June 6, 2023

LOS ANGELES FIRE DEPARTMENT

KRISTIN M. CROWLEY
FIRE CHIEF

May 31, 2023

BOARD OF FIRE COMMISSIONERS
FILE NO. 23-055

TO: Board of Fire Commissioners

FROM: Kristin M. Crowley, Fire Chief

SUBJECT: LAFD STANDARDS OF COVER ANALYSIS

FINAL ACTION:	_____ Approved	_____ Approved w/Corrections	_____ Withdrawn
	_____ Denied	_____ Received & Filed	_____ Other

SUMMARY
The Los Angeles Fire Department (LAFD or Department) retained Citygate Associates, LLC (Citygate) to perform a Standards of Cover (SOC) deployment analysis. This study included reviewing the adequacy of the existing deployment system of apparatus and personnel from current fire station locations, testing deployment scenarios to improve response performance, and analyzing workload per response unit.

The study does not include specialized response systems at the Port of Los Angeles, Los Angeles International Airport, LAFD Air Operations, hazardous materials, technical rescue, and complex incident teams. This study focuses on neighborhood-based fire and emergency medical services resources.

Throughout the report, Citygate makes key findings and, where appropriate, specific action item recommendations. Overall, there are 17 key findings and six specific action item recommendations.

The report is presented in three volumes. The Technical Report (Volume 1) includes the Executive Summary containing a synopsis of Citygate's analysis and suggested next steps; Sections 1–6, which contain the deployment and SOC elements of the study; and Section 7, which discusses next steps and summarizes all findings and recommendations. A Map Atlas of deployment coverage measures is provided in Volume 2, and a comprehensive Community Risk Assessment is provided in Volume 3.

The Department is evaluating the findings and recommendations contained in the report to prioritize plans to implement those recommendations, as appropriate.

RECOMMENDATION
That the Board:
Receive the report and transmit to the City Council.

DISCUSSION
The scope of work and corresponding Work Plan for the Standards of Cover analysis were developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with best practices from the criteria of the Commission on Fire Accreditation International (CFAI).

The scope of the SOC deployment analysis includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not an assessment of fire departments adjacent to LAFD, the assessment does consider the impacts of LAFD's automatic/mutual aid agreements common throughout the area.
- Updating performance goals for LAFD consistent with the local risks to be protected, national best practices, and guidelines from the NFPA and the CFAI.
- Using the incident response time analysis program StatsFD™ to review the incident response statistics of historical performance.
- Using the geographic mapping response time measurement tool FireView™ to measure fire unit driving coverages from LAFD's current fire stations.

The assessment addresses the following questions:

- Is the type and quantity of apparatus and personnel adequate for LAFD's deployment to emergencies?
- What is the recommended deployment to provide adequate emergency response times as growth continues?

The data analyzed by Citygate for the SOC report covers Calendar Years 2018 to 2020. Delays in validating the analysis and providing background information to Citygate began to compound as the COVID-19 lockdown began and the Department deployed Special Duty and civilian resources away from their regular duties to support the testing and vaccination efforts. Other City departments also deployed resources from regular duties, further delaying our ability to provide timely updates to Citygate.

The Department's FireStatLA Section conducted its own analysis of the Unit-Hour Utilization data and found that the trends in the data, extended over an additional two-year period, remained, essentially, the same; and, therefore, do not affect the findings in the report.

Standards of Cover Report Findings

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

Finding #2: The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3: Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.

Finding #4: Given that the current fire station plan provides 5:00-minute travel time coverage to 88.7 percent of public streets City wide, using a 5:00-minute travel time goal to physically space fire stations across the City's very diverse geography is effective. The incident workload assessment in this study evaluates the needed units per station.

Finding #5: The northern service area needs one additional Battalion Command Team at Station 100 to improve command coverage for more serious incidents.

Finding #6: One additional fire station with an engine is needed northeast of Station 81, as modeled in Scenario Map 1a and 1b (Volume 2—Map Atlas).

Finding #7: LAFD's time-of-day, day-of-week, and month-of-year calls for service demand occurs in consistent, predictable patterns. LAFD's service demand is sufficiently high in all areas, 24 hours per day, to require an all-day, year-round response system.

Finding #8: The top ten busiest engines, trucks, and rescue ambulance companies' unit-hour utilization measures significantly exceed 30 percent for several hours or more at a time. Based on this measure alone, the busiest unit crews are overworked and need relief units and/or strategies to decrease the quantity of non-urgent EMS incidents.

Finding #9: The volume and simultaneous demand of 10 to 28 LAFD stations is the highest Citygate has measured in a metro client to date. Given the likelihood that some of these stations are adjacent to each other—as population density zones are typically larger than a single fire station area—Citygate located the top 10 stations and then expanded the search to the top 28.

Finding #10: As shown in Map #18, there are three clusters in the east-central and southern City core containing 16 of the top 28 stations for workload demand, and nine of the top 10. In the northern Valley area, there are two clusters containing five of the top 28, with one of the top ten. There are seven other stations in the top 28, but they exist as individual stations without an adjacent busy station.

Finding #11: Battalion 1 in the east-central area of the City has three of the top 10 overworked stations; Battalion 13 in the southern area of the City has another five of the top 10.

Finding #12: The importance of this clustering measure is that for long, consecutive hours of the day, large numbers of fire crews are busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response, even when many of the busiest stations have multiple crews assigned to them.

Finding #13: At 2:03 minutes in 2020, call-processing performance to 90 percent of fire and EMS incidents is only 33 seconds longer than Citygate's and the National Fire Protection Association's 1:30-minute recommendation where no language or location identification barriers exist. In light of the size of the City and the typical barriers to a short 9-1-1 call, the LAFD's average processing time of 1:08 minutes is very good as 235,855 incidents are processed faster than best practice guidelines.

Finding #14: At 1:21 minutes, crew turnout performance to 90 percent of fire and EMS incidents, with an average of 47 seconds, is excellent, and shows a rare attention to the importance of delivering prompt turnout times.

Finding #15: At 7:00 minutes, LAFD's fire unit travel times to 90 percent of fire and EMS incidents is slower than the National Fire Protection Association's urban best practice recommendation of 4:00 minutes, due in part to LAFD's difficult topography in some areas, traffic congestion, and simultaneous incidents. The average travel time of 4:27 minutes does reach 193,743 incidents promptly.

Finding #16: First-due unit call-to-arrival performance to 90 percent of fire and EMS incidents Citywide, at 9:21 minutes, is longer than a best practice goal of 7:30 minutes. However, the average measure of 6:20 minutes means 216,937 incidents received a first responder *faster* than a best practice goal, or 594 times per day in 2020.

Finding #17: Category A first arrival and ERF call-to-arrival times to 90 percent of all occurrences are better than, or very close to, best practices in all but the most geographically challenged areas. This ERF performance is stronger than what Citygate has observed in other metropolitan clients. It is understandable that the Category B response times are longer as more units travel farther to an incident, as with all metropolitan departments.

Standards of Cover Report Deployment Recommendations

Based on the technical analysis and findings contained in this study, Citygate offers the following near-term deployment recommendations:

Recommendation #1: Maintain current response time goals and reporting.

Recommendation #2: Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

Recommendation #3: Shift or rotate crews differently every 12 hours on an agreed-upon number of the highest-workload, 24-hour rescue ambulances.

Recommendation #4: Refine and build the case to shift low-acuity EMS incidents from firefighter-staffed rescue ambulances in very high-incident-demand areas to non-firefighter-staffed, low-acuity units to include medical, mental health care, and homeless resources.

Recommendation #5: Maintain the current mix of single-unit and Effective Response Force deployment units and personnel staffing as they meet the risks to be protected in the City.

Recommendation #6: In the following focus areas, plan to change staffing methods and add additional rescue ambulances as this study's data indicates. Note that the first two focus areas contained 29 percent of Citywide incidents in 2020.

The Department is developing plans to implement the report's recommendations, where appropriate. The plans include outreach to internal and external stakeholders for input and/or approval of the plans.

Board report prepared by David A. Perez, Deputy Chief, Chief of Staff.

Attachment

LOS ANGELES FIRE DEPARTMENT

STANDARDS OF COVER ANALYSIS

VOLUME 1 OF 3: TECHNICAL REPORT

MAY 17, 2023

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TABLE OF CONTENTS

VOLUME 1 of 3 – Technical Report (This Volume)

Table of Tables

Table of Figures

VOLUME 2 of 3 – Map Atlas (Separately Bound)

VOLUME 3 of 3 – Risk Assessment (Separately Bound)

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Executive Summary


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105

EXECUTIVE SUMMARY

The City of Los Angeles (City) Fire Department (LAFD) retained Citygate Associates, LLC (Citygate) to perform a Standards of Cover (SOC) deployment analysis. This study included reviewing the adequacy of the existing deployment system of apparatus and personnel from current fire station locations, testing deployment scenarios to improve response performance, and analyzing workload per response unit. The study does not include specialized response systems at the Port of Los Angeles, Los Angeles International Airport, the LAFD Aviation bureau, hazardous materials, technical rescue, and complex incident teams. This study focuses on neighborhood-based fire and emergency medical services resources.

This report is presented in three volumes. The Technical Report (**Volume 1**) includes: this Executive Summary containing a synopsis of Citygate's analysis and suggested next steps; Sections 1–6, which contain the deployment and SOC elements of the study; and Section 7, which discusses next steps and summarizes all findings and recommendations. A Map Atlas of deployment coverage measures is provided in **Volume 2**, and a comprehensive Community Risk Assessment is provided in **Volume 3**.

Throughout this report, Citygate makes key findings and, where appropriate, specific action item recommendations. Overall, there are 17 key findings and six specific action item recommendations.

POLICY CHOICES FRAMEWORK

As the City of Los Angeles (City) Mayor, Council, and the Fire Commission all understand, there are no mandatory federal or state regulations directing the level of fire service to be provided, including regulations concerning response times and outcomes. The level of service and any resultant costs are a local community decision in the United States. The body of regulations on the fire service suggests that if fire services are provided, they must be provided with the safety of firefighters and the public in mind. Thus, there is often a constructive tension between the desired level of fire services and the level that can be funded, and many communities may not have the level of fire services they desire. The City's large investments in fire services over the past decades serve as its baseline commitment today.

This study identifies that continued investment in fire services is still necessary to provide expanded and additional services from LAFD as the City evolves. The fundamental fire and EMS ambulance service policy choices are derived from two key questions:

1. What outcomes are desired for the emergencies to which LAFD responds? Is the desire to provide emergency medical care in time to lessen the possibility of preventable death or severe disability, and to keep a building fire to the room, building, or block of origin?

2. Should equitable response performance be provided to all neighborhoods with similar risks to protect?

Once desired outcomes are determined, the fire and EMS first responder deployment must be designed to cover the most geography in the fewest minutes to meet stated outcome goals. In a large fire and EMS agency with multiple neighborhoods, such as Los Angeles, it must be determined whether similarly populated areas should receive similar response time performance from a fire services unit.

CITYGATE'S OVERALL OBSERVATIONS ON LAFD'S FIRE CREW DEPLOYMENT

Fire services deployment, simply stated, is about the **speed** and **weight** of the response. **Speed** calls for initial (first-arriving or first-due) all-risk intervention units (engines, ladder trucks, rescue ambulances, and specialty units) strategically located across a jurisdiction to respond within an effective travel time to deliver desired outcomes for routine-to-moderate emergencies and prevent an incident from escalating to greater size or complexity. **Weight** is about multiple-unit response to more serious emergencies, such as a room-and-contents building fire, a wildland fire, a multiple-patient medical incident, a vehicle accident with extrication required, or a technical-rescue incident. In these situations, enough firefighters must be assembled within a reasonable timeframe to safely control the emergency and prevent it from escalating to an even more serious event.

LAFD's service area is marked by diverse populations, land uses, hilly topography in some areas, and a public road pattern that, in certain areas, is geographically challenged with rivers, open spaces, and/or a lack of major cross-connecting roadways, limiting LAFD's response times. Population drives EMS service demand, and infill development increases population. As different areas continue to redevelop and add population density, LAFD's services will need adjustment just to *maintain*, much less *improve*, response times across the City's geography—more so when simultaneous incidents occur at peak hours of the day.

In the most densely developed sections of the City, while the substantial growth in EMS incidents over the past decade seems all-consuming, there is still a need for both a first-due firefighting unit and multiple-unit Effective Response Force (ERF) deployment (First Alarm) consistent with current best practices to limit the risk of fire to only part of an affected building and keep wildland fires small and within the initial attack force's capabilities. In other words, *all communities need a standby and readily available firefighting force* that can respond when fires break out, regardless of peak-hour EMS workload.

As shown in this report, Citygate analyzed response times, station locations, and incident workload on the primary types of responding apparatus. This analysis is based on GIS mapping and incident statistics, which combine to formulate Citygate's opinions and overall deployment findings and recommendations in this section.

The LAFD has response time goals and reports its operational metrics via a public website. The LAFD uses an *average* measure of response time, and the CFAI and NFPA communities use a 90-percent-of-goal (*fractile*) measure. Both are effective measures, and both are utilized in this study. All response time measures point to a strong and effective response system, especially in light of the geographic terrain challenges across the City. Overall, LAFD deployment represents the strongest metropolitan area coverage Citygate has ever studied. While field crew deployment needs some adjustment and improvement in key areas, it is not—by any measure—significantly insufficient or in need of major change or fire station relocation.

Citygate's analysis of prior response statistics and use of geographic mapping tools reveals that LAFD is currently strained by extraordinarily high EMS incident demand in several areas of the City. LAFD's current deployment system performance is described in detail by the maps provided in **Volume 2** and the corresponding text explanation beginning in **Section 4.2** of this volume.

The ongoing effective deployment of fire and EMS first responder units throughout the City is constrained by one critical issue and a small need to add two resources, which will stabilize current response times and increase firefighting unit availability. Across our deployment review, Citygate found the following two challenges by which LAFD is strained to meet the needs of the City.

Challenge #1: High-Volume EMS Incident Demand

As the response unit workloads by time of day show, EMS incidents in 2020 comprised 81.9 percent of total incident demand. The peak of this demand occurs during daylight to mid-evening hours and in clusters of high population and simultaneous incidents. Accordingly, even if fire stations are appropriately located and contain multiple staffed apparatus, peak service demand frequently results in all units assigned to a station simultaneously committed to one or more incidents, thus driving some simultaneous service demand to adjoining stations, which results in cascading delays on unit travel times and overall response performance.

These high workload areas need either (1) more response units or (2) a reduction in non-acute EMS workload, which would be more cost-effective, to stabilize and likely improve response times and availability for serious fire, acute EMS, and technical incidents.

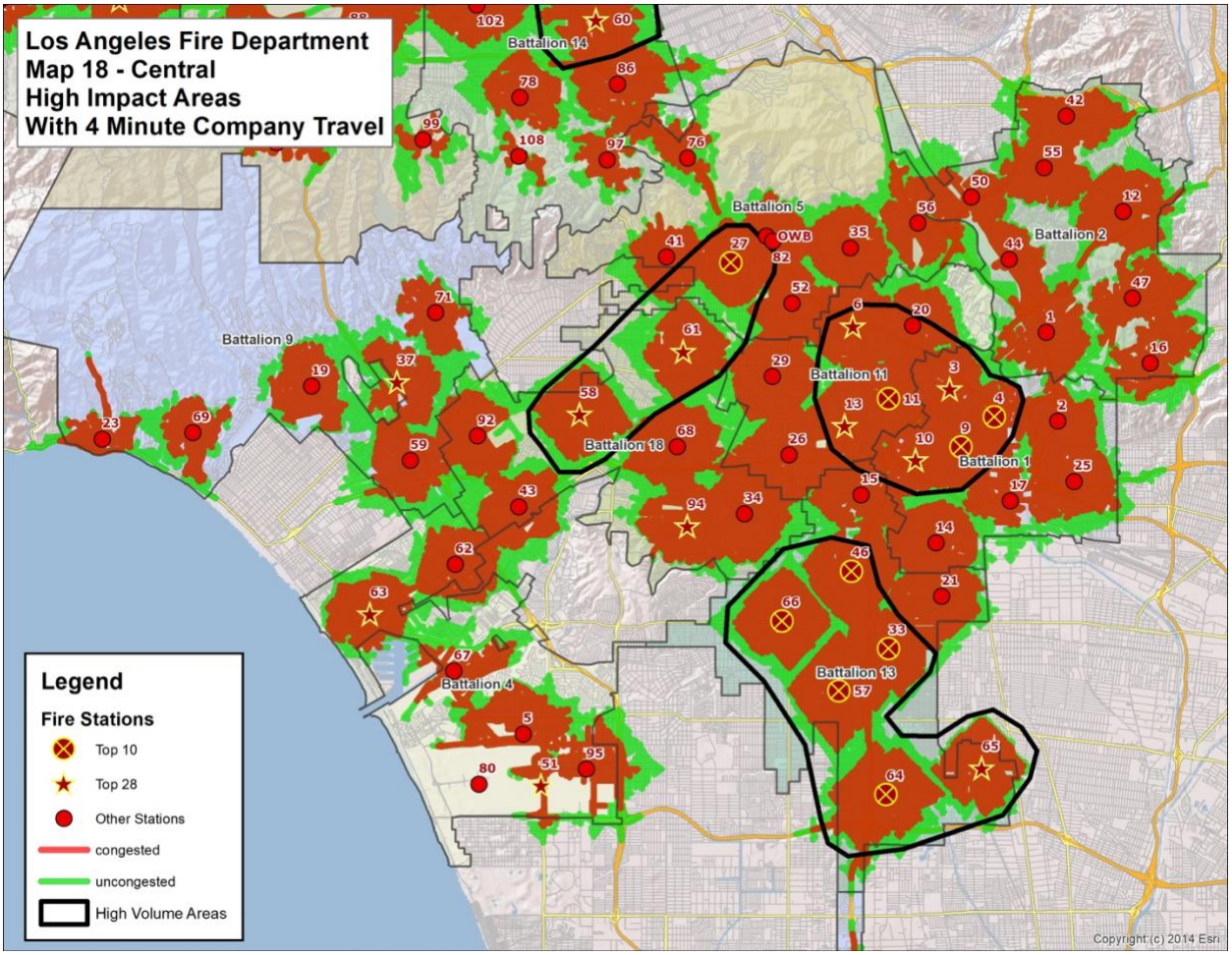
To put the EMS demand in perspective, in 2020, the LAFD responded to 392,949 EMS incidents, some of which had more than one patient. It is not an exaggeration to say the LAFD sees almost half a million patients per year. In 2020, the busiest emergency room in the United States was Parkland Health and Hospital in Dallas, Texas, which saw 210,152 patients. Los Angeles County / USC Medical center was seventh in the nation with 136,161 patients.

In other words, the LAFD is in the human care business, but not all these incidents require traditional emergency medical skills. All incidents do not need the response of a paramedic firefighter engine, truck company, and/or a two-person paramedic or EMT ambulance for a ride to an emergency room. LAFD is well-suited to be an alternative human crisis response agency with

specialized responders in addition to LAFD's firefighters. While such an alternative response system is needed Citywide, it is *critically* needed now in core eastern and southern City areas. Although constructing such a system represents a new expense, overall, it will be more cost-effective than adding fire units. The City *"needs its fire department capacity back."*

The highest incident volume in central Los Angeles is in the areas identified by Map #18 (**Volume 2—Map Atlas**). The top ten busiest engine, truck, and rescue ambulance companies are adjacent to each other, predominantly in two clusters.

Figure 1—Central Los Angeles High-Impact Areas



The individual unit-hour utilization (UHU) measures for these units significantly exceed 30 percent for long, consecutive hours at a time. Based on this measure alone, the busiest unit crews are overworked and in need of relief units and/or strategies to decrease the quantity of non-urgent EMS incidents. The volume and simultaneous demand on the top 10 to top 28 LAFD stations is the highest Citygate has ever measured in a metro client.

The busiest fire stations already have three to six primary units assigned (not chiefs or support units). Some units are placed outdoors on front aprons or in rear lot areas. Many sites are now at their physical limit for adding response units and/or personnel.

Over the course of late 2021 and into 2022, the City and County rolled out a pilot project for the delivery of alternative, non-urgent patient care—including mental health and homeless program diversion; however, this is not enough. The alternative response program needs to *scale massively and quickly* to lower the workload placed on fire units back down to moderate and serious emergencies.

As an illustration of volume, in 2020, Fire Station 9 in the east downtown area responded to 18,986 incidents—an average of 52 per day, or two per hour. If 30 percent of those incidents were managed by an alternative response team, that amounts to approximately 16 incidents per day. If the seven busiest stations in just the east-central area of the City had this low-acuity volume, that total would be 112 incidents per day over the busiest 16 hours.

If the alternative response team spent only 30 minutes per patient contact on average, that would be two contacts per hour per team. The east-central area alone could consume two to three units during daylight and early evening hours. If all six high-workload areas needed three units each, that would amount to 18 units per day, seven days per week, for at least 16 hours per day. Additionally, the other battalions could each use at least one alternative unit, representing another eight units, for a total of 26 units Citywide. On eight-hour shifts at two personnel per unit, that equates to 52 personnel per day just to cover five days per week, not including earned leave time. Therefore, well over 100 new non-firefighter personnel must be hired and trained for alternative response measures to meet the service needs of the City.

In light of the large personnel and unit count needed for alternative care teams, even as a "rapid" program, implementation could take two to three fiscal years. In the meantime, the busiest fire units need relief now. Citygate recommends the LAFD add at least 14 additional rescue ambulances (both ALS And BLS to relieve the busiest types), one engine company at a new station in the northern area of the City, and one Battalion Command Team in the north at an existing fire station.

Further, there are currently at least 25 rescue ambulances on 24-hour shift staffing that are overworked for excessively long periods of a 24-hour day. Citygate does not believe that critical patient care, much less safe firefighting, is always possible when a crew has gone from call to call for 12 or more hours. The LAFD should find a way to "split shift" these busiest 24-hour ambulances by either rotating crews to slower companies (though there are none close by in East and South Los Angeles) or placing these units on an alternative staffing workweek with 12-hour days.

Citygate does not recommend this lightly. This change will require collective bargaining with the represented workforce and will require more firefighters be hired in the near term. However, outside of the traditional 24-hour fire service staffing model, where in America do critical health care professionals, airline pilots, or railroad engineers preform critical work well past 12 consecutive hours without a mandated rest break? Citygate does not believe the LAFD can wait years for an alternative response program to be established, during which time EMS incident volume will likely further *increase.*

Challenge #2: Small Response Coverage Gaps

This study identified the need for one additional Battalion Command Team to serve the northern area of the City near Fire Station 100. In addition, a large enough gap in first-due engine travel-time coverage exists in the eastern section of the northern area of the City (Map #17, **Volume 2—Map Atlas**) that one additional fire station is required.

Given the significant Battalion Command Team coverage gap in the north between Stations 73, 100, and 90, the study maps show the significant benefit of adding a Battalion Command Team at Station 100, located at 6751 Louise Avenue in Van Nuys. Almost 100 percent of the underserved road miles at a travel time of 8:00 minutes are included in this area southeast of the Van Nuys Airport.

The addition of an engine on the east side of the northern area, near the intersection of Woodman and Roscoe in Panorama City, would also be beneficial. This location is west of SR-170, a little south of the SR-170/I-5 interchange, at the intersection of two prime arterials, which will allow an added engine to route into far-away neighborhoods more quickly. As such, this location test did the best job of filling in the engine travel time gap at both 4:00 minutes' and 5:00 minutes' travel time. The added engine would increase public road coverage by 51.7 miles at 4:00 minutes, or up to 55.23 more miles at 5:00 minutes of travel time. The remaining underserved gap is between the fifth and sixth minute of coverage from adjoining stations 77 and 98.

FINDINGS AND RECOMMENDATIONS

Overall, there are 17 key findings and six specific action item recommendations contained in the body of the report. These are now presented in a comprehensive list for ease of reference.

Findings

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

Finding #2: The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3: Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.

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Deployment Recommendations

Based on the technical analysis and findings contained in this study, Citygate offers the following near-term deployment recommendations:

Recommendation #1: Maintain current response time goals and reporting.

Recommendation #2: Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

Recommendation #3: Shift or rotate crews differently every 12 hours on an agreed-upon number of the highest-workload, 24-hour rescue ambulances.

Recommendation #4: Refine and build the case to shift low-acuity EMS incidents from firefighter-staffed rescue ambulances in very high-incident-demand areas to non-firefighter-staffed, low-acuity units to include medical, mental health care, and homeless resources.

Recommendation #5: Maintain the current mix of single-unit and Effective Response Force deployment units and personnel staffing as they meet the risks to be protected in the City.

Recommendation #6: In the following focus areas, plan to change staffing methods and add additional rescue ambulances as this study's data indicates. Note that the first two focus areas contained 29 percent of Citywide incidents in 2020.

Focus Area 1 – Battalions 1 and 11

Total: seven stations, 14.3 percent of Citywide incident volume in 2020.

- Station 3 – Needs split shift crews on both rescue ambulances
- Station 4 – Add third rescue ambulance
- Station 6 – Needs split shift crews on both rescue ambulances
- Station 10 – Needs split shift crews on both rescue ambulances
- Station 11 – Add third rescue ambulance
- Station 13 – Split shift crew rescue ambulance 13

Focus Area 2 – Battalion 13

Total: six stations, 14.8 percent of Citywide incident volume in 2020.

- Station 33 – Add third rescue ambulance
- Station 46 – Add third rescue ambulance
- Station 57 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances

- Station 64 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances
- Station 65 – Monitor need for split shift crews and/or fourth rescue ambulance
- Station 66 – Add fourth rescue ambulance

Focus Area 3 – Battalions 5 and 18

- Station 27 – Add third rescue ambulance, split shift crews on two rescue ambulances
- Station 58 – Add fourth rescue ambulance, split shift crews on three rescue ambulances
- Station 61 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 4 – Northern Areas

- Station 39 – Split shift the rescue ambulance
- Station 60 – Split shift the two rescue ambulances
- Station 89 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 5 – Northern Area – Battalion 12

- Station 7 – Add second rescue ambulance
- Station 98 – Split shift the two rescue ambulances

NEXT STEPS

Near-Term

- Review and absorb the findings and recommendations provided in this report.
- Develop a methodology for how to split shift the overloaded rescue ambulances.
- Direct staff to return with costs and timing to make near-term staffing changes.

Longer-Term

- Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

- If central City, high-impact stations cannot physically add rescue ambulances, locate and implement ambulance-only hub stations in existing commercial properties in the high-workload areas.
- Monitor response time performance against adopted goals.

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Section 1

Introduction and Background


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SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC's (Citygate) detailed work product for the Los Angeles Fire Department (LAFD) is presented in this volume. The scope of work and corresponding Work Plan for this analysis were developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with best practices from the criteria of the Commission on Fire Accreditation International (CFAI).

1.1 REPORT ORGANIZATION

This report is comprised of three volumes. A Map Atlas is found in **Volume 2** and a comprehensive Community Risk Assessment is found in **Volume 3**. **Volume 1** consists of the following sections:

Executive Summary: A summary of our analysis and suggested next steps.

Section 1 Introduction and Background: An introduction to LAFD and background facts.

Section 2 Standards of Coverage Introduction: An introduction to the SOC (deployment) process and methodology used by Citygate in this review.

Section 3 Deployment Goals, Measures, and Risk Assessment: An in-depth examination of LAFD's ability to deploy firefighters and apparatus to meet the risks, expectations, and emergency needs of its constituents.

Section 4 Staffing and Geo-Mapping Analysis: A review of (1) the critical tasks that must be performed to achieve LAFD's desired fire and emergency medical services (EMS) outcomes, and (2) LAFD's existing fire station and apparatus locations as well as needed future locations.

Section 5 Statistical Analysis: A statistical data analysis of LAFD's incident responses.

Section 6 Firefighting and Rescue Ambulance Deployment Evaluation: An integrated summary of deployment priorities and an overall deployment recommendation.

Section 7 Findings and Recommendations and Next Steps: A summary of recommended next steps and a list of all findings and recommendations.

1.1.1 Goals of the Report

This study will cite findings and make recommendations, as appropriate, related to each finding. Findings and recommendations are numbered sequentially. Section 7 of this report brings attention to the highest priority needs and recommended next steps.

This document provides technical information about how fire services are provided and legally regulated and how LAFD currently operates. This information is presented in the form of recommendations and policy choices for the Fire Commission and City Council to consider.

1.2 Project Scope of Work

1.2.1 Standards of Coverage (Deployment) and Services Reviews

The scope of this SOC deployment analysis includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not an assessment of fire departments adjacent to LAFD, the assessment does consider the impacts of LAFD's automatic/mutual aid agreements common throughout the area.
- Updating performance goals for LAFD consistent with the local risks to be protected, national best practices, and guidelines from the NFPA and the CFAI.
- Using the incident response time analysis program StatsFD™ to review the incident response statistics of historical performance.
- Using the geographic mapping response time measurement tool FireView™ to measure fire unit driving coverages from LAFD's current fire stations.

SOC Review Questions

This assessment addresses the following questions:

- Is the type and quantity of apparatus and personnel adequate for LAFD's deployment to emergencies?
- What is the recommended deployment to provide adequate emergency response times as growth continues?

1.3 Los Angeles Fire Department Overview

This review of LAFD's field services deployment must be completed in the context of the risks and areas served by LAFD. While LAFD exists to provide firefighting and rescue services, the provision of First Responder EMS by LAFD now dominates emergency incident volume, as illustrated by calendar year 2020 when **81.85 percent** of all incidents responded to by LAFD were medical emergencies.

The following facts illustrate the LAFD service area and resultant services system:

- 3.9 million residents

- 469 square miles
- 32.06 square miles of water
- 616,925 single-family residences; 112,081 apartment complexes
- 64,226 commercial or industrial properties
- Over 36,079 acres of all types of open spaces
- Total real property values (2021/22) assessed at $774.38 billion
- Dozens of tourist venues, many with worldwide status
- Large, nationally significant employers
- A total City budget of $11.76 billion
- 106 fire stations with 98 staffed engine companies
- 93 Paramedic ambulances
- 42 ladder truck / light force companies, of which 28 are Paramedic Assessment Engines
- 43 Basic Life Support ambulances
- 15 Brush Patrols
- 6 Urban Search and Rescue (USAR) companies
- 8 aircraft firefighting apparatus
- 7 helicopters
- 5 bulldozers/loaders
- 5 fireboats
- 4 Hazardous Materials companies
- 4 Swift Water Rescue teams
- 4 firefighting foam tenders
- 1 Heavy Rescue Unit
- 14 Battalion Command Teams and 2 Assistant Chiefs for daily incident command
- Fire station personnel are also cross-trained to respond in specialty apparatus, such as hazardous materials units, wildland fire units, all-terrain vehicles, fireboats, foam units, etc.

- In FY22/23, 1,023 fire station platoon field staffing, plus 32 platoon duty dispatch personnel, and 40 special duty sworn field members
- Total LAFD employees: 3,535 sworn and 428 civilian

All sworn LAFD personnel are trained to either the Emergency Medical Technician (EMT) level to provide Basic Life Support (BLS) pre-hospital emergency medical care or to the EMT-Paramedic (EMT-P) level to provide Advanced Life Support (ALS) pre-hospital emergency medical care.

Ambulance transportation is provided by the LAFD. When needed, air ambulance transport services are also provided by LAFD Air Operations.

Section 2

Standards of Coverage Introduction

SECTION 2—STANDARDS OF COVERAGE INTRODUCTION

2.1 STANDARDS OF COVERAGE REVIEW PROCESSES

The core methodology used by Citygate in the scope of its deployment analysis work is the *Community Risk Assessment: Standards of Cover* fifth and sixth editions, which is a systems-based approach to fire crew deployment as published by the CFAI. This approach uses local risk and demographics to determine the level of protection best fitting an agency's service area needs.

The SOC method evaluates deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to help elected officials make informed decisions on fire and EMS first responder deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the assessment, the depth of the components may vary.

In the United States, there are no federal or state government requirements for a minimum level of fire services. The level of fire services is an issue for each community to consider and fund in protecting its risks as it chooses. Rather than a one-size-fits-all prescriptive formula, the SOC systems approach to deployment allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire and emergency medical service levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than using only a singular component. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss overworked companies. If a risk assessment for deployment is not considered and deployment is based only on travel time, a community could under-deploy to incidents.

The SOC process consists of the following eight elements.

Table 1—Standards of Coverage Process Elements

Element	Meaning
Existing Deployment Policies	Reviewing the deployment goals the agency has in place today
Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies
Community Risk Assessment	Reviewing the assets at risk in the community
Critical Task Study	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force (ERF)
Distribution Study	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies
Concentration Study	Reviewing the spacing of fire stations so that building fires can receive sufficient resources in a timely manner (First-Alarm Assignment or ERF)
Reliability and Historical Response Effectiveness Studies	Using prior response statistics to determine the percent of compliance the existing system delivers
Overall Evaluation	Proposing Standards of Coverage statements by risk type as necessary

Fire services deployment, simply stated, is about the **speed** and **weight** of the response. **Speed** calls for first-due, all-risk intervention units (engines, ladder trucks, rescue ambulance and specialty units) strategically located across an agency's service area responding in an effective travel time. These units are tasked with controlling moderate emergencies without the incident escalating to second alarm or greater size, which would unnecessarily deplete the agency's resources as multiple requests for services occur. **Weight** is about multiple-unit response for serious emergencies, such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy-rescue incident. In these situations, enough firefighters must be assembled within a reasonable period to safely control the emergency, thereby keeping it from escalating to greater alarms.

This deployment design paradigm is reiterated in the following table.

Table 2—Fire Services Deployment Simplified

Element of Attack	Meaning	Purpose
***Speed* of Attack**	Travel time of first-due, all-risk intervention units strategically located across a jurisdiction.	Controlling moderate emergencies without the incident escalating in size or complexity.
***Weight* of Attack**	Number of firefighters in a multiple-unit response for serious emergencies.	Assembling enough firefighters within a reasonable timeframe to safely control the emergency.

Thus, small fires and medical emergencies require a single- or two-unit response (engine and specialty unit) with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies.

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Section 3

Deployment Goals, Measures, and Risk Assessment


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SECTION 3—DEPLOYMENT GOALS, MEASURES, AND RISK ASSESSMENT

3.1 HOW DOES LAFD DELIVER EXISTING FIRE CREW DEPLOYMENT SERVICES?

3.1.1 Existing Response Time Policies and Goals – What Are LAFD's Goals?

SOC ELEMENT 1 OF 8*
EXISTING DEPLOYMENT POLICIES
*Note: This is an overview of Element 1. The detail is provided in Section 3.2.

Advisory best practices are for a City, County Fire Department or Fire District to adopt response time goals to drive the provision of fire services. Historically, where this was done, response time was cited, but not tied to an outcome goal. In the last 20 years, driven by the CFAI and NFPA, the goal statements have become more robust to include organization *by type of emergency*, with an outcome goal that suggests the staffing needed over a response time to deliver the desired service.

There are two typical methods to state a fire/EMS response goal policy—in the Safety Element of a city or county's Comprehensive General Plan for community zoning/development, and/or by fire departments publishing their goals as budget performance measures and in their Strategic Plan. The City uses both methods of stating and measuring fire and EMS services goal statements.

In the City's updated 2021 General Plan Safety Element:

Goal 2: Emergency Response states: *"A city that responds with the maximum feasible speed and efficiency to disaster events so as to minimize injury, loss of life, property damage and disruption of the social and economic life of the City and its immediate environs."*

Objective 2.1 states: *"Develop and implement comprehensive emergency response plans and programs that are integrated with each other and with the City's comprehensive hazard mitigation and recovery plans and programs."*

Policy 2.1.5 Response: Develop, implement, and continue to improve the City's ability to respond to emergency events. Participate in regularly scheduled disaster exercises to better prepare Police, Fire, Public Works, and other City employees with disaster responsibilities.

2.1.6 Standards/Fire: Continue to maintain, enforce, and upgrade requirements, procedures, and standards to facilitate more effective fire suppression and safety.

A. *Enforce peak water supply / fire flow requirements and ensure that new development is able to sufficiently source water, including in VHFHSZs.*

B. *Enforce minimum roadway widths and clearances for evacuation and fire suppression.*

C. *Maintain special fire-fighting units at the Port of Los Angeles, Los Angeles International Airport, and Van Nuys Municipal Airport capable of responding to special emergencies unique to the operations of those facilities.*

D. *Coordinate with CALFIRE, local fire agencies, fire safe councils, private landowners, and other responsible agencies to identify the best method(s) of fuel modification to reduce the severity of future wildfires, including Prescribed fire; Forest thinning; Grazing; Mechanical clearing; Hand clearing (piling, burning/chipping); Education; and Defensible space.*

E. *Maintain mutual aid or mutual assistance agreements with local fire departments to ensure an adequate response in the event of a major earthquake, wildfire, urban fire, fire in areas with substandard fire protection, or other fire emergencies.*

FireStatLA Section

In 2012, then Fire Chief Brian Cummings established a new administrative section to track LAFD performance measures—FireStatLA. The goal for the section was to provide "A leadership and management strategy designed to quantify and evaluate the performance of our fire and EMS units at the station, battalion, and Department level." LAFD was also one of the first departments to widely publish its incident volumes and response times on the web for transparency.

With the creation of FireStatLA, the Department chose to report actual incident counts and response times to major incident types. Los Angeles does not include any Departmental performance measures in its budget. In its strategic plan, the LAFD reviews performance by incident type but does not set forward a specific set of outcome goals. Within FireStatLA, the Department's measures and, just as importantly, measurement standards are:

- **LAFD Operational Response Time:** The time interval that begins when first contact is made (either through 9-1-1 or the fire dispatch center) and ends when the first Standard Unit arrives on-scene.
- **LAFD Call-Processing Time:** The time interval that begins when the call is created in computer-aided dispatch (CAD) by a Fire Dispatcher until the initial fire or EMS unit is dispatched.
- **Turnout Time:** The time interval between the activation of station alerting devices to when first responders have put on their PPE, are aboard apparatus, and are en-route (wheels rolling). Both station alarm and en-route times are required to measure this interval for each unit that responds. Turnout time is calculated for each unit dispatched to each incident.
- **Travel Time:** The time interval that begins when the first Standard Unit is en-route to the incident and ends upon arrival of any of the Standard Units first on scene.

This requires one valid en-route time and one valid on-scene time for the incident. Travel time can differ considerably amongst stations. Many factors, such as traffic, topography, road width, public events, and unspecified incident locations may impact travel time.

- **Incident Count:** The number of incidents that result in one or more LAFD units being dispatched, regardless of record qualification.
- **Qualified Data:** Only qualified data is used to calculate call-processing time, turnout time, and travel time. Qualified data meets the following criteria:
  - Data with negative values or values greater than 24 hours is removed if it involves computed time variables (call processing, turnout, and travel times).
  - Occasionally, multiple time stamps can occur due to multiple button presses. The time stamp recorded with the first button push will be used for the analysis.
  - Non-emergency responses are removed. Only emergency responses are included.
  - Airport and Port resources (Fire Stations 80, 110, 111, and 114) are excluded because they are not dispatched through the LAFD CAD system.
  - Turnout time measurement is restricted to QTR (in quarters) dispatch status.
  - The highest and lowest one percent of computed time values (operational response time, call-processing time, turnout time, and travel time) are removed or "trimmed" from the available data each month. This is done to protect the calculated value from the influence of outliers.
- **ALS Critical Incidents:** This incident type includes all Advanced Life Support (ALS) incidents that are marked for immediate dispatch. This includes most types of critical incidents.
- **Structure Fire Incidents:** This incident type indicates that a building or structure is reported to be actively burning. This category is calculated on a quarterly basis due to frequency of occurrence.

FireStatLA measures and reports average response times and incident counts for the categories of:

- EMS
- Non-EMS

- Critical ALS (Paramedic)
- Structure Fire

FireStatLA uses the "average" measure as it is a more common measure of the middle of a dispersed data set from low to high. As such, an *average* represents the bulk of the transactions. As technical authorities for internal fire service planning, the CFAI and the NFPA, in contrast, have adopted *fractile* (percentile, or percent of goal) measures, as they allow an understanding of the distribution curve for a type of data in the event of there being many responses significantly exceeding the average. Both response time measures do not tell the entire deployment story; they are two useful, *different* views of time. Other measures in an SOC analysis provide even more "camera angles" related to assessing performance. In this study, Citygate will use multiple measures to provide a robust understanding of what and where improvements to deployment are indicated.

LAFD has a long history of striving to provide a level of service that is evidenced in the number and types of fire companies and minimum daily staffing. Thus, even without explicit, outcome-driven response time goals, LAFD has requested funding for a level of service to meet the City's needs as they relate to risks to be protected.

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

This report can assist the LAFD in adding outcome-driven response time goals, should it so choose. Nationally recognized standards and best practices call for a response timeline with several important measurements, including a definition of all aspects of response time—*which the LAFD FireStatLA program already does*. In this SOC assessment, Citygate uses response time goals to include dispatch process time, crew turnout time, and travel time which together equal a total response time to all risks, including fire, EMS, hazardous materials, and technical rescue responses. The goals are consistent with the CFAI and NFPA systems approach to response.

Per the current NFPA Standard 1221 for dispatching, 9-1-1 emergency calls without language barriers to the most acute calls should be dispatched in 60 seconds, 90 percent of the time. Prior versions of this best practice were 90 seconds, absent language barriers. As for crew turnout time, for years, the NFPA and CFAI have believed (without extensive research) that turnout could take 60 to 90 seconds. In Citygate's experience with hundreds of fire services clients over the past 20 years, it is exceedingly difficult to don the protective clothing mandated by the Occupational Safety and Health Administration (OSHA), be seated, and have a seat belt secured in less than 2:00 minutes, 90 percent of the time. These times are also challenged by some station designs and the differences between waking and sleeping hours.

As for travel time, since the NFPA first published its recommended Standard 1710 for career fire services deployment, the travel time goal in urban areas has been 4:00 minutes. However, this was part of an overall response time measure. The 4:00-minute travel time was "believed possible" across a traditional-grid, right-angle road network. There was no empirical research on differing road network designs or topography. In Citygate's experience, few clients can deploy to meet a 4:00-minute travel time outside of urban core downtown areas *with a grid street network and adequate fire station spacing*.

3.1.2 Existing Outcome Expectations

SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The SOC process begins by reviewing existing emergency services outcome expectations. This entails determining the purpose for which the response system exists to provide the fire and EMS services funded.

Within the SOC process, positive outcomes are the goal, and from that goal, crew size and response time can be calculated to allow efficient fire station spacing (distribution and concentration). Emergency medical incidents have the most severe time constraints. The brain can only survive between 4:00 and 8:00 minutes without oxygen. Heart attacks, other trauma events that cause severe blood loss, or a respiratory emergency can all cause oxygen deprivation to the brain; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in 8:00 to 10:00 minutes. If fire services response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, *all* responding crews must arrive, assess the situation, and deploy effective measures before brain death occurs or a fire leaves the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is *beginning* to manage the problem within a 7:00- to 8:00-minute total response time. This is right at the point that brain death is becoming irreversible, or a fire has grown to the point of leaving the room of origin and becoming very serious. Thus, LAFD needs a first-due response goal that is within a range that can give hope for a positive outcome. It is important to note that the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine starts to be driven on the response route. Ideally, the emergency is noticed immediately, and the 9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, 1:30 minutes. Crew notification and travel time then take additional minutes. Once arrived, the crew must walk to the patient or emergency, assess the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 minutes or more. This timeframe may be increased considerably due to long driveways, apartment buildings with limited access, multiple-story apartments or office complexes, or shopping center buildings such as those found in parts of Los Angeles.

Unfortunately, there are times the emergency becomes too severe, even before 9-1-1 notification or LAFD response, for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed system, only issues like bad weather, poor traffic conditions, or multiple emergencies will slow the response system down. Consequently, a properly designed system will give 9-1-1 callers the hope of a positive outcome for their tax-dollar expenditure.

For this report, total response time is the sum of the dispatch processing, crew turnout, and road travel time steps. This is consistent with the recommendations of the CFAI.

3.2 RISK ASSESSMENT

The third element of the SOC process is a community risk assessment. This section summarizes a very detailed Risk Assessment contained in **Volume 3** of this study.

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

Within the context of an SOC review, the objectives of a community risk assessment are to:

- Identify the values at risk to be protected within the community or service area.
- Identify the specific hazards with the potential to adversely impact the community or service area.
- Quantify the overall risk associated with each hazard.
- Establish a foundation for current/future deployment decisions and risk-reduction / hazard mitigation planning and evaluation.

A *hazard* is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. *Risk* is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community.

3.2.1 Values to Be Protected

Broadly defined, *values at risk* are those tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people, critical facilities/infrastructure, buildings, and key economic, cultural, historic, and natural resources.

3.2.2 Overview of Values at Risk and Hazards in LAFD's Service Area

Citygate's evaluation of the values at risk and hazards likely to impact LAFD's service area yields the following conclusions.

People

Residents, employees, visitors, and travelers in a community or jurisdiction are vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency. At-risk populations typically include children younger than 10 years of age, the elderly, people housed in institutional settings, households below the federal poverty level, and people living unsheltered. The following table summarizes key demographic data for the City.

Table 3—Key Demographic Data – City of Los Angeles

Demographic	2022
Population	**3,903,648**
Under 10 years	11.80%
10 – 14 years	5.90%
15 – 64 years	68.60%
65 – 74 years	7.90%
75 years and older	5.90%
Median age	35.8
Daytime population	3,948,032
Housing Units	**1,513,840**
Owner-Occupied	34.80%
Renter-Occupied	58.90%
Vacant	6.30%
Median Household Size	2.67
Median Home Value	$736,691
Race/Ethnicity	
White Only	34.10%
Black / African American Only	8.50%
Asian Only	12.30%
Other / Two or More Races	45.10%
Hispanic/Latino Origin	47.00%
Diversity Index	87.7
Education (population over 24 yrs. of age)	**2,663,659**
High School Graduate	81.00%
Undergraduate Degree	39.20%
Graduate/Professional Degree	13.10%
Employment (population over 15 yrs. of age)	**2,072,308**
In Labor Force	92.90%
Unemployed	7.10%
Median Household Income	$75,564
Population Below Poverty Level	16.90%
Population without Health Insurance Coverage	12.10%

Source: Esri Community Analyst (2022) and U.S. Census Bureau

Of note from the previous table is the following:

- Nearly 26 percent of the population is under 10 years or over 65 years of age.
- The City's population is predominantly Other / Two or More Races (45 percent), followed by White (34 percent), Asian (12 percent), and Black / African American (9 percent). In addition, 47 percent of the population is Hispanic/Latino in origin.
- Of the population over 24 years of age, 81 percent has completed high school or equivalency.
- Of the population over 24 years of age, slightly more than 39 percent has an undergraduate, graduate, or professional degree.
- Of the population 15 years of age or older, nearly 93 percent is in the workforce; of those, 7 percent are unemployed.
- Median household income is slightly more than $75,500.
- The population below the federal poverty level is nearly 17 percent.
- Slightly more than 12 percent of the population does not have health insurance coverage.

Projected Growth

The Southern California Association of Governments (SCAG) projects the City's population will grow by 18 percent over the next 18 years to 2040.[1]

Buildings

The City has more than 1.1 million buildings[2] with an assessed valuation of more than $774 billion to protect, including more than 1.5 million residential housing units[3] and approximately 200,000 businesses.[4]

Critical Infrastructure / Key Resources

The U.S. Department of Homeland Security defines critical infrastructure / key resources as those physical assets essential to the public health and safety, economic vitality, and resilience of a community, such as lifeline utilities infrastructure, telecommunications infrastructure, essential government services facilities, public safety facilities, schools, hospitals, airports, etc. The City has identified 3,023 critical facilities and infrastructure in its 2018 Local Hazard Mitigation Plan.

[1] Source: College Station Project, Draft Environmental Impact Report, March 2018, Table 4.8-1.
[2] Source: Los Angeles Fire Department Planning Section.
[3] Source: Esri Community Analyst – Community Profile (2022).
[4] Source: Esri Community Analyst – Business Summary (2022).

A hazard occurrence with significant consequence severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Economic Resources

With the sixteenth largest economy worldwide and regarded as the entertainment capital of the world, the City of Los Angeles economy is led by the education/healthcare/social services industry (22 percent), followed by the professional/scientific/management/administrative industry (15 percent), arts/entertainment/recreation industry (13 percent), public administration (3 percent), and other industries (47 percent).[5] The City's Adopted Budget for Fiscal Year 2022/23 is $11.76 billion, with a total assessed valuation of $723.6 billion.[6]

Natural Resources

Key natural resources within the City of Los Angeles include:

- Pacific Ocean/Los Angeles Harbor
- Los Angeles River
- Griffith Park
- Santa Monica Mountains National Recreation Area

Cultural/Historic Resources

As a vibrant, multicultural city, Los Angeles boasts a large inventory of cultural and historic resources, including:

- Natural History Museum
- Walt Disney Concert Hall
- Los Angeles County Museum of Art
- The Underground Museum
- The Museum of Jurassic Technology
- Museum of Tolerance
- Getty Art Museum
- Discovery Cube

[5] Source: City of Los Angeles 2018 Local Hazard Mitigation Plan, Figure 4-20.
[6] Source: County of Los Angeles Auditor-Controller's Office website.

- The Banning Museum

Special/Unique Resources

The following facilities are special or unique resources to be protected:

- Los Angeles International Airport
- Multiple internationally known universities, colleges, and their sports venues
- Occidental College
- Dodger Stadium
- Griffith Observatory
- Crypto.com Arena

3.2.3 Hazard Identification

Citygate utilized prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency- and jurisdiction-specific data and information to identify the hazards to be evaluated for this study. The 2018 City of Los Angeles Local Hazard Mitigation Plan identifies the following ten hazards of concern:

1. Adverse weather
2. Climate change / sea-level rise
3. Dam failure
4. Drought
5. Earthquake
6. Flood
7. Landslide
8. Tsunami
9. Wildland/Urban Interface (WUI) fire
10. Human-caused hazards

LAFD provides some hazard mitigation services, such as fire prevention, code enforcement, and wildland fuel reduction programs. In addition, it must provide response services related to multiple hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

3.2.4 Risk Assessment Summary

Citygate's evaluation of the values at risk and hazards likely to impact the City of Los Angeles yields the following:

- LAFD serves a very diverse urban population with densities ranging from less than 5,000 to more than 40,000 people per square mile over a widely varied urban land-use pattern.
- The City's population is projected to grow by 18 percent over the next 18 years to 2040.
- The City has a large inventory of residential and non-residential buildings to protect.
- The City has significant economic and other resource values to be protected, as identified in this assessment.
- The City has multiple mass emergency notification options available to effectively communicate emergency information to the public in a timely manner.
- The City's risk for five hazards related to emergency services provided by LAFD range from **Low** to **Extreme**, as summarized in the following table. Risk ratings consider the probability of occurrence, probable consequence severity, and impact on LAFD's ability to maintain sufficient response capacity.

Table 4—Overall Risk by Incident Type

Hazard	Sub-Hazard	Risk Rating
Building Fire	Outbuilding/ADU	***Moderate***
	Single-Family Residence	***High***
	Multi-Family Residence	***High***
	Light Commercial	***High***
	Heavy Commercial / Industrial	***High***
Vegetation/Wildland Fire	Grass/Brush (Non-Hazard Areas)	***Low***
	Grass/Brush (Moderate-Hazard Areas)	***Moderate***
	Grass/Brush (High/Very High-Hazard Areas)	***High***
	WUI (> 25 acres)	***Extreme***
Medical Emergency	BLS only	***Moderate***
	BLS/ALS	***High***
	ALS	***High***
	Mass Casualty Incident	***High***
	Weapon of Mass Destruction	***Extreme***
Hazardous Materials	Alarm/Odor Investigation	***Low***
	HazMat Level 1	***Moderate***
	HazMat Level 2 Biological/Chemical Threat Natural Gas Leak	***High***
	HazMat Level 3 Biological/Chemical Release Railroad Incident	***High***
	Explosion / WMD	***Extreme***
Technical Rescue	Elevator Rescue	***Low***
	Trauma / Pin-In / Potential Jumper Rope Rescue	***Moderate***
	Confined Space / Trench Rescue	***Moderate***
	Building Collapse / Natural Disaster	***Extreme***

3.3 CURRENT LAFD DEPLOYMENT

3.3.1 Existing Deployment Situation – What LAFD Currently Has in Place

SOC ELEMENT 1 OF 8*
EXISTING DEPLOYMENT POLICIES
**Note: Continued from Section 3.1.*

As the Department has not adopted specific fire and EMS response time goals, this assessment will benchmark LAFD against the fractile response time recommendations of NFPA 1710 for career fire services deployment, as well as LAFD's internally reported results as averages.

The NFPA 1710 goals are:

- Travel time of 4:00 minutes for the first-due unit to 90 percent of all types of fire and EMS *emergencies* (thus not including other and non-emergent incidents).
- Travel time of 8:00 minutes for multiple units needed to 90 percent of *serious emergencies* (First Alarm).

LAFD's current daily staffing plan is summarized in the following table.

Table 5—LAFD Current Daily Minimum Staffing per Unit

Primary Units	Minimum Staffing Per Unit	Extended Minimum
98 Engine Companies	4	392
42 Aerial Ladder Truck/Light Force companies	6	252
1 Aerial Ladder Company (Single Piece)	5	5
93 Paramedic Ambulance	2	186
43 Basic Life Support Ambulances	2	86
7 EMS Supervision Units	1	7
Technical Response Companies (HazMat, USAR, ARFF)	Varies by Company	31
Other Response Companies (Fire Boats, Helicopters)	Varies by Resource	32
14 Battalion Command Teams and 2 Bureau Command Teams	2	32
Total Typical 24/7/365 Fire/EMS Operations Staffing		**1,023**

These daily personnel "cross-staff" specialty response units such as:

- 15 Brush patrols
- 5 Urban Search and Rescue (USAR) companies
- 2 Aircraft firefighting apparatus

- 5 Bulldozer/loaders
- 3 Hazardous Materials companies
- 4 Swift Water Rescue teams
- 4 Firefighting foam tenders

This total daily staffing is adequate for the immediate response needs presented in the most built-up, urban areas of LAFD—without the mandatory use of automatic aid forces from a neighboring agency to staff typical daily incident types.

Services Provided

LAFD provides an all-risk response, providing the public with services that include structure, wildland, and marine fires, BLS and ALS first responder EMS, ALS and BLS ambulances for patient transport, technical rescue, and hazardous materials response, as well as other services.

Given these risks, the City's Metropolitan Fire Communications (MFC, or dispatch) uses a tiered approach of dispatching different types of apparatus to each incident category. MFC selects the closest and most appropriate resource type for each incident. As an example, the following table shows the resources dispatched to common risk types.

Table 6—Resources Dispatched to Common Risk Types

Risk Type	Minimum Number and Type of Resources Sent	Initial LAFD Personnel Sent
One-Patient EMS	One Engine or Light Force and Rescue Ambulance	6
Auto Fire	One Engine	4
Category A Small Building/Residential Fire	Three Engines, One Light Force, One Paramedic Rescue Ambulance, One Basic Rescue Ambulance, and One Battalion Command Team	24
Category B Commercial Building Fire	Four Engines, Two Light Forces, One Paramedic Rescue Ambulance, One Basic Rescue Ambulance, One EMS Captain, and One Battalion Command Team	35
Category C Special, such as Technical Rescue and Hazardous Materials or aircraft or harbor	Minimum of three Engines, one Light Force	18

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Section 4

Staffing and Geo-Mapping Analysis

SECTION 4—STAFFING AND GEO-MAPPING ANALYSIS

4.1 CRITICAL TASK TIME MEASURES – WHAT MUST BE DONE OVER WHAT TIME FRAME TO ACHIEVE THE STATED OUTCOME EXPECTATION?

SOC ELEMENT 4 OF 8
CRITICAL TASK TIME STUDY

SOC studies use task time information to determine the number of firefighters needed within a timeframe to accomplish the desired fire control objective on moderate residential fires and modest emergency medical incidents.

4.1.1 Firefighting Critical Tasks

LAFD's Effective Response Force (ERF, or First Alarm Assignment) to initial reports of a residential structure (dispatch Category A) fire in urban areas includes three engines, one Light Force ladder truck, one Battalion Command Team, one Paramedic Rescue Ambulance, one BLS Ambulance, for an ERF total of **24** personnel.

The following table shows what a force of 24 can accomplish. The larger the force (weight of attack), the faster the tasks are completed.

Scenario: *The following is a simulated one-story residential working structure fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire.*

Upon arrival, they were told approximately 1,000 square feet of the home was involved in fire.

Table 7—First Alarm Category A Structure Fire – 24 Personnel

Company Level Tasks
First Arriving Engine and Light Force
1. Lay in a hydrant supply line
2. Stretch the 200-foot, 1 ¾-inch hose line to the point of access for fire attack
3. Operate the pump to supply water and attach hydrant supply line.
4. Assume command of initial operations.
5. Conduct primary search and rescue.
6. Ventilation and salvage of the structure and contents
Second Arriving Engine
1. If necessary, lay in a second hydrant supply line.
2. Stretch a second 200-foot hose line as a back-up line and for fire attack.
3. Establish two-in / two-out safety team.
Third Arriving Engine
1. Staff the Rapid Intervention Crew.
2. Secondary rescue search if needed.
Rescue Ambulances
1. Assist with forcible access/egress as needed. Patient care as needed.
2. Secure utilities.
3. Remove any obstructions or debris that would hinder fire ground operations.
Battalion Command Team
1. Establish exterior command and scene safety.

Grouped together, these duties form an ERF or First Alarm Assignment. These tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish these tasks, the incident progression clock keeps running.

Fire spread in a structure can double in size during its *free-burn* period before firefighting starts. Many studies have shown that a small fire can spread to engulf an entire room in fewer than 6:00 to 8:00 minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire attack and search commence before

the flashover point occurs if the outcome goal is to keep fire damage in or near the room of origin. In addition, flashover presents a danger to both firefighters and any occupants of the building.

4.1.2 EMS Critical Tasks

LAFD responded to approximately 392,949 EMS incidents in 2020. These incidents included car accidents, childbirths, strokes, heart attacks, difficulty breathing, falls, and many other medical emergencies.

Some EMS calls require treatment for more than one patient. These calls include vehicle accidents, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

MFC dispatchers are responsible for screening calls to establish the correct initial response. The first fire officer on the scene can amend the response once conditions have been assessed. Standard operating procedures are used to request adequate personnel and resources.

The following critical task table reviews the tasks required on a critical response to a single illustrative cardiac arrest incident.

Table 8—Cardiac Arrest – Engine Crew (Four Personnel) and Ambulance (Two ALS or BLS Personnel)

Task	Personnel Required	Type of Treatment Administered
Compressions	1–2	Compression of chest to circulate blood
Ventilate/oxygenate	1–2	Bag-valve-mask, apply O_2
Airway control	1–2	Manual techniques/intubation/cricothyrotomy
Defibrillate	1–2	Electrical defibrillation of dysrhythmia
Establish I.V.	1–2	Peripheral or central intravenous access
Interpret ECG	2	Identify type and treat dysrhythmia
Administer drugs	1	Administer appropriate pharmacological agents
Patient charting	1–2	Record vitals, treatments administered, etc.
Hospital communication	1–2	Receive treatment orders from physician
Scene management	1	Safety, security, and communications
Quality assurance	1	Medical Service Officer oversight
Treat en route	2–3	Continue to treat/monitor/transport patient
Total	**6**	

4.1.3 Critical Task Analysis and Effective Response Force Size

What does a deployment assessment derive from a critical task analysis? The total task needs (as displayed in Table 7 and Table 8) to stop the escalation of an emergency must be compared to outcomes. When flashover occurs after approximately 6:00 to 8:00 minutes of free burning, the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. Additionally, brain death begins to occur within 6:00 to 8:00 minutes of the heart having stopped. Thus, the ERF must arrive in time to stop these catastrophic events from worsening.

LAFD, given its size, is staffed with enough firefighters to deliver multiple ERFs of 24 firefighters, each without the use of automatic aid, to a building fire. Mitigating an emergency event is a team effort once units have arrived. This refers to the "weight" of response analogy: if too few personnel arrive too slowly, the emergency will worsen instead of improving. The outcome times will be longer with less desirable results if the arriving force is later or smaller.

The quantity of staffing and the arrival timeframe can be critical in a serious fire. Fires in older and/or multiple-story buildings could well require the initial firefighters needing to rescue trapped or immobile occupants. If a lightly staffed force arrives, it cannot simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that the other units arrive in time to complete an effective intervention. Time is one factor that comes from *proper station placement*. Good performance also comes from *adequate staffing* and *training*. In the critical tasks identified previously, LAFD can perform well in terms of staffing. However, in situations where fire stations are spaced too far apart, such as when one unit must cover another unit's area, or multiple units are needed, these units can be too far away.

Previous critical task studies conducted by Citygate, the National Institute of Standards and Technology (NIST), and NFPA Standard 1710 find that all units must arrive with 17 or more firefighters within 11:30 minutes from the time of call at a residential room-and-contents structure fire to be able to perform the tasks of rescue, fire attack, and ventilation *simultaneously and effectively*.[7]

If fewer firefighters arrive, the search team will most likely be delayed, as will ventilation efforts. The attack lines will only consist of two firefighters, which does not allow for rapid movement above the first-floor deployment. Rescue is conducted with only two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Effective

[7] NIST Technical Note 1661, Report on Residential Fireground Field Experiments (April 2010).

deployment is about the **speed** (travel time) and the **weight** (firefighters, medics, appropriate apparatus, etc.) of response.

Twenty-eight initial firefighters can manage a moderate-risk, confined house fire; however, even an ERF of 24 will be seriously slowed by a fire that is above the first floor in a low-rise apartment building, or in a commercial/industrial building. This is where the capability to add units to the standard response (as LAFD does) becomes important.

The fact that LAFD's First Alarm plan (ERF) delivers 24 personnel to a moderate-risk building fire reflects LAFD's goal to confine serious building fires to or near the room of origin. This is a typical desired outcome in built-out areas and requires more firefighters more quickly than the typical rural outcome goal of keeping a fire contained to the parcel of origin.

LAFD's current physical response to building fires is, in effect, LAFD's de facto deployment measure to built-up urban/suburban areas. Thus, this becomes the baseline policy for the deployment of firefighters.

4.2 Distribution and Concentration Studies – How the Location of First-Due and First-Alarm Resources Affects the Outcome

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

LAFD is currently served by 106 fire stations fielding engine companies, ladder truck companies, specialty units, and Chief Officers for incident command. It is appropriate to understand what the existing stations do and do not cover, if there are any coverage gaps needing additional stations, and what, if anything, to do about them.

In brief, there are two geographic perspectives to fire station deployment:

- Distribution – the spacing of first-due fire units to manage routine emergencies.
- Concentration – the clustering of fire stations in proximity of each other so that building fires can receive sufficient resources from multiple fire stations quickly. This is known as the ERF or, more commonly, the First Alarm Assignment.

To analyze first-due fire unit travel time coverage, Citygate used a geographic mapping tool to measure theoretical travel time over the City's street network. For this calculation, Citygate used the base map and street travel speeds calibrated to actual fire company travel times from previous responses to simulate real-world coverage. A second model was built that uses traffic congestion data to slow the fire unit responses at peak traffic periods. Using these tools, Citygate ran several deployment tests and measured impacts on various parts of LAFD's service area. The first-due unit *travel* time measure initially used was 4:00 minutes and 8:00 minutes for multiple units over

the road network, which is consistent with the benchmark recommendation in NFPA 1710 and desirable outcomes in critical emergencies.

In all the geographic information system (GIS) models described, care was taken to add into the model as many of the newest streets as possible. The following described maps can be found in **Volume 2—Map Atlas**. Due to the City's size, the maps measure response time coverage in three views—North, Central, and South. There is some overlap between views to help maintain orientation. Some map series' also feature a letter designation—a, b, c, or d—to differentiate between the types of coverage shown—such as uncongested, congested, or a scenario (i.e., showing both uncongested and congested).

- Each map series with an "a" designation (e.g., Map #3a) shows uncongested coverage in green street segments.
- Each map series with a "b" designation shows traffic-congested coverage in a dark color above the non-congested green street segments.
- Each map series with a "c" designation shows paramedic Rescue Ambulance coverage.
- Map series "d" shows EMT (BLS) ambulance coverage.

This is further clarified in the description of each map series in the following section, with a clear discussion of what the sub views each show.

4.2.1 Base Maps – Existing Coverage

Due to LAFD's extensive service area, each map "series" is presented by "Central," "North," and "South" designations for greater fidelity in representing detailed coverage in the City.

Map Series #1 – General Geography and Station Locations

Map Series #1 shows the existing fire station locations in the City and, by differing colors, each Battalion area. These are reference maps for the other maps that follow.

Map #2 – Risk Planning Zones

Map #2 shows the current 14 Battalion areas for risk assessment planning and quantification by differing colors for each Battalion area. This is also a Citywide reference and orientation map for other maps that follow.

Map #2a – Population Density

This map shows current population densities in the City by Battalion risk planning areas. Zoning across the City's diverse communities allows for differing population clusters. For EMS events in particular, population drives 9-1-1 requests for medical assistance. It is important to understand

where the highest density resident population areas are in relation to the actual incident demand to be mapped later in this series. [This map does not describe the mobile populations of traffic, employment, and tourism as accounting for those populations by geographic area is very difficult given variabilities over the course of a year.]

What should be noted are the population densities in Battalion 11 in the downtown core. In Citygate's experience, the areas with more than 40,000 people per square mile are the highest in the western United States and in just one mile there are more people than many smaller suburban cities spread out over many square miles. This high population density is what is driving the high EMS incident demands on the LAFD.

Map Series #2 Bat. 1–18 – Battalion Level Risk Maps

Map Series #2 Bat. shows the risks assessed in each Battalion planning area. Note: At present, there are only 14 battalions. Some numbers were reserved for creation of a future Battalion. Hazard occurrences are identified in the risk assessment at a local level to understand where significant risks occur that—in the event of an emergency—the resultant loss will impact individuals, the public, or community services and local economics.

Map Series #3a – First-Due Unit Distribution: 4:00-Minute Engine Travel

Using green street segments, Map Series #3a shows the *distribution* of fire stations per a response goal of a 4:00-minute best practice *travel* time recommendation. Therefore, green indicates the locations an engine could reach within this time *assuming* it is in its station and encounters no unusual traffic delays. The computer mapping tool uses prior fire company speeds by roadway type. Thus, the green projection is realistic for engines within normal traffic conditions.

Given the design of the road network, topographical barriers, and the current fire station locations, there are very few gaps in coverage of the public streets when applying a 4:00-minute travel time goal in the central and southern areas. However, in the north area, there are several—both small and more significant gaps. These will be studied further after the baseline maps are reviewed.

Map Series #3b – First-Due Unit Distribution: 4:00-Minute Engine Travel – Traffic Congestion Combined

Map Series #3b uses red to represent the reduced travel time coverage at peak traffic congestion during morning/evening hours, which is overlaid on the green uncongested coverage. Severe traffic congestion can hamper travel time even with traffic signal preemption technology. The impact is the largest in the more travelled major road and commercial corridors but does have an impact in all areas of the City. Larger impacts are seen in the northern and west central areas where the fire stations are farther apart.

The purpose of this geographic mapping is to determine response time coverage across a community's geography to balance station locations. This geographic mapping design is then

checked against actual dispatch time data, which reflects real response times. There should be some overlap between station areas so that a second-due unit has a chance of an adequate response time when it covers a call in another station's first-due area.

As Section 5 will detail, the *travel* time to 90 percent of core fire and EMS incidents is 7:00 minutes Department-wide in reporting year (RY) 2020. This is supported by the GIS model that shows that 4:00 minutes for travel does not fully cover the road network, more so during periods of traffic congestion.

Map Series #3c – ALS (Paramedic) Rescue Ambulance Coverage

Map Series #3c measures the coverage for Paramedic RAs at a travel time of 6:00 minutes, which when added to dispatch and turnout time, delivers Paramedic-level transport in less than 10:00 minutes. 6:00-minute coverage is very good Citywide, with only small gaps apparent in the northern and southern areas.

Map Series #3d – BLS (EMT) Rescue Ambulance Coverage

Map Series #3d measures the coverage for BLS RAs at a travel time of 6:00 minutes, which when added to dispatch and turnout time, delivers BLS-level transport in less than 10:00 minutes. There are larger gaps in the BLS RA coverage in the northern and southern areas of the City, where there are not as many deployed due to incident demand and the placement of the Paramedic RAs in areas at the edge of the City.

Map Series #4 – ISO 1.5-Mile Travel Coverage Areas

This map set displays the Insurance Services Office (ISO) requirement that stations cover a 1.5-mile *distance* response area. Depending on the road network in an agency, the 1.5-mile measure usually equates with a 3:30- to 4:00-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As the map series shows, the more conservative ISO coverage does not cover all public road miles and, outside of the most central urban areas, has many of the same gaps as the 4:00-minute travel time model.

Map Series #5a – Citywide Residential Building Fire: Category A ERF – 8:00-Minute Travel Concentration

The most common multiple-unit ERF needed in any urban area is for a residential or small commercial building fire. The LAFD response to these fires is three Engines, one Light Force, one Paramedic Rescue Ambulance, and one basic rescue ambulance, and one Battalion Command Team totaling 24 personnel.

Map Series #5a shows the *concentration*, or massing, of Category A fire crews for serious fire or rescue calls. Building fires require 17 or more firefighters to a house fire, or 28 personnel to a

smaller commercial building fire (per NFPA 1710).[8] arriving within a reasonable timeframe to work together and effectively stop the escalation of an emergency. Otherwise, if too few firefighters arrive, or if they arrive too late in the fire's progress, the result is a greater-alarm fire, which is more dangerous to the public and the firefighters.

The concentration maps display LAFD's ability to initially send its Category A within an 8:00-minute travel time (11:30 minutes from 9-1-1 dispatch receipt). This measure ensures that a *minimum* of 24 personnel can arrive on-scene to work *simultaneously* and effectively to begin to stop the spread of a serious building fire.

This map set shows in green where LAFD's current fire station system should deliver the Category A force. Given an 8:00-minute travel time measure, the coverage is all but complete except for small pockets in the northern and southern areas.

Map Series #5b – Citywide Residential Building Fire: Category A ERF – 8:00-Minute Travel Concentration – Traffic Congestion Impacts

This map set shows the Category A coverage impacted by traffic congestion. In a multiple-unit response, the coverage measure cannot be met until the last-due unit arrives on-scene. It is much more challenging to get all needed units on-scene when some must travel against congestion the entire travel route.

As the map set shows, traffic congestion impacts Category A coverage in all areas of the City, with a smaller impact in the central, core areas where station coverage spacing is tighter due to historic demand for service.

Map Series #5c – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel Concentration

For more serious fires in larger buildings, the LAFD response is called a Category B level as it adds units to provide more firefighters immediately. The Category B force is four Engines, two Light Forces, one Paramedic Rescue Ambulance, one basic rescue ambulance, one EMS Captain, and one Battalion Command Team totaling 35 personnel.

As with Category A, this coverage is very good in the central area of the City. However, the added units do mean that gaps in the north and south are larger as there are too many units in 8:00-minutes' travel time to the edges of the south service area. As for the north, the fire stations in much of the northern area, along the mountains and to either side of the I-5, are too far apart.

[8] NFPA 1710, 2020 Edition, Section 5.2.4.1.1.

Map Series #5d – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel Concentration – Traffic Congestion Impacts

This map set shows the Category A coverage impacted by traffic congestion. Given more units to cover the distance, the impact of congestion increases even more in all three areas. However, the Category B coverage is good where it must be—in the most populated core areas.

Map Series #6a – Ladder Truck Coverage (Light Forces): Category A ERF – 8:00-Minute Travel Concentration

A valuable part of the multi-unit ERF is the aerial ladder truck which, in the LAFD, is a two-apparatus team of an aerial Ladder and a pumping Engine, together staffed by one crew. As this uncongested coverage shows, there are enough Ladder units to cover the entire City in almost all areas.

Map Series #6b – Ladder Truck Coverage (Light Forces): Category A ERF – 8:00-Minute Travel – Traffic Congestion Impacts

The spacing of the Light Forces is so good that even under traffic congestion, they can cover all but a few small pockets of the City within a travel time of 8:00 minutes, and two of those pockets are in northern area, not the most populated central area.

Map Series #6c – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel – Normal and Combined with Traffic Congestion Impacts

The Category B response adds a second Light Force Ladder team; thus, these maps show the normal and congested coverage for two Light Force Ladder teams. As would be expected by adding a second Light Force, the uncongested coverage is reduced in all three areas, but this reduction is less in the central area of the City. However, under traffic congestion, there are significant reductions everywhere except the most densely populated areas.

Map Series #7a – One Battalion Command Team: 8:00-Minute Travel

This map set shows ERF coverage for one Battalion Command Team on either a Category A or B response. The uncongested coverage is all but complete Citywide. The two small, underserved areas are the southern tip of San Pedro and the northern area near Station 100 up to Station 114.

Map Series #7b – One Battalion Command Team: 8:00-Minute Travel – Traffic Congestion Impacts

The single Battalion Command Team coverage under traffic congestion is reduced in all areas to the sections around Battalion headquarters. The impact is the most severe in the center of the northern area of the City.

Map Series #7c – One Emergency Medical Supervisor: 8:00-Minute Travel – Normal and Combined with Traffic Congestion Impacts

There are not as many of these specialty supervisor units as there are Battalion Command Teams. As such, 8:00-minute travel coverage is somewhat weaker than it is for Battalion Command Teams. In both normal and congested traffic, the coverage of these units is sufficient in the most densely populated sections of the central and southern areas of the City. However, the core of the northern area is not reached in a travel time of 8:00 minutes even under normal traffic conditions.

Map Series #8 – All Incident Locations

This series of maps shows the exact location for all incident types across a three-year period. It is apparent that there is a need for fire services on almost every developed street segment of the service area. This incident plot (and the others to follow) also show where LAFD units respond outside of its area for regional mutual aid incidents.

Map Series #9 – Emergency Medical Services and Rescue Incident Locations

This series shows only emergency medical and rescue call locations. With most of the calls for service being EMS-related, virtually all areas of the City need EMS coverage.

Map Series #10 – All Fire Type Locations

This map set identifies the location of all fires in the City for the three-year assessment period. All fires include any type of fire call, from auto to dumpster to building. There are obviously fewer fires compared to medical or rescue calls; however, it remains evident that all first-due engine districts experience fires—although fires are more concentrated where buildings are older or more densely spaced due to zoning and historic growth. Major road arterials can also be seen due to the occurrence of vehicle fires.

Map Series #11 – Structure Fire Locations

This series shows all structure fire locations. While the structure fire quantity is a smaller subset of the total fire quantity, there are two meaningful findings from this map. First, there are still structure fires in every fire station district, and the location of many building fires parallels the areas where it is more common to find older and higher-risk building types. These areas and buildings pose a significant fire- and life-loss risk to communities. Second, fires in the more complicated building types must be controlled quickly or losses can be significant. Thus, again, core areas of the City must maintain an available, effective multiple-unit response capacity.

Map Series #12 – Emergency Medical Services and Rescue Incident Location Densities

This map set examines (by mathematical density) where clusters of EMS incident activity occurred over the three-year assessment period. The darkest color plots the highest concentration of all

incidents and shows the location of frequent workload, which is more meaningful than simply mapping the locations of all EMS incidents, as were measured for Map Series #9.

This perspective is important because the deployment system must include an overlap of units to ensure the delivery of multiple units when needed for serious incidents, or to handle simultaneous calls for service. It is obvious that there are multiple areas that generate a much higher demand for emergency medical services. Therefore, crew workload planning must consider actual incident demand by hour—not just population density in general.

Map Series #13 – All Fire Location Densities

This series is like Map Series #10 but shows the hot spots of activity for all types of fires. As with EMS incidents, fire density is more concentrated in the highly populated, most-developed, older areas of the City.

Map Series #14 – Structure Fire Densities

This map set shows only the building fire workload by density. While the density is greater in the oldest areas, each battalion has smaller clusters of structure fires over the three-year assessment period, pointing to the need for a successful ERF for building fires in every battalion's service area.

Map Series #15 – Wildland Fire Densities

This series shows the wildland fire workload by density. While smaller in total count than building fires, importantly, many are in open space areas and hills with a high risk for wildfire. Also worrisome is the quantity of fires along highway corridors where an auto fire can easily spread to a wildland area. In these areas, fires must be suppressed quickly during dangerous fire weather or they can easily become catastrophic events.

4.2.2 Coverage Gap and Improvement Scenarios

Given the 4:00-minute travel time coverage gaps in the existing station network—as evidenced in both the normal and congested travel maps in addition to historical incident response travel time records in **Section 5** of this study—Citygate conducted additional GIS measures to understand where adding fire stations or specific fire company types might be indicated. Some of the following analyses feature the GIS tool measuring how many public road miles are covered by a fire station plan. The entire table of measures will follow the map descriptions.

Map Series #16 – 5:00-Minute Travel Time Coverage

Given that LAFD's fire station spacing covers 76 percent of the City, and most of the coverage gaps are at the edges of small gaps between two fire station areas, the question becomes how much better is the coverage at just one more minute of travel? In Citygate's experience, many larger departments with challenging geography to cover can space fire stations at 5:00 minutes and,

ensuring they control dispatch and turnout times, still deliver first-due units in 8:30 minutes or slightly less from the time of dispatch answering a call.

These three maps test this measure. As can be seen in just one more minute of travel from 4:00 to 5:00 minutes, central and southern area coverage is almost complete. In the northern area, the gaps have reduced to only two that remain large enough to merit further consideration for resources—between stations 100 and 88 and stations 98 and 99. The 5:00-minute coverage for public streets increases to 92 percent Citywide, which is a figure Citygate has never seen citywide in a metro client.

Map Series #17 – 4:00- and 5:00-Minute Travel Gap: Small Area Gap Analysis

To further illustrate the locations of some of the remaining travel time gaps at both the fourth and fifth minute of travel, this series of maps scales in very close to see neighborhood-level coverage compared to the terrain and highway barriers present. The following table compares the gaps by mile of coverage.

Table 9—Small Area Gap Analysis

Gap Area	Gap in Coverage at 4:00 Minutes	Gap Miles Covered at 5:00 Minutes	Open Gap Miles Remaining
North Gap Near Station 7	169.11	89.2	79.91
Central Gap Near Station 57	72.09	34.51	37.58
South Gap Near Station 85	28.02	6.22	21.8

In the central area, simply increasing the measure to 5:00 minutes closes *48 percent* of existing gaps and, due to the remaining gaps being at the edges of the City limits, adding fire stations would not be cost effective, as most of the added coverage would extend more into neighboring cities.

In the northern area, using 5:00-minute coverage closes 53 percent of the gap, but still leaves a large gap between stations 98 and 99. Even with 5:00-minute coverage, the remaining east side gap in the northern area is 79.9 road miles. This is large enough to merit further study for an added station once this analysis considers the incident demands and response times for the five stations in proximity to this gap.

As for the southern area, at either the fourth or fifth minute of travel, the only significant gap is the small corridor of City limits connecting Battalion 6 – San Pedro, to the central City areas. Given the gap left after 5:00 minutes of travel time is only 21.8 miles, the area is too small to justify adding a fire station.

Map Series #18 – Central and North Area Highest Incident Demand Locations

These maps are presented at full scale and will also be used in this analysis in the incident statistics section to follow. The volume and simultaneous demand on the top 10 to 28 LAFD stations is the highest Citygate has measured in a metro client. Given that it was likely that some of these stations were in close proximity to each other as zones with greater population density are typically larger than the area that can be covered by one fire station, Citygate located the top 10 stations and then expanded the search to the top 28.

As the map set shows, this instinct was correct. In the central area of the City in three clusters are 16 of the top 28 stations for workload demand, and **9** of the top 10. In the northern area, there are two clusters containing 5 of the top 28 stations for workload demand, and **1** of the top ten.

There are 7 other stations in the top 28, but they exist individually/distinctly in the central and southern areas and, as such, are not mapped. The importance of this clustering measure is that at peak hours of the day, a large area's worth of fire crews is likely busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response. When multiple units are added to fire stations it is to provide "reliever units" to high-incident demand stations.

4.2.3 Road Mile Coverage Measures

In addition to the visual representation of coverage provided by maps, the GIS software allows the miles of public streets covered at 4:00, 5:00, or 8:00 minutes to be measured.

The following tables provide these metrics to compare the existing normal coverage to congested coverage in each area of the City.

Table 10—LAFD North: Road Mile Coverage – First-Due and ERF

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	3936.98	2818.65		**1118.33**
		(72% of total public miles)		
		2818.65	1146.55	**1672.1**
			(41% of uncongested ERF)	
4:00-Minute First-Due	3936.98	2323.2		**1613.78**
		(59% of total public miles)		
		2323.2	1347.23	**975.97**
			(58% of uncongested first-due)	
5:00-Minute First-Due	3936.98	3385.2		**551.78**
		(86% of total public miles)		
		3385.2	2544.51	**840.69**
			(75% of uncongested first-due)	

Table 11—LAFD Central: Road Mile Coverage – First-Due and ERF

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	4399.34	3588.61		**810.73**
		(82% of total public miles)		
		3588.61	2307.16	**1281.45**
			(64% of uncongested ERF)	
4:00-Minute First-Due	4399.34	3353.33		**1046.01**
		(76% of total public miles)		
		3353.33	2386.43	**966.9**
			(71% of uncongested first-due)	
5:00-Minute First-Due	4399.34	4056.83		**342.51**
		(92% of total public miles)		
		4056.83	3568.7	**488.13**
			(88% of uncongested first-due)	

Table 12—LAFD South: Road Mile Coverage – First-Due and ERF

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	661.42	279.32		**382.1**
		(42% of total public miles)		
		279.32	142.03	**137.29**
			(51% of uncongested ERF)	
4:00-Minute First-Due	661.42	401.77		**259.65**
		(61% of total public miles)		
		401.77	327.73	**74.04**
			(50% of uncongested first-due)	
5:00-Minute First-Due	661.42	535.02		**126.4**
		(81% of total public miles)		
		535.02	473.54	**61.48**
			(89% of uncongested first-due)	

The current fire station spacing for first-due units at 4:00 minutes only covers 59 percent of the City's public road miles. The fire station spacing in the west central and northern area of the City is simply too great. However, at the fifth minute of travel time, coverage increases to 86 percent which, in Citygate's experience, is particularly good for a large, metropolitan City.

At present, traffic congestion—and more curvilinear streets rather than a right-angle grid system—outside of core downtown areas only slows travel time coverage by one percent for the fourth travel minute. However, the more expansive fifth minute of coverage, as it extends more to the edges of the City limits or hillside areas, is slowed by 11 percent.

As for multiple-unit ERF coverage for Schedule A at 8:00 minutes, coverage ranges from 82 percent in the central area, to 72 percent in the north, to 42 percent in the south. Given the demands for service in the central area, the 82 percent coverage is particularly good for a major metro location. Adding a small number of resources in the north will improve the ERF in that area. As for the southern area, coverage is only reduced due to the Battalion Command team being located

farther inland. There is not a serious building fire rate closer to the ocean that would justify adding another Battalion Command Team or moving Battalion 6 from Station 49 in the middle harbor.

4.2.4 Added Coverage Scenarios

Given the Engine and Battalion Command Team gap identified in the Northern area, the next three maps model the benefit of adding coverage, or lack thereof.

Map Series Scenario 1a & 1b – Central and North Area Highest Incident Demand Locations – 4:00- and 5:00-Minute Travel

These maps measure the addition of an engine in the east side of the northern area near the intersection of Woodman and Roscoe in Panorama City. This location is west of SR-170, a little south of the SR-170/I-5 interchange, and is at the intersection of two major prime arterials which will allow an added engine to route into farther away neighborhoods more quickly. As such, this location test does the best job of filling in the engine company gap at both 4:00- and 5:00-minutes of travel time. There remains some uncovered area to the northeast, but if the station is placed any further in that direction, north coverage is lost to the south.

The added coverage is shown in two views. The "a" view includes overlapping coverage with existing engine companies. The "b" view is the added coverage for only the test location against the outside boundary line of the entire gap area. The added Engine would increase coverage by 51.7 miles at a travel time of 4:00 minutes, or up to 55.23 miles at a travel time of 5:00 minutes. The remaining gap is between the fifth and sixth minute of coverage from adjoining stations 77 and 98. Given the added coverage in an area that is difficult to serve quickly, the added engine would be beneficial.

Map Scenario 2 – Add a Battalion Command Team in the North Area

Given the significant Battalion Command Team coverage gap in the North between stations 73, 100, and 90, this map shows the significant benefit of adding a Chief at Station 100, located at 6751 Louise Avenue, Van Nuys. Almost 100 percent of the underserved road miles at an 8:00-minute travel time are covered in this area southeast of Van Nuys Airport. Note: Station 114 on the map is inside the working airport property and is the aviation base for LAFD aircraft. As such, it is not a typical neighborhood fire station.

4.2.5 GIS Mapping Findings

Finding #2:	The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3:	Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.
Finding #4:	Given that the current fire station plan provides 5:00-minute travel time coverage to 88.7 percent of public streets City wide, using a 5:00-minute travel time goal to physically space fire stations across the City's very diverse geography is effective. The incident workload assessment in this study evaluates the needed units per station.
Finding #5:	The northern service area needs one additional Battalion Command Team at Station 100 to improve command coverage for more serious incidents.
Finding #6:	One additional fire station with an engine is needed northeast of Station 81, as modeled in Scenario Map 1a and 1b (**Volume 2—Map Atlas**).

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