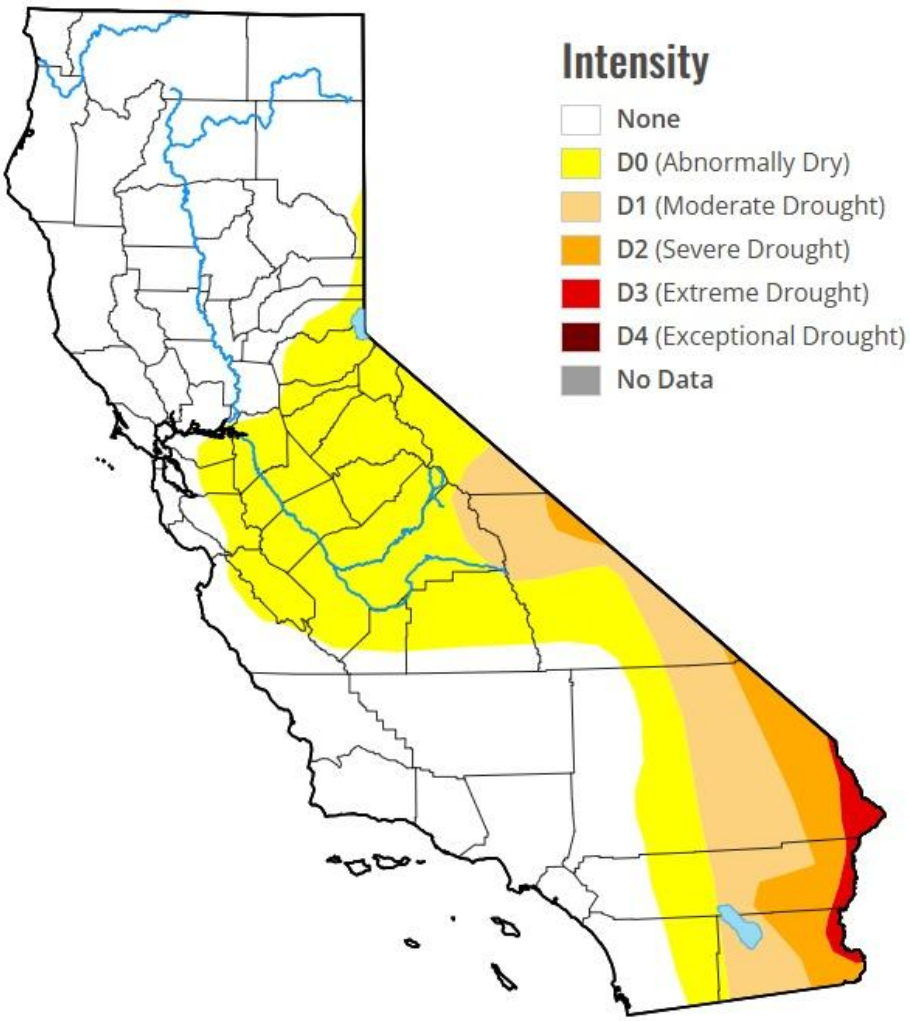
Santa Cruz County is not currently in a drought. However, the region was in severe drought until 2023, as noted in the following figure.

Figure 45: Drought Monitor (2000–2025)



The following figure shows the drought condition as of December 3, 2024.

Figure 46: Drought Conditions[42]



[42] U.S. Drought Monitor website.

Physical Hazards

A physical hazard is generally described as a natural disaster or weather event that affects the community. The event may last a few hours or extend for a lengthy period, such as a heatwave or drought. The National Weather Service (NWS) issues advisories, watches, or warnings for these hazards when conditions exist or are in the immediate forecast.

Wildland Fires

The city is a Local Responsibility Area (LRA), and there are Moderate and High Fire Hazard Severity Zones (VHFHSZ). These areas are along the city's northern outer regions and the mountains. The largest continuous areas are the campus of UCSC, Pogonip Open Space, De Laveaga, North Coast, Arroyo Seco / Western Drive, Arana Gulch, Carbonera, and Paradise Park.

To understand the wildland-urban interface (WUI), the SCFD must realize that it is an area where conditions create an environment that can lead to a high loss of life or property. Conditions like weather can cause fires in locations not considered in the WUI and impact the community. The City has adopted the 2022 California Fire Code and the WUI requirements for building construction and vegetative and fuel management. The following are new requirements for building construction.[43]

- Local AHJ (authority having jurisdiction) established a high fire hazard severity zone (CWPP).
- References 2019 California Building Code, Chapter 7A.
- References California Residential Code, Section R327.
- This applies to all new construction and materials used for remodels and construction.
- Includes fire or flame-resistant roofing material, roof vent coverings/screens, exterior siding, skylights, windows, doors, and decks.
- This applies to accessory structures on the same property.
- Fire exposure and acceptance criteria for fire resistance specified in SFM, NFPA, ASTM, and/or UL.

[43] City of Santa Cruz website, Reducing Wildfire Risks, https://www.cityofsantacruz.com/government/city-departments/fire-department/reducing-wildfire-risks.

The following are the requirements for vegetative and fuel management.

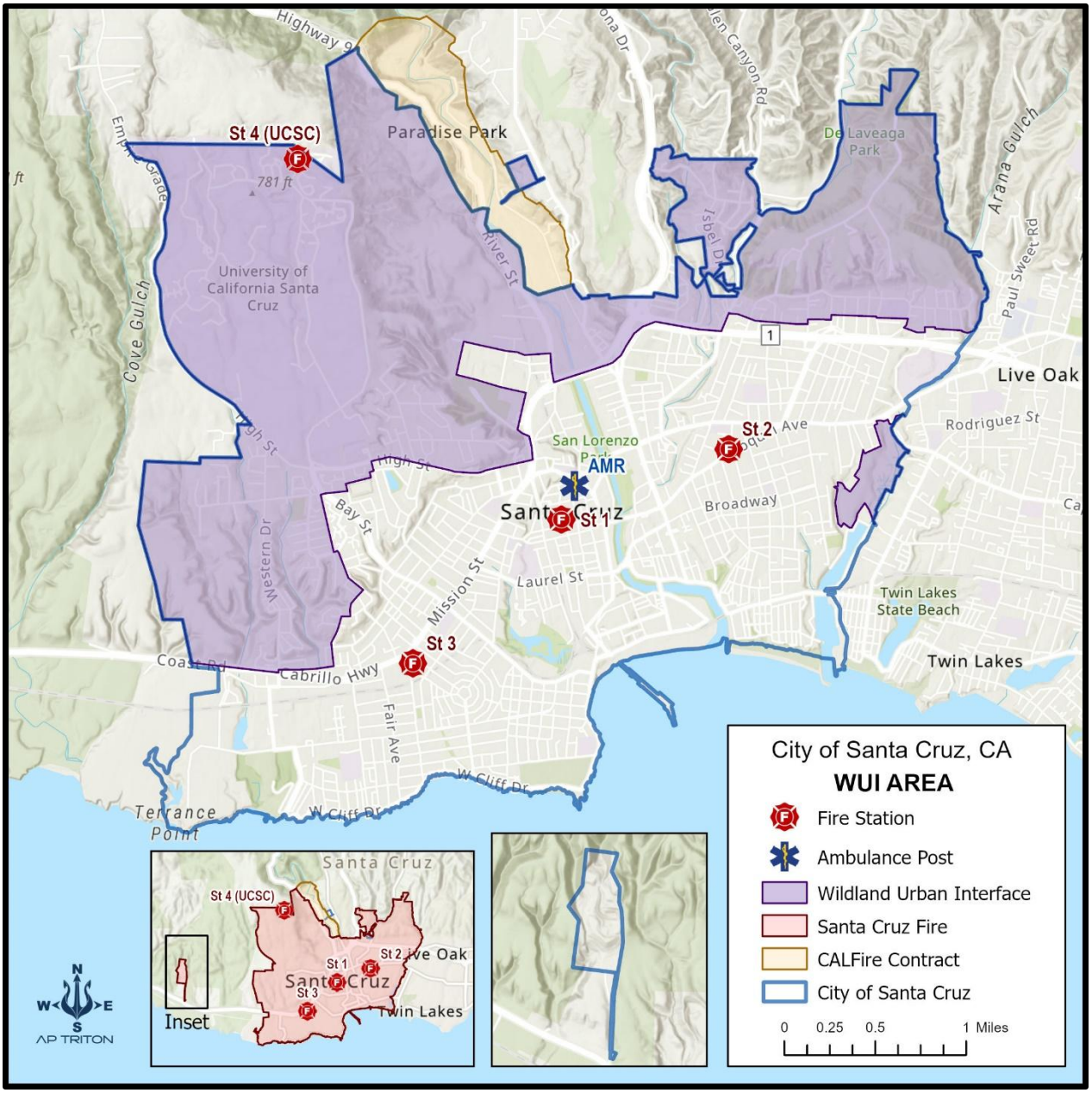
- Local AHJ (authority having jurisdiction) established a high fire hazard severity zone (CWPP).
- References Public Resources Code, Section 4291.
- Fuel management begins 100 feet from the structures(s), with the first 30 feet requiring the most intense management.
- Remove trees/branches that extend within 10 feet of the outlet of the chimney/stovepipe.
- Maintain vegetation adjacent to the overhanging of a building.
- Maintain the roof of a structure free of leaves, needles, or other vegetative materials.

Vacant lots must meet the City's weed abatement requirements that must be met by May 15. The SCFD provides vacant lot inspections, and if the parcel is not maintained, the City can bring the lot into compliance and charge the property for the mitigation to meet the City's minimum requirements. If a complaint is submitted, the SCFD will inspect the site to determine if it is out of compliance. All new homes are inspected before occupancy to ensure they meet the WUI code requirements. Building permits, including solar and energy systems, can also trigger these inspections.

The SCFD is an advisory member of the Fire Safe Council of Santa Cruz County and has assisted with significant mitigation efforts in public areas. Vegetation management has been completed using grants, and they are developing a resiliency plan for open spaces and critical infrastructure. The SCFD provides consultation services for private property owners, their property, and residents. They also respond to complaints.

The Firewise USA® program is very active. The program, developed by the National Fire Protection Association (NFPA), helps communities adapt to wildfires. It encourages neighbors to work together to reduce wildfire risks by taking proactive measures. The program provides resources and a structured approach for communities to create action plans that guide their risk-reduction activities. The SCFD reports that the City was the first in Santa Cruz County to formally establish a Firewise community, the Prospect Heights neighborhood on the upper east side of Santa Cruz. Two new Firewise communities have recently been developed in the city. The SCFD helps with semi-annual meetings, provides dumpsters for community-wide vegetation management, how to improve the hardscape surrounding their homes, and provides information on home hardening.

Figure 47: Fire Hazard Severity Zones



Flooding

There are areas in the city classified as regulated waterways by the Federal Emergency Management Agency (FEMA); the city has the following flood zones:[44]

- An area classified as an "A" zone is exposed to a 1-percent chance of a flood event. Still, it does not have a "…detailed hydraulic analysis."
- The AE designation is considered "areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods." It is further defined as a 26% chance of a flood occurring in 30 years.
- A99 designation is an area subject to inundation by the 1-percent-annual-chance flood event. Still, it will be protected after an under-construction federal flood protection system is completed. These are areas of special flood hazard where enough progress has been made in constructing a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may be used only when the flood protection system has reached specified statutory progress toward completion. No BFEs or flood depths are shown.
- VE designation is areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. BFEs derived from detailed hydraulic coastal analyses are shown within these zones.
- Zone "X" is a "moderate risk area within the 0.2-percent annual chance floodplain.

The San Lorenzo River and the Arana Gluch have regulated waterways as identified by FEMA flood zone maps. The regulated waterways for the San Lorenzo River begin in the mountains above the city and extend to the Pacific Ocean. The regulated waterways for the Arana Gulch extend from the Woods Lagoon to the north of the Cabrillo Highway.

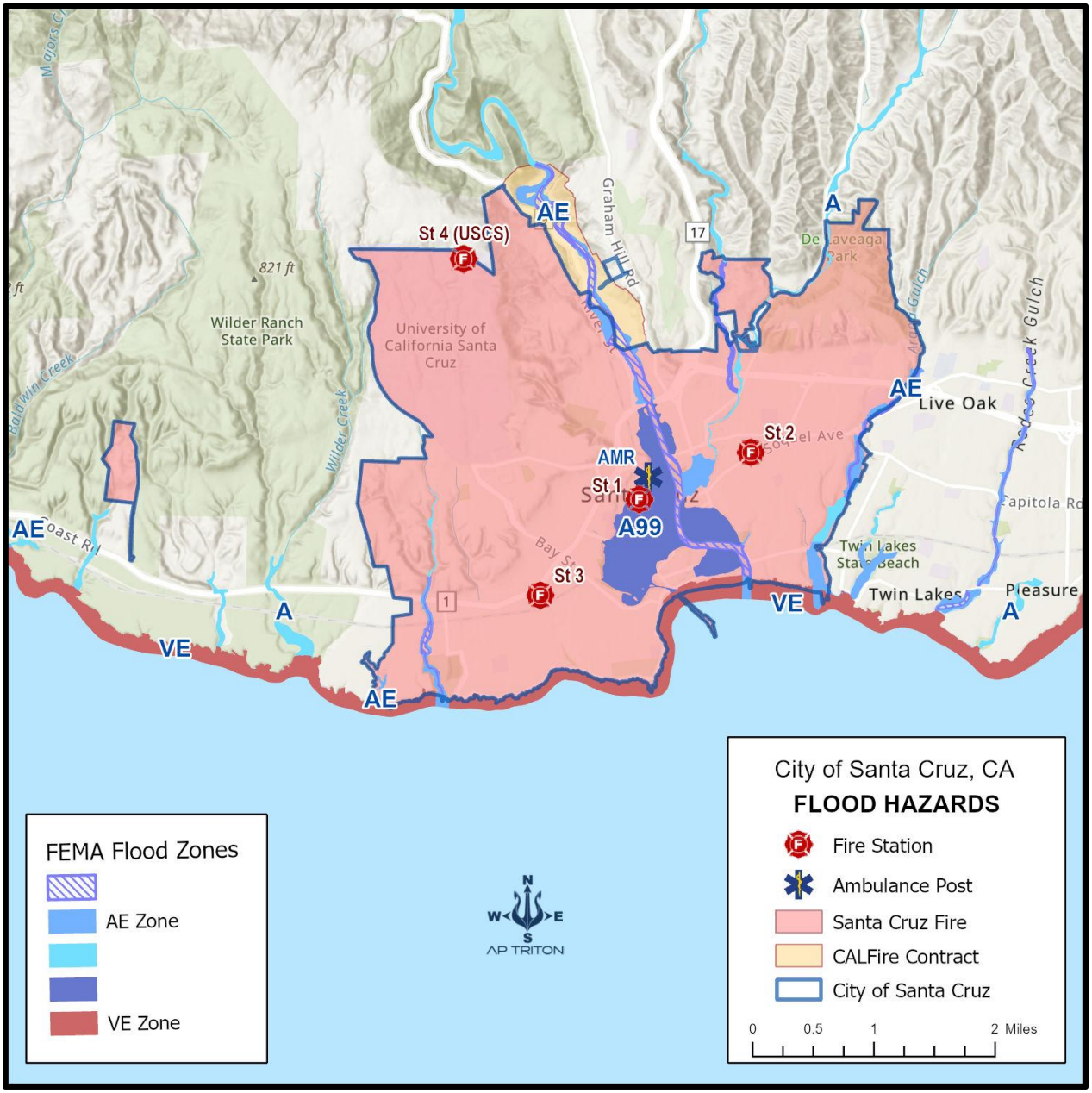
Flooding can occur in a location for multiple reasons, including heavy or extended periods of rainfall, overflowing rivers and creeks, tsunamis, storm surges, dam or levee failures, and development when urbanization occurs.

[44] FEMA Flood Map Service Center website.

There have been numerous flooding events in recent recorded history in the city, according to the Hazard Mitigation Plan (HMP), dating back to the late 1700s. Flooding from the San Lorenzo River has spilled into the floodplain surrounding the river. Floodwalls and levees have been built along the river from the Cabrillo Highway to the Pacific Ocean, which has reduced the amount of flooding. The most recent events occurred in January and December 2023 during the heavy rain and storm conditions along the coast. The HMP considers flooding from rainfall and coastal storms a significant risk for the city.

The following figure shows the locations of the Federal Emergency Management Agency's flood hazard zones.

Figure 48: Flood Hazard Zones

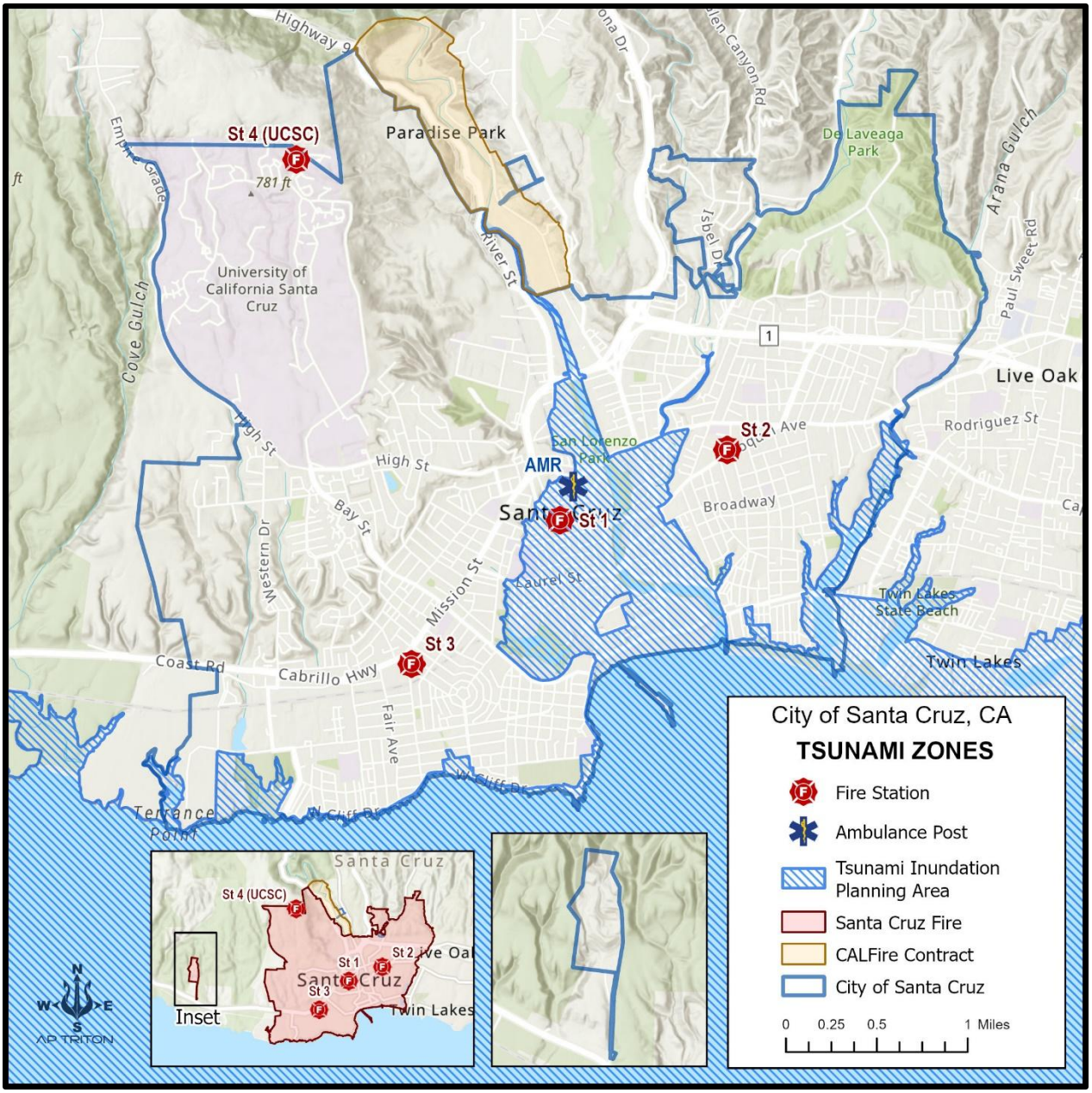


Tsunami

There is a chance of a tsunami occurring in the city caused by a seismic event. The HMP identifies a tsunami as a significant risk. Tsunamis may impact the city, including teletsunamis, which occur from an earthquake in the Pacific Ocean or the numerous faults in the region. These events may occur in the Pacific Ocean or the Pacific basin and create tsunami waves that reach the coast of Santa Cruz County. The most recent event with significant damage occurred in 2011 after a 9.0 magnitude earthquake struck Japan. The waves associated with the tsunami caused approximately $20 million in damage in Santa Cruz Harbor. In January 2022, a tsunami advisory was issued because of the underwater Tongan volcano eruption in the Pacific Ocean.

The SCFD provides prepared information on its website, which links to the inundation map from the California Department of Conservation. The most recent inundation maps were updated in 2022, impacting more than 8,000 address points and a population of approximately 18,000 in the city. Other information includes staying at least 100' above the sea or 1–2 miles inland. SCFD has a standard operating procedure for a tsunami. The following figure shows the tsunami inundation areas.

Figure 49: Tsunami Inundation Areas



Earthquakes

An earthquake may cause damage to infrastructure depending on the severity and location. If roads or highways are damaged, assistance from outside agencies may be delayed and impact the community. Other impacts include loss of utilities, damage to buildings, injuries, and loss of life. The probability of an earthquake is considered a significant risk per the City of Santa Cruz Local Hazard Mitigation Plan 2018–2023 (HMP).

Six major fault zones or systems are within 15 miles of the city. They include the San Andreas, San Gregorio, Zayante, Butano, and the Monterey Bay Fault Zone. The Ben Lomond fault crosses over W Cliff Dr and travels northward to near Glenn Coolidge Dr. It continues following the San Lorenzo River north of the University of California Santa Cruz.[45]

The most recent significant earthquake (Loma Prieta) occurred in 1989, with a magnitude of 7.1. Other significant earthquakes in recent history were the 1906 (8.3 magnitude) and 1926 (6.1 magnitude) earthquakes. The 1989 Loma Prieta earthquake, about 10 miles east of the city, caused two deaths and destroyed much of the downtown area. The following figure from the HMP shows California's ten most likely earthquake scenarios. Since most of these scenarios are in the Bay Area of California, they will likely impact the city. There is an SOP for an earthquake event.

[45] Santa Cruz Museum of Natural History, https://www.santacruzmuseum.org/rock-record-the-faults-that-shape-santa-cruz/.

Figure 50: Ten Most Likely Earthquake Scenarios in California[46]

Ten Most Likely Damaging Earthquake Scenarios	30-year probability	Magnitude
Rodgers Creek	15.2%	7.0
Northern Calaveras	12.4%	6.8
Southern Hayward (*possible repeat of the 1868 earthquake*)	11.3%	6.7
Northern + Southern Hayward	8.5%	6.9
Mt. Diablo	7.5%	6.7
Green Valley-Concord	6.0%	6.7
San Andreas: Entire Northern California segment (*possible repeat of 1906 earthquake*)	4.7%	7.9
San Andreas: Peninsula segment (*possible repeat of 1838 earthquake*)	4.4%	7.2
Northern San Gregorio segment	3.9%	7.2
San Andreas: Peninsula + Santa Cruz segment	3.5%	7.4

Liquefaction is caused when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking.[47] This can cause major damage to buildings and other structures during earthquakes and is a significant risk in the city because of the soil types. The soils in the Santa Cruz area are conducive to liquefaction and create higher risks for the community.

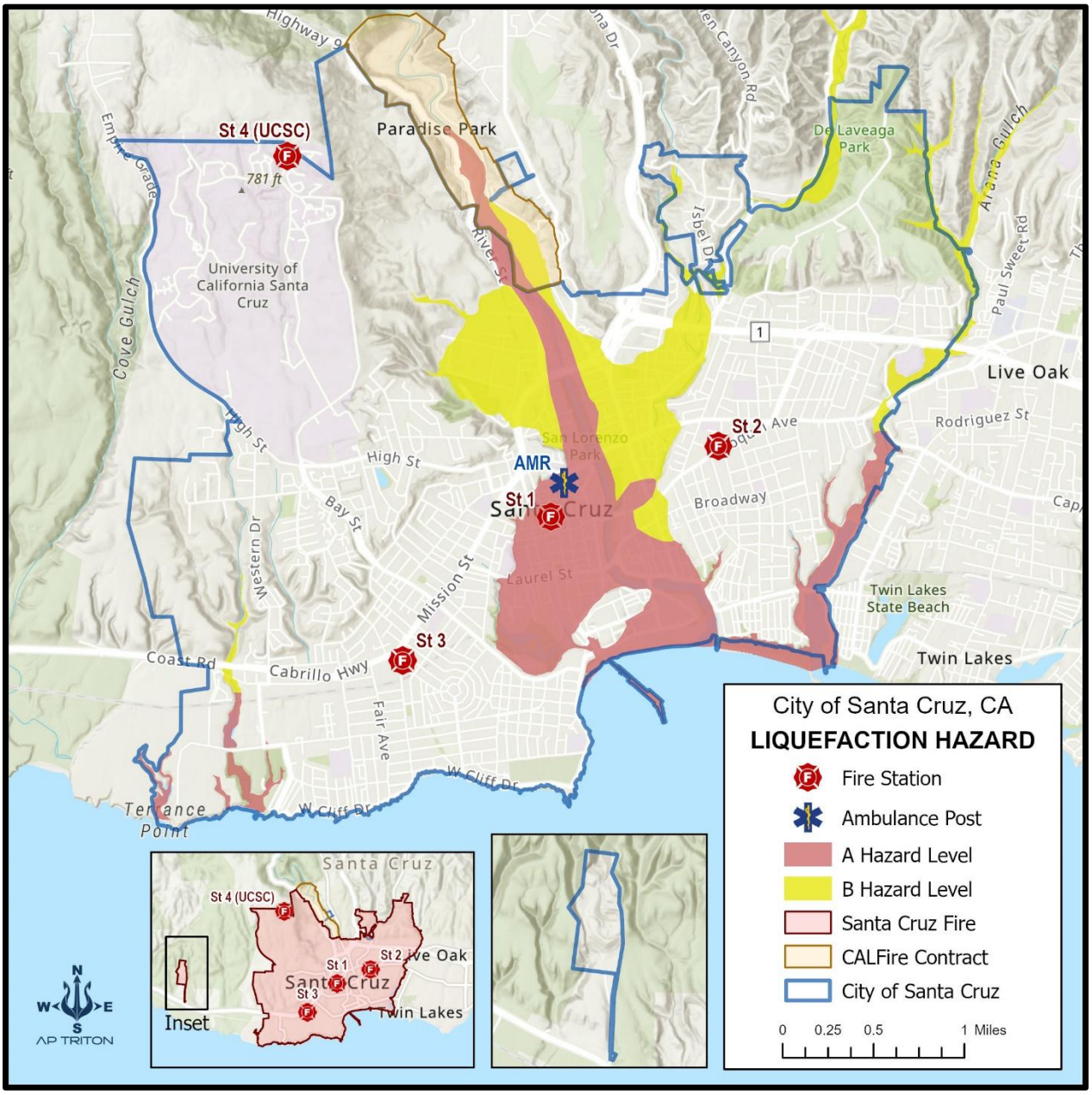
Liquefaction Hazard Level A zones refer to areas with the highest susceptibility to liquefaction during an earthquake. These zones typically include regions with loose, saturated soils, such as human-built landfills or areas with young, unconsolidated sediments. Hazard Level B zones indicate areas with a moderate to high susceptibility to liquefaction. These zones are less susceptible than Level A but pose a significant risk during seismic events.

[46] City of Santa Cruz Local Hazard Mitigation Plan Five Year Update 2018–2023.

[47] United States Geological Society, What is liquefaction?, https://www.usgs.gov/faqs/what-liquefaction.

The following figure provides the location of liquefaction hazard areas.

Figure 51: Liquefaction Hazard Areas



Marine Rescue

The marine rescue division provides water rescue services along the oceanfront, as discussed in this report's Review of Services section. The following figure shows the number of water-related National Fire Incident Reporting System (NFIRS) types between 2018 and 2023.

Figure 52: Water-Related Incident Types (2019–2023)

Water-Related Incident Type	2019	2020	2021	2022	2023	Total
342–Search for a Person in Water	16	21	22	12	16	**87**
360–Water & Ice-Related Rescue, Other	4	0	0	19	0	**23**
361–Swimming/Recreational Water Areas Rescue	8	7	13	10	13	**51**
363–Swift Water Rescue	4	0	0	0	5	**9**
364–Surf Rescue	110	39	80	58	142	**429**
365–Watercraft Rescue	13	0	13	23	13	**62**

Critical Infrastructure

Critical infrastructure and key resources (CIKR) explain what is crucial for a community's functioning in a modern economy. Critical infrastructure is defined as a sector "whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof." There are sixteen defined Critical Infrastructure Sectors (CIS):[48]

- Chemical Sector
- Commercial Facilities Sector
- Communications Sector
- Critical Manufacturing Sector
- Dams Sector
- Defense Industrial Base Sector
- Emergency Services Sector
- Energy Sector
- Financial Services Sector
- Food and Agriculture Sector
- Government Facilities Sector
- Healthcare and Public Health Sector
- Information Technology Sector
- Nuclear Reactors, Materials, and Waste Sector
- Transportation Systems Sector
- Water and Wastewater Systems Sector

All these sectors may not be in the city; each community must determine critical infrastructure locations and develop pre-incident plans for responding personnel.

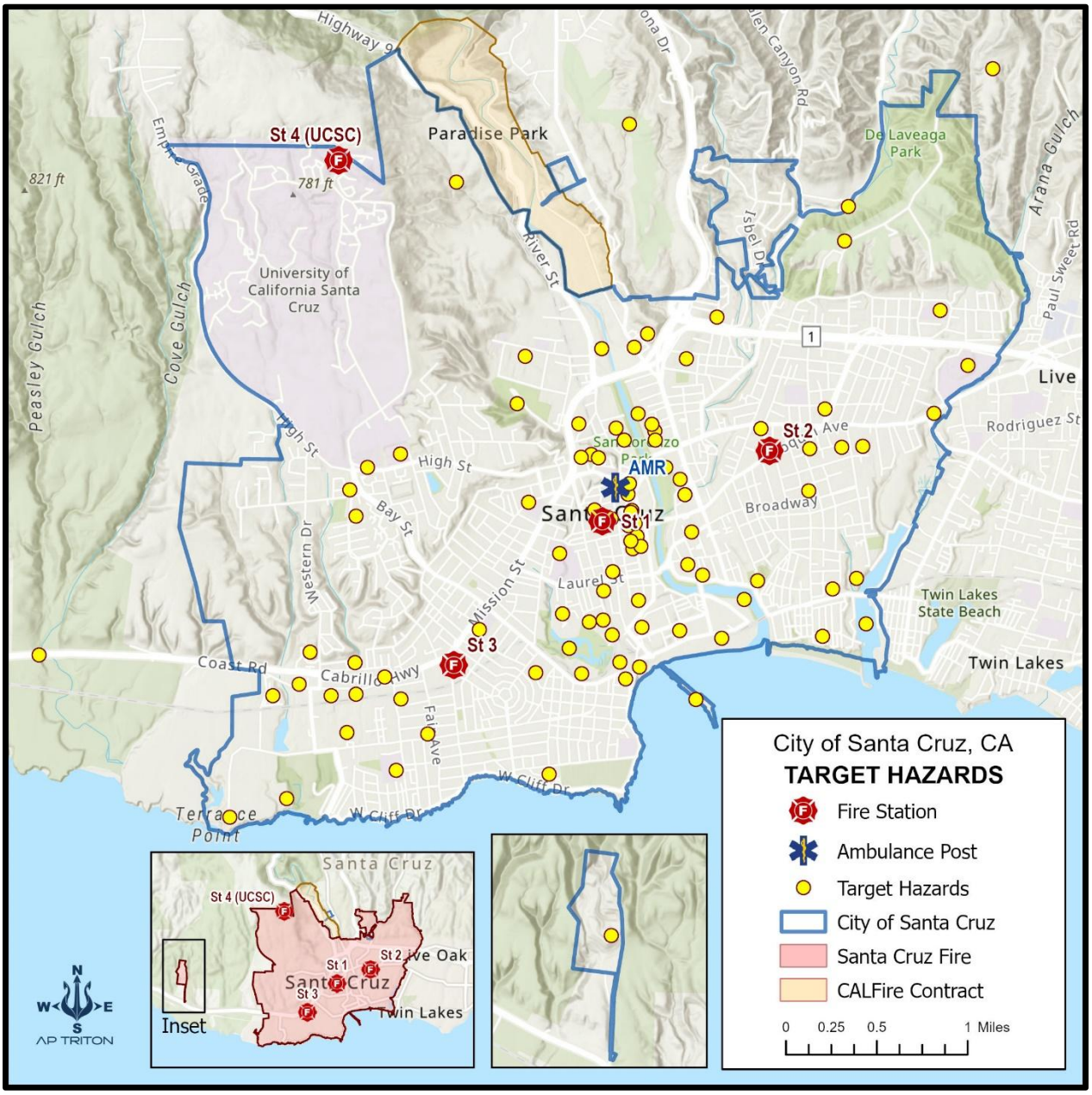
Other buildings to consider as target hazards could include occupancies with a potential for a significant loss of life, such as places of public assembly, schools, childcare centers, medical and residential care facilities, and multi-family dwellings. Other considerations include buildings with substantial value to the community—economic loss, replacement cost, or historical significance—that, if damaged or destroyed, would have a significant negative impact.

[48] Infrastructure Security, Department of Homeland Security.

Target Hazards

A target hazard is a location or facility that poses a risk to the community. The CIKR provides a list of sectors that are critical to a community. Target hazards also include high-value buildings and historic or cultural sites. Identifying these locations allows a fire department to prepare for potential emergencies and ensure they have the appropriate resources and strategies to prevent, respond, and mitigate risks. The following figure shows the locations of target hazards identified by the SCFD.

Figure 53: Target Hazards



Hazardous Materials

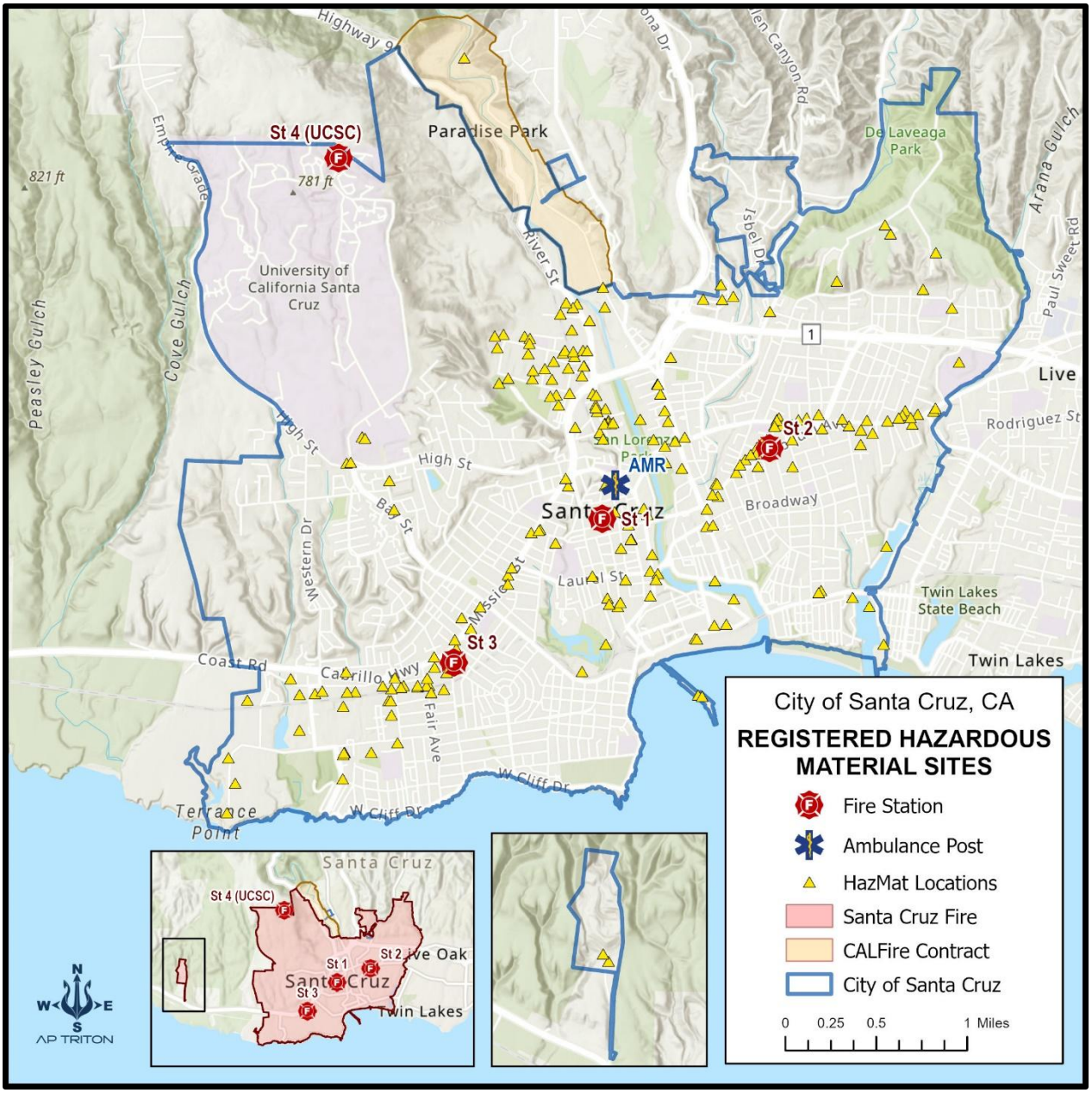
Events that occur without warning or that are unknown and suddenly appear are considered technological hazards. Examples include industrial accidents or hazardous chemical releases. Each community should create contingency plans for the specific risks in its jurisdiction. This may include permitting, periodic fire and life safety inspections, and pre-incident planning. These activities are designed to reduce risks and provide on-site visits for fire department personnel.

Suppose a building or facility that stores or produces hazardous materials has been identified. In that case, special personal protective clothing and equipment may be required to control or mitigate the event. Locations with hazardous materials on-site for any time during the year exceeding the limits established by the Environmental Protection Agency are required to file Tier II reports. These reports are provided to local jurisdictions, local emergency planning committees, and the State's Emergency Response Commission as required by the Emergency Planning and Community Right-to-Know Act of 1986, also known as Superfund Amendments and Reauthorization Act (SARA) Title III. These thresholds require submission:

- Ten thousand pounds for hazardous chemicals.
- The lesser of 500 pounds or the threshold planning quantity for extremely hazardous chemicals.
- California requires additional reporting quantities through a five-tier system that authorizes the treatment and storage of hazardous waste.

The SCFD personnel are trained in hazardous materials response at awareness, operational, and technician levels. The SCFD is a cooperating agency with the Santa Cruz Hazardous Materials Inter-agency Team. This team includes other fire departments in the county. The hazardous materials unit is housed at the Scotts Valley Fire District Station 2. It provides equipment for decontamination, plume modeling, weather analysis, gas monitoring, plugging, diking, and spill containment. Santa Cruz County conducts the Certified Unified Program Agency hazardous materials inspections within the city. The following figure shows the storage locations of Tier II hazardous materials.

Figure 54: Hazardous Materials Tier II Locations



Highways & Roads

Emergency personnel need a transportation network to respond efficiently to an incident. A delayed response can occur without a system of interconnected roads and streets. Interconnectivity provides multiple access points to a location if another approach is unavailable. Many of the streets in the city are on a grid system, while others are winding and interspersed with cul-de-sacs with only one access point. California Hwy 1 (Cabrillo Hwy) is the primary thoroughfare through the city and is controlled access from the eastern city limits to Mission St. Other collector streets include Soquel Ave, Water St, High St, Bay Dr, Laurel St, and Broadway. Buildings on the University of California, Santa Cruz (UCSC) campus can present a risk if fire apparatus cannot access them during an incident. The following figure shows vehicles' and trucks' annual daily traffic counts.[49]

Figure 55: Annual Average Daily Traffic Vehicle and Truck Counts

Location	Annual Average Daily Vehicle Count	Annual Average Daily Truck Counts
Cabrillo Hwy at Soquel Ave	98,000	5,880
Cabrillo Hwy at River St	45,000	N/A
River St at Cabrillo Hwy	25,500	1,785
River St north of Vernon St	5,700	171

The following figure shows the location of major roads in Santa Cruz.

[49] 2022 Caltrans Vehicle and Truck annual Average Daily Traffic counts websites.

Figure 56: Major Roads

Energy

The ability to provide energy is a necessary component of a thriving community. The community depends on energy sources: electricity generation and transmission systems, fuel distribution and storage tanks, or natural gas pipelines and regulator stations.

Electricity

Pacific Gas and Electric (PGE) provides electrical services in Santa Cruz. A 66-kilovolt electrical transmission line travels along Delaware Ave to Centennial St, north on Centennial St to Bay St, California St from Bay St, and ultimately terminating at the end of Blaine St. Another section travels north from Delaware Ave along an easement to Nobel Dr, continues to Meter St, and then turns westward to the vicinity of the Home of Peace Cemetery.[50]

A 2.8-megawatt solar photovoltaic facility with battery storage is at the UCSC East Remote Parking Lot. UCSC also operates a 4.4-megawatt natural gas-fired combustion turbine for additional power generation.[51]

An electrical substation steps down the voltage in the distribution system for residential and commercial users. Emergency responders must exercise extreme caution if an incident occurs at one of these locations. Entry by the SCFD personnel to a sub-station should not happen until representatives of PGE arrive on the scene and give clearance.

Natural Gas

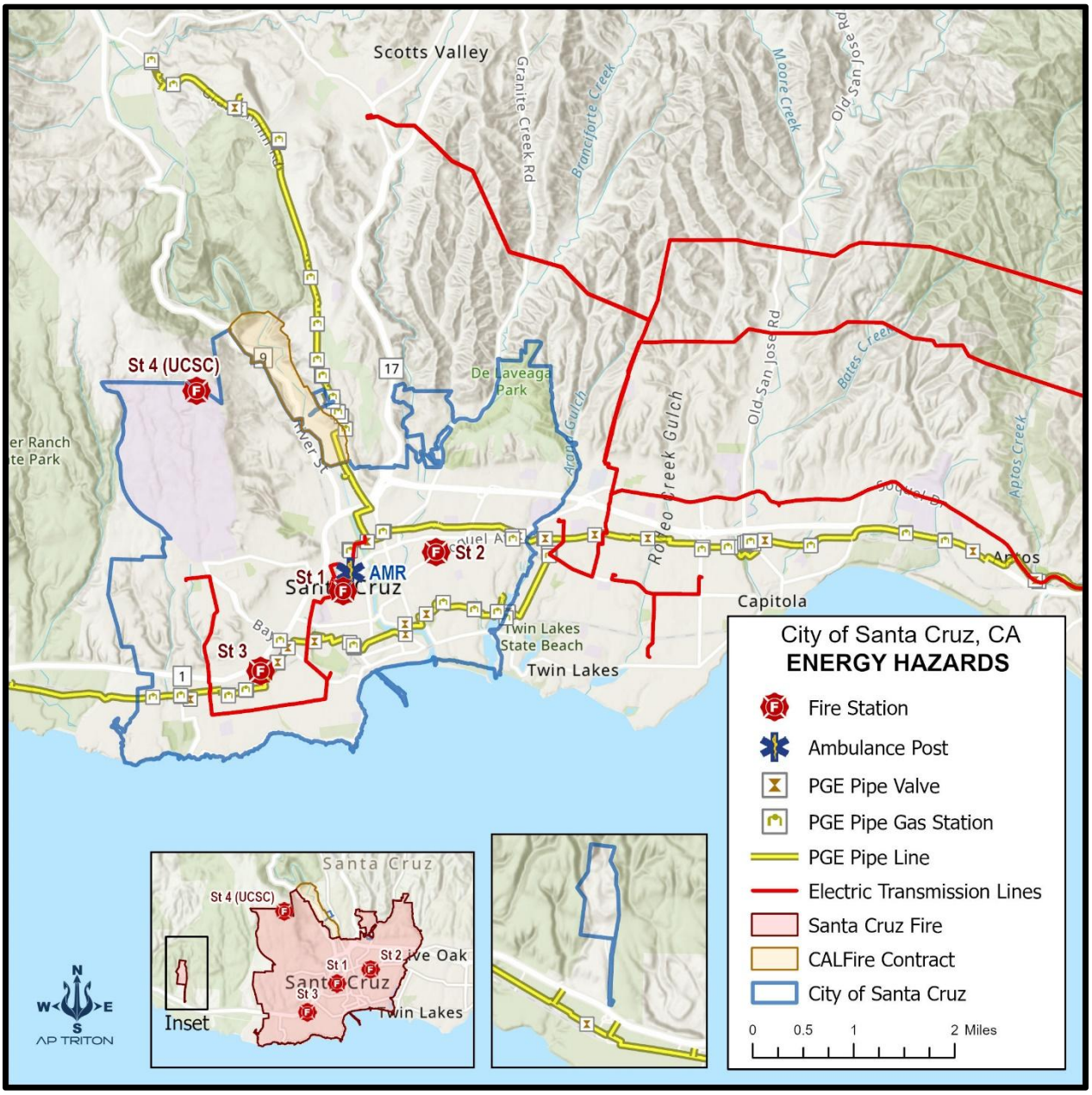
PGE provides natural gas in Santa Cruz County through transmission and high-pressure distribution lines that supply service lines for commercial and residential use. PGE's natural gas transmission pipelines travel along several easements through the department, which run north-south and east-west. Natural gas incidents are often caused by contractors who cut or damage lines during construction excavation.

[50] Homeland Infrastructure Foundation-Level Data, Geospatial Management Office website.

[51] U.S. Energy Atlas website.

The following figure shows the locations of energy hazards in Santa Cruz.

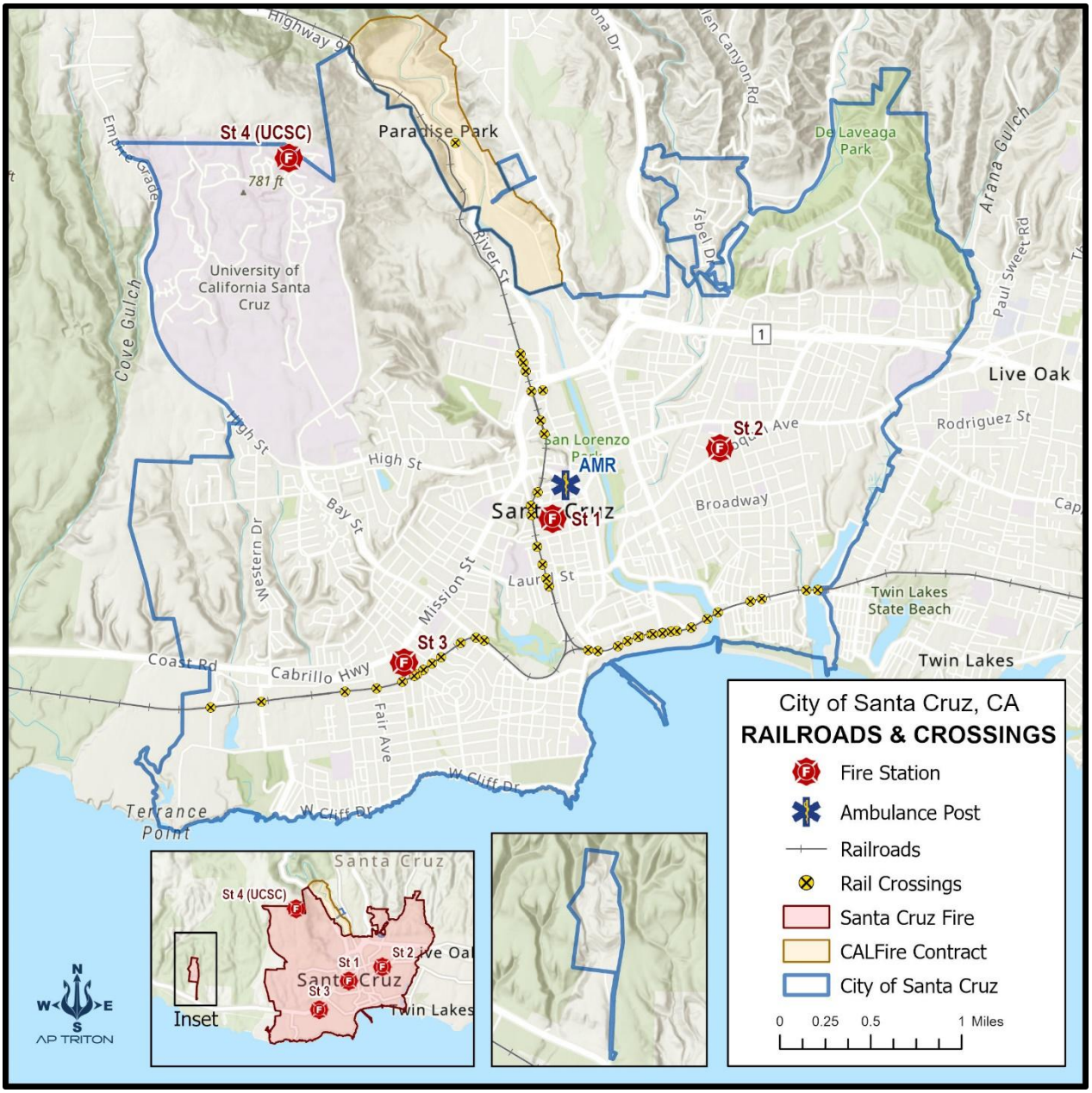
Figure 57: Energy Hazards



Railways

Union Pacific previously operated the rail line that passes through Santa Cruz County. However, it was purchased by the Regional Transportation Commission in 2012. No freight train service is provided to Santa Cruz. Roaring Camp Railroads now uses the rail line for excursion trains that depart and arrive in Santa Cruz. The rail line travels in the middle of Beach St, creating problems for pedestrians or vehicles when a train uses this rail section. The train travels through a tunnel in the city. The rail line corridor is being developed as a multi-use and pedestrian trail. These locations can present access issues for the SCFD during an incident. The following figure shows the location of rail lines and crossings.

Figure 58: Railway Location



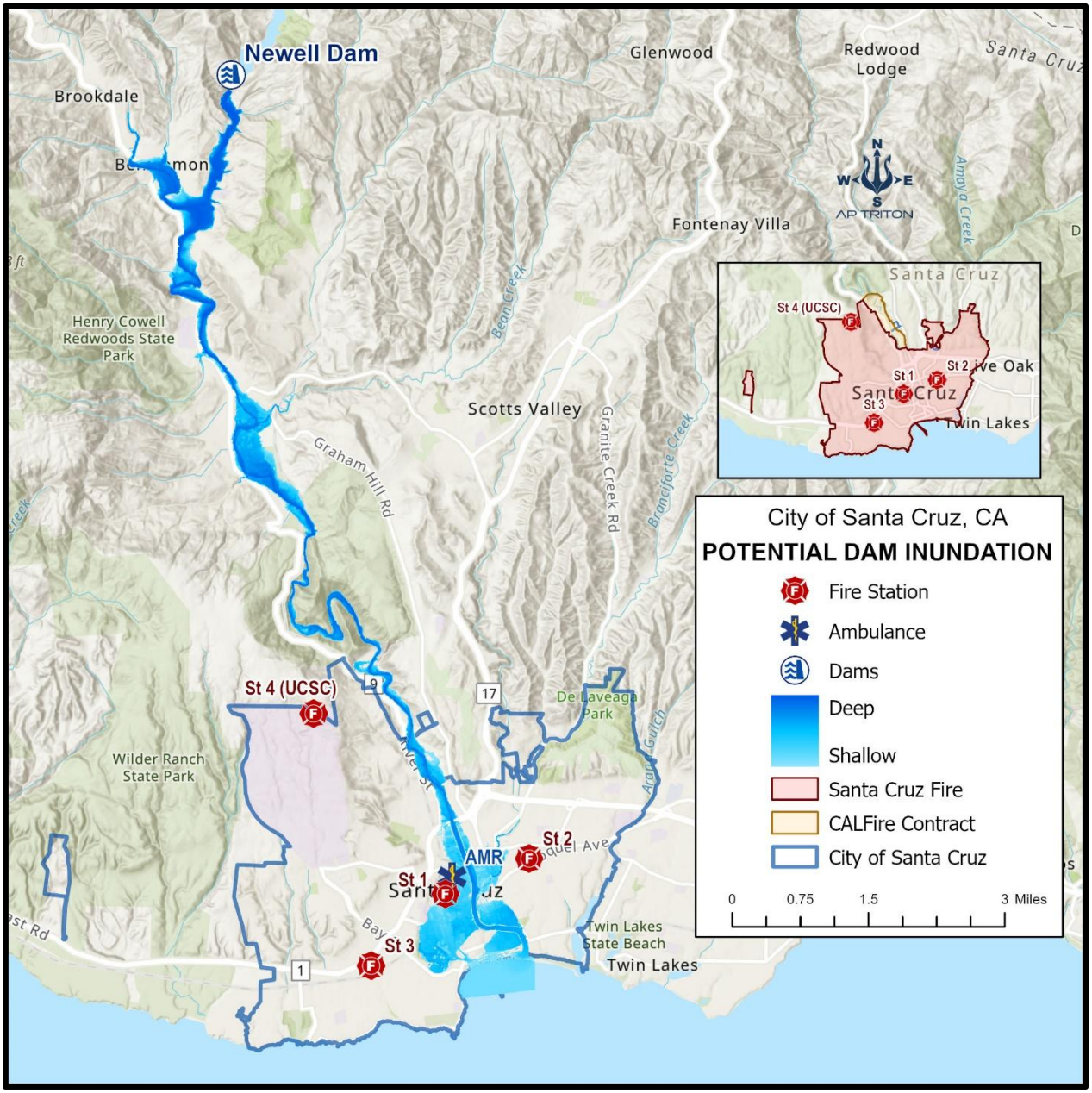
Dams

When a dam fails, it can cause devastating damage to property, injuries, and loss of life to people downstream. The City of Santa Cruz operates the Newell Dam for water supply. It is an earthen dam completed in 1960, is 750 feet long, and has a maximum storage of 8,991 acre-feet of water. The surface area is 172 acres. The National Inventory of Dams classifies the dam as having high-risk potential.[52] The City of Santa Cruz Local Hazard Mitigation Plan states that losses to life and property associated with complete dam failure would be high. Given the monitoring protocol, level of security, and infrastructure design capacities, the probability of dam failure is very low. A failure would impact critical facilities in the city, such as City Hall, Fire Station 1, the Fire Administration Building, the Civic Auditorium, and the police department.[53] The following figure shows the Newell Dam and inundation areas.

[52] U.S. Army Corps of Engineers, National Inventory of Dams.

[53] City of Santa Cruz Local Hazard Mitigation Plan Five Year Update 2018–2023.

Figure 59: Dam and Inundation Areas



Water and Sewer Utilities

The City of Santa Cruz's utility department provides water and wastewater services to residents.

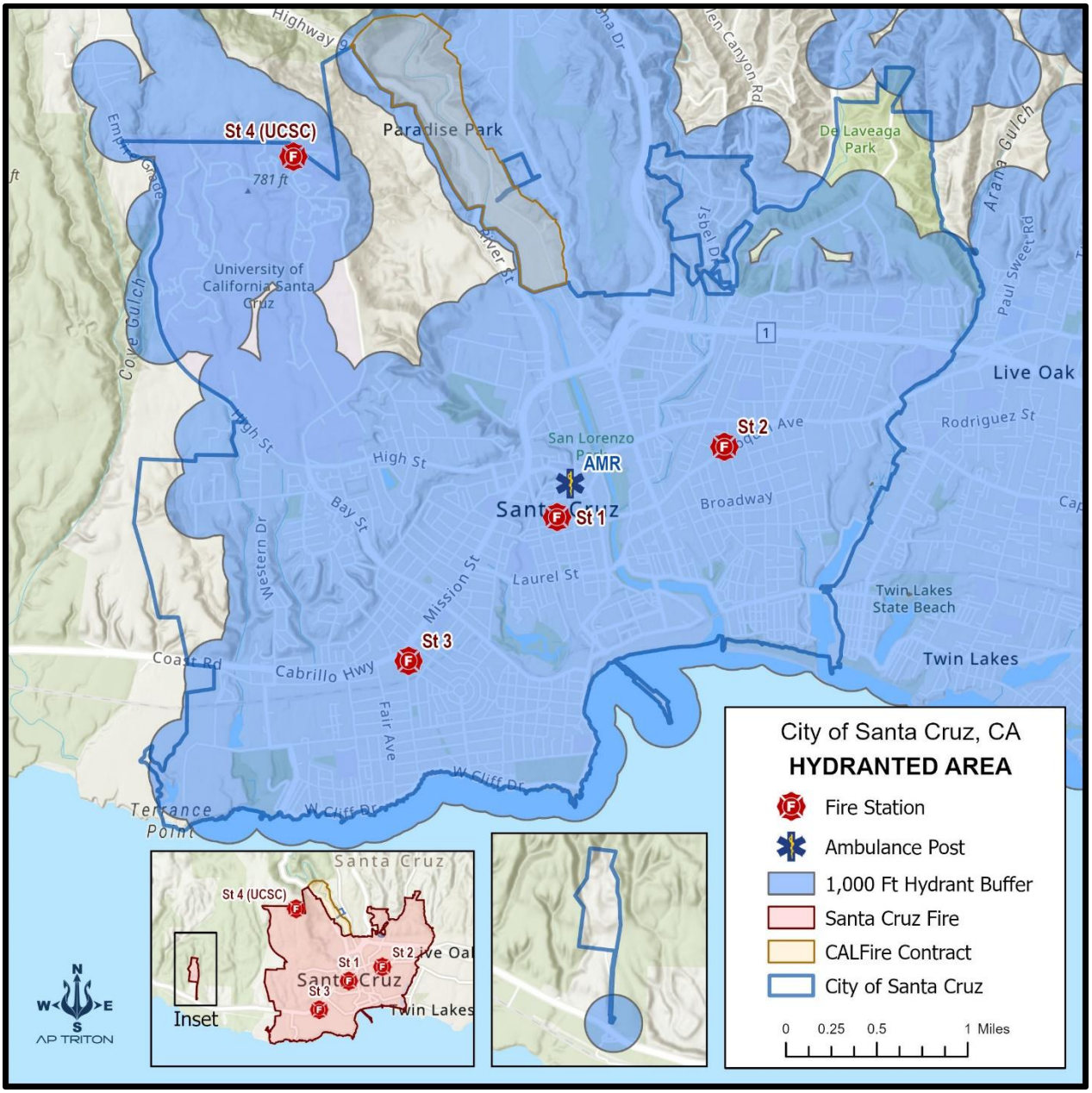
Water

Controlling a fire becomes challenging without an adequate water supply and distribution system consisting of water storage, mains, and a fire hydrant system. A system of well-distributed hydrants and appropriately sized water mains are necessary to provide the required water for fireground use.

The Water Department serves approximately 25,500 customers with water for residential, commercial, and agricultural uses. Water for the system comes from the San Lorenzo River and Tait Wells, Loch Lomond Reservoir, North Coast, and the Live Oak Beltz Groundwater Wells. These water sources are all dependent on annual rainfall and runoff. The water is treated at the Graham Hill Water Treatment Plant (94%) and the Beltz Water Treatment Plant (6%). There is a connection with the Soquel Creek Water District to supplement the water supply during February, May, and August.

The system covers approximately 20 square miles and has 31 miles of raw water mains and 263 miles of treated water mains. There are 15 distribution system storage tanks with a capacity of 20.9 million gallons. The following figure shows the area where hydrants are located.

Figure 60: Hydranted Area



Wastewater

Wastewater for domestic and industrial uses is collected through underground pipelines and sent to the City of Santa Cruz Wastewater Treatment Facility. The facility can treat up to 17 million gallons per day (MGD) during dry weather flows and provide wet weather treatment for up to 81 MGD. The treatment facility also services Capitola, Live Oak, Soquel, Aptos, and the University of California Santa Cruz.

Communications

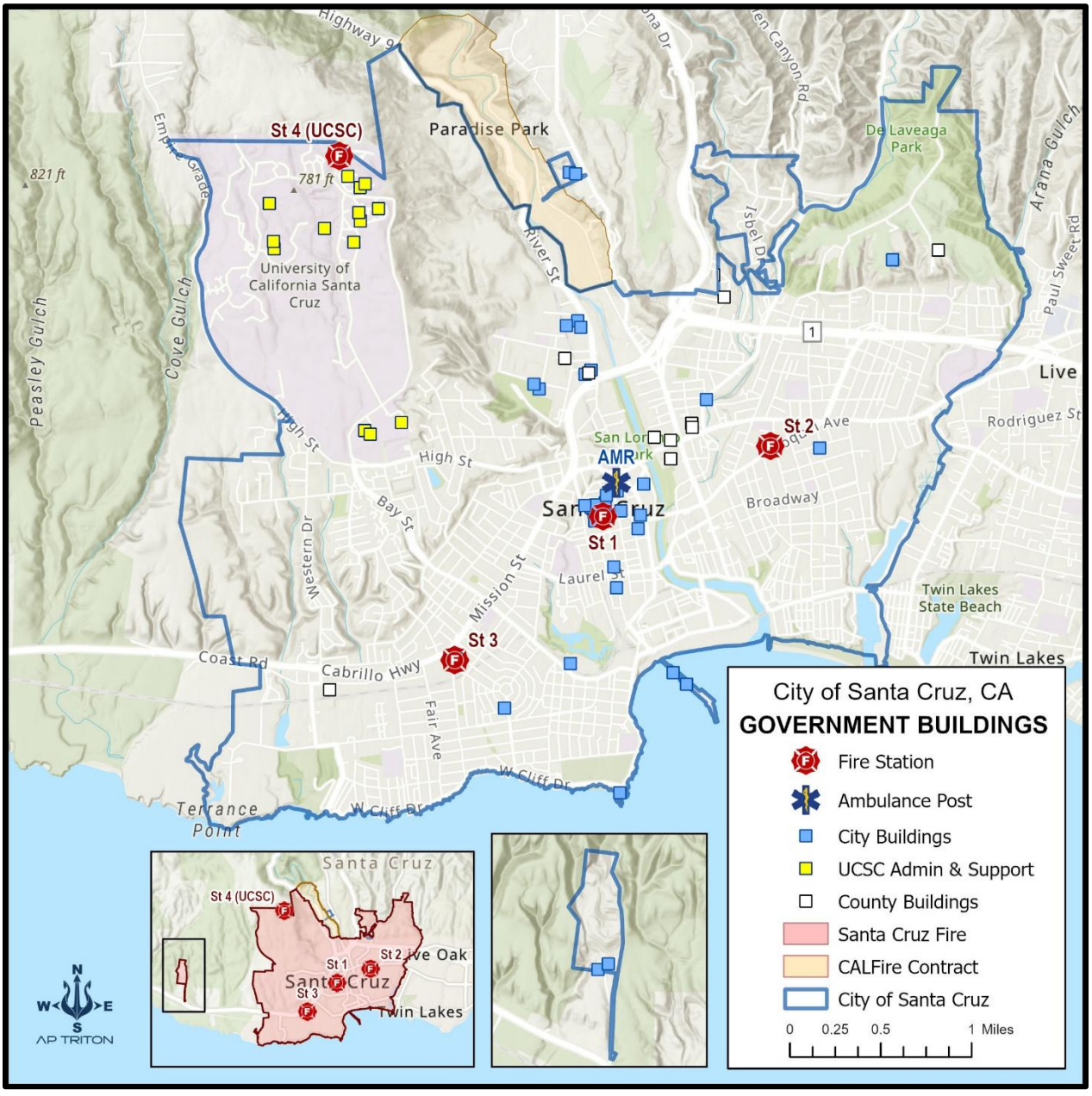
When an incident occurs, essential facilities to receive and transmit alarm information require a communication center to communicate with emergency responders properly. Other communications are critical to the community, such as cellular phones, Voice over Internet Protocol (VoIP) telephone systems, or transmission lines from the local telephone company. These systems allow the public to notify emergency services of an incident. Internet services are essential for the public, commercial establishments, and emergency services in daily business. Whether the internet services are through cellular access or an internet service provider, the failure of these communication systems can significantly impact emergency services and the public.

Dispatching services are provided by the Santa Cruz Consolidated Emergency Communications Center, also identified as Santa Cruz Regional 9-1-1 (NetCom). The dispatch center is a Joint Powers Authority created in 1996. The center provides services to law enforcement agencies, EMS, and the fire departments in the county and dispatched 42,841 fire incidents in 2023. There are 43 authorized positions for the center, with five to nine telecommunicators on shift, depending on the time of day. The telecommunicators have 15 workstations and use Motorola Premier One Computer-Aided Dispatch to track incident responses and dispatch the appropriate units for an incident. The center has battery backup and a generator if an electrical failure occurs. There are two backup locations if the building needs to be relocated during an emergency.

Governmental Buildings

Governmental buildings are typically located close to their customers to manage proper public services. The buildings are considered a part of the critical infrastructure needed to operate services provided by local, state, or Federal government. The following figure shows the locations of government buildings.

Figure 61: Government Buildings



Land Use

The concept of land use regulation is to provide attractive social and environmental outcomes to assist in the efficient management of development. Land use for a community is designed to assign a classification for properties within a geographical area generally under governmental control. Zoning areas may vary from one portion of the service area with a mixture of low-, moderate-, and high-risk properties.

- **Low Risk:** Areas zoned for agricultural purposes, open spaces, low-density residential, and other low-intensity use.
- **Moderate Risk:** Areas zoned for medium-density single-family properties, small commercial and office uses, low-intensity retail sales, and similarly sized business activities.
- **High Risk:** High-intensity business districts, mixed-use areas, high-density residential, industrial, storage facilities, and large mercantile centers.

The City of Santa Cruz's planning area includes approximately 25 square miles. The Sphere of Influence encompasses a small portion (0.06 square miles), while the "area of interest" totals 12.5 square miles. The city is about 12.7 square miles. The current General Plan serves as a guide for future development and growth. Its guiding principles include maintaining natural resources, neighborhood integrity and housing, the university, mobility, prosperity for all, a dependable municipal tax base, a balanced community, education, arts and culture, community facilities and services, and involving the citizens.

Figure 62: Land Use

Land Use	Acres	Percentage of Total Acres
Total Residential	2,617	38.4%
Single-Family	*2,068*	*30.3%*
Multi-family	*509*	*7.5%*
Mobile Home Park	*40*	*0.6%*
Commercial	252	3.7%
Office	61	0.9%
Industrial	197	2.9%
Public/Institutional	1,756	25.8%
Parks	645	9.5%
Open Space	1,068	15.7%
Parking	52	0.8%
Vacant	169	2.5%
Total	**9,434**	**100%**

Increased growth and density in Santa Cruz affect how the fire department delivers service to the community. The City of Santa Cruz Sixth Cycle Housing Element 2023–2031 discusses development trends and the downtown. For the Fifth Cycle Regional Housing Needs Allocation (RHNA), the City of Santa Cruz exceeded all categories for new housing. The City was assigned 747 new housing units, and 1,664 were built. The RHNA assigned the City 3,736 units between 2023 and 2031. The following figure shows the RHNA allocations for Santa Cruz through 2031.

Figure 63: Regional Housing Needs Allocation (2023–2031)

Income Level	RHNA Allocation
Very Low	859
Low	562
Moderate	709
Above Moderate	1,606
Total	3,736

Eleven projects are either under construction or past the planning stage and are in the building permitting process. These 1,446 residential units are in a mix of affordable housing projects, mixed commercial and residential, senior housing, and a clinic with transitional housing. The following figure shows the projects past the planning stage and into building permits or under construction.[54]

Figure 64: Current Development Proposed or Under Construction

Location	Stories	Housing Units	Status
314 Jessie Street	4	50	Under Construction
119 Coral Street	5	119	Under Construction
418 Front Street	7	175	Under Construction
100 Ingalls Alley	3	161	Under Construction
902 Pacific Avenue	5	94	Under Construction
130 Center Street	6	233	Permit Review
530 Front Street	7	276	Permit Review
119 Lincoln Street	7	124	Permit Review
850 Almar Avenue	3	38	Permit Review
126 Eucalyptus Avenue	2	76	Permit Review
313 Swift Street	4	100	Permit Review

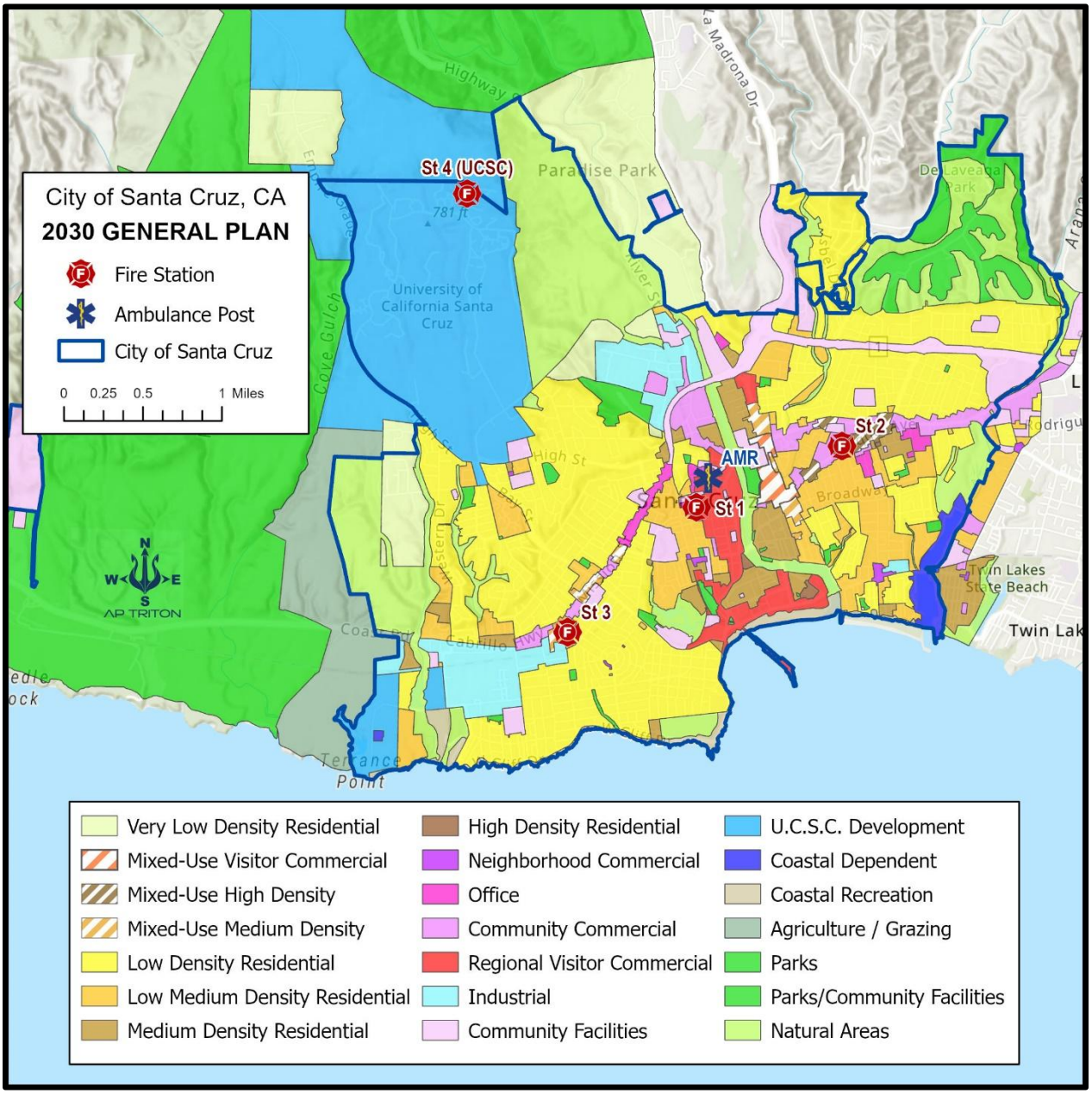
In addition to these approved projects, there are nineteen significant projects with 2,087 residential units currently in the planning approval process. These higher-density buildings are three to eight stories in height and range from 26 to 389 units per project.[55]

[54] City of Santa Cruz Active Planning Applications website.

[55] Ibid.

The continued development in the city will impact the fire department with an increasing population and demand for service. The following figure provides the zoning in the city.

Figure 65: City of Santa Cruz Zoning



Physical Assets Protected

Commercial occupancies or properties are considered target hazards in every community because of the special or unique risks to emergency responders and the occupants during an incident or event. Each of these occupancies should have up-to-date pre-incident surveys completed annually. The surveys allow responders to become familiar with the building, property, and special hazards. This section evaluates specific building assets by occupancy use and characteristics.

During an incident, these occupancies and facilities should have a current pre-incident plan for the SCFD operations personnel. The pre-incident plan informs emergency responders about potential hazards. It can help them develop strategies and tactics during an incident. The SCFD only has pre-incident plans available in PDF format, which can be downloaded from the 911 Center CAD software. There is no policy for conducting pre-incident plans. All target hazards and, ultimately, all commercial buildings should have up-to-date pre-incident plans. The SCFD has a limited pre-incident planning program but does some training on high-risk structures.

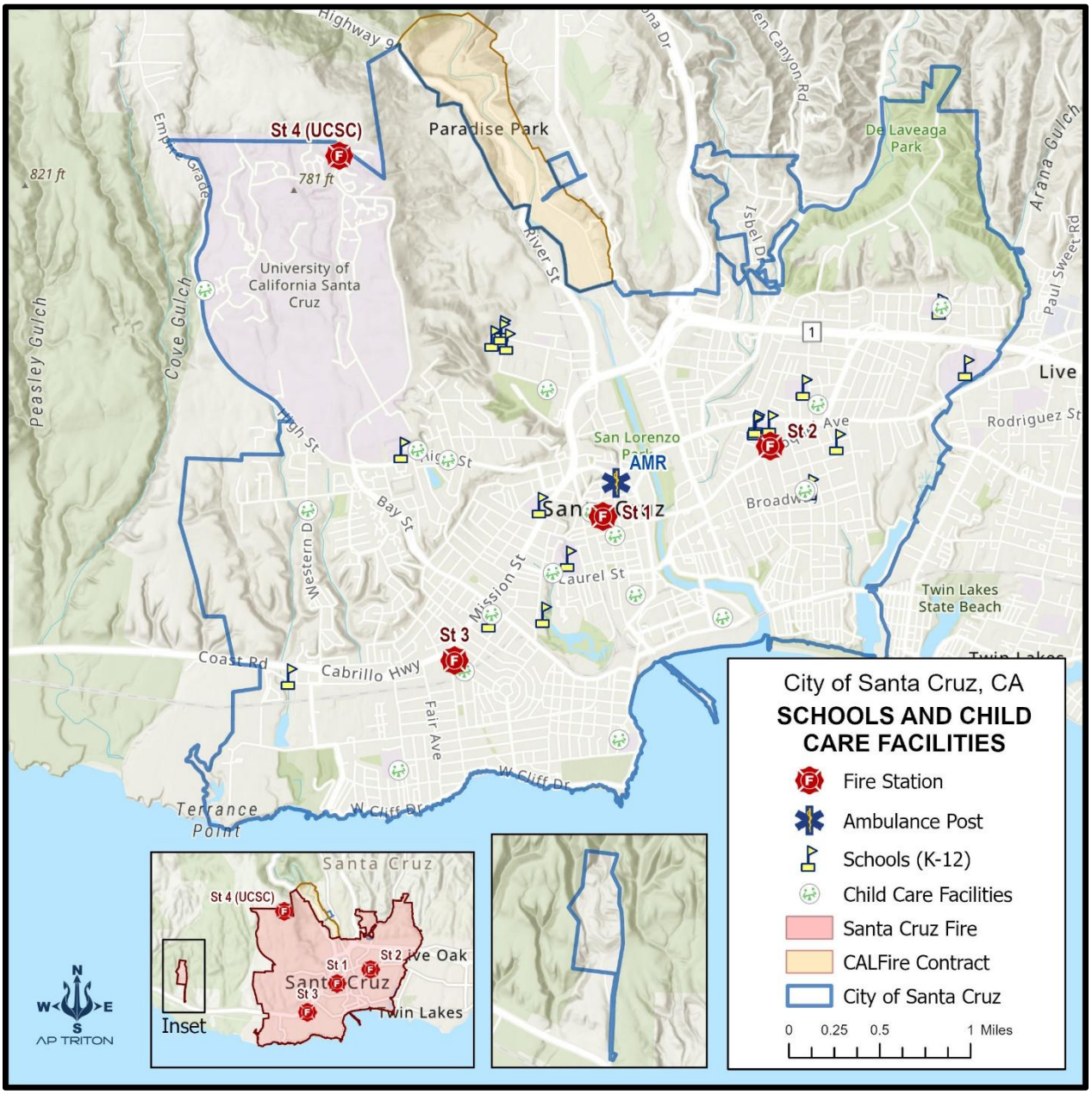
Educational and Childcare Facilities

Public and private schools and childcare facilities increase risks in any community and require substantial assistance during a significant event, such as a mass casualty or fire response. In the city, numerous schools and childcare facilities require inspections and pre-incident plans to ensure the property is safe and that emergency responders are familiar with the location and site-specific hazards.

The Santa Cruz City School (SCCS) provides public education. The SCCS offers kindergarten through 12th grade at ten locations in the district. SCCS also provides education through Branciforte Small School, which offers an alternative learning environment.

The following figure provides the locations of Santa Cruz schools and childcare facilities.

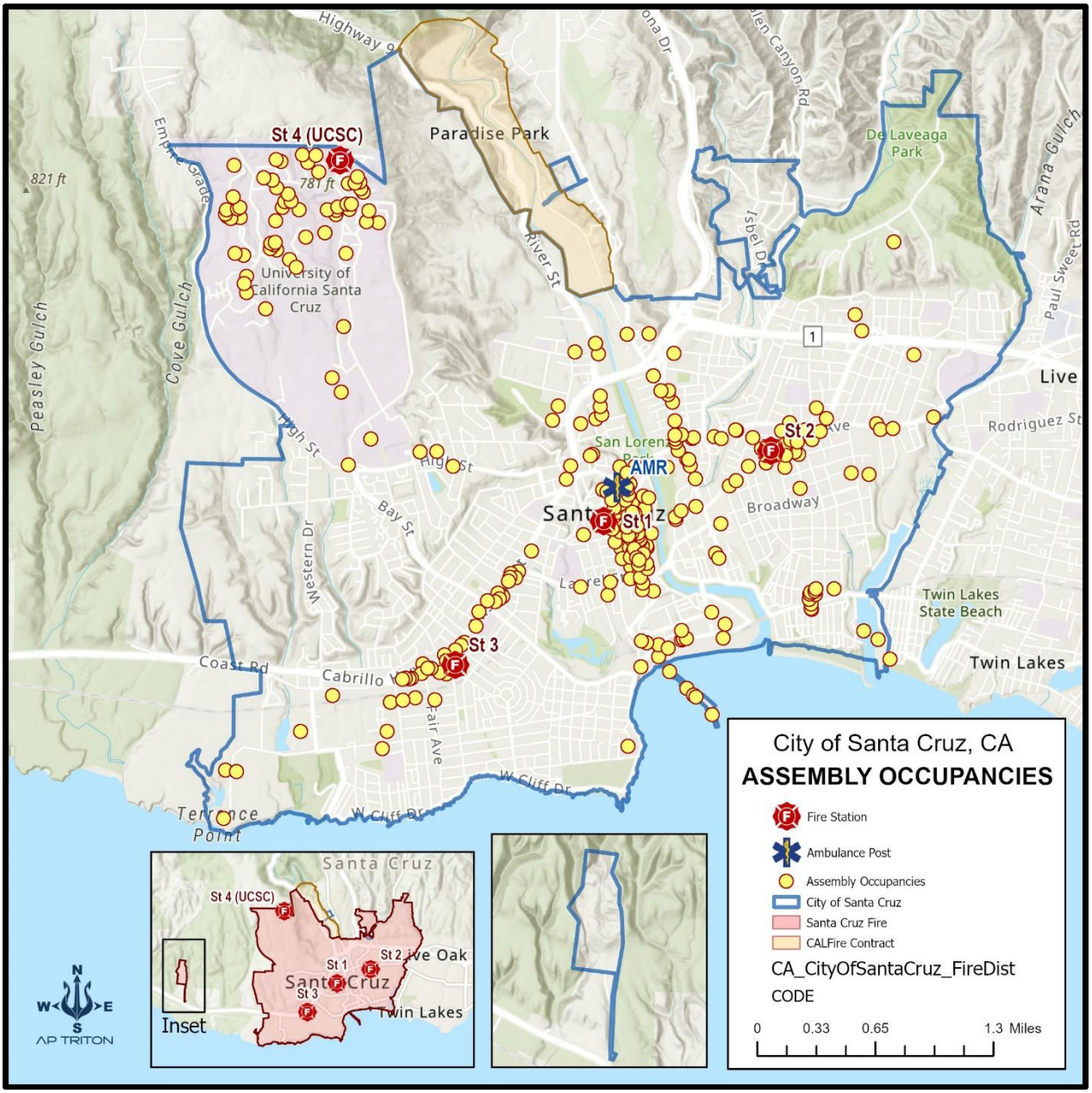
Figure 66: School Locations



Assembly

These occupancies gather large groups of people in a single location or building, increasing risks. These include worship, entertainment venues, eating establishments, and arenas like the Kaiser Permanente Arena. The following figure provides the location of assembly occupancies in the Santa Cruz response area.

Figure 67: Assembly Occupancies



Large Outside Gatherings and Events

Another large gathering area may be in non-permanent structures, parks, or other open areas available for congregation. Outdoor special events such as street fairs or mass gatherings may require a public safety plan per the California Fire Code. This plan should include emergency vehicle access and egress, fire protection, emergency medical services, public assembly areas, directing of vehicular traffic and attendees, vendor and food concessions, need for law enforcement, fire or EMS personnel, and weather monitoring. The city hosts numerous such events throughout the year, including multiple triathlons, graduation at the UCSC, festivals, and surfing competitions. Some locations in the city that host these events include the boardwalk, the beach, the Santa Cruz Wharf, and other open outdoor areas throughout the city. The city's beach areas are active outside assembly areas throughout the year, with increased traffic during the warmer months.

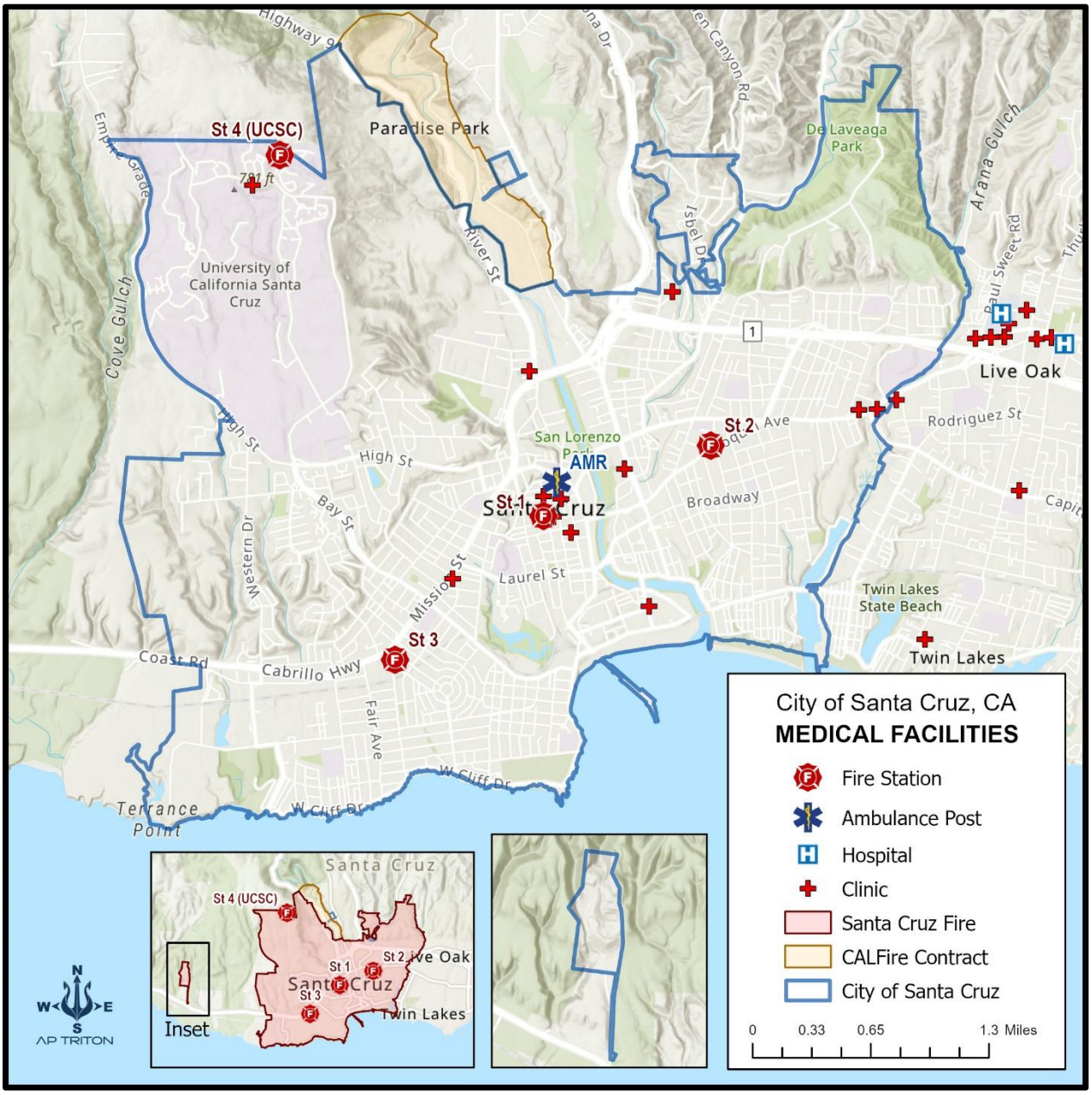
Health Care Facilities

These types of buildings are where occupants may be unable to leave without assistance from the staff. These locations may contain medical gases that can create additional risks for emergency responders during a fire, and completing up-to-date pre-incident plans is necessary. Although the Dominican Hospital is not in the SCFD's jurisdiction, it is close to the city's eastern border.

As people age, additional care may require them to seek a facility to meet their needs. Depending on their mobility or cognitive conditions, they may need more assistance evacuating the building. Staff should have developed plans to remove occupants or patients during an emergency. These locations, like hospitals, require additional fire protection systems to protect the occupants. Special locking arrangements for areas where patients with dementia or Alzheimer's are living are allowed to prevent them from leaving the facility.

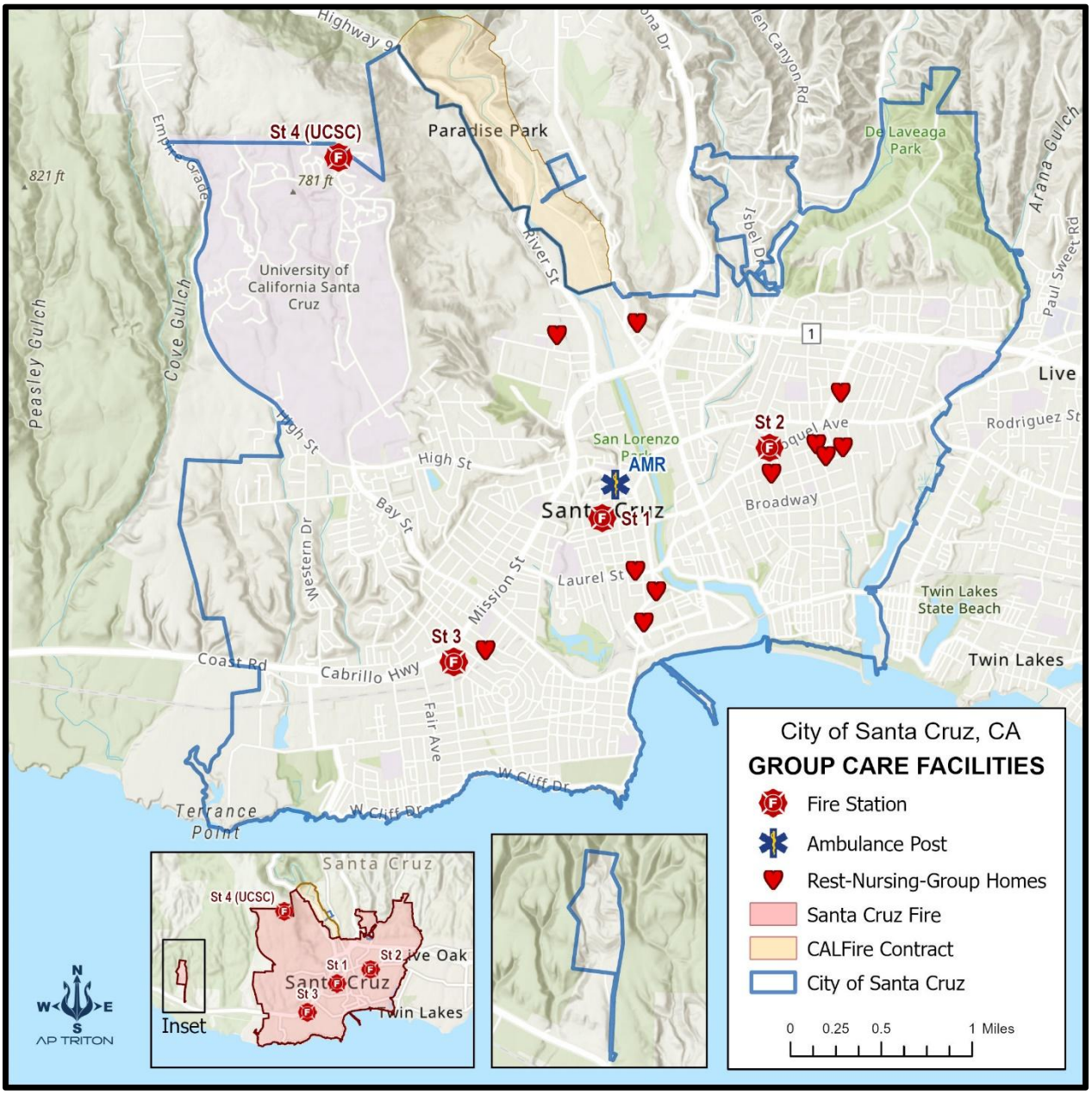
The following figure provides the location of the city's primary hospital and medical clinics.

Figure 68: Clinical Facilities and Hospitals



The following figure shows the locations of group care facilities.

Figure 69: Group Care Facilities

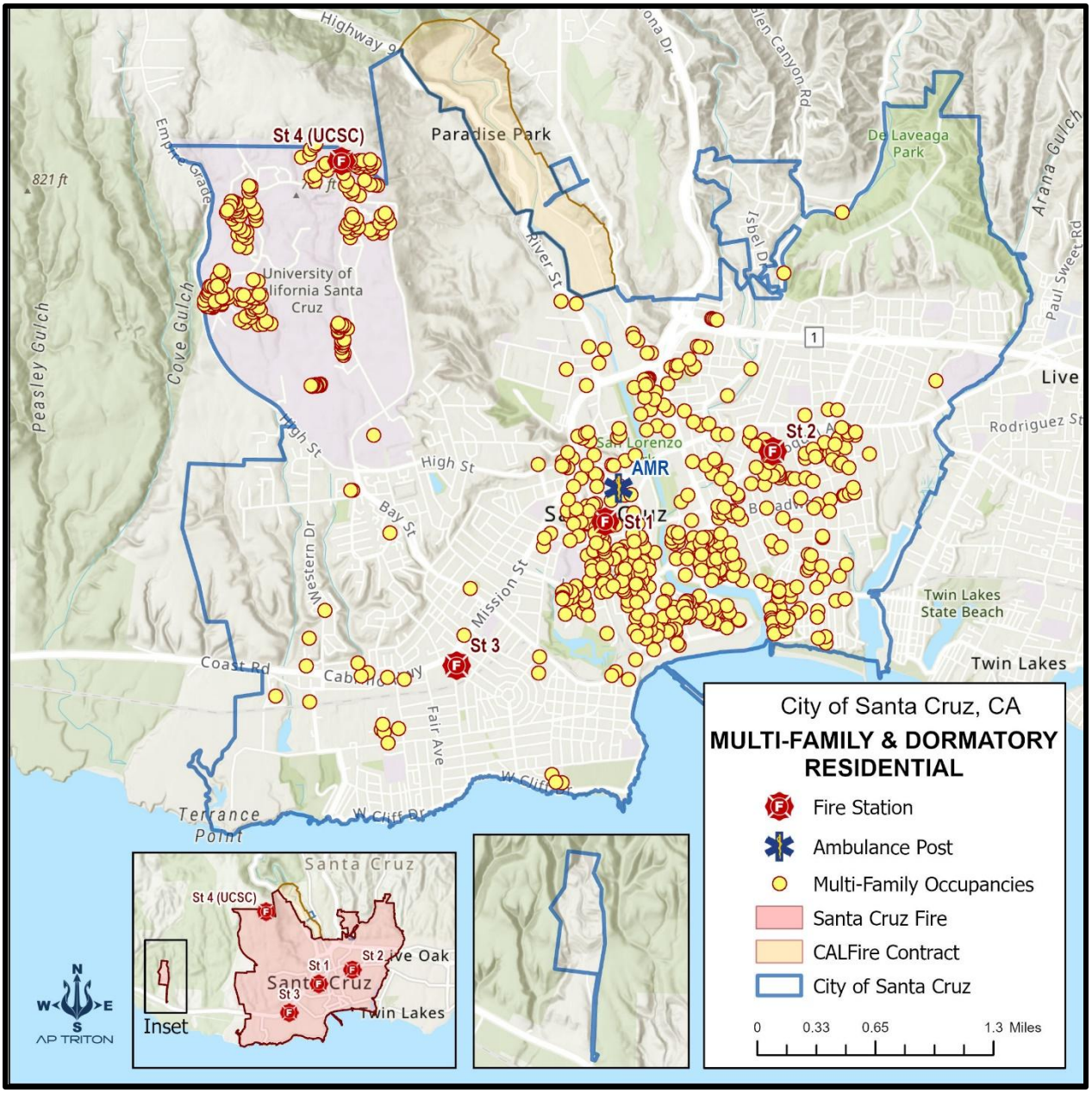


Multi-family Occupancies

Although multi-family housing has fewer fires caused by electrical or heating malfunctions, the risk of cooking fires is twice the rate of other types of building fires.[56] Updated building and fire codes now require these buildings to have a residential fire sprinkler system installed and interconnected smoke alarms in all bedrooms, hallways, and floors. These fire protection systems are designed to provide enough time for the occupants to evacuate the building. The following figure shows the location of multi-family housing units in the city.

[56] Topical Fire Report Series, Multifamily Residential Building Fires (2013–2015), June 2017.

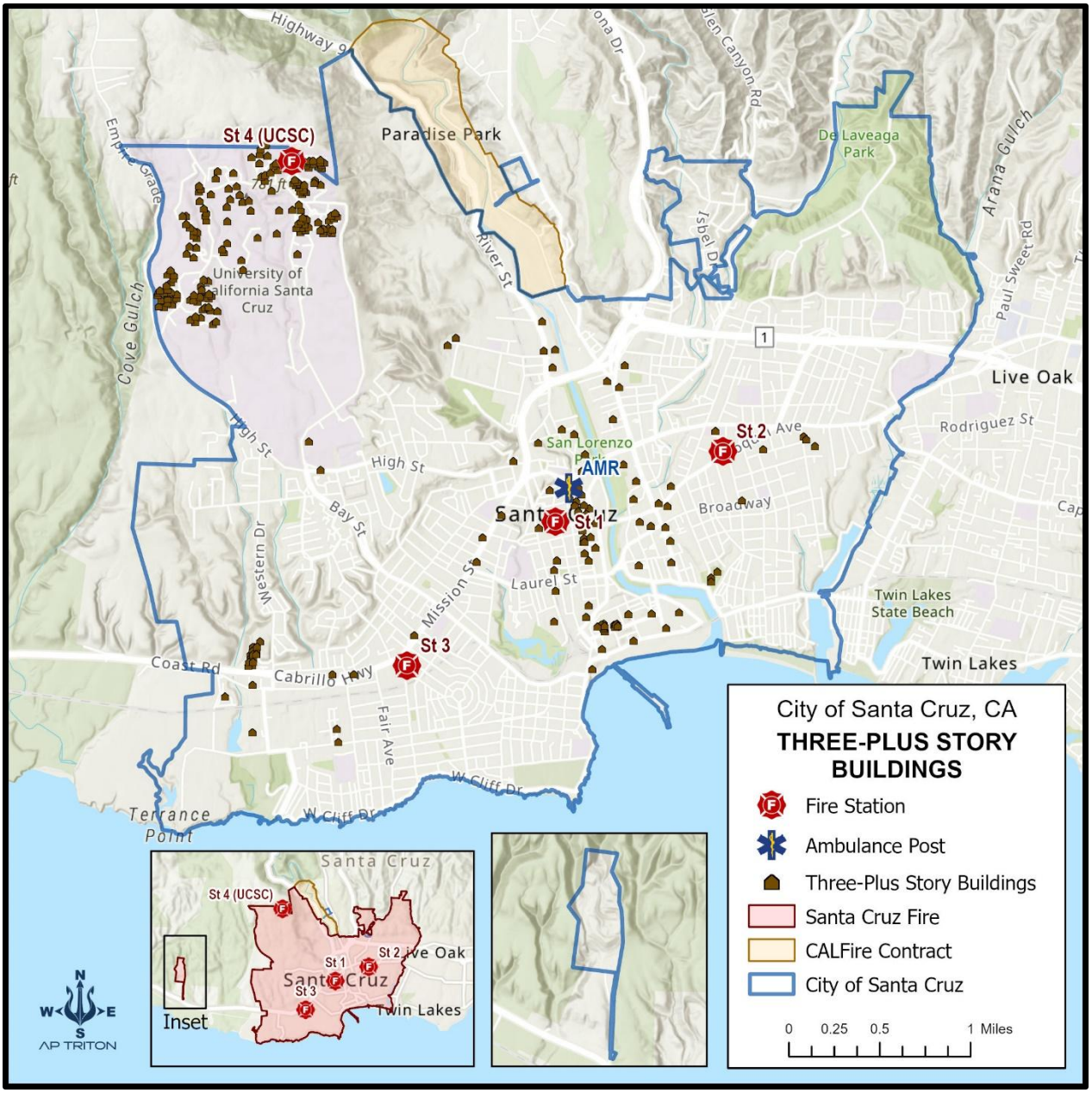
Figure 70: Multi-Family Housing Units



Buildings Three or More Stories in Height

Structures three or more stories in height require a response of an aerial apparatus with elevated master stream capabilities. The Insurance Services Office (ISO) reviews the coverage area for a ladder truck for all buildings within 2.5 miles. A ladder truck may be necessary to access these higher buildings' upper floors or roofs since most ground ladders cannot reach these heights. The following figures display these buildings.

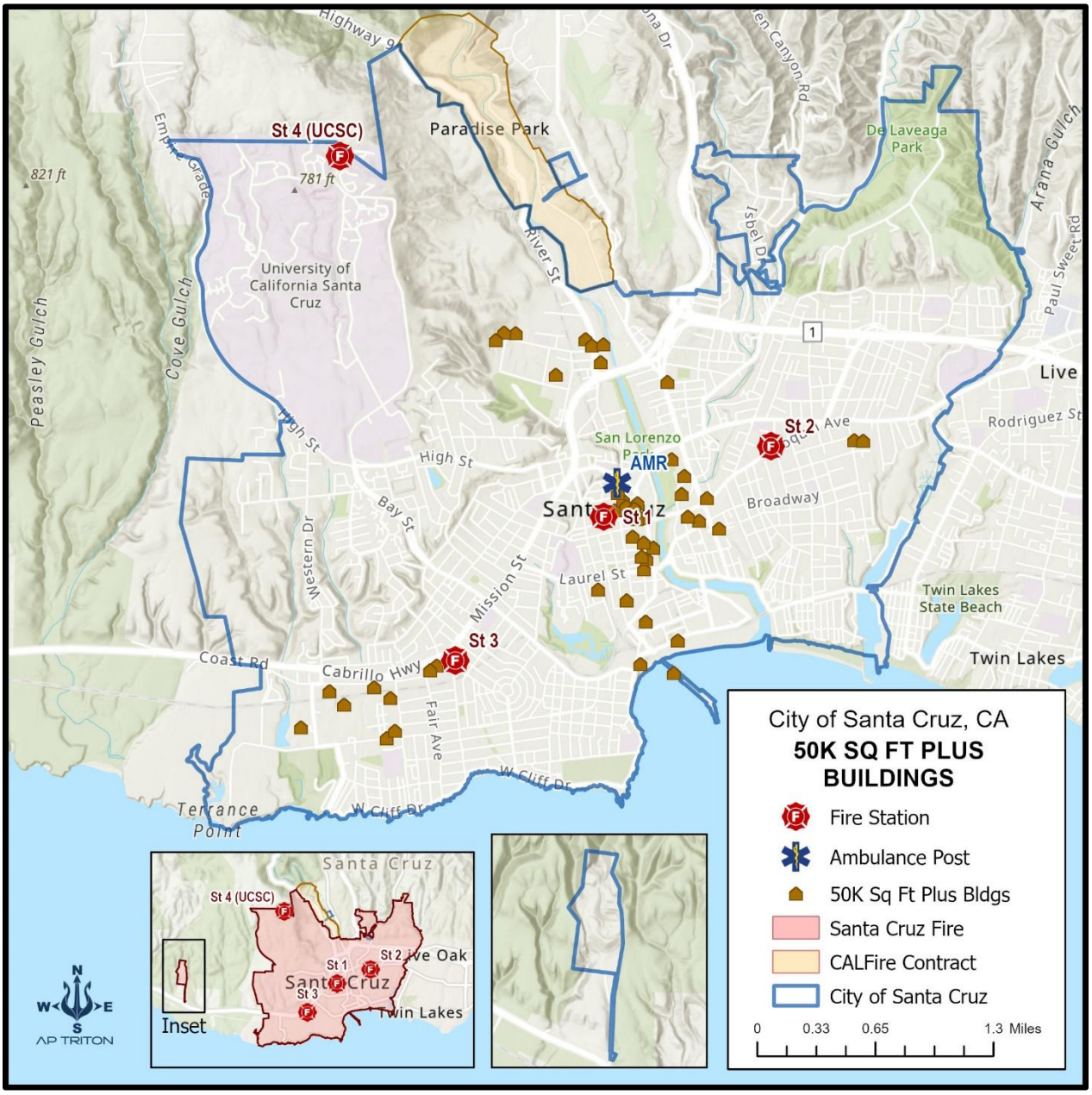
Figure 71: Buildings Three Stories or More



Large Square Footage Buildings

Large buildings, such as warehouses, strip malls, and large "box" stores, need greater volumes of water for firefighting and require more firefighters to advance hose lines long distances into the building. Although the number of large square footage buildings is low, the fire flow may be more significant for smaller buildings because of construction type, distance to exposures, and lack of built-in fire protection systems such as fire sprinklers. The following figure is based on data from ISO and shows the locations for buildings 50,000 square feet and larger.

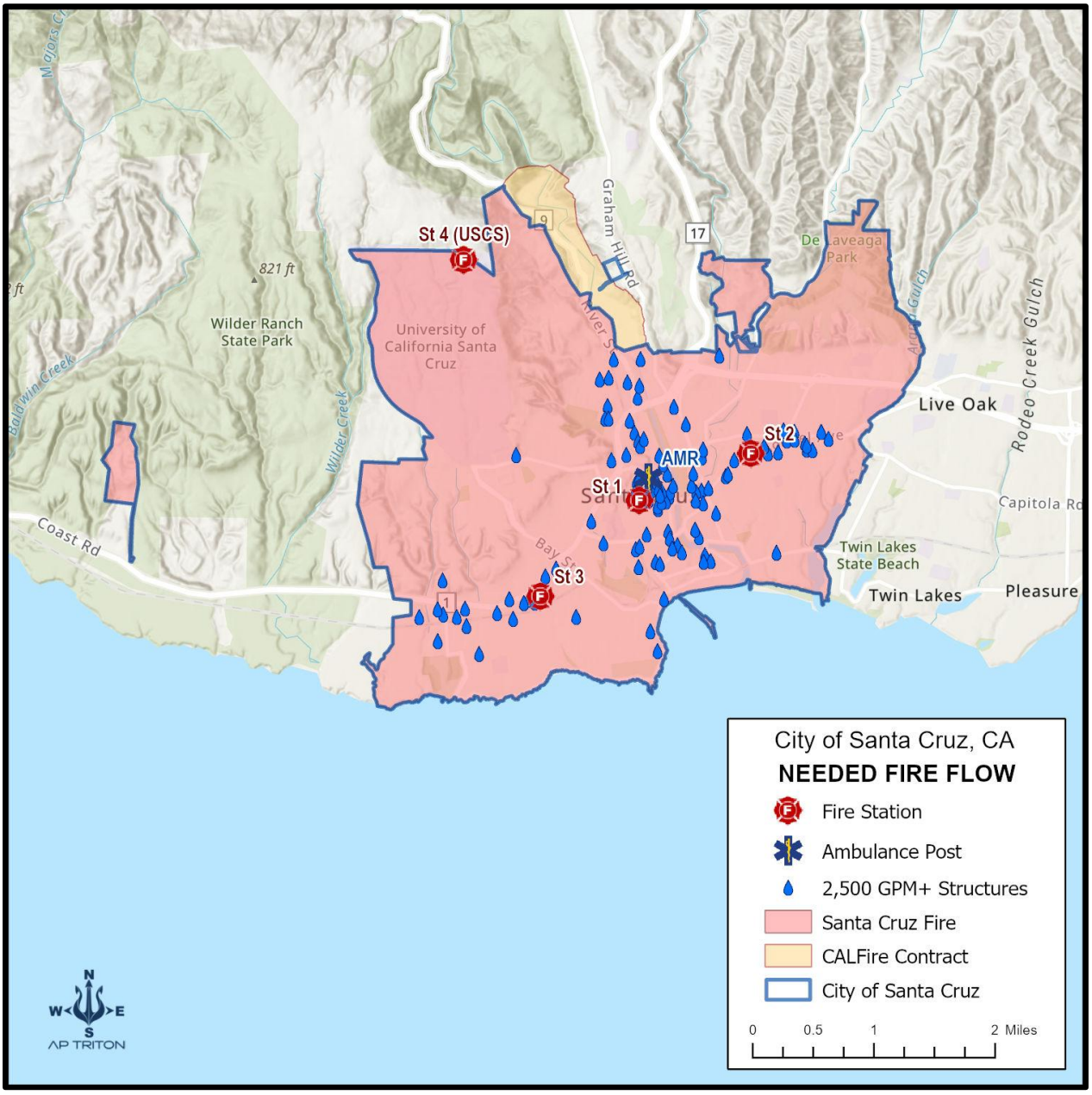
Figure 72: Buildings 50,000 Square Feet and Greater



High Fire-Flow Occupancies

Other buildings may require a higher amount of water to extinguish a fire. These occupancies can present a problem if the needed water is less than what is available from the water supply from hydrants or other water sources. The following figure shows the occupancies with a needed fire flow greater than 2,500 gallons per minute.

Figure 73: Buildings with Large Fire Flows (> 2,500 gallons per minute)



Risk Classification

Risk Assessment Methodology

Developing a risk score to determine risks in a community is necessary to provide an organization with a method for creating response protocols for an incident. The Three-Axis Heron model establishes a score by reviewing probability, consequence, and impact factors and assigning a score between 2–10 in each category.[57] A description of the incident types for each risk is located in Appendix B.

Use of the Three-Axis Heron Formula includes the following equation.

$$\text{Risk} = \sqrt{\frac{(P * C)^2}{2} + \frac{(C * I)^2}{2} + \frac{(I * P)^2}{2}}$$

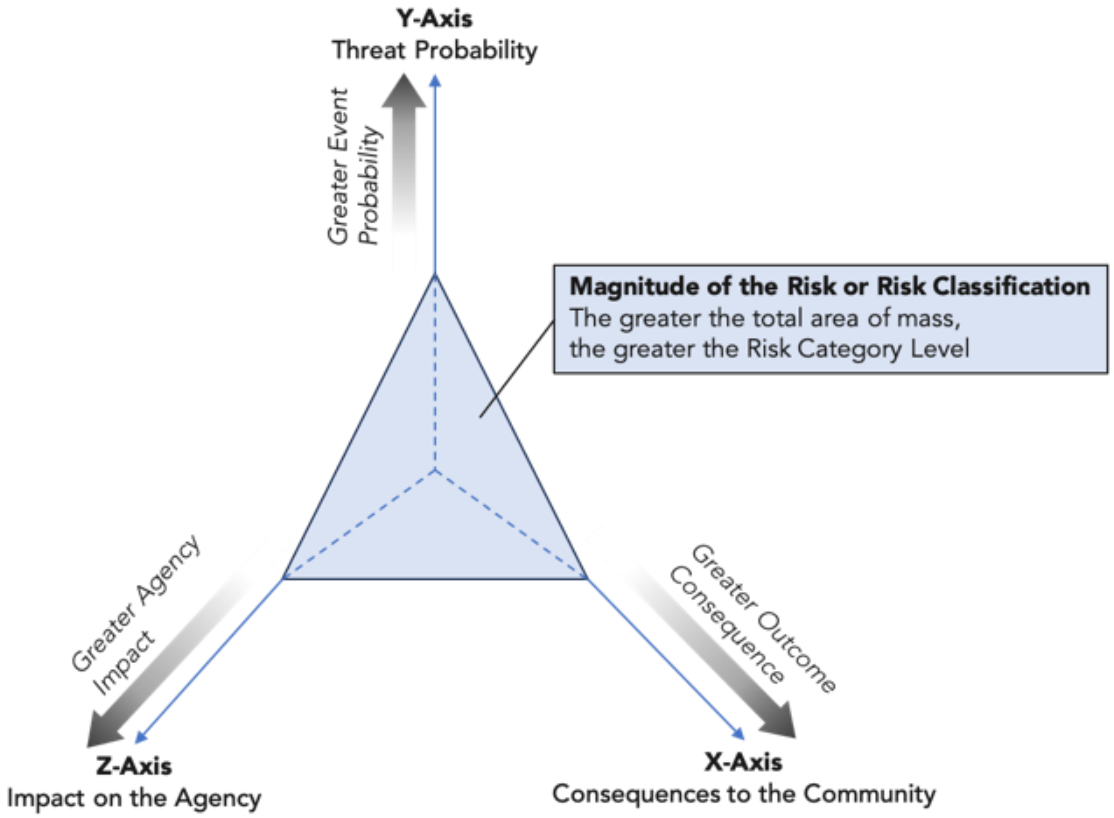
The risk is graphically illustrated through a three-axis model as follows:

- **P** = Probability (Y-Axis)
- **C** = Consequences (X-Axis)
- **I** = Impact (Z-Axis)

The following figure summarizes the three-axis risk classification process and how a score is developed.

[57] Quality Improvement for the Fire and Emergency Services.

Figure 74: Three-Axis Risk Classification Process



When developing the score, each of the three scoring components is based on incident data. An example of a low-risk fire response scoring is based on the probability of that type of incident occurring. Most low-risk incident types are frequent (occurring multiple times a day). Still, the consequences to the community and impact on the city are low. The probability of a low-risk incident in the city is 10 (high), while the consequence and impact are 2 (low). These numbers are placed into the above formula to create a score of 20.2. The score increases dramatically for a maximum risk. However, the probability is low (2) because the consequence to the community is an 8. The impact on the SCFD is the highest at 10, which gives a score of 59.4.

These scores are designed to provide the SCFD with information to determine the level of service required for the community. The probability of an incident may affect response times if multiple events occur simultaneously. Even if the risk is low, it will place an apparatus out of service for the response. The higher the score, the greater the risk in the community. Although the highest risk score available is 122.5, the probability of this type of event occurring is low. The following information provides additional information on probability, consequence, and impact.

Probability

Probability is the likelihood of an incident occurring in the community over time. This axis reflects the probability of a particular type of incident occurring (contributing to the risk level). Many factors are considered, including the time of day, location, hazard present, season of the year, building construction and maintenance, demographic factors, and more. It can range from a rare event to one that occurs often. The following figure defines probability categories.

Figure 75: Probability or Likelihood of Occurrence

Score	Category	Probability or Likelihood
2	Minor	Unlikely: < 0.02% of total call volume. Expected to occur very rarely.
4	Low	Possible: 0.02%–0.07% of total call volume. Expected to occur rarely.
6	Moderate	Probable: 0.07%–0.3% of total call volume. Expected to occur monthly.
8	High	Likely: 0.3%–2% of total call volume. Expected to occur multiple times per week.
10	Extreme	Frequent: > 2% of total call volume. Expected to occur one or more times per day.

Consequence

The consequence of an incident can vary from minor casualties to severe impacts that may destroy historical or major facilities in the community and create a large loss of employment or life. The following figure defines consequence categories.

Figure 76: Consequence to the Community

Score	Category	Consequence to the Community
2	Minor	1–2 people affected (injuries/deaths). < $10,000 loss.
4	Low	< 5 people affected (injuries/deaths). < $500,000 loss.
6	Moderate	5–50 people affected (injuries/deaths). $500,000–$1,000,000 loss.
8	High	51–100 people affected (injuries/deaths). $1,000,000–$5,000,000 loss.
10	Extreme	>100 people affected (injuries/deaths). > $5,000,000 loss.

Impact

The third factor in determining the risk is the fire department's impact and the critical tasking needed to control or mitigate an incident. This includes the number of emergency responders and apparatus available internally or from external agencies. It measures the department's ability to respond to a given risk or incident while providing service to the remaining parts of the city. The following figure defines impact categories.

Figure 77: Impact on Operational Forces

Score	Category	Impact on Operational Forces
2	Minor	≥ 90% Remaining Apparatus/Crews
4	Low	≥ 75% Remaining Apparatus/Crews
6	Moderate	≥ 50% Remaining Apparatus/Crews
8	High	≥ 25% Remaining Apparatus/Crews
10	Extreme	< 25% Remaining Apparatus/Crews

Risk Classifications

After defining the risk classification, the next step is applying it to each agency's response program. The SCFD's programs include fire, EMS, technical rescue, hazardous materials, and wildland fire.

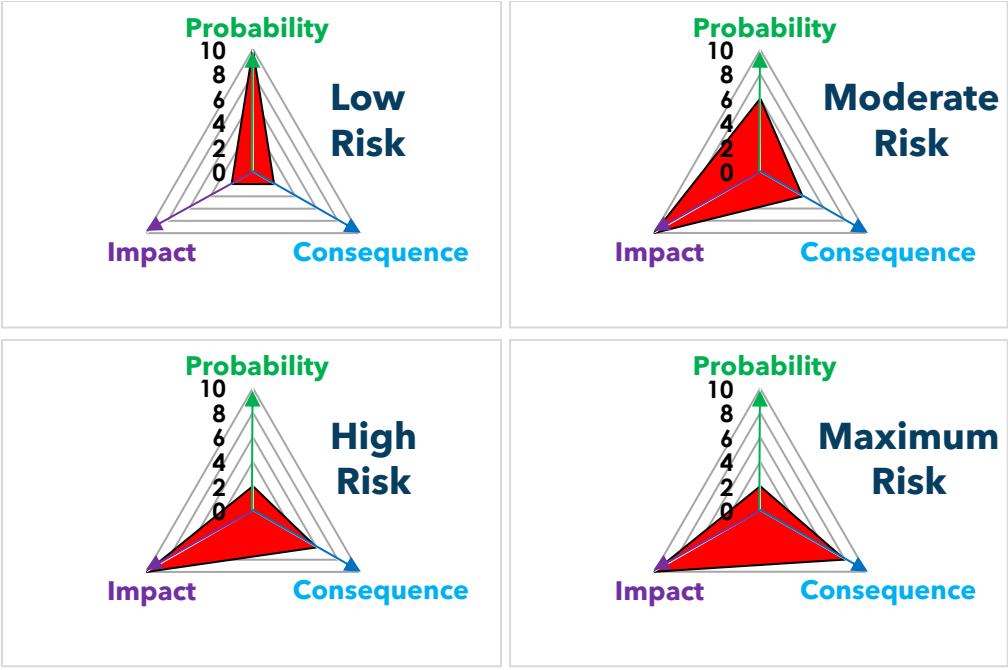
Fire Response

The SCFD is the primary provider for mitigating fire-related incidents ranging from low-risk incidents, such as a vehicle fire, to a maximum-risk incident involving a school fire. Fire risks for a vehicle fire are considered low compared to a maximum risk for a school that houses students. This scoring is applied to four different categories of fire incidents in the SCFD's response area to provide staffing needs to meet critical tasks on the fire ground. The following figures show the fire response risk assessment score and three-axis risk classifications.

Figure 78: Fire Response Risk Assessment

Description	Low			Moderate			High			Maximum		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	10	2	2	6	4	10	2	6	10	2	8	10
Score Assigned	20.2			53.7			45.5			59.4		

Figure 79: Fire Three-Axis Risk Classifications



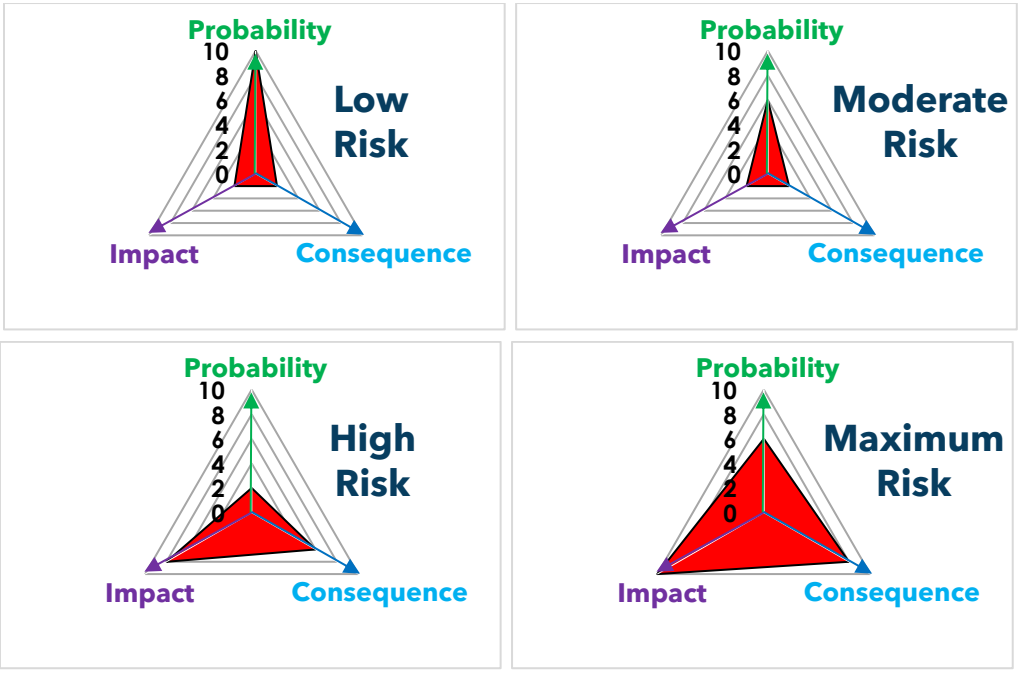
Emergency Medical Services Response

The SCFD provides advanced life support and emergency medical care in the city. Low-risk incidents range from a medical assist to a maximum-risk incident for a multi-victim event. The following figures provide the risk score and classifications assigned to each type of EMS risk. The following figures provide the EMS response risk assessment scoring and the three-axis risk classifications.

Figure 80: EMS Response Risk Assessment

Description	Low			Moderate			High			Maximum		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	10	2	2	6	2	2	2	6	8	6	8	10
Score Assigned	20.2			12.3			36.8			78.4		

Figure 81: EMS Three-Axis Risk Classifications



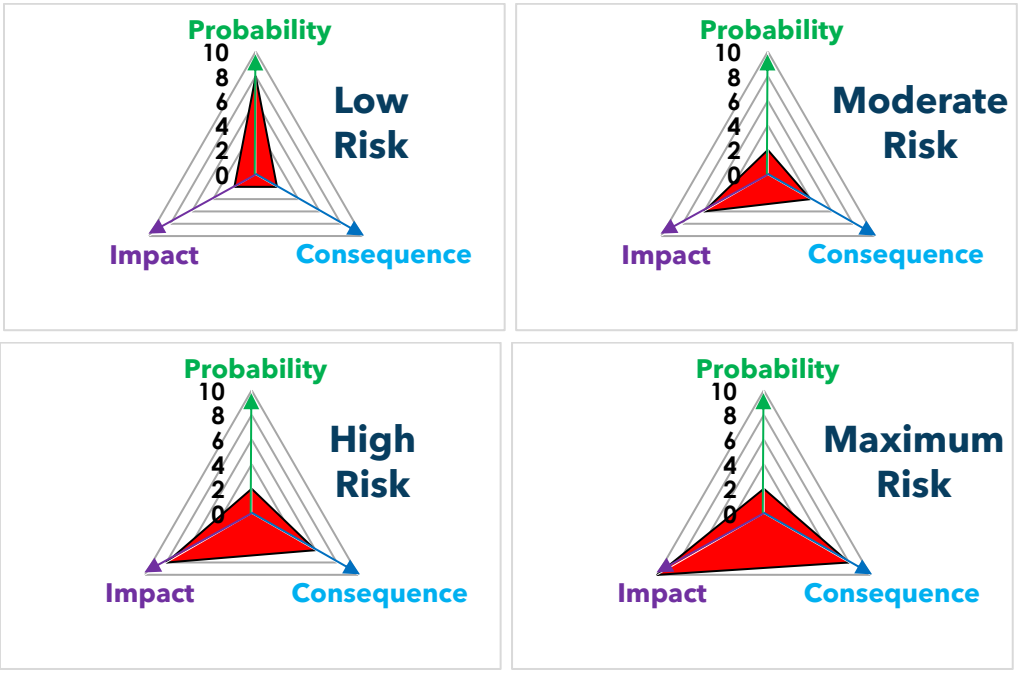
Technical Rescue Response

Rescue services can vary from a low-risk incident, such as accessing a locked vehicle with a child inside, to a confined space incident (maximum risk) that potentially requires many personnel to mitigate the incident. The following figures provide the risk score and classifications assigned to each type of technical rescue risk in the SCFD's response area. The following figures show the technical rescue response risk assessment scoring and three-axis risk classifications.

Figure 82: Technical Rescue Response Risk Assessment

Description	Low			Moderate			High			Maximum		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	8	2	2	2	4	6	2	6	8	2	8	10
Score Assigned	16.2			19.8			36.8			59.4		

Figure 83: Technical Rescue Three-Axis Risk Classifications



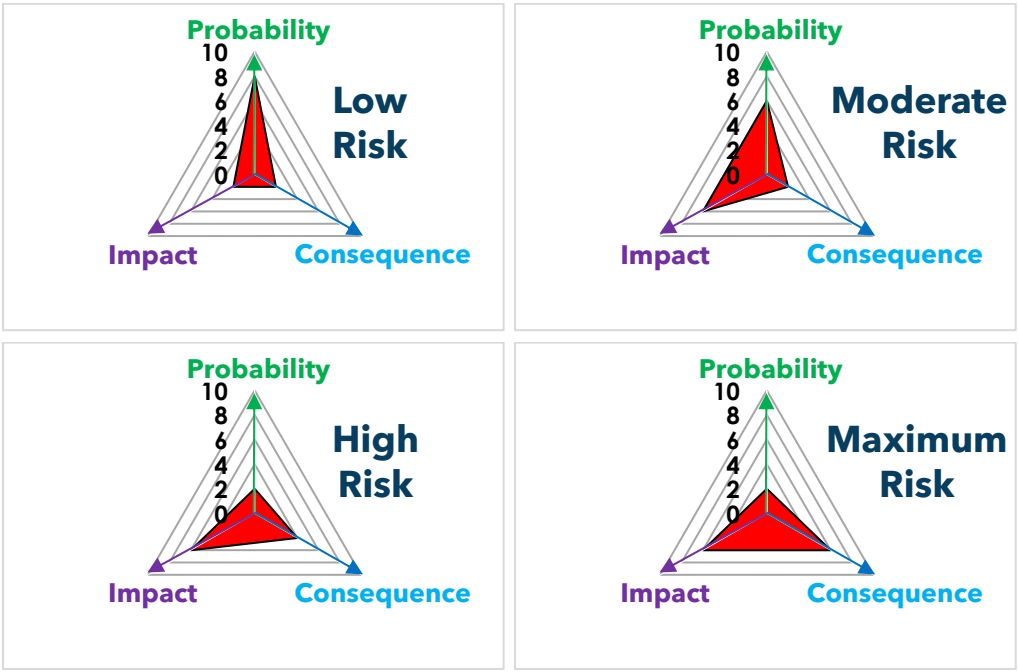
Hazardous Materials Response

Hazardous materials responses can vary from low-risk odor investigations to the maximum risk for a fuel tanker fire in higher populated areas. Most of these incidents can be managed by the SCFD, but higher risks may require assistance from outside resources. The following figures provide the risk score and classifications assigned to each type of hazardous materials risk. The following figures show the scoring of hazardous materials response risk assessment scoring and three-axis risk classifications.

Figure 84: Hazardous Materials Response Risk Assessment

Description	Low			Moderate			High			Maximum		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	8	2	2	6	2	6	2	4	6	2	6	6
Score Assigned	16.2			28.1			19.8			28.1		

Figure 85: Hazardous Materials Three-Axis Risk Classifications



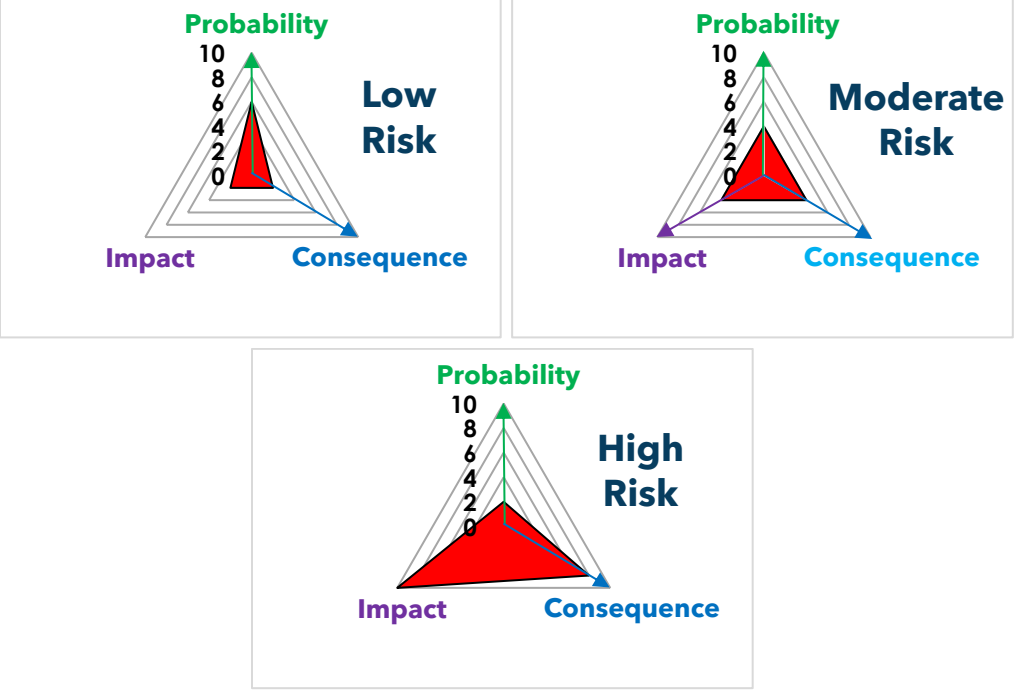
Wildland Fires Response

The types of wildland fire risk vary from small grass fires to large forest fires requiring many internal and external resources. The following figures provide the risk score and classifications assigned to each type of wildland fire risk in the SCFD's response area. The wildland fire risk is classified as low, moderate, and high, with a maximum risk triggering a state and federal response. The score assigned for high risk (73.5) is significant because of the maximum score of ten for the consequence to the community and impact on the SCFD. This type of incident will strain the community and emergency services. The following figures show the wildland fire response risk assessment and three-axis risk classification scoring.

Figure 86: Wildland Fires Response Risk Assessment

Description	Low			Moderate			High		
Risk Score	P	C	I	P	C	I	P	C	I
	6	2	2	4	4	4	2	8	10
Score Assigned	13.9			19.6			59.4		

Figure 87: Wildland Fires 3-Axis Risk Classifications



Marine Safety Division Program

Classifying and assessing an ocean safety program's risk requires a slightly different approach. The typical probability, consequences, and impact volume statements do not fit into the same categories as a typical fire department response. The concepts discussed above have some validity. However, the study of this program requires adjustment. The approach used above isn't practical because there is a significant inconsistency between what the Marine Safety Division records and what is captured in SCFD's RMS. A relational and mathematical evaluation cannot be accomplished confidently without the data typically used to create the methodology and classifications. However, a modified approach can be utilized to quantify the water safety risks.

Risk Assessment Methodology

When enough data is collected, the same three-axis probability, consequence, and impact model may be applied. Two data sets were supplied for this CRA-SOC. Most units, including the Marine Safety Division, use one data set, the department records management system. The second data set, the Marine Safety Division statistics, are compiled by the division and appear more detailed and oriented towards beach operations. However, the information provided was annual numbers. It was unclear if the statistics were annual or limited to the active beach season, where the division is fully staffed.

Probability

The probability model presented in the first part of this section is still valid. Depending on which data collection system is used, the department has a high or extreme likelihood of a needed water rescue. The RMS system indicates 130 water rescues as classified in NFIRS. This equated to less than 0.3% of the incident volume for 2019 through 2023. This suggests that, on average, there is one water rescue every two weeks. However, if the MSD annual statistics are used instead of the RMS, the total increases to 1,160 total rescues. This paints a different picture and shows a 2.7% likelihood within the incident set or approximately 5 times a week. This means this happens almost daily. In this case, assuming that the MSD and SCFD have a high probability of a water rescue should be made.

Consequence

The consequence to the community measure used in the standard category analysis does not necessarily follow for the Marine Safety Division program. The measure of the number of people involved would likely remain 1–2 for most risk levels, as each water rescue would be a stand-alone incident. The dollar loss calculation is typically accomplished by evaluating the property and content's value at risk. The economic impact of a water rescue is not readily apparent. This indicates that a different measure of consequence should be adopted.

In the case of the Marine Safety Division program, dollar valuation would most likely be measured by the dollars lost to tourism based on negative press or lawsuit loss. The financial consequence of the risk level is challenging to define and would likely not follow a linear progression. For example, the negative press and tourism effect would not likely be as problematic for a high- or extreme-risk category. The risk categories are described in Appendix B. They are generally defined by high surf, weather, longer distance from shore, and higher attendance levels. Often, when a person is lost in risky ocean conditions, the media presents this as an avoidable tragedy based on individual choice. In addition, the agency and responders are, or should be, protected by policies. The same can't be said when a person is lost in less risky situations. Typically, during these events, an individual, the person charged with response or prevention, the agency, or even the entire community is called into question, which could place pressure on tourism and legal dollars.

It becomes evident that the typical model and the use of consequence as a category are difficult to apply to this program. The economic model is less reliable, and the number of people involved will likely be very low. In this case, the most reasonable approach would be to apply the risk level shown in Appendix B as the consequence. This will require the agency to note the conditions of each rescue before a model can be created.

Impact

The impact on the SCFD will change based on the staffing levels of the Marine Safety Division. For example, a low-risk Lifeguard rescue during peak season when the division is fully staffed will have little impact on the organization. When fire apparatus is dispatched during off-season incidents, a single- or two-unit response will change the impact from minor to low or moderate. Therefore, the impact must be evaluated based on the division staffing levels. These levels change during the year and are appropriately different based on whether it is a weekday or weekend.

Risk Classification

Unlike the other programs, the three-axis risk assessment cannot be accomplished without accurate information. However, general observations and statements can be made based on the information available and the definitions of the risk levels in Appendix B.

A low-risk event has a high probability of occurring in the waters around the city. This event would have little impact on the organization when staffing is adequate, generally from Memorial Day to Labor Day. The impact will increase when the system is not as well staffed, as fire apparatus will be required to respond to all rescues. The consequence to the community is very low if the rescue is effected without difficulty. However, it may become very high if not handled within standards.

A moderate-risk event is not as likely to occur. Still, there is some evidence this more risky rescue happens with some regularity, perhaps weekly or monthly during the summer season. These will have a higher impact as the rescue swimmers will likely need to be deployed, as will more lifeguard assets if available. During the off-season, this impact will be more pronounced. The consequences to the community are limited, but if mishandled, they could pose significant legal risks for the City.

A high-risk event is rare but not unheard of. These will have a more pronounced impact on the fire department as more resources will be needed. The consequences for the community are difficult to judge based on the model suggested.

Comparison of Fire Risks in Other Communities

Fire Loss

In 2022, fire departments responded to more than 1.5 million incidents in the United States that caused 3,790 civilian fire fatalities and over 13,250 civilian fire injuries. The property damage was estimated at $18 billion. The following figure shows that the per capita fire loss can fluctuate yearly, with 2021 being the lowest at $10.25, while 2022 has the highest at $105.72.

Figure 88: SCFD Property Loss per Capita

Year	SCFD Property Loss	U.S. Property Loss[58]
2019	$41.26	$43.73
2020	$27.71	$66.07
2021	$10.25	$48.22
2022	$105.72	$54.36
2023	$77.47	Not Available for U.S.

The number of fires per 1,000 population in the SCFD response area is higher than the national average, as shown in the following figure.

Figure 89: Fires per 1,000 Population

Year	SCFD Fires per 1,000 Population	U.S. Fires per 1,000 Population[59]
2019	6.4	4.0
2020	6.1	4.0
2021	10.2	4.3
2022	10.4	4.5
2023	6.8	Not Available for U.S.

[58] Fire Loss in the United States, NFPA, 2018, 2019, 2020.

[59] *Ibid.*

The higher number of fires per capita in Santa Cruz could be based on several factors, including drought conditions, human activity, homelessness, higher population density, and intentionally set fires.

Intentionally Set Fires

Intentionally set fires, or in many cases considered arson, is defined as "any willful or malicious burning or attempt to burn, with or without intent to defraud, a dwelling house, public building, motor vehicle or aircraft, personal property of another.[60] The number of intentionally set fires has increased from 28 in 2019 to 75 in 2023. The highest year was 2022, when there were 97 intentionally set fires. The following figure lists the number of intentionally set fires from 2020–2023.

Figure 90: Intentionally Set Fires in the City of Santa Cruz (2019–2023)

Year	Intentionally Set Fires
2019	28
2020	42
2021	75
2022	97
2023	75

[60] Crime Data Explorer, Federal Bureau of Investigation.

Section III:
STANDARDS OF COVER & DEPLOYMENT ANALYSIS

Historical System Performance

This section will give the SCFD a general understanding of relevant response information. It was developed to assist the department in identifying its recent demand and performance and creating baseline performance expectations. The SCFD, the City of Santa Cruz, and political leaders can then use this information to understand how their decisions, policies, and outside pressures affect performance.

Research Information

The information within this section was developed from various sources provided by the SCFD. Detailed information is evaluated here from January 1, 2019, through December 31, 2023.

Statistics Discussion

Mathematical and technological methods must be used carefully when evaluating information as complex as emergency incident response data. Historical instances of incorrect evaluations lead to severe consequences in deployment and operational decisions. This analysis quantifies and examines the available information. It is intended to be a starting place for the agency as it seeks to improve performance. However, leaders must understand the limitations of making decisions based solely on statistical study and utilize sound judgment with proven analytics.

Statistical Tools

Various statistical analytical tools were employed to create this section. The fundamental tools were categorization, percentile, and regression analysis. This helps paint a picture of historical performance, with some inferences that may help leaders identify positive and negative performance trends.

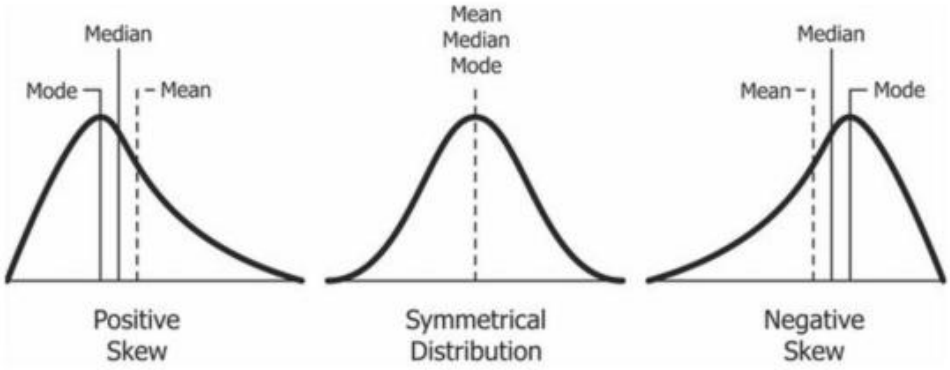
90th Percentile

The time performance measures for this report are done using the 90th percentile measure. While discussing the mathematics behind this measure is outside this report's scope, it is helpful to understand why it is utilized.

The most common reason for using this measure is that the industry has adopted it. If a fire agency wishes to judge its performance against standards or other agencies, it must use the 90th percentile. For example, the National Fire Protection Association (NFPA) utilizes the 90th percentile measure in most of its standards. In addition, the Commission on Fire Accreditation International (CFAI) requires reporting performance measures at the 90th percentile.

The statistical reason for using the measure is that it captures performance more thoroughly and will identify trends in performance more quickly. As with most emergency services systems, the time performance data used in this study has a skew. When the data skews, it makes using other statistical measures less sensitive and representative. The following figure is a general example of data skew.

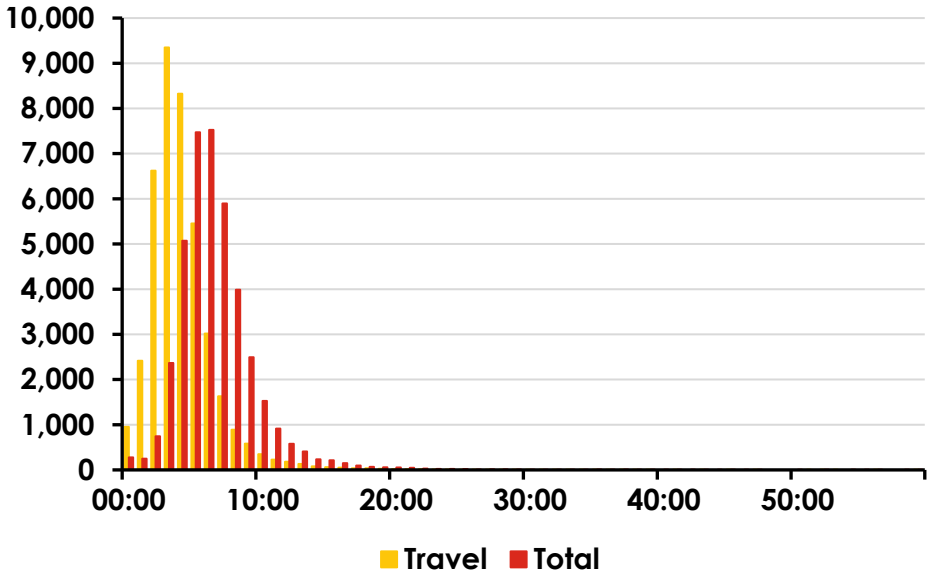
Figure 91: Data Skew[61]



In a symmetric distribution, the mean (average), median (middle of the data), and mode (the most frequent) are all equal. When the distribution skews, these three measures of the middle shift. Using the average (mean) in negatively skewed data would underrepresent the bulk of the performance. In contrast, the opposite is true when positively skewed. In the SCFD's case, most time-performance data is positively skewed. In this case, using the average would over-represent the performance. This skew is typical and in a similar direction to other emergency services agencies. It is presented here as information only and not as a performance definition or an area of concern. The following figure shows the binned total response time and travel times for the SCFD to identify the skew in the data.

[61] Pipis, G. (2020, November 9). *Skewness and Kurtosis in Statistics*. R-Bloggers. https://www.r-bloggers.com/2020/11/skewness-and-kurtosis-in-statistics/.

Figure 92: SCFD Data Skew



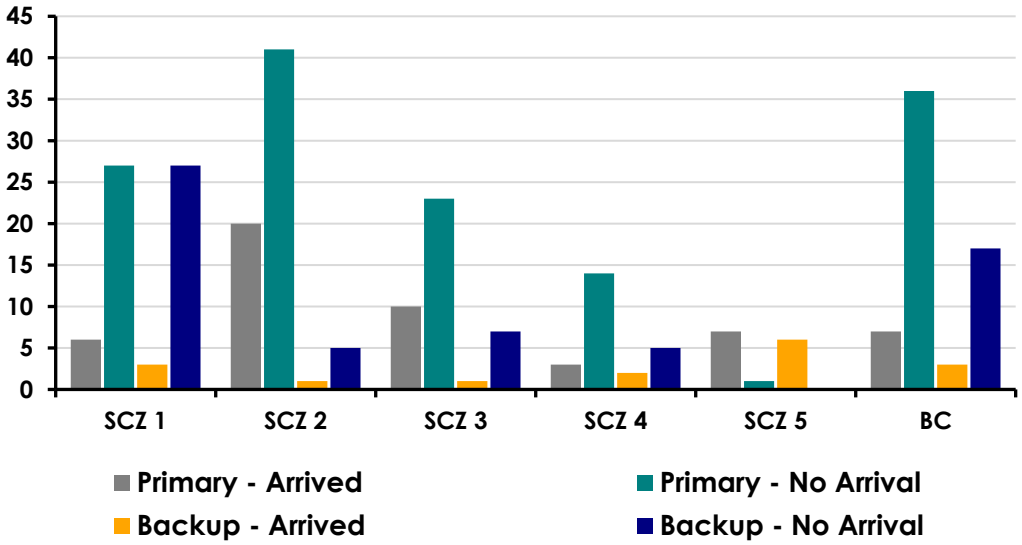
Data Discussion

Detailed data was provided from the SCFD's primary incident reporting software (RMS) and the computer-aided dispatch (CAD) system. These different database tables were combined utilizing proven data engineering techniques into one analytical data set.

Data Engineering Findings

The number of incident records for the RMS and CAD systems was similar, but there were some differences. There were 50,181 individual incidents in CAD and 44,421 in the RMS. This indicated a drop of 5,760 incidents (11%) from CAD to RMS. This warranted a more thorough study of the differences. In this case, 3,806 of the SCFD unit arrivals were logged in CAD, which did not have a corresponding RMS report. This represents an 8% drop in incident reporting data. While this does not represent a significant statistical issue, it is presented as a possible area of improvement for the department. The following figure shows the total number of incidents missing from RMS by station and whether they were a backup or primary unit for 2019–2023. There is potential for improvement in reporting unit arrivals, particularly for Station 2.

Figure 93: CAD Units Dispatched, By Arrival, Not Captured in RMS (2019–2023)



Unit records within the CAD data were merged with the RMS data to form a full analytic incident record for each incident. Of the 44,421 RMS incidents, unit data was available for 42,810 incidents, representing 96.4% of the total. As a result, the total number of incidents in this analysis is 42,810, with 110,593 associated unit records.

Data Error Handling

Data collection within the various data sets has the potential for significant errors. Although there can be many reasons for incorrect information, these errors are typically a combination of human input and collection errors. Various methods exist to manage these errors, including statistical exclusion, real-time exclusion, formula manipulation, and logic testing.

For the SCFD, most of the data did not require statistical intervention. However, to mitigate extremes that were likely inaccurate information, some data was excluded by formula or logic tests. The time segment analysis used a logic tree to eliminate negative and null data sets. The steps taken for each time segment are identified within those analyses.

Service Demand

The first dimension of the analysis is the overall system call load. This is a simple count of the incidents by type and location, so no data was excluded after the previously described data engineering steps.

Volume Analysis

A simple volume analysis can indicate how often the department is called upon to respond to an incident. The first look is at the overall call counts grouped by primary categories in the National Fire Incident Reporting System (NFIRS). Establishing the incident jurisdiction required a match between the geocoded information and the provided geographic boundaries. The following figure shows the total number of responses recorded by the agency in the data set and the percentage of the categorized responses.

Figure 94: Total Incident Count (2019–2023)

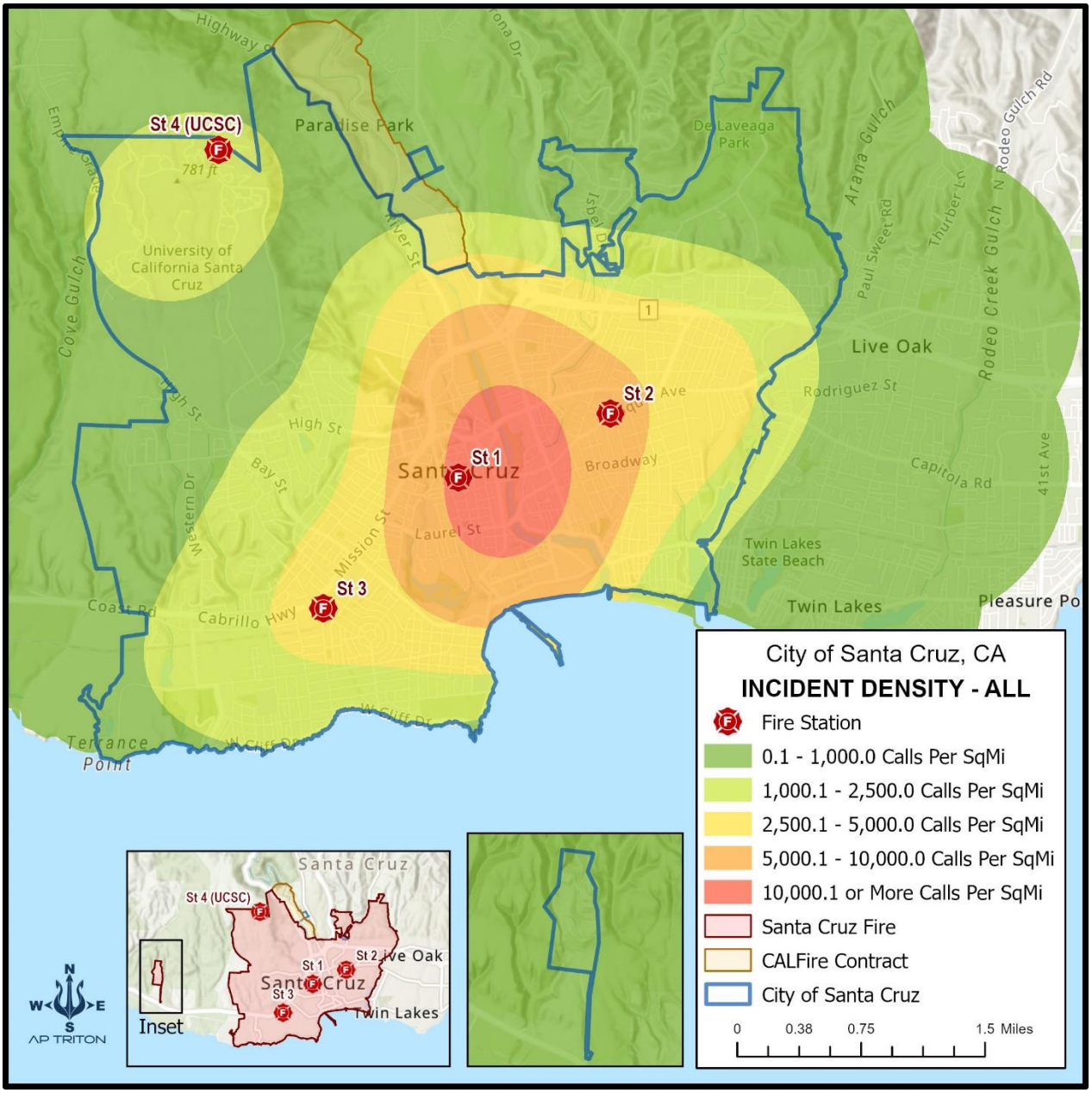
Incident (NIFRS Group)	Count	Percentage of Total Responses
The SCFD Responses		
Fire (100)	1,057	2.47%
Overpressure (200)	27	0.06%
Rescue-Medical (300)	24,121	56.34%
Hazardous Condition (400)	1129	2.64%
Service (500)	4,229	9.88%
Good Intent (600)	9,566	22.35%
False Alarm (700)	2,642	6.17%
Disaster (800)	9	0.02%
Special (900)	30	0%
Total Santa Cruz Fire Department	42,810	100%
Mutual Aid		
Auto and Mutual Aid Received	399	0.9%
Auto and Mutual Aid Given*	483	1.13%

*Includes the 307 incidents within the SCFD automatic response areas.

Geographic Analysis

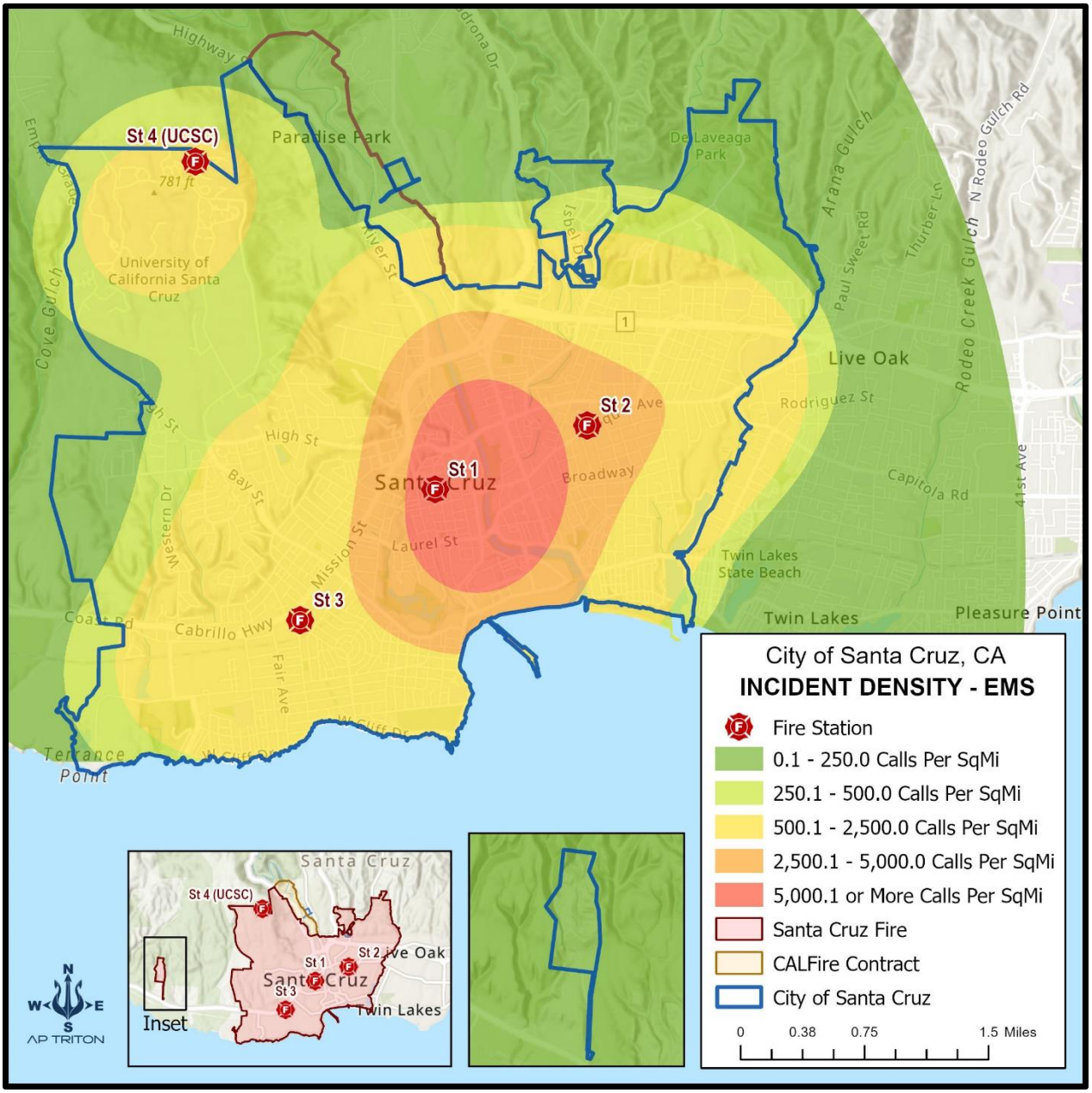
A call density analysis area with high call frequency helps determine the best locations for apparatus placement. It is also useful when evaluating where the prevention programs may have the most impact. The following figure geographically represents the incident density for the study period.

Figure 95: Incident Density (2019–2023)



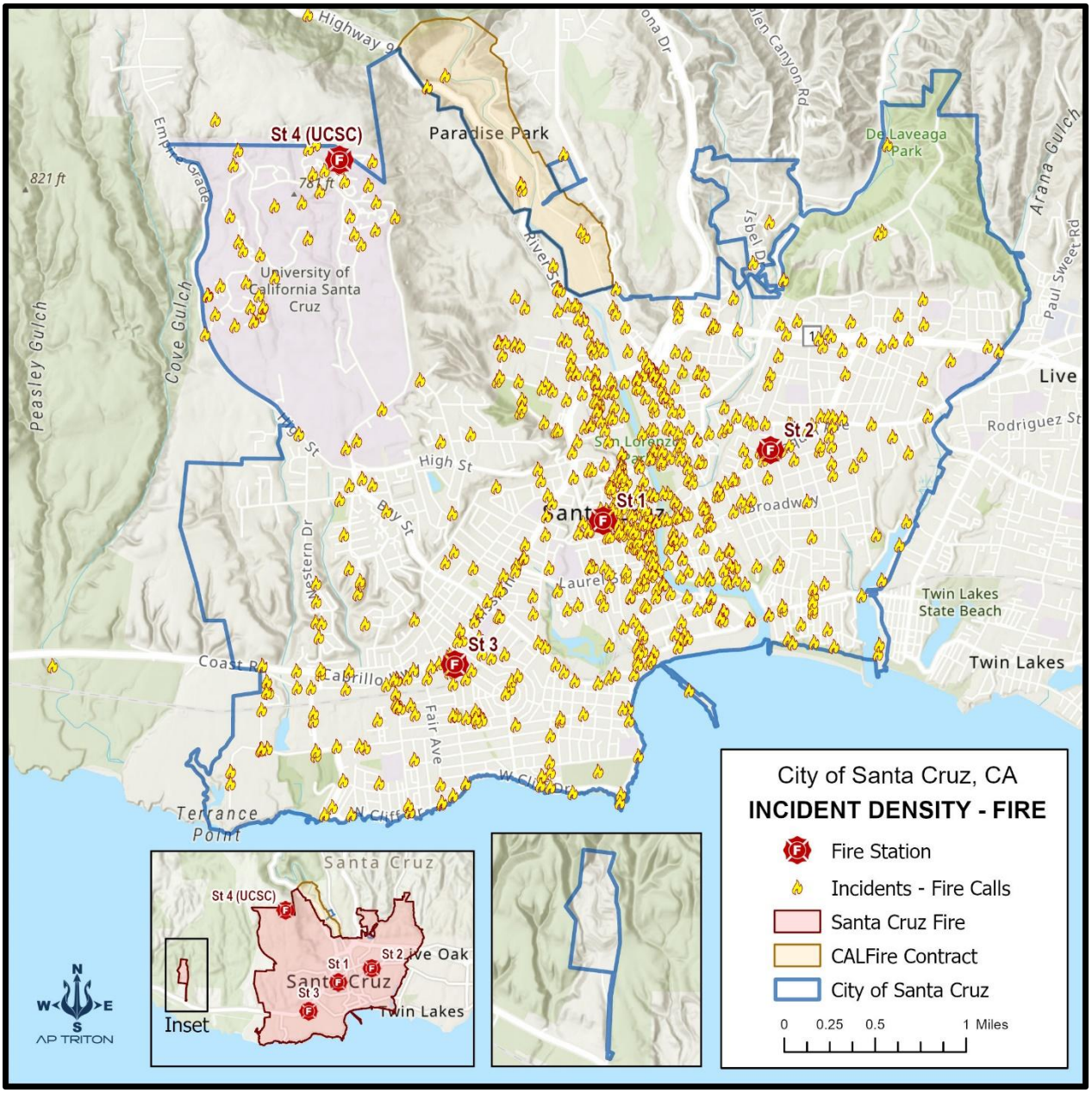
Incidents are generally concentrated in the center of Santa Cruz, where population density is highest. However, areas with higher population density outside of the center of Santa Cruz do not have a corresponding increase in incidents. Population distribution is not the sole predictor of incident concentration. Overall, incident density is driven primarily by medical responses. EMS incidents account for over 56% of the response volume. This creates a strong correlation between the overall and EMS incident densities. The following figure shows the density of EMS and rescue incidents.

Figure 96: EMS Incident Density (2019–2023)



Fire incidents generally follow the same pattern as EMS and overall incident volume, although the volume is significantly lower. The lower volume makes a comparative map less informative. Therefore, the following figure shows the location of each fire-related incident.

Figure 97: Fire Incident Density (2019–2023)



While these clusters are not predictive of future incident locations, they may help leadership visualize where the emergency problems are located and possibly help focus prevention activities.

Several addresses have more significant incident counts. These locations include shelters, senior and assisted living facilities, and medical care facilities. This is not uncommon as large populations are concentrated in one address. The following figure shows the top five locations by the address where the SCFD responded.

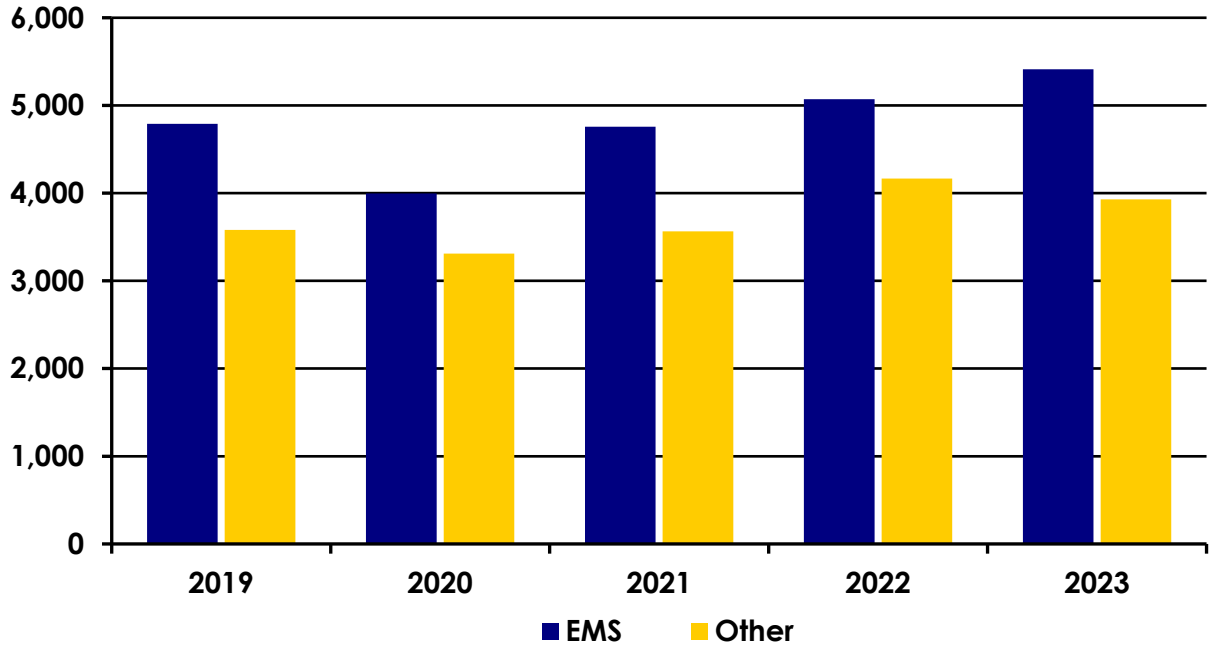
Figure 98: Top 5 Response Locations

Location	Location Type	Incidents
259 and 295 Water St	Jail – SCPD	909
80 Front St	Senior Living	862
115 Coral St	Shelter	828
609 Frederick St	Senior Living	696
2025 Soquel Ave	Medical Care	670

Temporal Analysis

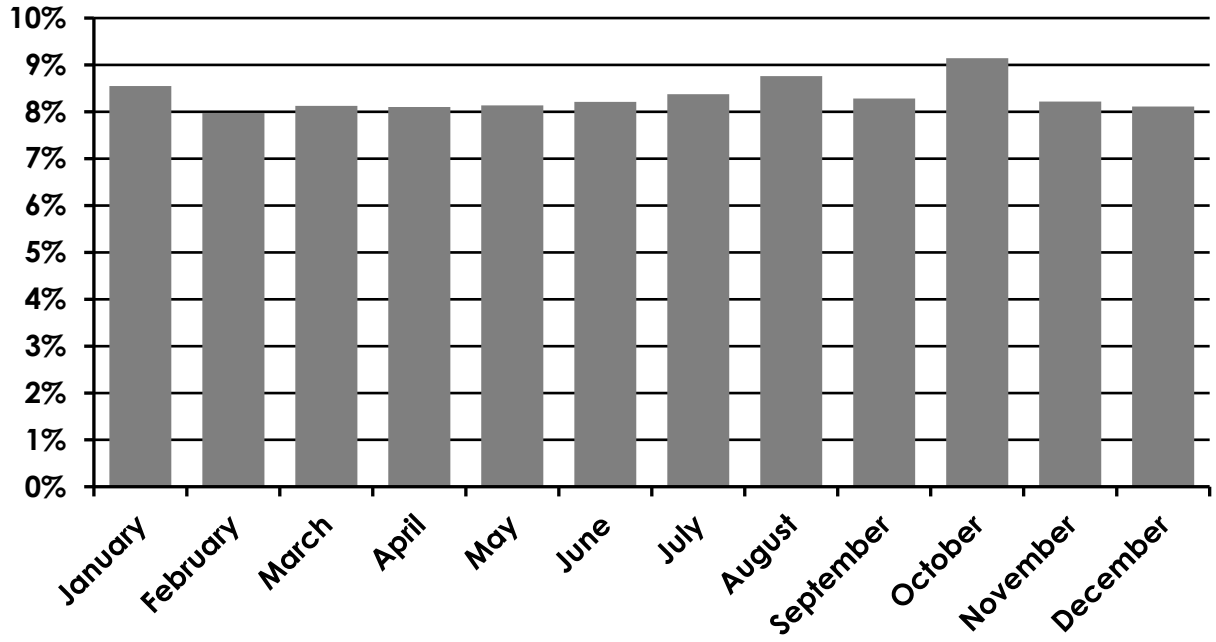
The annual incident count for the SCFD within the city has fluctuated slightly but seems to remain centered around 8,516 yearly incidents. Incident volumes dropped in 2020, likely due to the COVID-19 pandemic and subsequent societal shutdown. However, demand has since experienced a steady increase, rising 28% from 2020 to 2023. The following figure shows the annual incident volume for the City of Santa Cruz and the identified response area from 2019–2023, separated into EMS and Other incidents.

Figure 99: Annual Incident Volume (2019–2023)



Analyzing the incident volume by month, day of the week, and hour is valuable when attempting to schedule events or add staffing. Additionally, months may reveal seasonality for the service needs. At the same time, days and hours may indicate population movement and activities throughout the days. The following figure analyzes incident percentages by month for January 2019 through December 2023.

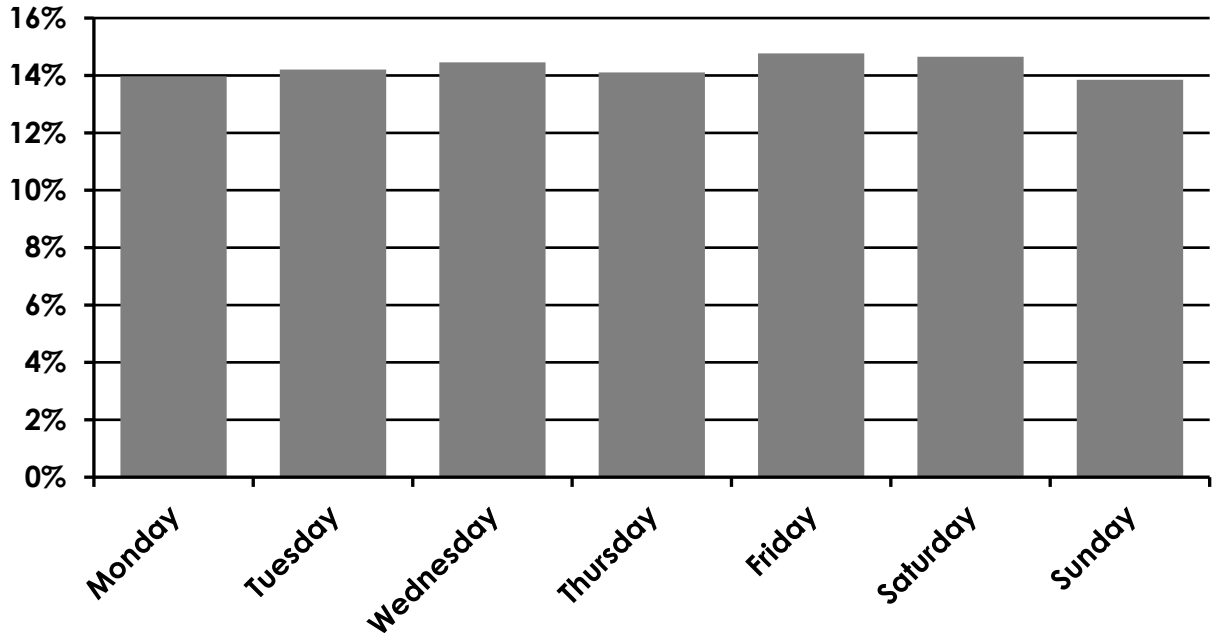
Figure 100: Incident Volume Percentage by Month (2019–2023)



There are minor deviations from the expected norm throughout the year. January through June are slightly lower than expected, while August and October are higher. This indicates a slight seasonality, with heavier responses in late summer through fall. It should be noted that the variation is less than ± 1% from the norm.

Another dimension for evaluation is the percentage of incidents that occur by day of the week. The following figure shows the percentage of incidents that occur by day of the week.

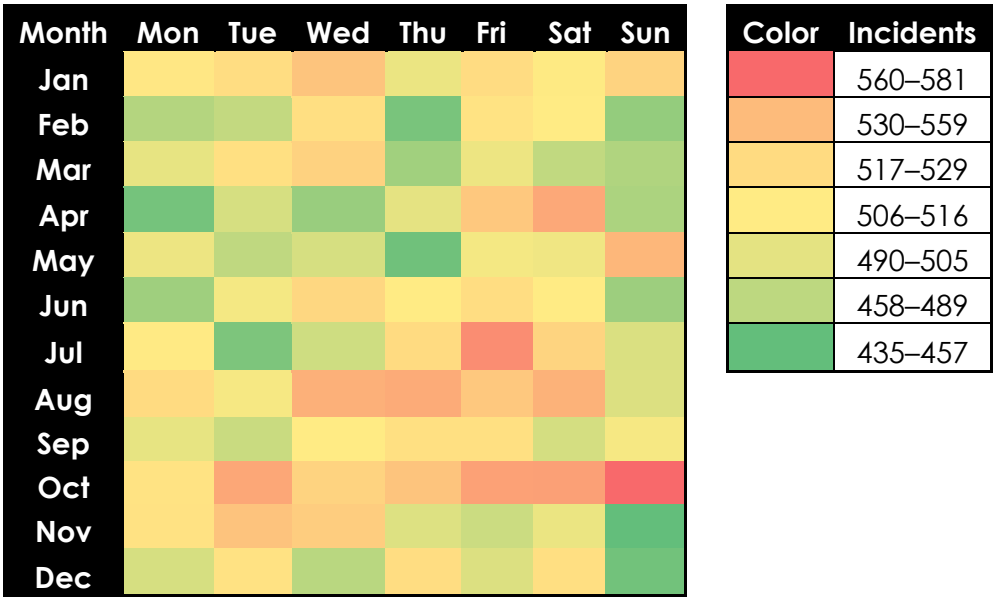
Figure 101: Incident Volume Percentage by Day of the Week (2019–2023)



In this case, there is a slight deviation from the normal distribution of 14.3% per day. Sunday is slightly lower than expected, with Friday and Saturday marginally higher.

It can be helpful to combine the month and day dimensions to identify potentially significant combinations of the month and weekday. For example, the following figure shows the density of call volume by month and weekday from 2020 through 2023.

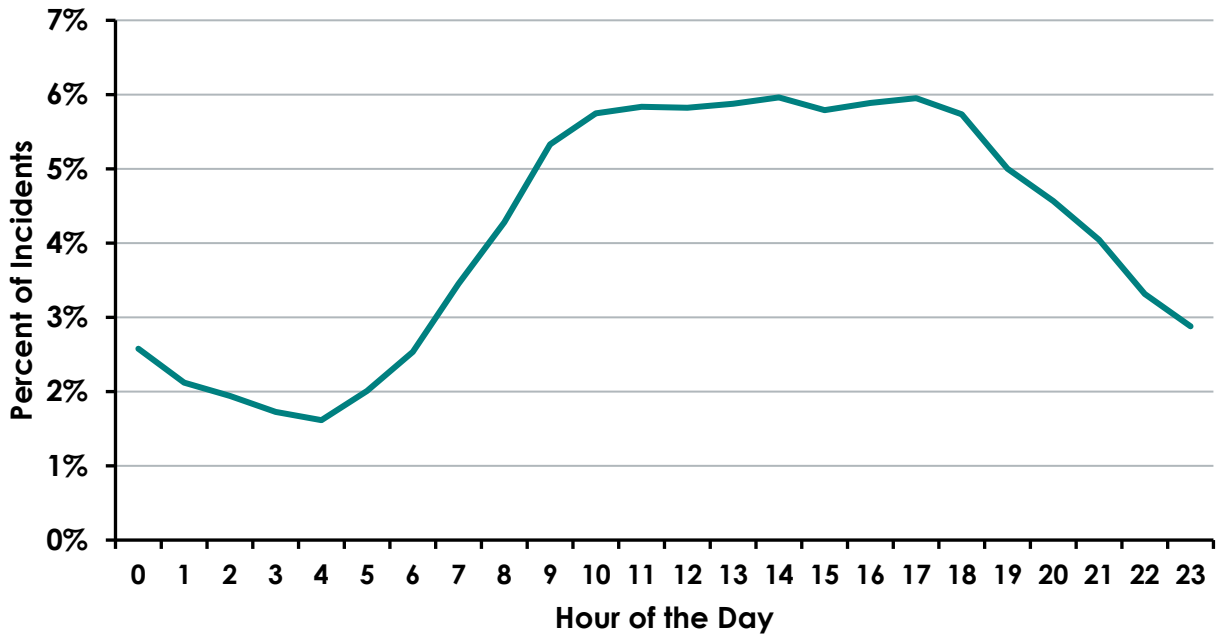
Figure 102: Month and Weekday Volume (2019–2023)



In this case, weekends in July, August, and October are busier than in other months, while early weekdays are generally not as busy throughout the year.

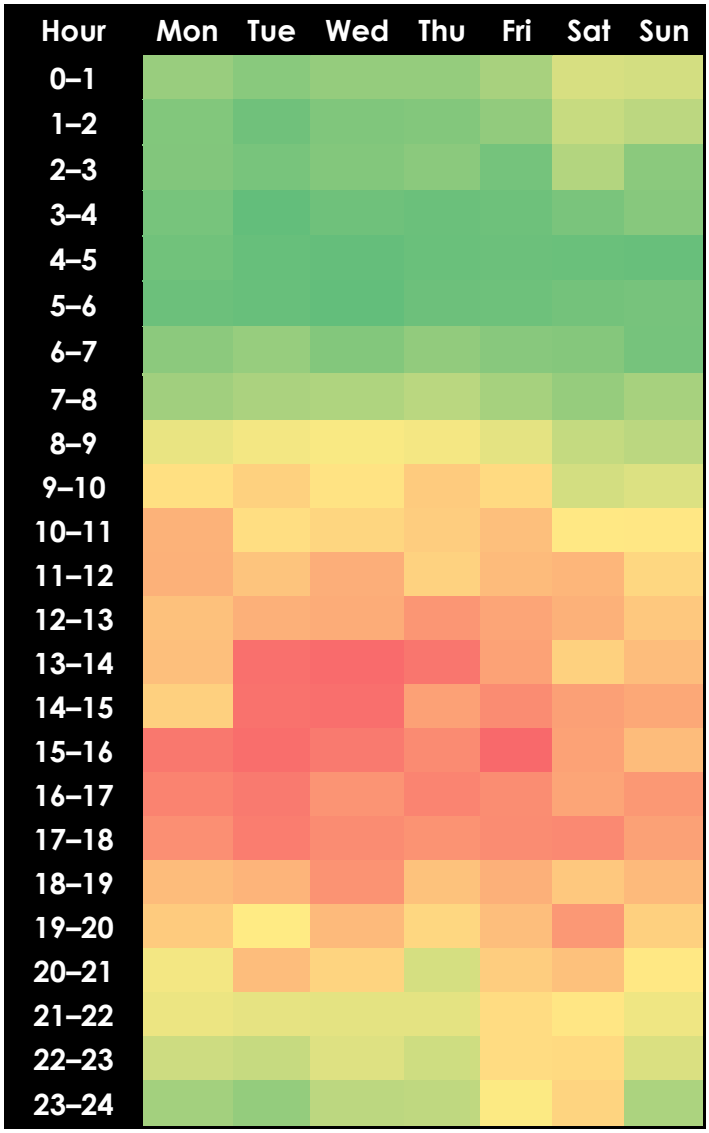
Another analytic dimension is to evaluate call volume throughout the hours of the day. For example, fire and EMS incidents are distributed unequally throughout most systems throughout the day. The daytime is typically more active than the evening, night, and early morning. The driving force behind this phenomenon is likely that people are awake and moving. The following figure indicates that the SCFD closely follows this daytime pattern, with approximately 70% of incidents occurring between 9 a.m. and 9 p.m.

Figure 103: Incidents by Hour (2019–2023)



It is essential to understand the combination of the hour of the day and the day of the week. By evaluating that density, some hot spot times can be identified. In the SCFD's case, the evaluation shows a consistent and statistically significant pattern of daytime calls regardless of the day of the week. A slight shift toward the later hours on Friday and Saturday indicates a weekend social scene within the city. However, this shift is not especially dramatic compared to some systems. The following figure indicates incident density by the hour and day of the week for all incidents between January 1, 2019, and December 31, 2023.

Figure 104: Weekday and Hour Volume (2019–2023)



Color	Incidents
	373–396
	335–372
	309–334
	273–308
	216–272
	152–215
	120–151

Resource Distribution

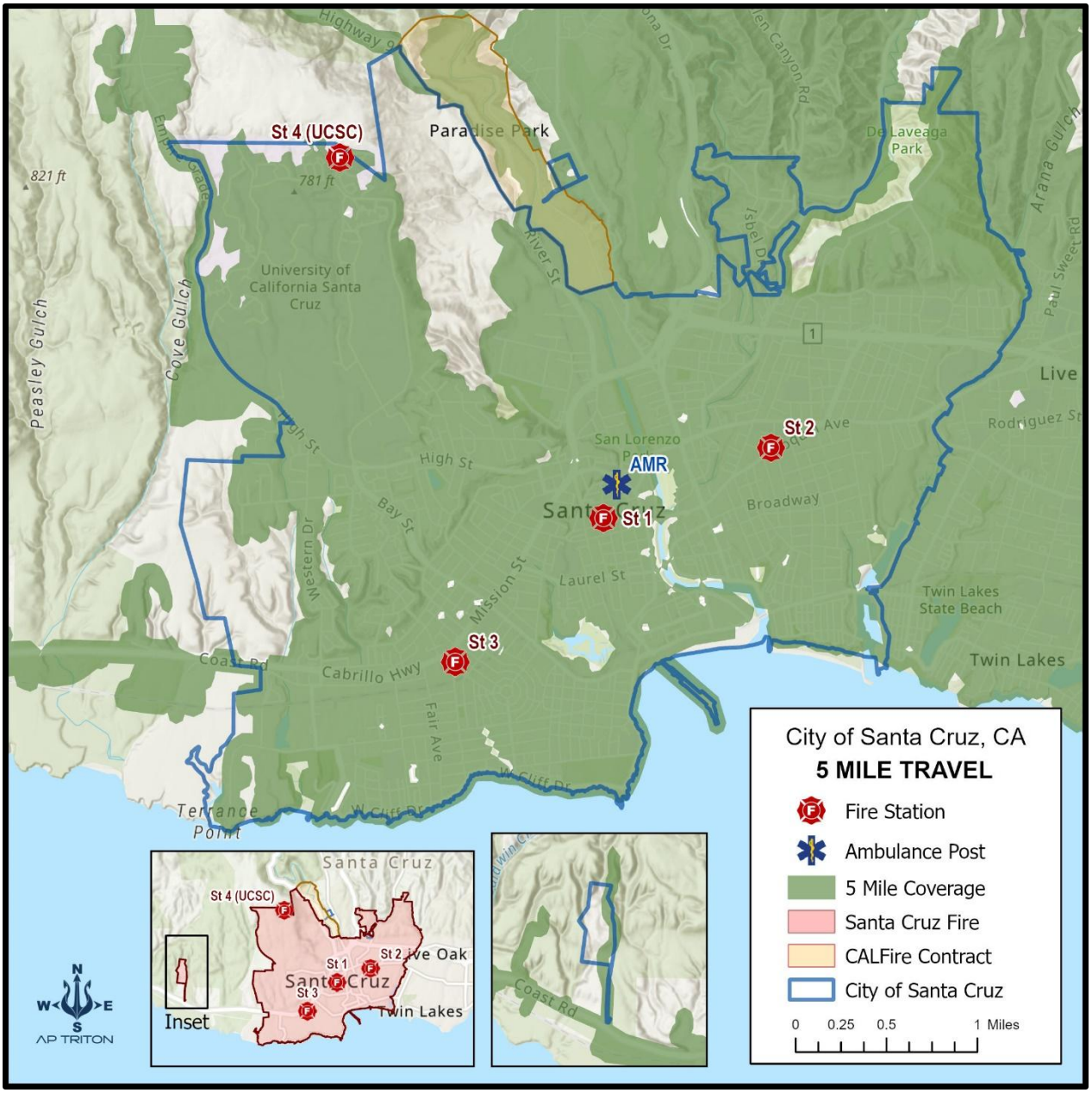
Several key performance metrics can help identify the effectiveness of resource distribution. A broad allocation of resources allows for a more rapid first response to any given area. However, the first unit is only a portion of the deployment question. It is critical to have enough units to respond to the incidents' volume, type, and severity. It is also essential to attempt to equalize the unit responses.

Geographic Distribution Analysis

Units and stations should be distributed to allow the best chance of reaching an incident in its earliest stages. There are two primary sources for performance standards that address this geographic distribution. The Insurance Services Office, Inc. (ISO) defines distance, while the National Fire Protection Association (NFPA) utilizes time as a criterion.

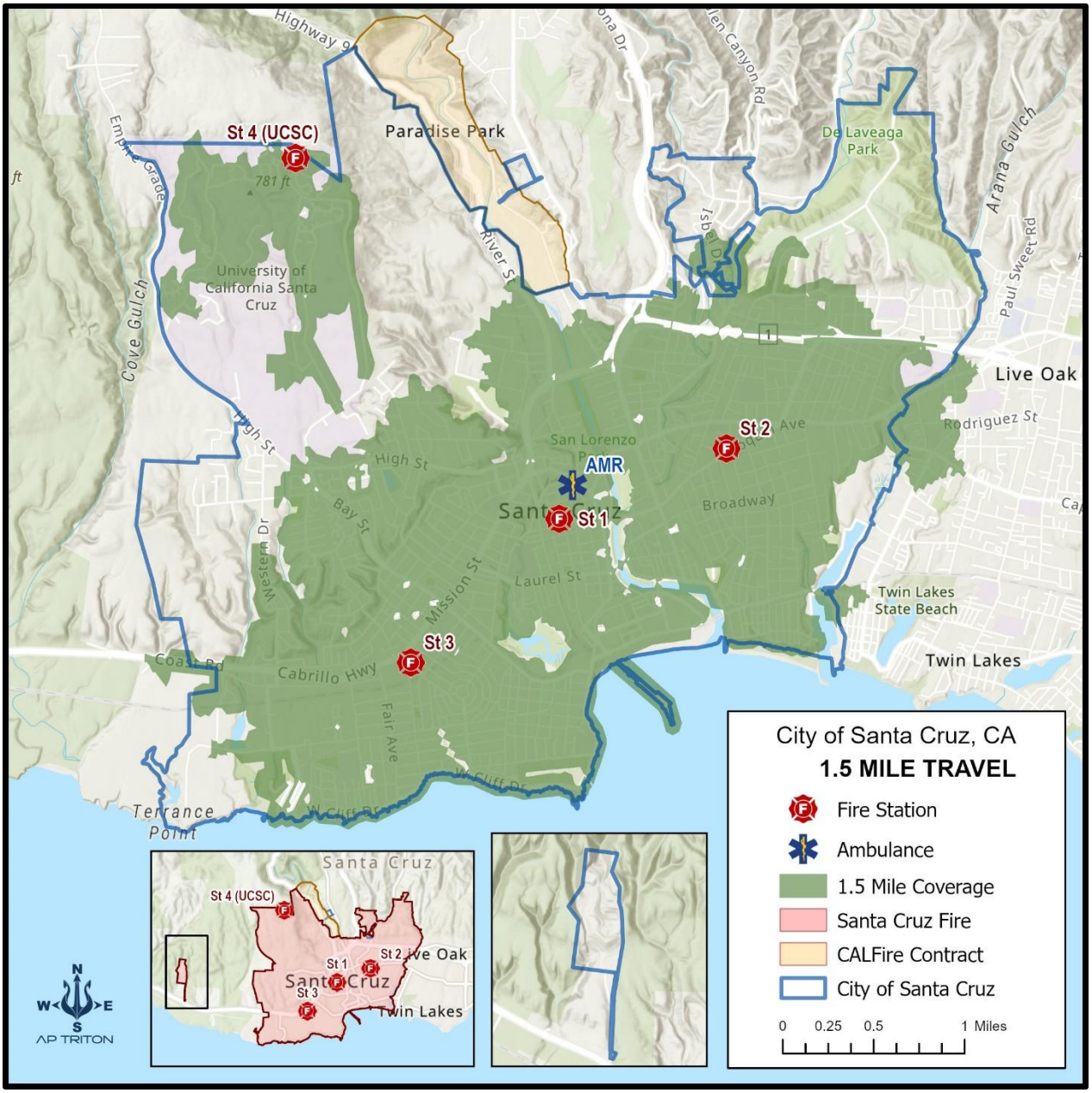
The ISO uses 5 miles from a fire station as its standard for minimal coverage. The SCFD has five operational locations within the jurisdiction. Four fire stations with firefighting apparatus are located within the primary population centers of the city. An additional location for the lifeguard function is situated at the municipal wharf. Except for areas that are difficult to access owing to few roads, the city limits are all within 5 road miles of a fire station. The following figure shows the 5-mile travel distance from a fire station.

Figure 105: ISO 5-Mile Distance



For full credit in an ISO Fire Suppression Rating Schedule (FSRS), any building within the jurisdiction should be within 1.5 miles of an engine company.[62] The City of Santa Cruz has an engine for each of the four stations within the city. The following figure shows the 1.5-mile travel distance from each station with an engine company.

Figure 106: ISO 1.5 Mile Engine Company Distance



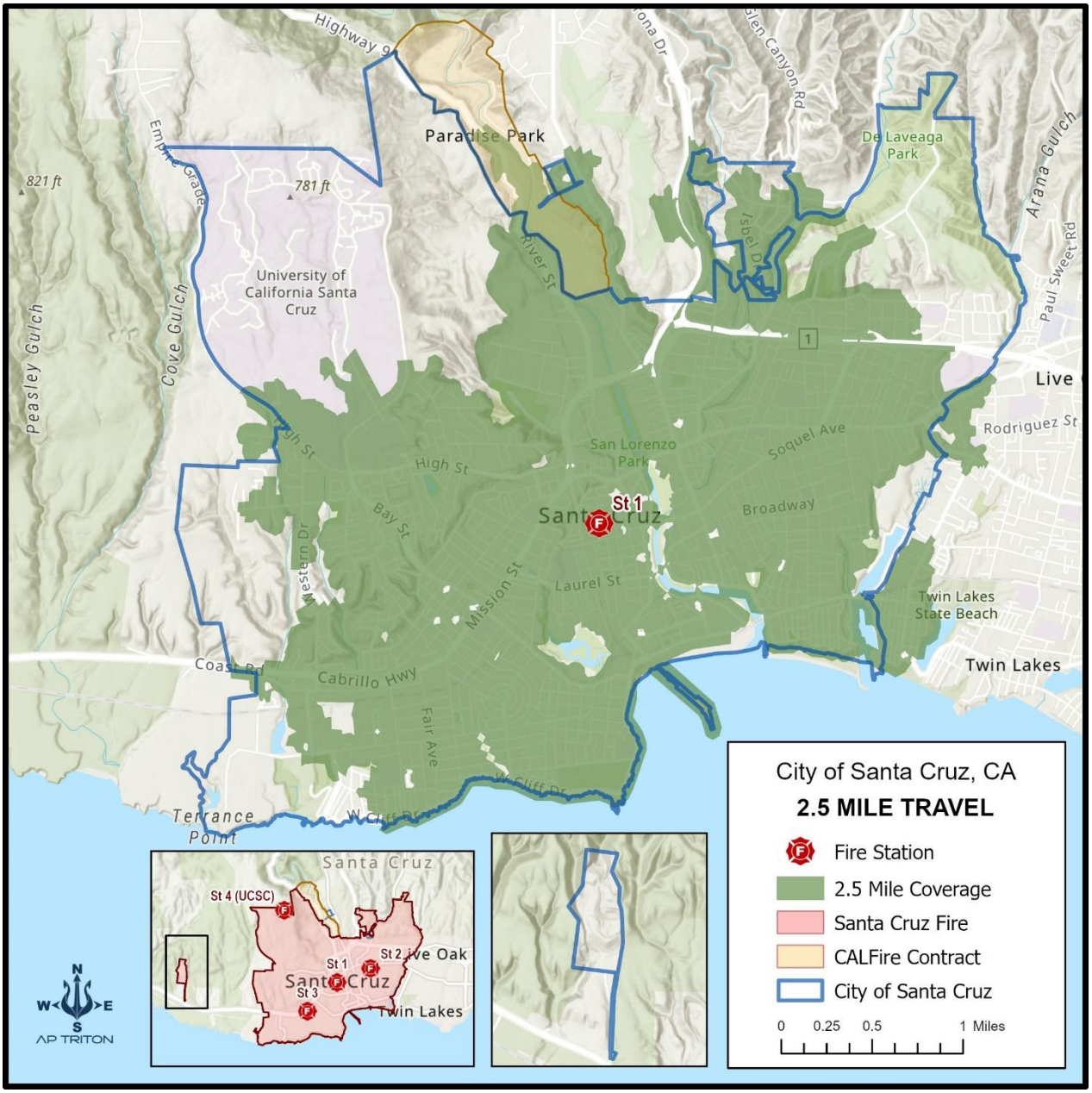
[62] Verisk. (2024). *Criteria for Deployment Analysis of Companies*. https://www.isomitigation.com/ppc/technical/criteria-for-deployment-analysis-of-companies.

Most population centers are within the recommended 1.5 miles of a SCFD fire station. Areas to the northeast and some to the west are outside the ISO recommended distance.

The ISO judges specialized equipment, such as a truck company, separately from an engine company. While engine companies are typically found at most fire stations, truck companies are only located at specific locations. ISO requires these truck companies to be within 2.5 miles of any building. [63] SCFD runs a truck company from Station 1, likely the best central location for a single truck. There is an extended travel distance to the University Campus, areas to the northeast, and some to the west. The following figure shows the 2.5-mile road travel from Station 1.

[63] Verisk. (2024). *Criteria for Deployment Analysis of Companies*. https://www.isomitigation.com/ppc/technical/criteria-for-deployment-analysis-of-companies.

Figure 107: ISO 2.5 Mile Truck Company Distance

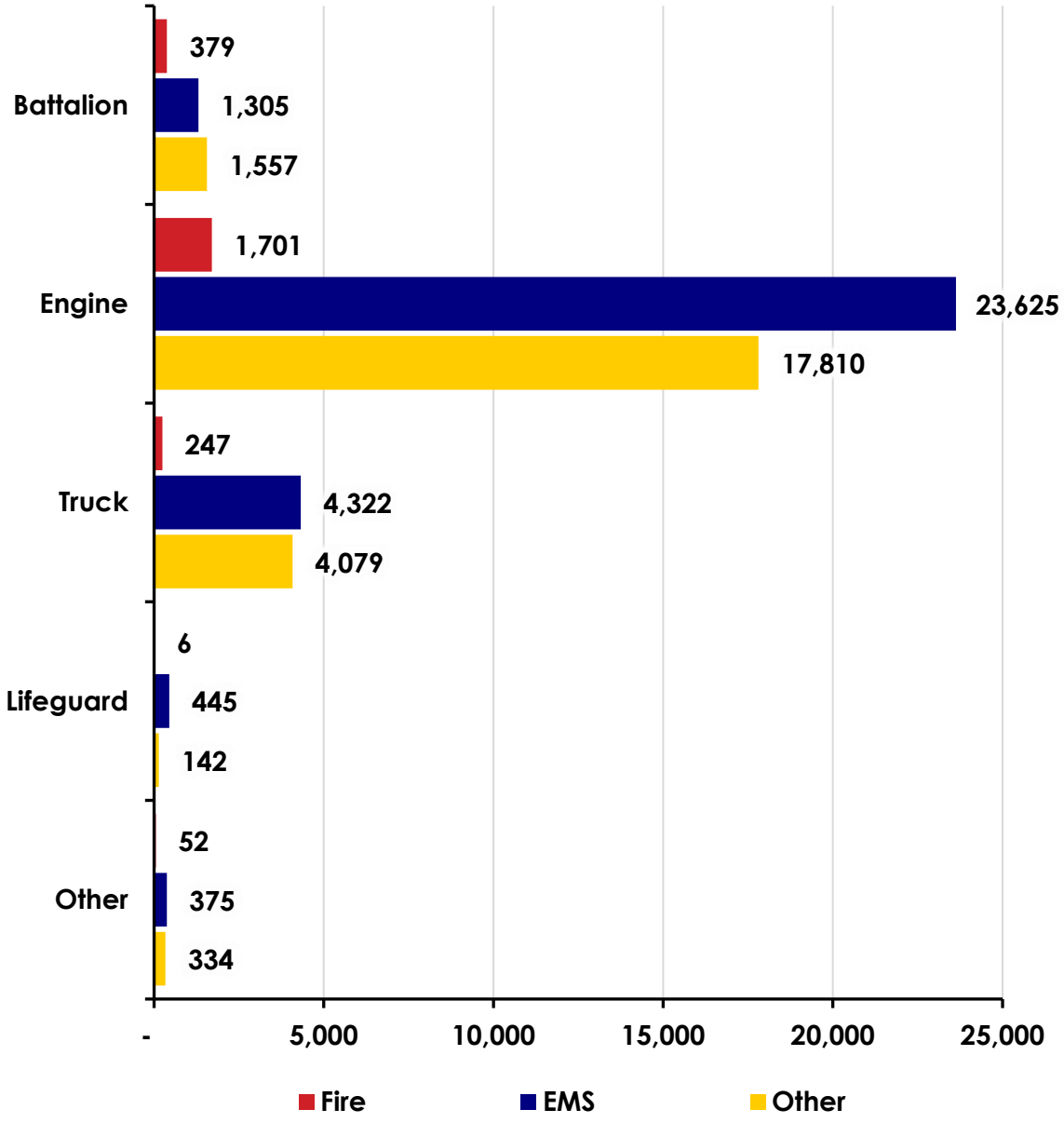


Unit Workload Analysis

Unit workload should be balanced to maintain readiness, resiliency, and service availability. While it is prevalent for one unit to be busier than others, no crew should carry a load that is too heavy, making them less effective.

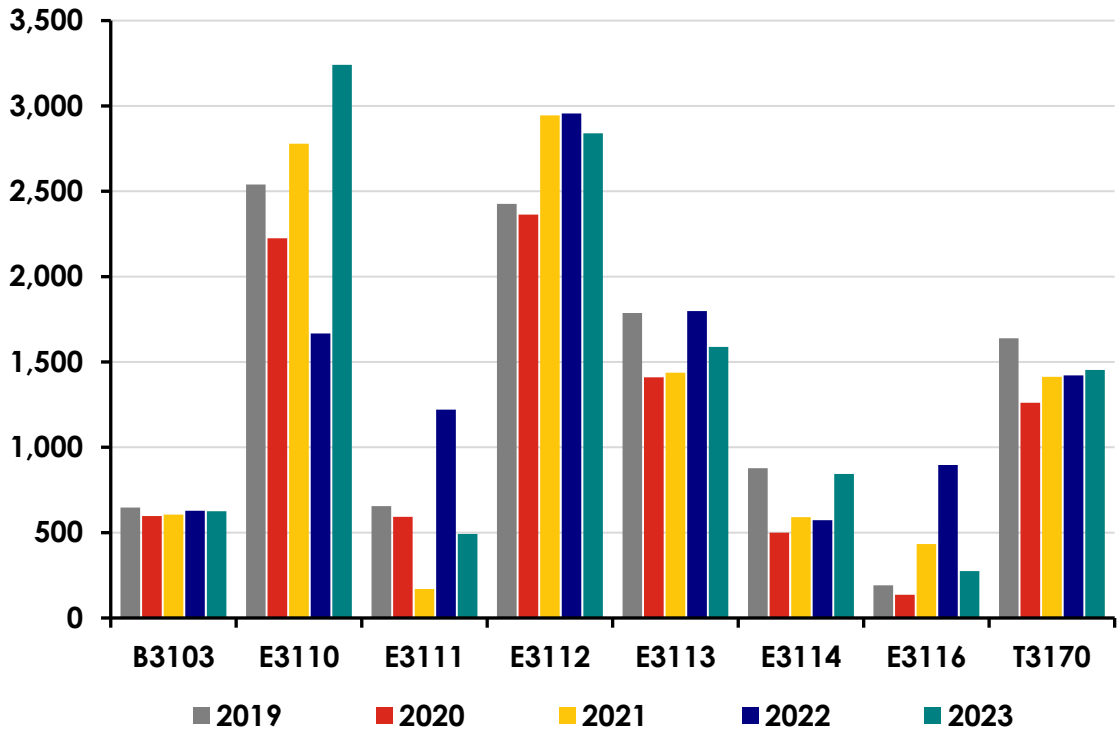
Over 85% of all unit responses were accomplished by four frontline engines, a truck, and the battalion chief. The reserve truck and engines account for 12% of the responses. The remaining units captured in "Other" include chief officers, specialty units, and other response vehicles. The following figure shows the top responding units within the SCFD for 2019 through 2023.

Figure 108: Workload by Apparatus Type (2019–2023)



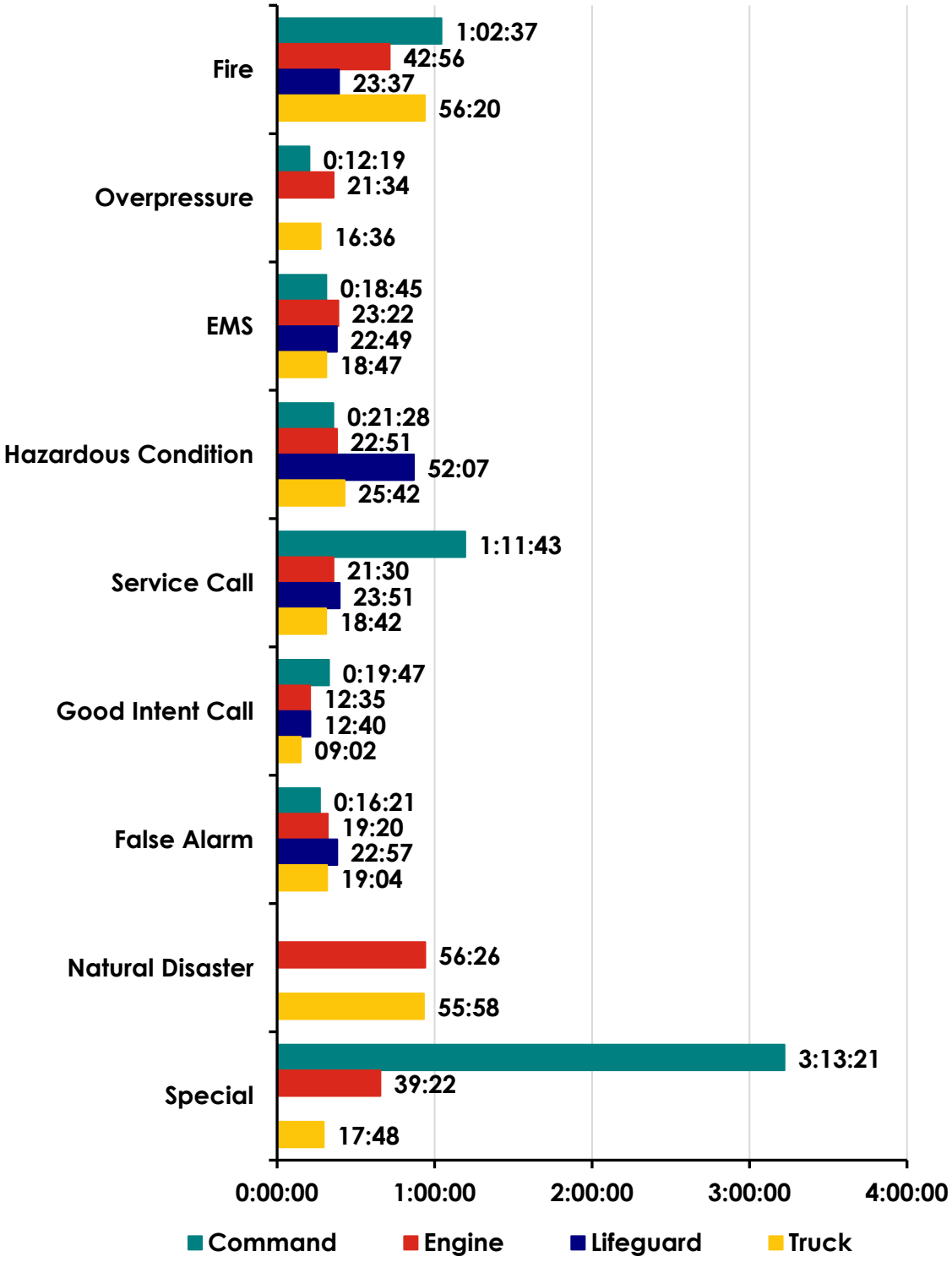
The workload is not evenly distributed across all the apparatus. Engine 3112 is found on approximately 31% of all engine responses. Engines 3110 responds to a similar number, at 29% of engine responses. Engines 3113 is slightly lower at 19%. Engine 3114 has a similar volume at 8% to Reserve Engine 3111 at 7%. E3116 is also a reserve unit with an expected low volume of 4%. The following figure shows the response volume for the busiest apparatus in numeric order for each year in the study period.

Figure 109: Annual Incident Volume by Unit and Year (2019–2023)



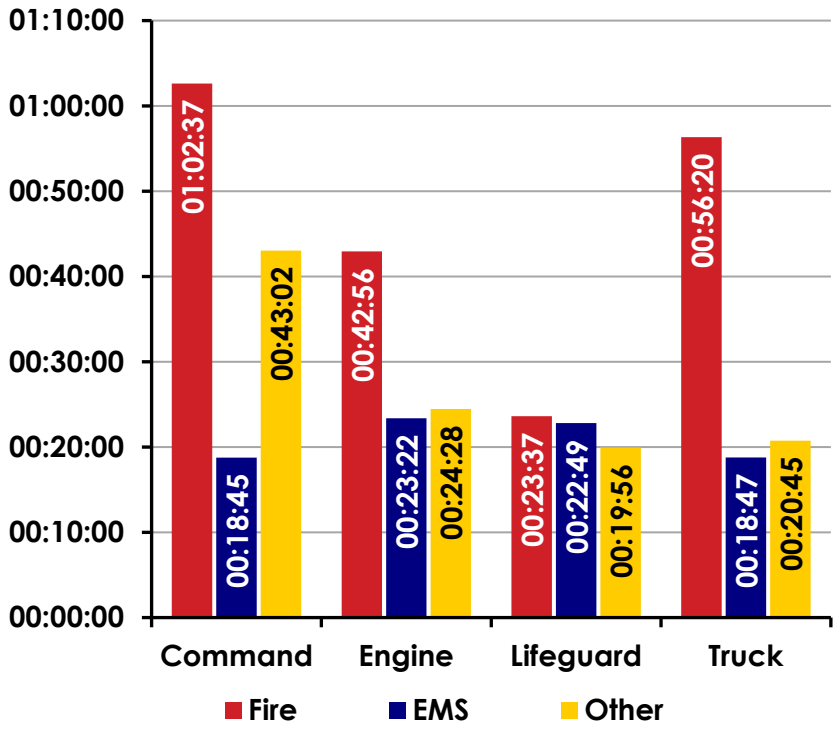
Each incident requires a unit to remain on the scene to handle the situation. Therefore, a general idea of how long a specific crew will stay on the incident can assist operational planning. The SCFD has four primary types of units that respond to emergencies. First, engines are the most flexible type of apparatus for general work. With the addition of elevated access, trucks can accomplish much of what engine companies do, depending on the equipment on the apparatus. Lifeguard units have a particular function in water-based incidents but can provide general incident response if needed. The Lifeguard units are included based on the NFIRS RMS for this study. Finally, command officers are any chief officers within the SCFD system. The following figure shows the average time each apparatus type was committed to a given incident category for the entire study period.

Figure 110: Unit Type Average Commit Time by NFIRS Category (2019–2023)



Generally, command staff remain on an incident for 43 minutes, engines for almost 27 minutes, trucks for close to 25 minutes, and the Lifeguard units for 21 minutes on average. As expected, SCFD apparatus are committed to fire incidents the longest on average, removing the more extreme Special and Natural Disaster types. EMS and other incident types have average commit times that remain around or under 30 minutes. The following figure shows the average unit commit time by incident and apparatus type groupings.

Figure 111: Unit Type Average Incident Commit Times (2019–2023)



One final dimension of unit workload is how much time each unit is committed to incidents throughout the year. The unit hour utilization (UHU) calculation evaluates how much time a crew is committed to an incident versus the total time on duty during a specific time frame. The formula for this calculation is the total time committed to an incident divided by the sum of all time the unit is staffed.

$$UHU = \frac{\sum Time\ Commited\ to\ a\ Scene}{\sum Time\ Unit\ is\ Staffed\ and\ In\ Service}$$

The desire is for the primary unit at a station, typically an engine or quint company, the most flexible response unit, to be under 10% UHU. Maintaining 10% UHU should indicate the area has 90% availability from unscheduled events. Stations with multiple engines and quint companies should aggregate to less than 10% UHU for all similar units.

The SCFD has a moderately busy system. Crew unit usage is unevenly distributed, and several units have cautionary UHU numbers. Capturing the entire crew workload required cross-staffed units to be added to the engine company at the station. Engines 3110 and 3112 appear to be at cautionary usage percentages in 2023. The following figure shows the UHU for each staffed apparatus and the cross-staffed units.

Figure 112: UHU By Unit Groupings (2019–2023)

Unit	Average	2023	2022	2021	2020	2019
Battalion 3103	**2.74%**	**2.43%**	**2.78%**	**2.67%**	**2.75%**	**3.07%**
Station 1 - Engine 3110	**8.55%**	**10.57%**	**5.62%**	**9.76%**	**8.17%**	**8.62%**
Station 1 - Truck 3170	**4.93%**	**4.75%**	**4.81%**	**4.87%**	**4.53%**	**5.69%**
Station 2 - Engine 3112	**9.84%**	**10.04%**	**10.54%**	**10.74%**	**8.51%**	**9.37%**
Station 3 - Engine 3113	**6.28%**	**6.06%**	**6.89%**	**5.67%**	**5.73%**	**7.04%**
Station 4 - Station Crew	**2.90%**	**3.52%**	**2.86%**	**2.43%**	**1.97%**	**3.70%**
Engine 3114	2.75%	3.39%	2.35%	2.32%	1.97%	3.70%
Engine 3137 (CS)	0.14%	0.10%	0.48%	0.11%		
Utility 3199	0.01%	0.03%	0.03%			
Reserve Units	**4.86%**	**4.03%**	**9.46%**	**3.00%**	**3.76%**	**4.02%**
Engine 3111	2.18%	1.76%	4.15%	0.58%	2.08%	2.36%
Engine 3115	0.38%	0.00%	0.94%	0.30%	0.33%	0.30%
Truck 3171	0.98%	1.37%	1.31%	0.62%	0.90%	0.69%
Engine 3116	1.32%	0.90%	3.06%	1.50%	0.45%	0.67%
Lifeguard HQ*						
Lifeguard 3108	10.00%	1.20%	4.72%	8.73%	25.54%	9.83%
Lifeguard 3161	2.04%	0.35%	3.88%	5.97%	0.00%	0.00%
Lifeguard 3162	0.33%	1.62%	0.00%	0.02%	0.00%	0.00%
Lifeguard 3163	23.17%	18.06%	20.56%	34.28%	17.64%	25.29%
Lifeguard 3164	4.05%	3.91%	3.80%	1.23%	11.30%	0.00%
Lifeguard 3165	58.16%	59.97%	66.89%	77.67%	36.61%	49.66%

*UHU based on office hours.

One problem with understanding the SCFD unit's full UHU burden is maintaining the reserve unit's radio designation when acting as the replacement apparatus. While not an uncommon practice, it does leave the reserve engine's crew assignment in doubt. It complicates capturing a crew's full UHU. For example, Engine 3110 had a suspiciously low UHU in 2022, while the reserve units had a high UHU. However, it is impossible to say with certainty which reserve units, if any, E3110's crew were staffing. It is apparent that without tracking response by crew, it is impossible to distinguish the complete usage.

While the UHU information helps identify if any single unit is overly burdened with the response, not all the time committed is apparent in the data. Crews may be out of service for maintenance, training, or other events that do not appear in this analysis. Approximately half of a crew's day is spent in administrative, training, or recovery activities. For example, assuming the crews are allowed 8 hours of rest and recovery daily, 2 hours for meals, and 2 hours for station, equipment, and vehicle maintenance, that totals 12 hours. Additional time is usually given to physical fitness, training, and public education.

Concurrency Analysis

Incidents that happen simultaneously can impact an agency's ability to respond. Sometimes, all crews are engaged, leaving the jurisdiction reliant on outside aid.

The first dimension of the concurrency evaluation is how often, within the SCFD's primary jurisdiction, there is more than one incident at any given time. For example, the following figure shows how frequently multiple incidents occurred simultaneously within the City of Santa Cruz in 2023.

Figure 113: Concurrent in the City (2023)

Incidents Operating	Percentage of Incidents
2	36.1%
3	9.2%
4	1.5%
5 or More	0.3%

As is evident, it is not uncommon for the SCFD to be running simultaneous incidents within the jurisdiction. There is a 47% chance that another incident will start before the first incident is completed. However, responding to more than 4 incidents is very rare. The maximum number of concurrent incidents in the data was 5. However, the jurisdictional issue does not provide a holistic picture for the SCFD. The agency occasionally responds outside the city, as indicated in the jurisdictional incident count study. The following figure demonstrates how often the SCFD works on multiple incidents throughout the response system.

Figure 114: Concurrent Entire System (2023)

Incidents Operating	Percentage of Incidents
2	36.4%
3	9.4%
4	1.5%
5 or More	0.3%

As is evident, the entire system does shift the concurrency slightly higher. Still, the maximum remaining 4 operating incidents are within the capacity of the 4 staffed engines and 1 truck.

Another factor in unit workload is the number of units assigned to a specific incident. The majority of the SCFD incidents, over 94%, are accomplished by one company. Over 97% are handled by one or two companies. The following figure shows the percentage of incidents where the specified number of response units were assigned to an incident.

Figure 115: Apparatus per Incident (2019–2023)

Apparatus per Incident	Percentage of Incidents
1	94.3%
2	2.98%
3	2.13%
4	0.29%
5	0.21%
6 or More	0.08%

While many apparatus response groupings are possible, the SCFD sends the same two-apparatus combination nearly 18% of the time. The following figure shows the number of single-unit responses and the top 5 two-apparatus combinations, which account for 95.9% of all incidents.

Figure 116: Common Unit Combinations

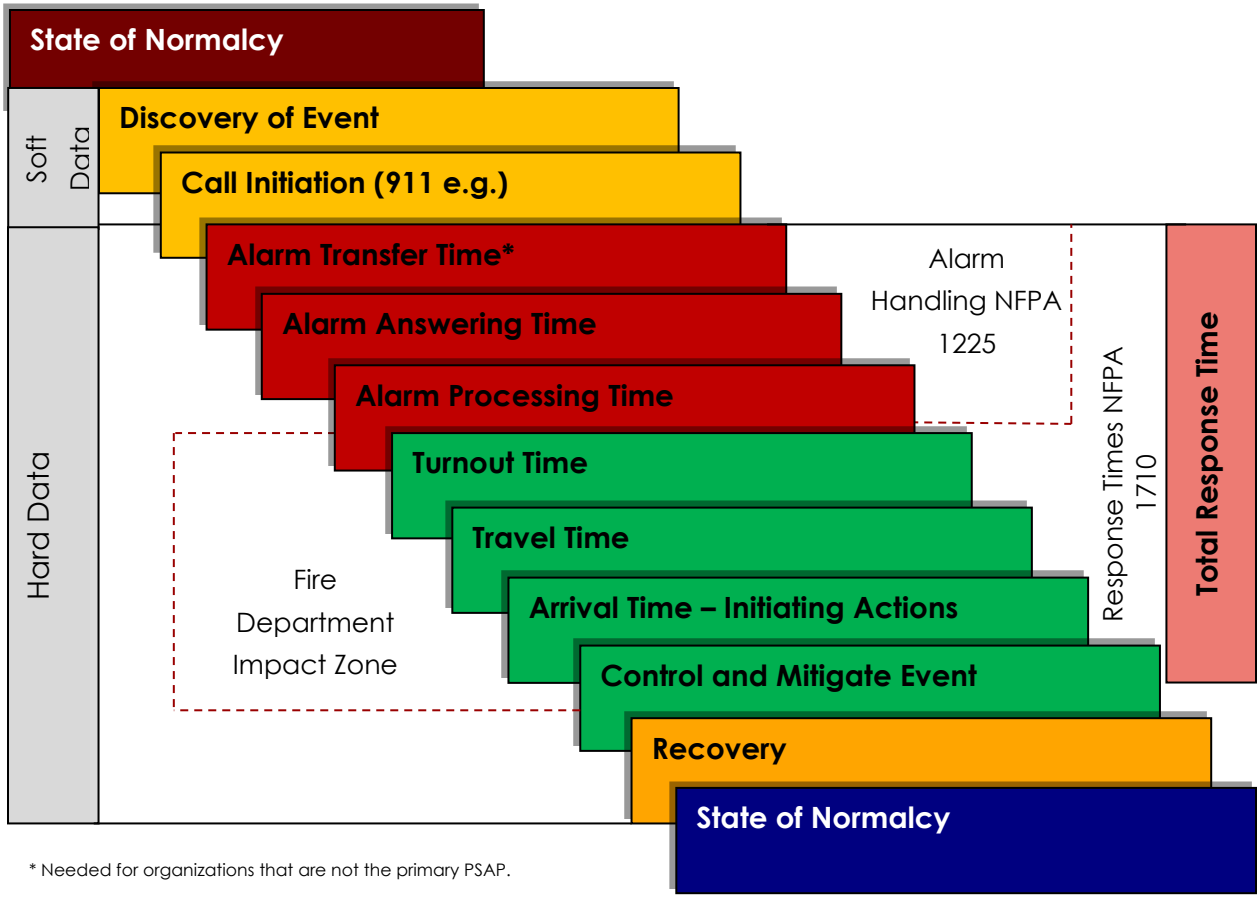
Apparatus Combination	Percentage of Incidents
Single Unit	94.3%
E3110 & T3170	0.53%
E3112 & T3170	0.48%
E3113 & T3170	0.31%
E3110 & E3112	0.15%
E3110 & L3165	0.15%

Performance Review

When evaluating a system, having a set of objectives or standards against which to judge performance is helpful. While national and state standards may be recommended, in California, it is up to the authority having jurisdiction to adopt specific ones. In this case, the SCFD has adopted two standards. The call processing goal is the NFPA standard 60 seconds with the addition of 13 seconds for dispatch to gather information. The adopted 60-second turnout time for EMS incidents is standard. The SCFD has adopted a 2-minute standard for Structure Fire, Rescue, Water Rescue, and Vehicle Accident incident types. The total response time goals are unique to the SCFD and vary depending on Urban, Suburban, and Rural response areas. Other goals reference the NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (NFPA 1710). The goals also reference portions from NFPA 1225: *Standard for Emergency Services Communications* (NFPA 1225).

Evaluating overall performance requires an understanding of the lifecycle of an incident. It starts with a normal state and should end with a new normal state, but there are many measurable time segments in between. Some elements, such as call processing and turnout time, can be improved by tactical management techniques such as training and policy. However, other time segment performances, such as travel time, are typically managed by a strategic methodology such as station location. The following figure identifies each time segment in the incident lifecycle.

Figure 117: Incident Lifecycle



The incident data provided did not allow for analysis of all time segments in the above list. However, enough information was provided to evaluate call processing, turnout, travel, fire department response, and total response time. While the SCFD has adopted call processing, turnout, and total response time standards, other available time segments will utilize the NFPA standards as a performance benchmark. The following figure indicates each time segment, standards referenced, and the most influential organizational actions.

Figure 118: Incident Segment KPIs

Incident Segment	Primary Agency Influence	Standard	Benchmark
Normalcy	Prevention	Local Codes & Ordinances	Community Risk Assessment
Discovery	Public Education		**TBD**
Notification	Public Education		**TBD**
Call Answer[1]	Dispatch Staffing, Systems, Policy, & Training	NFPA 1225 & Local Standard	15 Sec 90th Percentile 20 Sec 95th Percentile
Call Transfer			30 Sec 90th Percentile
Call Processing			73 Sec 90th Percentile (priority)[2]
Turnout Time	Station Design, Policy & Training	NFPA 1710 & Local Standard	60 Sec 90th Percentile (EMS) 80 Sec 90th Percentile (Other) 120 Sec 90th Percentile (Structure Fire, Rescue, Water Rescue, and MVC)
Travel Time (1st Due)	Station Location, Systems, & Training	NFPA 1710	4 Min 90th Percentile
Travel Time (2nd Due)			6 Min 90th Percentile
Travel Time (ERF)			8 Min 90th Percentile (Low or Moderate Risk) 10 Min 10 Sec 90th percentile (High Risk)
Action Initiation or Patient Contact	Station Location, Systems, Staffing, & Training		**TBD**
Control/Mitigation			**TBD**
Recovery	Prevention & Public Education	Updated Codes & Ordinances	Community Risk Assessment
New Normal	Prevention	Local Codes & Ordinances	Community Risk Assessment

[1] Applies to both PSAP and Secondary Answering (Agency) Dispatch Centers.
[2] Non-Priority Incidents are exempt from NFPA 1225. Agencies are expected to set standards.

The time segment performance standards are evaluated as a percentile. This will allow the SCFD to compare its performance against other agencies and the standard with a similar statistical technique.

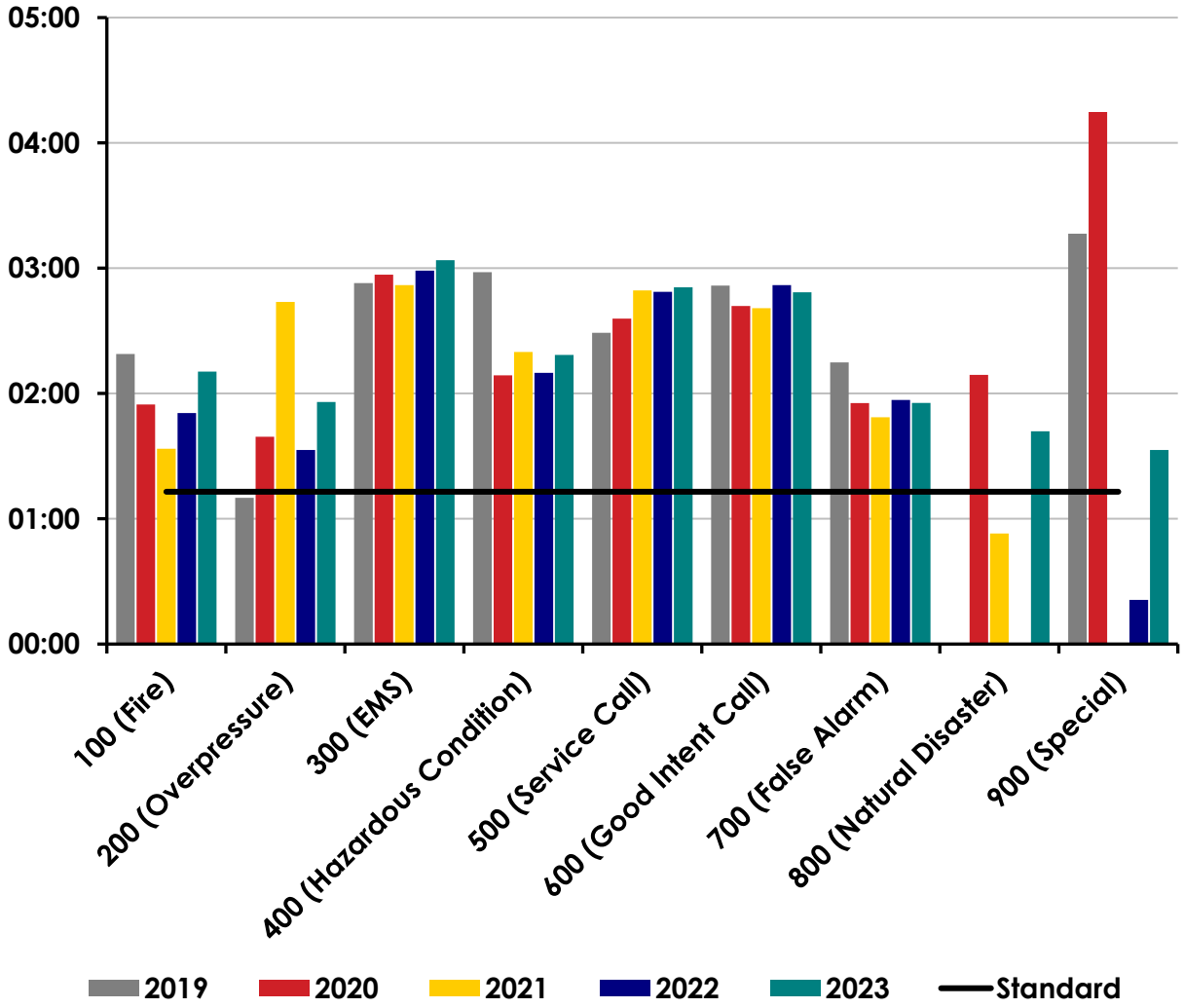
Call Processing Analysis

There are several time measures of a dispatch center. The metrics identified in NFPA 1225 and NFPA 1710 are ring time and call processing. Ring time measures when the phone in dispatch begins to ring until someone answers. NFPA 1225 requires the ring time to be less than 15 seconds, 90% of the time and less than 20 seconds, 95% of the time. Call processing indicates the time it takes from when a person answers the call for help until the first unit is notified of an incident. Ring time is typically captured in a separate system, and the raw data was unavailable for this report. However, sufficient data was available to evaluate call processing.

Call processing should start from when the phone is answered until the first, preferably correct, unit has been notified an incident is in progress. However, there is typically a short period, usually seconds, from when the phone is answered and the incident is started in the computer-aided dispatch system. For this analysis, it is assumed this short period, while not captured, is inconsequential. The NFPA 1710 standard indicates that a high-priority incident should be processed within 60 seconds, 90% of the time. NFPA further defines specific call types to be processed within 90 seconds, 90% of the time, and 120 seconds, 99% of the time. These incident types include those requiring emergency medical questioning, hazardous materials incidents, and technical rescue incidents. This additional time is available for persons needing translation, calls from devices used by hard-of-hearing individuals, text messages, and calls requiring location determination.

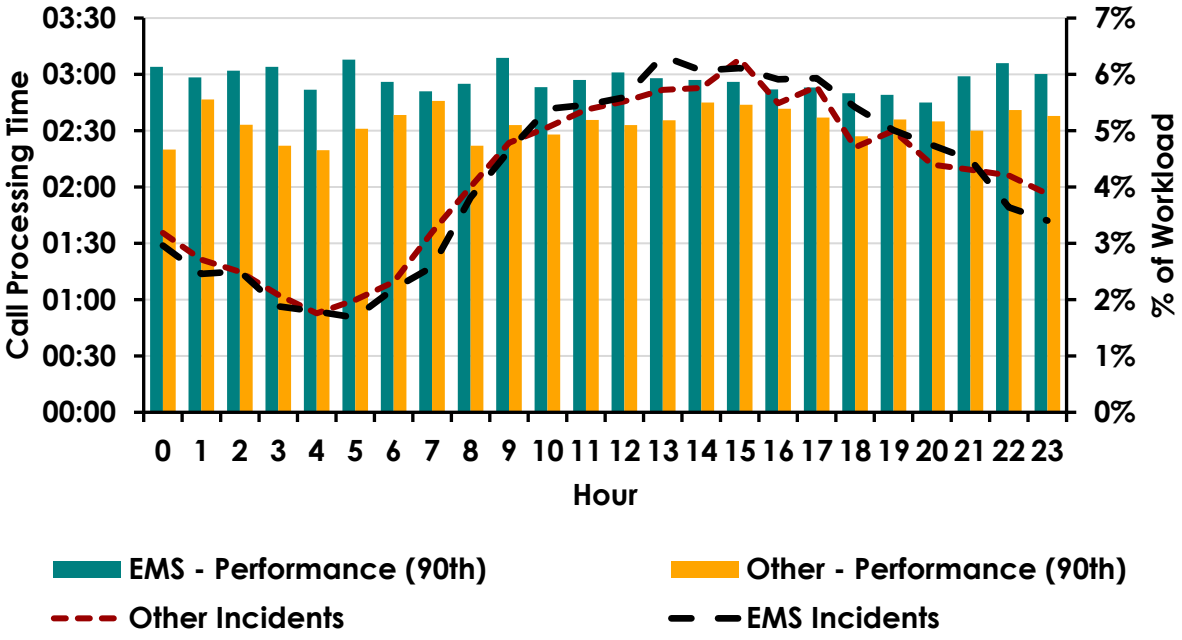
The data provided was evaluated for integrity and reliability. It was found that the data was generally reliable. Specific incidents were excluded to find the emergency call processing times. These excluded incidents were mutual and automatic aid outside the jurisdiction, incidents without units in the data, canceled units, and "null" incident categories. However, that did leave 24,394 incidents, or 57% of all incidents, for evaluation. Overall, the Santa Cruz Consolidated Emergency Communications Center (SCCECC) processed calls at approximately 2 minutes, 51 seconds or faster 90% of the time. The following figure shows the call processing time at the 90th percentile based on the NFIRS incident grouping for 2019–2023.

Figure 119: Call Processing by NFIRS Category (2019–2023)



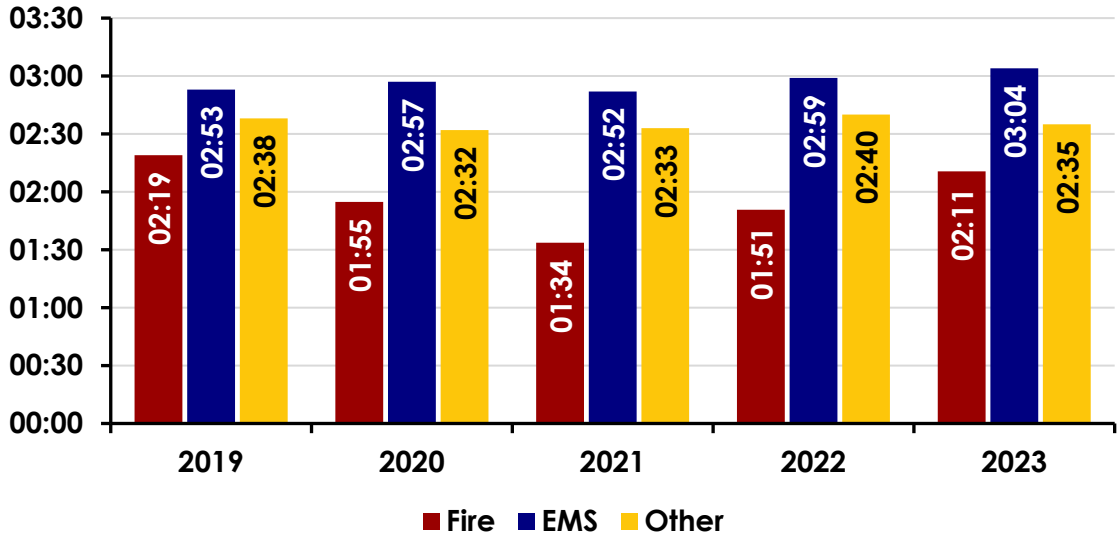
Another dimension of the call processing time is how incident workload affects dispatch center performance. SCCECC manages the workload well, and the call processing time remains relatively consistent by the hour. The following figure is the call processing times of medical incidents and all other incidents by the hour of the day, with the call load added as a reference.

Figure 120: Call Processing by Hour (2019–2023)



Annual call processing has remained consistent for all years in the analysis. One exception is a sizable drop in call processing times for Fire incidents from 2019 to 2021. The following figure shows the annual call processing time by general categories.

Figure 121: Annual Call Processing (2019–2023)



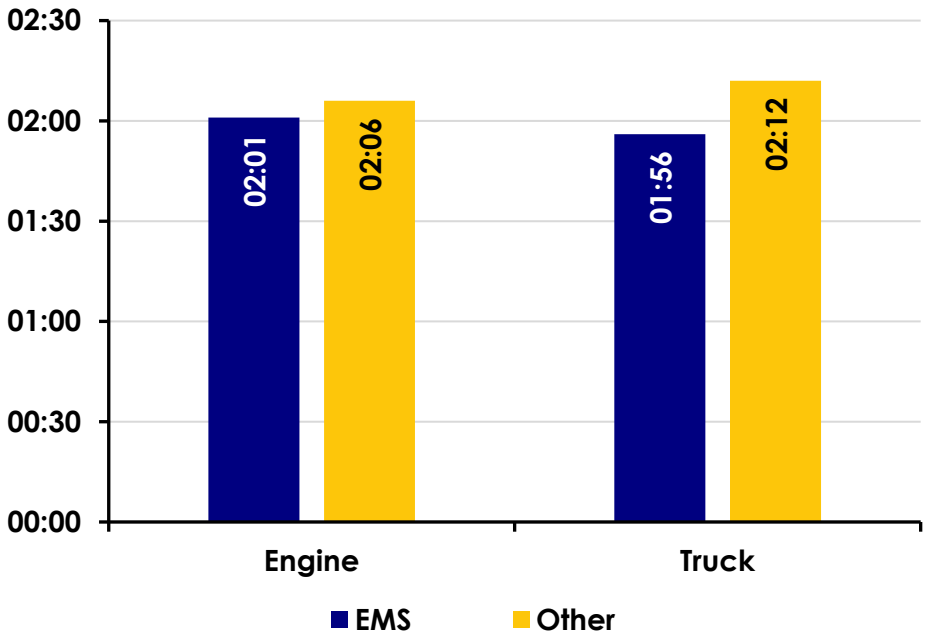
Turnout Time Analysis

Turnout time is the difference between when the unit is notified of an incident and when they begin to respond. NFPA 1710 indicates the performance measure for this time segment is 60 seconds for EMS incidents and 80 seconds for other incidents.

Some incident data was removed to create the most realistic turnout time evaluation. First, incident data missing either the dispatch time, the en route time, or where the dispatch time was later than the en route time was eliminated as erroneous. In addition, units without arrival times and lifeguard units were removed. Finally, only the SCFD frontline units were evaluated, and the turnout time was limited to a 6-minute maximum as it was a natural break between the meaningful data and the extremes outside the maximum limit.

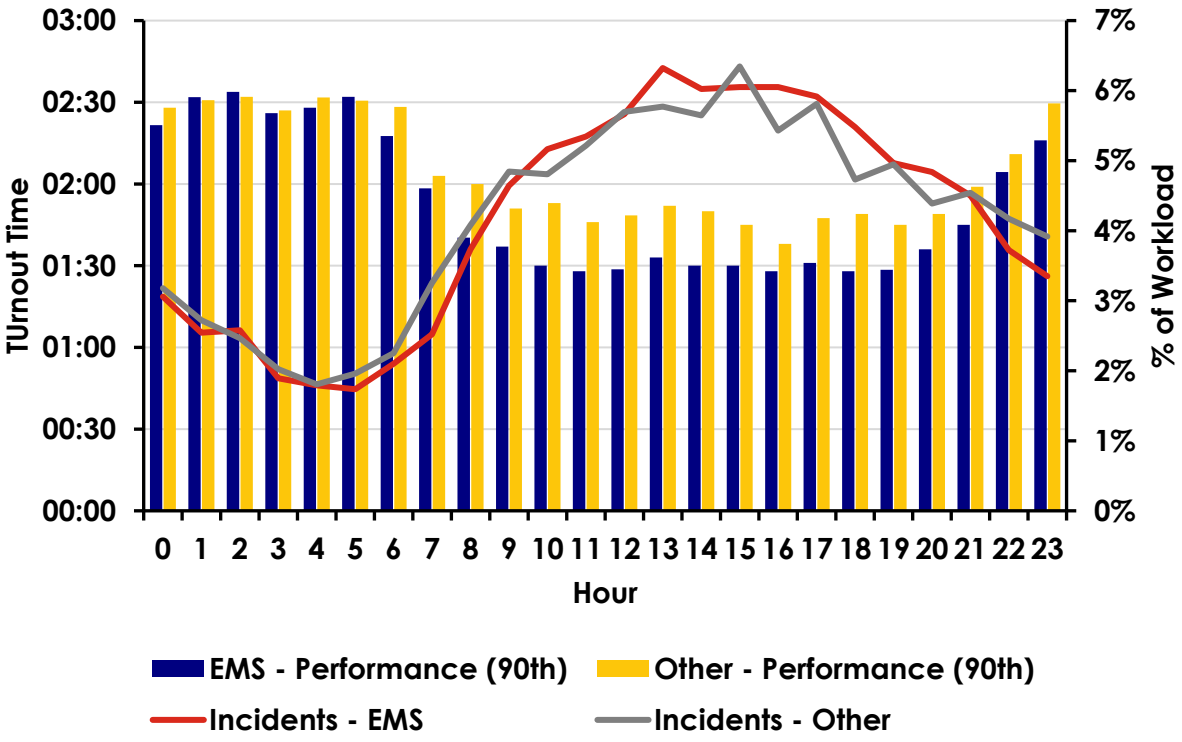
The data was analyzed for statistical reliability, and over 21-thousand records could be measured. This represents approximately 50% of the recorded information, a typical percentage in this type of analysis. Overall, the SCFD staffed apparatus has a turnout time of 2 minutes, 5 seconds, 90% of the time, or faster. The following figure shows the turnout times by unit type and general incident types.

Figure 122: Turnout Time by Apparatus and Incident Type (2019–2023)



The temporal evaluation of the turnout time shows changes in the percentile by hour of day and annual performance. Since the SCFD staffs their engine and truck units 24 hours a day, it is expected that crews can try to sleep at night. However, sleeping personnel can impact how fast they can get to the apparatus and begin to respond. The following figure shows the turnout percentile by the hour of the day, with the workload by general incident type added for reference.

Figure 123: Turnout Time by Hour (2019–2023)



It is interesting to note the inverse pattern of turnout times and workload. This phenomenon is common in agencies with lower call volume at night. This can be explained as a combination of crews resting and fewer incidents to analyze. A limited data set is typically much more susceptible to higher times and more obvious data swings.

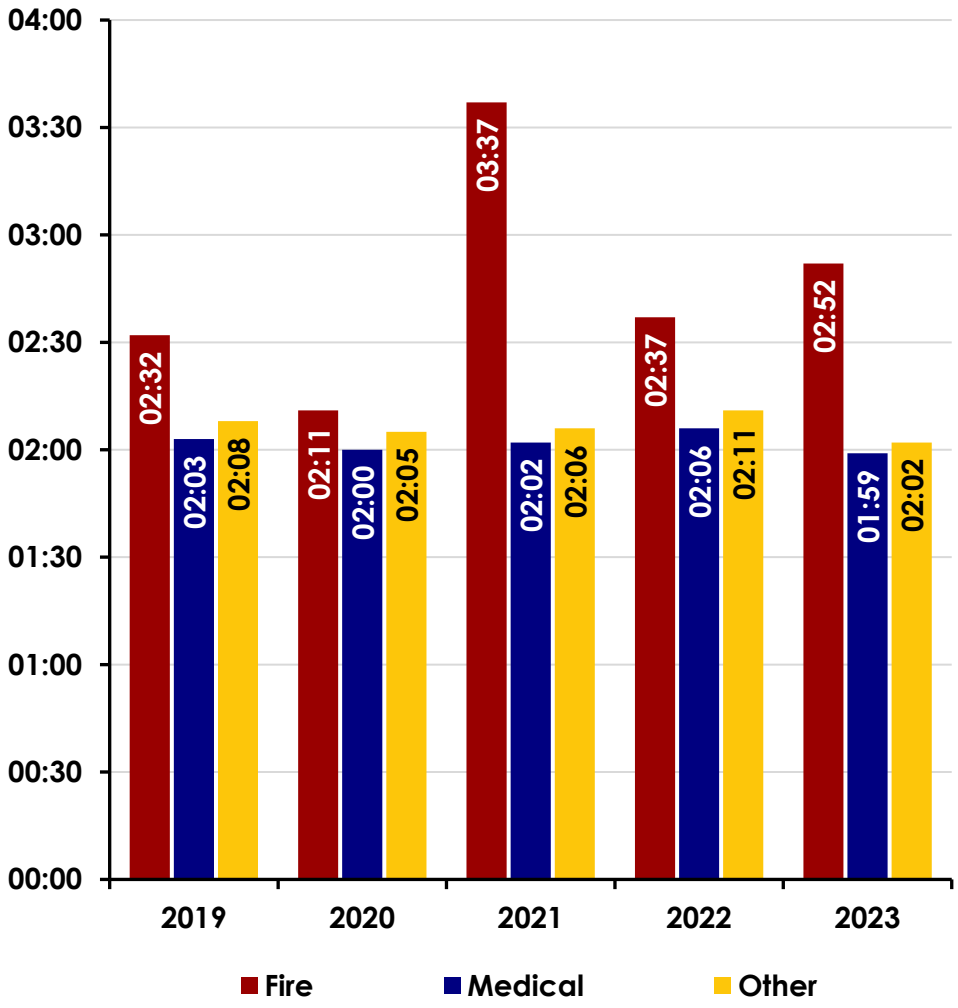
The SCFD specifies a turnout time performance of 60 seconds for medical incidents and 120 seconds for Structure Fire, Rescue, Water Rescue, and MVC incidents. The analysis below will illustrate performance grouped by type, such as medical incidents, "fire" incidents (Structure Fire, Rescue, Water Rescue, and MVC incidents), and all other incidents. It is important to note that the incident count for the fire incident category was generally very small, dropping from a high of 46 in 2019 to a low of 8 in 2020. The performance is summarized in the following figure alongside the SCFD adopted standard.

Figure 124: Turnout Time Performance by Incident Type (2019–2023)

Incident Type	90th Percentile Performance	Performance Standard
Overall	2:05	—
Fire	2:42	2:00
Medical	2:01	1:00
Other	2:07	—

The following figure illustrates changes in performance over time in the defined incident categories. The most striking feature of this analysis is the Fire turnout time in 2021. Still, it is reflective of only 12 rescue incidents.

Figure 125: Annual Turnout Time Performance by Incident Type (2019–2023)



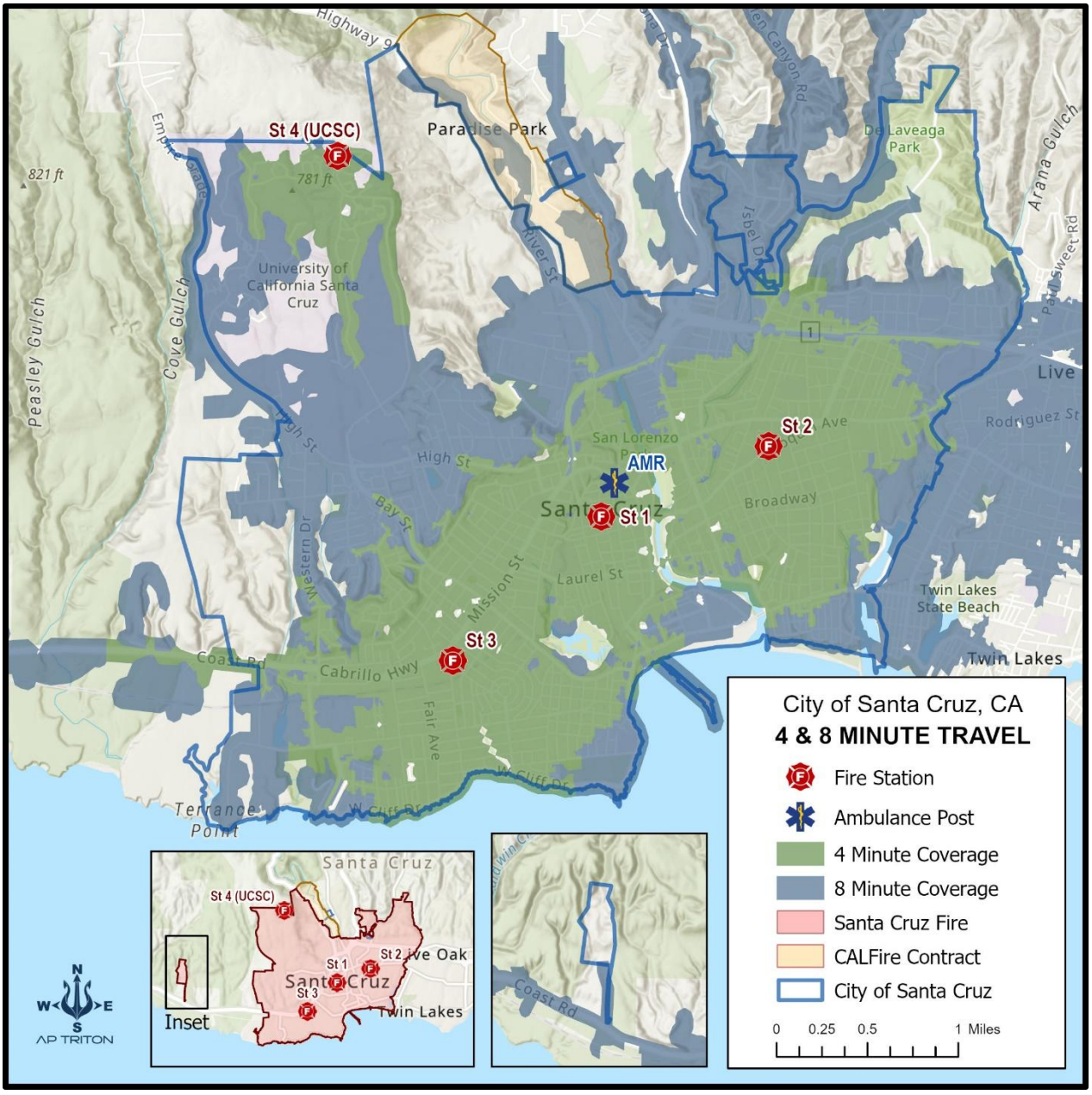
Travel Time Analysis

NFPA 1710 lists several travel time requirements for apparatus. The first defined travel time is the first unit, either an engine or a truck that can operate as an engine, should be 4 minutes. The second-due engine should travel 6 minutes, and the first alarm should arrive within 8 minutes for a moderate-risk structure fire.[64]

Travel time is the difference between when the apparatus goes en route and when it arrives on the scene. Travel time for the incident is from when the first arriving unit is en route until it comes on the scene. The following map shows theoretical travel areas 4 and 8 minutes from the four SCFD stations.

[64] National Fire Protection Association. *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departmentss.*2020) [Appendix D].

Figure 126: 4- and 8-Minute Travel Time Model



Theoretically, the distribution and concentration are appropriate for the majority of the jurisdiction. However, much of the open space areas and the contracted area around Paradise Park are beyond the 8-minute coverage area.

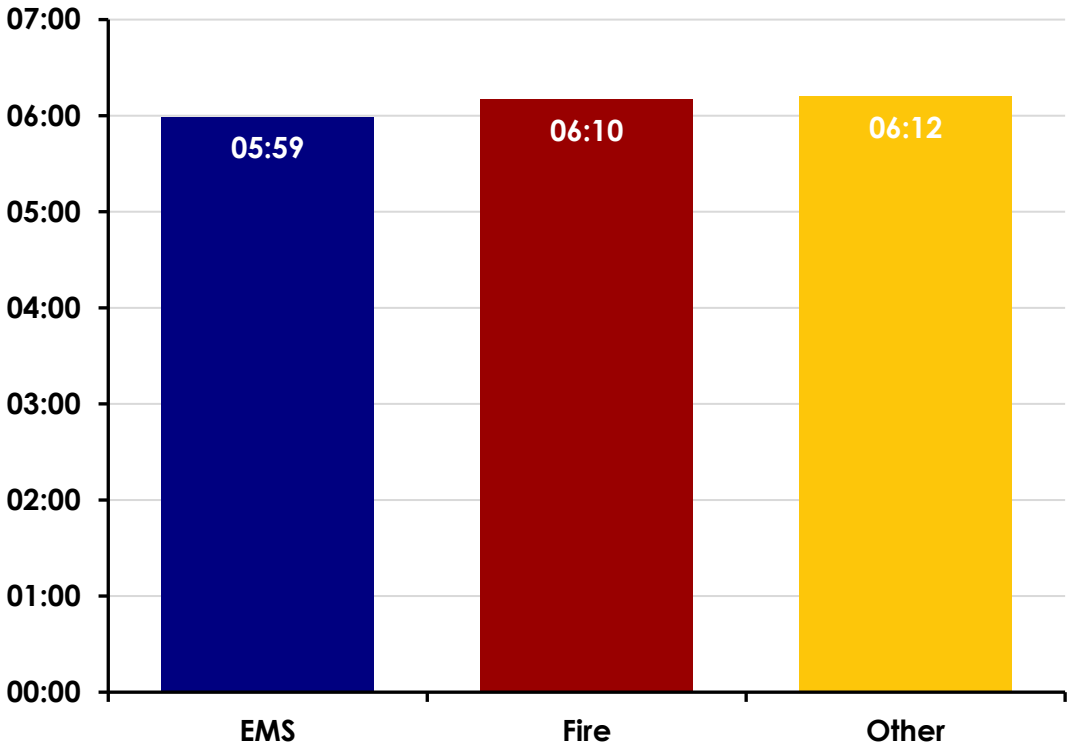
Theoretical models are beneficial when evaluating what can happen. However, considering the actual performance may give a better understanding of what the SCFD can provide.

First Due Apparatus

For the following analysis, travel times were limited to those incidents listed as an emergent response where the dispatch and arrival times were not "null" and dispatch times were prior to arrival times. In addition, the maximum travel time was limited to 25 minutes to be included in the analysis as that is the estimated time to drive from the Seymour Marine Discovery Center on McAllister Way and DeLaveaga Disc Golf Course on Upper Park Road. These locations were chosen because they are located diagonally across the city and response areas.

The first due performance for the SCFD is just over 6 minutes for all incidents within the city and the contracted SCFD response area. The following figure shows the first due travel time for emergency responses by the city and incident types.

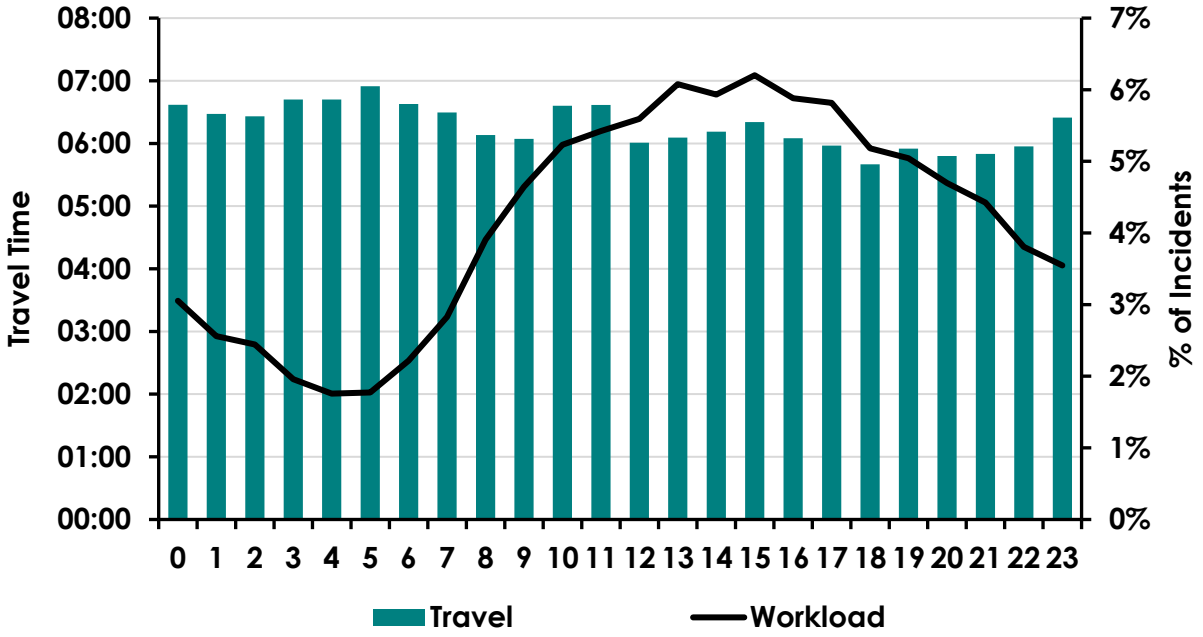
Figure 127: First Due Travel Time by Incident Type (2019–2023)



Because EMS calls are the most significant percentage of emergent incidents and the stations are so similarly staffed, the EMS times appear to be the primary driver of the overall performance time.

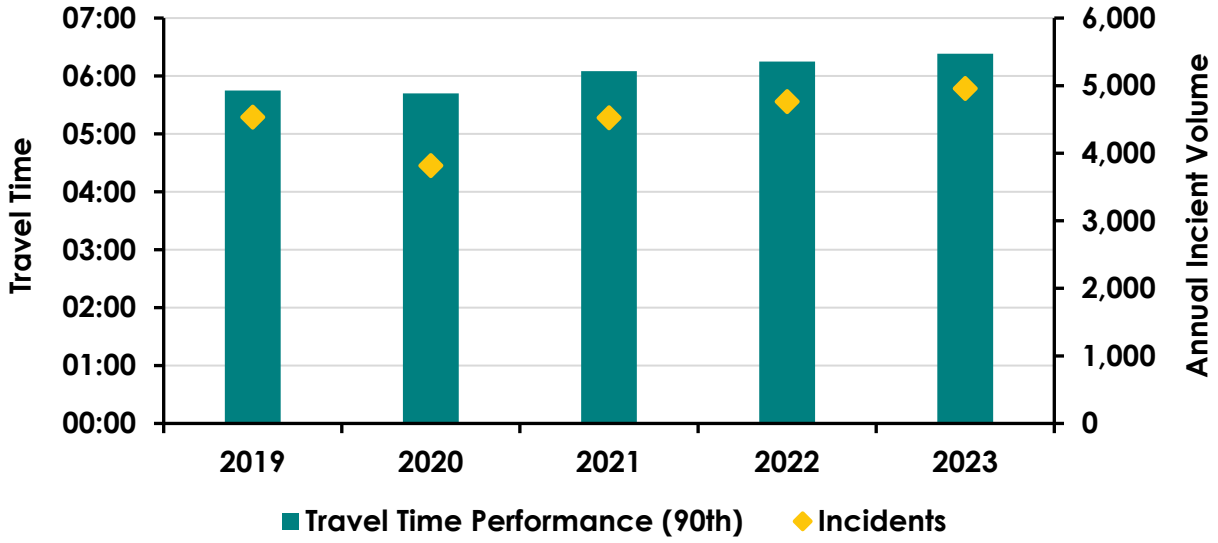
Time of day can enormously impact travel times in the form of crew readiness, traffic patterns, and incident volume. Nevertheless, the SCFD's travel times throughout the day remain relatively consistent. The following figure shows the first due travel times by the hour, with the workload shown for reference.

Figure 128: Travel Time by Hour (2019–2023)



Finally, the annual travel times for the first apparatus have not changed significantly over time. The following figure shows the response area travel times by year, with the total number of responses displayed for reference. Travel time performance was only assessed on incidents within the city and with valid timestamps.

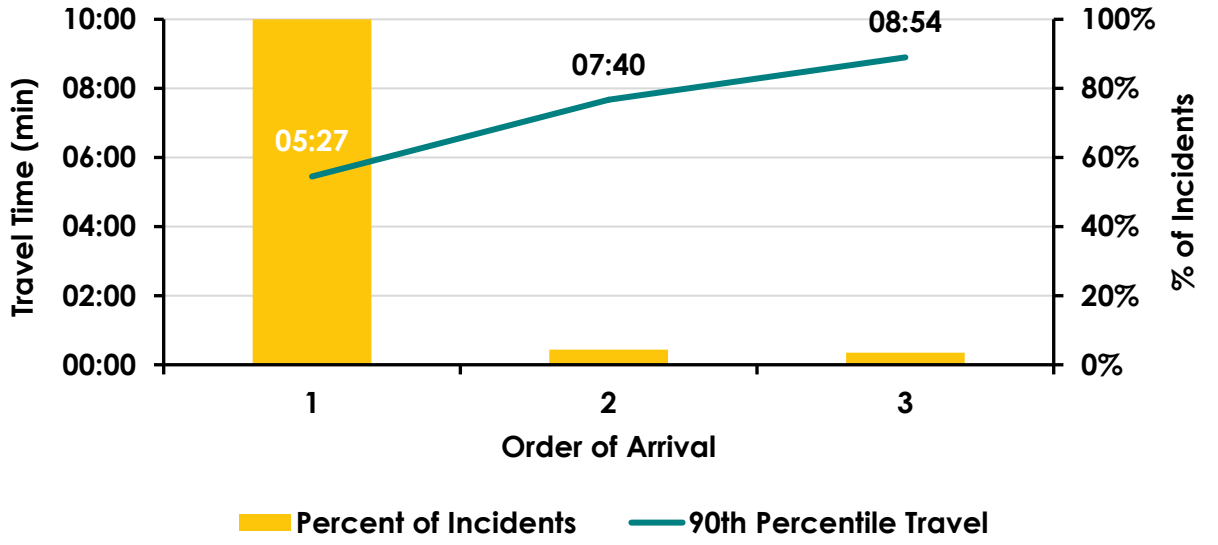
Figure 129: Annual Travel Times (2019–2023)



Effective Response Force

The second dimension of the travel time analysis is how well the effective response force (ERF) needed for a type of incident can be assembled. ERFs change with the complexity and resources required of any incident. They can range from one unit to multiple units with specialty equipment. The SCFD can maintain consistent ERF travel across all incident types due to the concentration of apparatus out of its four regularly staffed stations. The following figure shows the travel time for emergent incidents of the first three units arriving.

Figure 130: Historical Travel, First Three Units (2019–2023)

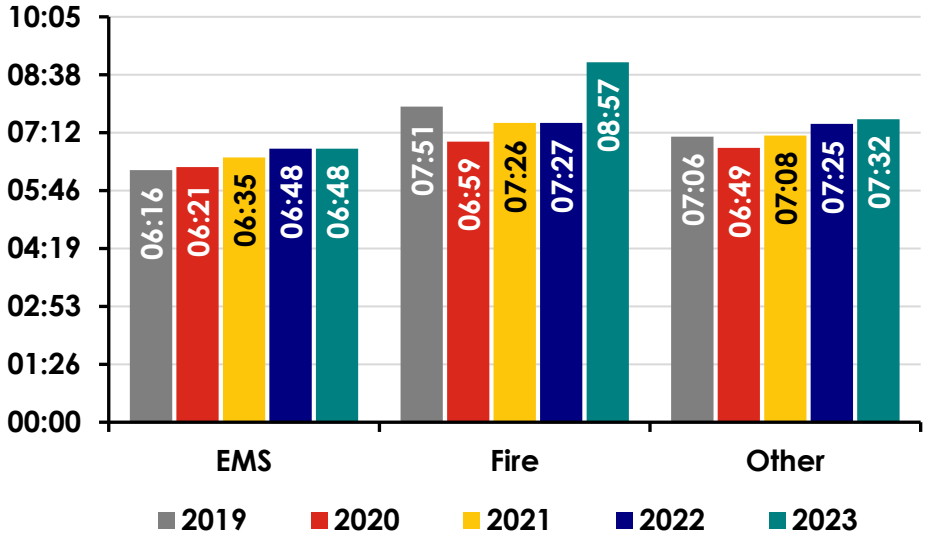


There is little difference between the third unit's arrival and subsequent times. Again, this is primarily due to concentration. Because of this, there is minor variation based on the two commonly evaluated incident types.

Fire Department Response Time Analysis

A time segment not identified by the NFPA or Commission on Fire Accreditation International (CFAI) is from when the fire department is notified until it arrives on the scene. The value of this measure is in how the fire department evaluates its specific performance, regardless of how the communications center performs. The overall fire department response time for the SCFD is 6 minutes, 47 seconds, or faster, for 90% of the responses. The following figure shows the annual fire department performance by incident type.

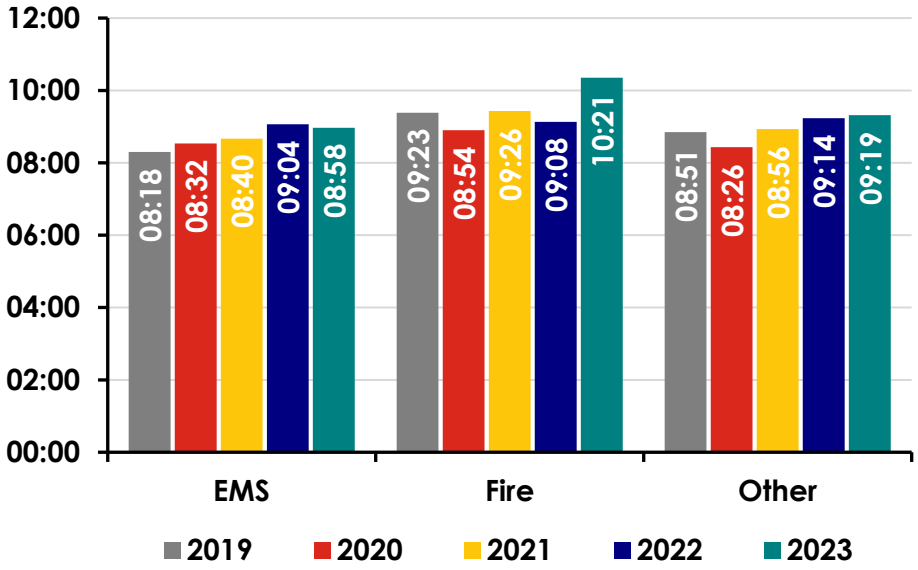
Figure 131: Annual Fire Department Response Times by Group (2019–2023)



Total Response Time Analysis

The reason each time segment is analyzed is to get an understanding of where performance can be measured and improved. However, the primary performance measurement is the total response time. The person in need sees this as the fire department's performance. For example, as previously discussed, the SCFD's fire department time for all incidents is 6 minutes, 47 seconds, or faster 90% of the time. However, the *total* response time is 8 minutes, 49 seconds, or faster 90% of the time. The following figure shows the annual first due total response time by incident type.

Figure 132: Annual Total Response Time by Group (2019–2023)



The SCFD has adopted total response standards for population density zones within the jurisdiction, identified as Urban, Suburban, and Rural. The following figure lists the total response time by reporting district with the SCFD adopted standard.

Figure 133: Total Response Time Performance by Reporting District (2019–2023)

Incident Type	90th Percentile Performance	Performance Standard
Overall	8:49	—
Urban	8:45	8:18
Suburban	9:18	12:18
Rural	13:20	20:18

One of the most straightforward methods of displaying the total response time was developed by the Commission on Fire Accreditation International (CFAI). Annually, the CFAI requires an accredited agency to report its performance through a response program in chart form. These charts show the incident time segments culminating in the total response time of the first unit and the entire ERF. While each element leading up to the total response time is self-explanatory and was explored in earlier sections of this report, the total response time can be confusing.

It may seem that the 90th percentile call processing plus the 90th percentile turnout and travel times would equal the 90th percentile total time. However, this is not usually the case. Each time segment is analyzed independently, including the total response time. The total response time does not add the segments' percentiles due to the variability of the time segments within each incident.

Ocean Safety Program Review

Because of its proximity to the ocean, a city beach, the destination for many visitors, and the limited access to similar services, the SCFD provides the specialized service of marine safety. Evaluation of this type of service does not follow the traditional response operations model. What follows is a description of the Marine Safety Division (MSD) service delivery based on the limited information available.

Data Discussion

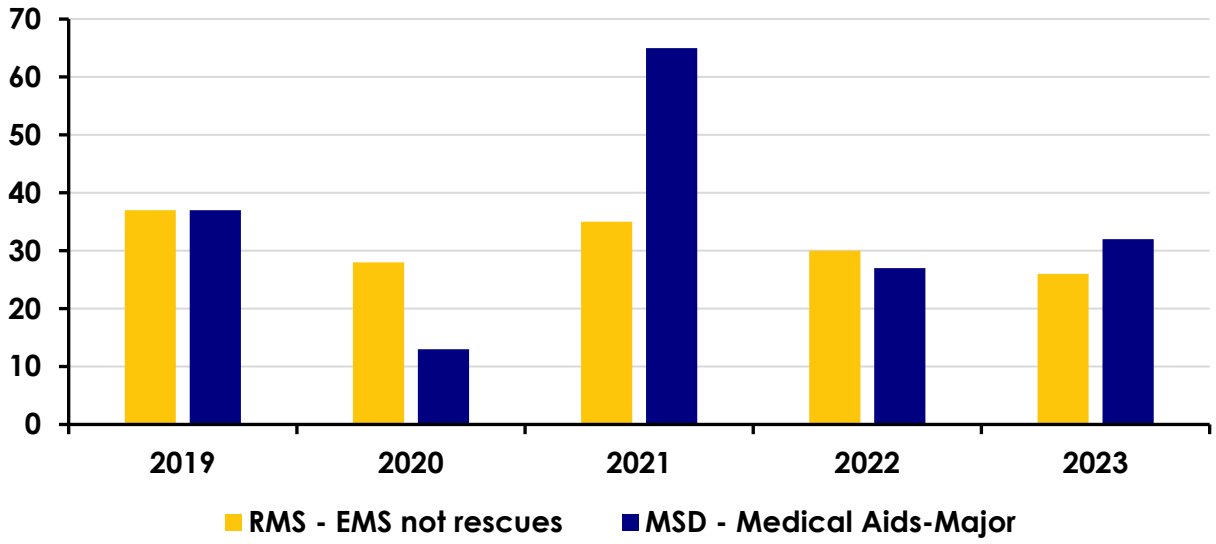
SCFD provided two data sources from which to evaluate the program. The CAD data contained some information for each dispatched lifeguard unit as part of an incident assigned by the regional 911 center. Once a unit is dispatched, an incident is generated in RMS, and the required information that categorizes the response type is provided by the responding units. The corresponding record in the CAD data provides unit identifiers and location information. When the division provides service to an individual without a 911 center dispatch, there is no CAD data to identify the response as belonging to the Marine Safety Division. Therefore, the analysis performed on the RMS data is limited to records with a corresponding CAD incident.

The second data source was the manual data the Marine Safety Division recorded for its annual reporting. Detailed information about the events captured in this data set was not provided. It is also not clear whether the incidents captured in the RMS are additional incidents or more detailed information for specific events enumerated in the summary data. The response categories in the division's report do not have a corresponding incident type in the RMS or CAD. Because of the lack of detail on the overall operations and the inability to relate the annual report to the RMS, trends and performance evaluations are limited.

RMS Reporting

Many incidents handled by the division are not captured consistently in the RMS. The following figure illustrates the gap between responses identified by the MSD as "Medical Aids – Major" and the Lifeguard unit responses in the RMS. Particularly evident in 2021, the RMS accounted for only 54% of the major medical responses. Likely, the incident was never captured in the CAD.

Figure 134: Division Reported Calls vs CAD-RMS Incidents (2019–2023)

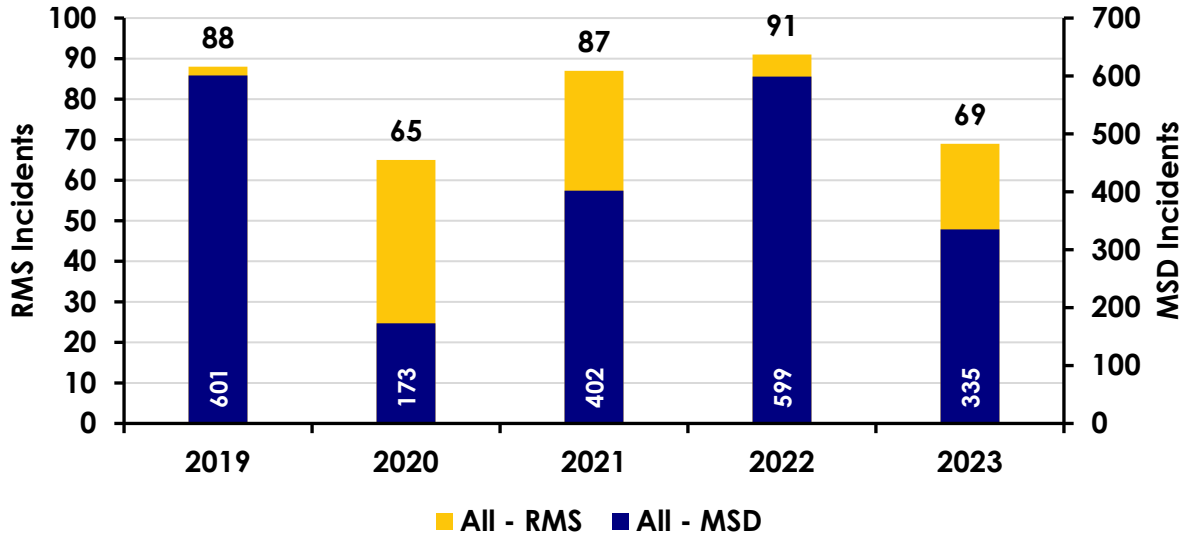


With the reporting gaps in mind, the following sections portray the temporal trends of Lifeguard unit responses in the RMS data and Marine Safety Division reporting. The RMS offers 400 incidents from 2019–2023, while the MSD records over 2,900 incidents for the same period.

Trends

While it is challenging to match RMS records to the MSD counts, the annual trends from each record-keeping system tell a consistent story. From 2019 to 2023, RMS incident volume peaked at 91 in 2022, followed by 89 in 2019. The MSD volume was highest in 2019 with 601, but 2022 was only slightly behind at 599.

Figure 135: Volume by Year (2019–2023)



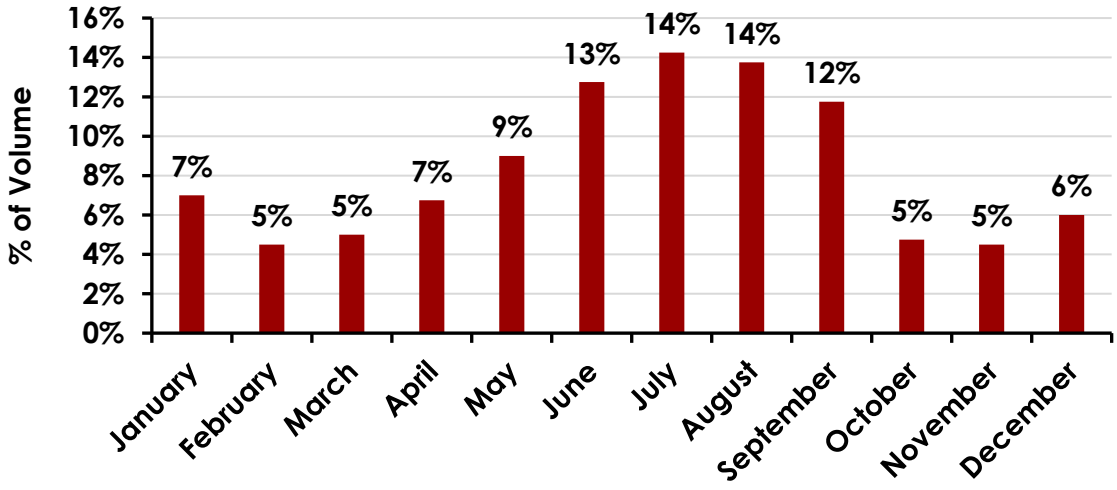
In concert with other incident data, there is a drop in both systems from 2019 to 2020, while both show an increase in 2021 and a drop from 2022 to 2023. The year-over-year change for each record-keeping system is shown below.

Figure 136: Annual Percentage Change of Incidents by System

	2019–2020	2020–2021	2021–2022	2022–2023
RMS	-26%	34%	5%	-24%
MSD	-71%	132%	50%	-44%

The Santa Cruz area follows the trend of many outdoor activity communities, and the demand for service is highly seasonal. The RMS volume peaks in July, while February and November have the lowest average number of incidents. Monthly values were not available for the MSD reports. Note the monthly values of lifeguard unit responses are likely autocorrelated with the staffing of these units. The following figure shows the MSD incident volume by month as captured in the RMS.

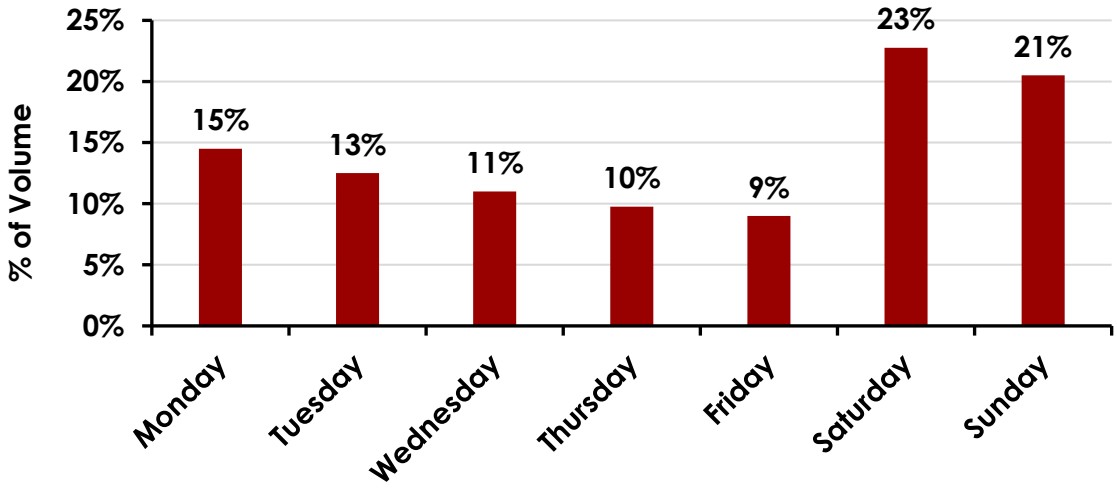
Figure 137: Percent of RMS Volume by Month (2019–2023)



The demand by day of the week peaks on Saturday, while Friday represents the lowest percentage of call volume. It is unclear from the available data whether the variation in weekday demand reflects actual calls for service in the response area or merely the availability of the lifeguard units based on set staffing schedules. The results are also affected by an extremely low number of incidents in the study population.

The time of day may also affect response volume. The busiest time of day is 2:00 p.m. to 5:00 p.m. As before, the demand for service reflects only calls involving the lifeguard units. The actual demand addressed by all units in the service area may reveal different trends. The figure below shows the volume of incidents as captured in the RMS by day of the week.

Figure 138: Percent of RMS Volume by Day of Week (2019–2023)



Marine Safety Division Response Categories

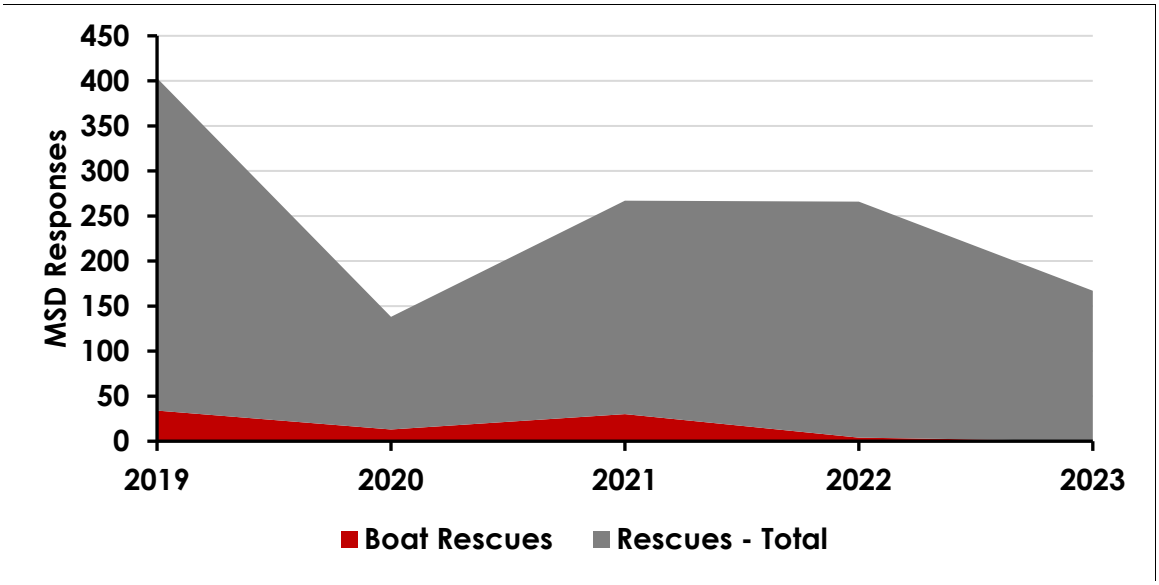
As mentioned, relating RMS records to the Marine Safety Division records is challenging. The incident reporting platform used by the lifeguard units provides categories for their activity tracking, including Rescues, Boat Rescues, Medicals (major and minor), Lost/Found Persons, and Prevents, among others. The following sections examine the annual trends in the MSD records by response type. A comparison will be made with the RMS volume for the given category, where possible.

Rescues

A review of "Rescues – Total" from 2019 to 2023 reveals the expected drop in 2020 but also a decline of 36% from 2022 to 2023. It will be interesting to note whether the decreasing trend continued, stabilized, or reversed in 2024.

Boat Rescues are identified as a sub-category of Rescues, and, as shown below, decreased from a high of 34 in 2019 to zero in 2023. It is unclear from the available data whether boat rescues decreased due to a lack of demand or resources to respond. The following figure shows the rescue category as captured by the MSD.

Figure 139: MSD Rescue Volume by Year (2019–2023)

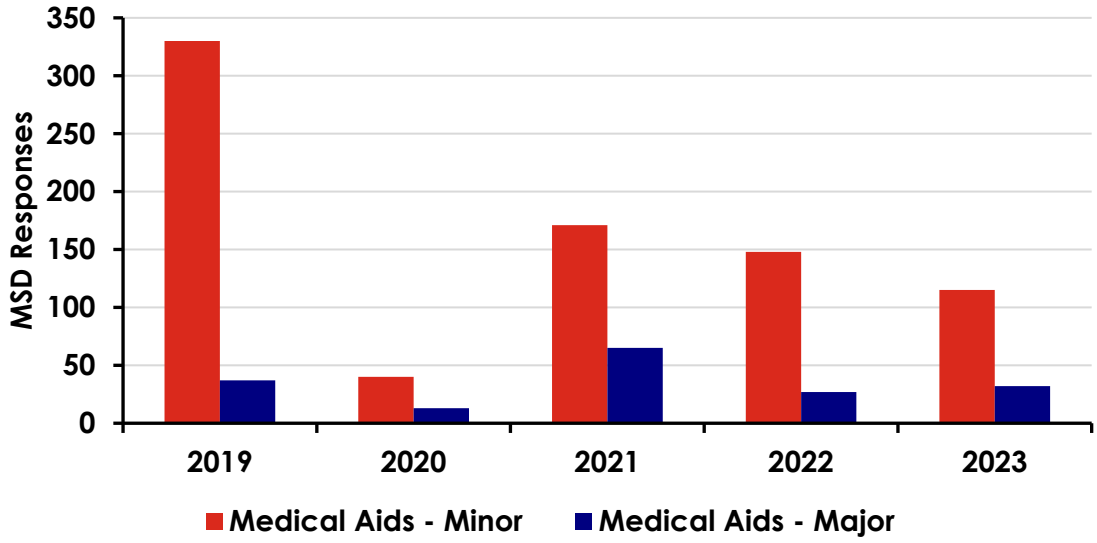


Medicals

As described in the introduction of this section, there is little correlation between the RMS data for EMS responses that are not rescues and the MSD records for "Medical Aids – Major." This discrepancy indicates a significant opportunity for improved reporting or a clear distinction between major medical aid and EMS incidents.

The following figure shows the annual trends for MSD medical responses, both major and minor. The steady decrease in "Medical Aids – Minor" is clearly demonstrated. A review of "Medical Aids – Total" from 2019 to 2023 reveals an expected drop in 2020 but also a decline of 38% from 2021 to 2023. Further investigation into the documentation processes is warranted to determine whether this trend is related to demand, capacity, or neither.

Figure 140: MSD Medical Aids Volume by Year (2019–2023)



Lost/Found Persons

Annual response trends for MSD lost and found persons show a notable deviation from other incident types reviewed in this study. Specifically, there was a significant increase in 2022, followed by a return to lower levels in 2023. Within the Records Management System (RMS), the closest comparable incident type is "Search for person in water." However, only 32 such responses by lifeguard units were recorded during the study period. These two data sources appear to reflect distinct types of incidents and, as such, should not be used to validate or supplement one another.

Population Growth & Service Demand Projections

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

For this study, AP Triton utilized annual population estimates for the response area obtained from the California Department of Finance and UC Santa Cruz Office of Budget Analysis and Planning.[65,66] The population of Santa Cruz has grown over the past fourteen years, but the rate has been impacted by years of growth and decline. If achieved, the goal of the City's long-range plan will be to add 3,736 housing units by 2031, with an unknown impact on population.[67] The upper confidence bound may be the more realistic outcome.

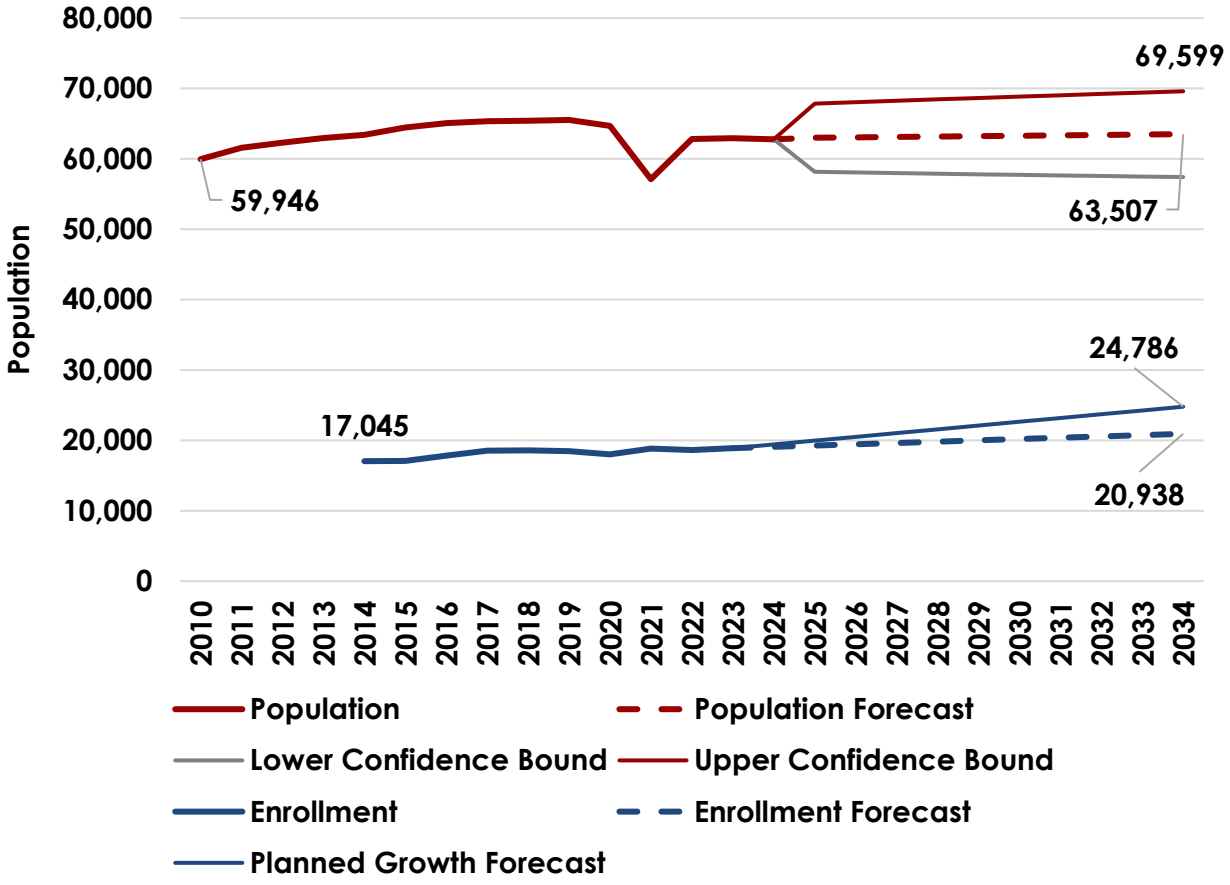
The University of California, Santa Cruz, impacts total population and incident demand. UCSC has an ambitious goal to increase enrollment to 28,000 students by 2040. The following figure demonstrates the enrollment growth at the university over the last ten years, along with a forecast based on the current growth rate. A second planned growth forecast assumes the university achieves its goal by 2040, increasing enrollment at a linear rate.

[65] https://dof.ca.gov/forecasting/demographics/estimates/.

[66] https://iraps.ucsc.edu/enrollments/index.htmlU.S. Census Bureau. (2024) *Explore Census Data*. https://data.census.gov/.

[67] https://www.cityofsantacruz.com/government/city-departments/planning-and-community-development/long-range-policy-planning/ordinance-policy-updates/housing-element-update.

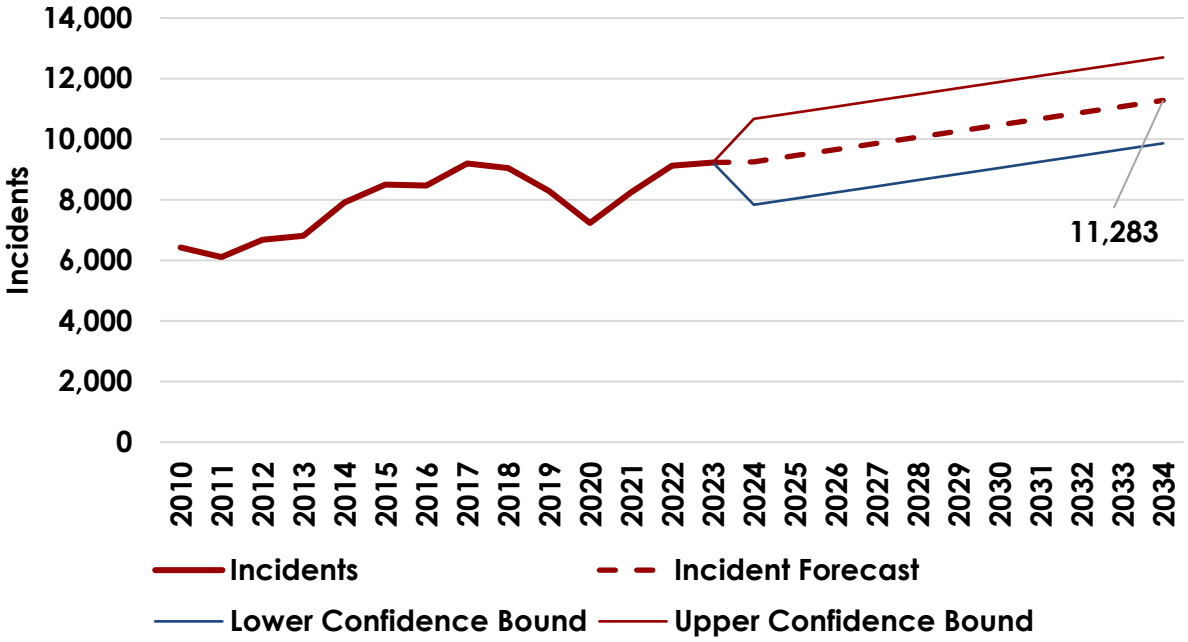
Figure 141: Future Population Projection



The forecasted incident workload is derived from a thirteen-year history of incidents to identify workload potential through 2034. The results of the analysis are shown in the following figure.

Based on population projections, service demand for the SCFD will potentially increase by 22% from 2023 through 2034. Policymakers should keep an eye on annual service demand and how it is impacted by changes in population.

Figure 142: Future Service Demand Projection

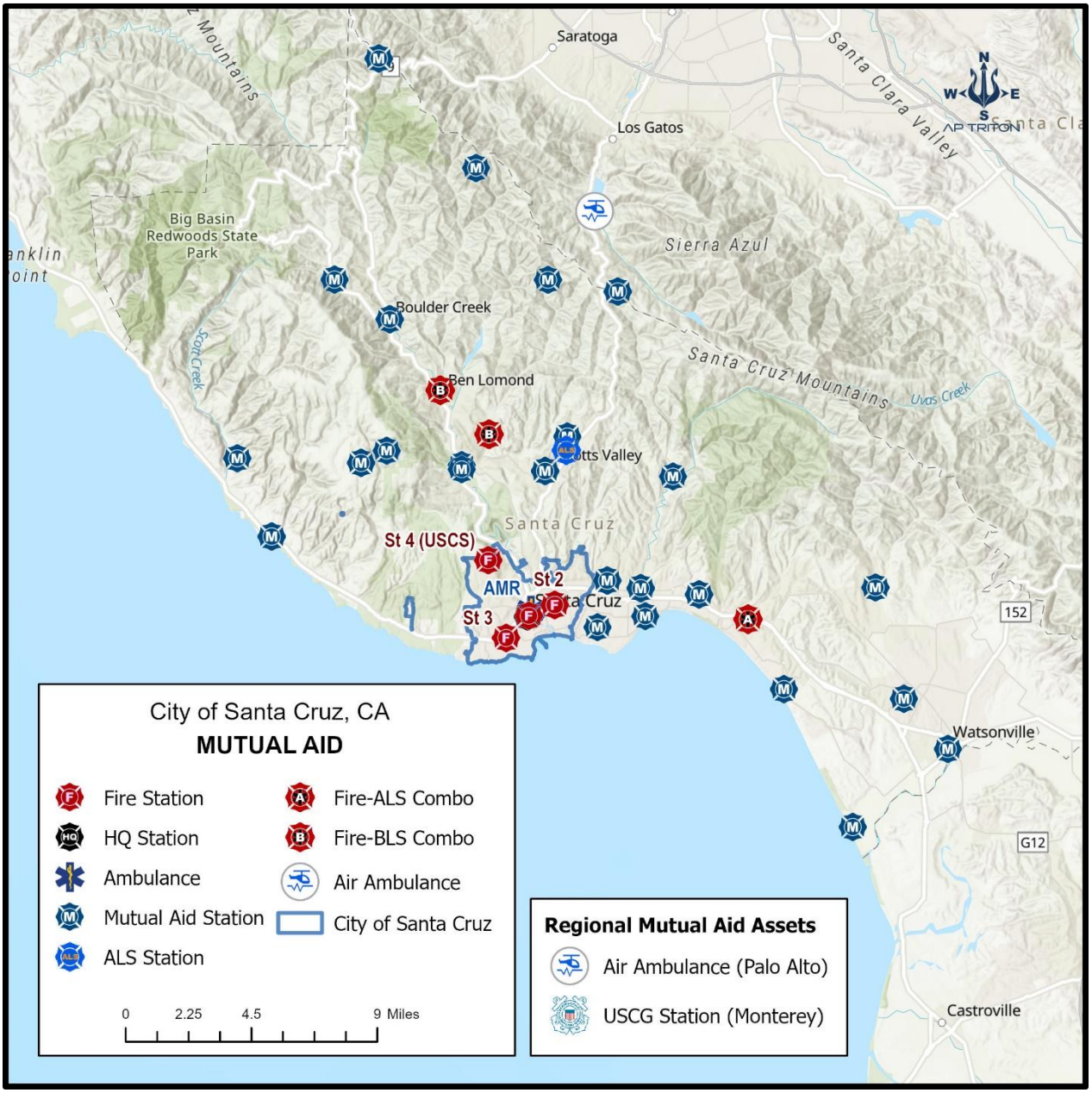


Effectiveness of Inter-jurisdictional Response

It's in the best interest of the Santa Cruz Fire Department and its State and local partners to cooperate to achieve objectives of common interest and concern. A functionally integrated fire protection system involving Federal, State, and local government resources is the most effective method of delivering fire protection where life, property, and natural resource values are at risk.

There are various agreements at various levels of government and between agencies that allow for aid during emergencies. These agreements may help in the form of automatic or mutual aid, where assistance is rendered free of charge (non-reimbursable) for generally a short-duration assignment. The Santa Cruz Fire Department is a party to the Santa Cruz County Mutual Aid Agreement and the California State Office of Emergency Services Mutual Aid Plan.

Figure 143: Mutual Aid Map



The Santa Cruz County Mutual Aid Agreement is a voluntary agreement between local entities that describes the initial responses to incidents occurring within the Santa Cruz County Operational Area. Additionally, local agreements determine whether the responses are automatic aid instead of mutual aid. Automatic aid automatically shares resources between agencies, while mutual aid requires requesting resources. Automatic aid is generally the most effective and efficient way to provide aid between two or more adjoining areas of close proximity, especially when regional dispatch such as Santa Cruz Regional 911 is in place. Regardless of agency, the nearest unit can be deployed with a regional communications center and an automatic aid agreement. This is done without requiring operational requests at the time of dispatch. There is real strength in the automatic aid agreements between the career fire departments and districts within Santa Cruz County. These agreements reduce response times, improve interagency coordination, and make better use of limited fire and emergency service resources. In some cases, automatic aid and automatic vehicle location (AVL) responses can create imbalances. The AVL system coordinates the global positioning satellite position of the units in the system with the incident through a dispatch interface. They can constitute a significant out-of-district impact for agencies and should be monitored. The many volunteer agencies in Santa Cruz County supplement the system; however, there are inherent availability concerns.

When interdependence exists, there are sometimes challenges. This means that decisions and subsequent actions taken in one jurisdiction can have consequences for a partner or adjoining jurisdictions. Some differences noted in dispatch procedures between agencies led to line staff questioning the accuracy of automatic aid dispatch. Currently, procedures have dispatchers choosing between preferred districts and using AVL for close units depending on the agency. While this may be a short-term concern as all agencies adjust to the technology and update the system, it creates opportunities for human error and differences that lead to response staff confusion.

The California Office of Emergency Services Fire & Rescue Division plan makes participating in local government jurisdictions' emergency apparatus available for dispatch and use through the state in the spirit of cooperation. The system is managed through operational areas (counties) in six state regions. For local government agencies, like the Santa Cruz Fire Department, reimbursement begins 12 hours after the initial dispatch. It is retroactive to the time of the initial dispatch. If the duration of the assignment is less than 12 hours, there is no reimbursement.

Establishment of Performance Objectives

There are two aspects of developing performance objectives. The first is determining the resources needed by completing a critical task and deployment analysis. The second is establishing a performance monitoring process with specific standards and goals for evaluation.

Critical Task & Deployment Analysis

SCFD provides fire protection, first responder EMS, and other emergency services to the city and contract areas. It also responds to the surrounding area through mutual and automatic aid agreements. The SCFD has 4 engines, 1 truck, and 1 command vehicle responding from 4 stations. The ambulance service is provided by a private third-party company. The critical task and deployment analysis is designed to match expected tasks with the apparatus dispatch practices associated with each type of incident and corresponding risk.

During a fire, the critical tasks that must be performed can be broken down into two key components: life safety and fire flow.

Life safety tasks are based on the number of building occupants and their location, status, and ability to take self-preservation action. Life safety-related tasks involve the search, rescue, and evacuation of victims.

The fire-flow component involves delivering sufficient water to extinguish the fire and creating an environment within the building that allows firefighters to enter.

The number and types of tasks requiring simultaneous action will dictate the minimum number of firefighters needed to combat various fires. Without adequate personnel to perform these actions, the commanding officer must prioritize the tasks and complete some in chronological order rather than concurrently. These tasks include:

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

Critical task analyses also apply to all agency program categories. To effectively control an emergency, numerous simultaneous tasks must be completed. The SCFD's ability to quickly muster the needed numbers of trained personnel is critical to successful incident outcomes.

Risk levels for each response type have been identified throughout this document. They are generally classified into low, moderate, high, and maximum risks. These classifications apply across the five department programs of fire response, EMS, technical rescue, hazardous materials response, and wildland firefighting. Risk levels and classifications are found in the community risk section of this report.

The SCFD completed a critical task analysis during this study. Each hazard type was identified, and the expected number of personnel was determined based on critical tasking and operational procedures. The following summarizes the total personnel required by incident type and risk category.

Figure 144: Staffing Determinations Base on Risk

Incident Type	Maximum Risk	High Risk	Moderate Riske	Low Risk
Fire	37	42	19	4
Emergency Medical	71	22	10	4
Wildland/WUI	N/A	40	20	14
Technical Rescue	42	20	15	4
Hazardous Materials	31	25	14	7

Establishing resource levels needed for various emergencies is a uniquely local decision. Factors influencing incident staffing include the type of equipment operated, training levels of responders, operating procedures, geography, traffic, and the nature of buildings and other protected risks.

Critical Tasking

The SCFD has developed the Critical Task Analysis in Figures 145 through 149 using risk matrices for various incident types. Critical tasks are those activities that must be conducted promptly by firefighters early in emergency incidents. This intervention is essential to control the situation, stop loss, and perform the necessary tasks required for a medical emergency. The SCFD is responsible for ensuring those responding companies can perform all described tasks promptly, efficiently, and safely. The following figures are the SCFD's minimum number of personnel needed by incident type and risk severity by function.

Figure 145: Fire Response Critical Tasking

Function	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Support	3	3	1	
Safety	1	1	*	1
Size up (360°)	1	*		
Driver/Engine or Pump Operator	7	7	4	1
Water Supply	2	1		
Standpipe/Sprinkler Control	1	1		
Fire Attack	9	6	3	1
Fire Attack & Search and Rescue			2	
Search, & Rescue	6	3		
Ventilation/Utilities	6	3	2	
Backup Line	2	3	2	
Rapid Intervention Team	6	3	3	
EMS Unit - ALS	2	1	1	
Breathing Air Support	2	2		
Total Effective Response Force	**48**	**34**	**18**	**3**

***** Temporary or Concurrent Assignment

Figure 146: Emergency Medical Services Critical Tasking

Function	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command	3	1	1	
Safety	2	1	*	1
Operations	1			
Triage Group	9	2		
Basic Life Support Treatment		4		
Advanced Life Support Treatment	20	8	4	2
Extrication/Hazard Mitigation			4	
Evacuation Group	10			
Transport Group	14	4		
Size up (360°)		1		
Staging	3			
Total Effective Response Force	**62**	**21**	**9**	**3**

***** Temporary or Concurrent Assignment

Figure 147: Wildland/WUI Fire Critical Tasking

Function	High Risk	Moderate Risk	Low Risk
Command	4	1	
Safety	1	*	
Driver/Engine or Pump Operator	12	2	1
Fire Attack			2
Recon Group	1		
Lookout	2	1	
Flank Divisions	2	2	
Water Supply	3		
Evacuation	4	1	
Structure Protection	12		
Staging	1	1	
Total Effective Response Force	**42**	**8**	**3**

***** Temporary or Concurrent Assignment

Figure 148: Technical Rescue Critical Tasking

Function	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Support	4	4	1	1
Safety	2	1		
Size Up (360°)	1	1		
Extrication/Hazard Mitigation		3	6	1
Operations	2	1		
Rescue Teams		8		
Rescue Support Group	6	3		
Advanced Life Support Treatment	12	6	3	
Staging	3			
Basic Life Support Treatment	2	1		1
Entry Team and Team Leaders	12			
Total Effective Response Force	**44**	**28**	**10**	**3**

Figure 149: HazMat Critical Tasking

Function	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Support	3	3	1	
Safety	1	2	*	1
Size Up (360°)	1	1		
Pump Operation/Decon			2	
Hazmat Group Supervisor			1	
Hazard Mitigation			4	2
Operations	2	2		
Entry Team Officer and Team	6	6		
Backup Entry Team	6	6		
Hazmat Support Group	5	4		
Decon Group	8	4		
Medical Group	8	6		
Staging	1			
Breathing Air Support	2	2		
Total Effective Response Force	**31**	**25**	**14**	**7**

***** Temporary or Concurrent Assignment

Alarm Assignments

The critical task process intends to build a dispatch model that most effectively fulfills the tasking requirement for the various levels of risk. The agency and dispatch center must ensure the staffing levels are met with the initial dispatch. The following compares the agency's reported dispatch complement of units and personnel to the identified staffing requirements for the associated risk levels.

Figure 150: Fire Alarm Assignments by Risk

Dispatched Apparatus	SCFD Units	SCFD Staff	Aid Units	Aid Staff	Staffing
Low Risk (ERF staffing = 3)					
Engine	1	3	—	—	3
Totals: Over/(Under) ERF	**1**	**3**	**0**	**0**	**0**
Moderate Risk (ERF staffing = 18)					
Engine	4	12	—	—	12
Ladder	1	3	—	—	3
Battalion Chief	1	1	—	—	1
EMS	—	—	1	2	2
Totals: Over/(Under) ERF	**6**	**16**	**1**	**2**	**0**
High Risk (ERF staffing = 34)					
Engine	4	12	3	9	21
Truck/Rescue	1	3	2	5	8
Battalion Chief	1	1	2	2	3
EMS	—	—	1	2	2
Totals: Over/(Under) ERF	**6**	**16**	**8**	**18**	**0**
Maximum Risk (ERF staffing = 48)					
Engine	4	12	7	21	33
Truck	1	3	2	5	8
Battalion Chief	1	1	2	4	5
EMS	—	—	2	4	4
Totals: Over/(Under) ERF	**6**	**16**	**13**	**34**	**2**

Figure 151: Emergency Medical Assignments by Risk

Dispatched Apparatus	SCFD Units	SCFD Staff	Aid Units	Aid Staff	Staffing
Low Risk (ERF staffing = 3)					
EMS Units	1	3	—	—	3
Fire Units	—	—	—	—	0
Totals: Over/(Under) ERF	**1**	**3**	**0**	**0**	**0**
Moderate Risk (ERF staffing = 9)					
EMS Units	—	—	1	2	2
Fire Units	3	7	—	—	7
Totals: Over/(Under) ERF	**3**	**7**	**1**	**2**	**0**
High Risk (ERF staffing = 21)					
EMS Units	—	—	4	8	8
Fire Units	5	16	—	—	16
Totals: Over/(Under) ERF	**5**	**16**	**4**	**8**	**3**
Maximum Risk (ERF staffing = 62)					
EMS Units	—	—	7	14	14
Fire Units	6	16	8	21	37
Totals: Over/(Under) ERF	**6**	**16**	**15**	**35**	**(11)**

Figure 152: Wildland/WUI Assignments by Risk

Dispatched Apparatus	SCFD Units	SCFD Staff	Aid Units	Aid Staff	Staffing
Low Risk (ERF staffing = 3)					
Fire Units	1	3	—	—	3
Totals: Over/(Under) ERF	**1**	**3**	**0**	**0**	**0**
Moderate Risk (ERF staffing = 7)					
Fire Units	3	7	—	—	7
Totals: Over/(Under) ERF	**3**	**7**	**0**	**0**	**(1)**
High Risk (ERF staffing = 42)					
Fire Units	6	16	9	21	37
Totals: Over/(Under) ERF	**6**	**16**	**9**	**21**	**(5)**

Figure 153: Technical Rescue Assignments by Risk

Dispatched Apparatus	SCFD Units	SCFD Staff	Aid Units	Aid Staff	Staffing
Low Risk (ERF staffing = 3)					
Fire Units	1	3	—	—	3
Totals: Over/(Under) ERF	**1**	**3**	**0**	**0**	**0**
Moderate Risk (ERF staffing = 15)					
Fire Units	3	7	—	—	7
EMS Units	—	—	1	2	2
Totals: Over/(Under) ERF	**3**	**7**	**1**	**2**	**(1)**
High Risk (ERF staffing = 20)					
Fire Units	5	16	3	9	25
EMS Units	—	—	1	2	2
Totals: Over/(Under) ERF	**5**	**16**	**4**	**11**	**(1)**
Maximum Risk (ERF staffing = 42)					
Fire Units	5	16	9	21	37
EMS Units	—	—	3	6	6
Totals: Over/(Under) ERF	**5**	**16**	**12**	**27**	**(1)**

Figure 154: Hazardous Materials Assignments by Risk

Dispatched Apparatus	SCFD Units	SCFD Staff	Aid Units	Aid Staff	Staffing
Low Risk (ERF staffing = 3)					
Fire Units	1	3	—	—	3
Totals: Over/(Under) ERF	**1**	**3**	**0**	**0**	**(4)**
Moderate Risk (ERF staffing = 8)					
Fire Units	3	7	—	—	7
Totals: Over/(Under) ERF	**3**	**7**	**0**	**0**	**(1)**
High Risk (ERF staffing = 25)					
Fire Units	5	16	6	14	30
EMS Units			4	8	8
Totals: Over/(Under) ERF	**5**	**16**	**10**	**22**	**2**
Maximum Risk (ERF staffing = 31)					
Fire Units	5	16	8	20	36
EMS Units			5	10	10
Totals: Over/(Under) ERF	**5**	**16**	**13**	**30**	**3**

Something that became apparent through this evaluation is the lack of consistency in dispatch procedures and the estimated requirement for personnel based on critical tasks. At first glance, the needs and the system requirements may be entirely out of sync. Therefore, it will be essential to systematically review the critical tasks, how and in what order they are performed, and then update dispatch procedures to ensure the proper resources are assigned to incidents.

Response Time Performance Objectives

There are two primary goals for establishing an effective response force total based on critical staffing. The first is to align the incident need with available resources, creating an efficient methodology for responding to incidents. As is evident in the previous section, some areas require attention if the SCFD is to improve deployment efficiency. The other goal is to assess whether the deployment methodology effectively meets the needs of various incident types.

The deployment analysis based on an effective response force requires two components: an effective response force and performance objectives. The most common methodology for a fire department to evaluate its performance is through time analysis. At a minimum, the arrival times of the first due unit and the ERF should be analyzed from the customer's perspective. This total time starts when the customer calls for service and includes meeting the benchmarks for first due and ERF arrival.

NFPA 1710 can be applied to the SCFD; the department indicated this was its benchmark time. This standard is described earlier in the report and does not need to be repeated. In addition, the ambulance service contract may indicate a different level of response. However, the NFPA standard will likely be more aggressive and will naturally meet other standards. The SCFD has already adopted a few performance goals. The following figure is a recreation of the response time stamps indicated by NFPA for career departments and the response objectives adopted by the fire department.[68]

Figure 155: SCFD Response Time Compliance Requirements

Time Segment	Compliance Percentile	Benchmark	the SCFD 5-Year Performance
SCCECC Answer	90% 95%	15 Seconds 20 Seconds	Unknown
SCCECC Call Processing	90%	60 Seconds	2:51
Turnout Time (EMS) Turnout Time (Other)	90%	60 Seconds* 120 Seconds*	2:05 2:07
Travel Time (First Due) Travel Time (2nd Due) Travel Time (ERF – L/M Risk) Travel Time (ERF – High Risk)	90%	4 Minutes 6 Minutes 8 Minutes 10:10	5:27 7:40 Not enough Data
Total Time Urban Total Time Suburban Total Time Rural	90%	8:18* 12:18* 20:18*	8:45 9:18 13:20

* The SCFD Adopted Performance Standard.

[68] National Fire Protection Association (NFPA) 1710 (2020) *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* & NFPA 1225 (2022) *Standard for Emergency Services Communication.*

The preceding time segments may be helpful for the SCFD to adopt. The most significant single improvement for the SCFD will be in turnout time, especially on EMS incidents, which can be improved through policy enforcement, crew evaluation, and improved station layout and technology. While the dispatch centers are not directly within the fire department's management purview, they can be influenced by the fire department through data requests and contractual performance language. With the cooperation of SCCECC leadership, this can be a manageable time segment. Finally, travel time will be predominantly affected by the location of the fire stations.

These time evaluations should also have a capability performance component. For example, an ambulance or battalion chief cannot effectively mitigate a fire incident. Each program and risk level should have a definition of what stops the clock and what an effective response force looks like. For example, based on the SCFD's moderate risk fire incident, the performance statement would look something like:

> *For a moderate risk structure fire, the first arriving unit will be capable of applying a minimum of 500 gallons per minute of water through a minimum of two hoses or one master stream, staffed by at least 1 firefighter, 1 engineer, and 1 captain. This apparatus will arrive within 8:45 after the communications center receives notification of the incident. The effective response force (ERF), consisting of nineteen firefighters, captains, and chief officers, and a minimum of one engine and one truck company, will arrive within 20:00 after the communication center receives notification.*

This statement is to be considered a standard. However, since there was insufficient data to give the ERF total time, the 20:00 should be regarded as a work in progress and not adopted until the performance is conclusively defined. The next step is identifying improvement areas and adopting realistic response goals for each time segment. The goals are a moving target, never to be realized but always attainable, and will help the fire department and City leadership identify resource needs to attain these objectives.

Establishing time-centric response goals is the most common and typically easiest to produce. However, the city culture may be more accepting if the SCFD evaluates different metrics, such as outcomes, customer satisfaction, or other less time-driven concepts. Therefore, it will be incumbent on the SCFD to explore appropriate and attainable measures. While defined goals are necessary, it is common for departments to develop performance zones to match services with demographic densities.

Fire agencies throughout the United States establish risk zones based on risk and population density. Risk or "demand" zones provide a more accurate picture of service delivery performance. This may be especially relevant for fire departments as extensive and diverse as the SCFD.

The preceding response discussion is presented as examples in the hope that it provides the SCFD with the information necessary to establish response standards and targets. Setting response standards and performance goals should be viewed as a strategic planning tool for community loss control. For the SCFD, it should help determine whether the current department performance is satisfactory and what steps may be necessary to improve that performance.

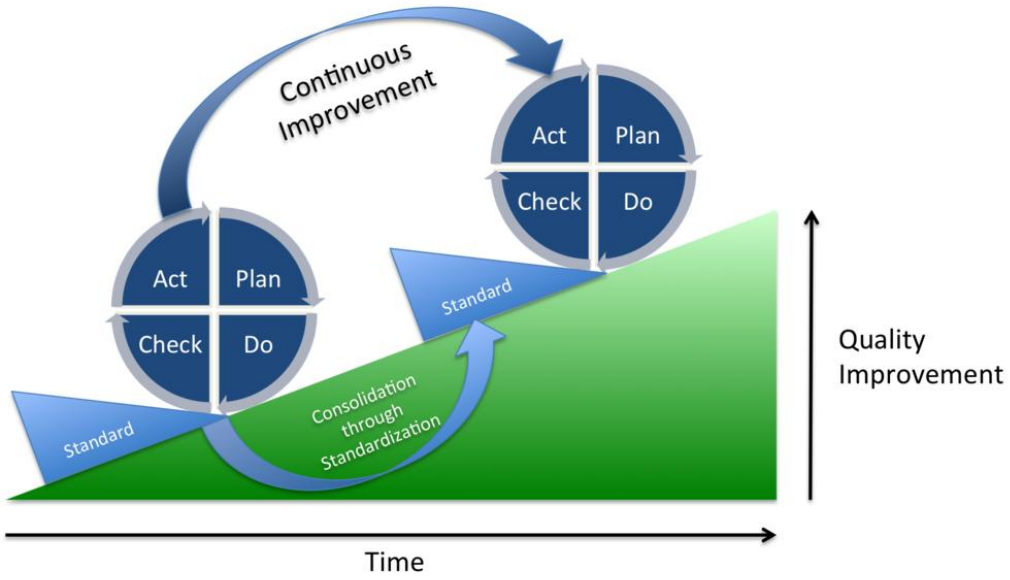
Section IV:
CONCLUSIONS & RECOMMENDATIONS

Compliance Methodology Overview

This Community Risk Assessment: Standards of Cover presents a detailed picture of the SCFD's current performance. However, this is just a starting point for the agency to pursue improved performance. The SCFD will benefit from an ongoing data analysis system to maximize the information presented. The approach should demonstrate performance in a meaningful and actionable way to leadership and create performance transparency for elected officials and residents.

Designing an analysis system is time-intensive, requiring capital and talent. Leaders must understand and engage in data analytics. The SCFD will also need to identify and assign someone with a penchant for data analytics, statistics, databases, and mathematics, regardless of the technology used. The plan, do, check, and act framework presents an analytic system's design and implementation concept. This is called the Deming cycle of continuous improvement and is pictured in the following figure.

Figure 156: Deming Cycle[69]



[69] www.getvetter.com/posts/129-define-continuous-improvement-8-experts-definitions.

Plan—Research & Codify

Creating a durable analytic system requires a definition and understanding of what the data should present, the impacts of the information, and what constitutes the data stream. Once the descriptions are understood, they must be adopted as policies and acceptable practices. The following areas are presented for the SCFD to consider as they plan for performance improvement.

Adopt Overall Performance Objectives

The first step for the SCFD is to decide what key performance metrics they will monitor and manage. The SCFD's current performance reports focus primarily on call volume and finance, with very little evaluation of time metrics for performance enhancement or management. The performance evaluation information in this document is a good starting point for understanding and defining which objectives the agency wishes to evaluate.

The SCFD and City leadership must agree on what performance metrics the department will manage. This document should provide some direction and the foundation for these discussions. The managed time components should correlate to an overall service objective or area. Fortunately, the SCFD stated they have adopted specific performance standards and deferred to NFPA 1710 for other performance goals. While this is a laudable goal, achieving full compliance with these standards will be challenging, given the current resource distribution and performance.

These standards provide a strong foundation for developing a performance evaluation system. Understanding the total time requirements establishes a base for call segment benchmarks. Recall that this report's 90th percentile total response time goal for the first unit goal for all incidents is 8 minutes and 18 seconds, 90% of the time or faster in urban areas. The NFPA requires 6 minutes or quicker 90% of the time for all EMS incidents and 6 minutes and 20 seconds for all other incidents. With an actual performance of 8 minutes and 45 seconds or faster 90% of the time, the SCFD does not meet either of these standards. However, they should be able to meet the 8:18 standard with some basic improvements, but they may never meet NFPA. Since the U.S. Census no longer defines or accepts suburban as a density definition, the SCFD should either define this or remove it as a performance standard.

Establish Management Segments

As discussed earlier in the performance section, an emergency incident has several identifiable segments. Adopting time objectives based on these segments allows an agency to understand how actions affect an incident's total response time. While much of the analytics available for the fire service is based on time, this is not the only performance that can be measured. Each segment can identify areas where the performance objective may be other than time, such as quality or prevention. However, the most widely available and used metrics center around time, so that will be used here.

Once the agency masters time analysis, it should expand into the less traditional performance evaluation methods. The following figure identifies the emergency incident segment, potential metrics, applicable NFPA standards, and other comments.

Figure 157: Incident Segments

Segment	Key Performance Metric		Standard	Comments
Normal State	Community demographics		N/A	This base state needs to be defined. Prevention mainly affects this.
Incident Initiation	Incident Counts			
Incident Detection				
Notification Action	PSAP Answer		NFPA 1225	Prevention and Education.
PSAP Notification				
PSAP Interrogation	PSAP Transfer & Agency Answer		NFPA 1225	CAD-to-CAD agreements.
Agency Notification				
Agency Interrogation	Call Processing	Total Response Time	NFPA 1221 & 1710	These segments should be evaluated at a minimum. Each segment should have an adopted performance standard.
FD Notified				
FD Unit Dispatched	> Turnout Time > Travel Time		NFPA 1710	
FD Unit Responding				
FD 1st Unit Arrives				
FD ERF Dispatched	ERF Travel & Total Time		NFPA 1710	
FD ERF Arrives				
EMS To Destination	> Destination Travel > Wall Time		N/A	Applicable to EMS transport agencies.
EMS At Destination				
EMS Clear Destination				
FD Units Clear Incident	From dispatch to clear, total time translates into unit utilization.		N/A	Used to evaluate unit workload and availability.
Normal State	The outcome of the incident response is the gold standard for service delivery analytics. However, this advanced study is outside the scope of this report and requires unconventional research and analytic methods.			

Expanding on the medical incident example, the time segments for the first arriving unit in a medical call will be call processing, turn out, travel, and total response times. However, due to dispatch performance, the SCFD could benefit from adding the call answer and PSAP transfer time segments as management components in its formal performance evaluations. The City and the SCFD leadership will need to make this decision.

For medical incidents, NFPA recommends a total response time of six minutes for the first unit. By evaluating the travel time extent map earlier in this report, it can be estimated that a travel time of four minutes is possible in certain areas near stations 1-3 but not other areas. In addition, station 4 is not placed in an area that would help facilitate a 4-minute travel time to the underserved regions of the city's center. Therefore, the benchmark for travel time for medical incidents cannot be reasonably set to four minutes for the entire area, and all first-due units would expect the same performance. A more reasonable standard would be to meet the current 6 minutes and set a goal, or benchmark, as 5 minutes. The relationship between the PSAP, the City police/fire dispatch, and SCCECC must also be considered. NFPA recommends a call transfer time of 30 seconds and a one-minute call processing time for the secondary PSAP for high-priority calls.

Additionally, the agency adopted a turnout time standard of one minute for medical calls and 120 seconds for non-medical incidents as a benchmark. The total time benchmark would be the expected travel time, turnout time, and call processing for the first response unit. In this case, the 8:13 standard would be the goal, and 8:45 is the standard. The difference is that a goal is to be reached, while the agency promises not to do worse than the standard.

Performance Specifics

The next step is defining what meets the analysis's performance requirements. For example, should command officers in a command car have the authority to stop the response clock, or should it be limited to an apparatus designed and equipped to address the incident specifics? Can an ambulance stop the clock on a structure fire, or should it be an apparatus that can begin to address the fire hazard, such as fire attack and water supply? There is no single answer to these questions, and leadership must define these criteria to align with the community's performance expectations.

The apparatus variable may be defined by type or a description of capabilities. If the capabilities of an engine company are well known, then stating a first-due apparatus as the engine company may suffice. However, if the engine companies differ in capabilities, a more detailed definition may be necessary. For example, a complete description might state, "the first arriving company capable of providing a minimum of three firefighters, officers, or engineers, and equipped with an AED and EMT-B firefighters." It will be up to the agency to clarify this component. However, CFAI expects clear definitions of the capabilities of the first arriving and effective response forces. For the SCFD medical incidents, the leadership could designate the first engine or ambulance as the clock-stopping vehicle. This is what will be used in the example.

Another variable that should be defined is geographic limitations. The SCFD identified 3 areas they would evaluate differently based on population density. These areas are listed as Urban, Suburban, and Rural. Mountain and state response zones are also parted out. As stated earlier, the Suburban demographic will need to be defined.

The SCFD may add or limit the number of qualifying statements for any incident type. However, the result remains the same: a performance chart based on incident type—possibly including severity—consisting of goals, standards, differences, and references. The following figure shows a potential performance statement example based on the abovementioned EMS information.

Figure 158: Performance Chart Example

Key Metric	Baseline	Benchmark	Strategic Improvement	Reference
First-due engine or truck performance for medical incidents in urban areas.				
PSAP Transfer	Unk	0:30	City Dispatch Center	City Policy
Call Processing	2:51	1:30*	SCCECC	Service Contract
Turn Out Time	2:05	1:00 EMS 2:00 Other	Management initiatives	SCFD Policy
Travel Time	6:00**	5:00	Routing and training	Realistic goal
Total Time	8:45	8:00 EMS 9:00 Other	Turnout and station location	Realistic goal

* Priority Incidents Only
** In City Only

The preceding figure is an example and does not necessarily meet or follow the overall performance review acceptable by the SCFD and the City. However, it does illustrate the process. This process would be repeated for all the service areas the SCFD intends to manage with data. For example, as in this risk assessment document, the SCFD could continue to group fire, medical, and other incidents.

One concept to remember is that total response times are not an aggregate of call processing, turnout, and travel times. Because the evaluation in this case uses the 90th percentile, the baseline incident time segments do not stack vertically, and the total time is its own statistical analysis. In other words, adding call processing, turnout time, and travel time for all incidents will not necessarily equate to the 90th percentile total response time.

Develop Evaluation Methodology

A methodology should be developed to analyze performance, using the performance charts defined for each incident segment and type. During this stage, the agency should evaluate who will perform the analysis and what tools they need to complete their tasks. Reporting periods and management expectations from the reports should also be defined.

It is common for leaders to see a technical report, such as a statistical evaluation of performance, and take little action. These statistical evaluations help leaders decide what to change, add, or maintain to provide the best service to the community. Unfortunately, technical reports that are not well understood or report irrelevant information are often useless. Such reports are received, read, filed away, and forgotten without connecting operations to the statistics.

Statistics are not a magic solution. Statistics were developed to reference complex issues and make them easier to comprehend. However, inaccurate or misleading evaluations can cause damage and other problems. For an excellent example of mathematical systems being inappropriately applied and corrupted by leaders, see the book "The Fires" by Joe Flood. Statistical measures need to be valid, representative, and consistently applied.

At its heart, statistics in emergency services should be designed to add an understanding of historical performance, reported in a way that is consistent and comparable to other similar agencies. To make this work for the SCFD, leadership must discuss and agree upon the statistical measures they will use. For example, they may use the mean or median measures for good reasons. However, the NFPA and CFAI have moved to percentiles for fire department performance analysis, typically the 90th percentile. Therefore, while the SCFD can choose its own statistical measures, it should consider continuing with the 90th percentile measures presented in this document.

When building an evaluation methodology, the final consideration is what data will be used in the analysis. There is significant debate within the fire service regarding what constitutes flawed data or outliers. Again, the decision on what to include and potentially exclude is up to the SCFD leadership. For credibility, these decisions should be well documented.

Errors in the records system are typically caused by people. For example, information in a record may be added incorrectly or left blank. These errors apply to time fields, code application, narration, and incident specifics an analyst uses to slice the data. Since these errors are usually created when the incident record is built, incorporating a robust quality assurance and training program is the most effective solution.

A quality assurance program involves reviewing each incident for errors and unacceptable performance. Once the incident report is complete, it is placed in a quality check queue. A reviewer who has knowledge of the call but not necessarily on the incident will then evaluate the report for accuracy. The following list is an example of a minimum quality assurance review.

- Well-written narratives that are legally defendable.
- All dispatched units added the correct information.
- Incident type matches the incident findings in the narrative or what the quality evaluator knows to be true about the incident.
- Incorrect date and time-stamped information is corrected through a verification process.
- Unexpected date and time-stamped information is captured and explained.

Once the records are accurate, there may still be some abnormal data that will skew the results. In this case, an agency may want to disregard these anomalies in its performance analytics. If the agency defines what records they will disallow, those records identified as unexpected can be removed from the analysis. This outlier policy should be well documented and not designed to undermine the agency's credibility. A custom or trigger field can identify the disqualified incident record as an exception and not be included in the analytic.

Caution should be exercised when removing any record that accurately shows performance. For example, it seems unlikely that any unit would be able to turn out in zero seconds, so often that zero data is removed. However, if a crew is contacted directly and initiates the response, the turnout time would be zero. Therefore, in this example, a zero response indicates the deployment of units for this incident was very effective. Another example is a long drive along a road under bad road conditions. While the time may be extensive, it represents the actual performance. Therefore, it should be evaluated accordingly as a problematic response. Considering and defining all the potential anomalies before any analytics are completed helps make the analysis more transparent and adds trust.

A secondary method to remove incorrect data is to identify statistical outliers. The methodology for detecting these outliers is based on the data's shape and variability. For example, identifying statistical outliers by using 1.5 multiples of the standard deviation may identify those statistical outliers for data points evenly distributed along a typical distribution curve. Conversely, data points with a strong left or right tendency have a different shape. For left or right tendency data, it may be more appropriate to evaluate those data points that are 1.5 multiples of the inner quartile range as a statistical outlier. Either statistical methodology may actually and incorrectly remove accurate anomalous information. However, these methods have a good chance of finding and eliminating incorrect data. Which approach is used becomes a compromise between absolute accuracy and time investment. The SCFD may consider consulting with the City, the university's mathematics and statistics faculty, or students to help determine appropriate approaches and methodologies.

Research and Adopt a Technology for Analysis

One or a few employees typically accomplish the initial analysis and development of goals, identification of capabilities and standards, and general service understanding. Evaluating the data in large sets, determining rules, and answering other questions can be an enjoyable experience for the right temperament, leading to hours of discovery. However, the ongoing reporting and analysis can be tedious and repetitive after this initial research. Therefore, it will be to the agency's advantage to start researching technological solutions early in the planning stage and finding the right personality to lead both segments of data analytics.

In the age of Microsoft Excel®, it is easy to believe a spreadsheet program is the ultimate tool for analysis. While Excel is a powerful tool, the agency should research and adopt other methods. Typically, this is a homegrown analytic with standard business analytic software or records management analytical systems. Other options are to look for a third-party fire-service-specific service or to hire external consultants to complete the analysis. Consulting reports can be reliable and are often conducted by professionals. However, these lengthy reports do not always help agencies manage their ongoing operations promptly.

The SCFD should investigate other technological solutions that are available to them. Whatever system the SCFD chooses, the solution should have three primary attributes. First, the system should be easy to master. Second, any analytic system should provide consistent results from data sets directly attached to the source. Finally, the system should be highly customizable for the current services the SCFD delivers and future service models.

One possibility is to use a third-party analytic vendor. This report will not name vendors for third-party analytics, as the field is highly competitive and changes constantly. Many vendors offer similar services but specialize in producing reports and analyses based on their expertise. Some of their products are truly exceptional and create complex calculations. The data they use is often directly tied to the CAD data and may miss some of the subtleties of the NFIRS system. However, if the SCFD can adopt performance objectives from CAD data, the agency may be able to write and manage its performance objectives effectively using a third-party system. One warning is that if a vendor closes its operations, the codes and mathematical assumptions are also gone. In addition, what they produce is not customarily owned by the fire agency. Another typical concern is the high initial and ongoing costs of these systems.

Another possibility is to use off-the-shelf analytic systems to create a reporting environment that is automated, researchable, verifiable, and valuable to management. Many vendors provide analytical software solutions, each with pros and cons. The current Gartner Magic Quadrant for business analytic software indicates that Microsoft's Power BI and Salesforce's Tableau remain the frontrunners in this field.[70] However, many options exist depending on the agency's operating system environment, budget requirements, and other available systems. Additionally, ArcGIS software, an industry leader in geospatial analysis, is generally accessible to fire departments within a city. If the City owns a license, they usually provide a seat license to all departments. One concern for the homegrown approach is the need for technologically skilled personnel to create, maintain, and present these reports.

One final option would be to utilize the analytics intrinsic or available within the agency's RMS. The SCFD uses Emergency Reporting® for incident reporting and Image Trend for patient information. Emergency Reporting® is owned by ESO®, which has a significant presence in fire and EMS reporting, but has a history of purchasing and dismantling records systems.

Adopt Policies, Procedures, and Systems for Analytics (Standardize)

Once all the above processes, definitions, and systems are evaluated and recommended, they must be officially adopted. This means capturing policies and procedures in writing. All analyses created will be conducted under the written rules to ensure consistency during the analysis period. These documents can be changed as the improvement process continues. However, the change process needs to be defined as well. In addition, changes should only be made if they can be reconciled with the previous analytics.

Do—Implement the Plan

Initial implementation of new plans can create dramatic organizational changes with minimal effort. This is typical because the changes primarily involve policy and procedure changes, not actual operations. However, as the continuous improvement cycle continues, implementing and evaluating change requires more effort and may have a less pronounced impact. Despite this, the most profound changes are usually encountered during these more difficult cycles.

[70] www.gartner.com/en/research/magic-quadrant.

Implementing the planned analysis systems requires communication and training throughout the organization. Most fire service organizations have a training system in place that can be tasked to meet this requirement. However, without adoption by those who create the reports and those who supervise and quality-check the information, the system will not produce accurate results. The best results come from engaging these people early and communicating the expected benefits, expectations, and intended outcomes.

Communicating expectations to those affected is crucial, not only the requirements, but also what their efforts will likely produce. Explain the methodologies to be used and create an open environment to help. People who do not understand the overall strategy of statistical analysis for improvement may not feel comfortable admitting this. In addition, those whose actions are being evaluated may feel insecure and attack the process. This emotional reaction is natural and should be anticipated. Steps should be taken to alleviate it, including an open feedback forum.

Personnel may also require ongoing education and training to complete accurate and representative reports. Training on new business processes, systems, and technical infrastructure may also be required. This ongoing training is particularly needed as the U.S. government's database for fire incidents, NFIRs, is being retired at the end of 2025, and a new system is being introduced. The new system is the National Emergency Response Information System (NERIS). Efforts should be made to coach staff through the changes and identify individuals who need training and those who may move into roles requiring proficiency in the new processes.

Check—Perform the Analytics

Now that the agency has defined the metrics and the collection system and adopted the analytic methodology, it should focus on reporting. Multiple levels and types of reports should be generated, each tailored to different audiences. Some reports may go to the SCFD leadership, some to all department personnel, and others to City leadership and council. The following is an example of the reports to be produced. It will be up to the SCFD and the City leadership to approve the content, distribution, and timing.

- Quality assurance information and exceptions.
- Overall time segments analysis by incident type and severity.
- Unit time segment reports by shift, station, and apparatus.
- First due and ERF Travel time by geographic area.
- Trend analysis by geographic location, unit, and overall.

The content and timing of these reports will be dictated by the intent of the information. For example, a daily report might be designed to identify data that may be incorrect and require evaluation and potential correction. A monthly statement for crews and leadership may indicate unit performance with trends to improve crew activity. A quarterly report could identify progress toward improvement goals and initiatives. Finally, annual reports would inform the public and the City leadership about the department's overall performance, improvements, gaps in service delivery, and potential needs.

Act—Improve Operations Based on the Analysis

The reason any agency should undergo this evaluation is to understand service delivery and to evaluate ways to enhance performance. The first step is identifying areas that could be improved, whether a geographic location or a specific unit at a particular station. The difference between expectations, goals, and actual performance is a gap analysis. Next, leaders and staff should evaluate what initiatives can be attempted and what outcomes are expected. Finally, after the proposal is implemented and a reasonable amount of time has passed, an analysis is reviewed against expectations. This comparative analysis allows management to see if the initiative has made the expected improvements.

These improvements may require a simple policy change, or the enhancements may be as financially prohibitive as new staffing or stations and take years to implement. Regardless of the improvement initiative, having solid analytic proof and definitive performance enhancement goals will improve the overall positioning and service of the SCFD.

Continuous Improvement

This process must be frequently repeated, keeping the process and analytics relevant. The intervals will be determined based on findings, initiatives, and systems. Initially, the method may need to be evaluated monthly or quarterly to ensure the information is pertinent and valid. However, after the initial build, the entire process must undergo formal evaluation at a less frequent but more defined interval. Performance indicators described in the CFAI 10th edition of their self-assessment manual may help create a formal review process. The following list shows a review process based on the CFAI documents.

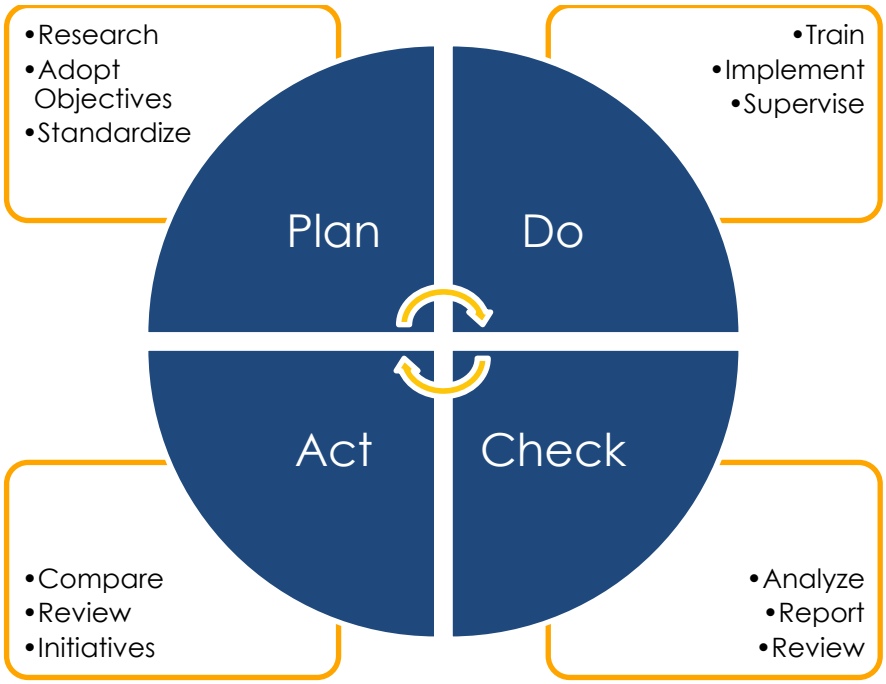
- Policies and procedures must be reviewed annually. This is an excellent time to ensure the analytic policies and practices are current with the incremental changes made within the year.

- Strategic plans should be produced every 3 years. The strategic plan should incorporate performance improvement initiatives. At this time, the types and levels of analysis may need to be redefined and adjusted.
- This Community Risk Assessment: Standards of Cover must be reviewed and updated every 5 years. The build-up to publishing this document is an excellent opportunity to determine whether the analytics still meet the agency's needs.

Because this process relies heavily on policy and documentation, there is a built-in standardization step each time the cycle starts again. The Deming Cycle is often pictured going up a ramp because without constant effort, the process can regress, and the organization will return to the beginning. Standardization, including the implementation and training of organization members, acts as a wheelchock. However, it may not be able to stop backward motion. Still, attention to the organization and standardization will help keep the ball rolling.

It does not matter what approach the organization takes to continually evaluate its operations and data. The critical concept is that the organization adopts a formal method that allows a deep understanding of improvement and guidance. The following figure is a review of the plan overview presented above.

Figure 159: Methodology Overview



Alternative Operational Models

Exploring alternative operational models for the SCFD can help optimize emergency services.

Regionalization of Fire Services

Regional fire and emergency services are critical to public safety, offering advantages and challenges. On the positive side, regionalization can lead to improved resource sharing, enhanced specialized training, and greater consistency in service delivery across different areas. It allows for a unified command structure, which can be particularly beneficial during large-scale emergencies where a coordinated response is essential. Moreover, regional services can benefit from economies of scale, potentially reducing costs and increasing efficiency.

However, there are also downsides to consider. Regional services may face challenges related to the diversity of the communities they cover, such as varying risk profiles and community needs, which can complicate the provision of tailored services. There's also the potential for decreased local control and input, which can lead to a disconnect between emergency services and the communities they serve. Additionally, the initial transition to a regional system can be complex and costly, requiring significant upfront investment in time and money.

In the context of the SCFD and the rest of Santa Cruz County, public safety and communities have evolved over time, reflecting local funding and needs. The region's current model illustrates the complexity of designing a system that balances regional coordination with local control. Any potential regionalization efforts should be carefully studied when the opportunity is proper to determine the financial and operational impacts and possible benefits.

Public safety consolidation can include merging fire and emergency medical services. However, EMS transport has some historical roots and presents its own pros and cons. While it can lead to increased savings and improved coverage, opponents argue it involves a significant identity shift, which can help with buy-in from elected officials and firefighters but also requires an initial investment.

Training for emergency services personnel is another area where regionalization has an impact. It can create increased opportunities for networking and improved regional services without too much loss of local autonomy.

Finally, regional collaboration in fire services involves more than just working together; it requires contributions from each member agency and often necessitates some sacrifice of individual autonomy for the greater good. The SCFD, other fire agencies, and Santa Cruz County would benefit from a thorough analysis of how regional fire and emergency services can offer improved efficiency and coordination while carefully addressing the unique needs of their communities, ensuring that the benefits outweigh any potential drawbacks.

The most logical first step to regionalization for the City of Santa Cruz is to disband the fire department as a City service and include it in the Central Fire District of Santa Cruz (CFD). This process is not unprecedented in California but poses several legal and community concerns. Funding and taxes will be the most significant hurdle. The citizens will have to decide if they are willing, and if state law allows, to transition the fire department funding from a sales tax base to a property tax levy at the same rate as CFD. Instead of fully incorporating the city boundaries into the CFD taxation boundaries, the City can enter into a contractual relationship with CFD.

There are several reasons a CFD/SCFD merger appears to be the most appropriate combination of services. Geography and distance from existing facilities allow for a continuous service provision with minimal changes to staffing levels. These agencies work closely together now, making an operational shift relatively easy. Both agencies work on similar communication systems and are dispatched by the same regional communications center. The continuous geography and similar demographics also favor this type of consolidation.

While there are several benefits, there are arguments against this as well. In addition to the general concerns listed above, there does not appear to be significant employee or operational cost savings in a merger of this type. There is only a little duplication of staffing positions, and the service areas of the current stations do not overlap significantly. This indicates that staffing levels and equipment would remain relatively static. Some administrative positions may appear redundant, but the amount of work needed for the increased size of the organization will require most administrative staff to remain.

Peak Demand Units/Dynamic Deployment Models

One strategy employed to enhance efficiency and effectiveness is deploying additional fire units during peak hours when call volumes are highest or to large scheduled community events. This approach, combined with data and technology to dynamically adjust deployment strategies based on real-time information, represents a significant advancement in emergency response management.

Fire departments often experience predictable fluctuations in call volumes, with certain times of the day and days of the week seeing higher demand for services. Many departments implement peak-load staffing models to address this, which involve deploying additional fire or EMS units during these high-demand periods. This strategy ensures that adequate resources are available to respond to emergencies promptly, thereby reducing response times and improving overall service delivery.

The benefits of peak-load staffing are multifaceted. It helps to alleviate the strain on full-time units, ensuring they remain available for critical incidents. Additionally, it optimizes resource utilization, as additional units are only deployed when and where they are needed most. This approach enhances operational efficiency and contributes to better outcomes for the community by ensuring timely and effective emergency response.

Alternative Response Vehicles and Mobile Integrated Healthcare (MIH)

The fire service has evolved significantly over the years, adapting to the changing needs of its communities to enhance efficiency, reduce costs, and improve patient outcomes. Alternative response vehicles and mobile integrated healthcare are specialized units designed to handle specific emergency calls, particularly those that do not require the full capabilities of a traditional fire engine or ladder truck. The vehicles are typically smaller, more maneuverable, and less costly. One of the primary goals is to reduce the strain on emergency departments and 911 systems by providing appropriate care in the community. They can also improve response times in congested urban areas where larger fire trucks might struggle to navigate.

These programs aim to provide proactive care, particularly for individuals who frequently use emergency services for non-emergent issues. These programs often involve a multidisciplinary team, including paramedics, nurses, and social workers, who work together to address the underlying causes of frequent emergency calls. Additionally, these programs can help to bridge gaps in the healthcare system, ensuring that vulnerable populations receive the care they need.

Integrating alternative response vehicles and mobile healthcare programs in the fire service significantly advances emergency response and patient care. These innovations not only enhance the efficiency and effectiveness of fire departments but also contribute to better health outcomes for the communities they serve. As these programs continue to evolve, they hold the potential to transform the landscape of emergency medical services, making them more responsive, cost-effective, and patient-centered.

Findings

A Community Risk Assessment and Standard of Cover project identifies a fire department's current conditions, risks, and ability to respond to those risks. This is a foundational document and a place for agencies to begin their journey to improvement. The following findings are developed from experience and, as part of the research process, lead to recommendations in the next section.

Aging Facilities

- The SCFD fire stations are older and do not meet the requirements of today's fire service. (***Recommendation A-1***)
- The stations lack adequate space and engineered systems to meet modern firefighting needs, including proper decontamination facilities for personnel and equipment. (***Recommendation A-1***)
- Firefighter fitness, decontamination, and equipment cleaning are all done in the apparatus bay at Station 2, creating an unhealthy firefighter environment. (***Recommendation A-1***)
- The administration building is historic but needs some upgrades to meet modern efficiencies, and the seismic safeguard status is unclear. (***Recommendation A-1 & A-3***)
- Station 1 has a history of flooding during heavy rain events. (***Recommendation A-1***)
- The estimated costs for new buildings (Station 1/Administration, Station 2, and a new Station 5) in the unfunded projects list may be significantly low based on recent fire station buildings. (***Recommendations A-1 & A-2***)
- Station 4 lacks sufficient grading, has one bathroom, and does not meet current accessibility or kitchen standards. (***Recommendations A-2 & A-3***)
- The Marine Safety Division station at the wharf is not large enough for the seasonal staff. It has had several additions but is now weathered and in poor condition. (***Recommendations A-3 & B-1***)
- All the facilities appear to have deferred maintenance and upgrade projects, adding to the overall poor condition of most of the stations. (***Recommendation A-4***).
- There did not appear to be a long-range capital equipment, apparatus, and facility replacement or repair plan. Capital project funding is on an ad hoc and as-needed basis. (***Recommendation A-4***)

- Deferred maintenance at each facility is beginning to accumulate. It will likely become more urgent and potentially more costly. (***Recommendations A-1, A-2, A-3 & B-1***)
- The number of needed reserve, staffed, and cross-staffed apparatus exceeds the number of bays available to store them. This forces the storage of some apparatus outside, reducing the apparatus's lifespan. (***Recommendations A1 & A2***)
- Due to an extreme delay between apparatus orders and delivery, the planning and funding for apparatus placement should be done well before replacement needs. (***Recommendation A-5***)

Marine Safety Program

- Given the program's size and the aquatic environment's complexity, the current control span and classifications within the fire department's program should be reviewed. (***Recommendation B-1***)
- The SCFD lacks ownership or rapid access to a boat capable of general emergency response, including rescue, fire attack, or spill response. (***Recommendation B-2***)
- The closest fireboat resource is from the Monterey Fire Department, which may take significant time to arrive during an emergency. (***Recommendation A-3***)
- There is a need for a second Marine Safety Officer, as documented in a memorandum from the Fire Chief to the City Manager in January 2023, with a similar request made in October 2024. (***Recommendation B-3***)
- The Marine Safety Division's reliance on temporary, limited-term lifeguards has resulted in inconsistent coverage and training difficulties. Restrictions on hours and the nature of a part-time workforce have led to critical staffing gaps, particularly in the early summer months. (***Recommendation B-1***)

Training Program

- The training division comprises a single battalion chief. This may be inadequate to develop, manage, and deliver a training program for the 63 uniformed personnel with differing levels of certification and experience. (***Recommendation C-1***)
- Except for some limited training props found at Station 3, there is little access to training facilities and equipment. (***Recommendation C-2***)

Service Demand

- Engines 3110 and 3112 appear to be approaching a cautionary usage rate. However, the aggregate for Station 1 reliability is well within expectations if the truck company is included. (***Recommendations A-2, D-1, & D-2***)

- Incident volume is the densest around stations 1 and 2. (***Recommendations A-2, D-1, & D-2***)
- Approximately 70% of all incidents happen between 9:00 a.m. and 9:00 p.m., and 56% of the call volume is rescue-medical. (***Recommendation D-1***)
- Service demand may increase by approximately 22% in the next 10 years. (***Recommendations A-2, D-1, & D-2***)
- While the planned increase in residential units does not significantly impact incident volume, the increased density may increase workload. Service delivery can be complicated by the increased area and height of buildings. (***Recommendations A-2, D-1, & D-2***)

Response Performance

- The call processing and unit turnout time do not meet the specified performance standard. (***Recommendation E-1***)
- Allowing the SCFD to stop the clock for the ambulance response may lead to potential abuse and reduced transport performance by the contracted ambulance service. (***Recommendation E-2***)

Performance Data

- Service demand and system analysis for 2020 and 2021 may be driven by the COVID-19 pandemic and associated societal measures taken to prevent its spread. The research indicated a significant change in the utilization of emergency services. It is supposed that many people were reluctant to call for medical aid, leave their homes, or travel during the pandemic. As a result, incident volumes for these years may not be what agencies might expect in less restrictive times. For this reason, further evaluation is warranted as non-pandemic data becomes available. (***Recommendation F-1***)
- Eight percent of the incidents in CAD did not have a corresponding report in the RMS system. (***Recommendation F-2***)
- The coordination between the fire department standard incident records management and the lifeguard incident records does not help create a clear picture of incident response by the lifeguard units. (***Recommendations F-2 & F-3***)
- The practice of maintaining the reserve unit designation makes a complete assessment of a crew's usage difficult to determine. (***Recommendation F-4***)

Recommendations

Recommendations are provided for policymakers as a general guide based on experience and industry best practices. These are guides only for leadership to review as potential areas for improvement in systems and services. The grouping follows the summary categories in the Overview and Executive Summary sections. These are not organized in order of priority, time of implementation, duration, or cost. Instead, they are presented as independent statements based on the experience of the members of AP Triton as a beginning point in the organization's planning effort.

Aging Facilities

Recommendation A-1: Replace or Substantially Renovate Fire Station 1 and Station 2

Description: Station 1, built in 1939, is rated " Fair " but has experienced surface street flooding and consistent internal flooding problems. Station 2, built in 1947, is rated in "Poor" condition and lacks dedicated areas for cleaning equipment and firefighter fitness. Both stations require significant upgrades to meet modern firefighting needs, including proper decontamination facilities for personnel and equipment after responses. The fire department leadership's plan to replace Station 1 and the administrative building with a new building will address the station issues and the administrative building's deficiencies.

Outcomes: Modernized facilities that meet current operational needs, improve firefighter health and safety, and enhance service delivery capabilities.

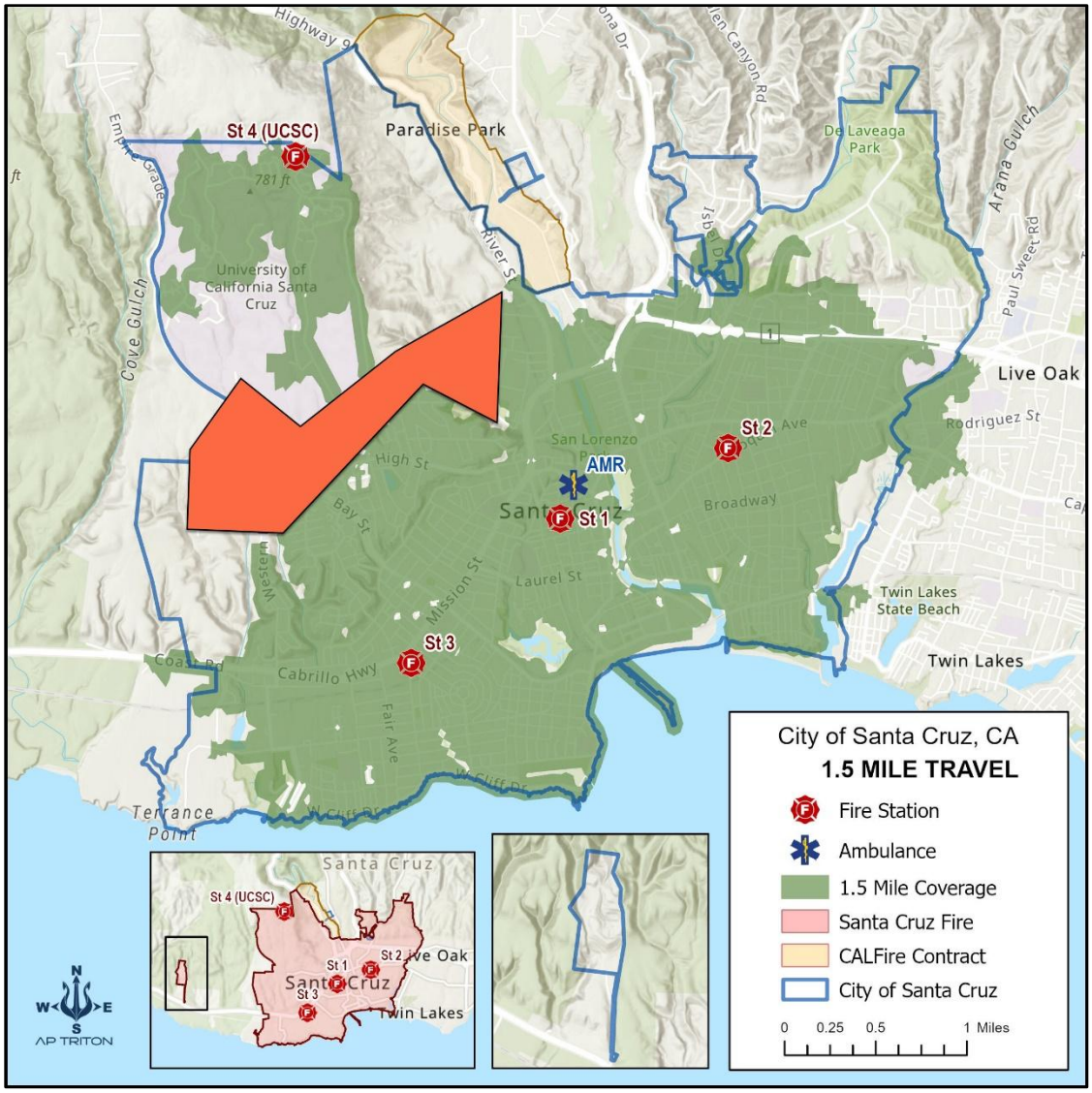
Financial Implication: The unfunded projects list identifies $19 million for Station 1 & Fire Admin replacement and $17 million for Station 2 replacement. However, based on the Kitchell study, the square foot estimate in 2027 would be $1,597. Increases are currently assumed to be planned at 5% per annum. The square footage of the station with associated administrative offices will necessarily be more extensive than a station alone. In addition, land costs must be included. However, due to the broad market values, the actual estimate is beyond the scope of this report. However, it is likely to run into millions for land in the heart of Santa Cruz, with a 0.28-acre lot in the new Everett Circle development listed at over $4 million.[71]

[71] www.zillow.com

Recommendation A-2: Evaluate Moving Station 4 or Adding Station 5

Description: Station 4 is owned by the University of California and is staffed by SCFD to fulfill the emergency service delivery contract with the university. This station is in poor condition, and the City does not have direct control over upgrades and maintenance. The station is located along the northern border of the university property. It has a limited effective radius based on road access and travel distance. Additionally, there is a need to improve response travel time, reduce Station 1 and Station 2 apparatus usage, and improve coverage along the areas north of Stations 1 and 2. The following figure is the travel time map from the service delivery evaluation section, with the area highlighted in red as an underserved area.

Figure 160: Underserved Area



Having a station within this area may provide adequate coverage for the area indicated and the university and help relieve the pressure on the Station 1 apparatus. If moving Station 4 is impossible, adding a station in this area is also an option.

Outcomes: Modernized facilities that meet current operational needs, improve firefighter health and safety, and enhance service delivery capabilities.

Financial Implication: Based on the Kitchell study, the square foot estimate in 2027 would be $1,597. Increases are currently assumed to be planned at 5% per annum. In addition, land costs must be included. Still, due to the broad market values, the actual estimate is beyond the scope of this report. However, it will likely run into millions for land in the heart of Santa Cruz. No land was listed in the area, but homes near that location are listed between $1 and $3 million.[72] Adding a station will necessarily require more staff and new apparatus. In 2024, the fully burdened staffing costs are approximately $1.5 million annually for a three-person company with a Captain, Engineer, and Firefighter-Paramedic, including overtime and coverage estimates. In addition, a new Type 1 engine will cost approximately $1 million and should be replaced every 5–10 years.

Recommendation A-3: Improve the Capabilities, Maintenance, and Usefulness of the Administrative Building and Station 4

Description: These buildings need significant upgrades and repairs. The administration building is ill-equipped to handle the current management functions required by modern fire service, and the security, energy efficiency, size, infrastructure capability, and seismic protection are questionable. The issues with Station 4 are not necessarily within the City's direct control. However, efforts should be made to influence UCSC to improve the building's functionality, safety, and livability. Drastic improvements may be delayed if Recommendation A-1 is adopted for a new administration building and Recommendation A-2 is adopted as a move for Station 4.

Outcomes: Improvements will allow administrative staff to function more effectively and create an improved living environment for the crews at Station 4.

Financial Implications: New facilities will cost approximately $1,597 per square foot in 2027 dollars. The cost of repairs and upgrades to the facilities is outside the scope of this study.

[72] www.zillow.com.

Recommendation A-4: Develop a Comprehensive Facilities Replacement and Maintenance Plan

Description: The SCFD fire stations are aging and do not meet the requirements of today's fire service. There does not appear to be a long-range facility replacement or repair plan from the City. Additionally, it was not apparent if a facility maintenance schedule was in place. The planning and purchasing of apparatus appeared to be based on an as-needed or identified. Still, they can be easily planned years in advance. Ensuring the stations are in good repair requires regular maintenance and scheduled replacement of specialized equipment. The plan should include HVAC, generators, roofs, driveways, parking areas, security gates, painting, carpet replacement, and small appliances.

Outcomes: A comprehensive facilities plan would allow the City to better plan for ongoing service from each station, prioritize repairs and renovations, and develop a more accurate long-term capital improvement budget.

Financial Implications: This study is primarily concerned with the 4 fire stations and the fire administration building, but this type of plan benefits all City buildings. Suppose Recommendations A-1, A-2, A-3, and B-1 are followed. In that case, most building systems will be improved, and the cost of creating an ongoing plan will be limited to either staff time or specialist consultants. If these recommendations are not approved, the cost of bringing the buildings up to date should also be incorporated into the planning process.

Recommendation A-5: Establish an Apparatus Replacement Fund and Schedule

Description: The SCFD does not have a long-range apparatus replacement fund, with apparatus purchases undertaken as part of the annual budget process. Fire apparatus is costly (engines exceeding one million dollars and trucks in the two-million-dollar range), and a systematic approach to their replacement would help ensure operational readiness and financial planning. The plan should establish a life cycle for different types of apparatus and create replacement funds to prepare for these major capital expenses. Because the lag time for apparatus delivery is extreme, committing to a replacement plan and pre-ordering before a fire truck becomes unserviceable is critical.

Outcomes: Improved financial planning for major apparatus purchases, reduced maintenance costs through timely replacement, and enhanced operational readiness.

Financial Implications: Staff time is the only consideration for direct expenses. Creating this type of schedule is much less complicated than a facilities plan, and several plans already exist. The staff time to make this plan should be limited.

Marine Safety Program

Recommendation B-1: Address Marine Safety Division Staffing and Facility Needs

Description: The Marine Safety Division's heavy reliance on temporary, limited-term lifeguards has resulted in inconsistent coverage and training difficulties. Restrictions on hours and the nature of a part-time workforce have led to critical staffing gaps, particularly in the early summer months. Additionally, the Lifeguard Headquarters building, located at the Municipal Wharf, is in poor condition, undersized for seasonal staff, and has limited accessibility compliance.

Outcomes: Improved staffing consistency, enhanced safety for beach and water users, and a more functional facility for the Marine Safety Division.

Financial Implications: The unfunded projects list identifies $5 million for Lifeguard Headquarters Replacement. Staffing costs for an additional Marine Safety Officer would depend on the salary and benefits package. Still, they would likely be comparable to similar positions within the department, approximately $74,718 annually in 2024.

Recommendation B-2: Gain Permanent Access to a Fire Boat

Description: The report notes that a fire boat is a unique resource required for a seaside community, especially one with a harbor and a wharf with buildings. Currently, the closest fire boat resource is from the Monterey Fire Department, which may take significant time to arrive during an emergency. This water-based firefighting and rescue capability gap could impact the department's ability to respond effectively to fires and other emergencies on or near the water.

Outcomes: Improved response capability for fires and other emergencies on or near the water, particularly in the harbor and wharf areas.

Financial Implication: The unfunded projects list identifies $2 million for a fire boat. Additional costs would include ongoing maintenance, training, and staffing considerations.

Training Program

Recommendation C-1: Address Training Division Staffing Needs

Description: The Training Division is a critical component of any fire department, dedicated to firefighters' continuous education and skill development. It encompasses a broad range of activities, from basic training for recruits to advanced courses for seasoned professionals. The goal is to ensure that all firefighters have the knowledge, skills, and abilities necessary to perform their duties effectively and safely, reflecting the latest advancements in firefighting and emergency response. It appears evident that the single Battalion Chief, with other duties, struggles to keep up with the evolving demands of an all-risk fire department, potentially compromising the quality and frequency of training programs.

Outcomes: Improved training program and support for new and continued certification and skills for the multiple requirements of a modern, all-hazardous fire community.

Financial Implications: Two aspects of this program should be addressed. An administrative assistant, potentially part-time, can record training completion and certification requirements. In 2024, the cost of an Administrative Assistant 1 was listed at approximately $53,000. Another need is the ability to monitor and deliver training. This should be accomplished by at least one trained line employee, who may be of any rank, as long as they have the appropriate level of certification and the skills and ability to create and manage a training program. In 2024, the approximate annual pay for a Captain was listed at approximately $130,000, an engineer at $114,000, and a firefighter/paramedic at $116,000.

Recommendation C-2: Training Facility

Description: The firefighters do not have access to a proper training ground. Completing hose evolutions in parking areas, whether owned by the City or the public, creates inconvenience for City employees, the public, and the firefighters. Training space should be of sufficient size with sufficient training props to keep the firefighter skills updated, especially with high-risk, low-frequency incident types like structure fires.

Outcomes: Improved training capabilities and a place for firefighters to train with appropriate space and facilities.

Financial Implications: A regional training facility is in the works, and it is currently indicated that the SCFD portion would be $2 million. As time passes, this will likely increase. Another measure would be to add some "training by design" properties to the improvements needed at the stations, which can likely be included in the estimates in Recommendations A-1 and A-2.

Service Demand

Recommendation D-1: Consider Adding a 12-hour Mobile Integrated Healthcare Response Vehicle Located Near or Between Station 1 and Station 2

Description: The volume of incidents in the city center is causing pressure on Engine 3110 and Engine 3112, increasing their demand to above that recommended for overall area fire service reliability. 70% of all call volume is during the 12 hours between 9:00 a.m. and 9:00 p.m. This is consistent throughout the week, and 56% of the incidents are medical. Anecdotally, from the staff and members of the business community, a large number of these calls center around individuals with less than critical needs and potentially persons with mental disorders.

Outcomes: Adding this unit will alleviate the pressure on two of the busiest engines in the system. Adding a medical-focused unit will also help provide the appropriate unit to respond to the lower acuity and potentially specialized needs of mental health patients.

Financial Implications: Four considerations are needed to evaluate the economic implications. AP Triton assumes the staffing will be additional firefighters and firefighter-paramedics to staff this equipment. Although civilian responders may be less expensive, it will be harder to backfill and cover overtime. It will take a minimum of 4 personnel to staff this unit every day for 12 hours. Assuming one paramedic and one firefighter EMT, the annual wage based in 2024 is $552,000. A standard vehicle like a pickup or SUV would be an additional $100,000 on start-up and every approximately 5 years. Additional start-up costs would be the equipment needed to outfit an ALS crew. Another consideration is whether the City can charge for this service and at what rate. There is currently no system to bill and recover medical costs from patients.

Recommendation D-2: Consider Regionalization of the Response Service

Description: Mutual and automatic aid is robust and effective in Santa Cruz. The Station 2 area, especially on the east side, has access from surrounding jurisdictions. Regionalization could be as simple as a full boundary drop where the closest unit, regardless of agency, is dispatched to the regional emergency needs. Regionalization could also be as complex as merging with surrounding departments with similar structures and capabilities. The agencies primarily concerned with this type of merger would be the Scotts Valley and Central Santa Cruz Fire Protection Districts.

Outcomes: A complete boundary drop, either operationally or legal change in service provider, may reduce some of the workload on the busiest engines and improve performance on the east.

Financial Implications: The financial implications to the taxpayers are a minimal shift in overall costs. AP Triton does not see a significant change in the number of personnel needed to provide coverage or supervision. Additionally, the required capital improvements and apparatus replacement still need to be accomplished.

Response Performance

Recommendation E-1: Adopt Performance Expectations, Update Policies, and Make Periodic Reports to Elected Officials

Description: The fire department should adopt time-based performance objectives for each analytical time segment presented in this report. These segments and other performance objectives should be memorialized in the writing. Guidelines and policies allow all parties to know and understand performance expectations. They should be reviewed periodically for currency and accuracy. The CFAI recommends all policies be reviewed at least annually. The fire department should make periodic reports to the elected officials and the public based on these performance guidelines. When partnering agencies, such as the ambulance company or the communications center, do not meet expectations, they should be asked about their shortcomings. Improvements can be made by understanding and correcting the core reason for the deficiencies.

Outcomes: Improve overall time performance by the fire department.

Financial Implications: This will require staff time to update the policies and procedures. Additional staff time will be necessary to capture and report the response information to the elected officials.

Recommendation E-2: Apply a Whole System Approach to Medical Emergency Performance Evaluation

Description: The county EMSA allows the SCFD's first responders to "stop the clock" for the performance of the contracted transport agency. This metric type can be misleading when evaluating response partner performance without a whole systems approach. Abusing this can lead to longer scene times for SCFD apparatus and crews, reducing unit reliability. It can have the additional effect of increasing the time it takes for patients to reach definitive care. A clear disclosure of the whole system's performance is preferred when evaluating EMS responses.

Outcomes: Applying a holistic systems approach to medical response performance evaluation can reduce unit usage. In addition, if managed appropriately, this can increase collaboration between the involved response parties and improve overall medical service delivery to the patient.

Financial Implications: Staff time to measure and renegotiate the performance requirements with the EMSA.

Performance Data

Recommendation F-1: Review Incident Data Annually

Description: The potentially distorted data during the COVID-19 pandemic years, trends, and predicted demand may be flawed. It is essential to understand the full effect of the pandemic on service delivery, and that will only be possible with continued analysis. Evaluating demand, service types, and other information annually until the pandemic-specific effects are fully accounted for and understood is critical. Until that effect is fully understood, the analytics created using the pandemic-era data have the potential to be misleading.

Outcomes: Creating an understanding of the pandemic era's effect on service delivery and performance analytics and creating appropriate adjustments to them.

Estimated Financial Cost/Savings: Costs will vary depending on the approach adopted. At a minimum, staff time will be required. Additional costs may include training, increased staff levels, compensation, equipment, or fees paid to outside vendors.

Recommendation F-2: Implement a Quality Check Process for Incident Reports

Description: Daily review of incident reports is integral to improving fire service performance data. Preferably, someone who is not involved in the incident but has knowledge of the incident should review each component of the report and the report narratives.

Outcomes: More accurate, complete, and legally defensible incident records.

Estimated Financial Cost/Savings: Staff time.

Recommendation F-3: Improve Lifeguard Incident and Prevention Reporting

Description: The depth of information within the lifeguard reporting system appeared lacking in detail. It wasn't clear if that was due to the program or how it was implemented. There does not appear to be a standardized crossover between the lifeguard and fire department reporting system. Both issues may be addressed by policies and training or by using a single reporting system. There did not appear to be many options in Ocean Safety incident reporting software, and standard fire department records management software may not be easy to adapt to lifeguard operations. The least expensive option is creating a policy and process whereby the two systems report their operations. If the Marine Safety Officers fill out an RMS report or when a fire department resource responds, both systems would be updated to allow cross references.

Outcomes: A coordinated method of capturing incidents where the Marine Safety Division responds with the fire department or vice versa.

Estimated Financial Cost/Savings: Staff time to implement a program. Updating to a new system will depend on the system selected.

Recommendation F-4: Establish a Process to Capture Which Crew is Using a Reserve Apparatus

Description: SCFD uses the hard asset number for each response vehicle as the radio name for incident reporting. The incident data included responses from the reserve apparatus without quickly seeing which crew was on the incident or accounting for crew response times and performance. This is a common practice, and there are several ways to capture the correct crew. Having the crew track the apparatus, days, and times they work on a reserve unit. This information can then be applied to response data for analysis. Another option would be to add or use a custom field in the RMS indicating which unit and crew were assigned to a reserve apparatus. Another option would be to have a crew maintain its name regardless of what unit It is riding. For example, the Engine 3110 crew riding on Engine 3111 would keep the designation E3110. This has the additional benefit of command officers knowing which crew was working by name alone without having to look up a cross-reference riding sheet. This will require a different physical numbering system on the apparatus to avoid confusing teams working on an incident.

Outcomes: Complete capture of a crew's operations and performance.

Estimated Financial Cost/Savings: The policy and program will require staff time to develop and train crews in usage. Physically removing apparatus numbers from the equipment for accountability may add costs.

Section V:
APPENDICES

Appendix A: Stakeholder Interviews

Introduction to the Stakeholder Interviews

Triton interviewed various Santa Cruz Fire Department's internal and external stakeholders. These interviews aimed to better understand issues, concerns, and options regarding the emergency service delivery system, opportunities for shared services, and expectations from community members.

It is important to note that the information solicited and provided during this process was "people inputs" (stakeholders individually responding to our questions), some of which are perceptions reported by stakeholders. All information was accepted at face value without an in-depth investigation of its origination or reliability. The project team reviewed the information for consistency and frequency of comments to identify specific patterns and/or trends. Multiple sources improved the credibility of the observations, and the information provided was significant enough to be included in this report.

Stakeholders were identified within the following groups: Elected Officials, Department Heads, Business Community Leaders, Citizens, Chief Officers, Labor Leaders, Volunteer Chief Officers, Firefighters, Rank & File, and Administrative Staff. The following answers to the questions are summarized. In addition, duplicate or similar answers are presented here, with the most frequent answers organized from top to bottom.

Elected Officials, City Management, and Department Heads

What strengths contribute to the success of the Fire Department? (What do they do well?)
Respondents consistently mentioned professionalism, community engagement, accessibility, and a strong local workforce. Several highlighted the department's visibility in the community, participation in various City groups, strong collaborative relationships, and responsiveness to requests. The leadership's forward vision, proactive approach to wildfire prevention, and cultivation of local talent through pipeline programs were also praised.

What are some areas in which you think the department could make improvements?
Suggestions included increased diversity in hiring, improved succession planning and administrative training, stronger financial expertise, better meeting plan review deadlines, enhanced state-mandated inspection compliance, alternative staffing models (EMTs vs. paramedics only), and addressing administrative resource gaps. Some mentioned the need for updated technology systems and improved communications.

What opportunities, in your view, are available to improve the service and capabilities of the fire department?
Common themes included consolidation possibilities, improved facility planning, enhanced financial resource management, technology integration improvements, crisis response alternatives, and state advocacy for local support. Training center development and interagency coordination were frequently mentioned. Several suggested leveraging City administrative resources more effectively.

Please share your thoughts regarding staffing utilizing 12-hour shifts and peak-hour units.
Most respondents indicated no specific input or deferred to department expertise. One mentioned looking into alternative work schedules like a 32-hour workweek.

What do you see as the top three critical issues faced by the fire department today?
Frequently mentioned issues included:

- Homelessness and related call volume
- Staffing (recruitment, retention, diversity)
- Financial constraints (equipment, facilities, CalPERS costs)
- Response to climate change and wildfire risks
- Development density and building height increases
- Mental health response challenges
- Succession planning and institutional knowledge retention

If you could change one thing in the fire department, what would it be?
Responses varied, but common themes included increased resources (financial, personnel, facilities), improved infrastructure (stations, training center, equipment), alternative response models for mental health calls, and better public communication about evacuation planning.

How would you describe the level of services provided by the fire department?
Responses were overwhelmingly positive, with descriptions ranging from "excellent" to "beyond excellent." Respondents praised the department's professionalism, responsiveness, all-hazards capabilities, and community commitment. Several specifically mentioned the department's effectiveness in handling a wide range of situations while maintaining high service levels despite resource constraints.

Businesses, Community Groups, Community Members, and Volunteer

Can you please describe your expectations of the Fire Department?

Expectations centered on emergency response readiness, professionalism, and protecting life and property. Respondents expected rapid response, technical expertise, and trustworthiness. Several mentioned expectations for fire suppression, first response medical care, and fire investigation.

Which of these expectations are not being met to your satisfaction?

Most respondents indicated that all expectations were being met or exceeded. One mentioned professionalism could occasionally be lacking, with concerns about workplace gossip and difficulties separating work from personal relationships. Another mentioned concerns about workload distribution.

What do you think the Fire Department is doing particularly well?

Fast response times, high levels of professionalism, and a calming presence during emergencies were consistently mentioned. Several noted the department's effectiveness in managing homeless-related issues and their willingness to go "above and beyond" basic service requirements. Multiple respondents specifically highlighted the department's responsiveness compared to other agencies.

Are there services that you think the department should be providing that they are not providing now?

Most respondents couldn't identify missing services. Suggestions included more formal family support programs, deeper medical capabilities, and more equitable workload distribution. One respondent suggested the need for a mental health program for crisis response.

Are there services the department provides that should be discontinued or done differently?

Several mentioned right-sizing responses to better match the nature of the incident, particularly for medical or mental health calls in business areas. One suggested not using large apparatus for smaller incidents. Another mentioned leadership training could be improved.

When you dial 911 to report an emergency, how long should it take for help to arrive?

Responses ranged from 5-10 minutes, with most expecting around 5-7 minutes for urban areas.

Do you believe that expectations should change depending on where in the community you are located?
Most respondents felt expectations should be consistent throughout the city, though one acknowledged the community might have location-dependent expectations.

Do you believe the Fire Department's first arriving response units are staffed and equipped to take appropriate actions given the emergency?
Most felt units were well-equipped, though one noted staffing concerns, explicitly mentioning the need for four-person crews rather than the current three-person configuration. This respondent also expressed concerns about overtime costs, injury rates, and mental health issues related to staffing levels.

Chief Officers, Labor Leaders, Administration, Rank and File.

What strengths contribute to the success of the fire department? (What do you do well?)
Interviewees consistently highlighted the department's strong community connection, with 85-90% of personnel being local residents. The department benefits from high-quality personnel selection, strong training programs, clear mission focus, and technical proficiency. Many noted the department's ability to maintain high standards despite resource limitations, emphasizing the pride, ownership, and area familiarity that comes from a locally-grown workforce.

What are some areas in which you think the department could make improvements?
Several themes emerged regarding improvement areas: enhanced community outreach and public education efforts; strained labor-management relationships creating barriers to growth; succession planning challenges; departmental silos both internally and with other City departments; staffing and resource limitations relative to call volume; and facility inadequacies. Additionally, some pointed to communication challenges between administration and line personnel and across shifts.

What opportunities, in your view, are available to improve the service and capabilities of the fire department?
Consolidation or shared services with neighboring fire agencies (Central Fire, Scotts Valley, Watsonville) was frequently mentioned. Other opportunities included expanded marine division services, the potential for a joint fire boat, additional funding/grants, expanded training facilities, increased staffing, and improved station locations to meet contemporary needs. County-wide block training was also suggested as a collaborative opportunity.

What do you see as the top three critical issues faced by the fire department today?
The most frequently cited issues were:

- Staffing levels and recruitment challenges
- Call volume increases, and service demand growth
- Development within the city requiring adaptive response capabilities
- Labor-management relationships
- Mental and physical health concerns for personnel
- Succession planning
- Ambulance/EMS response challenges

Please share your thoughts/ideas regarding alternative staffing and dynamic deployment to enhance staffing levels.
Responses were mixed. Some interviewees expressed openness to alternative models like QRVs (Quick Response Vehicles), two-person rescues, or different staffing configurations. Others noted resistance to change would be likely, particularly from labor. Several mentioned the need for good communication if implementing such changes. The concept of EMT-only positions received mixed responses.

If you could change one thing in the fire department, what would it be?
The most common responses were:

- Improved facilities, including additional stations and a training center
- Increased staffing, particularly four-person engine companies
- Improved labor-management relations
- Consolidation with neighboring agencies

On a scale of 1-10, how would you rate the fire department's emergency services level? Please provide a 1 sentence reason for that score.
Ratings ranged from 8 to 10, with most around 8-9. Reasons included excellent response times, commitment to the community, technical proficiency, well-trained personnel, and high-quality service despite resource constraints. Some gave separate ratings for fire (higher) versus EMS (lower).

Appendix B: Risk Classifications

The following are the risk classifications determined by incident type.

Fire

Low Risk

These incidents are considered low-risk and minor in scope and intensity. These incidents require a single fire apparatus and crew to manage fires involving passenger vehicles, fences, trash or dumpsters, downed power lines, residential or commercial alarm investigations, or an odor investigation.

Moderate Risk

These incidents are the first alarm response needed to manage a moderate fire risk incident. These incidents include smoke in a building, small outside building fires, commercial vehicle fires, a single-family residence, a lightning strike to a building, an automatic fire alarm at a high-risk occupancy, or a hazardous materials pipeline fire.

High Risk

These incidents are a second alarm response needed to manage a high-fire risk incident. These incidents include smoke in a high-life hazard property (school, skilled nursing, etc.), a single-family residence with injured or trapped victims, a multi-family residential building, or a moderate-sized commercial/industrial occupancy.

Maximum Risk

A third alarm response is needed to manage a maximum fire risk incident. These incidents include a hospital, assisted living facility, fire in an apartment building, high-rise building fire, a large commercial or industrial occupancy, hazardous materials railcar, or storage occupancy. Incident assignments will include additional command staff, recalling off-duty personnel, and mutual aid assistance for other critical tasking needs.

EMS Risks

Low Risk

A single EMS unit can manage a low-risk EMS incident involving an assessment of a single patient with a critical injury or illness, non-life-threatening medical call, lift assist, or standby.

Moderate Risk

A two-unit response is required to control or mitigate a moderate-risk EMS incident. It involves assessing and treating one or two patients with critical injuries or illnesses or a motor vehicle crash with 1–2 patients.

High Risk
A multiple-unit response is required to control or mitigate a high-risk EMS incident. It involves 3-8 patients with injuries ranging from minor to critical. Patient care will include triage, BLS, ALS treatment, and coordinated patient transport.

Maximum Risk
A multiple-unit response is required to control or mitigate a maximum-risk EMS incident. It involves more than nine patients with injuries ranging from minor to critical. Patient care will include triage, BLS, ALS treatment, and a coordinated transport of patients. If this is an active shooter incident, the response may require a casualty collection area unit to treat patients not in the hot zone.

Technical Rescue

Low Risk
A single fire unit can manage a low-risk technical rescue incident involving minor rescues, such as a child locked inside a vehicle, elevator entrapment, or minor mechanical entrapment.

Moderate Risk
A two-unit response is required to control or mitigate a moderate technical rescue risk incident. Support is not usually required from a technical rescue team. This type of incident involves a motor vehicle crash that requires patient extrication, extricating a patient from machinery or equipment, or a person trapped by downed power lines.

High Risk
A multiple-unit response is required to control or mitigate a high-risk technical rescue incident. This type of incident may involve full-scale technical rescue operations ranging from structural collapse to swift water rescues. It may involve multiple motor vehicles that require extrication, commercial passenger carriers, or a vehicle collision with a building. Support is usually required from a technical rescue team. This incident may require multiple alarms.

Maximum Risk

A multiple-unit response is required to control or mitigate a maximum-risk technical rescue incident. Support is required from a specialized technical rescue team and may involve multiple operations locations. This type of incident will involve full-scale technical rescue operations, such as victims at risk or trapped due to structural collapse, swift water, or earth cave-ins. This incident will require multiple alarms and may expand beyond the identified critical tasking. Recall of off-duty personnel or assistance from auto or mutual aid may occur during a disaster or when additional alarms and command staff are needed.

Hazardous Materials

Low Risk

A single fire unit can manage a low-risk hazardous materials incident involving carbon monoxide alarms and other unknown hazmat investigations without symptomatic victims, fuel spills involving less than 20 gallons, natural gas meter incidents, downed power lines, equipment or electrical problems, attempted burning, or automatic alarms that may originate from a hazardous material.

Moderate Risk

A two-unit response is required to control or mitigate a moderate-risk hazardous materials incident. Direct support is not usually required from a hazardous materials team. This type of incident involves a carbon monoxide alarm with symptomatic patients, a fuel spill of 20–55 gallons, or a gas or petroleum products pipeline break not threatening any exposures.

High Risk

A multiple-unit response with a hazmat team is required to control or mitigate a high-risk hazardous materials incident. Support is needed for a Level 2 hazmat incident that involves establishing operational zones (hot/warm/cold) and assigning multiple support divisions and groups. This response includes a release with 3-8 victims, gas leaks in a structure, hazmat alarm releases with victims, flammable gas or liquid pipeline breaks with exposures, fuel spills exceeding 55 gallons, fuel spills affecting underground drainage or sewer systems, transportation or industrial chemical releases, or radiological incidents. Additional assistance may be required to expand operations past the identified critical tasks.

Maximum Risk

A multiple-unit response is required to control or mitigate a maximum-risk hazardous materials incident. Support is required from an on-duty hazmat team and their specialized equipment. This type of incident involves establishing operational zones (hot/warm/cold) and assigning multiple support divisions and groups. Examples include nine or more contaminated or exposed victims, a large storage tank failure, a hazmat railcar failure, or a weapon of mass destruction incident. This incident will require multiple alarms and may expand beyond the identified critical tasking. Recall of off-duty personnel or assistance from auto or mutual aid may occur during a disaster or when additional alarms and command staff are needed.

Ocean Rescue Risks

Risk classification for such a specialized type of rescue will necessarily be based on natural conditions. While risk assessments for general fire department programs are very well understood, a large body of work does not appear to be on ocean rescue operations risks. However, the few available resources tend to match the SCFD policies and guidelines[73] on low-, moderate-, and high-risk situations.

Low Risk

A low-risk ocean rescue can be defined by the nature of the weather and surf. The Personal Watercraft Operations SOP defines this as a small surf, light winds, and a short distance from shore. It should be added that the rescue is a surface rescue without any predatory animals present and crowds at a manageable level. These rescues can be performed by a single lifeguard or rescue swimmer with safety shore support.

Moderate Risk

Moderate-risk ocean rescues require more rescuers and rescue swimmers with more specialized equipment in the water and a larger contingent of onshore support and safety. Rescue watercraft are preferable and require a deckhand. The surf and winds would be moderate, the rescue would be within city limits, and additional support would be needed if predatory animals are reported but unobserved. The rescue may be an observed victim or a known last location of a victim that cannot be found on the surface. Crowd levels are still manageable within routine operations.

[73] Santa Cruz City Fire Department, SOP 3 #3-2.3, Personal Watercraft Operations (2012).

High Risk

A high-risk operation requires a cautious approach with staffing similar to a moderate-risk event; however, two watercraft must also be present. During these events, rescuers are placed in an extremely hazardous condition. The surf, winds, or both would be considered high, or the rescue would happen in unfamiliar waters such as those during mutual aid deployment. An observed predatory animal is reported. A high-risk situation is also indicated when an above-normal crowd is present or during a significant crowd water event.

Appendix C: Table of Figures