Lahaina Fire Incident Analysis Report

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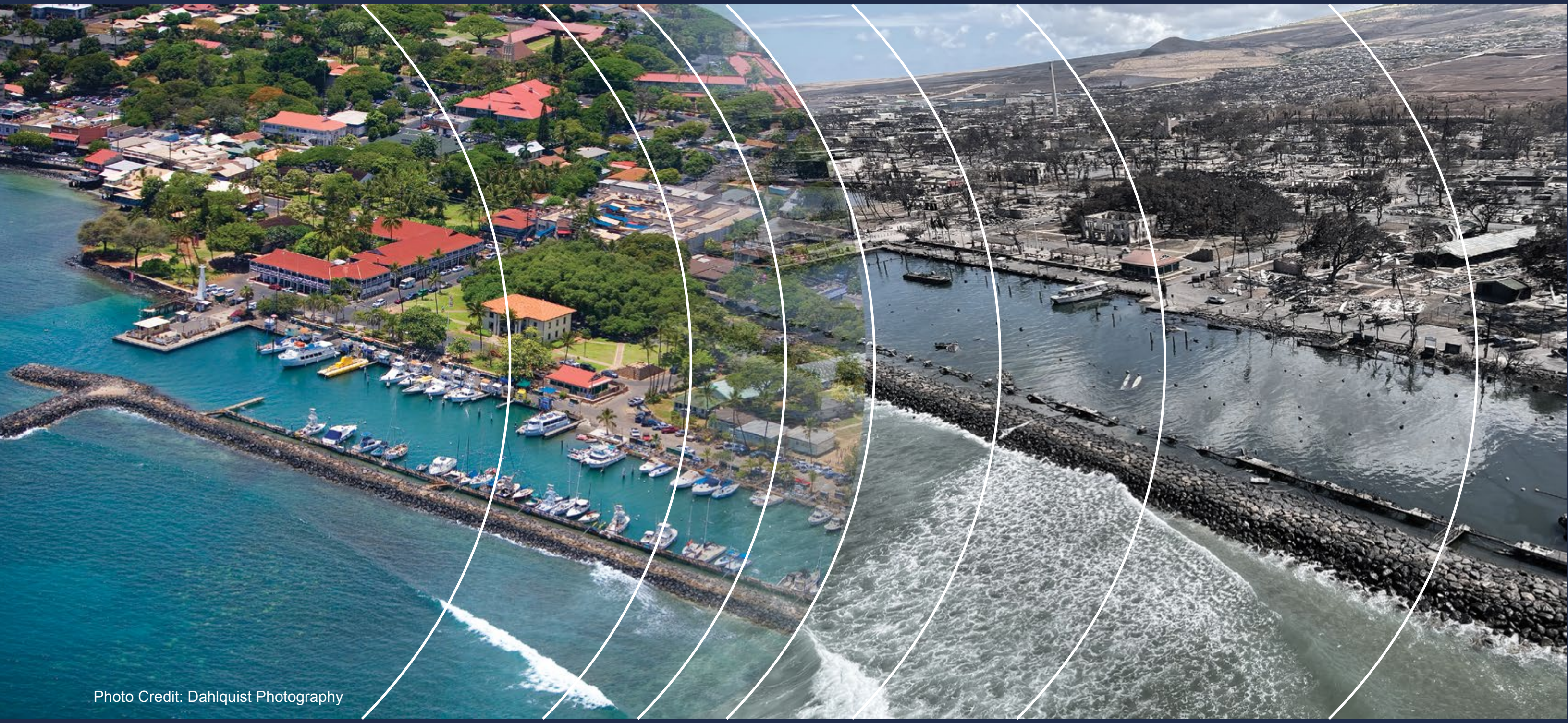

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Abstract

This document is the second in a series of three (3) reports commissioned by the Hawai‘i Department of the Attorney General (DOAG) to provide an independent review of the tragic fire that destroyed much of Lahaina, Hawai‘i, on August 8-9, 2023.

Using a systems analysis methodology, the *Lahaina Fire Incident Analysis Report* presents relevant background information; discusses weather, fuel, and infrastructure conditions; describes communication, incident management, fire suppression, and evacuation efforts; and details the impact of the fire on Lahaina’s built environment. It also considers these factors in the context of the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy).

This Phase Two report incorporates science- and evidence-based analyses with information from FSRI’s fire dynamics research, local subject matter experts, industry standards and best practices, and the collective experiences of FSRI’s research team. This report does not include an analysis of recovery efforts or the fire’s cause and origin, which is being investigated by the County of Maui with assistance from the United States Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF).

This report focuses on the events that occurred prior to, during, and immediately following the Lahaina PM fire, such as preparedness efforts, weather and its impact to infrastructure, and other fires occurring on Maui for the time period beginning at 14:55 (2:55 p.m. HST) on August 8, 2023, and concluding at 08:30 (8:30 a.m.) on August 9, 2023. Data from the three (3) other Maui fires is also included in specific sections to give context to the situation in Lahaina.

Keywords: Maui fire, wildland-urban interface, WUI, Lahaina Fire, grassland fire, urban conflagration

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

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EXECUTIVE SUMMARY

This document is the second in a series of three (3) reports commissioned by the Hawai‘i Department of the Attorney General (DOAG) to provide an independent review of the tragic fire that destroyed much of Lahaina, Hawai‘i, on August 8-9, 2023.

The first (Phase One) report in this series, *Lahaina Fire Comprehensive Timeline Report*, was prepared by the Fire Safety Research Institute (FSRI) and released on April 17, 2024. It contains a complete timeline of the August 2023 fires, based on available information, and provides essential context for reading this report.

This second report (Phase Two), *Lahaina Fire Incident Analysis Report*, outlines FSRI's independent analysis of the events surrounding the fires. This report includes findings and recommendations pertaining to each topic analyzed.

The *Forward-Looking Report* (Phase Three) of this comprehensive independent analysis will help answer critical questions like, “How do we prevent this from happening again?” This final report in the series will have several discrete and interrelated components, including a standards of cover (SOC) analysis to assess the capabilities of the County of Maui Fire Department (MFD), a Community Risk Assessment (CRA) to analyze natural- and human-caused risks to Maui, a community risk reduction plan to help mitigate risk, and a review of fire and building codes.

With a focus on assessing the resources needed to effectively and sustainably address the Maui community's risk profile, Phase Three will provide a forward-looking report with detailed recommendations on how similar events might be prevented, along with ensuring a safe and effective response to limit the impact of future fires.

Using a systems analysis methodology, this Phase Two report presents relevant background information; discusses weather, fuel, and infrastructure conditions; describes communications, incident management, fire suppression, and evacuation efforts; and details the impact of the fire on Lahaina's built environment.

It also considers these factors in the context of the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy), whose tenets include 1) resilient landscapes, 2) fire-adapted communities, and 3) safe and effective risk-based wildfire response.

Phase Two incorporates science- and evidence-based analyses with information from FSRI's fire dynamics research, local subject matter experts, industry standards and best practices, and the collective experiences of FSRI's research team. Based on the comprehensive analysis, this report highlights key findings and recommendations.

This report does not include an analysis of recovery efforts or the fire's origin and cause, which is being investigated by the County of Maui with assistance from the United States Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF).

With this second phase of comprehensive independent review of the tragic fires that impacted Maui in August 2023, FSRI's overarching goal is to ensure similar events are prevented in the future: across Maui Nui (the islands that make up the County of Maui, including Maui, Moloka‘i, Lāna‘i, Kaho‘olawe, and the islet of Molokini), throughout the State of Hawai‘i, and in many other vulnerable communities around the globe.

There were four distinct fires that took place on Maui between August 8-9, 2023: the Olinda and Kula fires (Upcountry fires), Lahaina AM/PM fire, and Pulehu fire. The Lahaina PM fire is the incident that caused the majority of the destruction to Lahaina, and is the main focus of this report.

EXECUTIVE SUMMARY

The destruction caused by the August 2023 fires in the County of Maui, Hawai‘i, resulted from a complex interaction of contributing factors with root causes going back years. It is vital to reiterate, as demonstrated throughout this report, that no single factor, or set of factors, is directly responsible for the tragic outcome.

While much of Hawai‘i, including Maui, has a relatively high risk of wildfire occurrence, it appears the perception of this risk—at the local, state, and national levels—is not always aligned with the actual, growing threat wildfires pose to the population and built environment. This gap between risk perception and reality seems to have contributed to a relative underinvestment in wildfire prevention, preparedness, and response capacity over the years.

Despite the limitations of the weather forecasting data available for Maui during August 2023, forecasts predicting severe and “critical fire weather” were accurately developed and widely communicated to both the public and response agencies prior to the August 8-9, 2023, fires. Until the wildfires started in Olinda, Lahaina (AM fire), and Kula on August 8, 2023, it appears these forecasts did not cause residents much alarm, or spur meaningful preparedness actions by local officials, even as people began feeling the strengthening winds across Maui Nui.

Vegetation played a crucial role in the Lahaina PM fire. The availability of vegetative fuel on the landscape allowed the fire to ignite and spread across unmanaged lands and into the built environment. Mitigating the risk of extreme fire behavior and rapid spread requires vegetation management in both wildland and urban areas. Additionally, certain types of well-watered and maintained ornamental vegetation may have limited fire spread in the built environment.

The readiness and performance of any jurisdiction’s underlying critical infrastructure (e.g., roads, water and sewer, electricity, and telecommunications) are key factors that contribute to the resiliency of the overall built environment system when impacted by a major fire or other disaster event.

In the hours leading up to the Lahaina AM and PM fires, severe winds and extreme fire weather significantly degraded infrastructure systems across the County of Maui. The impact of the initial fire and resulting urban conflagration (a large, destructive fire that spreads rapidly through a community, often beyond natural or artificial barriers) further affected the already-deteriorating infrastructure, especially in the built-up areas of Lahaina.

Community planning and zoning regulations and enforcement also play vital roles in matching infrastructure to the surrounding built environment.

Timely and consistent communications are integral to wildfire management, connecting all three (3) tenets of the National Cohesive Wildland Fire Management Strategy. Clear and accurate information from trusted sources is crucial during incidents for overall safety, operational effectiveness, and community-related actions.

The preparedness and actions taken (or not) during the Lahaina PM fire, by both the public and response agencies, were significantly affected by how key communications were handled, including Red Flag warnings, notices of potentially extreme fire behavior, and evacuation plans.

Incident management is essential for a coordinated and effective wildfire response, aligning with the Cohesive Strategy’s goals of protecting lives, property, and natural resources through timely communication and risk management.

EXECUTIVE SUMMARY

The incident management organizations for the Maui Police Department (MPD), County of Maui Fire Department (MFD), and Maui Emergency Management Agency (MEMA) faced significant challenges in planning and executing emergency response functions during the August 2023 fires.

On August 8, 2023, while the MFD was also fighting wildfires in other locations across the island of Maui, fire suppression operations initially began on a fast-moving vegetation fire fanned by hurricane-force winds in an open field at the east end (mauka) of Lahaina.

Resources assigned to this fire, dubbed the “Lahaina AM fire,” seemed to be making progress to contain the fire in hot, dry, and windy conditions. However, this fire would go from being reported as extinguished to a fire in the same area being reported at 14:55. This fire, dubbed the “Lahaina PM fire,” burned over firefighters and residents, and ultimately, destroyed Lahaina several hours later.

Fire suppression operations were completely overwhelmed by the fast-moving urban conflagration. MFD resources were limited in capabilities due to: two (2) other Upcountry fires (Olinda and Kula) also drawing on the finite resources on the island, electrical wires and downed utility poles blocking access, no hydrant pressure, and other complicating factors. With nowhere else to turn for more structural firefighting resources, the MFD was resourceful with what they had and adapted the best they could.

Rapid evacuation of a community is difficult in the best of circumstances. With the addition of severe weather like what was experienced on August 8, 2023, it becomes especially difficult. This is exactly what was experienced during the Lahaina PM fire. The high winds drove rapid fire spread, necessitating swift and effective actions from the MPD and MFD.

The complexities of the evacuation were compounded by infrastructure failures and the dynamic nature of the emergency.

The Lahaina PM fire’s rapid spread to residential, commercial, and industrial structures, ultimately caused it to become an urban conflagration. The speed of the fire’s progression was influenced by various factors. The Red Flag Weather, especially the hurricane-force winds blowing downslope into a densely developed Lahainaluna neighborhood, quickly accelerated the fire’s progression to the coastline.

Resource limitations are a recurring theme throughout this report and were a principal contributor to persistent challenges with prevention, preparedness, and response capacity before and during the August 2023 fires.

The entire FSRI team joins the survivors of this tragedy in mourning the loss of Maui residents and stands in support of their families, friends, neighbors, and community.

1.0 INTRODUCTION

With this second phase of the comprehensive independent review of the tragic fires that impacted Maui in 2023, FSRI's overarching goal is to ensure similar events are prevented in the future: across Maui Nui, throughout the State of Hawai‘i, and in other vulnerable communities around the globe.

Phase One of this work, the *Lahaina Fire Comprehensive Timeline Report*, was released on April 17, 2024, and showed a comprehensive timeline of relevant events, based on available information, that occurred from August 8-9, 2023.

This document, the *Lahaina Fire Incident Analysis Report*, is Phase Two of the series and contains a detailed analysis of the facts presented in Phase One against current policies, procedures, and evidence-based best practices for the period from August 8, 2023 (14:55 HST), to August 9, 2023 (08:30 HST), along with preparedness efforts that occurred before August 8, 2023.

This report does not include an analysis of recovery efforts or the fire's origin and cause, which is being investigated by the County of Maui with assistance from the United States Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF).

Phase Three is a forward-looking report and will help answer critical questions like, “How do we prevent this from happening again?” Beyond providing additional detail on recommendations arising from findings specific to the August 2023 fires—identified in the Phase Two analysis—Phase Three will comprehensively address strategic, policy, and community-related considerations of vital importance to residents of Maui Nui, and across the State of Hawai‘i.

Phase Three will include several discrete and interrelated components, including a standards of cover (SOC) analysis to assess the capabilities of the MFD and a review of fire and building codes. The report will also include a Community Risk Assessment (CRA) to analyze natural- and human-caused risks to Maui Nui, as well as a community risk reduction plan to help mitigate these risks.

From the very start of this comprehensive independent analysis, FSRI has desired to work collaboratively with state, county, and federal officials, community members, and other interested parties. We appreciate the cooperation received from so many individuals/organizations and sincerely hope for continued collaboration in Phase Three.


Lahaina Fire Comprehensive Timeline Report

Research Institutes

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Photo Credit: Dahlquist Photography

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1.0 INTRODUCTION

Fire is a complicated phenomenon under any circumstances. The August 2023 fires on Maui occurred in a complex open system with myriad variables, all interacting in ways that are challenging to accurately specify, even with the best-available science.

The devastation caused by the Lahaina PM fire was ultimately the result of a complex chain of events years in the making; there was no single factor, or set of factors, that led to the tragic outcome. The systemic issues contributing to the fatal events of August 8-9, 2023, stem from a widespread lack of resources and investment that spanned multiple domains, including:

- Policy Activity and Norms
- Weather Alerts and Action
- Vegetative Fuels and Management
- Infrastructure, Community Planning, and Zoning
- Transportation
- Communications
- Incident Management
- Fire Suppression
- Evacuation

There was no single entity that controlled, or could have controlled, all of the system inputs/outputs and relationships that impacted the Lahaina PM fire's outcome.

Many of the challenges faced by responders to this incident have been documented and studied in other events, usually without clear, easy, or simple solutions. Moreover, the complex nature of the operating environment can cause a "solution" for one (1) facet of the identified problem sets to trigger unforeseen or unintended negative consequences elsewhere in the broader system. This potential discord arises from the complex interaction of the many factors involved and the systemic challenges encountered.

The Fire Safety Research Institute (FSRI), part of UL Research Institutes (ULRI), is a leading independent safety science organization with a global footprint and a lineage dating back to the formation of Underwriter's Laboratories (UL) in 1894. Fire safety was an initial catalyst for the formation of UL, and FSRI was the first research institute to be incorporated within ULRI. FSRI is widely recognized as the premier fire safety science organization in the world. Drawing on the resources of ULRI's global network of scientists and safety professionals, FSRI is uniquely positioned to apply science to complex real-world challenges.

FSRI's analytical approach in Phase Two is informed by the tenets of systems theory and the need to view what happened on Maui in August 2023 through a holistic and multifaceted set of lenses.

1.1 Systems Analysis Methodology

The methodology used to comprehensively analyze the August 2023 Maui wildfires, and more specifically, the Lahaina PM fire, requires a systems analysis approach. FSRI's analysis examines the overall prevention, preparedness, and effectiveness of the operational system.

1.1 INTRODUCTION

This approach is necessary due to the complex nature of wildfires, especially those leading to urban conflagrations. It considers the interplay of environmental conditions, human activities, policies, and norms. Wildfires—especially those that lead to urban conflagrations as occurred in Lahaina—are complex events influenced by a multitude of interconnected factors.

Addressing any single factor in isolation is insufficient. Considering the complex interactions and cumulative effects of these factors is a more effective way to adequately understand what took place and how the preparedness, prevention, and response systems performed.

A systems approach (a holistic and interdisciplinary method for understanding and solving complex problems) enables a comprehensive understanding of events and system performance, leading to recommendations and subsequent actions that address root causes, reduce risk, and improve future fire outcomes.

1.1.1 Framework for Analysis

The National Cohesive Wildland Fire Management Strategy (referred to as the Cohesive Strategy) provides a reference point that can be used to analyze the August 2023 Maui wildfires, and more specifically, the Lahaina PM fire. The vision of the Cohesive Strategy is: “To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and collectively, learn to live with wildland fire.”[1]

The Cohesive Strategy establishes a widely accepted, integrated wildfire management approach[2] that facilitates a comprehensive understanding of this incident’s multifaceted causes and impacts. Every Community Wildfire Protection Plan (CWPP) in Hawai‘i (including those that cover the impacted areas on Maui) were specifically developed in alignment with the Cohesive Strategy, for example, the Western Maui[3], South Maui[4], and Leeward Haleakalā[5] Community Wildfire Protection Plans.

Analyzing contributing factors within the context of the Cohesive Strategy facilitates alignment between local, state, and national systems, policies, and best practices. It was used to identify areas of focus for deeper analysis and establish criteria for evaluating wildfire preparedness, prevention, and response efforts.

1.1.2 General Topics within Phase One[6] Requiring Further Study

The Cohesive Strategy categorizes the broad system of components that determine wildfire outcomes into three (3) major areas of focus:

Resilient Landscapes
Landscapes, regardless of jurisdictional boundaries, are resilient to fire, insect, disease, invasive species, and climate change disturbances, in accordance with management objectives.

Fire-Adapted Communities
Human populations and infrastructure are as prepared as possible to receive, respond to, and recover from wildland fire (that impacts communities).

Safe, Effective, and Risk-Based Wildfire Response
All jurisdictions, responding in all land types, participate in making and implementing safe, effective, and efficient risk-based wildfire management decisions.

1.1 INTRODUCTION

These focus areas make up the overarching goals of the Cohesive Strategy, with numerous management options within each. The Cohesive Strategy encourages the use of the best available science to inform the work within each area, underscoring the need for consistent and timely communication and coordination among all efforts.

The 2023 Cohesive Strategy Addendum[7] added several critical emphasis areas and key challenge priorities, including:

- Climate Change
- Diversity, Equity, Inclusion, and Environmental Justice
- Community Resilience
- Workforce Capacity, Health, and Well-Being
- Science, Data, and Technology

1.1 INTRODUCTION

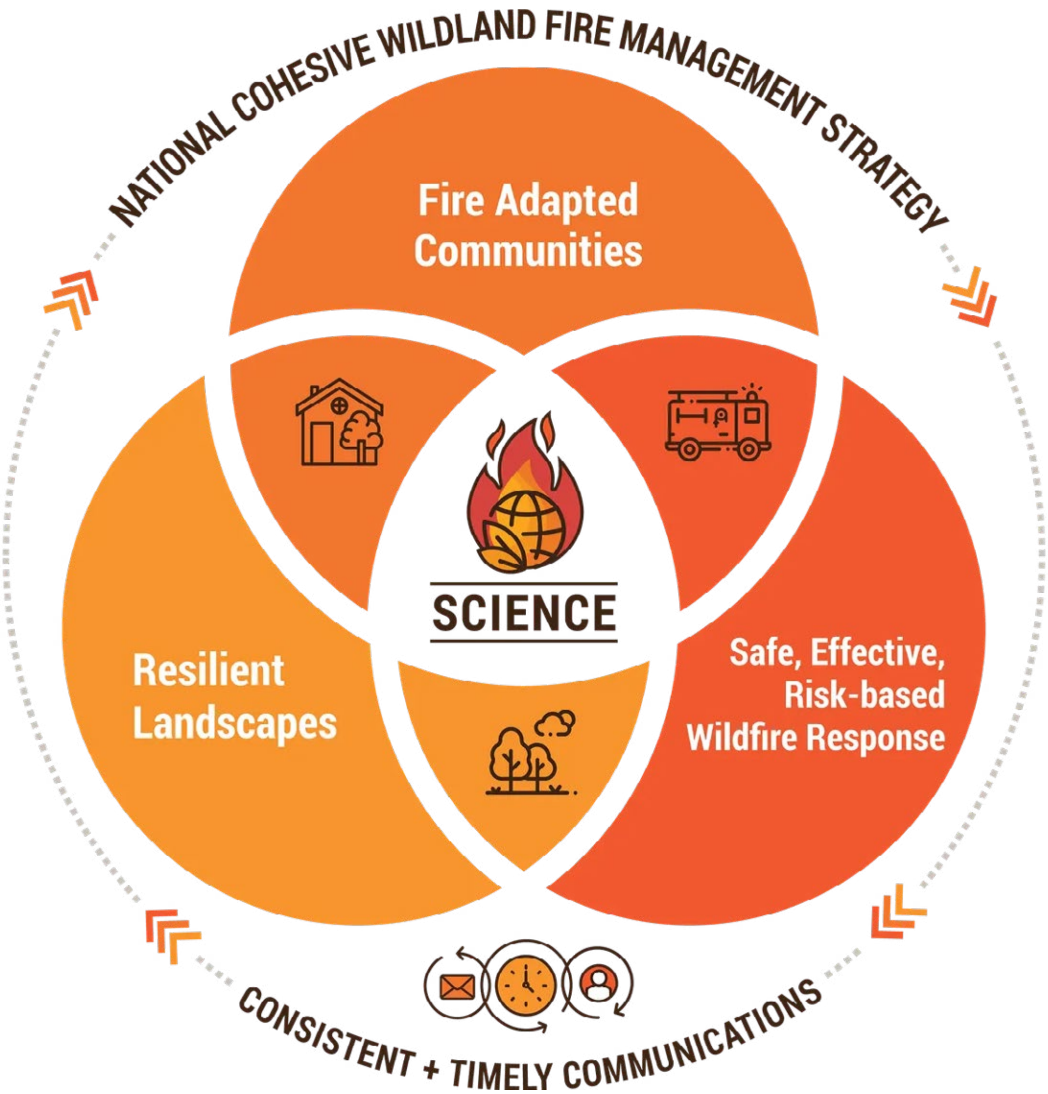


Figure 1.1.2.1 National Cohesive Wildland Fire Management Strategy (NCWFMS). Source: Wildland Fire Leadership Council.

National Cohesive Wildland Fire Management Strategy

The Cohesive Strategy graphic (Figure 1.1.2.1) represents these three (3) tenets and their over-arching goals. Each of the goals, and subsequent actions taken to address them, are inextricably intertwined and result in positive advancement of the other two (2) goals. All actions are informed by the best available science, information, and technology, which is placed at the center.

During Phase One, several system components were identified for further analysis, focusing on organizational leadership, preparedness, prevention, and response. In this report, these components were clustered into the Cohesive Strategy tenets to which they belong.

1.1 INTRODUCTION

1.1.3 Wildfire Resilient Landscapes

The Resilient Landscapes goal of the Cohesive Strategy focuses on 1) the threats to natural resources caused by wildfire and other disturbances and 2) the measures necessary to reduce fuels that contribute to ignitions and rapid wildfire spread. It aims for landscapes that are resilient to fire and other pressures in order to prevent, survive, and recover from wildfire.

The goal states, *"Landscapes, regardless of jurisdictional boundaries, are resilient to fire, insect, disease, invasive species, and climate change disturbances, in accordance with management objectives."*

The system component analyzed in Phase Two is:

- Vegetative Fuel

1.1.4 Fire-Adapted Communities

The Fire-Adapted Communities goal of the Cohesive Strategy focuses on the human system of laws, plans, budgets, and programs, as well as the safety and preparedness of the built environment and its residents.

The goal states, *"Human populations and communities are as prepared as possible to receive, respond to, and recover from wildfire (that impacts communities)."*

The system components analyzed within Phase Two include:

- Infrastructure (road networks, planning and zoning, water, and electrical)
- Evacuation
- Built Environment Impact on Fire Progression

Each of these topics includes a discussion of relevant policies.

1.1.5. Safe, Effective, and Risk-Based Wildfire Response

The Safe, Effective, and Risk-Based Wildfire Response goal of the Cohesive Strategy focuses on informed decision-making, risk management, and effective communication and coordination to enhance safety and efficiency in wildfire response. It aims to prevent injury and loss of life, while quickly and safely minimizing impacts of fire incidents.

The goal states, *"All jurisdictions, responding in all land types, participate in making and implementing safe, effective, and efficient risk-based wildfire management decisions."*

The system components analyzed in Phase Two include:

- Weather Forecast and Sensemaking
- Communications and Coordination (pre-incident and during)
- Incident Management
- Fire Suppression Preparations and Operations
- Evacuation Processes

Cohesive Strategy icons are embedded throughout the report to highlight where each section of the analysis falls within the Strategy's tenets and goals.

1.1 INTRODUCTION

1.1.6 Policy Analysis

Each of the identified system components nested within the Cohesive Strategy framework is examined within this report. A detailed review of each component as it relates to the Lahaina PM fire is provided, discussing its role within the broader system and its specific circumstances and contributions to the incident outcomes.

Each system component is reviewed for comparison to county and state policies and procedures, and, where appropriate, to nationally recognized, evidence-based best practices. Where applicable, an examination is provided of what the policy states and how that compares with the actions taken by the organizations.

Findings are provided both incident-wide and per organization, as appropriate. Where immediate actions to reduce risk are most critical, recommendations are also provided. Recommendations requiring more extensive planning will be further detailed and supplemented in Phase Three.

1.1.7 Resident Observations and Experiences

As mentioned in the Phase One report (pages 28-29), FSRI researchers engaged in technical discussions (TDs) with residents after the fire. Although researchers had discussions with more than 100 residents who lived within the burn perimeter, or just outside it, a smaller number agreed to answer specific questions related to the fire.

The limitations of the data are that it represents a small group of individual experiences in a specific location. Having TDs with groups of individuals in all the areas impacted by the fire was nearly impossible due to many surviving residents and visitors leaving the island, residents relocating to other areas of Maui that FSRI investigators did not visit, or individuals being unwilling to answer questions.

In several cases, there was also a language barrier that hindered accurate sharing of information. The data from these discussions will be shared throughout the report to provide context to some of the sections. The complete resident technical discussion data set is provided in Section 6.3 of the Appendix.

1.1.8 Findings and Recommendations

At the conclusion of each section are “Findings and Recommendations” pertaining to the section’s topic. Findings are specific areas of interest that impacted the pre-event conditions and activities and incident operations. They can be related to policies, procedures, guidelines, decisions, organizations, actions, and equipment. A finding can also be related to information that is missing or incomplete.

Recommendations are connected to findings. They include information on how to improve the condition mentioned in the finding. In some cases, there may be several recommendations connected to one (1) finding, and some findings may have no recommendations. The findings and recommendations appearing at the end of each section can also be found in Section 6.1 of the Appendix.

In addition, resource and funding limitations will be noted throughout this report. While government funding is critical to mitigating wildfire risks, the ultimate solution must be rooted in establishing interorganizational partnerships that span the breadth of entities covered in this report and work collaboratively to establish policies, procedures, and guidelines designed to protect the community.

1.1.9 Information Sources

Information and data was gathered from a variety of sources. Consistent with Phase One, requests for information from the County of Maui were made via subpoena. Details around the requests for information can be found in Section 6.4 of the Appendix.

Hawaiian Electric, National Weather Service (NWS)-Honolulu Office, and the State of Hawaiʻi also provided information used within the analysis. Information related to planning, codes, and standards was gathered from the State of Hawaiʻi and County of Maui webpages. Specific websites are identified throughout the report.

1.1.10 Report Formatting Details

Throughout the report, time is identified in a 24-hour format that includes two-digits for hour, colon/separator, and two (2) digits for minutes (i.e., 14:00 is 2:00 p.m.).

Points of Reference:

- Pre-fire: Events occurring before 06:30 HST on August 8, 2023
- Lahaina AM fire: Fire occurring August 8, 2023, between 06:34 and 14:17 HST
- Lahaina PM fire (Kuʻialua fire): Fire occurring August 8-9, 2023, between 14:55 and 06:00 HST

Maps are used extensively throughout the report to display the location of landmarks, fire progression, and general and specific incident operations orientation. Many of these maps include the Lahaina PM fire perimeter and interior burned areas created by FSRI investigators, using data collected from ground-level observations.

This fire perimeter differs in certain areas, and excludes additional unburned areas, compared to the perimeter mapped by the Wildland Fire Interagency Geospatial Services Group. See Figure 1.1.10.1 for a comparison of the two Lahaina PM fire perimeters.

1.1 INTRODUCTION

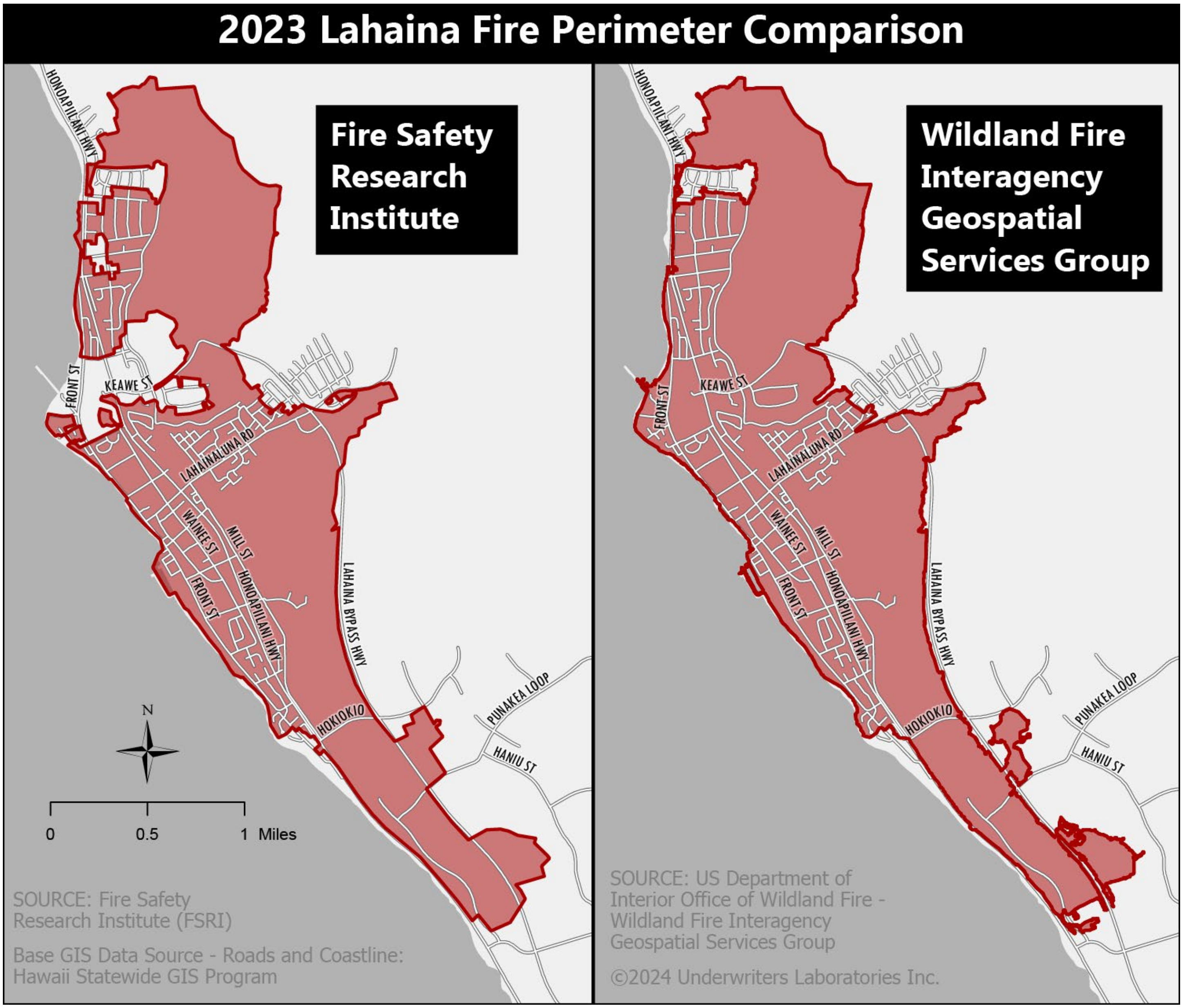


Figure 1.1.10.1 Comparison of the Lahaina PM fire perimeters generated by FSRI and Wildland Fire Interagency Geospatial Services Group.

1.2 INTRODUCTION

1.2 Limitations of Analysis

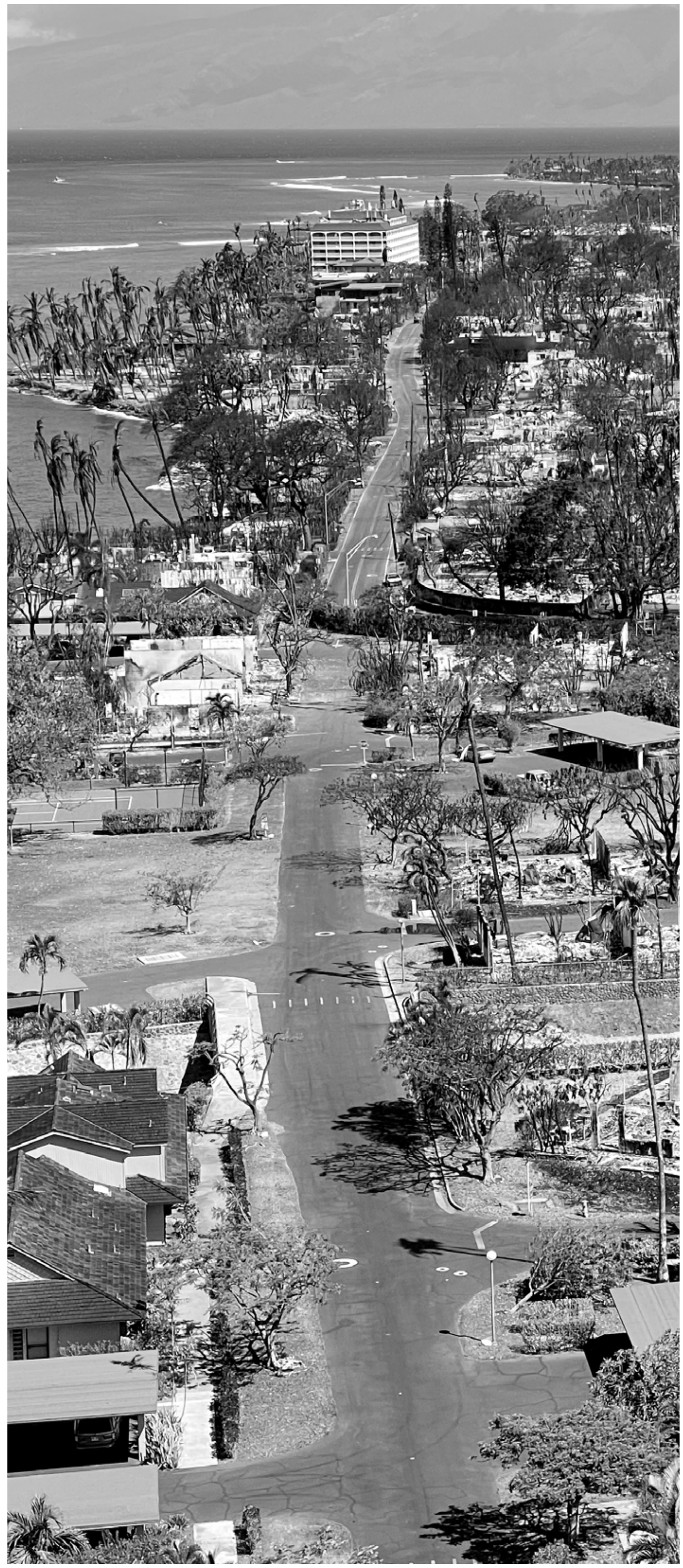
Examining every part of a wildfire-initiated urban conflagration's contributing factors is challenging due to the complexity and interconnectivity of variables. Applying a systems approach is valuable and effective because it allows for a better understanding of the various factors and conditions that contributed to this event. It identifies multiple influences, reveals interconnections, and helps identify key leverage points for future intervention.

However, this approach has limitations due to complexity and scope, data, and time constraints, and is resource intensive. The vast range of factors and their interdependencies make it difficult to capture every detail and fully understand all interactions.

Accurate and comprehensive data for every component can sometimes be lacking and can potentially lead to intermittent and/or unintentional gaps in the analysis. Some of the data gaps are due to the County of Maui being unable to produce the data requested, or difficulties experienced extracting usable data from some file formats provided by the County of Maui. Known data gaps will be identified throughout the report. The clear framework of the Cohesive Strategy ultimately helps focus and define the boundaries of the analysis.

This analysis includes information gathered from before the morning of August 8, 2023. Not included within this report are efforts which have begun at the national, state, and county level to address some of these issues.

Despite the limitations, a good faith effort was made to account for and examine major factors that contributed to the catastrophic wildfire events that occurred on Maui in August 2023.



2.0 Analysis of Background

2.1 Statewide Background

During the analysis of the August 2023 wildfires on Maui, a broader statewide set of norms and context emerged, serving as an essential backdrop for this report. This statewide context plays strongly into the practices and conditions observed on Maui during this time, which is a microcosm of the general set of circumstances, drivers, and patterns of wildfire management across Hawai‘i. Acknowledging this statewide context provides deeper insight into the nature of the Maui incidents and their systemic influences.

Conducting a statewide assessment of wildfire norms, attitudes, available information, and practices is integral to utilizing the Cohesive Strategy as a tool for analysis and future action. It provides a comprehensive understanding of the current social and biophysical landscape of wildfire management in Hawai‘i, and reveals statewide conditions that significantly influenced fire patterns, decision-making, and outcomes in Lahaina. Laying out the policy, funding, and social attitudes that influence the entire system creates a foundation on which all other system factors can be better understood and evaluated for future change.

2.1.1. Statewide Risk

Much of Hawai‘i, including Maui, is fire-prone. Hawai‘i has a very high risk of wildfire—higher than 88% of other U.S. states.[8] Lahaina has a 98% higher risk than the rest of the country.[9] Other parts of Hawai‘i also have extreme risk, for example, Waikoloa Village on the island of Hawai‘i has 100% higher risk than any other place in the U.S., and is not the only community in Hawai‘i facing extreme risk of wildfire.

This context is crucial for understanding that the wildfire challenges faced on Maui are not unique to the island, but are indicative of a high-risk situation that exists statewide, with regions of high-to-extreme risk present on every island.

This is significant when considering that extreme fire behavior was also observed on other Hawaiian Islands under the same conditions that fueled the Maui fires. While the catastrophic loss of life and property on Maui understandably dominated news coverage, three (3) additional wildfires also broke out on the island of Hawai‘i on the same day (North Kohala, South Kohala, and Waimea).[10]

Wildfire risk and incidents have been growing across Hawai‘i over the last several decades, with 94% of Hawaii’s communities sitting along the wildland-urban interface (WUI)—the area where human development and undeveloped wildland meet—and are vulnerable to human-caused wildfire ignition and rapid fire spread.[11] [12] [13] Human-caused ignitions, large swaths of unmanaged fire-prone vegetation, and community design and infrastructure that are not adapted to the high level of wildfire threat are unmitigated statewide issues.

Around the North Kohala area of the island of Hawai‘i, the Akoni Pule Fire,[14] continued burning for days after the Lahaina PM fire, and a fourth fire on the island (South Point) began in the following days, all driven by similar low humidity and high winds that were gusting to 80 mph. These conditions prompted several evacuations on the island of Hawai‘i. While less publicized, these fires caused considerable damage to structures, lands, and community infrastructure, including the destruction of an auxiliary building of the Mauna Kea Beach Resort.[15]

Fire occurrence on the island of Hawai‘i under the same conditions is highlighted here to acknowledge

2.1 ANALYSIS OF BACKGROUND

the ongoing statewide threat and the multi-island impact of the weather and fire events on August 8-9, 2023. However, this is not unique.

In 2018, when Hurricane Lane passed by Hawaiʻi, it brought high winds and low humidity to the state, exacerbating the existing drought conditions. See Section 2.2.4 for additional information on this event. Also in 2018, four (4) separate fires ignited simultaneously on Maui and Oʻahu,[16] and one (1) followed in the subsequent days on the island of Hawaiʻi.[17]

Each year, Hawaiʻi experiences an average of 0.5% of its land burning, a statistic that is on par with the most fire-prone states in the U.S.[18]

2.1.2 Perception of Wildfire Risk within Hawaiʻi

Historically, the majority of Hawaii's native plants and ecosystems were not dependent on, nor adapted to, wildfire. Unlike other places with frequent wildfire occurrences that have taken place for millennia, Hawaii's wildfire risk grew substantially in less than three (3) generations.

Over the last 20 years, much has been documented, published, and initiated across Hawaiʻi by those most directly and regularly dealing with wildfire threats and impacts. Efforts to raise awareness of the growing issue and reduce risks include:

- Wildfire Preparedness Campaigns[19]
- Briefings to Elected Officials[20]
- Community Wildfire Protection Plans[21]
- Local and state natural resource management plans that acknowledge and seek to address wildfire threats[22]
- Academic and media publications about the increasing threats, fire ecology, the changing landscape leading to wildfire risk, and fire weather[23]

However, widespread misconceptions of wildfire risk in Hawaiʻi persisted.

Limited, but notable, exceptions to a broader underestimation of risk were identified in a study conducted in October 2023.[24] The study, conducted by the Hawaiʻi Wildfire Management Organization (HWMO), interviewed and held workshops with more than 120 fire, emergency, and forestry managers across the state. The summary of findings revealed many residents and professionals living and working in fire-prone areas have long recognized wildfire risk and sought or initiated action.

Despite the documented and diverse efforts by many to mitigate wildfire risk and advocate for funding to aid these efforts, they have encountered challenges to mitigating risk at scale due to inadequate political and financial support. For example, as long ago as 2007,[25] a memo submitted by the former Governor Linda Lingle noted an increase in wildfires, a "lack of public investment for wildfire prevention and pre-suppression," and the Department of Land and Natural Resources' (DLNR) need for an adequate budget, yet DLNR has continued to struggle to secure adequate funds to meet the wildland fire risk and operational needs of Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW)–managed lands.

Later, in both 2018 and 2019, the Pacific Fire Exchange fire science communication program, led by University of Hawaiʻi, Mānoa, and HWMO, organized and hosted field trips for Hawaiʻi state legislators to orient them to the growing threat of wildfire and the needs for funding to support proactive mitigation and prevention.

A more recent memo sent to the legislature in January 2023 from the Hawaiʻi Governor's office also noted the need for increased State investment and DLNR's limited resources, indicating that money

2.1 ANALYSIS OF BACKGROUND

and lack of staff are the program's "greatest obstacle" in achieving its mandates.[26]

Additionally, the West Maui Community Wildfire Protection Plan (2014),[27] a collaboratively developed vegetative fuels management mapping and prioritization report for Maui (2019),[28] and a County of Maui Cost of Government Commission Report on Wildfire Prevention and Cost Recovery on Maui (2021)[29] each underscored the need for increased investment, policy, and regulation toward wildfire readiness, yet none resulted. Without funding and policy support, people in the sectors and communities working to reduce wildfire risk have been limited to actions they could take within restricted budgets, via competitive federal grant competitions, or volunteerism.

These issues were highlighted in recent articles that became Pulitzer Prize finalists for their in-depth investigation into the withholding of funding,[30] and were also presented at the 2023 Hawai'i Fire Chiefs Association annual conference as ongoing challenges.[31]

Historically, the counties and their cooperators have been largely successful in managing wildfire events, despite having limited resources. In 2007 and 2008, the first three (3) Community Wildfire Protection Plans were developed on the island of Hawai'i and Maui, with additional plans developed for every other high-risk area across the state since that time.[32]

Hazard assessments were completed and priority projects were identified, but implementation was limited due to lack of funding. Without exception, all of the plans prioritized community awareness, the management of vegetative fuels, ignitions from electric infrastructure, and firefighting capacity, access, and water.

Quantifying the value of fire prevention is a persistent challenge. The few projects that Hawai'i successfully implemented were primarily funded at low levels from competitive, small-scale national grant opportunities that were awarded project by project to practitioners, but were unable to achieve the breadth, scale, and continuity toward the priorities identified.[33] [34] [35] This may reflect a tendency against investing in proactive measures.

Similarly, having recognized the growing risk of wildfire, communities on the island of Hawai'i started organizing to take action as early as 2004. There were 16 nationally recognized National Fire Protection Association (NFPA) Firewise USA™ communities (which help raise awareness and organize at the community level to create fire-adapted communities through the implementation of defensible space standards) across Hawai'i by the time the August 2023 wildfires hit.

These communities include four (4) in the County of Maui, two (2) near the areas affected by the August 2023 wildfires, and six (6) near the fires that occurred on the island of Hawai'i on that same day.

A Joint Fire Science Program (JFSP) knowledge exchange program was started by the HWMO, University of Hawai'i, and United States Department of Agriculture (USDA) Forest Service in 2012 to increase the availability of regionally-specific fire science information in an effort to empower local fire and land management practitioners with Hawai'i-specific best practices.[36]

These programs and campaigns are cited to demonstrate there were many existing efforts to address Hawaii's growing wildfire risk before August 2023. However, these efforts were limited in scale and impact, as they only touched on a portion of the broader system necessary for wildfire safety and they were not institutionalized into broader governmental systems around funding and policy.

2.1 ANALYSIS OF BACKGROUND

These limited policies and investments, as well as the lack of widespread public knowledge/recognition of wildfire risk, meant the system as a whole was not able to keep pace with the increasing wildfire threat level to Hawaiʻi communities.

2.1.3 National Perception of Hawaii's Wildfire Risk

An inaccurate perception of a relatively lower wildfire risk in Hawaiʻi has also been prevalent at the national level. Hawaiʻi typically receives less wildfire funding (proportionally) compared to other states, particularly those in the western U.S., like California, Colorado, and Oregon, whose risk levels are similar.

While the number of acres that burn annually in Hawaiʻi may be smaller when compared to larger states, Hawaiʻi is on par with the most fire-prone states in the country when evaluated by percentage of land area burned each year.[37] This misperception of risk can be attributed to the unique fire management challenges of Hawaiʻi, such as its tropical climate and diverse ecosystems.[38]

The problem is also attributed to national systems designed to measure, track, and model wildfire risk, and report wildfires to Congress. These systems often fail to accurately capture the:

- Hundreds of wildfires that occur each year in Hawaiʻi
- Broad and long-lasting impacts of those fires from summits to nearshore coastal waters
- Unique types of vegetative fuels and their contribution to rapid fire spread even at high humidities
- Limited access to firefighting assets and resources that Hawaii's fire managers must contend with[39 40]

The lack of consistent and accurate reporting of wildfires and WUI fires to federal organizations may also contribute to why Hawaiʻi is not recognized as having a significant wildfire threat.

This may be due to inconsistent data entry and submission by Hawaiʻi fire agencies. A review of the National Interagency Coordination Center's annual reports[41] from 2011 to 2022 show Hawaiʻi wildfire data fluctuating widely year to year. Some years (2013[42] and 2014[43]) have no wildfire data included, and several others have few, such as 2012,[44] where only two (2) fires totalling 1,800 acres are included. These reports are inconsistent with Hawaiʻi wildfire data showing substantially more wildfire activity throughout the Hawaiian Islands.[45]

A similar issue likely exists with reporting wildfires via the National Fire Incident Reporting System (NFIRS). In this case, the limitations of Hawaiʻi wildfire data may be linked to incomplete data entry and inconsistent submissions, which may be related to a lack of a state agency responsible for all wildfire preparedness, prevention, and response coordination.

It is also significant that, nationally, Hawaiʻi is perceived primarily as a vacation destination rather than as a fire-prone landscape with a significant wildfire threat. This perspective is evident even in established national wildfire training materials, which treat other regions with gravity but perpetuate the bias of Hawaiʻi as primarily a recreational destination.

For example, one (1) common set of national materials encourages firefighters to seek assignments in Hawaiʻi for its appeal rather than acknowledging it as a region prone to extreme fire behavior.[46] Combined, these national biases likely diminish the state's ability to compete for federal funding and attention in addressing its wildfire management and mitigation challenges.

2.1.4 Perception of Responsibility

In Hawaiʻi, human activity, climate factors, landscape conditions, and a built environment that was not designed with considerations for wildfire all contribute to a high risk of significant wildfire impacts and rapid fire spread. For this reason, the responsibility for improving wildfire outcomes must lie across many sectors, agencies, and stakeholder groups to address the entire system of components that contribute to wildfire risk.

Firefighting is the last line of defense. However, the perception of responsibility for addressing wildfire in Hawai‘i has led to a focus placed primarily on response. This is evidenced by local and state government structures, policies, and financial investment, which have pursued a limited focus primarily on firefighting and incident response. A persistent reliance on fire agencies, coupled with the expectation that firefighting alone can keep Hawaii’s people and places safe from wildfire, has contributed to extreme vulnerability.

This approach misses the need to address underlying risk factors and leaves communities and natural resources exposed to conditions and vulnerabilities that are beyond the control of fire agencies. This limitation is especially important during times of critical fire weather like that of August 8, 2023, where conditions led to extreme fire behavior and rapid fire spread.

Additionally, equipment, resources, and other assets used for fighting wildfires were historically supplemented by agricultural operators. The majority of those plantations are no longer in place, leaving a gap that has yet to be addressed.[47]

2.1.5 Leadership and Accountability

Currently, there is no government organization within the State of Hawai‘i with the sole responsibility for wildfire readiness. In other states with significant wildfire threat, this effort is often led by a state funded organization, such as a state fire marshal’s office, which has the authority, funding, and personnel to implement system-wide wildfire prevention and preparedness initiatives. In the State of Hawai‘i, prior to the 2024 state legislative session, there was no state fire marshal, and consequently, no such funded system-wide initiatives specific to wildfire.[48]

The State Fire Council (SFC), consisting of the four county fire chiefs (Hawai‘i, Honolulu, Maui, and Kaua‘i), a DLNR-DOFAW representative, and the fire chief of the State of Hawai‘i Aircraft Rescue Fire Fighting Unit is Hawaii’s equivalent of a state fire marshal’s office. The SFC has many responsibilities which include advising the governor and the legislature with respect to fire prevention and protection, life safety, and any other functions or activities for which the various county and state fire departments are generally responsible.[49]

Although wildfire prevention, preparedness, and technical guidance to decision-makers seems to fall under the responsibility of the SFC, minimal state funding, programming, and organizational support may indicate a lack of emphasis on the criticality of the wildfire situation.

Since 2000, without a state-funded organization to lead and coordinate wildfire prevention activities, the non-profit Hawai‘i Wildfire Management Organization (HWMO) has filled the gap in the absence of statutory responsibility.

In the 24 years since it was established, the HWMO has worked to:

- Prepare Community Wildfire Protection Plans for the majority of the state
- Establish Hawai‘i‘s primary wildfire incident database
- Establish 25 Firewise Communities across three (3) counties (with 12 more in process since August 8, 2023)
- Prepare and distribute community wildfire preparedness information
- Establish a fire science communications and research partnership with the University of Hawai‘i called the Pacific Fire Exchange

2.1 ANALYSIS OF BACKGROUND

- Collaborate with landowners, farmers, and ranchers to implement vegetation management projects (most recently partnering with communities and local groups[50] to clear hazardous neighborhood vegetation)
- Coordinate all of these initiatives with the federal, state, and county fire agencies across the State of Hawai'i[51]

The fire departments, DLNR, and other government agencies, like the National Park Service, have come to rely on the HWMO to lead, coordinate, and carry out community wildfire prevention and preparedness activities statewide. This is further evidenced by consistent referrals to HWMO's information and programs on many emergency management and fire department websites, as well as the DLNR-DOFAW website.[52] [53] [54] [55] [56]

Without designated state funding, the HWMO has performed these critical functions using limited competitive federal grants and monies raised from community fundraisers. The role the HWMO has taken to address the State of Hawaii's wildfire threat cannot be overstated—nor can its persistent prioritization and care toward filling the existing wildfire safety gaps. Without dedicated and sustainable funding, these essential functions across the state will go unmet.

The CRA and community risk reduction planning elements of the Phase Three report will further address wildfire prevention.

2.2 County of Maui Background

2.2.1 County of Maui Wildfire Risk

Similar to the statewide background and findings, wildfire risk across the County of Maui was also well known and documented. Several expert- and practitioner-led efforts to affect change had already taken place prior to 2023. Plans and studies were in place since 2014 that identified wildfire risks and hazards and laid out priorities for risk reduction and preparedness actions.

These plans included the Community Wildfire Protection Plans for Western Maui[57] (2014), South Maui[58] (2016), Upcountry Maui[59] (2016), Moloka'i[60] (2016), Leeward Haleakalā[61] (2020), and the Wahikuli-Honokōwai Wildfire Mitigation Plan[62] (2014).

Within each of these plans, the top priorities identified for action include:

- Community Awareness and Preparedness Programs
- Vegetation Management
- Evacuation Planning and Additional Routes
- Ignitions by Electrical Infrastructure and Other Human Causes
- Access and Water for Firefighting
- Training and Equipment for Firefighters
- Emergency Communications
- Recovery Readiness

As of August 2023, four (4) communities on Maui were actively participating in the Hawai'i chapter of the Firewise USA™ program,[63] co-led locally by the HWMO and DLNR-DOFAW. The Ready, Set, Go! Wildfire Preparedness Action[64] guide was available and distributed broadly at community events and workshops across the County of Maui since 2016 by the HWMO, DLNR-DOFAW, and MFD.

An annual public wildfire preparedness campaign, called Wildfire and Drought Lookout!,[65] co-led by several local agencies and organizations, had also been taking place each May-September, with radio PSAs broadcast for one (1) to two (2) months across the County of Maui (on years when funding could be secured).

2.2 ANALYSIS OF BACKGROUND

Wildfire and Drought Lookout! wildfire preparedness campaign materials were sent by the HWMO to all elected officials representing districts in the County of Maui at both county and state levels, and included a request for assistance (RFA) in distributing these materials to community members, since the campaign was largely unfunded. The kick-off press conference for the campaign rotates among counties throughout the state and was first held on Maui[66] in 2018.

Additionally, a 2018-2019 project to map and identify vegetation management priorities[67] was conducted for Maui that mapped vegetation management per land ownership. That project subsequently brought stakeholders together to identify gaps and establish priority areas for vegetative fuels management to reduce wildfire risk and to pave the way for an "All Hands, All Lands" cross-boundary approach to wildfire risk reduction at the landscape-scale.

Section 3.3 on vegetative fuels discusses how the priority areas identified for fuels treatment coincide with the areas that burned in August 2023.

A report by the County of Maui, entitled "Cost of Government Commission Report on Wildfire Prevention and Cost of Recovery on Maui"[68] (July 2021), also highlighted the need to heavily bolster prevention, preparedness, and mitigation. Furthermore, the collaborative science communication project run by the University of Hawai'i and HWMO, called the Pacific Fire Exchange[69] (PFX), has published several maps, graphs, and fact sheets that detail Maui's wildfire history, including the trends and patterns of wildfire occurrence and its impacts (2000-2022).

2.2.2 Perception of County of Maui Wildfire Risk

While the risk of wildfire to the County of Maui has been identified as elevated compared to much of the rest of the country, there is a perception that the danger to the community is less compared to other hazards, such as tropical cyclones and tsunamis.

Over the past several years, even with the increased frequency of wildfires, historically the MFD and their collaborators have been largely successful in managing these events. Residents interviewed following the Lahaina PM fire expressed confidence in the ability of public safety agencies to control the fire. It is possible this perception led to a false sense of security and a misjudged understanding of MFD and MPD capabilities among first responders and residents alike.

2.2.3 Perception of Responsibility

Due to this low perception of wildfire risk, there may have been an assumption that the responsibility to prevent and control wildfires primarily lies with the fire department. Or a misunderstanding that wildfires rarely impact the built environment. This may have contributed to an overall lack of funding and regulation to address wildfire risk in the built environment or wildland landscape in the County of Maui.

Despite these limitations, several wildfire-aware groups and wildfire-informed practitioners (composed of agencies and nonprofit representatives) were trying to take effective action. These included the DLNR-DOFAW-led West Maui Fire Task Force and Leeward Haleakalā Fire Task Force, Maui Ridge to Reef, several watershed partnerships, and the HWMO, all of which had worked over the last two (2) decades to increase wildfire preparedness and reduce risk to protect both communities and natural resources.

2.2 ANALYSIS OF BACKGROUND

The progress and efficacy of these groups and their activities was possible because of highly collaborative, multipartner participation. However, their ability to affect change and address the scope and scale of the issue is likely limited by the lack of available funding for projects, limited personnel capacity, and the overall lack of regulations and sustained funding needed to pursue and maintain widespread and continuous wildfire risk reduction actions.

2.2.4 August 2018, Lahaina Fire[70]

The Lahaina Fires of 2018 and 2023 shared similarities, but also had important differences. Both occurred in August and were fanned by high winds generated by a pressure gradient caused by an approaching tropical cyclone. They also shared a burn perimeter off the Highway 3000 Bypass (Lahaina Bypass) north of Punakea Loop and approximately 65 acres of shared burned area (Figure 2.2.4.1).

The 2018 fire ignited a distance away from densely populated areas in a location dominated by vegetation at approximately 01:00, giving firefighters time to react and position themselves before the fire reached populated areas. The 2023 incident occurred in close proximity to Lahaina‘s heavily populated areas at 14:55. It was reported that winds may have been stronger in 2023 and there were three (3) other active fires on Maui at the time, diminishing available resources for emergency response.[71]

The 2018 fire burned 2,100 acres and destroyed 21 structures and 27 vehicles, with estimated damages totaling $4.3 million. At the time, it was the most destructive wildfire in Hawaii’s history.

After this fire, MEMA was the only county agency to initiate an After Action Review (AAR).[72] The AAR was never finalized and was titled a “preliminary report” with an August 2019 date on the cover. The County of Maui released the report publicly in late October 2023 after receiving requests from the press and others a few months after the August 2023 wildfires.

The AAR mostly focuses on MEMA responsibilities and does not address the operational response efforts of the MFD and MPD.

Documenting experiences from previous incidents is essential to understanding where improvements to prevention, preparedness, and operations can occur. An AAR can also serve as an important benchmark for measuring change over time. Knowing the lessons learned from the 2018 fire, and the changes implemented afterwards, can help with tracking improvements over time.

In an effort to learn about incident operations, FSRI requested a technical discussion with the 2018 Lahaina fire incident commander (IC). The request was initially made via email to the County of Maui, and the Hawai‘i Attorney General later issued a subpoena.

The County of Maui filed a motion to quash the subpoena issued by the Hawai‘i Attorney General, arguing that the technical discussion with the IC was not essential to the Maui wildfire investigation conducted by FSRI. The Hawai‘i Attorney General filed a motion to strike the county’s motion to quash the subpoena, as well as an application to compel compliance with the subpoena. The Attorney General and the county each withdrew their pending motions after the County of Maui agreed to make the incident commander available for an interview with FSRI in September 2024. As a result, the analysis of the 2018 Lahaina fire was limited.

2.2 ANALYSIS OF BACKGROUND

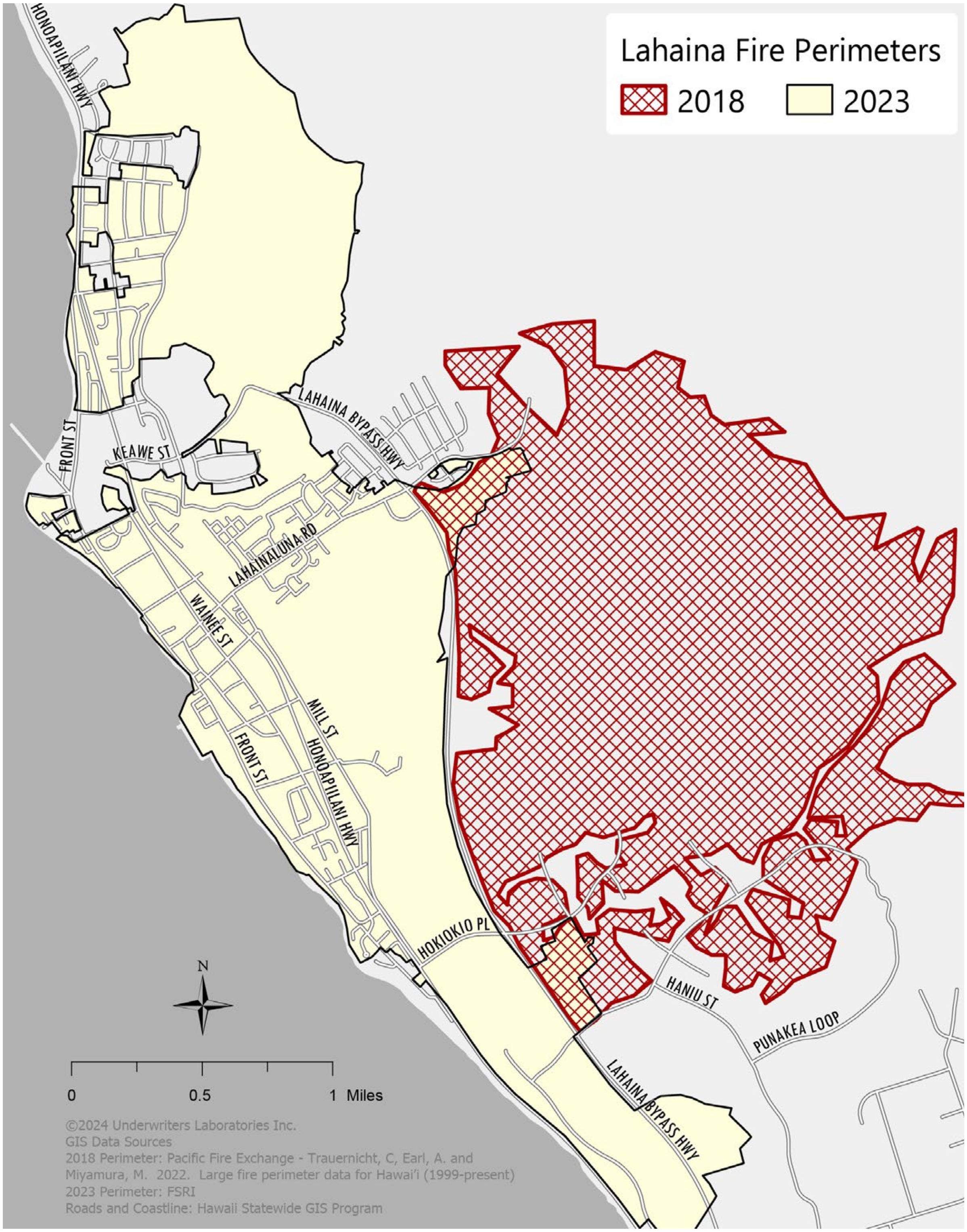


Figure 2.2.4.1 Overlay of 2018 and 2023 fire perimeters.

2.2.5 Findings & Recommendations

1. **FINDING:** Lack of state policy-making and investment addressing Cohesive Strategy components.	**RECOMMENDATION:** Pursue integrated solutions using a multidisciplinary team to address the entire system of factors that influence wildfire risk and outcomes, including land use and subdivision planning, agriculture, forestry and environmental protection, emergency response, economists and tax experts, and policymakers. Use the existing and established plans and studies as starting points for discussion and action. **RECOMMENDATION:** Learn from states that already have existing advanced wildfire-fighting policies and procedures in place that are more mature in their work on wildfire prevention, preparedness and response.
2. **FINDING:** Statewide wildfire prevention is led by the non-profit Hawaiʻi Wildfire Management Organization (HWMO) without state funding.	**RECOMMENDATION:** Establish dedicated and sustained funding for the HWMO to support the coordination and implementation of wildfire prevention and preparedness efforts, especially for communities and land stewards.
3. **FINDING:** Lack of standardized and consistent wildfire data collection and report submissions to federal organizations.	**RECOMMENDATION:** Standardize wildfire data collection process for all counties and require Incident Status Summary, Form 209[73] completion for wildfires meeting reporting criteria. **RECOMMENDATION:** Leverage the impending release of the National Emergency Response Information System (NERIS) to institutionalize fire reporting while ample resources are available and focused on onboarding and supporting fire agencies in this new federal program.
4. **FINDING:** The MFD and MPD did not initiate an AAR for the 2018 Lahaina Fire. MEMA did not finalize an AAR for the same incident.	**RECOMMENDATION:** MEMA, the MFD, and the MPD should create policies that include incident parameters requiring an AAR to ensure learnings are documented and changes required for improvement are implemented.

3.0 ANALYSIS OF SYSTEM COMPONENTS

3.0 Analysis of System Components

This analysis is broken down into sections addressing the specific system components of prevention, preparedness, and response.

3.1 Origin and Cause

The MFD is responsible for fire suppression for the area where the Lahaina AM and PM fires burned. This responsibility includes completing an origin-and-cause investigation and a comprehensive fire report. Due to the fire involving electrical infrastructure, investigators from the ATF assisted with the investigation. At the time of finalization of this report, the official origin-and-cause report on the August 2023 Maui fires has not been released.

3.2 Weather

Preparing for a wildfire requires knowledge of the weather. The weather forecasts leading up to August 8, 2023, informed state and county emergency managers of when and where high-wind warnings and Red Flag conditions would persist within the state. These forecasts were sent via social media channels by state and county agencies to inform the public, and were also shared by local news media.

This section will analyze the forecast information to identify how it was, or was not, used to make decisions, and to determine where changes are necessary to match appropriate preparedness actions to critical fire weather.

3.2.1 Fire Weather Forecasting

Fire weather forecasting and sensemaking are crucial for preparing for possible wildfires under extreme conditions. This is critical to implementing the Cohesive Strategy because it directly influences all three (3) of the Cohesive Strategy's main goals. It requires effective, appropriately framed communication and coordination across the system, and often represents a collaboration between various agencies, including the NWS and local fire departments.

Utilizing advanced weather forecasting models and technologies ensures accurate and reliable predictions, which are essential for anticipating and mitigating the impacts of extreme fire conditions. These forecasts enable residents to understand and prepare for the risk of wildfire and the risk of loss, while also helping land managers prevent accidental ignitions and guide decisions about activities with ignition potential.

Moreover, forecasts support proactive pre-incident planning, such as evacuation planning, risk communication, and preparing firefighting tactics and strategies. By predicting fire behavior and anticipating dangerous conditions, fire weather forecasts allow for strategic resource allocation and adaptive decision-making. Timely, accurate weather forecasts ultimately protect residents and firefighters and contribute to safer, more effective wildfire management, especially during extreme weather events.

NWS Honolulu released numerous weather forecasts (products) leading up to August 8, 2023. Section 6.6 in the Appendix provides a summary of the products addressing wind and fire weather, date and time the product was released, and a comparison to what was actually experienced to verify the forecast matches what was experienced and/or measured.

A simple verification rating of yes/no was used. For example, the Kohala Ranch Remote Automatic Weather Station (RAWS)[74] on the island of Hawai'i

3.2 ANALYSIS OF SYSTEM COMPONENTS

recorded the highest wind speeds of all RAWS and is located within the area the forecast indicated would experience high winds and Red Flag Weather.

A "yes" rating indicates the forecast was verified according to content, date/time, and location. The limitations of this data are that verification is evaluated based on reports of wind damage or fire spotting, and limited measurements from RAWS.

3.2.1.1 Remote Automatic Weather Stations (RAWS)

As stated in Phase One, and mentioned throughout this report, there were no RAWS in West Maui at the time of the fire or before, restricting the data available around the islands' diverse microclimates.

Since RAWS were not placed in high fire danger areas like West Maui, the weather data for these regions was not included in the dataset needed to determine when parts of the island were approaching or experiencing Red Flag conditions. Instead, Red Flag Weather is, and was at the time of the incident, determined by the Automated Surface Observation System (ASOS) at the Honolulu airport.

An example of why location is important is the Kohala Ranch RAWS[75] on the island of Hawaiʻi. This station is located on a southwest-facing slope, in an area similar to where the Lahaina PM fire started. As previously mentioned, the Kohala Ranch RAWS recorded the highest wind speeds of all RAWS and is located within the area the forecast indicated would experience high winds and Red Flag Weather.

In addition to the limited number of RAWS available, and the placement of these locations not enabling adequate resolution of data across all areas, other challenges were uncovered. Maintenance and repairs are expensive, and physical access to stations that are located in hard-to-access terrain can be challenging and limit the frequency of maintenance, leaving some RAWS inoperable and/or unreliable until maintenance resumes.

The information in Section 6.6 of the Appendix demonstrates the high level of accuracy of the NWS' forecast products, suggesting the level of confidence emergency managers should have with weather products released by the Honolulu Office.

3.2.2 Red Flag Warnings

Forecasters will issue Fire Weather Watches/Red Flag Warnings when the combination of dry fuels and weather conditions support extreme fire danger and/or fire behavior.[49] Red Flag Weather criteria for Hawaiʻi has been adjusted for its unique tropical environment and the specific high fire danger conditions that have been established by local experts.[77] A Red Flag Weather event is triggered for leeward portions of the state when all three (3) of the following criteria are met for two (2) hours or more during any part of a day at the Honolulu International Airport (PHNL):

1. Keetch-Byram Drought Index (KBDI) ≥ 600
2. Minimum Relative Humidity (RH) ≤ 45% (2 hours or more)
3. Wind ≥ 20 mph (≥ 17 kt) (2 hours or more)

A comparison of Red Flag conditions between Hawaiʻi and California illustrates those differences. For example, the Red Flag threshold for RH in Hawaiʻi is 30% higher than the California criteria.

According to historical data provided by the NWS in Figure 3.2.2.1, Hawaiʻi experiences five (5) Red Flag Weather days per year on average, occurring mostly in the summer and fall months. The challenge with Hawaiʻi Red Flag Weather is that there is little difference between a normal summer day and a Red Flag day. For example, it is typical for RH during

3.2 ANALYSIS OF SYSTEM COMPONENTS

summer months to be around 50%, which is only 5% higher than the RH criteria for Red Flag Warnings.

The same issue applies to wind. Breezy summer days are common in Hawai'i with winds hovering around 15 mph, which is close to the 20 mph limit for Red Flag Warnings. The minor perceptible differences between Red Flag Weather and normal summer weather has the potential to impact how emergency managers perceive Red Flag conditions.

If a Red Flag day feels like a typical summer day, preparing for Red Flag conditions could be limited, which could result in fire managers staffing for a normal day. This could be a contributing factor as to why state and county emergency managers, Hawaiian Electric, and the County of Maui Department of Water Supply did not augment staffing prior to the weather arriving August 8, 2023.

Figure 3.2.2.1 displays the number of Red Flag Warning days in the State of Hawai'i for each month during the years of 2008 through 2023. There were no Red Flag Warnings issued from 2014 through 2019 due to an overall wet period and the KBDI only briefly climbing above 600 at times, none of which coincided with strong winds/dry air. Notably, according to forecasters and fire managers, there were large wildfires during this period despite, there being no Red Flag Warnings.

The average number of Red Flag Warning days annually in Hawai'i is similar to some areas in California where emergency managers and local officials have initiated significant changes to their preparedness efforts over the course of the last 30 years. Historical data from Los Angeles County coast (NWS Zone 241), which includes the Malibu area where several large WUI fires have occurred, shows that this area experiences six (6) Red Flag Warning days annually.[78]

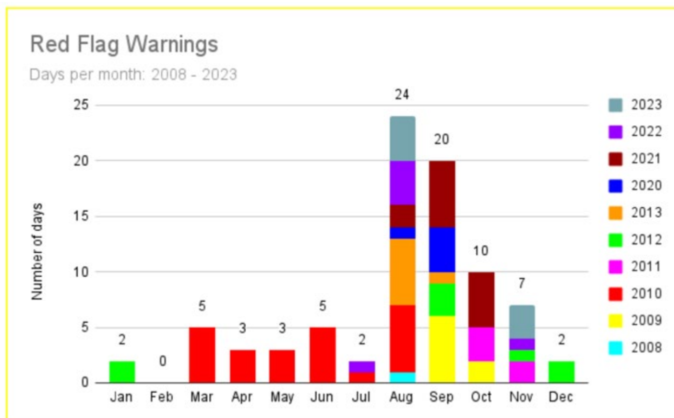


Figure 3.2.2.1 Red Flag Warning days in the State of Hawai'i 2008 through 2023. Source: National Weather Service - Honolulu.

3.2 ANALYSIS OF SYSTEM COMPONENTS

3.2.2.1 High Wind Events

High Wind Events are another data point connected to the weather on August 8, 2023. Wind events are instances of damage caused by the wind as reported in the National Centers for Environmental Information (NCEI) Storm Events database.[79]

For the State of Hawaiʻi on August 7-8, 2023, the wind-caused damage consisted of destruction to the built environment, as well as downed utility poles and trees causing a number of issues, including increased fire spread and evacuation challenges.[80]

Figure 3.2.2.1.1 highlights how infrequently damage is sustained in the State of Hawaiʻi due to high winds in the summer months, in contrast to the relatively high number of Red Flag Warning days. The coupling of the high winds with Red Flag Weather on August 8, 2023, was unprecedented.

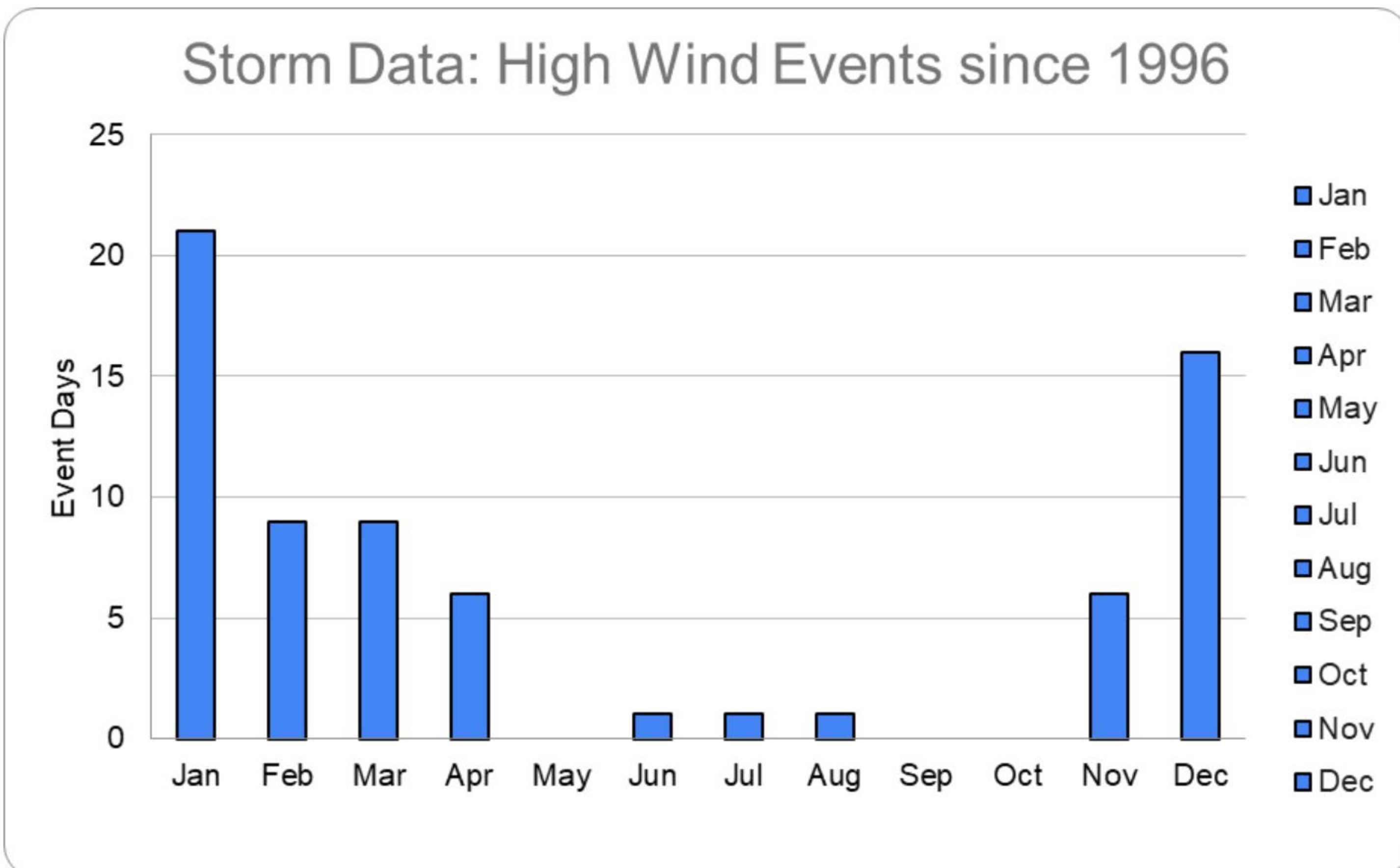


Figure 3.2.2.1.1 State of Hawaiʻi High Wind Events by month from 1996 through 2022. High Wind Events are documented damage caused by the wind. Source: National Weather Service - Honolulu.

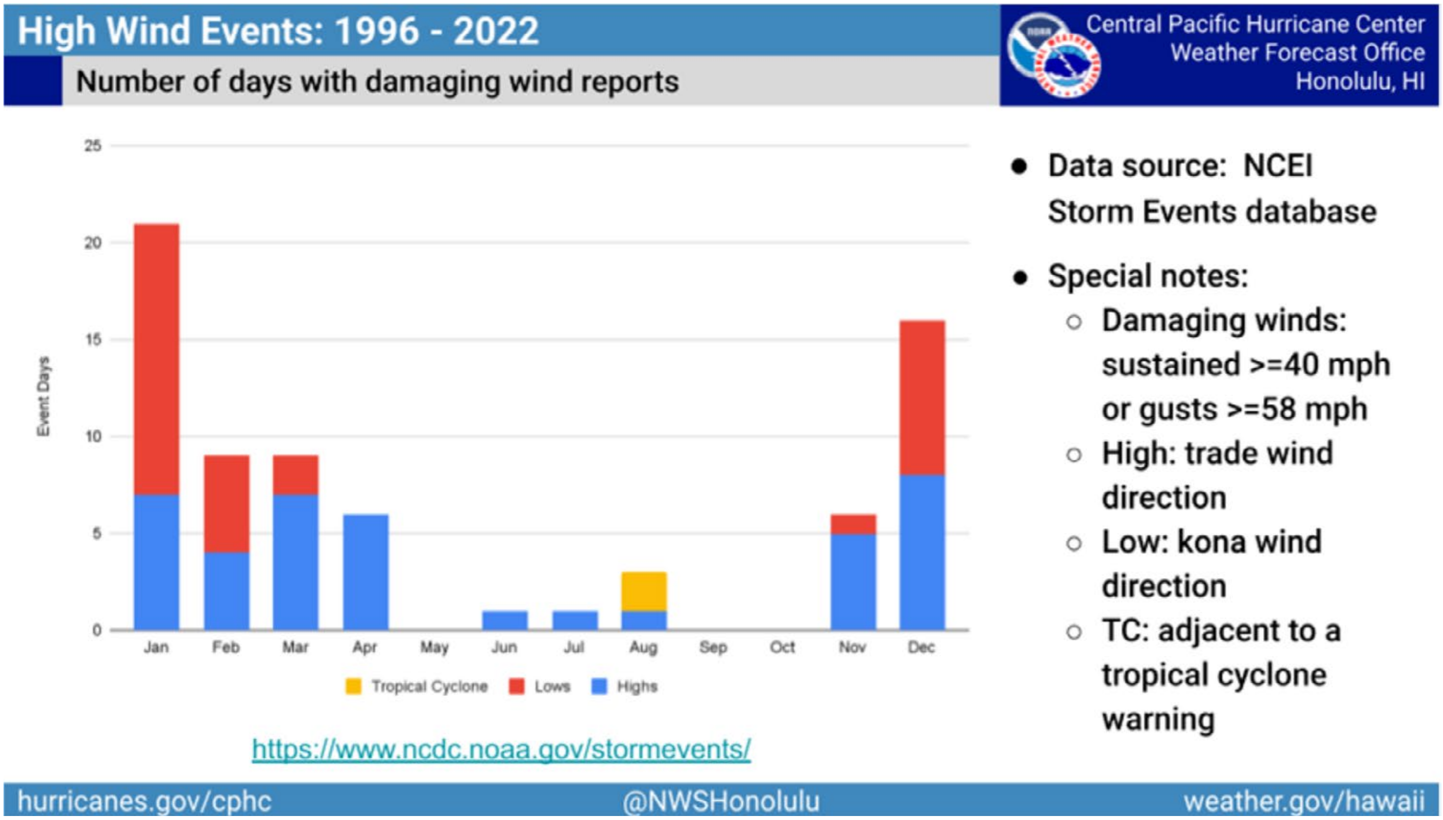


Figure 3.2.2.1.2 Hawaiʻi State High Wind Events by month from 1996 through 2022. Colors indicate the source of the damaging winds and, by inference, the general wind direction. High-Trade wind direction (north-northeast); Low - Kona/non-trade wind direction (south-southwest); Tropical Cyclone - Adjacent to a tropical cyclone warning.

The winds on August 8, 2023, ranged between 60-80 mph. The large-scale damage caused by the wind is consistent with the Beaufort Wind Scale—a measure for describing wind speed based on observed conditions at sea or on land. Table 3.2.2.1[81] includes the Beaufort Wind Scale for 60-80 mph winds.

Table 3.2.2.1 August 8, 2023, Wind Speed.

Wind Speed August 8, 2023		
Impacts/Wind Speed	**60–70 mph winds** **10–11 on the Beaufort scale**	**70–80 mph winds** **12 on the Beaufort scale** **Hurricane Force**
On land	Trees may be uprooted, branches can break off, and debris, such as small objects and loose items, can become airborne. Powerlines can be blown and swing, and utility poles can become unstable and/or fall. Structural damage to buildings is likely, including broken windows, damaged roofs, and signs or fences being blown over.	Widespread damage to trees and structures can occur, with many trees likely uprooted and severe structural damage incurred to buildings. Powerlines and utility poles may be downed, leading to power outages.
On sea	Very high waves and poor visibility are observed. Waves can reach heights of 29-41 feet, and the sea surface appears white with foam and spray. Sea spray significantly reduces visibility.	Waves can exceed 45 feet–the air is filled with foam and spray, greatly reducing visibility. Ships may be at serious risk of damage or capsizing.
Experience	Walking or standing outside is extremely difficult and dangerous; individuals may be blown over.	Walking outside is nearly impossible; staying outside is extremely hazardous. There is a high risk of injury from flying debris, falling branches, or collapsing structures. It is generally unsafe to be outside during such conditions. The wind produces a loud, constant roar, and the sound of objects being moved or destroyed can be heard. The wind feels incredibly powerful and forceful, making it hard to stay upright or move forward. Breathing may become difficult due to the force of the wind.

3.2 ANALYSIS OF SYSTEM COMPONENTS

The extreme wind conditions on August 8, 2023, drove much of the fire spread and destruction that resulted. It was also the extreme environment within which emergency responders were conducting their suppression, mopup, and evacuation efforts.

Being outside and exposed to the elements in 60-80 mph winds can be extremely dangerous, typically requiring immediate shelter, yet emergency responders remained in these conditions to complete their public service and safety commitments.

3.2.3 Operationalizing the Weather Data

An August 4, 2023, email sent by a NWS forecaster to fire managers was above and beyond NWS' typical notification process. Due to the exceptional certainty of the forecast models, and the obligation to inform emergency managers of the wildfire risk, the email was sent to provide unprecedented advance warning of the approaching fire weather due to arrive late August 7, 2023, and strengthen into August 8, 2023.

Hawai‘i Emergency Management Agency (HI-EMA) followed up with a statewide briefing on August 4, 2023, at 13:00. Several more high fire danger forecasts followed the August 4, 2023, email, as shown in Table 3.2.2.1.

The email included language not typically used by a forecaster:

> *"There is **higher than normal confidence** in the forecast track..."*
>
> *"…there is **significant concern** that strong trade winds will develop sometime Monday and peak Tuesday."*
>
> *"**Critical** fire weather on Tuesday…"*
>
> *"NWS conditions this many days away is **quite rare**."*

The strongly worded nature of the email, had it been communicated to fire managers in other states with better developed severity preparedness strategies, could have gained attention and prompted discussion and operational planning. It was a call for State of Hawai‘i fire managers to prepare for the impending extreme weather.[82]

Although MFD chief officers discussed the forecasted weather well before August 8, 2023, no evidence of pre-event preparedness plans by the MFD were produced.

HI-EMA, County of Maui Department of Water Supply, the MPD, and Hawaiian Electric were also aware of the impending weather, but did not provide evidence of pre-event preparedness planning. MEMA responded by partially activating the Emergency Operations Center (EOC), installing two (2) personnel on the evening of August 7, 2023.

A plausible reason for the perception of inaction of fire managers could be related to the statewide context discussed in Section 2.1. Wildfire risk appears to be underappreciated within the spectrum of natural disaster risks threatening Hawai‘i.

This response could also be related to fire managers focusing on the first sentence of the NWS' email, "NWS Honolulu expects Hurricane Dora to pass south of Hawai‘i early next week," and not moving beyond it because, as a state, a hurricane is a higher priority risk. Since Dora would not be making landfall, the perceived risk was lessened, and therefore, provided less reason to engage.

3.2 ANALYSIS OF SYSTEM COMPONENTS

3.2.4 Resident Technical Discussion Information

Limited resident experiences regarding the weather were also captured. Nearly all (95%) of the 70 residents who had lived in Lahaina for an average of nearly 30 years, said August 8, 2023, was the windiest day they had ever experienced. Most were present during the 2018 Lahaina Fire and many were present during several tropical storms.

When asked if they were aware that August 8, 2023, was going to be a windy day, just over half of the 64 residents that responded said yes. These same residents also stated that they did not expect the winds to be as strong.

Although this data is constrained by the collection methodology, the information does point toward a possible issue with getting actionable weather information to residents. More study in this area is required.

3.2.5 Findings & Recommendations

5. FINDING: Actionable extreme weather forecasts were provided to fire chiefs and emergency managers prior to the August 2023 fires. However, adjusting staffing for extreme weather events and their resultant risk of extreme fire behavior was not standard.	**RECOMMENDATION:** Assign a point of contact within the MFD who is tracking weather conditions, and is disseminating that information to the rest of the department and across partner agencies. **RECOMMENDATION:** Establish standard operating procedures for Red Flag and severe fire weather warning conditions, to include: preparing and pre-positioning supplies, equipment, vehicles, and personnel in high-risk areas; ensuring clear and open lines of communication within and among agencies to optimize for rapid and coordinated deployment of resources; and communicating with the public to aid residents in translating the forecasted conditions and risks into evacuation readiness. The California Fire Weather Annual Operating Plan is a good place to start developing a Hawai‘i plan.[83]
6. FINDING: A lack of RAWS in West Maui, and other high wildfire risk areas, limits the capability to determine where Red Flag conditions may locally exist. The lack of resolution of fire weather data and monitoring yields uncertainty at the local level due to fire weather forecasts and Red Flag Warnings being based on data collected at the Honolulu airport, which is on O‘ahu (not Maui). It does not represent the conditions observed in the diverse and numerous microclimates across all high fire risk areas across the state, including Lahaina, and therefore, serves as a point of reference (or inference, at best) for other regions.	**RECOMMENDATION:** Install and fund the maintenance for a strategic set of RAWS that can provide information with resolution across the microclimates of high fire risk locations in the state.

3.2.5 Findings & Recommendations

7.	**FINDING:** There is little perceptible difference between Hawai‘i Red Flag criteria and a typical summer day, which may have contributed to the emergency manager’s response to the forecast.	**RECOMMENDATION:** Engage federal partners to assist in refining Red Flag criteria to be commensurate with appropriate fire danger that is actionable by policymakers, emergency managers and responders, and the public.
8.	**FINDING:** NWS-Honolulu fire weather forecast briefings to fire and emergency managers should occur on a more frequent basis.	**RECOMMENDATION:** Engage policymakers, emergency managers and responders, and the public with more frequent fire weather forecast briefings. This will elevate understanding of the weather, while informing the community of the risk.

3.3 ANALYSIS OF SYSTEM COMPONENTS

3.3 Vegetative Fuel

Vegetation played a crucial role in the Lahaina PM fire. The availability of combustible vegetative fuel on the landscape allowed fire to ignite and spread across unmanaged lands, and eventually, into the built environment. Mitigating the risk of extreme fire behavior and rapid spread requires vegetation management in both wildland and urban areas.

The vegetation management, or lack thereof, leading up to August 8, 2023, left lands at high risk of ignition and rapid spread. This section will analyze the vegetation management practices across land ownerships to identify how vegetation was, or was not, managed to reduce the hazard posed by unmanaged vegetative fuels.

Effective vegetation management directly impacts fire behavior, ecosystem health, and community safety, tying in to all three (3) goals of the Cohesive Strategy. These actions are particularly important in achieving resilient landscapes that can resist, survive, and recover after disturbances, particularly fires. Thinning heavy fuel loads, creating fuel breaks, removing invasive species, and promoting native ecosystem restoration and active agriculture help reduce fire risks and protect both natural resources and communities from rapid ignition and fire spread.

Managing vegetation in wildland areas at the WUI, and around homes, creates defensible spaces where individual homes and communities stand a better chance of survival and firefighters have a safer area in which to work.

For maximum protection, vegetation management and defensible space must be incorporated into overall land use planning, with funding, policy, and education available to sustain and support adequate risk-reduction work, ultimately reducing hazardous fuels and creating safer conditions for both communities and firefighters.

3.3.1 Condition and Management of Vegetative Fuel

Adjacent to many of Lahaina’s built subdivisions are wildland areas dominated by highly combustible vegetative fuels (Figures 3.3.2.1 and 3.3.2.2). Like most of Hawai‘i, the undeveloped wildland areas across West Maui are owned by a patchwork of public entities and private individuals/entities.

There were limited-to-no active wildland vegetative fuels management efforts in the vicinity of Lahaina’s urban areas before August 8, 2023, leaving the majority of vegetation to grow unimpeded, contiguous, and dense due to steady build-up over long time scales.

Composed mostly of grasses with some shrubs, these lands are subject to rapid drying during seasonally dry conditions, drought, and/or low-humidity conditions. The passing hurricane (which substantially dropped RH), the expected dry conditions and limited precipitation in August, and the additional ongoing drought conditions resulted in vegetative fuels being highly ignitable and capable of supporting rapid fire spread.

These dry, receptive fuels are especially hazardous in high-wind conditions, which were present on August 8, 2023. This dense, uninterrupted, and unmitigated standing dead vegetation posed a substantial risk of wildfire ignition and rapid fire growth.[84]

3.3 ANALYSIS OF SYSTEM COMPONENTS

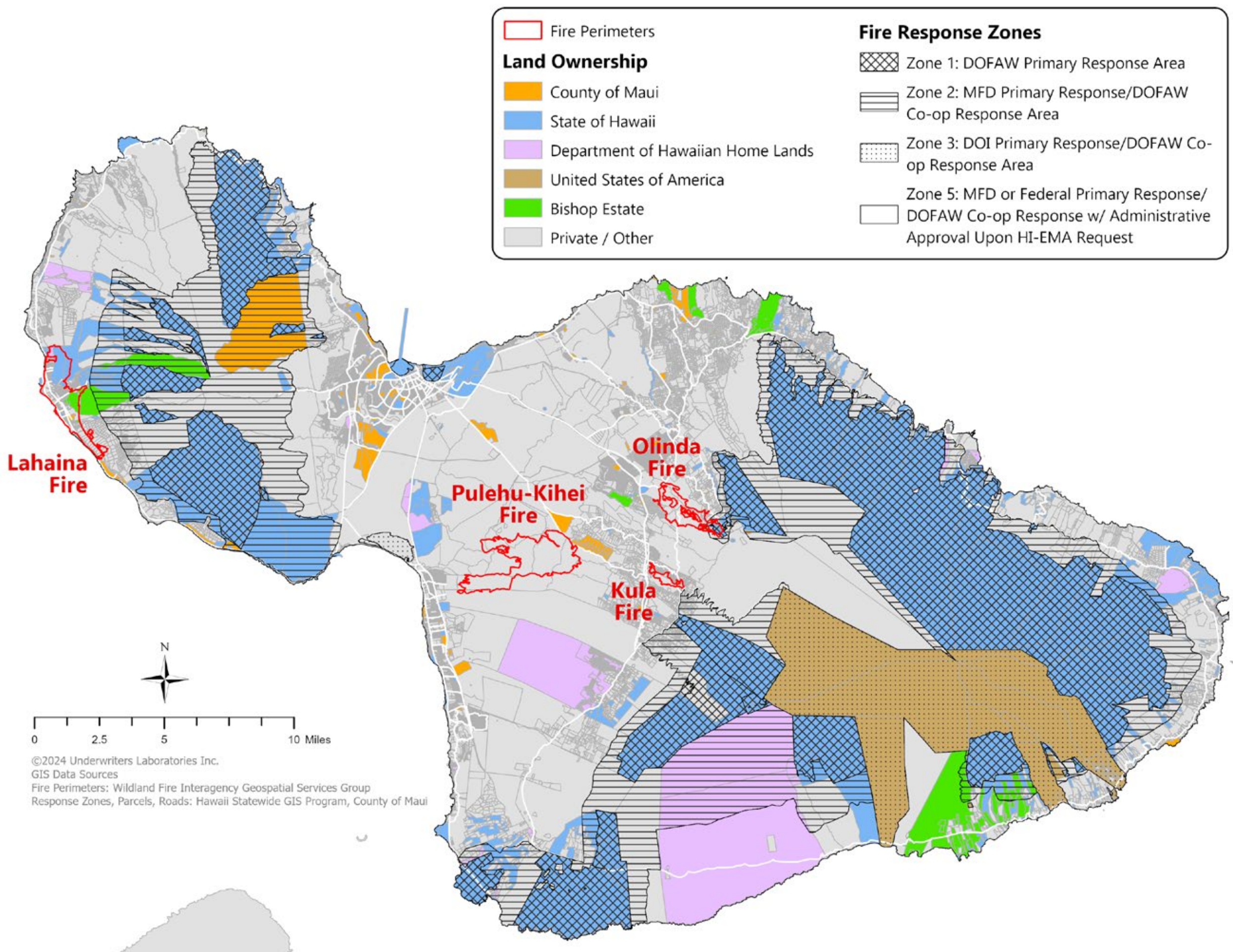


Figure 3.3.2.1 Map of Maui showing burn perimeters of the four (4) August 8, 2023 fires, land ownership, and fire response zones. Source: https://www.arcgis.com/sharing/rest/content/items/66a59db4bc31459298b28a94564de533/info/metadata/metadata.xml?format=default&output=html; https://files.hawaii.gov/dbedt/op/gis/data/fireresponse_summary.pdf

3.3.2 Vegetation Management on State Lands

Vegetative fuels management and suppression responsibilities on state lands vary widely. Wildfire prevention, vegetative fuels management, and suppression response on state forest reserves, natural area reserves, and areas managed for public hunting or conservation activities are managed by the DLNR-DOFAW.

While there is clarity on the parties responsible for firefighting response (Figure 3.3.2.1), the responsibilities for wildfire prevention and mitigation via fuels management are less defined on state lands that are not managed directly by the DLNR-DOFAW.

For example, two (2) of the four (4) August 2023 fires impacted state lands. In Lahaina, one (1) parcel of the impacted wildland area is under management of DLNR-Land Division, with no record of vegetation management. Several smaller parcels within the impacted developed area are owned and managed by the State Department of Education (within the blue State of Hawaiʻi area), also with no clear accountability for wildfire risk reduction or vegetative fuels management (Figure 3.3.2.2).

3.3 ANALYSIS OF SYSTEM COMPONENTS

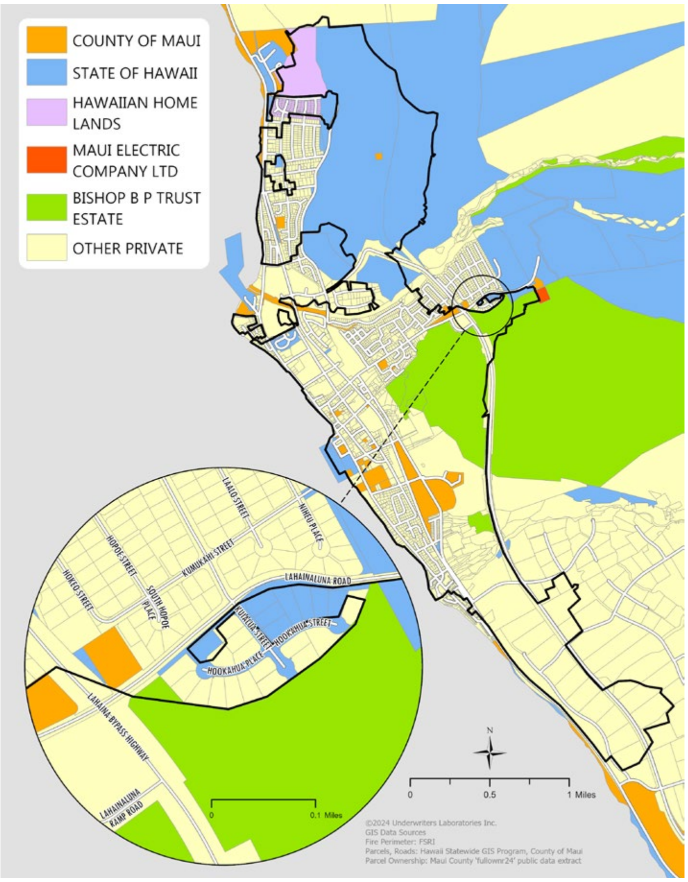


Figure 3.3.2.2 Map of Lahaina showing burn perimeter and land ownership. Detail shows Lahaina fire origin just northeast of Ho'okahua Street where the County of Maui, State of Hawai'i, and private lands converge. Source: Hawai'i Statewide GIS Program, Office of Planning and Sustainable Development, State of Hawai'i.[85]

By contrast, the Olinda fire included forest reserve lands that were under management of the DLNR-DOFAW, where ongoing fuels management and wildfire risk reduction activities had been taking place. Yet, even with the responsibility and good faith effort by reserve managers to mitigate the wild-fire risk posed by vegetation, the DLNR-DOFAW has had to do this work with a restrictively limited budget.

Statewide, the DLNR is responsible for managing 25% of the land in Hawai'i (around 1 million acres). However, under 1% of the current Hawai'i state budget has been allocated to the DLNR to carry out the diverse management mandates across all of its divisions. Only one (1) of its divisions, the DLNR-DOFAW, has part of its budget allotted to fire suppression and fuels management.[86]

A recent attempt to secure funding for community fuels projects through the legislature was unsuccessful. Senate Bill (SB) 409,[87] which was introduced in 2023, requested $1,500,000 for the DLNR-DOFAW to be able to complete community fuels reduction projects supporting wildfire prevention and hazardous fuel reduction measures.

3.3.3 Fuels Management Around Electrical Infrastructure

Highly ignitable vegetative fuels are also present under and around utility lines and substations across West Maui. Management of aerial vegetation touching powerlines, growing into conductors, and growing within substation boundaries is important for reducing wildfire risk and for providing continued electrical service to Maui customers. These measures are part of Hawaiian Electric's wildfire safety plan.

The wildfire risk posed by downed lines onto unmanaged vegetative fuels, a plan for fuels management under lines, and the opportunities for powerline vegetation management to serve as additional emergency access or fuel breaks, do not appear to be effectively addressed in Hawaiian Electric's previous or current wildfire safety plans,[88] and are not covered within the County of Maui's Title 14 Public Services Code[89] or the 2002 version of the National Electrical Safety Code referenced within the Hawai'i Public Utilities Commission (PUC) website.[90] [91]

3.3.4 Fuels Management and Defensible Space within Subdivisions

The tropical climate of Hawai'i and the growth rates of vegetation support prolific year-round growth of vegetation around homes and yards. Lahaina, specifically, has many residential areas that have been in place for decades, some over a century. Old growth and/or dense vegetation was prevalent in many neighborhoods at the time of the August 2023 fires. How this vegetation impacted the fire is discussed within Section 4.0.

Very little, if any, proactive defensible space measures were taking place for the purpose of wildfire risk reduction within the built environment, with a few notable exceptions. These included a development built in 2019–2020, which was newer and lacked mature vegetation,[92] and Launiupoko on the edge of the impacted area, which has been working on vegetative reduction projects as part of its participation in the Hawai‘i chapter of the Firewise USA™ program.[93]

3.3.5 Roadside Fuels Mitigation

Hawai‘i Department of Transportation (HDOT) and the County of Maui Department of Public Works (DPW) reduces roadside vegetation to lower ignition probability and to ensure signage is visible. From January 1, 2023, to August 8, 2023, DPW cleared close to 20 acres of vegetation at a cost of approximately $58,000 within, and just adjacent to, the Lahaina burn scar area (see Table 6.7.1 in the Appendix).

The clearing methods included mowing and weed whipping. Although the type of vegetation cleared is not identified within the work orders, and maps with perimeters (area cleared) were not provided, the nearest street is included and does identify where the work was initiated.

Reviewing pre-fire images of the areas reveals these fuels were mostly buffelgrass, guinea grass, and haole koa. The challenge with these highly fire adaptive plants is that herbicide and complete removal (with bagging and disposal) can temporarily prevent regrowth, but abundant seed sources exist on nearby unmanaged lands and will continue to repopulate the area due to wind dispersal.

Fuel conversion, which involves planting a less fire-prone plant to occupy and protect the area from repeated invasion, is costly and requires adequate seed, water, and maintenance until the replacement plants are able to outcompete, shade out, or prevent the unwanted species from continuously invading. Coupled with the tropical climate and rapid growth rates of these grasses, frequent maintenance is needed to keep fire risk down.

The state has also been active with their roadside fuels mitigation. State records indicate they cleared approximately 180 miles of roadside vegetation in West Maui at a cost of approximately $63,000 within the Lahaina general area from January 1, 2023, to August 8, 2023 (see Table 6.7.2 in the Appendix).

3.3.6 Former Large Acreage Farmlands Unmaintained by Private Landowners

A portion of the lands involved in the Lahaina PM fire are within the footprint of an area on Maui that was converted from native vegetation to agricultural crops over the last century, and have since gone out of active agricultural production.

The subsequent private purchasing of land has led to ownership of lands for purposes that do not include active use or management, resulting in lands that are fallow, and unmaintained.[94]

Lack of maintenance or activity on these large acreage parcels leaves them vulnerable to highly invasive grasses that grow profusely when not managed. These species dry out rapidly, creating hazardous fuel loads and high fire risk. There is a notable lack of incentives in the tax and regulatory system to adequately ensure active management of large parcels for the purpose of risk reduction.

3.3.7 Challenges to Vegetation Management Implementation

The lack of broader context of wildfire in Hawai‘i, including misconceptions of risk and responsibility, and a persistent lack of action and prioritization of wildfire risk (see Section 2.1) contributed strongly to the overall lack of laws, codes, and funding pertaining to any wildfire risk reduction activities statewide.

Such activities could have included fuels management on undeveloped large acreage parcels, proactive defensible space inspection and enforcement, and the development of programs that can effectively deal with wildfire mitigation imperatives statewide.

Three (3) independent reports—West Maui Community Wildfire Protection Plan (2016),[95] County of Maui Cost of Government Commissioned Report on Wildfire Prevention and Cost Recovery on Maui (2021),[96] and a collaboratively developed vegetative fuels management mapping and prioritization report for Maui (2019)[97]—each underscored the need for robust prevention, mitigation, and fuels management, along with code updates and enforcement programs for the safety and health of both communities and natural resources on Maui.

All three (3) reports emphasized the need to recognize that investment in, and reliance on, fire suppression alone was insufficient.

The August 2018 fire in Lahaina demonstrated that under extreme weather conditions, the risk to life and property from wildfires starting on undeveloped lands with similar dried vegetative fuels could be substantial, and that managing vegetative fuel was an essential piece of reducing risk (see Sections 2.1-2.2 for information about Hurricane Lane).

No additional regulation or accountability for fuels management on unmaintained lands appears to have been put in place after the August 2018 fire, with the status quo culture, policies, and funding allocations directed toward fire suppression as the primary (and sometimes only) solution.[98]

There appears to be a belief that wildfires do not pose a significant threat to lives and property due to distance from the built environment. Under most conditions, fire agencies have been able to contain wildfires before reaching the built environment, perhaps diminishing a sense of public urgency and/or policy leadership to prioritize the mitigation of wildfire risks posed by undeveloped overgrown areas.

This misperception of risk may have contributed to the lack of policy action, program development, and code updates that prioritize and treat vegetative fuels that are on lands distant from the built environment.

The rate of grass regrowth presents an important challenge to vegetative fuel management as it necessitates continuous maintenance. Unlike mainland grasses with an average 7-month growing season, Hawaii’s grasses grow year-round.[99] Several species grow in dense bunches, reaching up to ten (10) feet tall, at a rate of up to six (6) inches per day. As they grow, they accumulate dead foliage, posing a high-to-extreme fire risk year-round.[100] This rapid growth can be prohibitively costly to manage.

Without ongoing dedicated funding programs to manage vegetative fuels, land managers in Hawai‘i have typically pursued competitive federal grant opportunities. However, these programs typically do not cover ongoing maintenance costs.

Several methods for fuels management can pose environmental challenges to Hawaii’s natural resources and nearby communities, and have contributed to the challenges to address fuels management needs.

For example, fire breaks scraped down to bare soil can lead to erosion and sedimentation into waterways, polluting nearshore waters, smothering coral reefs, and impacting fisheries, water quality, and recreation.

Additionally, using herbicides leaves standing dead fuel that still requires follow-up removal, and is often a source of controversy due to potential toxicity to waterways and community health. Prescribed fire is also not a primary tool for fuels management in Hawaiʻi as it is in other parts of the world. Burning the highly fire-adapted invasive species that are a key driver of wildfires in Hawaiʻi can promote more growth of these species.[101] [102]

Escaped burns also endanger native watershed forests and species that do not recover well from fire. There are limited tools for ongoing vegetation maintenance, which is why fuels conversion, native ecosystem restoration, or active agricultural use are recommended for longer-term risk reduction—the added community benefits of food production or restoration of native watersheds make them more viable options.

3.3.8 Policy Challenges

Current policy initiatives and financial allocations toward vegetation management and inspection/enforcement programs have been insufficient in reducing the risk of a catastrophic wildfire incident. Despite many years of dedicated efforts from the DLNR-DOFAW, local watershed partnerships, the HWMO, and community volunteers, a persistent lack of funding and policy support from governments at all levels has limited the capacity of these entities to reduce risk at scale, or consistently over time.

The priority needs of vegetation management, including maintenance funding, vegetation management around and/or under powerlines, maintenance around the perimeters of subdivisions in high-risk areas, and financial programs to assist the public and large landowners with vegetation management, have been identified and highlighted in many reports[103] [104] [105] without meaningful changes in policy, regulation, or funding.

For example, from 2018-2019, the HWMO completed a mapping and collaborative prioritization process to initiate an “All Hands, All Lands”[106] approach to vegetation management and to catalog vegetation management gaps, needs, and priorities. Its findings align with this analysis: vegetation management is needed under powerlines, around subdivisions, and along roadsides; consistently carrying these activities out requires additional funding, regulation, and policy action.

Despite Lahaina being identified as one of the highest priority areas for vegetative fuels management (Figure 3.3.8.1), it appears that relatively little work was actually done, due to the continued combination of funding challenges and lack of incentives, penalties, or financial support for private landowners to participate.[107]

3.3 ANALYSIS OF SYSTEM COMPONENTS

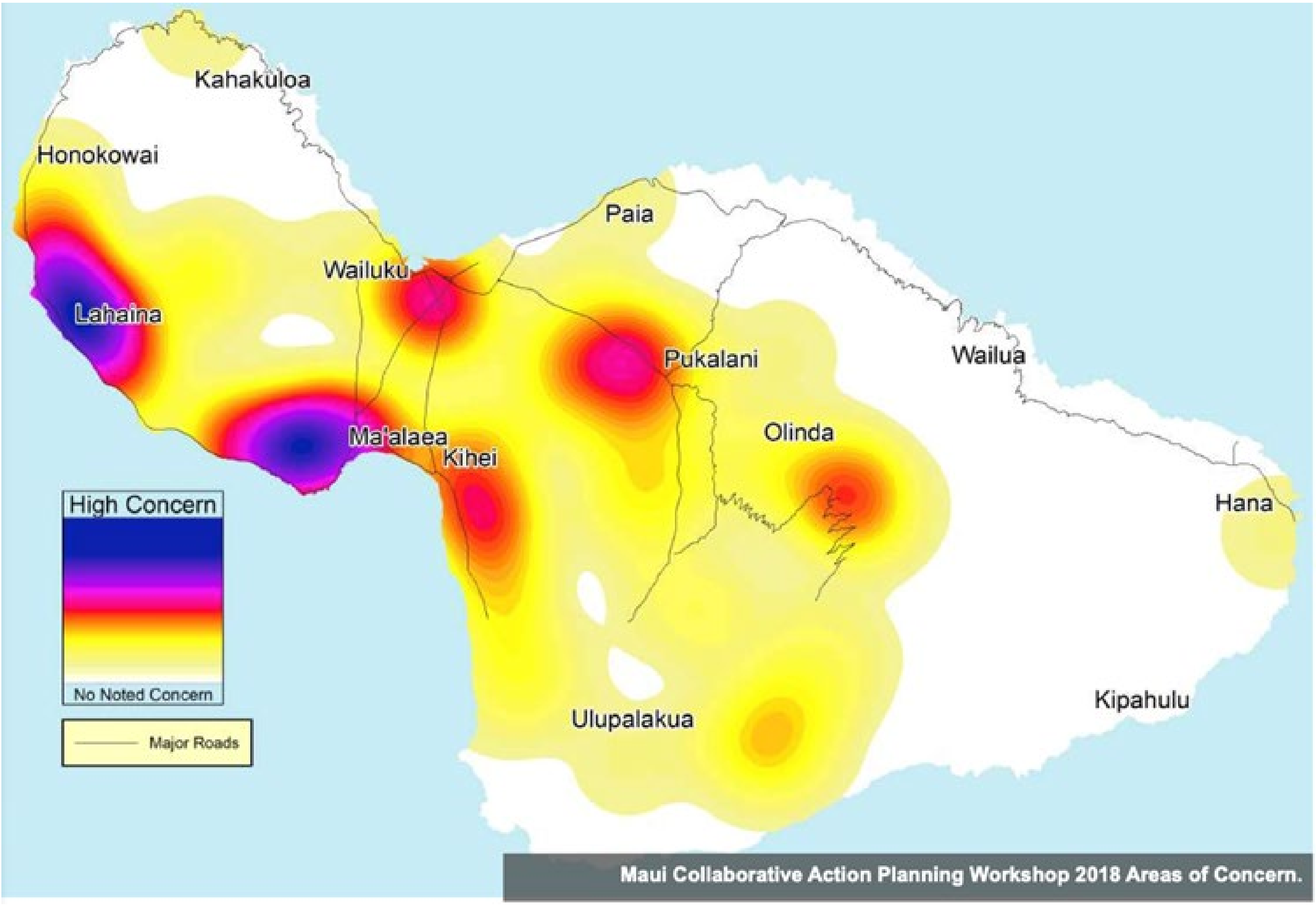


Figure 3.3.8.1 Fire Risk Heat Map: In 2018, 41 individuals from Maui representing government organizations, businesses, private landowners, and residents participated in a workshop to identify and prioritize county areas by their values at risk, hazardous vegetation, and where to start the hazard mitigation effort. The areas of highest concern represent where the participants selected as high priority for each of the three (3) categories.[108]

On September 10, 2020, the Hawaiʻi State Fire Council adopted the *National Fire Protection Association (NFPA) 1, Fire Code©, 2018 Edition* (as amended) as the state's fire code. Subsequently, the County of Maui passed Ordinance 5451 on November 23, 2022, which included amendments specifically addressing vegetation management.[109]

The amendment within Subsection 10.13.10 within Ordinance 5451 extends authority to the fire department to require property owners to mitigate the vegetation around structures and to establish and maintain fuel breaks when deemed necessary.

As of this writing, the County of Maui has not produced any evidence that the MFD has enforced these amendments in the Lahaina area, through inspection, follow-up, and ultimately, a $1,000 fine.

3.3.9 Findings & Recommendations

Finding	Recommendation
9. FINDING: A lack of vegetation management programs, including policy, regulation development and enforcement, and funding support to address vegetation management needs across the variety of landowner types contributed to a prevalence of unmanaged vegetation on the wildland and urban areas impacted by the August 8, 2023, fire.	**RECOMMENDATION:** Develop comprehensive vegetation management programs that address the many types of land ownership and risk-reduction needs, to include thinning vegetation, removing invasive species, and creating strategic fuel breaks: • On public lands, funding for vegetation management must be commensurate with the personnel, equipment, and maintenance costs needed to strategically and consistently reduce risk. • On private lands, a combination of tax incentives and penalties for active land management, as well as a robust and proactive defensible space code inspection and enforcement programs are needed. • Such programs must be funded and staffed at a level appropriate to adequately ensure risk-reduction measures are implemented and effectively mitigate the potential for fire ignition and rapid spread through unmanaged lands. **RECOMMENDATION:** Establish specific governmental authorities, responsibilities, and goals for the management of vegetative fuels. (Currently, authority to address vegetation hazards is covered by a vague responsibility by the mayor and fire chief to address any number of hazards). **RECOMMENDATION:** Establish a system of penalties to address owners of agricultural land who are not participating in active agriculture or vegetation management. **RECOMMENDATION:** Develop programs that support coordination and implementation of an "All Hands, All Lands" approach, where vegetation management strategies and projects reduce risk across land ownerships, according to topography and anticipated fire behavior, rather than in fragmented or siloed parcels. **RECOMMENDATION:** Implement and expand use of targeted grazing for non-native forage grass removal and fuels reduction at landscape scale.

3.3.9 Findings & Recommendations

10.	**FINDING:** Fire risk and protective measures are not generally considered or integrated into land use planning, ordinances, or permitting processes to ensure adequate defensible space or consistent management of vegetative fuels in and around communities.	**RECOMMENDATION:** Require integrated land use planning through zoning regulation that requires vegetation management in high-risk areas. **RECOMMENDATION:** Educate homeowners on how to create defensible space around their properties, and require them to maintain these spaces. **RECOMMENDATION:** Incorporate community-scale, maintained green spaces that are multi-use and could act as fuel breaks and public safe refuge areas.
11.	**FINDING:** The existing landowner and land steward risk-reduction programs, which include best practices for vegetative fuels management, have limited capacity and have not been invested in by the government at a level that meets the current need.	**RECOMMENDATION:** Provide land steward and community education regarding vegetation management best practices. Invest in, and grow, the existing programs of Firewise USA™ and educational programs for land stewards offered by existing groups, such as those already led (but underfunded) by the HWMO, University of Hawai'i, and their established partners.
12.	**FINDING:** There is no adequate system for monitoring fuel loads, fuel moisture, and other relevant characteristics.	**RECOMMENDATION:** Improve monitoring of fuels and utilize drones, satellite imagery, and ground-based monitoring systems to detect and assess vegetative fuel loads, fuel moisture, and high fire risk conditions. **RECOMMENDATION:** Establish an information dissemination system to fire and emergency managers to communicate high-risk locations and periods.

3.3 ANALYSIS OF SYSTEM COMPONENTS

3.3.9 Findings & Recommendations

13. **FINDING:** There is a need for additional public and private investment in long-term ecosystem restoration and sustainable land management practices that promote healthy ecosystems, maintain active agriculture, reduce fire risk, and control erosion.	**RECOMMENDATION:** This investment can be accomplished as key components of integrated land use planning, financial incentive and assistance programs, and land steward education (all described above). **RECOMMENDATION:** Invest in watershed partnerships, conservation groups, and other existing ecosystem conservation and agricultural initiatives. **RECOMMENDATION:** Invest in and bolster plant material supply chain for bulk seed production to support adequate fuel conversion and post-fire mitigation. For example, these programs could include common native seed collection, plant propagation, and outplanting.

3.4 ANALYSIS OF SYSTEM COMPONENTS

3.4 Infrastructure

The readiness and performance of any jurisdiction's underlying critical infrastructure are key factors that contribute to the resiliency of the overall built environment system when impacted by a major fire or other disaster events.

Infrastructure contributes to community resilience by ensuring critical services like hospitals, electrical grids, communication networks, and drinking water treatment, storage, and distribution remain operational during and after wildfire events.

Infrastructure plays a pivotal role across all three (3) goals of the Cohesive Strategy, and occupies a dominant role in the focal area of Fire Adapted Communities. Robust infrastructure, such as well-maintained roads and wildfire-safe subdivision design, enables swift deployment of firefighting resources to containment areas, minimizing fire spread.

In the hours leading up to the Lahaina PM fire, severe winds and extreme fire weather significantly degraded infrastructure systems across the County of Maui. The impact of the initial fire and resulting urban conflagration further affected the already-deteriorating infrastructure, especially in the heavily populated areas of Lahaina where many lots meant for single homes had multiple structures.

Planning and zoning regulations can influence where and how communities develop, impacting fire risk, structural ignitability, and evacuation routes. Properly planned infrastructure supports evacuation efforts by providing safe routes, emergency shelter locations, ignition-resistant structures, and adequate setbacks (the minimum distance required between a structure and the property line or other structures, dictated by zoning laws and building codes) and spacing to inhibit rapid fire ignition and spread.

Transportation infrastructure in Maui was challenged by the weather and fire conditions on August 8-9, 2023. The pre-existing road network in Lahaina left some neighborhoods with only one (1) way in or out. Many of these access/egress routes were blocked—by downed utility poles/wires, abandoned vehicles, traffic, smoke obscuration, and/or fire impingement—limiting first responders ability to access these neighborhoods and preventing many residents from getting out.

Water infrastructure that was sufficiently designed to handle daily demand in Lahaina under normal operating conditions was unable to continuously generate sufficient pressure and volume for firefighting purposes after the Lahaina PM fire destroyed a large number of buildings and their associated domestic water piping.

Electrical infrastructure also began failing early in the day on August 8, 2023; these failures negatively affected the ability of fire and police units to access and deploy into neighborhoods for firefighting, warning, and evacuation purposes. Collapsed utility poles and downed wires also prevented some residents from escaping along surface streets. It also appears that downed wires and related arcing may have caused additional fires across Lahaina, throughout the duration of the Lahaina PM fire.

The wind on August 8, 2023, proved too much for Lahaina's aging above-ground electrical transmission infrastructure. A small vegetation fire sparked by a downed line would ultimately become an urban conflagration where residents were challenged to evacuate densely populated areas with narrow streets and locked gates, and the rapid loss of hydrant pressure and flow would limit the water available for firefighting.

Zoning, fire/building code regulations, and road networks, as well as water and electrical infrastructure are critical components of the built environment fire protection system. Infrastructure that lacks sufficient resilience to match the weather and wildfire threat increases the likelihood of failure over time.

This section will analyze elements of the preparedness and response efforts for each of these infrastructure components, while also examining how fire suppression resources interacted with the existing road network, the County of Maui Department of Water Supply, and Hawaiian Electric.

3.4.1 Planning, Zoning, and Codes

Community planning and zoning, with the adoption and enforcement of building/fire codes and standards, are critical components within the overall fire protection and life safety system. This section will analyze these elements with respect to how they impacted fire progression, suppression, and community egress on August 8-9, 2023.

3.4.1.1 Planning

The County of Maui Department of Planning[110] is responsible for offering technical advice, proposing zoning legislation, drafting updates to plans, providing reports and recommendations on development proposals, and overseeing programs, including special projects. Land use planning is an important aspect of community resilience to natural hazards, such as flooding and wildfire, especially at the WUI.[111]

The County of Maui General Plan[112] is a long-term, comprehensive blueprint for the physical, economic, environmental development and cultural identity of the county. The first component is the Countywide Policy Plan, which provides broad goals, objectives, policies, and actions that portray the desired direction of the county's future.

The second component is the Maui Island Plan,[113] which provides direction for future growth, the economy, and social and environmental decisions on the island through 2030. Additionally, each of the nine (9) communities in Maui Nui have developed a plan(s) providing recommendations specific to their areas. Lahaina and the communities impacted by the August 2023 fires are included in the West Maui Community Plan.[114]

Wildfire is addressed in the West Maui Community Plan as one of several hazards posed by a changing climate. The plan requires that all development projects incorporate defensible space around their perimeter and addresses the need for ongoing maintenance as recommended by the MFD.

The August 2018 fire in Lahaina is mentioned as an example of the potential for destructive fires during high winds. Recommendations include requiring defensible space around structures and vegetative fuels management in high fire hazard areas. Notably the plan does not recommend buildings to be built or retrofitted to recognized WUI standards, as it does for hurricane standards.

3.4.1.2 Zoning

Development standards, height regulations, and building setbacks are crucial elements in urban planning and fire safety, significantly impacting fire progression, suppression, and egress during emergencies. Development standards include minimum lot area and minimum lot width, and for some zoning classifications, such as apartments, maximum lot coverage and maximum floor area ratio.

Building setbacks are designed to provide sufficient space for firefighting operations, reduce the risk of fire spreading between buildings, and ensure safe evacuation routes.

In Lahaina, the issues related to building setbacks and property information became evident during the Lahaina PM fire. Many areas in Lahaina had closely spaced buildings, which increased the fire's rapid

3.4.1 ANALYSIS OF SYSTEM COMPONENTS

progression. The limited setbacks meant that once one (1) structure ignited, the fire was able to spread more easily to adjacent buildings through radiant heating, and potentially, direct flame contact. This issue was particularly problematic in densely built neighborhoods where homes were often separated by only a few feet.

Title 19 of the Maui County Code of Ordinances[115] provides land use regulations in a manner encouraging orderly development in accordance with the County of Maui's General Plan and community-specific plans. The zoning requirements are also intended to provide development standards that help implement the community plans, including location, density, and use of buildings/structures.

There are 22 districts (zoning classifications), including residential, two-family, apartment, hotel, business, industrial, park, and agricultural. The zoning classifications may change over time as amended by the county. Current zoning maps for Maui, which consider existing structures on the property, became law on March 22, 2022.[116] Figure 3.4.1.2.1 shows the zoning classifications for Lahaina.

The zoning classification determines types of structures permitted on the property and development standards, including lot size, coverage area, building height, and setback distances. A majority of the area impacted is zoned residential. There are three (3) categories of residential with corresponding development standards. R-1 allows the most dense and narrowest lots with a minimum of 6,000 square-feet per structure and a minimum of 60-foot lot width. Minimum setback distances are 15 feet in the front and 6 feet in the side and rear. Lot size and setback distances create the basis for separation distances between structures—this is discussed further in Section 4.0 in the analysis of fire progression in the built environment.

In addition to the primary structure, outbuildings, shade structures, and accessory dwelling units (ADUs) are common on many properties. Figure 3.4.1.2.2 shows the percentage of each parcel occupied by a building and Figure 3.4.1.2.3 shows the approximate building cover per acre grid.

The Phase Three report will provide additional analysis, findings, and recommendations related to planning and zoning.

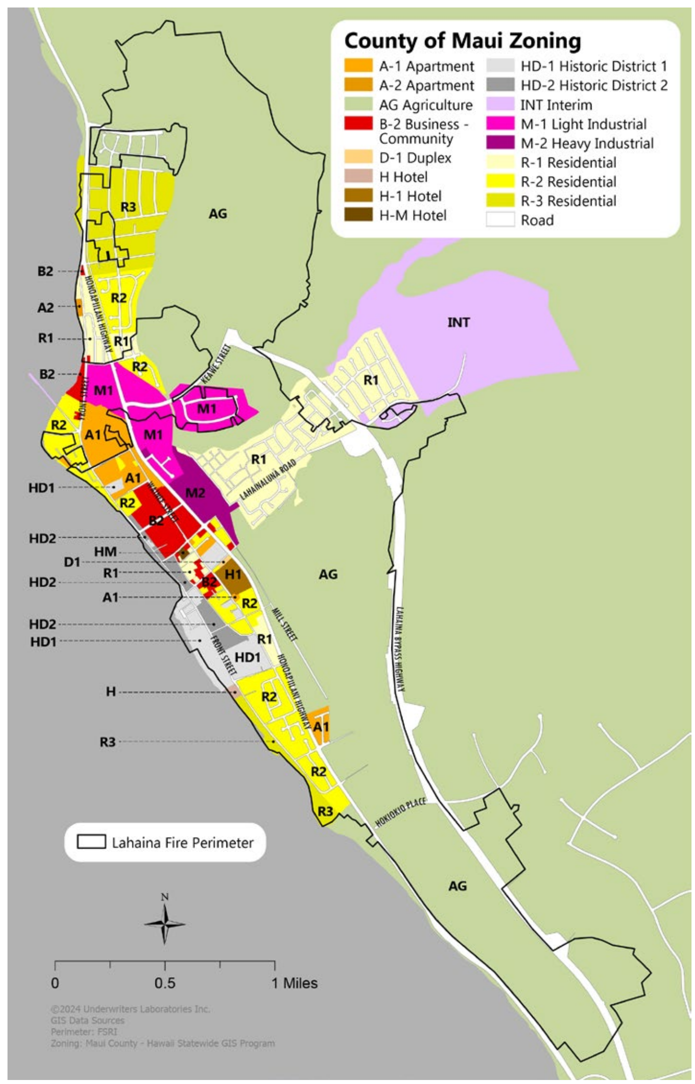


Figure 3.4.1.2.1 Zoning map of Lahaina and area impacted by fire.

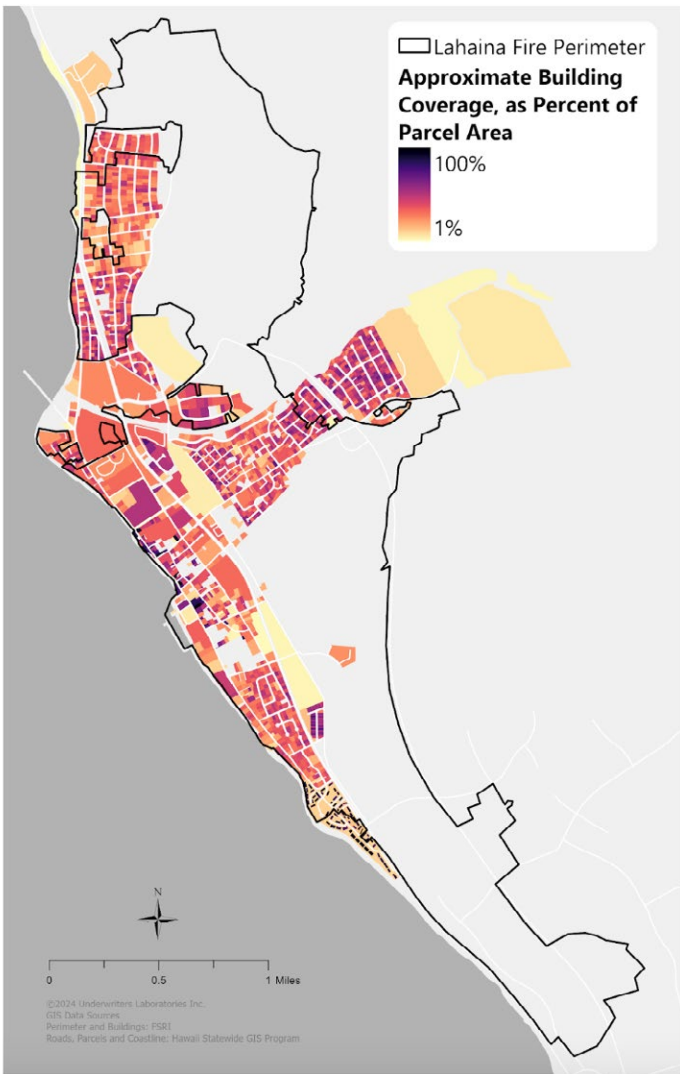


Figure 3.4.1.2.2 Percentage of parcels covered by buildings, approximated by roof line.

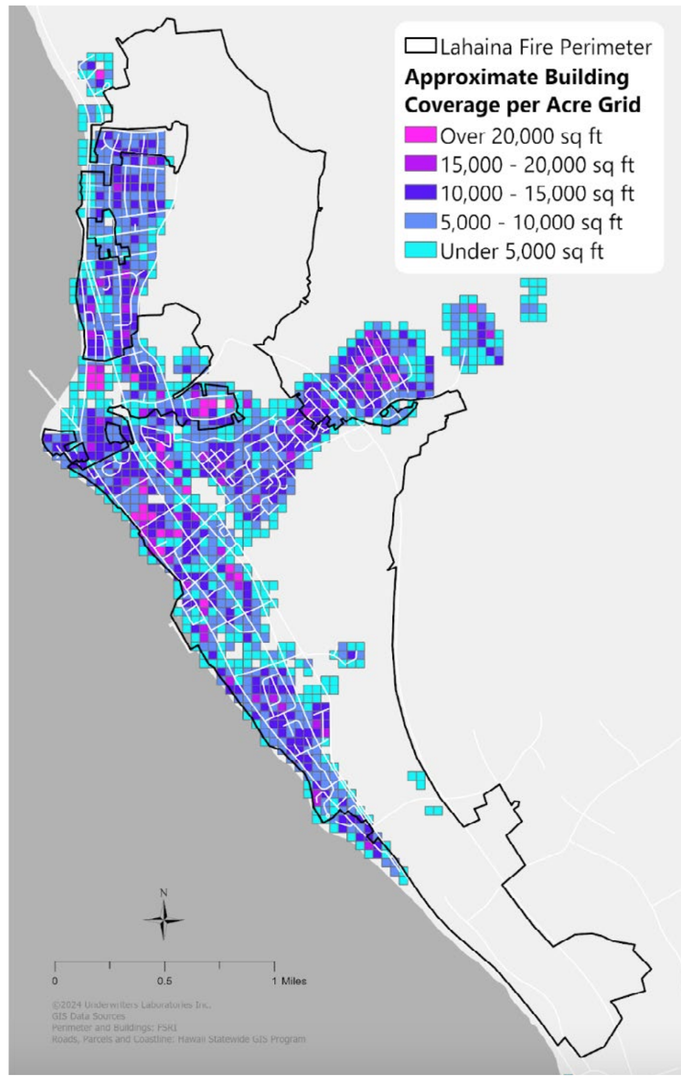


Figure 3.4.1.2.3 Building coverage per one (1) acre grid cell. These cells cross parcel boundaries.

3.4.1 ANALYSIS OF SYSTEM COMPONENTS

3.4.1.3 Codes

At the time of the August 2023 fires, the State of Hawai‘i used the 2018 *International Residential Code*©[117] (IRC) and the 2018 *International Building Code*©[118] (IBC), but there are two (2) important caveats.

First, the state has several amendments to the model code. Second, code enforcement is at the county level. The State of Hawai‘i has adopted NFPA 1 as the statewide fire code. Within the state fire code, WUI provisions are provided in Chapter 17.

The State of Hawai‘i statute[119] prescribes that each county shall amend and adopt the Hawai‘i state building codes and standards no later than two (2) years after the adoption by the state. Most recently, the State of Hawai‘i adopted the 2018 IRC and the 2018 IBC in April 2021, and the State Fire Council adopted the 2018 NFPA 1 with amendments as the state fire code in September 2020.

On and before August 8, 2023, the County of Maui was enforcing the 2006 IRC and IBC, which they had adopted in 2012 as Chapter 16.26B within the Maui County Code. Chapter 16.26B was amended by ordinance in 2016, 2017, 2018, and 2022.

In April 2023, the County of Maui passed ordinances to adopt, with amendments, the 2018 IBC. The ordinance specified the County of Maui would begin enforcing the updated editions of the codes on October 28, 2023.

The County of Maui has a County Wildfire Preparedness Plan, originally developed in 2014.[120] The county also has a Hazard Mitigation Plan, most recently published in 2018,[121] and updated in August 2020.[122]

Additional information related to the code adoption process and potential impact on fire protection will be included within the Phase Three report.

3.4.1 ANALYSIS OF SYSTEM COMPONENTS

3.4.1.4 Findings & Recommendations

14. FINDING: At the time of the fire, zoning in some areas of Lahaina was not commensurate with the modern built environment, environmental risks, and population growth.	**RECOMMENDATION:** Review and adjust zoning laws to better reflect the actual occupancy levels in Lahaina. **RECOMMENDATION:** Implement stricter enforcement to ensure compliance with occupancy limits. **RECOMMENDATION:** Enforce building codes and zoning regulations that require sufficient road width and access points in new developments to ensure better planning for future developments. **RECOMMENDATION:** Increase the availability of off-street parking solutions to reduce the reliance on narrow streets for vehicle parking. **RECOMMENDATION:** Emergency responders should have pre-determined plans, as well as uniquely adapted equipment (if available), tactics, and strategies for specific areas with narrow streets, outlining alternative access points, water supply strategies, and evacuation procedures.
15. FINDING: At the time of the fire, the County of Maui was enforcing the 2006 edition of the *International Residential Code* and *International Building Code*.	**RECOMMENDATION:** Review and ensure adoption process meets requirements of state statute (HRS 107-28).

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

3.4.2 Road Networks

3.4.2.1 Lahaina Roads and Highways

Lahaina's road network provides access to residential neighborhoods, hotels, businesses, and recreational areas for a population of nearly 13,000.[123] Prior to August 8, 2023, 80% of the 2 million tourists visiting Maui each year would visit Lahaina.[124] Resident, business, and tourist traffic put tremendous stress on the road system during typical days, even when there was no emergency.

The Lahaina road system plays a critical role in providing egress during emergencies. Egress (north and south) out of Lahaina is mostly supported by the larger state highways cutting through the center of Lahaina, including the four-lane Honoapi'ilani Highway (Hwy-30) and the two-lane Lahaina Bypass that extends along the eastern (mauka) border of the town. Although more narrow than the state roads, a few county roads provide alternate options for north and south traffic flow through the central portion of Lahaina.

See Figure 3.4.2.1.1 for a map of the road system.

Figure 3.4.2.1.1 Road Network. Map shows Lahaina with fire perimeter and egress routes used throughout August 8, 2023. State highways in orange and county roads in yellow.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

Figure 3.4.2.2.1 Kuhua Street Northbound: Map showing Kuhua Street looking north toward Aki Street. Pre-fire image taken September 2011 (bottom, right) and post-fire image taken October 6, 2023 (top, right).[126]

3.4.2.2 Description of Roadways in the Area

Narrow roads with limited ingress and egress points in Lahaina impede normal daily traffic flow and can severely interfere with expedient evacuations during an emergency. Road standards in neighborhoods can vary based on multiple factors, such as anticipated traffic volume, the dimensions and characteristics of vehicles using the roads, and pertinent local regulations.

The National Association of City Transportation Officials (NACTO)[125] notes that a curb-to-curb width of 28 to 30 feet is common for residential streets with parking on both sides, balancing the need for vehicle movement and parking space, while also promoting slower traffic speeds (NACTO). This prescribed width facilitates the unimpeded passage of vehicles, including those of emergency services.

This recommended road width was often not present in Lahaina. For example, Kuhua Street, a narrow dead-end road bordering the former Pioneer Sugar Mill industrial area, often encountered daily traffic challenges due to both legal and illegal parking. Additionally, this street is located within a densely populated residential area, which impeded the evacuation of residents during the fire.

According to police maps, 29 of the fire victims were located on Kuhua Street (Figure 3.4.2.2.1 and Figure 3.4.2.2.2). Other narrow roadways and alleys throughout Lahaina posed similar challenges during the evacuation process.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

Figure 3.4.2.2.2 Kuhua Street Southbound: Map showing Kuhua Street looking south toward Kamamalu Street. Pre-fire image taken September 2011 (bottom, right) and post-fire image taken October 6, 2023 (top, right).[127]

Safety issues also arise, as emergency vehicles struggle to navigate through parked cars and heavy traffic, delaying their response times. Several fire apparatus were trapped in the Lahainaluna neighborhood (east of Hwy-30) and vehicles eventually destroyed, which further limited response capabilities, including the loss of critical firefighting and life-saving equipment and delayed availability of emergency response personnel to address other response needs.

Pedestrian safety was also compromised as increased congestion posed risks, especially in areas lacking proper sidewalks or crosswalks.

The county roads providing access to older communities, such as the area locally known as the Lahainaluna neighborhood, are narrow, some less than 20 feet wide. This particular subdivision also has a labyrinth of roads that terminate in dead ends, or intersect with other roads that do not lead to a road tied directly to one of the major egress options (Figure 3.4.2.2.3). Street signs existed for most streets, however, signage informing drivers of dead ends, or indicating egress route direction were mostly not present.

Analysis of the road network and the built environment from before August 8, 2023, was conducted through the use of Google Street View,[128] Rapid Integrated Damage Assessment Tool,[129] and EagleView,[130] which allowed for the evaluation of the area from a time period prior to the August 2023 fires. The date range of the images evaluated were from 2011 to 2022. Post-fire images were also used to measure road widths using EagleView.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

Figure 3.4.2.2.3 Map of the Lahainaluna neighborhood displaying a labyrinth of roads, multiple dead ends, and limited egress routes. Kuhua Street is where many of the 102 decedents were found.

3.4.2.3 Vehicle Parking

In the more established neighborhoods of Lahaina, such as the Lahainaluna neighborhood, the number of occupants in homes directly influences the number of vehicles on the subdivision's narrow streets. According to the U.S. Census Bureau's American Community Survey,[131] the average vehicle ownership per household in Lahaina is approximately 2.3 vehicles. However, in high-density neighborhoods, this number can be significantly higher due to extended family living arrangements.

Many homes in Lahaina house more residents than originally envisioned. Multi-generational living arrangements and the need for affordable housing contributes to higher occupancy levels. With more occupants per home, the number of vehicles per household typically increases, leading residents to park on narrow streets due to limited off-street parking, which increases congestion. This situation created several bottlenecks during the evacuations on August 8-9, 2023.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

Zoning laws and housing regulations are designed to control the density of residential areas. These laws are often based on an estimated number of occupants per household and aim to ensure adequate infrastructure, including roads, to support the expected population. Local ordinances often specify parking requirements, such as the number of off-street parking spaces per dwelling unit, to prevent congestion on narrow streets (Figure 3.4.2.3.1).

The discrepancy between regulations and actual behaviors exacerbated these issues, highlighting the need for more effective planning and enforcement of existing zoning laws, ordinances, and housing regulations.

The County of Maui's Parking Law[133] (Chapter 10.48 Stopping, Standing, and Parking) includes requirements generally seen in other municipalities. However, in many of the older Lahaina neighborhoods with small lot sizes and narrow streets, it is not possible to legally park where parking is restricted within four (4) feet of either side of a public or private driveway. On and before August 8, 2023, there were too many vehicles and not enough parking spaces to accommodate them.

Signage restricting stopping and parking is mentioned in Chapter 10.48 of the County of Maui's Parking Law.[76] "No Parking" signs can be seen in Google Street View images at the end of roads in the Lahainaluna neighborhood (Figure 3.4.2.3.2). The degree to which parking violations within the neighborhoods (not in the business districts) are enforced is unknown.

Figure 3.4.2.3.1 Kaili Place showing narrow street and vehicle parking. Pre-fire image taken September 2011 and post-fire image taken October 6, 2023.[132]

Figure 3.4.2.3.2 Pāʻūʻū Place. Image showing multiple no parking signs at the dead end of Pāʻūʻū Place in the Lahainaluna neighborhood. Pre-fire image taken September 2011 and post-fire image taken October 6, 2023.[134]

3.4.2.4 Dirt Roads – Cane Haul Road Network

Dirt roads formerly used during the plantation era are maintained to some extent even today (Figure 3.4.2.4.1). FSRI team members drove and/or walked all of the roads within the burn area, beginning in late August 2023 through October 2023.

The roads within the north flank of the burn area were all drivable and some even experienced considerable vehicle traffic during the team's visits. During a vegetation fire in the east (mauka) Kāʻanapali area, team members encountered a number of vehicles on dirt roads, including private contractor heavy equipment, civilian vehicles, and motorcycles.

Many of the roads were groomed with pull outs and turnarounds in several locations, and some were two (2) lanes wide. It is unknown if the dirt roads were in this condition prior to the fire. It is likely that some of the roads were graded during the fire to accommodate redirected traffic from streets blocked by downed electrical equipment, burned and disabled vehicles, and other debris.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

Signage identifying the dirt roads was not observed during FSRI's visits and names are not always visible or consistent in available mapping resources (e.g. Google Maps or EagleView).

The Old Cane Haul roads, as many locals referred to them, were well known even though they were unmarked. Firefighters, police officers, and residents referred to specific roads by different names (Figure 3.4.2.4.1).

For example, the dirt road running north to south along the eastern (mauka) border of the Wahikuli neighborhood was sometimes referred to as the "Old Road," "Oil Road," "Old Oil Road," "Stuart Road," or "Old Stuart Road" by emergency responders and residents. Google Maps refers to this road as Old Stuart Road just north of the Lahaina Civic Center, and then refers to it as Oil Road after crossing north of Pu'ukoli'i Road.

Dirt roads in central and south Lahaina also served as evacuation routes. The dirt road extending along the south bank of Kahoma Stream, parallel to Komo Mai Street, and the dirt road cutting through the vegetation on the south end were both critical egress options. These dirt roads also lacked signage and are not consistently identified on maps.

See Figure 3.4.2.4.2 for a map of Lahaina's dirt road network.

Figure 3.4.2.4.1 Photo of Old Cane Haul Road, often referred to by police officers and firefighters as Oil Road, just north of Kapunakea Street. This road is accessed through a gate located on the north side of Keawe Street at Kuhua Street. Oil Road was used extensively during evacuations due to utility poles blocking Hwy-30 just north of Keawe Street. Inset: Old Cane Haul Viewpoint. Image showing the area depicted in the photograph above.

Figure 3.4.2.4.2 Unpaved Roads. Cane Haul Roads. Map of Lahaina's dirt road network, including fire perimeter. Road names are included with source. These roads were used by residents to evacuate as fire and smoke was bearing down.

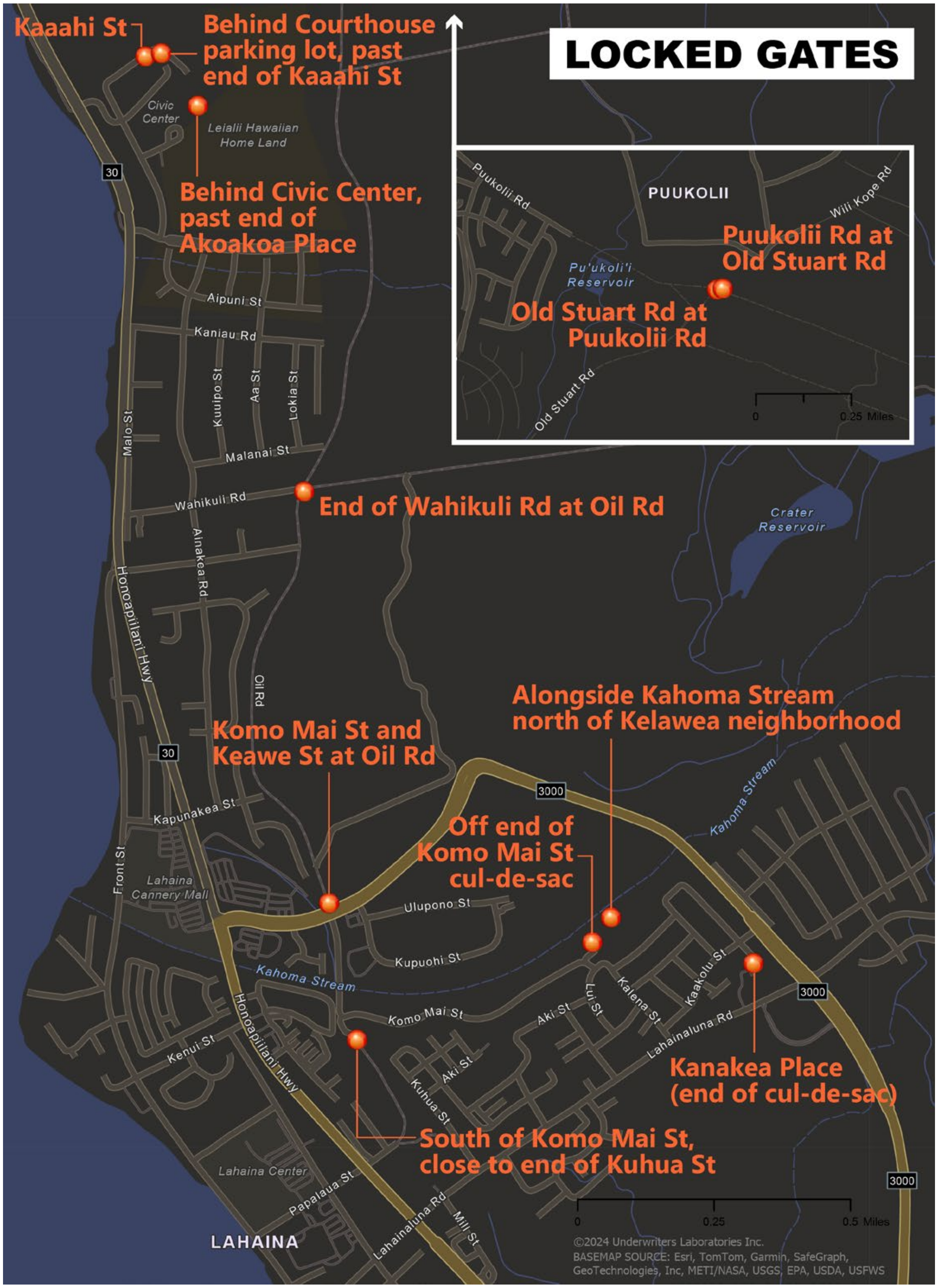


Figure 3.4.2.4.3 Locked Gates Map. Map showing location of locked games preventing access to dirt roads used during August 8-9, 2023. MPD officers shared how they had to cut the locks to open the gates to allow vehicles to escape the fire and smoke.

3.4.2 ANALYSIS OF SYSTEM COMPONENTS

There were several instances where dirt roads located on private properties were difficult to access due to locked gates. MPD officers shared experiences of having to use cutting tools to break the locking mechanism to allow the gate to be opened. In some cases, vehicles were used to ram or pull the gate open as residents waited in their vehicles while fire and smoke impacted the area. The location of the locked gates identified during technical discussions are shown in Figure 3.4.2.4.3.

Additional discussion on the impact of dirt roads and locked gates is provided in Section 3.8.

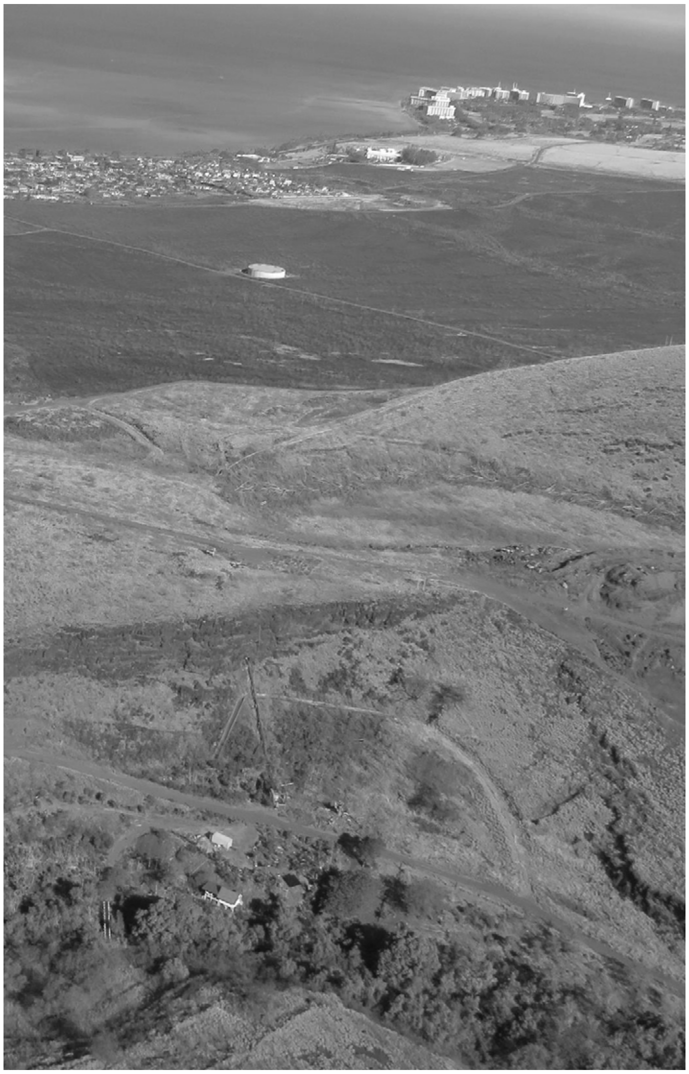
The unplanned use of these roads during the emergency highlighted several issues. The lack of maintenance of these roads over the years has led to deterioration, making them difficult to navigate quickly and safely. Overgrown vegetation, erosion, and debris further complicate their use. The emergency nature of opening gates to connect paved roads to these dirt roads pointed to an important gap in pre-planned alternate routes for emergency evacuations and access.

Moreover, the blocked and gated roads greatly impeded access to these escape avenues by first responders, who were forced to use tools to cut through locks and chains or find local residences with access keys. This delay and additional effort might have been avoided with pre-arranged access permissions and coordinated efforts with landowners and local authorities.

The situation also highlighted the importance of regular maintenance and inspections of these potential evacuation routes to ensure they remain viable options during emergencies.

The reliance on these dirt roads during the fire exposed the need for improved signage and mapping. Many residents, tourists, and first responders were not familiar with the layout of these roads, leading to confusion and potential delays. Enhanced communication, training, and detailed mapping of these routes could improve response times, egress, and firefighting access in future emergencies.

While the unnamed dirt roads provided a critical alternative during the fire, the experience underscored the necessity for better planning, maintenance, and coordination to ensure these routes can be effectively used in future emergencies.



3.4.2.5 Findings & Recommendations

16. FINDING: Emergency responders did not have ready capability to unlock emergency gates at various locations, including schools, to facilitate evacuations. They were often forced to rely on a third-party response for such access.	**RECOMMENDATION:** The MPD and MFD should develop an assessment of its ability to access local utilities (Hawaiian Electric), flood control, waterworks, farms, resorts and public facilities (ex. private and public schools), flood control roads and gates, agricultural roads and gates, harbor areas, etc.) for emergencies. Create a system of universal lock security access that is available to all emergency responders and landowners.
17. FINDING: Severe congestion due to parked cars along neighborhood streets hindered evacuation and response efforts.	**RECOMMENDATION:** The MPD and county authorities should assess the parking needs and challenges within neighborhoods. This may include evaluating factors, such as population density, housing types, availability of off-street parking, street width, proximity to commercial areas or public transportation, and existing parking issues.
18. FINDING: Limited written traffic plans or guidelines for emergencies and escalating incidents.	**RECOMMENDATION:** Develop a pre-incident plan for the MPD to manage traffic during a wildfire that involves coordinating efforts to ensure public safety, facilitate evacuation, if necessary, and maintain traffic flow in affected areas. Update MPD G.O. 405.1 Traffic Section and G.O. 405.7 Traffic Direction and Control to include instruction on wildfire evacuation (Appendix 6.12.1-2). **RECOMMENDATION:** Implement and enforce strict no-parking zones on critical streets and encourage the use of off-street parking solutions to reduce the number of vehicles parked on narrow streets. **RECOMMENDATION:** Where possible, redesign traffic flow in congested areas, including implementing one-way street systems, to optimize vehicle movement. **RECOMMENDATION:** Residents in areas with narrow streets should be educated on fire safety procedures, importance of clear buffer zones/defensible spaces, and evacuation plans to ensure a more coordinated response.

3.4.2.4 Findings & Recommendations

19. FINDING: Roadways and evacuation routes were not adequately maintained prior to August 8, 2023, to sustain effective evacuation efforts during the fire event.	**RECOMMENDATION:** Identify, name, map, and provide signage on dirt roads that serve as alternate egress/evacuation routes so residents and emergency responders refer to them by the same name. **RECOMMENDATION:** Inspect and maintain dirt roads annually. Modernize, standardize, and maintain barriers on dirt roads to help ensure they can be used during emergencies. **RECOMMENDATION:** Where feasible, widen roads to accommodate more parking, traffic, and provide room for emergency vehicles.

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

3.4.3 Water System

Potable water supply infrastructure is crucial for wildfire management, supporting the goals of the Cohesive Strategy by enhancing response and suppression efforts, landscape resiliency, and community protection. Collaboration among local communities, water departments, firefighting agencies, and land management organizations is necessary to strategically manage water resources.

Drinking water is essential for fire suppression—efficient storage and distribution systems help ensure availability where and when needed to fight fires. Toward resilient landscapes and fire-adapted communities, drinking water infrastructure and distribution systems can also support the maintenance of defensible space around homes and subdivisions, as well as agricultural and ecological restoration efforts.

In Lahaina, the demand for drinking water on August 8-9, 2023, exceeded the ability of the drinking water treatment, storage, and distribution system to deliver sufficient quantities of water at adequate volume and pressure within the distribution system. The number of structures on fire at one time, and subsequent loss of large amounts of water due to failed domestic water lines, left many of the hydrants with little to no pressure.

The scale and speed of the destruction could not be addressed rapidly enough with the resources available to the County of Maui Department of Water Supply. Water availability played an important role in the Lahaina PM fire. For this reason, an analysis of water infrastructure was conducted. This section will analyze the water supply system and explain its operation throughout the incident.

3.4.3.1 Lahaina Water Supply System

Drinking water is provided to the Lahaina area by the County of Maui Department of Water Supply. In the County of Maui, as well as the rest of the United States, drinking water may be used for a variety of reasons, including drinking, showering/bathing, flushing toilets, washing clothes, watering plants and lawns, washing vehicles, and firefighting.

Two (2) county water treatment plants produce drinking water that is used in this area on the west side of the county. The Lahaina treatment plant to the south, located near the Lahainaluna High School, has a capacity of 1.8 million gallons per day (MGD) equivalent to 1,250 gallons per minute (GPM).

The Māhinahina treatment plant to the north, located near the Kapalua Airport, has a capacity of 2.0 MGD (1,390 GPM). These treatment plants are also supplemented by a system of three (3) small groundwater well/tank combinations that enter directly into the distribution system. Water storage tanks fed by these plants and wells can store approximately 10 million gallons of treated drinking water.

Although the storage and distribution systems for these two (2) drinking water treatment facilities are connected, there is no interconnection with other parts of the County of Maui water system or other smaller water providers in the Lahaina area.

The County of Maui Department of Water Supply was seemingly in compliance with the Drinking Water Design Standards for the State of Hawaiʻi[135] by having sufficient drinking water stored prior to the August 2023 fires. However, the drinking water distribution system was unable to meet the hydraulic objective of providing a sufficient quantity of water at sufficient pressure for the large-scale August 2023 fire event in Lahaina.

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

3.4.3.2 Water System Standards

The United States Environmental Protection Agency (EPA) is responsible for the enforcement of all aspects of the Safe Drinking Water Act (SDWA) and public health protection involving Community Water Systems (CWS) within the United States and its territories.

The EPA delegates primary enforcement responsibility (also called primacy) for public water systems to states, territories, and tribes if they meet certain requirements set by section 40 CFR 141 of the Code of Federal Regulations (CFR). An entity with primacy is the agency with responsibility for implementing the SDWA. The State of Hawaiʻi has primacy within the state for enforcement of all drinking water standards.

Within these regulatory boundaries, professional engineers determine drinking water storage and distribution systems using:

- Their engineering judgment and experience based upon engineering studies
- Design guidance from the American Water Works Association (AWWA)
- Published engineering textbooks
- State design standards
- The ten (10) state standards for water: *Recommended Standards for Water Works* (2012)[136]
- Other technical material from governmental and professional organizations—ex. *Insurance Services Office Inc. Guide for Determination of Needed Fire Flow* (2014)[137]

Water System Standards for the State of Hawaiʻi

Water system design standards for Hawaiʻi[138] were developed in 2002 and have been amended to address specific design concerns and technological improvements in water system planning, design, and operation. The last amendment to these standards occurred on December 14, 2023, to address pipes and appurtenances. A complete list of the amendments are included in Section 6.9 of the Appendix.

These water system standards are applicable to all community water supplies in Hawaiʻi. It should also be noted that these standards may be slightly different between county governments within the state. They apply to the Department of Water Supply for the County of Hawaiʻi, Board of Water Supply for the City and County of Honolulu, Department of Water for the County of Kauaʻi, and the Department of Water Supply for the County of Maui.

In general, three (3) primary factors control the sizing of drinking water systems. These factors are domestic consumption, demand factor, and specific fire flow requirement (the amount of water needed to control a fire in a building or structure). The state standards require that the capacity of the distribution system deliver the maximum daily demand simultaneously with the required fire flow. The distribution system should also deliver the peak hour flow (without fire flow).

Table 100-18[139] from the Water System Standards is a listing of the domestic consumption guidelines based upon the zoning designation and county within the State of Hawaiʻi. These guidelines were in effect at the time of the August 2023 fires and would have been used by the county to determine the adequacy of the Lahaina and Māhinahina drinking water systems based upon the zoning designation and the population of the surrounding communities.

Based on the domestic consumption requirements of Table 100-18, and County of Maui zoning information, the average daily water demand in Lahaina was conservatively estimated to be slightly less than 6 million gallons (MG). Using a demand factor of 1.5 from Table 100-20, Lahaina had a maximum daily water demand of slightly less than 9 MG. A demand factor of 3.0 from Table 100-20 is required for the peak hourly flow. The required peak hourly water usage would be 0.75 MG delivered with a minimum pressure of 40 pounds per square inch (psi).

The total amount of water capable of being stored in the combined Lahaina and Māhinahina drinking water storage and distribution systems was 10 MG with all tanks full. This value was above the maximum required daily demand estimated in this report of 9 MG. The amount of water stored in each individual system also exceeded the peak hourly storage requirement of 0.75 MG.

As per Figure 6.8.3, total system volume on August 8, 2023, ranged from just less than 7 MG to less than 6 MG until 15:30 when data was no longer available. Therefore, the amount of water stored in the two (2) systems met the state requirements for the required average daily demand until data was no longer available as described above.

The most demanding fire flow case for Lahaina, from Table 100-19,[140] is heavy industrial/hotels at 2500 GPM for two (2) hours at a critical fire hydrant with a residual pressure of 20 psi. This value equates to 0.3 MG of water stored. The water stored in each individual system at the time of the fire exceeded these requirements.

Table 100-18 Domestic Consumption Guidelines. Source: Board of Water Supply, City and County of Honolulu.

Table 100-18 - DOMESTIC CONSUMPTION GUIDELINES

AVERAGE DAILY DEMAND*

ZONING DESIGNATION	HAWAII	KAUAI	MAUI	OAHU
RESIDENTIAL:				
Single Family or Duplex	400 gals/unit	500 gals/unit	600 gals/unit or 3000 gals/acre	500 gals/unit or 2500 gals/acre
Multi-Family Low Rise	400 gals/unit	350 gals/unit	560 gals/unit or 5000 gals/acre	400 gals/unit or 4000 gals/acre
Multi-Family High Rise	400 gals/unit	350 gals/unit	560 gals/unit	300 gals/unit
COMMERCIAL:				
Commercial Only	3000 gals/acre	3000 gals/acre	6000 gals/acre	3000 gals/acre
Commercial/Industrial Mix	--	5000 gals/acre	140 gals/1000 sq. ft.	100 gals/1000 sq. ft.
Commercial/Residential Mix	--	3000 gals/acre	140 gals/1000 sq. ft.	120 gals/1000 sq. ft.
RESORT (To include hotel for Maui only)	400 gals/unit (1)	350 gals/unit	350 gals/unit or 17000 gals/acre	350 gals/unit or 4000 gals/acre
LIGHT INDUSTRY:	4000 gals/acre	4000 gals/acre	6000 gals/acre	4000 gals/acre
SCHOOLS, PARKS:	4000 gals/acre or 60 gals/student	4000 gals/acre or 60 gals/student	1700 gals/acre or 60 gals/student	4000 gals/acre or 60 gals/student
AGRICULTURE:		2,500 gals/acre	5000 gals/acre	4000 gals/acre

* - Where two or more figures are listed for the same zoning, the daily demand resulting in higher consumption use shall govern the design unless specified otherwise.

(1) - Subject to special review and control by the Manager.

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

The County of Maui Department of Water Supply was seemingly in compliance with Hawai‘i State standards for the required average daily demand until data was no longer available after 15:30 on August 8, 2023. It should also be noted that both the Lahaina and the Māhinahina drinking water treatment plants continued to produce water throughout the fire event. The demand from the fire and system losses due to uncontrolled water release in burned structures seemingly overwhelmed the system's capability to deliver water at fire hydrants with sufficient pressure as the fire progressed.

Table 100-19 Fire Flow Requirements. Source: Board of Water Supply, City and County of Honolulu.

Table 100-19 - FIRE FLOW REQUIREMENTS

LAND USE	FLOW (GPM)/DURATION (HRS)/FIRE HYDRANT SPACING (FT.)			
	HAWAII	KAUAI	MAUI	OAHU
Agriculture	500/0.5/600 (1)	250/1/500	500/2/500	1000/0.5/700
Rural			1000/2/500	
Single Family	(2)	(4)	1000/2/350	1000/1/350
Duplex	1500/1/300	(4)	1250/2/350	1000/1/350
PUD Townhouse and Low Rise Apartments	1500/1/300	(4)	(5)	1500/1/250
Schools, Neighborhood Businesses, Small Shopping Centers, Hotels (except Maui), and High Rise Apartments	2000/2/300	2000/2/350	2000/2/250	2000/2/250
Light Industry, Downtown Business, Large Shopping Center, and Hospitals	2,000/2/300	3000/3/350	2000/2/250	4000/3/250
Heavy Industry, Hotels	2,000/2/300	3000/3/350	2,500/2/ 250	(3)

(1) - Applies to one acre lot size or less
(2) - 10,000 sq. ft. or larger lot size = 500/2/600; Less than 10,000 sq. ft. lot size = 1000/1/600
(3) - Subject to special review and control by Manager
(4) - R-2 = 500/1/500 R-4 = 750/2/500 R-6 = 1000/2/500 R-10 = 1250/2/350
R-20 = 1500/2/350 RR-10 = 1500/2/350 RR-20 = 2000/2/350
(5) - A-1 = 1500/2/250 A-2 = 2000/2/250

Note:
1. On dead end streets, the last F.H. shall be located at one half the spacing distance for F.H.s from the last house/unit (frontage property line or to the driveway/access for the property).
2. Spacing of fire hydrant shall be measured along the roadway.

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

Table 100-20[141] from the Water System Standards shows the demand factors for the various county governments in Hawai‘i that are used for the design of drinking water storage and distribution systems. Although the peak demand is consistent throughout the state, under the state standards, the peak hourly flow for Kaua‘i, Maui, and O‘ahu is calculated as only three (3) times the daily average.

Finally, the County of Maui Department of Water Supply was seemingly in compliance with Hawai‘i State standards for the amount of water stored for a community population of more than 13,000.

Table 100-20 Demand Factors. Source: Board of Water Supply, CIty and County of Honolulu.

Table 100-20 - DEMAND FACTORS

Island	Maximum Daily Demand	Peak Hour
Hawaii	1.5 x Average Day	5.0 x Average Day
Kauai, Maui, Oahu	1.5 x Average Day	3.0 x Average Day

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

Drinking Water System Storage Capacity
At the time of the August 2023 fires, the population of Lahaina was approximately 13,000.[142] As a result, the maximum daily water demand for a community of that size would be approximately 3.5 MGD, which was in line with state standards.

The total water storage capacity in both the Lahaina and Māhinahina systems is 10 MG. This storage amount is almost three (3) times the maximum water demand for Lahaina, meaning the County of Maui was meeting current state standards for both the Lahaina and the Māhinahina treatment, storage, and distribution systems for water treatment capacity and water storage capacity.

All drinking water storage tanks have an effective storage volume that may be used on a daily basis, depending upon the hydraulics and operational philosophy of the drinking water treatment, storage, and distribution system. During unexpected water demand events (like the August 2023 fires), storage tanks can utilize emergency storage volume.

Depending upon the system design and operational philosophy, the storage tank levels may drop during an emergency to an ineffective storage level. At this level, there may still be water in the tank, however, it may not be hydraulically feasible for this water to be available in all parts of the distribution system.

Water Distribution System Pipe Sizes and Standards
Drinking water distribution pipelines can be divided into two (2) general categories based upon their size and number of connections. Distribution pipelines or mains are generally smaller diameter water pipes, ranging from six (6) to 16 inches in diameter that provide water to a relatively small area of service and have multiple service connections.

Transmission pipelines or mains are generally larger in diameter (greater than 16 inches), do not generally have service connections, and are designed to transport larger quantities of water within the storage and distribution system during periods of peak demand.

There are currently no pumps in the Lahaina water distribution system, it is fed entirely by gravity.

The Water System Standards for the State of Hawaiʻi require water distribution pipelines to be sized according to the following standards:

1. Provide the maximum daily flow plus fire flow with a residual pressure of 20 pounds per square inch (psi) at a critical fire hydrant

2. Provide peak hourly flow with a minimum residual pressure of 40 psi

3. Provide a maximum velocity in the distribution main (without fire flow) of 6 feet per second (fps)

4. **For Maui Only**: In addition, the maximum velocity in the mains shall apply as follows:
    a. Distribution Mains – 10 fps with fire flow at max day domestic flow
    b. Transmission mains without water services or fire flow – 10 fps

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

3.4.3.3 The Fire Event of August 8, 2023, and the Water System

During the Lahaina PM fire, water demand in parts of Lahaina exceeded the ability of the water storage and distribution system to deliver sufficient quantities of water at adequate pressure within the system. In central parts of Lahaina, water system pressure and capacity were observed to be insufficient to support firefighting operations.

As per FSRI data, 3,336 structures were exposed to fire in Lahaina and 2,118 of those structures were classified as destroyed. As homes and other buildings burned, domestic drinking water pipes failed and water ran freely. Pressure in water lines dropped and very little water was available for use by firefighters in central and southern Lahaina.

It should be noted that the water supply did not fail in all parts of Lahaina. Some areas of Lahaina had water service throughout the fire. Water shortages were most common in central and southern Lahaina. Additionally, the County of Maui Department of Water Supply continued to produce water throughout the duration of the fires. Both plants had electrical power and produced water throughout the fire.

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

3.4.3.4 Findings & Recommendations

20.	**FINDING:** The County of Maui Department of Water Supply was seemingly in compliance with the Water System Design Standards for the State of Hawaiʻi in August 2023.	**RECOMMENDATION:** Given the increasing threat of wildfires and wildfire-initiated urban conflagrations, it may be necessary for the State of Hawaiʻi to revisit its design standards and guidelines for storage and distribution systems that could be used for firefighting purposes.
21.	**FINDING:** No pumps are used outside of the water production facilities to provide pressure in the system. Both systems had uninterrupted electrical power during the August 2023 fires and produced water at capacity for the duration of the fire.	**RECOMMENDATION:** N/A
22.	**FINDING:** The amount of drinking water in storage tanks at the beginning of the August 2023 fires seemingly met standard design requirements as required by the Water System Design Standards for the State of Hawaiʻi.	**RECOMMENDATION:** N/A
23.	**FINDING:** As per the Phase One report (pages 237-239), the water supply monitoring system failed at 15:30 (3:30 p.m.) on August 8, 2023, and no storage tank data was recorded for the duration of the fire event. Once this data connection was lost, the County of Maui Department of Water Supply did not know how much stored water was available for firefighting during the fire.	**RECOMMENDATION:** Develop, install, and maintain a resilient drinking water tank level monitoring system for the Lahaina and Māhinahina storage and distribution systems that can be monitored from the County of Maui EOC and other locations.
24.	**FINDING:** As homes and other structures were damaged and destroyed by fire, household plumbing (e.g., plastic and other piping) inside of the buildings failed, allowing unrestricted flow of water from one (1) or more locations in each home or structure, resulting in water freely flowing from more structures and diminishing the overall water pressure and flow in the fire area.	**RECOMMENDATION:** N/A

3.4.3 ANALYSIS OF SYSTEM COMPONENTS

3.4.3.4 Findings & Recommendations

25.	**FINDING:** As per the Phase One report (page 239), County of Maui Department of Water Supply employees were unable to enter the fire area to assist firefighters due to multiple factors, including traffic congestion and the danger presented by the fire. Firefighters did not have the time, training, or tools to shut off water.	**RECOMMENDATION:** Develop a plan to coordinate with the County of Maui Department of Water Supply to address water system needs at the incident command post (ICP). (See Section 3.6.3 for more information)
26.	**FINDING:** Due to the hydraulics of the drinking water storage and distribution system, and given the excessive demand caused by the flow from damaged/destroyed structures, water was not provided with sufficient volume and sufficient pressure (i.e., the system could not meet the required demand) for use in firefighting for the entire August 2023 fire event in Lahaina.	**RECOMMENDATION:** Perform a hydraulic analysis of both the Lahaina and Māhinahina storage and distribution systems. Use the results of this analysis to design larger and/or multiple interconnected pipes between the two (2) drinking water storage and distribution systems. Consider the use of pumps, as appropriate, to supplement pressure and volume. Determine pressure and volume limits for a major fire event that stakeholders understand and can operate to.
27.	**FINDING:** Water quality and cost concerns make it impractical to size a drinking water treatment, storage, and distribution system to accommodate the firefighting demands for a fire conflagration event similar to the one that occurred in August 2023 in Lahaina.	**RECOMMENDATION:** Provide alternate means of firefighting water supply for extreme events. This may include portable pumps to draw water from public and private pools, ponds, and other bodies of water (including sea water), large diameter hose equipped apparatus, sites, or connections for marine vessels to draw water from the Pacific Ocean, and other means.

3.4.4 ANALYSIS OF SYSTEM COMPONENTS

3.4.4 Electrical Power

Electrical power infrastructure is crucial for wildfire management, as its proper management mitigates fire risks, ensures public safety, and maintains reliable power during and after wildfires. Coordination among utility companies, fire and emergency response agencies, and consumers is required, aligned with the timely and consistent communication focus recommended by the Cohesive Strategy.

Policies and practices that support adopting preventative vegetation management programs around power infrastructure, investing in resilient electrical infrastructure, implementing Public Safety Power Shutoffs (PSPS) during extreme fire weather, and supporting backup power solutions work together to enhance community wildfire safety and system reliability.

Power companies must also have strategies for rapid response to extreme weather and wildfire incidents, ensuring quick restoration of services to support community recovery and firefighting efforts, and coordinating with fire agencies to prioritize power shutoffs and restorations.

Electrical power infrastructure played an instrumental role in the Lahaina PM fire, including both ignition hazards and safety challenges to the public and emergency responders.

The specific role Lahaina's electrical system played in the ignition of the fire will be covered in the origin-and-cause report being prepared by the County of Maui and ATF.

3.4.4.1 Hawaiian Electric Preparedness

As stated within the Phase One report (page 41), Hawaiian Electric staffed for normal operations on August 8, 2023. This was consistent with how the MFD, MPD, and the County of Maui Department of Water Supply staffed, and can also be related to the statewide perceptions of wildfire risk mentioned in Section 2.1.

Preparing for extreme weather events is critical to being able to best prevent and respond to anticipated emergencies, such as the August 2023 fires. Prevention of electrical infrastructure failure due to high winds and wildfire requires years of planning, investment, execution, and government oversight by the PUC.

Beginning July 22, 2019, Hawaiian Electric established a Resilience Working Group (RWG) consisting of more than 70 individuals representing a broad cross-section of industries and government agencies.[143] The group assisted with developing the Climate Adaptation Transmission and Resilience Program that would ultimately be approved by the PUC, thus paving the way for Hawaiian Electric to receive $95 million in funds granted under the federal Infrastructure Investment and Jobs Act to match an equal contribution from customers.[144] Details of the program and the proposed projects are included within Hawaiian Electric's website.[145]

In Lahaina, there was a mixture of above-ground and below-ground transmission wires. It appears the above-ground infrastructure had little to no vegetation management around utility poles. Pre-fire images from Google Earth Street View show dry grass growing along roadsides and right up to the base of the poles. Many utility poles caught fire and 29 ultimately fell to the ground, while numerous transmission lines were compromised due to the extreme downslope winds from the northeast.

3.4.4.2 Knowledge of Power Status and Coordination with the MPD and MFD

Firefighters and law enforcement officers are trained to work with extreme caution around electrical equipment. If they are uncertain that lines are de-energized, they are instructed to treat them like they are energized and to remain at a safe distance and protect their crews and the public.

The MFD and MPD personnel encountered many downed utility poles and compromised electrical transmission lines, starting in the early morning of August 8, 2023. They communicated these hazards along with non-operational traffic signals to Central Dispatch on numerous occasions.

The minute-by-minute timeline[146] within the Phase One report includes more than 150 radio transmissions addressing electrical power and infrastructure issues. Nearly half of these communications (70) occurred between the hours of 01:00 to 10:00 on the morning of August 8, 2023.

Most of these communications were to advise Central Dispatch of the hazard (i.e., downed or leaning poles and transmission lines on the ground), so they could inform Hawaiian Electric. Several were requests to know the status of the power.

Table 3.4.4.2.1 provides a partial record of Hawaiian Electric's communications with MPD and MFD dispatchers informing Hawaiian Electric of leaning poles and requests for the status of the power during four (4) separate times.

Table 3.4.4.2.1 Partial record of Hawaiian Electric communications with the MPD and MFD regarding power status. Central is the MPD's central dispatch.

Hawaiian Electric Communications with Maui Police Department (MPD) and Maui Fire Department (MFD) Regarding Power Status (Partial Record)		
August 8, 2023	21:33:00	**Hawaiian Electric:** Hello, Maui Electric. **Central:** This is the police department; we are trying to confirm that the lines down in front of the Lahaina Station on Honoapiʻilani are all deenergized. **Hawaiian Electric:** Yes, it is but it is not grounded, so you still cannot touch the lines, but the substation is burning. **Central:** OK, because they need to evacuate, so can they drive over it? **Hawaiian Electric:** Oh, what is the location? Where is it? Lahainaluna Road? **Central:** On Honoapiʻilani Highway, in front of the Lahaina Station. **Hawaiian Electric:** The Lahaina substation, right? **Central:** The Lahaina Police Station. **Hawaiian Electric:** Oh, Lahaina Police Station. (talking in the background asking about running over lines.) Yea. You can have them run over the lines.
*Now known as Hawaiian Electric. Red text: Indicates that the power supply is cut off.		

3.4.4 ANALYSIS OF SYSTEM COMPONENTS

Hawaiian Electric's response regarding the power status indicated a measure of uncertainty. On some of these recordings, you can hear the dispatcher asking other personnel in the work space if they knew if power was shut off to an area in question.

A full record of these communications can be found in Table 4.3.4.3 in the Phase One report (pages 235-236).

The conversation may not have instilled confidence with the Central dispatcher responsible for relaying the power status to firefighters and police officers. These inconclusive communications may have resulted in firefighters and police officers operating with extra caution and restricting their engagement with traffic control, evacuation, and fire suppression when it was known that lines were down.

Hawaiian Electric, the MFD, and the MPD do not have written guidelines or policies for first responders working around electrical equipment.

Best practices taken from a major California utility states the following:[147]

- **Secure the area.** Keep yourself and the public at least 100 feet away from fallen powerlines. Fallen transmission lines from large towers require 100 feet of clearance.
- **Stay clear of all downed lines** and anything they are contacting, including nearby fences, trees, cable or phone lines, and the ground.
- **Be extremely cautious when using water to fight fires near downed powerlines.** If you must use water, use only a mist or spray. Do not use a stream—it can create a clear path for current.

In addition, Hawaiian Electric issued a news release on August 8, 2023, at 15:30 informing West Maui and Upcountry residents of downed electrical equipment. The news release stated:

> *With the forecast of continued high winds, if you see a downed powerline, assume it is energized and dangerous. Stay away from downed powerlines – at least 30 feet or more (at least two (2) car lengths). Report downed lines immediately by calling Hawaiian Electric's Trouble Line; the number is 808-871-7777, available 24 hours a day, 7 days a week.*[148]

This communication was released just over thirty minutes after the Lahaina PM fire was called in by Hawaiian Electric crews. If residents were able to receive this information via their cell phones, which as per resident accounts were unreliable at that time, the information may have contributed to the inefficient movement of traffic through Lahaina as residents may have treated the downed utility poles and electrical transmission lines as if they were energized.

3.4.4.3 Incident Command Post (ICP) Presence and Operational Positioning

There was no evidence of Hawaiian Electric personnel coordinating and planning with MFD and MPD ICs. This is feasible due to the MFD and MPD maintaining their own incident command organizations and both being mostly mobile through the morning of August 9, 2023.

Not having an assigned Hawaiian Electric representative working closely with MFD and MPD incident commanders at a command post may have contributed to the lack of real-time information pertaining to the electrical hazards and the status of the electrical power throughout the many different areas of the incident.

Hawaiian Electric provided automatic vehicle locator (AVL) data for their operations personnel assigned to Lahaina. This data shows where crews responsible for clearing streets of fallen utility poles and electrical lines, and providing access to structures, were

3.4.4 ANALYSIS OF SYSTEM COMPONENTS

located at the time the Lahaina PM fire was reported through midnight on August 8, 2023 (see Figure 3.4.4.3.1).

AVL timepoints (a moment in time when an event or measurement takes place) indicate Hawaiian Electric units were positioned where downed utility poles and electrical wires were located as per the Phase One report (page 231). AVL timepoints generally decreased as the fire progressed throughout the day. As the fire extended into areas where downed electrical equipment was located, the situation became too dangerous for Hawaiian Electric units to remain in the area.

The presence of timepoints in the north area of Lahaina near the Civic Center during the 22:00 hour is consistent with the Phase One report (page 231) where a downed utility pole and electrical lines were partially blocking traffic on Hwy-30. The absence of timepoints from 23:00 to 24:00 is due to no AVL data being provided for this time period.

This could be due to conditions being too dangerous for Hawaiian Electric crews to be in the operational area. During this time, the fire had burned through the majority of Lahaina and extended as far north as the northern edge of the Wahikuli neighborhood and as far south as the Puamana area near Hwy-30 and Hokiokio Place (see Phase One Figure 4.3.1.2, page 47).

See Section 6.10 of the Appendix for a comparison of MFD, MPD, and Hawaiian Electric's AVL timepoints.

3.4.4.4 EOC Presence

A Hawaiian Electric representative was present at the Maui EOC starting at 05:15. This individual sent an email to Hawaiian Electric managers on the status of the fires and EOC operations at 06:15 (Phase One report, page 327). The email included instructions for MFD and MPD crews, stating:

"*Proactively asking the MPD/MFD where their crews are and to be sure that they assume all downed lines are energized. The MPD is checking to see if they need to request lines to be de-energized.*"

A Hawaiian Electric EOC representative was present throughout the critical periods of the incident as per the EOC sign-in sheets (Phase One report, page 316).

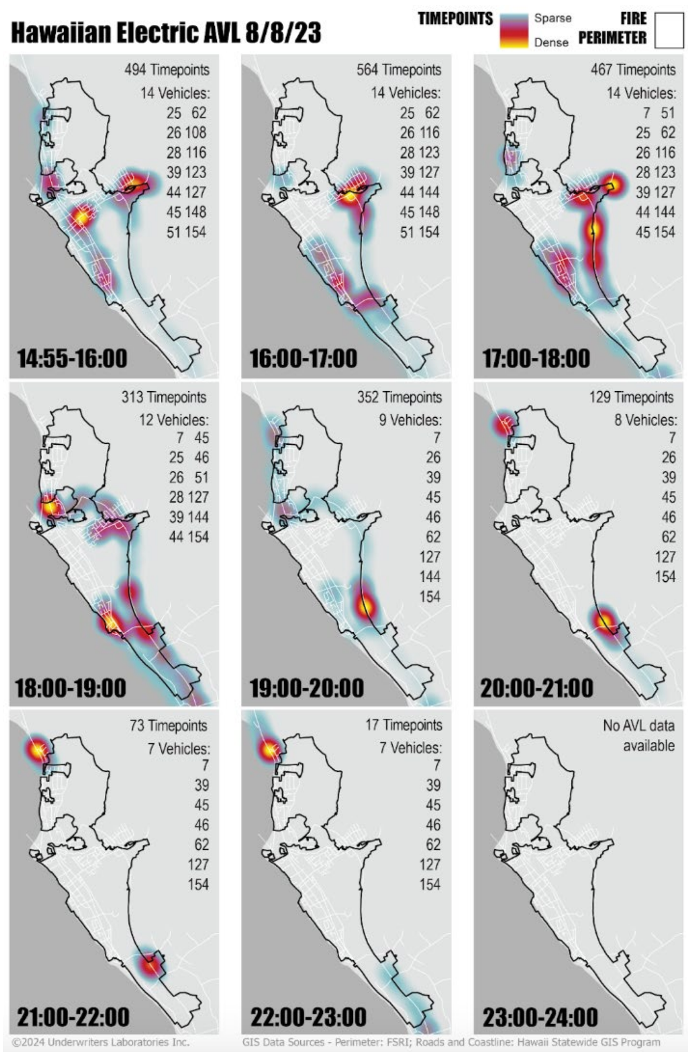


Figure 3.4.4.3.1 Hawaiian Electric AVL data for vehicles operating in the Lahaina area on August 8, 2023.

3.4.4.5 Findings & Recommendations

28.	**FINDING:** Hawaiian Electric (in partnership with the MFD and MPD) did not have an adequate staffing plan to prepare for the wildfire conditions of August 8, 2023.	**RECOMMENDATION:** Hawaiian Electric should work closely with the MFD and MPD to develop a staffing plan in preparation for high fire danger days. The plan should include implementing spotters and an artificial intelligence-enabled camera network, which can assess vulnerable areas of the infrastructure so failure points can be addressed quickly; operating a dedicated phone line to the MFD and MPD to communicate power and repair status; and assigning a representative to the ICP.
29.	**FINDING:** A lack of electrical utility vegetation abatement regulations and enforcement may have contributed to vegetation at the base of utility poles and near transmission lines, creating a receptive fuel source for arcing electrical wires.	**RECOMMENDATION:** Hawaiian Electric should continue to work closely with the PUC to execute the Climate Adaptation Transmission and Resilience Program and develop a long-term investment plan to protect infrastructure from high wind events and wildfire. The plan should include immediate vegetation management and enforcement requirements, a phased approach for undergrounding transmission lines in vulnerable areas, strategic replacement of bare overhead wires with covered conductors, and a Public Safety Power Shut-off program.
30.	**FINDING:** Hawaiian Electric did not have a Public Safety Power Shut-Off program in place at the time of the fire.	**RECOMMENDATION:** Establish a Public Safety Power Shut-Off program and communication protocol in collaboration with the community. Shutting off power to vulnerable areas of the grid reduces the chance of ignition due to electrical infrastructure failure.
31.	**FINDING:** The lack of execution of a Hawaiian Electric pre-event organizational plan led to having to staff more field positions during the event to address problems with electrical and water infrastructure.	**RECOMMENDATION:** Hawaiian Electric to prepare a staffing plan that is coordinated with the pre-event incident action plan (IAP).

3.5 ANALYSIS OF SYSTEM COMPONENTS

3.5 Communications

Timely and consistent communications are integral to wildfire management, connecting all three (3) tenets of the Cohesive Strategy. Clear and accurate information from trusted sources is crucial during incidents for overall safety, operational effectiveness, and community-related actions.

For resilient landscapes, effective communication informs land managers about best practices for vegetation management, fire prevention, and operational changes during high-risk periods. In fire-adapted communities, educating residents about fire risks, defensible space, and evacuation procedures ensures proactive risk reduction and readiness.

For safe and effective response, continuous communication within and among response agencies enables coordinated efforts, while public communication about evacuation routes and orders ensures safe evacuations. Emergency alert systems (EAS), supported by pre-event educational campaigns about their uses and meanings, provide timely warnings and instructions, enhancing overall preparedness and response efficiency.

During the August 8-9, 2023, fires, there were several key communication tools available to, and used by, County of Maui residents, government officials, and others, including the wireless emergency alerts (WEA) system, wireless phones, a public safety radio system, traditional landlines, voice over IP (VoIP), and satellite phones. It is important to develop strategies for communicating when technology fails.

Wireless (cellular) telecommunications service availability and effectiveness appears to have been highly variable at the time of the fire, as indicated by residents (Section 3.5.1.1), and likely the result of multiple factors, such as:

- Individual wireless carrier/providers
- Individual or organizational subscriber's specific service type or plan
- A person's particular location
- Desired mode of transmission (i.e., voice call, SMS text, or app-based messaging)
- Local/area network traffic at the time of transmission/receipt

It should also be noted that 911 calls continued to be received by dispatch throughout August 8, 2023, indicating there was service. Understanding the degree to which the cellular network was out of service on August 8, 2023, is difficult to determine due to the limited data available at the time this report was published.

For August 9-12, 2023, the Federal Communications Commission report indicates that 100% of the cell sites were out of service (Figure 3.5.1).

Federal Communications Commission

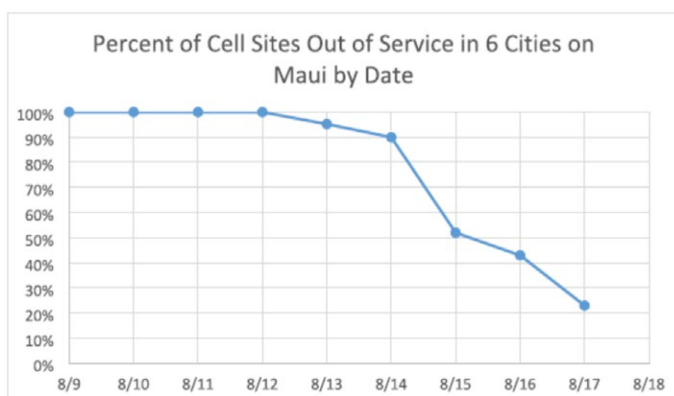


Figure 3.5.1 FCC-registered cell sites out of service in the County of Maui, HI. Source: Federal Communications Commission, Communications Status Report for Areas Impacted by Hawai'i Wildfires August 9-17, 2023.

3.5.1 ANALYSIS OF SYSTEM COMPONENTS

The dedicated public safety radio system used by County of Maui agencies appears to have been fully-functional throughout August 8-9, 2023, and was used by first responders during the incident.

Off-island communication could also be accomplished with landline telephones using POTS (plain old telephone system) or VoIP technology. Satellite phones were also an option for the limited number of people who have access to these devices.

Regardless of the technical mode of communication, the “human” factor must always be accounted for, such as (1) understanding the message content as intended by the sender(s); and (2) taking action(s) based on the content of the message(s) and/or the sender’s direction(s)—if applicable.

3.5.1 Public Communications

The preparedness and actions taken (or lack thereof) during the Lahaina PM fire, by both the public and response agencies, was impacted by how key communications were handled, including Red Flag Warnings, notices of potentially extreme fire behavior, and evacuation plans.

From the documentary evidence provided, the County of Maui and others sent multiple public-facing messages, which warned of impending weather conditions, provided fire notifications, and directed evacuations. Most of these messages were transmitted using the nationwide WEA system that relies on commercial carrier cellular networks for effective transmission. Other messaging was sent that required recipients to have access to other forms of communication technology.

Wireline and cable telecommunications services were also rendered inoperable for many subscribers from the impacts of the August 8-9, 2023, fires, including electrical failures, fire impingement, etc. (Figure 3.5.1.1)

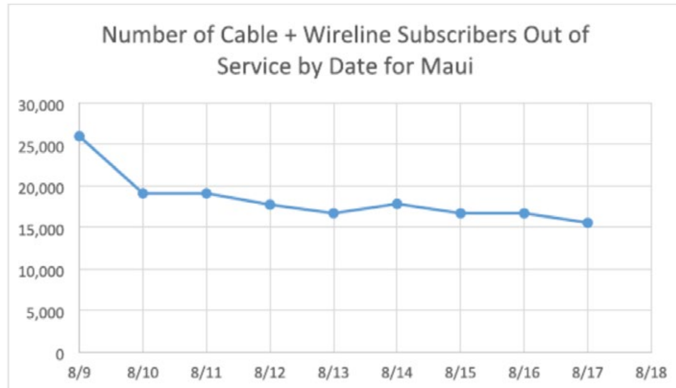


Figure 3.5.1.1 Number of cable and wireline subscribers out of service by date for Maui.[149]

According to the Federal Communications Commission, public AM and FM radio stations across Maui remained operable during the August 2023 fires.

3.5.1.1 Observations and Experiences from Resident Technical Discussions

In TDs with Lahaina residents, 71 individuals responded to the question: Did you receive a text notification from the county regarding the high winds and high fire danger?

- 87% (62/71) stated they did NOT receive a text notification
- 13% (9/71) stated they DID receive a text notification

There were many comments regarding text notifications. The majority of the residents stated they received no notification prior to or during the event. Some stated that they did not receive texts/ alerts while the person next to them did.

3.5.1 ANALYSIS OF SYSTEM COMPONENTS

Another experience shared was that the alert appeared as a scrolling message that could not be retrieved or reread. Overall, residents felt the text notifications were ineffective because they did not reach everybody. And for those that did receive them, some felt it did not adequately inform them of the urgency of the situation.

The experiences of the residents point to challenges with cell signals as stated above, but could also be due to lack of message clarity. These challenges should both be topics of further study.

3.5.1.2 Outdoor Warning Siren System

The State of Hawaiʻi maintains an All-Hazard Outdoor Warning Siren System (previously known as the County of Maui Outdoor Warning Siren) within each county to alert residents of natural and human-caused events.[150] The County of Maui provided no evidence of discussing siren activation prior to, or during any, of the four (4) Maui wildfires on August 8-9, 2023.

The effectiveness of warning sirens remains an open question. On August 8, 2023, it seems unlikely that—if the sirens had sounded—Maui residents and visitors alike would have known what the signal(s) meant they should do. At the same time, siren activation may have provided an additional cue to alert residents of an emergency and to seek further information.

Sirens are placed strategically around the island and can be activated within specific geographic areas. Sirens have been traditionally used to alert residents of impending tsunamis. According to HI-EMA staff, there has been an emergency siren trigger every 3-5 years on average.

Both the state and the county have the capability to sound the sirens (broadly or localized to a specific area), but the state coordinates with the counties prior to triggering any alerts. Although the sirens can be used for other types of emergencies, the false missile alert of January 13, 2018,[151] has caused some hesitancy in using them for other emergency situations. The sirens are based on mobile connection and during disruptions of cellular service, the sirens may not work.

Siren test records indicate approximately 20% of the sirens statewide are inoperable on any given day (Appendix Section 6.11). The counties are responsible for monthly testing of the siren system and for reporting those results to HI-EMA.

The TELCOMM branch within HI-EMA is required to maintain and repair the sirens. There is no set maintenance schedule for the sirens. HI-EMA does not have adequate staffing to keep up with the maintenance of the siren systems. Sirens within tsunami zones are given priority for repair.

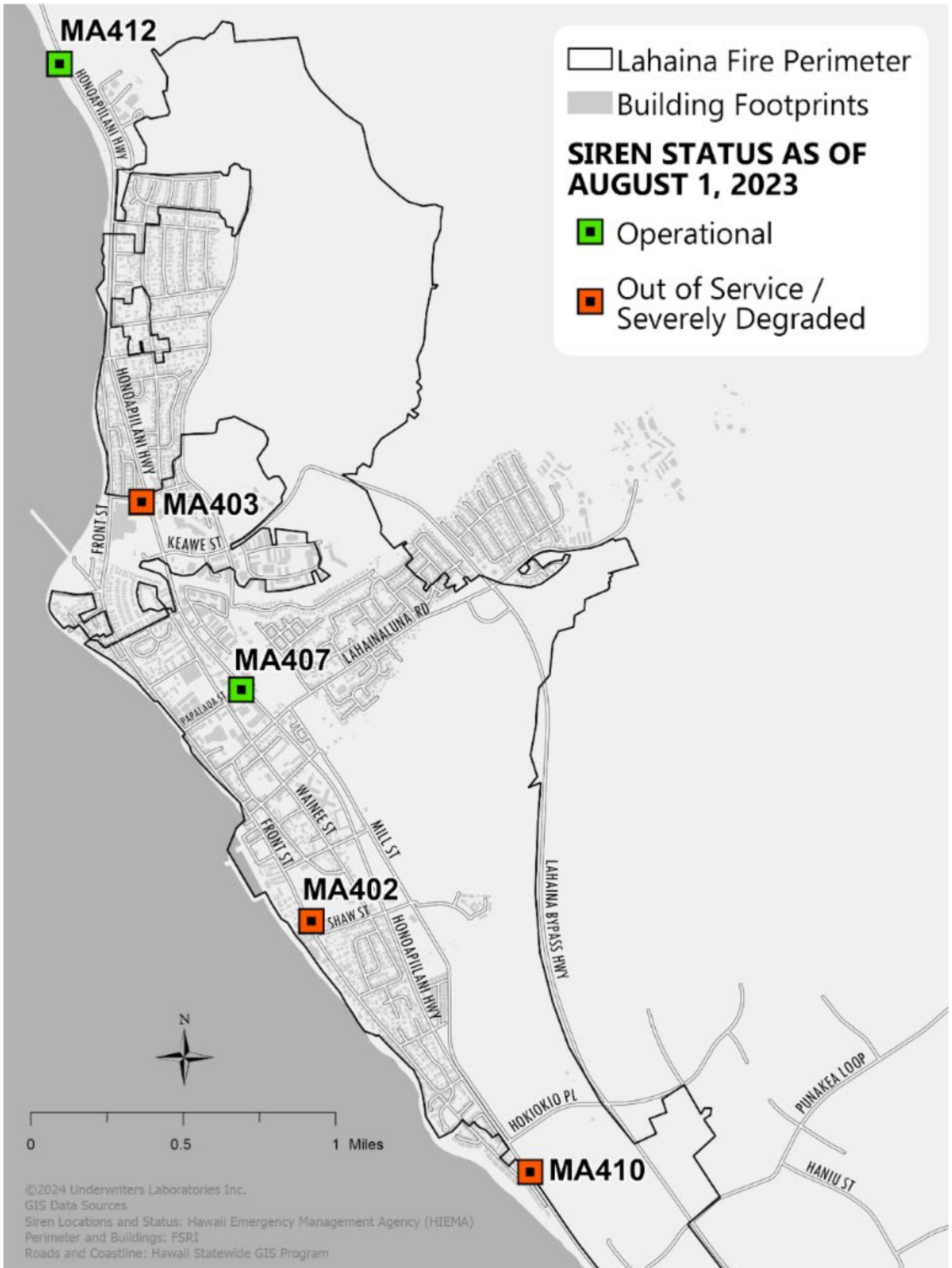
3.5.1 ANALYSIS OF SYSTEM COMPONENTS

Prior to the Lahaina PM fire, the sirens had never been used for warning of WUI fires (including the 2018 Lahaina fire). During TDs with MEMA and HI-EMA members, they stated that activation of the siren system was not discussed during August 8, 2023.

On August 8, 2023, there were five (5) sirens located off of Hwy-30 and near the coastline in the area of the Lahaina PM fire[152] (Figure 3.5.1.2.1). According to siren test records (Appendix Section 6.11) provided by both MEMA and HI-EMA, siren MA407, located near Papalaua Street and Hwy-30, and siren MA412, located off Hwy-30 just north of the Lahaina Civic Center, were the only two sirens operable at the time of the fire.

The records provided are exception-type reports, where only inoperable sirens are listed for each county. Although siren's MA407 and MA412 may have been operable on or before August 8, 2023, they were also very likely inoperable throughout August 8, 2023, due to the area experiencing intermittent cell service. Without a reliable cell signal, it would have been difficult to activate them.

3.5.1 ANALYSIS OF SYSTEM COMPONENTS



ID	Location	Status	Reason
MA402	Maluuluolele	Out of Service / Severely Degraded	Legacy siren. Frozen Motor
MA403	Old Cannery Kapunakea	Out of Service / Severely Degraded	Legacy siren. Frozen Motor
MA407	Lahaina 1st Hawn/Papalaua St.	Operational	
MA410	Puamana	Out of Service / Severely Degraded	Ongoing electrical issues
MA412	Wahikuli	Operational	

Figure 3.5.1.2.1 Map displaying locations and functional status of Lahaina outdoor warning sirens as of August 1, 2023 (first business day of the month = siren monthly test day). Base map provided by https://hiema.maps.arcgis.com/apps/dashboards/226e62cd78f340c29e52d4f38c46ac21. Siren status and maintenance records provided by MEMA and HI-EMA.

3.5.1 ANALYSIS OF SYSTEM COMPONENTS

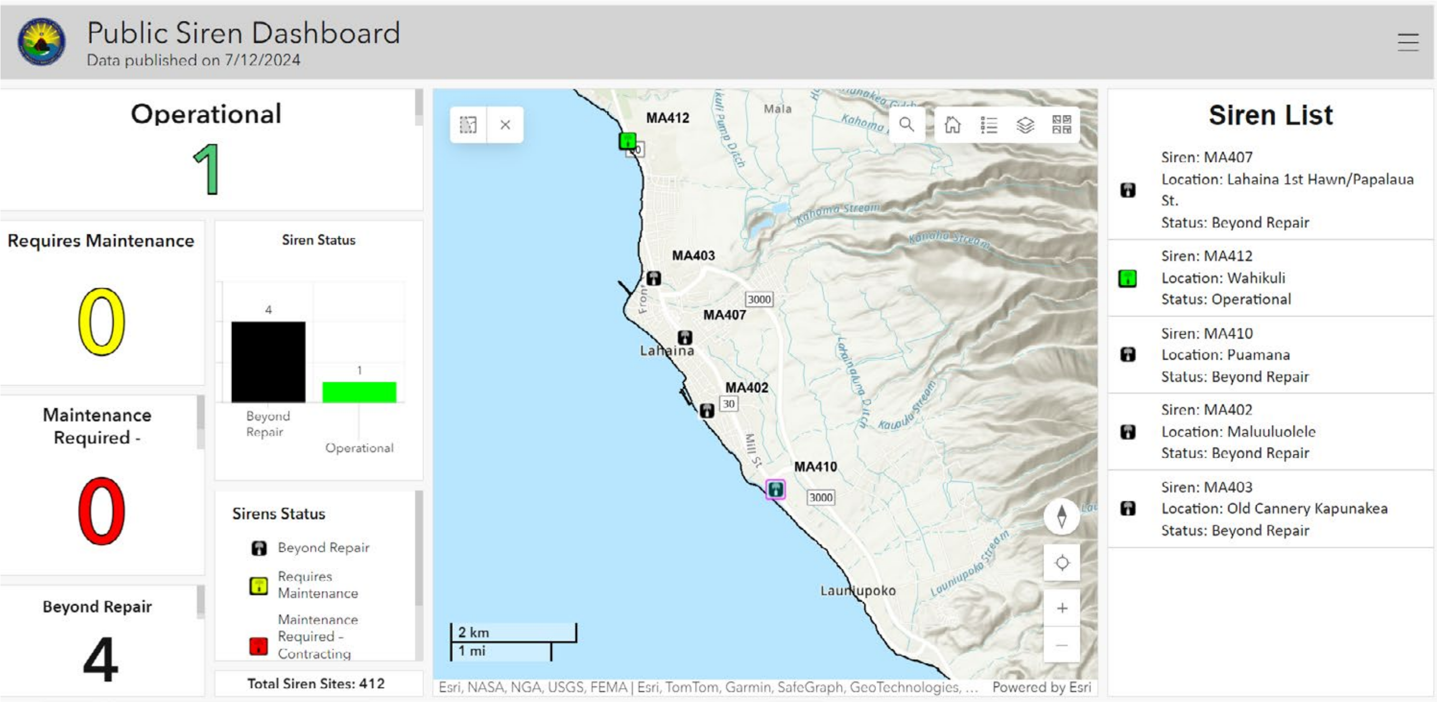


Figure 3.5.1.2.2 The public sirens in Lahaina on August 8, 2023, and their operational status as of July 12, 2024. Source: ARCIS.

The status of the State of Hawai'i Outdoor Warning Siren System is shared via the Public Siren Dashboard.[153] The July 12, 2024, dashboard for the Lahaina area in Figure 3.5.1.2.2 indicates that MA412, just north of the Lahaina Civic Center, is currently (as of July 2024) the only operable siren.

It also identifies four (4) of the five (5) Lahaina sirens as "Beyond Repair." Although the specific reason for being out of service is not disclosed, it is likely MA407 sustained significant thermal damage due to being directly in the fire's path.

Test and maintenance records for MA402, MA403, and MA410 indicate they had been out of service for several months prior to August 8, 2023 (Appendix Section 6.11).

Since the Lahaina PM fire, HI-EMA has taken an all-hazards approach to utilizing the siren system. Adopting the use of this "all-hazards policy"[154] requires additional public education about what a siren alert may mean and how the public should respond.

Maintenance of the system also needs to be addressed to ensure an adequate number of sirens are operational to effectively alert residents of the hazard.

Approximately two (2) weeks after the August 2023 fires, HI-EMA coordinated with the County of Maui and activated localized (geomapped) sirens for a wildfire.

3.5.2 ANALYSIS OF SYSTEM COMPONENTS

3.5.2 Emergency Responders

By all accounts, the County of Maui's land mobile radio (LMR) system—used by the MFD and MPD—remained fully functional, from a technical/serviceability standpoint, throughout the duration of the fires.

One of the communication challenges identified by responders was having to wait for open airtime on the radio to be able to transmit. This challenge is clearly evidenced from the master timeline where it is common to see 10-12 transmissions per minute during the height of the Lahaina PM fire operations. Options for reducing the communications load on the radio system were limited due to the simultaneous Olinda, Kula, and Pūlehu-Kīhei fires using the other tactical channels and having no additional dispatchers.

Both the MFD and MPD maintain a radio communications standard operating guideline (SOG) within their general policies. The MFD's Radio Communications policy (E.O. 300.04) was last revised on July 21, 2020, with an effective date of September 1, 2020 (Appendix Section 6.12.3).

The MPD's Radio Communications policy (G.O. 301.5) was last revised on December 23, 2021, with an effective date of February 28, 2022 (Appendix Section 6.12.4). Although each agency generally followed their radio communications SOGs, there were areas where personnel indicated improvements could be made. These areas will be explored within this section.

3.5.2.1 Central Dispatch

The 911 center ("Central"), located at Wailuku Police Station, is responsible for 911 emergency call-taking and dispatch, answering non-emergency calls, and answering and assisting with police administrative calls for the County of Maui (including a secondary location on Molokaʻi for coverage of Molokaʻi and Lānaʻi). Central dispatches the MPD, MFD, and AMR (American Medical Response) emergency medical services ("Med Comm"). During emergency events, Central is responsible for incident coordination, personnel tracking, and potentially assisting with resource requests from field personnel (e.g., requesting Hawaiian Electric's assistance).

Central staff are trained in call-taking (e.g., answering emergency, non-emergency, and MPD administrative calls), and are cross-trained to dispatch and monitor incidents for police, fire, and medic units. Each dispatcher is trained to staff the terminals and radio channels. Staffing may rotate on a daily basis.

On the island of Maui, Central has five (5) radio consoles, including a dispatch terminal, three (3) call-taking terminals, and one (1) training terminal that can be put into use if needed. Staffing on the island consists of a supervisor and three (3) dispatchers. This is considered "normal" staffing on a day-to-day basis.

During the Lahaina PM fire, MPD officers primarily used the Main D-1 Dispatch channel for calls for help or service, while also having the option to switch to tactical channels as needed. Tac 1 saw a lot of use, particularly by an Assistant Chief and the Lahaina MPD Captain, who coordinated their efforts and discussed various operational details. Tac 2 was also available and referenced occasionally, providing an additional communication line.

At 17:51 on August 8, 2023, Assistant Chief Reid Pursley (A-4) began using the radio extensively on the main dispatch channel and Tac 1, discussing operations, the National Guard, and the Red Cross with the captain. Pursley had a significant amount of radio traffic at the EOC level.

He transmitted 237 times during the fire, with 227 broadcasts after 17:52 when he began working from the EOC, covering logistics, planning, closures, evacuations, possible deaths, and road conditions. Throughout the incident on the evening of August 8, 2023, the captain and Assistant Chief Pursley mainly used Tac 1 to communicate.

Initially, the Kīhei and Lahaina districts (District 6) shared the same primary dispatch radio. However, at 20:57, dispatch advised all non-Lahaina units to switch to a different channel called the Kīhei PD channel. Consistently, through every interview, officers confirmed the radio system infrastructure was working well. They could receive and transmit messages, although sometimes it was difficult to hear when they were out in the hurricane/fire area wind. Overall, the radio system functioned effectively.

Central is also responsible for six (6) fire department (FD) channels. When a dispatcher answers an incoming call, they are responsible for the entirety of that call (i.e., dispatch of units and monitoring tactical radio operations until the resolution of an incident). The primary radio channel for fire operations is FD1. Multiple incidents may use FD1 as the primary communication channel between Central and field personnel.

On August 8, 2023, Central had five (5) dispatchers operating on Maui responsible for emergency, non-emergency, and administrative calls. As calls began to stack in Central, one (1) dispatcher on Molokaʻi, without notification or preparation, began receiving emergency calls from Maui. Police channels were also in use and being monitored by Central dispatchers.

Due to the multiple fire events, as well as other emergency calls across Maui, individual dispatchers were responsible for monitoring, tracking, and dispatching response, and assisting with resource requests for multiple large-scale events. The lack of radio channels, coupled with limited infrastructure and personnel, added to communication challenges during this event.

3.5.2.2 MFD and MPD Communications

Some firefighters were responding in relief apparatus (older apparatus that were no longer front line) and utility vehicles (typically standard pickup trucks—no water tank or pump—used to transport personnel into the operational area) that were not equipped with individual portable radios. Face-to-face communications were challenging for responding personnel due to the severe wind and low visibility from heavy smoke and fire.

Firefighters were entering Immediately Dangerous to Life or Health (IDLH) environments without the ability to readily communicate with each other. This may have led to complications during the mayday/burn-over event (see Section 3.7.4.2), as well as a report of a missing firefighter on August 9, 2023, during fire suppression efforts in the Launiupoko neighborhood.

The lack of a standardized call sign for self-deploying MPD officers hampered coordination and accountability. Without clear and unique identification, the communications center and other on-duty personnel struggled to identify who was on scene. This led to challenges in tracking resources, assigning tasks, and managing the overall response.

The absence of a clear call sign system for self-deploying officers can result in overlapping assignments or critical areas being neglected. Safety and risk management are key considerations. Knowing the precise identity and location of every officer on scene is crucial for safety, especially in hazardous situations or when an officer requires immediate assistance.

To reduce confusion in the future, Section III.F. Assignment of Radio/Call Designations of G.O. 301.5 (Appendix Section 6.12.4) could be enhanced to address how self-deploying resources obtain a radio designator when conditions require an all-hands response.

3.5.2 ANALYSIS OF SYSTEM COMPONENTS

Cellphones are also a critical communication tool for responders, which are used to communicate via voice (longer messages), transmit confidential information that should not be communicated over the radio, address non-emergent needs (e.g., staffing), back-up radio communications, and document conditions (record video or photos).

In many instances, responders reported that cellphones were unreliable, which contributed to the lack of coordination between on-scene resources, support personnel, supervisors, and the EOC.

3.5.2.3 Channel Operations

Police channels operate separately from Fire channels, and it has not been the past practice for field personnel to communicate directly with other agencies (i.e., police cannot hear fire/medic traffic and fire/medics cannot hear police channels).

MFD portable radios do not have a scan function (i.e., the ability to automatically hear traffic on another channel), rather personnel must physically change the radio channels. These factors may have contributed to a lack of situational awareness for the firefighters operating on the Upcountry fires, as it pertained to the Lahaina PM fire, or for firefighters operating at different locations on the PM fire.

3.5.3 Private Equipment Operators

Private contractors providing heavy equipment have become integral in MFD and DLNR-DOFAW wildfire suppression. The MFD and DLNR-DOFAW maintain formal and informal agreements with multiple private contractors for use of dozers, loaders, excavators, and water tankers, which are needed to supplement each organization's limited resources.

These private contractors mostly rely on cellular service both for dispatch instructions and for operational coordination. Although the MFD and DL-NR-DOFAW also maintain a limited cache of tactical radios that can be provided to the private contractors, they were not trained to use portable radios.

During the Lahaina PM fire, cellular service was intermittent or unavailable. The responding private assets relied on communications with Central and face-to-face communications with MFD crews. Coupled with the loss of public water access, the inability to communicate reliably via cell phones led to a lack of coordination and reduced effectiveness of private water tankers. At times during the Lahaina PM fire, MFD personnel flagged down water tankers to initiate protective measures and structural firefighting.

3.5.4 ANALYSIS OF SYSTEM COMPONENTS

3.5.4 Findings & Recommendations

32. FINDING: Central Dispatch ("Central") was limited by the availability of equipment and personnel.	**RECOMMENDATION:** Expand Central's surge capacity by increasing the terminals/necessary equipment for call taking and dispatching operations and consider training personnel (including members from the MFD and MPD) to serve as "call takers" capable of transferring emergency 911 calls, and managing the non-emergency/administrative calls. **RECOMMENDATION:** Complete a comprehensive study of Central Dispatch to assess staffing, workloads, and technology to identify any gaps or additional resource needs to help ensure resilient communication during major emergencies and disasters.
33. FINDING: Central Dispatch, and many other responding personnel, were deeply affected by this incident.	**RECOMMENDATION:** Continue providing opportunities for individuals and crews to meet for a "report back/ debrief." Ensure members know warning signs for PTS, PTSD, depression, suicide, and related impacts on personnel mental health. Provide access to Employee Assistance Programs (EAP) and peer support networks—encourage use when warning signs are present.
34. FINDING: Dispatchers were responsible for monitoring multiple large fires and other associated events. Most of the dispatchers were experienced, but all dispatchers were overwhelmed and some expressed lack of adequate knowledge, ready access to needed information, and concern about the safety of the instructions they were providing callers. There were persistent communication challenges between Central, the MPD's Department Operations Center (DOC), and the EOC.	**RECOMMENDATION:** Staff a MFD fire officer and a MPD officer at the rank of lieutenant (or higher) in Central Dispatch to aid with operational monitoring, EOC/DOC coordinations, incident tracking, communications, and assistance with command decisions when the EOC is activated.

3.5.4 ANALYSIS OF SYSTEM COMPONENTS

3.5.4 Findings & Recommendations

35.	**FINDING:** Private equipment operators primarily communicate with response entities and field personnel using personal cell phones.	**RECOMMENDATION:** Create a formal communication plan for private contractors to use during emergency situations that includes resilient hardware and appropriate training.
36.	**FINDING:** Many residents did NOT receive a text notification from the county regarding the high winds and high fire danger.	**RECOMMENDATION:** Assess the resiliency of communication systems and establish redundant public alert programs and warning processes, including best practice messaging guidance.
37.	**FINDING:** Only one (1) siren from the All-Hazard Outdoor Warning Siren System was operable within the burn perimeter of the Lahaina area on August 8, 2023.	**RECOMMENDATION:** Implement a statewide sustainable program for the All-Hazard Outdoor Warning Siren System, which includes functioning hardware resilient against mass communications failure, regular maintenance, public education, and additional resources and staffing.
38.	**FINDING:** The All-Hazard Outdoor Warning Siren System had not been utilized for warning of WUI fires prior to August 8, 2023. As of the publication date of this report, MEMA has implemented a process for activating sirens for wildfires.	**RECOMMENDATION:** N/A
39.	**FINDING:** Even when people were told to evacuate and conditions seemed obvious that evacuation was necessary, many refused because there did not appear to be official notification that danger was imminent.	**RECOMMENDATION:** Engage the community to provide additional public education regarding the importance of what to do in an emergency and to heed all evacuation instructions.

3.6 Incident Management

Incident management is crucial for a coordinated and effective wildfire response, aligning with the Cohesive Strategy goals of protecting lives, property, and natural resources through timely communication and risk management. The Safe and Effective Response involves pre-incident planning, risk assessments, resource inventories, agency engagement, and tactical response strategies.

During a wildfire, incident management coordinates communication and tactical decision-making through unified command structures, monitors real-time fire behavior and weather conditions, and ensures rapid deployment and synchronization of available resources. Additionally, incident management oversees evacuation efforts, ideally providing accurate and timely information to the public about fire status, evacuation orders, and shelter locations.

3.6.1 MFD Incident Management

The MFD has standard operating procedures (SOPs) that require incident command systems (ICS) to be used for managing all types of emergency incidents, including fire events (Appendix Section 6.12.4). The department routinely employs ICS to successfully resolve emergencies, including wildfires and structural fires. FSRI team members have observed MFD units using ICS to manage incidents since the August 8-9, 2023, fires.

The MFD's existing ICS was used to manage the Lahaina AM fire to a point where the fire was determined to be "extinguished." After which, the IC role was transferred from the on-duty battalion chief back to an engine company supervisor.

At the beginning of the Lahaina PM fire, it appears the MFD's ICS was used effectively until the fire jumped the Lahaina Bypass and became a fast-moving urban conflagration that quickly overwhelmed the department's available resources. Nonetheless, the MFD always had a designated IC for the Lahaina PM fire.

On both the AM and PM fire, the MFD and MPD would have benefitted from a unified command post, which could have enhanced the coordination of operational tasks, streamlined communication, and improved situational awareness. A unified command increases the likelihood that all responding units work toward common objectives, reduces misunderstandings, and optimizes strategic goals.

Throughout the balance of the Lahaina PM fire, MFD chief officers—in their roles as ICs—established multiple ICS groups and divisions in an attempt to manage the fire. These efforts were hampered by the complex, dynamic, and fast-moving nature of the fire, and were compounded by the severe resource constraints under which the MFD was operating during this entire period.

It is also apparent that neither the ICs nor anyone else had sufficient information on the full scale of the incident to develop an accurate common operating picture (COP) of the situation in Lahaina until aerial assets became available after daylight on August 9, 2023.

3.6.2 MPD Incident Management

While the MPD has a policy—ICS and SRT Operations (G.O. 412.1)—in place for managing incidents, there was limited expansion of the ICS during the Lahaina PM fire on August 8, 2023, particularly in the context of the large-scale evacuation of residents (Appendix Section 6.12.6).

Most tactics employed by the MPD were focused on task-level operations of traffic coordination and evacuation. These tasks did not benefit from a fully expanded ICS structure that would have provided a more strategic and coordinated approach.

3.6.3 ANALYSIS OF SYSTEM COMPONENTS

The MPD and MFD do not have a history of establishing a unified command on emergency responses where both departments are operational. The lack of prior experience and practice in unified command operations meant that during the PM fire, there was inadequate coordination and integration between the two (2) departments. The MPD Lahaina captain, while actively engaged on the streets of Lahaina at the task level, did not establish a formal command post with the MFD.

It is notable that on August 9, 2023, the MPD did establish a Department Operations Center (DOC). The DOC served as a centralized hub for coordinating response efforts, as well as facilitating communication, resource management, and strategic planning. Establishing the DOC allowed the MPD to better organize their recovery efforts, streamline information flow, and improve situational awareness.

3.6.3 Analysis of MFD and MPD Incident Management

When analyzing MFD and MPD responses to the fire, it is important to take into consideration that on the morning of August 8, 2023, the MFD was fighting multiple wildfires simultaneously, with limited available personnel, vehicles, and equipment resources.

On that morning, it appears the entire on-duty complement of the MFD assigned to the island of Maui, plus many “off-duty” firefighters staffing relief apparatus and support vehicles, were fighting the Upcountry fires, working the Lahaina AM fire, or responding to other emergency incidents across the island.

Given the high winds, helicopters were not available after 11:26 on August 8, 2023, to help with fire suppression, nor could Hawai‘i Army National Guard (HIARNG) helicopters fly to Maui to assist.

It seems likely the MFD crews that responded to the Lahaina AM fire were aware of these resource limitations. From the dispatch records, it is clear that these units were responding to, or being requested at, other emergency incidents for the duration of that morning.

From the very start of the Lahaina PM fire, MFD and MPD resources in and around Lahaina were overwhelmed.

In fact, given the conditions and limited resources available, the front-line firefighters, police officers, medics, Coast Guard members, lifeguards, and ordinary Lahaina residents made an extraordinary number of rescues—often at great personal risk.

Off-duty MFD firefighters and MPD police officers left their own homes, some of which were at risk from the Lahaina PM fire, and responded throughout the incident. These dedicated first responders did their best to cobble together the necessary vehicles (in some cases privately owned), equipment, and personnel to place additional response units in-service. Their collective efforts are admirable and unquestionably resulted in saving lives across Lahaina.

The MFD command staff was also stretched thin for the entire period from August 8-9, 2023, as they attempted to manage several major fires in Olinda, Kula, Lahaina, and Pūlehu-Kīhei simultaneously. Throughout the time of the Lahaina PM and Upcountry fires, the IC for each of the fires was a battalion chief.

It is perfectly reasonable and understandable that the fire chief, in any fire department, will occasionally be unavailable due to the same range of circumstances as any other employee. During the time of the Lahaina PM fire, the MFD Fire Chief was out of town on personal leave (Phase One report, page 41).

3.6.3 ANALYSIS OF SYSTEM COMPONENTS

The other command officers, Deputy Chief Fire 2 (F2) and Assistant Chief Fire 3 (F3), appear at various points in the dispatch record, but did not establish themselves in relevant tactical or strategic positions, nor did they assume the IC role for any of the fires on August 8-9, 2023 (Phase One report, pages 188-192).

Sometime after 17:30, F2, F3, and BC3 left the Lahaina PM fire to travel to the hospital where E6 Captain was being transported. This relocation of staff took three (3) chief officers out of command functions and left BC5 alone to command the fire. See Section 3.7.4.2 for more information on the E6 Mayday.

Given the size and scale of the Lahaina PM and Upcountry fires, the entire operation would have benefitted from experienced, high-level command engagement. The PM fire, with all of its emergent conditions (i.e., failing infrastructure, hurricane force winds with fire, and blocked egresses), demanded the attention of augmented incident command overhead.

It is these types of large incidents that require top-level chief officers to be in charge, making strategic decisions, interfacing with assisting and cooperating agencies, and implementing an incident action plan. Possible roles F2 and F3 could have filled were Area Commander (if Area Command was implemented) and Lahaina Incident Commander.

BC5 and BC3 could have assisted in command support roles or as Deputy Area/Incident Commanders. This organization may have improved communications with the Assistant Chief (F4), who was the MFD liaison in the County of Maui EOC for the duration of the incident.

It also appears that there was no one formally in charge of strategic resource allocation or future planning. This is perhaps to be expected during the Lahaina PM fire, since the MFD was overwhelmed from the start.

It is surprising that the MFD and MPD did not prepare more for these Red Flag conditions, especially given the advance warning provided by NWS Honolulu and having previous experience with the 2018 Lahaina Fire. As mentioned in Section 2.1, this lack of preparation could be related to the lack of attention wildfire preparedness and prevention receives statewide.

Based on our findings, it does not appear that any consideration was given to adding resources in advance of the Red Flag days, or planning responses to various “what-if” scenarios, from a strategic and resource deployment perspective.

There is an opportunity for the MFD, MPD, DLNR-DOFAW, and MEMA to work on their joint/shared procedures for incident management, in particular the value of unified command and area command(s) for managing major wildfire incidents with a multi-/interagency/-jurisdictional footprint.

These procedures are very common in many other jurisdictions across the United States, where cross-agency communication, collaboration, and coordination are almost always needed continuously throughout major incident responses and recovery operations.

The value of establishing a fixed (unified) ICP with representatives from all key responding agencies should be reinforced. The MFD, MPD, Hawaiian Electric, MEMA, County of Maui Department of Water Supply, and/or DLNR-DOFAW could be included depending on the type of incident and in what jurisdiction it occurs.

3.6.3 ANALYSIS OF SYSTEM COMPONENTS

Training for private operators and procedures for ensuring communication, coordination, and collaboration with those firms and individuals is also important from a resource management and operational safety perspective.

The MFD has used the Blue Card Incident Management System (IMS) training in the past and appears to be currently engaging in additional training and implementation opportunities. These efforts will benefit from synchronization with, and participation from, partner agencies/organizations, including MEMA, the MPD, the DLNR-DOFAW, HDOT, and Aircraft Rescue and Fire Fighting (ARFF).

The MFD also sponsors a county-wide Type 3 incident management team[155] (IMT) that could be useful for major events, especially if activated and used prior to an emergency, potentially during periods where extreme weather, or other potentially challenging scenarios that might be reasonably anticipated. IMTs can play a central role in organizing resources, coordinating efforts, and ensuring efficient communication during preplanned and emergency incident operations.

3.6.4 EOC Operations

Like the MFD and MPD, MEMA went into August 8, 2023, understaffed and with limited available resources.

County of Maui Mayor, Richard Bissen, received a text alert around 05:00 and went directly to the EOC, arriving at approximately 06:00/06:30. He reported that, over the course of August 8-9, 2023, "we were opening shelters left and right, 6 or 7."

Due to changing conditions, such as the approaching fire front, loss of power, and loss of water, shelters were opened, closed, or relocated throughout the incident.

MEMA ostensibly uses the National Incident Management System (NIMS) for incident management during EOC activations. NIMS utilizes the ICS to define the operating characteristics, management components, and structure of incident management organizations throughout an incident.

According to FEMA, NIMS-ICS is a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines.

The intent of NIMS-ICS is to be applicable across a full spectrum of potential incidents and hazard scenarios, regardless of size or complexity, and improve coordination and cooperation between public and private entities in a variety of domestic incident management activities. NIMS-ICS provides a consistent nationwide template to enable all government, private-sector, and nongovernmental organizations to work together during domestic incidents.

Due to severe weather alerts, MEMA staff made a decision to partially activate the EOC on the afternoon of August 7, 2023. Two (2) MEMA employees reported to the EOC that afternoon at 21:00 to monitor conditions within the County of Maui. This activity is consistent with the EOC Activation and Deactivation SOGs (pages E-1 and E-2) within the County of Maui Emergency Operations Plan (EOP).[156]

Overnight, the first report for the Olinda fire was received at 00:22. As the wind severity intensified, widespread reports of power outages, road obstructions, downed poles and powerlines, and structural damage increased. Emergency call volume continued to increase, with the Lahaina AM fire reported at 06:34 and the Kula fire at 11:27.

Agency representatives began to self-report to the EOC throughout the day. However, the EOC was not fully activated until 16:30 when representatives from all county and partner agencies were required to report. Although many EOC members were present prior to full activation, the delay in declaring full activation, coupled with the delayed posting of the Maui Emergency Proclamation, is not in alignment with the County of Maui EOP.

In addition to the challenges associated with the Upcountry fires, by 16:30, the Lahaina PM fire had already burned over nearly all MFD resources and residents living in the Lahainaluna neighborhood east of (mauka) Hwy-30.

At the time of the PM fire, MEMA had a staff of nine (9) full-time personnel. In addition to their daily planning and preparedness duties, each MEMA staff member is trained to assume a specific ICS role during EOC activations. The MEMA administrator, who is appointed by and reports directly to the Mayor, serves as the EOC Director during EOC activations.

Other positions filled by MEMA staff members may include: Operations Section Chief, Planning Section Chief, Logistics Section Chief, Recovery Section Chief, County PIO, Mitigation Specialist, and Situation Awareness Lead. Each role has defined responsibilities, support functions, and expected deliverables.

On August 8, 2023, seven (7) of the nine (9) MEMA personnel were on Maui (the MEMA Administrator was on Oʻahu attending an emergency management conference and one (1) staff specialist had been deployed for training with the National Guard).

When the MEMA Administrator is not available, each staff member is expected to “bump up” to a different position, or positions, within the NIMS-ICS framework to ensure all essential emergency functions are covered. In this case, the Operations Section Chief became the Acting MEMA Administrator/EOC Director, the Planning Chief was assumed to fulfill the role of Operations and Planning Chief, and so on.

There were more roles than there were MEMA personnel, which may have led to some overlap and gaps within essential functional areas.

Through TDs conducted individually with MEMA personnel, it appears there was a lack of clarity as to who was filling each role, and what their corresponding responsibilities were, within the EOC. MEMA staff gave conflicting accounts as to who was responsible for the specific support functions as the events of August 8, 2023, unfolded.

Additionally, there were conflicting accounts regarding communications and briefings occurring within the EOC. Some MEMA staff stated formal briefings (where all agency representatives gather during regular intervals to report priority information regarding the incident) were being held at regular intervals, whereas other staff members did not recall the occurrence or schedule of any formal briefings.

It is also unclear if timely and accurate situation reports (sitreps)—a standard practice during any EOC activation—were being drafted or distributed with any regularity, or who (if anyone) was assigned this responsibility.

NIMS-ICS best practices call for the development of formal incident action plans (IAP) for each operating period to help monitor the scale and trajectory of the incident and ensure continuity of operations and situational awareness among oncoming and off-going shifts.

The intense pace of the incidents made it difficult for MEMA staff to provide regular status reports. These factors likely contributed to a lack of situational awareness and recognition of the severity of the Lahaina PM fire within the EOC.

3.6.4 ANALYSIS OF SYSTEM COMPONENTS

Given the range of hazards across Maui Nui and the lack of immediate mutual-aid, it seems likely that MEMA does not have a sufficient budget/personnel allocation to effectively and sustainably perform the wide range of preparedness, response, and recovery missions assigned to it; this was starkly evident on August 8-9, 2023.

For any EOC to fulfill these critical functions, it must be properly staffed and operationalized with designated representatives from all cooperating/involved agencies/organizations to provide subject matter expertise, resource coordination/tracking, and immediate information relays to ICs in the field.

Through TDs with EOC representatives, challenges within the EOC became clear. Multiple personnel reported that as the incidents escalated, the EOC became crowded within its limited space (the FSRI team was not permitted to physically visit the space). It was reported that communication within the EOC was challenging due to these space limitations.

Individuals had to find alternate work locations, such as using the kitchen and other common areas, to monitor and support operations, which may have contributed to miscommunications and missed information.

In the months prior to the August 8, 2023, fires (exact date not provided), MEMA transitioned to the WebEOC platform for EOC incident reporting and tracking. MEMA utilizes software, such as WebEOC, during routine and emergency activations for a variety of functions, including, but not limited to:

- Drafting and storage of IAPs
- Providing situational awareness among county-level EOC cooperators
- Tracking evacuations and shelter openings
- Sending requests for information (RFIs) and RFAs to HI-EMA

HI-EMA also uses WebEOC for similar functions at the state-level.

It is important to note that, while the systems are technically interoperable, the county and state WebEOC systems have been maintained as separate platforms requiring different levels of permissions. MEMA staff cannot readily or routinely view HI-EMA's WebEOC files or system, and the state does not have access to the County of Maui's WebEOC framework.

Through TDS with MEMA staff, it became clear the MEMA EOC personnel did not have a high-level of familiarity or proficiency with the WebEOC software. This may have contributed to the lack of available EOC documentation during the August 8-9, 2023, time period.

Similarly, HI-EMA does not appear to have sufficient resources to effectively conduct its work across the State of Hawaiʻi, and during all phases of the comprehensive emergency management cycle.

HI-EMA relies heavily on the individual counties' emergency management agencies and EOCs to provide the State Warning Point (SWP) and State Emergency Operations Center (SEOC) with awareness of what's happening on the ground in their jurisdictions.

During a major incident, HI-EMA staff are understandably reluctant to push the local EOCs for information. There are opportunities, as acknowledged by HI-EMA's Administrator James DS. Barros, for HI-EMA to develop a better understanding of local conditions, before, during, and after disasters.

3.6.4 ANALYSIS OF SYSTEM COMPONENTS

3.6.4.1 Difference Between Incident Command and EOC Functions

It's important to distinguish between the roles of EOCs and ICPs. Emergency incidents, like the Lahaina PM fire, are primarily managed from ICPs. However, EOCs fulfill essential functions during emergencies that require effective coordination and synchronization with incident management resources (such as the ICS), any active area commands, and incident-level ICPs, whether directly or through an area command structure.

In emergency response, incident command and EOC command work together, but play distinct roles. Incident command focuses on the tactical response at the scene itself. This is where the ICS comes in, providing a standardized structure for on-site operations.

The ICS system is scalable and the structure can be built out, depending on the size and scope of the incident. Within the ICS, incident command operates at the ICP located on scene. The ICP is the focal point for tactical decision-making and resource management for the immediate emergency. The IC utilizes ICS functions like operations, planning, logistics, and finance to directly manage responder activities and resource allocation.

Each fire that occurred between August 8-9, 2023, had an IC assigned. Each IC was in charge of a specific fire incident (i.e., Olinda, Kula, Lahaina, and Pūlehu-Kīhei), and was responsible for making quick decisions that directly impacted responders and how they handled the immediate situation.

The IC can divide the incident into divisions and assign division supervisors that have oversight of the strategy and operational tactics within a defined area. Information is relayed in a timely manner to the IC, who maintains an overview of the incident, directs overall strategy and tactics as warranted by the changing conditions, maintains accountability of assets, and requests additional resources from the EOC (or Central dispatch) as needed.

The EOC, in contrast, serves as a centralized, off-site location for strategic coordination and support. It is the emergency response center responsible for supporting field operations and coordinating additional resources, including, but not limited to, coordinating utility control and requests for private assets, distributing evacuation notices, establishing shelters, and monitoring and sending alerts regarding road closures.

Representatives from various agencies (e.g., fire, police, public health, Hawaiian Electric, public works, etc.) are trained regarding their agency's role within the EOC and they collaborate with the other agencies within the EOC. The EOC Director facilitates information sharing, analyzes the broader impact of the incident, and coordinates the deployment of additional resources based on the IC's requests and evolving conditions. The EOC Director, while crucial for facilitating communication and resource support, does not directly control incident response.

Following best practices, the ICS and the EOC should work in tandem to ensure a well-coordinated and effective response to emergencies. This division of responsibility between on-scene incident command and off-site EOC support allows for a focused tactical response by the IC, while leveraging the EOC's capabilities for broader strategic planning and resource management.

3.6.5 ANALYSIS OF SYSTEM COMPONENTS

3.6.5 Incident Command

The incident management organizations for the MPD and MFD faced significant challenges in planning and executing emergency response functions during the Lahaina PM fire on August 8, 2023. These challenges were exacerbated by a lack of pre-incident preparation and readiness for the escalating incidents caused by extreme fire weather. Prior to the fire, there was insufficient preparation despite ongoing incidents and information forecasting across Maui, which should have heightened awareness and readiness.

As the fire rapidly expanded, stretching available resources thin, the MFD and MPD incident commanders did their best to focus on immediate priorities and tactical levels of command, but quickly became task-saturated and overwhelmed. These conditions contributed to the ICs' difficulties developing overall situational awareness and the strategic focus that would help effectively manage the growing complexity of this unprecedented incident.

The MPD's focus on routine duties like traffic control and calls for service, rather than preemptively preparing for a wildfire evacuation, further hindered their ability to pivot to an emergency response role effectively. This lack of proactive planning and preparedness underscored the challenges in coordinating a cohesive response effort among the MPD, MFD, and MEMA.

Consequently, the ICSs were ill-prepared to scale up in response to the increasing demands of the wildfire incident. This lack of readiness and coordination left responders struggling with the dynamic and rapidly escalating conditions of the Lahaina PM fire, highlighting critical gaps in both preparedness and response coordination across the agencies involved.

One of the primary challenges was the lack of adequate command level resources and infrastructure to manage such a dynamic incident. Blocked roads hindered evacuation efforts, while the absence of water availability in certain areas exacerbated firefighting efforts. Visibility was severely limited by smoke, complicating navigation and situational awareness for responders.

For both the MPD and MFD, communications were strained due to limited channel availability, leading to congestion and difficulty in coordinating between multiple responding agencies. Additionally, intermittent cell service further hampered communication capabilities, isolating responders from critical information and updates.

The absence of a stationary ICP during the fire on August 8, 2023, significantly impacted operational effectiveness for both police and fire departments. Although the MPD and MFD share the use of a mobile command vehicle as per MPD policy—see Command Vehicle Standard Operating Procedures (G.O. 304.11) in Section 6.12.8 of the Appendix—the County of Maui did not provide evidence of it being deployed or used.

Had the command vehicle been positioned in Lahaina prior to the PM fire, it could have served as an assembly point for representatives of assisting and cooperating agencies assigned to the AM fire and those addressing evacuation issues, such as downed utility poles and electrical lines. A stationary ICP supports effective incident management by providing a clear focal point for information gathering, information sharing, situational awareness, and strategic planning.

It allows command to maintain oversight of the entire incident area, while remaining safely out of the immediate operational zones, thereby optimizing operational effectiveness and safety for personnel involved in emergency response efforts. Instead of a fixed location serving as a centralized command hub, command operations for the Lahaina PM fire were mobile, moving with the evolving incident.

While mobility can offer flexibility and adaptability, it also presents challenges, such as compromised communications, limited visibility of operations, and being potentially within or near the immediate operational area, which can pose safety risks.

The lack of an overall IAP during the fire posed significant challenges to effective emergency response coordination. It is understood that the Lahaina PM fire was highly dynamic with fire moving from structure-to-structure at a rate MFD members had likely never previously witnessed, at the same time that large-scale evacuations demanded the attention of both the MPD and MFD.

However, a basic IAP at the start of the incident could have provided a foundation that continued to be developed over time. An IAP serves as a comprehensive blueprint for managing complex incidents, outlining objectives, strategies, and operational tactics to guide responders. Without this structured framework in place, there was a notable absence of clear priorities, resource allocation strategies, and coordinated efforts among responding agencies.

This deficiency hindered the ability to streamline operations, optimize resource deployment, and adapt to the rapidly evolving fire dynamics. As a result, the ICs faced heightened difficulties in managing critical tasks, such as firefighting, evacuation coordination, and communication logistics. The absence of an IAP underscored the critical need for robust pre-planning and preparedness measures to enhance response capabilities and resilience.

The lack of unified command during the Lahaina PM fire between the MFD and MPD operations posed significant challenges to effective emergency response coordination. Unified command is essential in complex incidents where multiple agencies must coordinate efforts to ensure public safety and optimize resource allocation.

During this incident, the MFD and MPD operated separately, which hindered decision-making and joint operational IAPs. Without a unified approach, there was a risk of duplication of efforts, conflicting priorities, and gaps in communication and resource utilization. While the MPD had one (1) captain overseeing command responsibilities, there was insufficient collaboration and integration with fire operations. This disjointed approach prevented unified decision-making and resource allocation during a critical phase of the emergency.

Evacuation operations, critical for ensuring the safety of residents and visitors, also suffered from the lack of unified command. Clear and coordinated direction between the MFD and MPD is crucial to efficiently execute evacuation plans, manage traffic flow, and communicate evacuation orders effectively to affected populations.

In emergencies, unified command fosters a collaborative environment where agencies can pool resources, share critical information, and make decisions collectively based on the evolving situation. This approach enhances overall response effectiveness, minimizes response delays, and maximizes public safety outcomes by ensuring a unified front in managing complex incidents like the Lahaina PM fire.

When Maui faced the challenge of multiple simultaneous wildfire incidents, establishing an area command structure became crucial in the Incident Management organization. This structure could have played a pivotal role in managing the multiple, concurrent emergencies effectively and efficiently.

3.6.5 ANALYSIS OF SYSTEM COMPONENTS

An area command would have allowed for centralized decision-making, ensuring that all incidents are managed under a unified strategy, which prevents conflicting actions and promotes a coordinated response. With multiple incidents, resources like personnel, equipment, and support services will be stretched thin. An area command ensures that these resources are allocated based on priority and immediate need, maximizing their effectiveness across all incidents.

Establishing an area command would have also facilitated clear and consistent communication channels, which ensures all units involved in the response are informed and coordinated. The area command structure allows for efficient coordination between different agencies and departments involved in the response, including fire, police, EMS, and public works, each supporting an integrated approach to managing incidents.

During the August 2023 wildfires, several challenges underscored the need for an area command. Multiple fires required immediate and coordinated responses to prevent escalation and minimize damage. Limited resources had to be strategically deployed to the areas of greatest need, which could have been effectively managed through an area command.

Resource limitations also impacted the ability for the MFD and MPD to stand-up an IMT reactively. This challenge may be moderated by staffing an IMT prior to an event, where personnel are pre-designated to perform in a variety of overhead roles. The MPD and MFD should explore training Ocean Safety personnel for these roles like some mainland departments have done with success.

3.6.6 ANALYSIS OF SYSTEM COMPONENTS

3.6.6 Findings & Recommendations

40. FINDING: Although there were opportunities for the MFD to provide staff support for the Battalion Chief(s) managing the incident, a formal command team was not established. The ICs were overwhelmed with the demands of the event and possessed limited situational awareness during a rapidly expanding emergency, which included a mayday; these factors contributed to challenges with tactical decision-making throughout the Lahaina PM fire.	**RECOMMENDATION:** Review and modify the dispatch algorithm to reflect the resource availability. **RECOMMENDATION:** Provide the resources and training necessary to establish and maintain effective support for the initial incident commander (IC). **RECOMMENDATION:** Within MFD Hazard Zone Command SOG (E.O. 302.01), include requirements for all chief officer engagement within the incident command structure for large complex incidents.
41. FINDING: The MFD and MPD never connected to establish a unified command.	**RECOMMENDATION:** The MFD, MPD, and other assisting and cooperating agencies should include guidance within their respective incident management SOGs on when unified command should be considered and how it could be established.
42. FINDING: Available public safety resources were inefficiently utilized. This resulted in the failure to establish and scale an effective incident management organization during the first 24 hours of the incident.	**RECOMMENDATION:** Provide sufficient staffing to establish and maintain an effective incident management organization, while maintaining the capacity to conduct unit-level tactical actions. Once established, develop a robust incident action plan (IAP). An IAP should outline objectives, strategies, and tactics for managing the incident, including evacuation procedures, traffic management, and resource allocation. Communicating the IAP to all responding personnel and stakeholders ensures a shared understanding of roles, responsibilities, and priorities.
43. FINDING: There was no comprehensive plan for the MPD's wildfire response.	**RECOMMENDATION:** Develop a comprehensive plan in coordination with the MFD for MPD's response to a wildfire that prioritizes public safety, efficient evacuations, and effective traffic management.

3.6.6 ANALYSIS OF SYSTEM COMPONENTS

3.6.6 Findings & Recommendations

44. FINDING: Limited sharing of critical information occurred between field operations units, the MPD Department Operations Center (DOC), and the EOC.	**RECOMMENDATION:** Review and update policies and develop new processes for information flow between MPD Command Personnel on site, command staff, dispatch, and the EOC. **RECOMMENDATION:** All commanders, captains, and above should receive training on activation of the DOC and a Department Operations Center quick reference guide should be developed for commanders to be utilized for any crisis.
45. FINDING: The MPD Natural and Man-Made Disaster Plan, G.O. 411.4, does not include wildfire incidents.	**RECOMMENDATION:** Update policy to include plans specifically related to wildfires.
46. FINDING: There was limited pre-event incident action planning for anticipated events or incidents by the MFD, MPD, and MEMA.	**RECOMMENDATION:** The MFD, MPD, and MEMA should update the current policies and procedures regarding pre-event planning (including preparing pre-event incident action plans), staffing, and equipment.
47. FINDING: There were no written procedures or guidelines for Continuity of Operations (COOP).	**RECOMMENDATION:** The County of Maui, MPD and MFD to prepare Continuity of Operations Plans (COOP) that outline procedures to ensure essential functions can continue during and after various types of emergencies or disruptions.
48. FINDING: Communication was limited between MEMA and HI-EMA EOC.	**RECOMMENDATION:** Additional resources are needed to have a persistent durable communication link prior to, and during, a major emergency or disaster event.
49. FINDING: Given the known conditions forecasted for the County of Maui on August 8, 2023, agency representatives self-reported to the EOC throughout the day, but full activation of the EOC did not occur until 16:30.	**RECOMMENDATION:** Under similar conditions, and given appropriate resources, consider full activation earlier to aid collaboration between all relevant emergency support functions.

3.6.6 ANALYSIS OF SYSTEM COMPONENTS

3.6.6 Findings & Recommendations

50. **FINDING:** MEMA does not have a sufficient budget/personnel allocation to effectively and sustainably perform the wide range of preparedness, response, and recovery missions assigned to it.	**RECOMMENDATION:** EOCs fulfill essential functions during emergencies and must be properly staffed and operationalized with (A) qualified overhead personnel to perform emergency management-related functions and (B) designated representatives from all cooperating/involved agencies/organizations to provide subject matter expertise, resource coordination/tracking, and immediate information relays to ICs in the field.
51. **FINDING:** During the EOC activation on August 8, 2023, there was a lack of clarity regarding the roles and responsibilities among MEMA personnel.	**RECOMMENDATION:** Provide clearly defined roles and responsibilities for each staff member during EOC activations. Staff members should be trained and fully competent to fulfill their designated role. MEMA should also ensure staff training for secondary roles and responsibilities for when personnel are expected to shift to a different position (e.g., when vacancies occur).
52. **FINDING:** Some MEMA personnel were unfamiliar with the software platform used for documentation and incident tracking during EOC activations.	**RECOMMENDATION:** Ensure all personnel are fully trained and proficient with use of the designated EOC software program (WebEOC or any other software program designated by the MEMA Administrator). **RECOMMENDATION:** Ensure all MEMA EOC personnel understand the NIMS-ICS requirements for documentation during EOC activations.
53. **FINDING:** The EOC was overcrowded and personnel had to find alternative work locations.	**RECOMMENDATION:** MEMA should examine the needs for the physical location and expand the EOC.

3.6.6 ANALYSIS OF SYSTEM COMPONENTS

3.6.6 Findings & Recommendations

54. FINDING: Both the MPD and MFD were unable to maintain personnel accountability for officers, firefighters, and crews during the Lahaina PM fire.	**RECOMMENDATION:** MPD roll calls should be initiated by dispatch and/or command staff as needed to maintain accountability. A policy should be established with defined roll call procedures. **RECOMMENDATION:** Ensure sufficient resources are available to support MFD ICs and division/group/unit-level supervisors with all functions of command/management, including personnel accountability. **RECOMMENDATION:** Adoption and consistent use of a common and resilient AVL platform on all MPD, MFD, and cooperators' (e.g., DOFAW, ARFF, and EMS) vehicles would assist dispatchers and command officers with personnel accountability and incident management.
55. FINDING: The MFD sponsors a Type 3 IMT that was not used August 8-9, 2023.	**RECOMMENDATION:** Consider pre-deploying the Type 3 IMT when severe weather and/or fire danger conditions are forecasted. **RECOMMENDATION:** Enhance training and expand participation to include personnel from multiple disciplines, reinforcing the value of an all-hazards IMT and fostering collaboration across agencies. Consider securing training and experiences for Ocean Safety personnel to be able to perform in specific IMT overhead roles.
56. FINDING: Hawaiian Electric should be at the incident command post (ICP), or tied in closely with the incident commander if an ICP is not established, to inform command of safety issues, other coordination opportunities, and act as a liaison to their organization.	**RECOMMENDATION:** Create and follow a protocol to embed Hawaiian Electric representatives in the ICP (when established) as liaisons.

3.6.6 ANALYSIS OF SYSTEM COMPONENTS

3.6.6 Findings & Recommendations

57. FINDING: The MPD and MFD did not deploy or use the mobile command vehicle as per MPD policy G.O. 304.11. Deployment and use of the vehicle in Lahaina before the PM fire may have initiated the unified command organization that was absent throughout the PM fire.	**RECOMMENDATION:** Follow G.O. 304.11 to ensure the mobile incident command vehicle is used for appropriately sized incidents, such as the Lahaina PM Fire. **RECOMMENDATION:** Deploy the mobile command vehicle at planned events to exercise the deployment process and equipment.
58. FINDING: There were no established unit identifiers for off-duty MPD officers or supplemental MFD units.	**RECOMMENDATION:** Create a call sign procedure for identification of off-duty MPD officers who self-deploy and MFD personnel assigned to supplemental MFD units. The existing MPD G.O. 301.5 policy should be revised regarding the establishment of call signs for incoming off-duty officers and self-deploying officers. The MFD should establish a policy to standardize identification of staffed supplemental resources.

3.7 Fire Suppression

Even though firefighting is (ideally) the last line of defense in wildfire management, fire suppression preparations and operations are key to the Cohesive Strategy. Effective fire management and impact reduction are achieved through preparedness, early detection, weather monitoring, rapid response, training, and coordination. Preparedness planning can aid in assessing the wildfire risks to optimize the allocation of resources and ensure rapid deployment for a robust initial attack.

Training ensures firefighter readiness to respond appropriately and effectively. Continuous weather monitoring and training to make sense of both forecasts and real-time conditions and situations help firefighters anticipate fire behavior and adjust strategies in real-time. An effective incident management structure, communication, resource sharing, and informed, risk-based decision-making are essential for protecting life, property, and natural resources.

On August 8, 2023, while the MFD was also fighting wildfires in other locations across the island of Maui, fire suppression operations initially began on a fast-moving vegetation fire fanned by hurricane force winds in an open field at the east end (mauka) of Lahaina.

Resources assigned to this fire (dubbed the Lahaina AM fire) seemed to be making progress to contain the fire in hot, dry, and windy conditions. However, this fire would go from being reported as extinguished to a fire in the same area being reported at 14:55. This fire burned over firefighters and residents, and ultimately, destroyed Lahaina several hours later.

MFD resources were limited in capabilities due to a variety of factors, including two (2) other Upcountry fires also drawing on the finite resources on the island, electrical wires and downed utility poles blocking access, no hydrant pressure, and other complications.

With nowhere else to turn for more structural firefighting resources, the MFD was resourceful with what it had and adapted the best it could. This section will analyze the response to the Lahaina AM and PM fires, while also discussing policy, procedures, and best practices.

3.7.1 Preparedness

As stated within the Phase One report (page 39), the MFD started August 8, 2023, with normal staffing. As events unfolded during the day, additional staff came to work and operated relief apparatus and other vehicles.

The MFD does not have policies supporting pre-event staffing when high fire danger and/or Red Flag Weather is forecasted. However, the MFD's Hurricane/High Wind Events policy (D.O. 600.01) does include instructions for preparing for High Wind Events when the forecast warrants it (Appendix Section 6.12.12).

Although the wind on August 8, 2023, did not arrive with a hurricane hitting any part of the islands, as is inferred within the policy, the hurricane's impact offshore created the pressure gradient that helped generate the 80 mph northeast winds experienced on the leeward sides of the islands.

The policy includes preparedness activities in advance of the event to include ensuring fuel tanks are filled, securing fire stations, and staffing fire stations and incident facilities. The policy also mentions staffing unified incident management positions and preparing a plan to address objectives.

3.7.2 ANALYSIS OF SYSTEM COMPONENTS

Although there was forewarning of the impending weather, there was no pre-event operational planning. The lack of pre-event engagement could be related to the policy not including Red Flag Weather or high fire danger conditions. Because the hurricane was not going to hit the islands directly, there was less attention on the impact the high winds, coupled with a dry air mass, would have on wildfire potential. See Section 3.1 for more information about weather conditions.

Pre-event staffing and pre-positioning of resources in wildfire-prone areas is common in the Continental United States (CONUS). It is standard operating procedure for fire managers in some areas to hold conference calls to brief personnel and to coordinate resources before arrival of a severe weather event. Some jurisdictions have pre-plans that consist of staffing an IMT and preparing an IAP in advance.

Calendaring annual in-person reviews of master mutual aid agreements with on-island federal and state partners can ensure they are kept current. Reviewing agreements with representatives from the National Park Service, ARFF, and DLNR-DO-FAW can also serve as an opportunity to discuss fire weather forecast products, vulnerable wildfire areas, command principles, and resource availability well in advance of impending weather.

3.7.2 Apparatus

3.7.2.1 Apparatus Readiness

The MFD did not formally upstaff (increase staffing in anticipation of increased call volumes) on the morning of August 8, 2023. As a result, pre-event and relief apparatus were not fully prepared for response. Some stations equipped with Minis or wildland apparatus (Type 6[157]) split their crews to put these specialty vehicles in service—in anticipation of increased call volume and increased risk of vegetation fires. Relief Engine 11 (RE11) was staffed by MFD personnel from the offgoing shift on the morning of August 8, 2023.

The MFD's Apparatus and Equipment Checks policy (M.A. 100.25), "ensures the readiness and maintenance of all apparatus (both front line and relief), and establishes standardization, tracking, and accountability guidelines for the use, maintenance, and loss prevention of emergency equipment." (Appendix Section 6.12.13)

The MFD does not have enough fully-equipped relief apparatus to provide a sustainable surge capacity that would readily allow upstaffing for major events to supplement their front-line fleet. The MFD also would benefit from fully-equipped apparatus that are readily available for response to major incidents, akin to the California OES (CAL-OES) "all-risk fleet"[158] that is pre-distributed to local fire departments across the state.

When personnel were called back to assist, most personnel reported to Fire Station (FS) 10 where the majority of relief apparatus are housed. FS3 and FS11 house their own relief engines. Despite department policies (M.A. 100.25) requiring equipment and inventory standardization of all MFD apparatus (dependent on type), each piece of relief apparatus had to be outfitted for wildfire and structural fire response prior to responding.

This process included having to locate and load hoselines, appliances such as nozzles (if available), hand tools, and other operational and safety equipment. With a full complement of equipment already on relief apparatus, the MFD may have been able to reduce response times as off-duty personnel arrived for work during the afternoon and early evening of August 8, 2023.

The lack of necessary equipment was exacerbated when units had to abandon hoselines and tools as fire conditions became life threatening. As the incident continued to evolve, crews collected usable equipment encountered throughout the area (e.g., retrieving nozzles from burnt hoselines, retrieving hand tools, etc.).

On August 8, 2023, there was limited use of aircraft for surveillance in the morning hours. Aircraft were grounded due to the weather and unable to engage in fire suppression (Phase One report, page 194, Table 4.3.2.19).

This report does not include an evaluation of appropriate aviation assets to address wildfires in Maui. Further study is advised to determine the appropriate number and type(s) of aircraft needed to address the multi-hazard threats that exist on all of the islands.

3.7.2.2 Personal Protective Equipment (PPE) & Radios

Frontline apparatus have self-contained breathing apparatus (SCBA) equipment and portable radios assigned to each riding position. Not all relief engines (or other apparatus) have SCBA or portable radios assigned to each riding position. This left firefighters to respond to the incident without respiratory protection equipment or the ability to communicate with others operating throughout the area.

Depending on the apparatus type, some apparatus had mobile radios (a radio fixed and mounted within the vehicle) and some did not. In some cases, crews that had portable radios for each riding position gave those radios to other units that lacked radios.

3.7.2.3 Personnel Resourcefulness

MFD personnel were resourceful throughout the duration of the event. Without direction, some firefighters responded to their own fire stations to gather personal protective gear and firefighting equipment, either before or after being assigned to a crew at FS10.

As personnel continued to call back to FS10, all available resources were utilized, including relief lifeguard pickup trucks and relief battalion chief SUVs. Firefighters operating out of non-traditional vehicles, including patrol cars and privately-owned vehicles (POVs) at different times, were able to perform rescues and coordinate with suppression apparatus to aid fire attack and evacuation efforts, despite a lack of respiratory protection, firefighting equipment, or portable radios.

3.7.3 Relief Staffing

The MFD's Emergency Callout policy (E.O. 300.12) includes guidance for "recalling off-duty personnel during emergency operations." (Appendix Section 6.12.14)

Under normal operating conditions, two (2) Battalion Chiefs (BC) are staffed by the MFD daily, with shift change occuring at headquarters (FS10 in Kahului). One (1) BC is tasked with "911 Operations," which involves handling all operational staffing for that day and the next (e.g., filling vacancies from sick leave, injury leave, etc.).

It is up to the BC on duty to maintain daily staffing and next-day staffing. To fill vacancies, BCs use the CivicReady app to send mass texts for callback, and BCs report that they generally have a good response for callback requests. F2 can make the decision to implement pre-event upstaffing and establish time parameters guiding overtime, within the framework of the Collective Bargaining Agreement (CBA).[159]

There are some days where F2 would implement pre-event stand-up crews, such as direct-hit storms or hurricanes (Hurricane Dora was not predicted to hit Hawaiʻi and was tracking far south). F2 considers select days of the year for "standard" upstaffing, including the Fourth of July and New Year's Eve, when fireworks use increases community risk.

3.7.3 ANALYSIS OF SYSTEM COMPONENTS

When upstaffing is authorized, it is the responsibility of the on-duty BCs to handle fulfillment of staffing. If both BCs are committed to incidents, they have the ability to call back or hold over another BC to assist with the daily and next-day staffing. A new policy was being piloted when the August 8, 2023, Lahaina PM fire occurred. This policy allowed for an additional BC to hold over or be called back. In the event three (3) BCs are on duty, one (1) on-duty BC runs the incident, the other on-duty BC is responsible for reporting information to EOC, and the holdover/callback BC assumes staffing duties.

3.7.3.1 36-hour Rule

The 36-hour rule dictates how long MFD field personnel can continuously remain on duty. As governed by the CBA, non-excluded employees receive double time for working over the 36-hour threshold. As a safety measure, if the non-excluded employee's next day is a regular duty day, they must take an 8-hour break after working 36 hours.

As excluded employees (management), the rank of BC and above are not ruled by the CBA time restrictions. BCs must remain cognizant of who they are calling back based on the number of hours worked.

Keeping account of the roster is a manual system requiring BCs to come to the office and cross-reference the duty roster and the Fire Reporting Management System to determine who is eligible for callback and how units will be staffed.

Due to the specific job functions and task-level responsibilities, each apparatus has a minimum number of personnel required for the unit to be put in service. For instance, a fire engine requires a minimum staff of four (4) qualified personnel. [Note: On a day-to-day basis many are assigned five (5) personnel. The "extra person" provides additional manpower for the crew and can also be detailed to other fire stations to cover vacancies (e.g., sick leave) as needed, reducing reliance on overtime.]

On August 8, 2023, many B-Watch crew members were held over and began to "time out" at or before 19:00. Many C-Watch members reported for callback on August 8, 2023, and had to report for regular duty starting at 07:00 on August 9, 2023.

Depending on their reporting time, they would be over the 36-hour threshold and "time out" at or before 19:00 on their duty day. A-Watch personnel were scheduled for duty on August 8, 2023, at 07:00. Depending on their reporting time, they would "time out" at or before 19:00 on August 9, 2023.

During the events of the August 2023 fires (Olinda, Kula, Lahaina, and Kīhei-Pūlehu), the BCs were tracking personnel time-on-duty and logistically arranging crew swaps, often on scene, in the midst of the operations, for all operational fire personnel.

This may have led to confusion among crew members working together and interrupted rescue and fire suppression attack operations. MFD personnel also had to be shuttled back and forth, utilizing an additional asset, to be brought to the incident scene or returned to the station.

Under normal conditions, for health and safety purposes, the 36-hour rule is a practical operating procedure; given the conditions and events of August 8-9, 2023, however, this rule might have been waived to help sustain MFD staffing.

3.7.4 Strategy and Tactics

August 8, 2023, was a weekday, and normally many (if not most) residents would have been at work or school. However, due to the severe weather conditions and widespread loss of power, many schools and businesses were closed and most residents remained at home. This likely increased the number of vehicles lining the narrow, winding residential streets, making the road even more difficult for MFD apparatus to navigate.

MFD units initially responded to the Lahaina PM fire according to their established SOPs and normal operating practices, but they were quickly overwhelmed by extreme conditions and resource limitations. The fire's rapid spread through densely populated areas, combined with the loss of firefighting equipment and personnel, created a catastrophic situation that outpaced the department's ability to respond effectively.

3.7.4.1 Initial MFD Resource Response

The Lahaina PM fire was first reported at 14:55 near Kuʻialua Street (the location of the Lahaina AM fire). At this same time, MFD units were still fighting the Upcountry fires, which reduced the immediate availability of MFD resources.

The road conditions encountered by responding personnel had drastically changed since the AM fire, as multiple roads, including Hwy-30, had been blocked by downed utility poles, powerlines, and trees. This led to longer response times for some units. The fire spread rapidly through the grass as Engine 11 (E11) took command and mounted a fire attack while coordinating with incoming units. Chief officer BC5 assumed command and instructed Central to add additional units to the call.

The rocky terrain, limited access due to challenging topography, severe wind, and abundance of light flashy fuels hampered MFD access to and containment of the fire. The initial vegetation fire quickly spread, jumping the Lahaina Bypass into Kelawea Mauka Makai Park at 15:24.

Tanker 3 (T3) personnel reported that the apparatus overheated and needed to be shut down at 15:27 (T3 had been operating off dirt roads in an effort to flank the fire) and remained inoperable until 15:32. At 15:28, fire spread to the exterior of a structure on the east side (mauka) end of Dickenson Road and on the south side of Lahainaluna Road.

The Lahainaluna neighborhood (Kelawea neighborhood/subdivision) is a densely populated residential area (both north and south of Lahainaluna Road). The neighborhood has many narrow, winding streets branching off of Lahainaluna Road, which is the main ingress and egress for the entire neighborhood.

It is common for multiple generations to live together. As such, many of the residential structures had additions, such as ohanas or ADUs, adjacent to the primary structures. Multiple residents per lot increased the number of vehicles within driveways, between structures, and along both sides of the street. Additional outdoor furniture, patio coverings, and other miscellaneous belongings created ladder fuels, which aided fire spread between structures.

Resident self-evacuations and MFD/MPD-initiated evacuations began on both sides of Lahainaluna Road. Due to road blockages from fallen trees, as well as downed utility poles and powerlines, traffic quickly backed up along Lahainaluna Road. This created additional challenges for responding MFD apparatus.

Modern fire apparatus are relatively large vehicles, due to the size of their onboard pumps, water tanks, and/or aerial devices; they are challenging to navigate through tight streets. Narrow, winding streets made the effective positioning of fire apparatus very difficult. Fire apparatus carry a limited supply of tank water and require an external water supply (typically either a fire hydrant or supply from a tanker) to extinguish fires with heavy fuel loads, such as the fully involved structures found in this neighborhood.

The large number of parked cars on either side of the street(s), along driveways, and parked on property created an additional physical barrier that challenged access to hydrants and deployment of firefighting hoselines and equipment. Several of these vehicles ignited, providing many distributed sources of intense heat and thick smoke. See Section 4.2.2 for a map of vehicle locations.

As fire began to spread from structure-to-structure, a large ember cast, driven by strong winds, ignited buildings throughout the neighborhood. The severe winds escalated the fire spread, while also laying a heavy blanket of dense black smoke horizontally across the neighborhood, reducing visibility. Residents and MFD personnel reported near black-out conditions during severe wind gusts.

These conditions and the fast-moving nature of the urban conflagration contributed to the overall lack of situational awareness experienced by units operating throughout Lahaina. This lack of situational awareness likely contributed to some tactical decisions that were not matched to the circumstances, along with an inability to maintain personnel- and unit-level accountability throughout the Lahaina PM fire.

Residents were evacuating primarily by personal vehicles down Lahainaluna Road when the road became impassable due to stopped traffic and windblown debris. At least one (1) passenger vehicle collided with a structure, which led to a stacking of cars along the road. MFD units that had responded onto Paunau Street became trapped as both access points onto Lahainaluna Road were completely blocked by cars trying to evacuate.

The initial MFD resources were mostly positioned in front of the fast-moving urban conflagration in an attempt to save lives and property. Ultimately, all the resources would be driven from their locations. Their hose streams were simply outmatched by the heat produced from multiple structures burning and downslope winds pushing the energy directly at them, limiting the reach of their water. The loss of water pressure from fire hydrants ultimately caused MFD units to re-position to locations where they could be more effective or were forced to shelter in place.

3.7.4.2 Critical Event

Engine 6 Mayday

The term “Mayday” is used internationally as a distress signal, and in firefighting, it is specifically reserved for the most critical emergencies involving firefighter safety. A Mayday call typically indicates the situation is life-threatening and immediate help is urgently needed.

When a Mayday is called, a rapid intervention protocol is triggered in which other firefighters immediately shift their focus to locate and rescue their endangered colleagues. When a Mayday is declared, it often results in a dramatic shift in incident priorities, with resources being redirected to rescue the firefighter(s) in distress, while simultaneously maintaining overall incident control. Common situations that might prompt a Mayday call during a wind-driven WUI fire include:

- Burn over - when an uncontrolled fire burns over an individual or resource
- Firefighter(s) suffering from a medical emergency

The declaration of a Mayday event is considered one of the most serious situations in firefighting operations, as it indicates that one of the responders has become a victim, complicating the ongoing emergency response.

At approximately 16:00, just over an hour after the Lahaina PM fire was called in, MFD units Engine 6

(E6), Engine 1 (E1), Mini1, Wildland 6 (WL6), and Relief Engine 1 (RE1) arrived in the neighborhood off of Pauoa Street, just south of Lahainaluna Road. Their route of travel coming from the south was northbound on Hwy-30 to eastbound (mauka) on Lahainaluna Road.

This created a situation where they were positioned to fight the fire from a downwind position, and in this case, it would have been like coming face to face with a blowtorch due to the extreme downslope winds coming from the east (mauka).

Not long after their arrival, conditions deteriorated even more. Fierce downslope winds continued to spread the fire from structure-to-structure with numerous structures fully involved by this point. Heavy traffic congestion with residents evacuating with severely limited visibility contributed to an already untenable environment. Flames 20 to 30 feet high encroached on the firefighters' positions.

Realizing the immediate danger, E6 ordered all units to evacuate. However, escape routes were blocked by collapsed structures, abandoned vehicles, and downed utility poles and powerlines. Firefighters attempted to find alternative routes and clear debris using MFD apparatus, but visibility was poor and getting worse. Cell phones and mobile maps were not working.

As one (1) unit maneuvered to evacuate, it collided with a fire hydrant, shearing it off and causing water to spray freely into the air, which impacted water supply for the entire area. As another searched for an escape route, crew members were shocked to see a deceased victim in the roadway. They had not yet heard of any reported deaths.

By 16:32, Command ordered all units to evacuate, but several units reported being unable to leave.

At approximately 16:47, the situation inside E6 was becoming critical. The crew was unsure if they would be able to hold their position because they were low on air and the intensity of the heat was becoming untenable. An E6 crew member exited the cab to retrieve spare SCBA air cylinders from the exterior compartments and found one (1) compartment door had melted shut.

An E6 crew member went to Mini1, which was in a parking lot nearby, to retrieve air cylinders. When he discovered Mini1 was operable, he drove it over a curb, through debris, and exited the parking lot by narrowly navigating in between E1 and E6. He tried blowing the horn to get the attention of all the crew on scene, but he had little to no visibility and heard no response.

Knowing Lahainaluna Road was blocked, he launched Mini1 over a concrete barrier, powerlines, a rock wall, and through the yard of a substation to access Hwy-30, where he encountered heavy traffic. He made several attempts to call a Mayday, but was unsure if radio transmissions were being relayed.

At 17:02, Central reported that a Mayday had been transmitted by E6 and the emergency alert button on a portable radio had been activated. Despite multiple attempts, neither Central dispatch nor Command could establish radio contact with E6 or E1 crews.

As the E6 crew member driving Mini1 reached Shaw Street, smoke and visibility were improving. When he met a police officer directing traffic, he removed his SCBA, called another Mayday, and told the officer that multiple MFD crew members were trapped and Mini1 was compromised (it had powerlines, debris, and a shopping cart wrapped around the axles and wheel wells).

The MPD officer advised the E6 crew member to take the MPD SUV to retrieve E1 and E6 crew members. As he returned to the scene, visibility was so poor he could not tell where the flames were coming from or what structures were on fire. He found his way back to the substation yard, went over the rock wall and concrete barriers, and pulled up beside E1 and E6.

E1 crew heard an MPD siren and saw the MPD SUV suddenly pull up next to them, being driven by an E6 firefighter. Crews began leaving their apparatus to get to the SUV. One disoriented E6 crew member collapsed before making it to the SUV. After removing equipment from the vehicle and their own SCBAs, all eight (8) crew members, including the now unresponsive member of E6, loaded into the MPD SUV. The E6 firefighter took the same route, with little to no visibility, back to the intersection of Shaw Street and Hwy-30, where the crew unloaded the unresponsive member and immediately initiated CPR.

At 17:11, Central reported CPR in progress at Shaw Street and Hwy-30. Central reported the arrival of medics on scene at 17:22 and the unresponsive E6 crew member was transported to the hospital. BC3, F2, and F3 followed them to the hospital and did not return to the incident. See Phase One report (pages 185-193) and Section 3.6.3 of this report for further information.

It is understandable why the chief officers may have wanted to be with their distressed member. Leaders have a responsibility for the health and safety of their subordinates. The radio traffic indicated a perilous situation. There is no doubt the chiefs wanted to be present for their personnel—to help in some way.

However, there was nothing they could have done to improve the care and transport of the member once in the ambulance. Leaving the Lahaina incident took three (3) chief officers out of critically needed command roles and left one chief officer (BC5) on his own.

At 17:26, RE1 crew advised they had all personnel accounted for and they were in a safe location in a dirt field off Dickenson Street.

This sequence of events highlights the rapid escalation of the fire, and the extreme dangers faced by the firefighters in a chaotic and unprecedented situation. Despite their training and experience, the firefighters found themselves overwhelmed by a burn-over event, while a firefighter suffered a medical emergency—an incident within an incident (IWI).

Operational Impact – Incident Within an Incident
Managing an IWI, such as the Mayday situation involving MFD E6, has far-reaching impacts on fire operations from an incident command perspective. A Mayday situation indicates an emergency involving a firefighter, which requires immediate and specialized response protocols to ensure the safety and well-being of the trapped or injured personnel.

The E6 Mayday occurred at a critical point during evacuations while fire was spreading rapidly. These factors contributed to the companies becoming trapped and burned over.

An IWI diverts critical resources and attention from ongoing firefighting efforts to focus on the emergency at hand. ICs must quickly assess the severity of the Mayday situation, mobilize rescue teams, and coordinate medical assistance while maintaining overall incident control. This priority emergency can strain available resources, requiring additional personnel and equipment to handle both the primary firefighting operation and the Mayday incident simultaneously.

During this Mayday event, E6, E1, WL6, and Mini1—four (4) out of the five (5) MFD apparatus operating in the area south of Lahainaluna Road at the time—were essentially out of service from 16:30 to after 18:00. See Section 3.6.3 for further information.

3.7.4 ANALYSIS OF SYSTEM COMPONENTS

The IWI may impact operational timelines and tactics. The IC may need to adjust firefighting strategies, such as defensive operations or temporary withdrawal, to prioritize firefighter safety and facilitate the rescue operation.

Managing an IWI requires training, decisive leadership, effective communication, and coordinated response efforts to mitigate risks, ensure firefighter safety, and maintain operational effectiveness during complex and demanding firefighting operations.

Automatic Vehicle Location Data – Apparatus Location

The positioning of MFD apparatus throughout the incident was communicated by MFD personnel during their TDs. Personnel assigned to each resource identified their location on a map and used the dispatch/communications record to verify their location in most cases.

For apparatus equipped with AVL capabilities, location was also verified using the data provided by the County of Maui.

For the resources assigned to the Lahaina PM fire, MFD AVL data was provided for Engine 3 (E3), Ladder 3 (L3), Engine 11 (E11), Engine 1 (E1), and Engine 6 (E6). Although AVL data was received for these five vehicles, only AVL timepoints for three vehicles was provided for the timeframes included within Figure 3.7.4.2.1.

The AVL heatmaps in Figure 3.7.4.2.1 display MFD resource location over time. The warmer the color, the more timepoints recorded in that location. Each one (1) hour time period displaying a heat signature represents a collection of units with their associated timepoints within a geographic area. At times, there were no units with timepoint data for the hour period, or there was only one (1) or a few units with only one (1) or a few timepoints—a limitation of the heatmap.

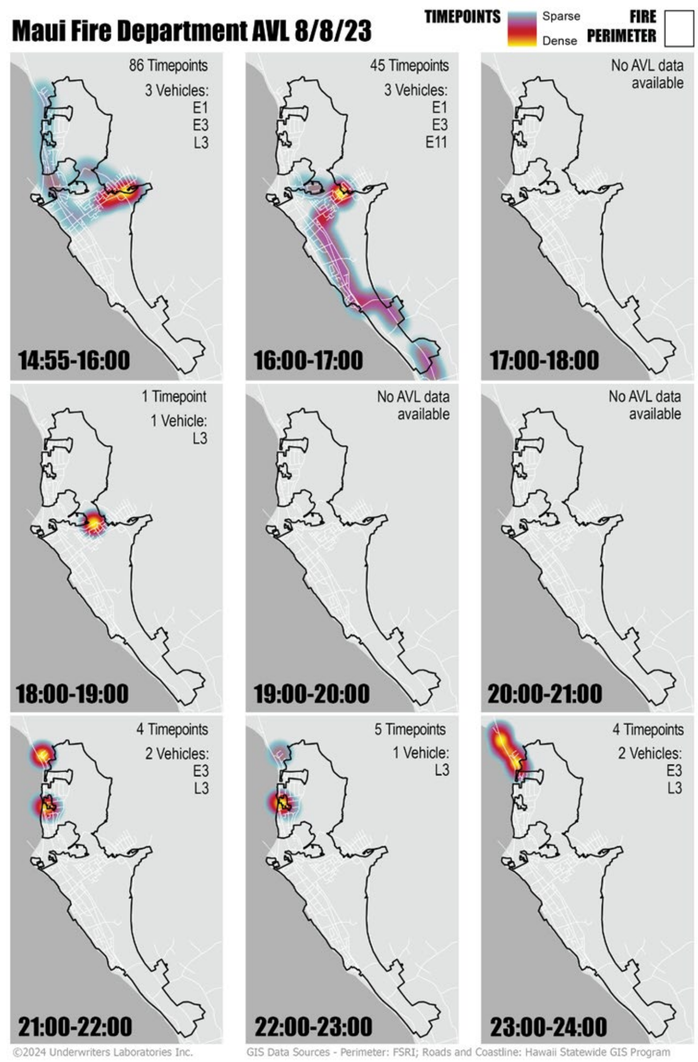


Figure 3.7.4.2.1 MFD AVL data aggregated to location within each hour, starting at the time of the Lahaina PM fire and through midnight. These maps are limited by the relatively sparse data provided for MFD units.

The location of MFD resources is mostly consistent with what personnel communicated, with the understanding that firefighters may be working a distance from their apparatus. This was especially common during the Lahaina AM fire suppression operations and early into the PM operations.

Furthermore, it is important to note that the MFD had a limited number of resources that were either AVL-enabled or where data was provided. The majority of resources assigned to the Lahaina PM fire on August 8, 2023, did not have AVL data included in the spreadsheet provided to FSRI, but were highly engaged in the most critical areas of rescue and fire suppression.

See Section 6.10 in the Appendix for a comparison of MFD, MPD, and Hawaiian Electric's AVL timepoints.

3.7.5 Assessing Electrical Power Status

There is no safe and reliable way for a firefighter to definitively tell if a downed powerline is energized by simply looking at it or using basic tools. Downed powerlines, energized or not, can appear identical. There might not be sparking or any other visual indicator of active current.

Firefighters are fire-safety specialists, not electrical hazard mitigation experts. For these reasons, all downed lines must be considered energized until confirmed safe by the utility company.

Downed powerlines pose a life-threatening risk to citizens and first responders. Electricity can travel through paths like water, conducting materials, and even short distances through air. Until a qualified representative from the utility company confirms a downed line has been de-energized, firefighters are trained to immediately establish a safety perimeter around the downed line (usually at least 100 feet, but the minimum safe distance depends on voltage and local regulations).

The IC then works with Central dispatch and the EOC to coordinate with the utility company to ensure power is shut off to the involved area.

As water conducts electricity, firefighters must be extremely cautious when fighting fires near downed powerlines, especially high-voltage lines. Many of the tools firefighters use through the course of fire attack conduct electricity and pose additional risk to responders (e.g., straight water streams and metal hand tools and ladders).

These tools must be used with extreme caution when downed lines are present. Until there is confirmation by a utility expert (who has advanced electrical detection and management tools), firefighters must maintain a heightened level of situational awareness for secondary hazards that could possibly conduct electricity, such as falling trees, swaying or leaning utility poles, additional downed lines, and damaged structures.

At 06:34 on August 8, 2023, crews responded to a grass fire located in the vicinity of a downed powerline near Kuʻialua Road and Lahainaluna Intermediate School. The crews, joined by a private equipment operator's assets, protected structures and worked to contain the grass fire.

Fire attack operations were challenging due to the unknown status of the powerline, heavy wind conditions that caused the grass fire to spread towards and threaten structures, lack of air support due to the heavy wind conditions, and rocky topography impacted by the spreading grass fire. The fire was reported 90% contained at 08:34, but personnel still did not have confirmation regarding the status of the powerlines. MFD crews remained on scene maintaining the safety perimeter, extinguishing hotspots, and wetting down the area to reduce risk of fire spread.

At 09:35, the IC requested a status update for the requested "MECO" (Hawaiian Electric is formerly known as MECO) representatives.

At 10:35, F4 relayed that he was in contact with the Hawaiian Electric (MECO) representative in the EOC and he would make sure Hawaiian Electric knew about the snapped pole and downed lines. At the same time, the IC instructed L3 to reposition due to strong wind gusts, which increased the risk of additional lines falling.

At 12:06, the IC reported, "The fire is pretty much secure, we are standing by waiting for MECO because there are a lot of lines we aren't sure about. We want to wait until we can confirm with MECO." During this time, multiple additional utility poles snapped, causing wires to come down across houses and roads.

At 12:27, the following radio exchange occurred:

> *"Lahaina Command from BC5: Did MECO ever arrive and confirm it is de-energized?*
>
> *Lahaina Command: Negative they came by and they checked some of the lines and he said he was not able to confirm all of them, he said some of them were de-energized but he was not able to confirm all of them, then he left, so he said he was going to come back or send someone up here, so we are just standing by and we have a bunch more lines down.*
>
> *BC5: Do you need anyone else?*
>
> *E3: We are OK, we are informing all of the residents, we don't need anyone else."*

At 14:17, the IC (E3 Captain) notified Central that Hawaiian Electric (MECO) had arrived and was working on the powerlines. The IC confirmed with Central that the fire had been extinguished and MFD crews were returning to quarters, leaving the Hawaiian Electric (MECO) representative to address the downed lines.

According to Central, Hawaiian Electric (MECO) confirmed power to the area had been shut down at 16:11 (the Lahaina PM fire started at 14:55).

3.7.6 Private Equipment Operators

Private contractors providing heavy equipment have become integral in county and state wildfire management. The MFD and DLNR-DOFAW have formal and informal agreements with multiple private contractors to use dozers, loaders, excavators, and water tankers, which are needed to supplement the County of Maui's limited resources.

There are no requirements for private contractors to use PPE and no PPE is provided to private contractors for fire operations. This exposes private operators to potential respiratory and other physical injury. There are no formal standards or guidance in place regarding private operator PPE.

The lack of MFD compatible equipment added to the challenges of firefighting operations on August 8, 2023 (i.e., some private tankers did not have the necessary adapters, therefore, they were unable to fill fire engines when the municipal water supply was lost).

As mentioned in 3.5.3 of the Communications section, private heavy equipment operators rely on cellular service both for dispatch instructions and for operational coordination. During the August 2023 fires, cellular service was intermittent, unreliable, or unavailable.

The responding private assets relied on communications with Central dispatch and face-to-face communications with the MFD. Coupled with the loss of public water access, the inability to communicate via cell phone led to a lack of coordination and efficiency with private water tankers. At times during the Lahaina PM fire, MFD personnel relied on flagging down water tankers to initiate protective measures and structural firefighting.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

Despite reliance on private heavy equipment assets, no formal county or state training programs are in place for private heavy equipment operators. Lack of fire training response led to inconsistent and, at times, ineffective firefighting tactics.

Some private equipment operators have become familiar with fireground operations and MFD personnel, while other private operators may have limited or no experience operating on an emergency fire incident. This lack of training and collaboration pre-event creates a potential safety risk for the private operators and the first responders.

3.7.7 Mopup of Lahaina AM Fire

The Lahaina AM fire (Lat Long: 20.884723, -156.662991) burned in an open field north of Ho‘okahua Street and east (mauka) of Ku‘ialua Street (Figure 3.7.7.1). The area is on a west (makai) facing slope of the West Maui mountains at approximately 300 foot elevation and 1.3 miles from the nearest access point to the coast (Pacific Ocean) at the end of Lahainaluna Road (Figure 3.7.7.2).

Figure 3.7.7.1 Google Earth image of Lahaina with highlighted area indicating Lahaina AM fire location where fire suppression resources were working.

Figure 3.7.7.2 Google Earth pre-fire image (July 9, 2016) of the area where the Lahaina AM fire burned. Red outline marks the ravine with walls made of large boulders that contained voids where tufts of dry vegetation and combustible trash were concealed. The area outlined is approximately five (5) acres.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

The mid-slope burn area includes a ravine with angled sides made from randomly stacked boulders of various sizes (Figure 3.7.7.3). Small tufts of dry vegetation and combustible human trash filled the voids created between the boulders. The ravine provides natural drainage, running east (mauka-higher elevation) to west (makai-lower elevation) toward the coast.

Figure 3.7.7.3 Post-fire image taken September 3, 2023, from near the top of the ravine southeast of the two-story home in the image at 8[redacted] Ho'okahua Street. Image shows unburned vegetation in rocky terrain. Inset: Viewpoint of the image in the photograph above.

Many overhead electrical transmission lines extended over the area where the Lahaina AM fire burned, and several were directly over the ravine (Figure 3.7.7.4).

Figure 3.7.7.4 Post-fire image taken September 3, 2023, from near the east end (mauka) of the ravine southeast of the two-story home in the image at 7[redacted] Ku'ialua Street. Image shows unburned vegetation in rocky terrain. Inset: Viewpoint of the image above.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

Images from before the August 8, 2023, fire show the highly invasive non-native buffelgrass and haole koa dominating the area just behind the homes off of Ho‘okahua Street and on the southside of Lahainaluna Road, across from the intermediate school (Figure 3.7.7.5).

Live and dead fuel moistures are unknown as these measurements were not recorded, however, the vegetation was in a well-cured state with golden brown color, common for August. As indicated in Section 3.2, the leeward side of Maui was in Red Flag Weather (KBDI > 600, >20 mph winds, RH <45%).

Figure 3.7.7.5 Google Street View image (pre-fire, date unknown) looking south from Lahainaluna Road. Home in the image is addressed at 8[redacted] Ho‘okahua Street and was the structure nearest the Lahaina AM fire point of origin. Image shows buffelgrass and haole koa at the base of several utility poles supporting overhead electrical lines. Inset: Viewpoint of the image above.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

3.7.7.1 Role of Mopup in Wildland-Urban Interface Fires

The work effort after a vegetation fire has been knocked down is referred to as the mopup period. Mopup operations need to be thorough to prevent reignition and the spread of residual hotspots. Fire suppression resources should focus on ensuring that all fire is extinguished, using water to cool all hot spots and clearing the vegetation adjacent to the burn to mineral soil.

Firefighters often use handlines and sprayers mounted on water tankers (i.e., water tenders) to extinguish the fire. A control line around the fire is constructed using hand tools or heavy equipment machinery like dozers.

Mopup can be made difficult by certain types of fuels, challenging terrain, hot-dry-windy weather, slope aspect, time of day, and overhead fall hazards like trees and utility infrastructure. (All of these factors were present during the Lahaina AM fire.) Heavy fuel loads, underground fires (in roots or duff layers), poor visibility (from smoke, ash, or difficult view access), limited water supply, and hunger and fatigue of responders can likely pose additional challenges during mopup.

Fires burning in rocky terrain can be especially challenging due to void spaces where vegetation and other combustible material can hide. Low RH exacerbated by high winds can also frustrate mopup, as vegetation, especially fine fuels (often referred to as "one-hour fuels") like grasses, rapidly dry and become more receptive to ignition. Also, vegetation on south- and west- (makai) facing slopes is susceptible to more drying from the sun's radiation, which is more intense after noon.

Mopup operations during extreme fire weather conditions are often even more rigorous. They can involve activities, such as extending the perimeter of the mopup, increasing patrol and weather monitoring frequency, and using resources like thermal imaging cameras to detect hidden hot spots. These and other actions aid in reducing the likelihood of flare-ups in extreme conditions.

3.7.7.2 MFD Mopup Guidelines

MFD mopup guidelines are included within the Brush and Wildland Fires (E.O. 302.14) policy, which can be found in Section 6.12.16 of the Appendix. The mopup guidelines state the following:

A. On small fires, all fires should be extinguished in the mopup area, where quantities of burning materials are not so large as to make this impractical.

B. On large fires, completely mopup enough of the area adjacent to the line to be certain no fire can blow, spot, or roll over the fire line under the worst possible conditions.

C. The areas or perimeter of the fire with the greatest chance for spread (e.g., head, uphill, flanks, downwind, or special hazards) should be given the highest priority for initial mopup.

D. All smoldering material that is not put out should be spread well inside of the control line.

E. Eliminate all burned trees inside of the control line that could throw sparks over the control line.

F. Add Class A foam to water when possible for increased effectiveness of wetting the vegetation and charred fuels.

G. Determine the distance inside the control line to be overhauled.

H. During rehab of mopup crews, ensure at least two (2) firefighters remain in the area to monitor for re-ignition or spread of fire.

I. Schedule follow-up checks by crews to ensure the fire is contained, controlled, or extinguished inside of the control line.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

3.7.7.3 Analysis of MFD Mopup Actions

MFD firefighters performed a mopup of the Lahaina AM fire, according to their typical procedure. They remained on scene for more than seven (7) hours, applying copious amounts of water on to the burning vegetation while also constructing a containment line.

However, there was a portion of the fire that was inaccessible due to unstable overhead powerlines located directly over a ravine made of large boulders where void spaces could hide unburned vegetation and combustible trash.

See Phase One report (pages 91-93) and Section 3.7.5 for radio communications during the mopup period.

Firefighters left the scene when no smoke was visible and when they thought they were “certain no fire can blow, spot, or roll over the fire line under the worst possible conditions.” They performed as they had on previous fires where they experienced successful outcomes. They likely anticipated the same result on this fire.

A careful review of the MFD’s effort revealed that challenges that are often faced during mopup efforts of wildfires were present in this situation. Firefighters believed the fire was fully extinguished because no smoke was visible for several hours after beginning mopup operations.

However, the fire was in challenging terrain with void spaces created by rocks in the ravine, which was difficult to access due to the danger of unstable utility poles and steep slopes described above (Figure 3.7.7.2). Additionally, the presence of dust in the area could have obstructed their view. The extreme downslope winds stirred up dust clouds, making it difficult to see any remaining smoke (Figure 3.7.7.3.1).

Figure 3.7.7.3.1 Video image captured on August 8, 2023, at 09:07, taken from a vehicle traveling eastbound (mauka) on Lahainaluna Road. At the far east end (mauka), a dust cloud can be seen near the location where the Lahaina AM fire burned. Insert: Viewpoint looking east (mauka) on Lahainaluna Road.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

The extreme weather conditions, cured fuel, time of day, slope aspect, and challenging terrain made mopup more difficult; all of these factors also increased the likelihood of flare-up conditions.

Wildland firefighting requires recognition and adjustment to weather conditions. These conditions may have not been recognized as critically important by the on-scene crews, whose training and experience are focused more on either structural fires or wildfires in less extreme conditions.

The MFD currently lacks established protocols to adjust operations accordingly. The firefighters operating at the Lahaina AM fire adhered to their training and carried it out completely. Additionally, the forecasts did not lead organizational leadership to implement any specialized operational strategies or instructions, potentially for the same reasons.

Additional fire suppression system factors that may have contributed to MFD resources leaving the scene when they did may be due to the lack of available resources and the need for crews to respond to other emergencies, such as the Upcountry fires. These fires, as well as widespread wind damage, drew down resources county-wide.

It may also be related to the following:

- The state's general lack of attention to addressing wildfire risk as described in Section 2.1.
- The absence of wildland firefighting training requirements and assigned performance standards at the county level.
- A possible lack of understanding and sensemaking of the weather forecasts as described in Section 3.2.
- A possible lack of precedent for adjusting operational strategies during extreme conditions as described in Section 3.7.1.
- A possible lack of experience working in these types of extreme conditions.

3.7.7.4 Comparison Analysis to Wildland Firefighting Mopup Best Practices

The National Wildfire Coordinating Group (NWCG) develops courses for wildland firefighting operations. Wildland Firefighter Training S-130 is the entry-level course required by many agencies around the country. Training includes instruction on Patrolling and Securing the Fireline (page 58).[160] It lists conditions that can lead to spot fires, including:

- Extremely dry weather
- Steep topography
- Heavy fuels
- Crown fires
- Whirlwinds or dust devils
- Torched-out, lone trees
- Wind across the fireline
- Punky logs and tree roots hidden beneath the fireline in the soil
- Snags
- Flashy fuels

Many of these conditions existed during the Lahaina AM fire. Addressing these conditions with adequate resources of the correct type is critical.

According to the MFD's Brush and Wildland Fires E.O. 302.14 (Appendix Section 6.12.16), the MFD's initial response to a reported brush fire consists of: one (1) Engine and one (1) Water Tender (Tanker). Response to a first alarm assignment to a brush fire consists of: two (2) Engines (Type 1), two (2) Wildland Units (Type 6), two (2) Water Tenders, one (1) Chief Officer, and one (1) water dropping helicopter.[161] The adequacy/inadequacy of these response packages will be assessed in the Phase Three report.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

If the fire threatens state land (which it did) specialized wildland DLNR-DOFAW units can be added through dispatch. There is no record of DLNR-DOFAW units being requested during the first 48 hours of the Lahaina fires, and there is no record of DLNR-DOFAW offering resources.

DLNR-DOFAW units were already engaged on the Olinda Fire, but they maintain a practice of calling in more resources when mutual aid is requested. Had they been requested to assist with the Lahaina AM fire, or had they been clear and/or notified that state lands were threatened and self-dispatched, mopup may have been handled by wildfire-trained personnel using equipment designed to address the challenging conditions that existed (if DLNR-DOFAW resources were available).

This process was challenged by the lack of clarity and systems for identifying land ownership by dispatch during incidents and lack of protocols for notifying state or federal fire responders when their lands are burning or threatened.

In many parts of the United States, the length of time resources stay on scene to mopup and/or patrol is dependent on weather and fuel conditions. If dry, hot, and windy weather exists, fire resources remain on scene to patrol and mopup around the clock. In many cases, these resources will remain on scene until the weather changes to be more advantageous to fire suppression, which can be several days to several weeks.[162]

Remaining on scene to mopup for days to weeks is likely foreign to MFD firefighters, as well as response teams in other Hawai‘i counties. However, due to the flashy fuels, rocky terrain, and persistent dry, windy weather in the summer, keeping trained firefighters on scene to mopup until the weather changes may be necessary to prevent future flare ups.

In the case of the Lahaina AM fire, firefighters may have been able to remain on scene to check for small hidden fires after Hawaiian Electric secured and de-energized the overhead lines, provided they had the appropriate resources.

3.7.7.5 Vegetation Fire Suppression Operations

The Lahaina PM fire consisted of a wildfire-initiated urban conflagration flanked by fast-moving vegetation fires on the north and south (Figure 3.7.7.5.1).

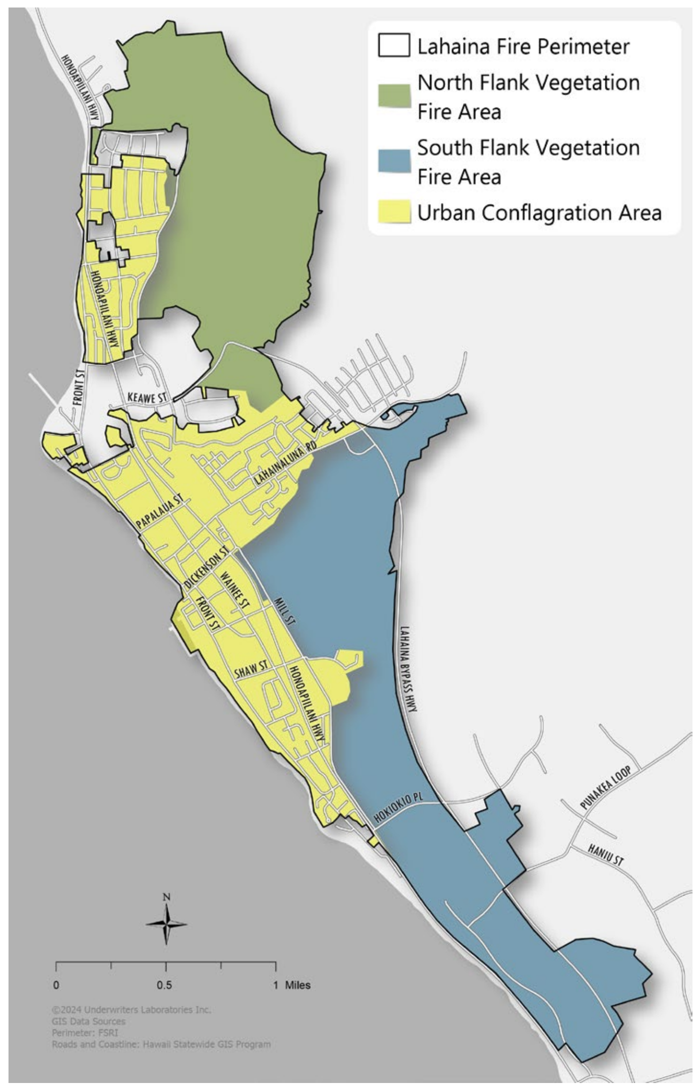


Figure 3.7.7.5.1 Map of Lahaina PM fire perimeter showing area of urban conflagration and vegetation fires on north and south flanks.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

As the fire moved from structure-to-structure, the fire's flanks widened as more vegetation was consumed.

The vegetation in the fields along the north and south flanks consisted mostly of the highly invasive, non-native buffelgrass and haole koa. On August 8, 2023, the vegetation was already well-cured. The hot, dry northeast winds continued to dry these vegetative fuels, making them even more receptive to fire.

The MFD's early engagement on the vegetation fire flanks was not possible with the resources assigned to the incident. The limited resources available for rescue and fire suppression were prioritized on the urban conflagration, where lives and property were immediately threatened. There were simply not enough MFD resources on the island to address the vegetation fires running along the flanks at the same time, and the lack of resources was compounded by the Upcountry fires where many MFD personnel and apparatus were already engaged.

Vegetation fires of this magnitude, and in these types of extreme conditions, would have demanded a considerable response, especially since aircraft were grounded due to high winds. The resources required to even attempt to narrow the vegetation fire's flanks were also beyond the MFD's capabilities.

Wildland apparatus initially assigned to the Lahaina PM fire consisted of: four (4) Type 6 engines, each staffed with two (2) firefighters from Type I engines, and one (1) water tender staffed with one (1) firefighter.

Two (2) dozers and multiple water tenders from private contractors also assisted. (See Section 3.7.6 regarding private contractor capabilities.) The Type 6 apparatus were equipped with only a few wildland hose packs and limited fire line construction hand tools. (Note: The MFD refers to Type 6 apparatus as "Wildland" and "Mini." The newest models are sometimes referred to as "Skeeter," the vehicle upfitter company name.)

Although the above represents what initially responded, what was actually available for the vegetation component of the fire changed as the incident progressed. For example:

- Wildland 3 (WL3) was burned an hour into the incident.
- WL6 was out of service for an extended period of time due to a utility pole falling on it.
- Mini1 was disabled for a short time due to damage sustained while rescuing E1 and E6 crews.
- Mini11's pump was reported as inoperable at 17:42 by E11.

If a similar WUI fire occurred in a moderately resourced CONUS area, the initial ground unit response may consist of:

- Five (5) Type 1 or Type 3 engines
- One (1) Type 6 engine
- Four (4) hand crews
- Two (2) hand crew superintendents
- One (1) water tender
- One (1) dozer

This initial response would likely be elevated to multiple alarms due to the weather and fuel conditions demanding more direct fire line engagement. Furthermore, if the fire department in that jurisdiction had limited resources, it is customary (and usually feasible) for CONUS fire departments to receive additional resources of a specific type upon request through mutual aid.

3.7.7 ANALYSIS OF SYSTEM COMPONENTS

Being an island in the middle of the Pacific, this is far from a reality for Maui, and all other Hawai‘i counties. As part of Phase Three, a standard of cover and CRA will examine the County of Maui’s resources against its fire and all-hazards risk profile.

The Lahaina PM fire’s vegetation component was equivalent to what is experienced in the CONUS during WUI fires. The threat to life and property is also similar. The resource limitations of state and county fire agencies to handle this crucial area are readily apparent and should be addressed urgently to avoid similar issues with vegetative fire suppression.

Lahaina PM Fire – Vegetation Fire Response Zones
As per the response map (see Figure 3.3.2.1), the MFD is primarily responsible for fire suppression of vegetation fires burning on county and private lands, and a large portion of state lands. The DLNR-DOFAW is generally responsible for state preserves, while federal agencies are responsible for fires on federal lands.

The vegetation portion of the Lahaina PM fire burned mostly on state lands to the north and private lands to the south. These areas are within the MFD’s response areas, making them responsible for fire suppression on both flanks. However, according to the response model, and consistent with the Mopup section, the DLNR-DOFAW could have assisted in the perimeter control objective. As mentioned in the Phase One report (page 42), the DLNR-DOFAW maintains a complement of specialized wildland firefighting apparatus that may have been able to engage on at least one (1) flank.

Federal wildland firefighting assets could have also been requested. Although using federal resources from the National Parks is uncommon, due to the severity of the wildfire threat, this should be considered for future WUI fires.

3.7.8 ANALYSIS OF SYSTEM COMPONENTS

3.7.8 Findings & Recommendations

59. FINDING: The MFD did not have an organizational pre-plan for an anticipated high wind or extreme fire weather event.	**RECOMMENDATION:** Ensure effective sensemaking of forecasts and real-time conditions through training and pre-planning. **RECOMMENDATION:** Implement organization-wide start-of-shift briefings to discuss extreme fire weather conditions. **RECOMMENDATION:** Ensure the ICS can scale up quickly, integrating additional support, including personnel normally serving in administrative roles or other functions (e.g., fire prevention, ocean safety, and training), as needed. Provide training and protocols for pre-deployment. **RECOMMENDATION:** Communicate anticipated environmental conditions, risks, and performance expectations across organizations. This includes the MPD, MEMA, County of Maui Department of Water Supply, DLNR-DOFAW, and Hawaiian Electric, who reacted to environmental conditions only after problems arose. **RECOMMENDATION:** Develop a system for ongoing situational awareness that includes continuous monitoring of weather forecasts, fuel moisture levels, and fire behavior through real-time data and predictive models.

3.7.8 ANALYSIS OF SYSTEM COMPONENTS

3.7.8 Findings & Recommendations

60. FINDING: With the impending forecast of severe fire weather, there was limited pre-deployment of additional public safety resources prior to the first fire event.	**RECOMMENDATION:** With the potential impact of hurricanes like Dora and Red Flag conditions, the MFD, MPD, DLNR-DOFAW, and their cooperators should consider deploying additional resources across Maui Nui. **RECOMMENDATION:** Identify fire apparatus, incident management, and law enforcement resources for upstaffing and pre-deployment when severe conditions are forecasted. **RECOMMENDATION:** Ensure sufficient fire apparatus, response vehicles, portable equipment, PPE, and radios are available to resource the pre-deployment of additional response units and overhead assets. Whenever possible, standardize the equipment loadout on similar apparatus/vehicles to facilitate use by callback personnel. **RECOMMENDATION:** Consider providing dedicated personnel and resources for staffing management and callback, on a daily basis and before/during major incidents, to make command-level resources readily available for strategic/tactical ICS roles.
61. FINDING: There appears to be a statewide culture of dismissing and/or under-recognizing wildfire risk. The underfunding and under-addressing of preparedness, planning, and mitigation efforts significantly impacts all parts of the system and fire outcomes. This cannot be overstated.	**RECOMMENDATION:** Establish a culture of respect for extreme conditions and the need for operational adjustment.

3.7.8 ANALYSIS OF SYSTEM COMPONENTS

3.7.8 Findings & Recommendations

62. FINDING: DLNR-DOFAW resources, specialized wildfire equipment, and trained personnel were underutilized due to restrictive fire response zone guidelines.	**RECOMMENDATION:** Incorporate land ownership maps into incident reporting and tracking to ensure that state and federal agencies with response duties and wildland firefighting capacity are notified and activated. **RECOMMENDATION:** Review and revise master mutual aid agreements for all fire suppression resources on Maui Nui, including, but not limited to, the MFD, ARFF, DLNR-DOFAW, and National Park Services to ensure optimal readiness and response for multi-hazard disasters.
63. FINDING: Densely populated and narrow roadways hindered both MFD and MPD movement during suppression (as well as evacuation and rescue) efforts. Apparatus positioning was not always optimal, due in large part to an overall lack of situational awareness about the location, severity, and trajectory of the fire(s).	**RECOMMENDATION:** Responding MFD units should have pre-determined plans and operating practices for specific areas with narrow streets, outlining alternative access points, water supply strategies, evacuation procedures, and addressing the needs of vulnerable populations. **RECOMMENDATION:** Place hardcopy maps, mapbooks, and pre-incident plans in all response vehicles to provide redundancy if cellular network communication is unavailable.
64. FINDING: The uncertainty around the status of power in the area created numerous impacts on MPD and MFD response to the incident.	**RECOMMENDATION:** As previously mentioned, Hawaiian Electric should have a representative at the ICP (when established).
65. FINDING: Private heavy equipment contractors lacked appropriate training, PPE, equipment, and communications.	**RECOMMENDATION:** Strengthen the coordination with private contractors and address limitations in training, equipment (including standardizing equipment to ensure compatibility with all fire suppression resources), PPE, and communication.

3.7.8 ANALYSIS OF SYSTEM COMPONENTS

3.7.8 Findings & Recommendations

66. **FINDING:** A portion of the mopup area was difficult to access and posed safety threats.	**RECOMMENDATION:** Include DLNR-DOFAW resources on initial response to vegetation and WUI fires. **RECOMMENDATION:** Ensure all personnel have the training to identify and establish safety zones and escape routes, and have protocols in place for communicating this to crews. **RECOMMENDATION:** Communicate the wildfire risk to all department members to set and/or reinforce expectations related to fire mopup procedures.
67. **FINDING:** MFD firefighters performed mopup as proven successful under typical conditions. However, under the severe weather conditions on August 8, 2023, this level of mopup appears to have been insufficient.	**RECOMMENDATION:** Revise policies, procedures, and trainings (E.O. 302.14) that address wildland firefighting (specifically mopup operations) to be in alignment with NWCG guidelines.[163] **RECOMMENDATION:** Implement schedules to manage responder fatigue, ensuring adequate rest periods and meals.
68. **FINDING:** MFD wildland firefighting training, equipment, and staffing should be commensurate with the level of wildfire risk faced by firefighters.	**RECOMMENDATION:** Conduct a comprehensive audit and gap analysis of existing MFD operating procedures/practices against relevant Occupational Safety and Health Administration (OSHA) regulations, National Fire Protection Association (NFPA) standards, fire service best practices, and NWCG standards/guidelines to help ensure compliance with industry regulations and best practices. By conducting an audit and implementing recommended improvements, the MFD can create a safer working environment for its personnel and enhance the effectiveness of its firefighting and rescue efforts for all incident types. **RECOMMENDATION:** Review the implementation of the MFD's 36-hour rule for alignment with operational needs during disasters and major emergencies.

3.7.8 ANALYSIS OF SYSTEM COMPONENTS

3.7.8 Findings & Recommendations

68. FINDING (CONT.): MFD wildland firefighting training, equipment, and staffing should be commensurate with the level of wildfire risk faced by firefighters.	**RECOMMENDATION:** Consider developing a WUI firefighting playbook to address the increasingly severe wildfire threat across Maui Nui. Look to departments that respond to WUI incidents for expertise and protocols, such as California.[164] **RECOMMENDATION:** Deliver training on, and provide a copy in all response vehicles, the *NWCG Incident Response Pocket Guide (IRPG), PMS 461*.[165] **RECOMMENDATION:** Provide additional wildfire and WUI firefighting training and experiences (such as shadowing incident management personnel in other areas) for MFD personnel. **RECOMMENDATION:** Continue providing medical monitoring and behavioral health support for responders and support personnel.
69. FINDING: Many initial attack resources were burned over due to fighting fire from a downwind position.	**RECOMMENDATION:** Train firefighters about the impact of wind on fire progression and fire suppression techniques as per evidence based information and best practices.
70. FINDING: Standard wildland firefighting operating procedures for the DLNR-DOFAW and MFD are not in alignment.	**RECOMMENDATION:** The DLNR-DOFAW and MFD should collaborate to update and integrate standard operating guidelines and training for wildland firefighting.

3.8 ANALYSIS OF SYSTEM COMPONENTS

3.8 Evacuation

Rapid evacuation of a community during a natural or man-made disaster is difficult in the best of circumstances. With the addition of inclement weather, such as high winds and limited egress routes, it becomes especially difficult.

This confluence of challenges occurred during the Lahaina PM fire on August 8-9, 2023. High winds prompted rapid fire spread throughout the town, while several community egress options were blocked due to downed utility poles and trees and windblown debris. The complexities of the evacuation were further compounded by infrastructure issues and the dynamic nature of the emergency.

Coordinated and effective evacuations are crucial to achieving the goals of the Cohesive Strategy for public safety and reducing wildfire fatalities. Despite prevention efforts, some wildfires will necessitate evacuation. Efficient evacuations save lives and minimize wildfire impacts, particularly when rapid fire spread threatens people and structures.

The Cohesive Strategy emphasizes pre-planning and close coordination among local governments, emergency responders, law enforcement, community organizations, and the public to ensure well-developed and executed evacuation protocols. Pre-incident planning and preparation by response entities are vital for effective evacuations.

During a wildfire, timely communication of the advancing disaster, evacuation orders, and previously identified routes and assembly points ensures residents can make decisions on their own to evacuate safely and quickly, reducing congestion.

Effective evacuation procedures require multifaceted pre-incident planning built on several best practices:

- **Timely communication to the general public.** Necessitates timely and clear dissemination of evacuation orders through multiple channels (SMS text alerts, social media, local news, etc.) before, during, and after an emergency
- **Smooth traffic management.** Involves the establishment of designated and maintained evacuation routes that are well-publicized to the public and regularly drilled to prevent bottlenecks and ensure a smooth flow of evacuees
- **Clear interagency communications.** Requires the establishment of communications plans between rescue and IMTs, especially in cases of wide-spread communication network failures (See Section 3.5)
- **Adequate personnel and resources.** Ensures each team has the necessary resources to effectively handle an emergency incident at its probable scale
- **Coordination among agencies.** Ensures a unified and efficient response from agencies, with well-defined roles established on key teams, including fire, police, and emergency management

3.8.1 Population Density

According to the U.S. Census, Lahaina, a Census-Designated Place (CDP), had a population of approximately 12,906 as of 2022.[166] The County of Maui had a total population of 164,754 and is predominately (78.6%) urban.[167]

Lahaina's population density is 1,632 people per square mile, compared to 162/sq mi for the County of Maui, making the historic coastal town nearly 10-fold more densely populated than the County of Maui. This relatively high population density likely exacerbated the challenges encountered when residents tried to escape the fire.

The area was further crowded by the number of tourists visiting Maui at the time—28,671 visitors in August 2023, according to the average daily census.

Risk to vulnerable populations in the Lahaina area is very high.[168] Both social and economic factors can adversely impact the ability of certain groups or demographic populations to prepare for, respond to, and recover from wildfire.

These vulnerable populations may exhibit limited mobility, or other medical conditions, exacerbated by stress or smoke, encounter cultural and institutional barriers, and/or have challenging access to resources.

Some specific examples of the increased challenges observed in vulnerable populations are provided here. Senior citizens and the disabled have greater sensitivity to both the air pollution and particulates generated by wildfire smoke.

Language barriers can hinder the ability to make preparations before a disaster, follow directions during an evacuation, or to access support after a disaster. Moreover, there are strong correlations among both race and/or ethnicity with health disparities and access to aid and/or resources.

Wildfires further disproportionately impact people with low incomes because of factors like substandard housing and a reduced ability to relocate or even evacuate.

3.8.2 Traffic Management and Egress Challenges

Several factors caused extensive congestion and traffic issues before the start of the fire on August 8, 2023. High winds downed utility poles and utility lines and toppled trees, while debris from vegetation and building materials blocked major traffic routes, creating numerous hazards for vehicles (Figure 3.8.2.1). This obstruction severely limited traffic flow in and out of Lahaina.

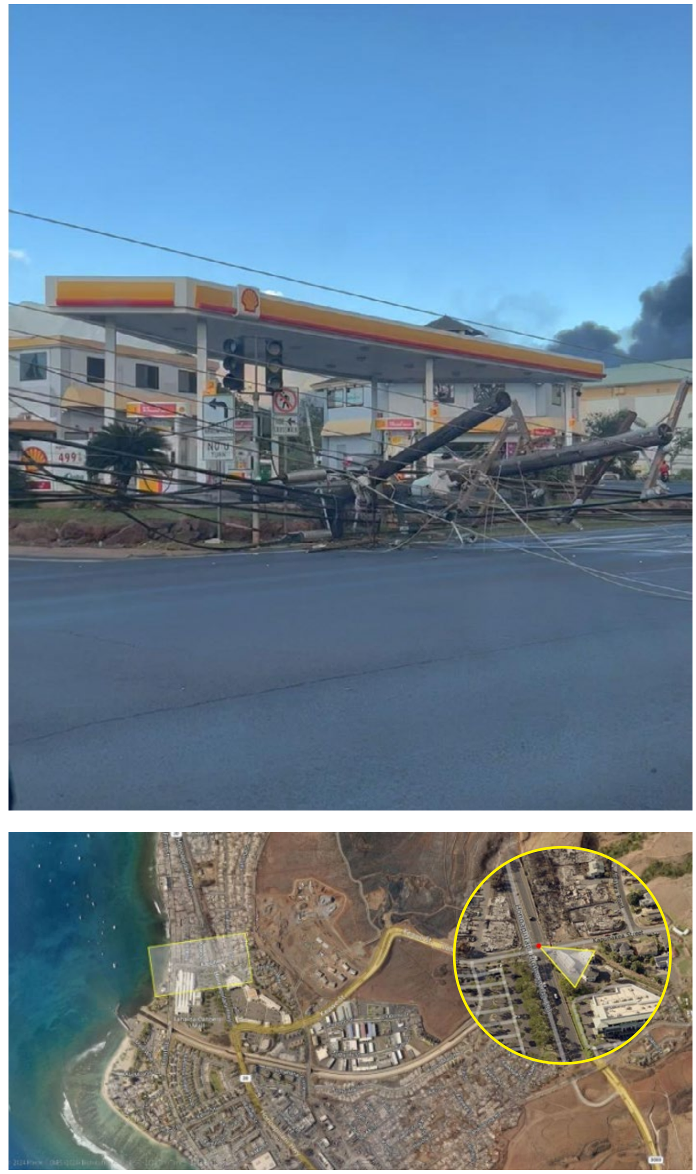


Figure 3.8.2.1 Several downed utility poles and powerlines in the northbound lane of Hwy-30 and Kapunakea Street. Photo taken August 8, 2023, at 16:52. Inset: Viewpoint of photo of downed utility poles and electrical lines at Hwy-30 and Kapunakea Street.

3.8.2 ANALYSIS OF SYSTEM COMPONENTS

The Hwy-30 and Kapunakea Street intersection was a major choke point before and during the fire. Due to downed utility poles and electrical lines on Hwy-30, vehicles were forced to use alternative routes on smaller streets and the Lahaina Cannery Mall parking lot to get north and south prior to the Lahaina PM fire.

As the PM fire progressed, traffic on Hwy-30 north of Kapunakea Street and Front Street over Kahoma Stream was restricted to northbound flow (Figures 3.8.2.2 and 3.8.2.3).

Many neighborhoods, especially those along Lahainaluna Road and surrounding areas, had narrow streets congested with multiple parked vehicles on both sides of the streets. Intense heat from burning structures and vehicles parked along the city streets further reduced options for safe passage, slowing traffic flow and complicating evacuation efforts (Figures 3.8.2.1-3.8.2.4).

As mentioned previously, addressing parking issues through community education and stricter enforcement of regulations could alleviate some of these problems in the future, providing clearer and quicker evacuation routes.

Even without these additional challenges blocking traffic flow, the Lahaina area had inherently limited access and egress routes, which became even more problematic during evacuations. The restricted road network was unable to handle the sudden surge in traffic as residents and tourists tried to navigate and evacuate the Lahaina area simultaneously.

These limited egress points meant any blockage, disabled vehicle, or accident could hinder residents' ability to evacuate quickly.

Figure 3.8.2.2 Northbound Front Street traffic over Kahoma Stream on August 8, 2023, at 17:05. Inset: Viewpoint of northbound Front Street traffic over Kahoma Stream on August 8, 2023, at 17:05.

3.8.2 ANALYSIS OF SYSTEM COMPONENTS

Safety issues arose for both emergency responders and pedestrians. Emergency vehicles struggled to navigate through parked cars and heavy traffic, while pedestrian safety was compromised, especially in areas lacking proper sidewalks or crosswalks.

The area's loss of power affected traffic signals, causing them to stop functioning and further hindering traffic flow. Without operational traffic signals, intersections rapidly became chaotic, slow, and dangerous, leading to severe traffic congestion.

Thick smoke and flames also reduced visibility, greatly obscuring drivers' ability to see and safely navigate the roads. This reduced visibility increased the risk of accidents and slowed evacuation efforts. Additional downed utility poles, powerlines, trees, and building materials, all scattered by the high winds, obstructed both primary and secondary egress routes.

This debris made many roads impassable and forced residents and emergency responders to find alternative, less direct routes. The high winds and subsequent fire damage led to the reports from some MPD officers of lost cellular connection. Some individuals reported GPS navigation systems were unreliable. These issues contributed to the chaotic and dangerous environment for evacuations, highlighting the critical need for improved emergency planning, infrastructure resilience, and public awareness.

Figure 3.8.2.3 Front Street at Hwy-30 on August 8, 2023, at 17:28 shows MPD vehicles redirecting southbound Hwy-30 traffic away from the fire, and vehicles on northbound Front Street merging onto northbound Hwy-30. Inset: Viewpoint looking south toward Front Street and Hwy-30 intersection.

3.8.2 ANALYSIS OF SYSTEM COMPONENTS

The MPD extended their night shift officers, who were due to be sent off duty, to help control traffic at key intersections. However, the extreme wind and heavy smoke from the fire further hampered efficient egress from the fire-ravaged areas of Lahaina and increased health and safety hazards for MPD officers.

Some old sugarcane roads (with different degrees of maintenance) on private and public lands, served as crucial alternative evacuation routes. Access to these dirt roads were mostly blocked by either locked gates or boulders, which were intended to prevent unauthorized use.

As the fire grew in intensity and consumed structure after structure down Lahainaluna Road, by 16:30 on August 8, 2023, the main westbound egress routes down Komo Mai Street and Lahainaluna Road were cut off by fire. Due to the quick actions of MPD officers and residents, alternative egress routes through locked gates and dirt roads enabled many residents to evacuate safely (Figure 3.8.2.4).

The route was accessed via the east end of Komo Mai Street using a small dirt road between 3[redacted] and 4[redacted] Komo Mai Street. This led to a path along the south bank of Kahoma Stream, which allowed traffic to flow eastbound onto Kanakea Loop (Figure 3.8.2.5).

Figure 3.8.2.4 Evacuation route used by residents exiting the Lahainaluna neighborhood as the fire burned through the Lahainaluna neighborhood. Route required breaking open three (3) locked gates (red circles), and driving on dirt roads to make access to Lahainaluna Road, and ultimately, the Lahaina Bypass.

Figure 3.8.2.5 Body-worn camera (BWC) images of a MPD officer captured August 8, 2023, at 16:27 and 16:28 on a private vacant lot north of 4[redacted] Komo Mai Street and south of Kahoma Stream. MPD officers and residents broke through the gate to travel on the dirt road to Kanakea Loop, and ultimately, out to the Lahaina Bypass via Lahainaluna Road. Inset: Viewpoint of BWC image of MPD officer assisting residents evacuating dirt road on a private lot on south side of Kahoma Stream.

3.8.2 ANALYSIS OF SYSTEM COMPONENTS

Egressing the neighborhood along Kanakea Loop proved challenging due to the westbound streets of Kahena, Kahako, and Kaʻakolu being cut off by fire. The only way out was through the County of Maui Department of Water Supply lot across from 1005 Kanakea Loop. MPD officers used their vehicles equipped with tow straps, and in some cases their own bodies, to open gates that were blocking the critical egress route (Figure 3.8.2.6).

Figure 3.8.2.6 BWC image capture of a MPD officer August 8, 2023, at 16:43,16:44, and 16:46 breaking through a locked gate securing the County of Maui Department of Water Supply Lot (Parcel No. 450310010000) on Kanakea Loop, directly across from 10[redacted] Kanakea Loop. Gate restricted access to the county lot, leading to a second gate that provided access to the Kelawea Mauka Makai Park parking lot, and ultimately, Lahainaluna Road. Inset: Viewpoint of MPD officers making access through the locked gate, securing the county lot in the west side (makai) of Kanakea Loop, across from 10[redacted] Kanakea Loop.

3.8.2 ANALYSIS OF SYSTEM COMPONENTS

Numerous vehicles followed one another from the Komo Mai Street dirt road to Kanakea Loop, through the County of Maui Department of Water Supply lot (Figure 3.8.2.7) and the Kelawea Mauka Makai Park parking lot, to eastbound Lahainaluna Road, and ultimately, to the safety of the Lahaina Bypass.

The direct intervention of MPD officers allowed for quicker evacuations and access to safer areas. The necessity of rapid access measures to open these gates highlighted a significant gap in the preparedness and planning for such emergencies. Ensuring these routes are maintained and accessible by emergency crews could vastly improve evacuation operations in future incidents.

Ensuring multiple, well-maintained evacuation routes are available and first responders have the necessary access to these routes is crucial. Pre-planned and regularly updated evacuation routes can mitigate delays and ensure smoother evacuations during emergencies.

Figure 3.8.2.7 BWC image captured on August 8, 2023, at 16:46 of a MPD officer within the County of Maui Department of Water Supply lot (Parcel No. 450310010000) just north of Kelawea Mauka Makai Park. MPD officers and residents broke through locked gates to exit the lot into the Kelawea Mauka Makai Park parking lot, then to Lahainaluna Road, and ultimately, to the Lahaina Bypass to escape the fire. Inset: Viewpoint of BWC image of MPD officer inside county lot residents used to travel through to escape the fire.

3.8.3 MPD Preparedness

No evacuation pre-plan for Lahaina and the Lahainaluna neighborhood was provided by the MPD. The lack of an executable evacuation plan contributed to many of the challenges the MPD faced during the Lahaina PM fire.

While the MPD's night shift, which had been held over, handled traffic control, MPD day-shift officers were tasked with responding to numerous incidents and emergencies that arose both during the course of the fire and normal, daily activity.

Despite the escalating severity of the situation in Lahaina, no supplementary support or reinforcements were requested until the start of the Lahaina PM fire on August 8, 2023, increasing the strain on already limited resources and manpower. Despite the officers' efforts, the urgent need for proactive staffing and comprehensive pre-incident planning became critical with such an extremely rapid fire.

It's imperative for the MPD to prioritize the implementation of strategic preparedness measures to mitigate the impact of future disasters. These measures will ensure the readiness of equipment and facilities to withstand the impact of emergency situations like storms and wildfires, and the prospect of loss of power that follows.

3.8.4 MPD Actions

During the Lahaina PM fire, effective coordination of resources and accountability were necessary for managing evacuations, rescues, and supporting evacuation routes. However, the MPD faced numerous challenges in ensuring a coordinated response.

Due to the vast distances and limited access routes, any additional assistance or support from neighboring districts was at least 20 to 30 minutes away, which created logistical problems. This geographical constraint further underscored the urgency of the situation and emphasized the critical importance of efficient resource allocation and strategic planning in emergency response efforts.

Dispatch was notified about evacuation orders at 15:06. However, the MPD had already been evacuating residents who were in the immediate area of the AM fire toward the Lahaina Bypass, while the MFD and private equipment operator crews were firefighting.

Directing traffic around roadway obstructions was critical before the PM fire and the MPD were stationed at strategic traffic control points, managing the traffic flow in and out of Lahaina. During this time, utility poles were falling, powerlines were coming down, and airborne debris was flying around, making the environment dynamic and perilous.

Power status was also unclear, elevating the risks for both officers and residents. Once the PM fire began and evacuations were ordered, there were not enough officers in position to notify every resident, especially those in the Lahainaluna neighborhood, of evacuation orders ahead of the fast-moving fire.

MPD officers made an emergency field decision to send limited evacuation vehicle traffic on Lahainaluna Road in a "contra-flow" manner to the west toward Hwy-30 at 16:47. This action provided limited relief to the vehicle gridlock.

Working off one (1) primary radio channel limited the MPD's ability to communicate effectively. Relaying timely information proved challenging as events unfolded rapidly. At times, officers were forced to delay transmission while other officers had the channel open. Transmissions were often difficult to hear due to deafening winds and the sound of fire destruction.

3.8.4 ANALYSIS OF SYSTEM COMPONENTS

Throughout the fire, the MPD conducted rescues of citizens and others endangered by the fire, including managing search and rescue (SAR) operations and providing aid to people in distress. Collaboration with the MFD at this task-level ensured the safe evacuation of hundreds of residents, maintenance of evacuation routes, and assistance to those in need.

One (1) notable instance highlighting the importance of incident management occurred when the MPD captain ordered a recall at 18:15 of all officers not engaged in traffic posts back to the station. According to the MPD, this decision was made to address a lack of coordination and accountability within the response teams, establish a new structured evacuation plan, and reallocate resources.

While the decision to recall these officers provided the opportunity to regain command and control of MPD units, it deviated from NIMS-ICS best practices. This action was taken without coordination with the EOC or MFD, highlighting a missed opportunity for a unified ICS.

Ideally, the initial MPD captain would have assigned and tracked resources at a strategic level, allowing officers to operate effectively at the task-level. This approach would have ensured better coordination, accountability, and a unified response with the MFD.

Despite encountering coordination challenges, it is imperative for the MPD to align with and engage in evidence-based best practices to ensure a more effective response in future crises.

3.8.4.1 Automatic Vehicle Location Data – Apparatus Location

The positioning of MPD apparatus throughout the incident was communicated by MPD personnel during their TDs. Personnel assigned to each resource identified their location on a map and used the dispatch/communications record to verify their location in most cases.

For apparatus equipped with AVL capabilities, location was also verified using the data provided by the County of Maui.

The AVL heatmaps in Figure 3.8.4.1.1 display MPD resource location over time. The warmer the color, the more timepoints recorded in that location. Each one (1) hour time period displaying a heat signature represents a collection of units with their associated timepoints within a geographic area. The limitation of the heatmap is, at times, there were no units with timepoint data for the hour period, or there was only one (1) or a few units with only one (1) or a few timepoints.

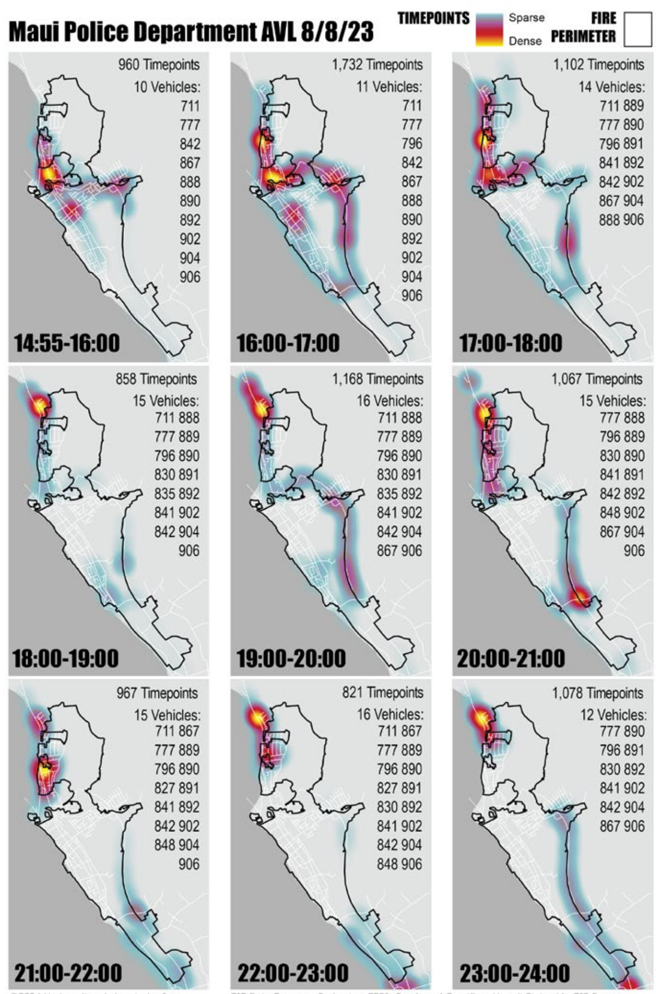


Figure 3.8.4.1.1 MPD AVL data aggregated to location within eaach hour, starting at the time of the Lahaina PM fire and through midnight.

3.8.5 ANALYSIS OF SYSTEM COMPONENTS

The location of MPD resources is mostly consistent with what personnel communicated. This was especially common during the Lahaina AM fire suppression operations and early into the PM operations.

Furthermore, it's important to note that, like the MFD, some MPD vehicles assigned to Lahaina may not have been AVL-enabled or data was not provided.

See Appendix 6.10 for a comparison of MFD, MPD, and Hawaiian Electric's AVL timepoints.

3.8.5 MFD Actions

During the Lahaina PM fire, the MPD and MFD performed their primary roles independently, with the MPD focusing on evacuation and the MFD on fire suppression. While there was no formal unified command structure, individual MPD officers and MFD personnel worked together on the ground to notify, evacuate, and make rescues.

The MFD concentrated on combating the fire, utilizing their resources and personnel to attempt to control the blaze and prevent it from spreading. However, the MFD also played a role in evacuating residents, particularly in areas where the fire posed an immediate threat.

Along with police officers, MFD crews went door-to-door, assisted in directing vehicles and citizens away from harm, and placed individuals in fire apparatuses for immediate safety. The MFD also used additional support vehicles for evacuations in the Front Street area and along the sea wall.

3.8.6 Resident Communications During Evacuations

Due to the loss of power and unreliable cellular networks, MPD officers began alerting Lahaina residents of the fire's imminent danger using vehicles equipped with public address (PA) systems and sirens.

The effectiveness of vehicle-mounted PA systems to alert residents of evacuations was dramatically impacted by several factors, including wind noise, limited ability of residents to hear within their homes (especially older residents with diminished hearing), and the directional nature of PA systems.

These systems are designed to project sound in a specific direction, meaning that if the vehicle is not oriented correctly, the sound may not reach all intended areas. These factors underscore the limitations of relying solely on vehicle-mounted PA systems for emergency alerts and the need for other communications channels in the event of full network failure.

Strong wind noise also drowned out the sound of PA systems, making it difficult for residents to hear evacuation orders. Wind noise is particularly problematic in open areas or streets where sound dispersion occurs. Studies have shown gusty, 15-30 mph winds can cause a reduction of a few decibels per 100 yards.[169]

Residents inside their homes faced additional challenges. With windows and doors closed to block out the wind, their ability to hear external announcements was greatly reduced. The insulating properties of buildings, especially modern homes with energy-efficient windows and solid doors, also decreased sound transmission from outside.

Additionally, the diminished hearing of older residents posed a significant challenge. Many elderly individuals suffer from age-related hearing loss, which can affect their ability to hear PA announcements clearly, even if they are nearby. Hearing loss affects approximately 33% of people over the age of 65, with high-frequency sounds, like those from PA systems, being particularly hard to hear.

Inaccessible roads due to downed trees and electrical lines prevented police vehicles from reaching certain areas, leaving those residents without direct audio alerts. Physical barriers also severely limited the distribution of emergency communications, necessitating alternative methods for reaching isolated populations.

The factors listed above made it impossible to notify everyone, especially those west (makai) of where the fire started and all the way to the ocean.

3.8.7 Rescue Operations

During the Lahaina PM fire, the MPD and MFD undertook numerous rescue operations, assisting those unable to evacuate on their own, including elderly residents and those with limited mobility, and rescuing people from the sea wall and the area around the aquatic center.

During the firefight, MFD companies evacuated numerous citizens from the fire's path. For example, the crew of L3, during their initial fire attack on Lahainaluna Road, encountered a family of seven (7), including a baby, trapped by the rapidly advancing flames. The firefighters placed the family in the safety of their cab, and coordinated with BC5 to transfer them to a secure area above the fire, away from immediate danger.

In another instance, L3 provided refuge for a victim who remained with them for an extended period of time until a safe location and transfer could be completed (see Phase One report, pages 103-108). Throughout the operation, MPD and MFD units rescued numerous individuals and families, guiding them to safe zones or the civic center, which served as a temporary shelter (see Phase One report, pages 151-157, 159-173, 179, 213-216).

3.8.8 Resident Response to Evacuation Efforts

The speed of the fire, extreme winds, blocked roads, and limited access points prevented the MPD from getting into all impacted neighborhoods and informing people of the imminent danger. For residents, the situation was confusing and unprecedented, making it difficult for individuals to know what action(s) to take.

As the fire moved, officers worked quickly to evacuate these critical areas. Some residents refused to leave their homes, despite evacuation orders, which endangered their lives and may have delayed the evacuation process for others.

During TDs, MPD officers cited repeated issues of complacency, and a lack of awareness or understanding of the fast-approaching danger posed by the fire. Negotiating these situations required the MPD to prioritize public safety and community evacuation over the dangers and delays created when individuals resisted evacuation directives.

Many residents believed that a fire had never substantially affected Lahaina or Maui before and trusted the MFD's past successes protecting Lahaina, leading to a false sense of safety by some residents.

As mentioned previously, the diminished cell service and loss of electrical power during the fire further complicated matters, as many residents did not receive evacuation notices, and did not hear PA announcements.

In TDs with residents from all parts of Lahaina (including areas that were not immediately impacted by the fire in the Lahainaluna neighborhood), 57% said they were not instructed to evacuate and those who did evacuate were urged to do so by friends or neighbors.

3.8.8 ANALYSIS OF SYSTEM COMPONENTS

Although MPD officers were driving around and making PA announcements about evacuating the area, many respondents commented they could not hear what was being said over the PA. Some heard the announcements, but stated there were no instructions for which routes to take or where to go (Appendix Section 6.3).

However, 79% said they encountered the MPD on August 8, 2023, with most encounters occurring in traffic situations while evacuating residences and businesses (Appendix Section 6.3).

Some residents also faced physical or logistical challenges, such as limited mobility or lack of transportation, which prevented them from evacuating promptly.

Overall, these factors highlight the critical need for community education and better communication strategies to ensure residents understand the importance of evacuation and are equipped to respond appropriately in future emergencies as part of a comprehensive and effective emergency preparedness plan.

3.8.9 Evacuation Reflection

Even with the evacuation challenges highlighted, thousands of Lahaina residents and visitors managed to escape to safety, a testament to the actions of emergency services personnel and everyday people helping each other through the disaster.

The situation in the Lahainaluna neighborhood was particularly tense, where the PM fire spread very rapidly. While an exact count is unclear, a majority of the population was able to evacuate, though some, unfortunately, did not make it out of the area.

The severe weather preceding the disaster likely caused many people to be at home during the fire. And since the fire took place primarily in the afternoon, many people were awake, alert, and able to evacuate. In the eastern (mauka) section of Lahaina, the 2022 U.S. Census (Block Groups 1-4, Tract 314.05) reports a population of 6,442.[170] [171] [172] [173]

The night of August 8, 2023, brought new challenges, especially for the residents of the Wahikuli neighborhood. As flames approached in the darkness, first responders were tasked with waking sleeping inhabitants and guiding them to safety. The urgent knocks on doors and sirens became a lifeline for many who might otherwise have slept through the encroaching danger.

Many residents who lived in this area decided to evacuate well ahead of the fire making it to this location. Of an estimated population of more than 3,000[174] [175] in this northern section of Lahaina, five (5) residents were lost.

3.8.10 Fatalities

The fires that occurred on August 8-9, 2023, on Maui resulted in an unprecedented loss of life and property damage. A total of 102 fatalities have been confirmed in Lahaina, with two (2) additional individuals still reported missing by the MPD.[176]

This section is intended to provide context and insight into the fatalities. Data presented in this section was compiled from:

- The MPD's Preliminary After-Action Report
- Data produced by the MPD
    - Driver's licenses on the victims (limited)
    - Victim home addresses and recovery notes
- Resident TDs
- Media reports

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

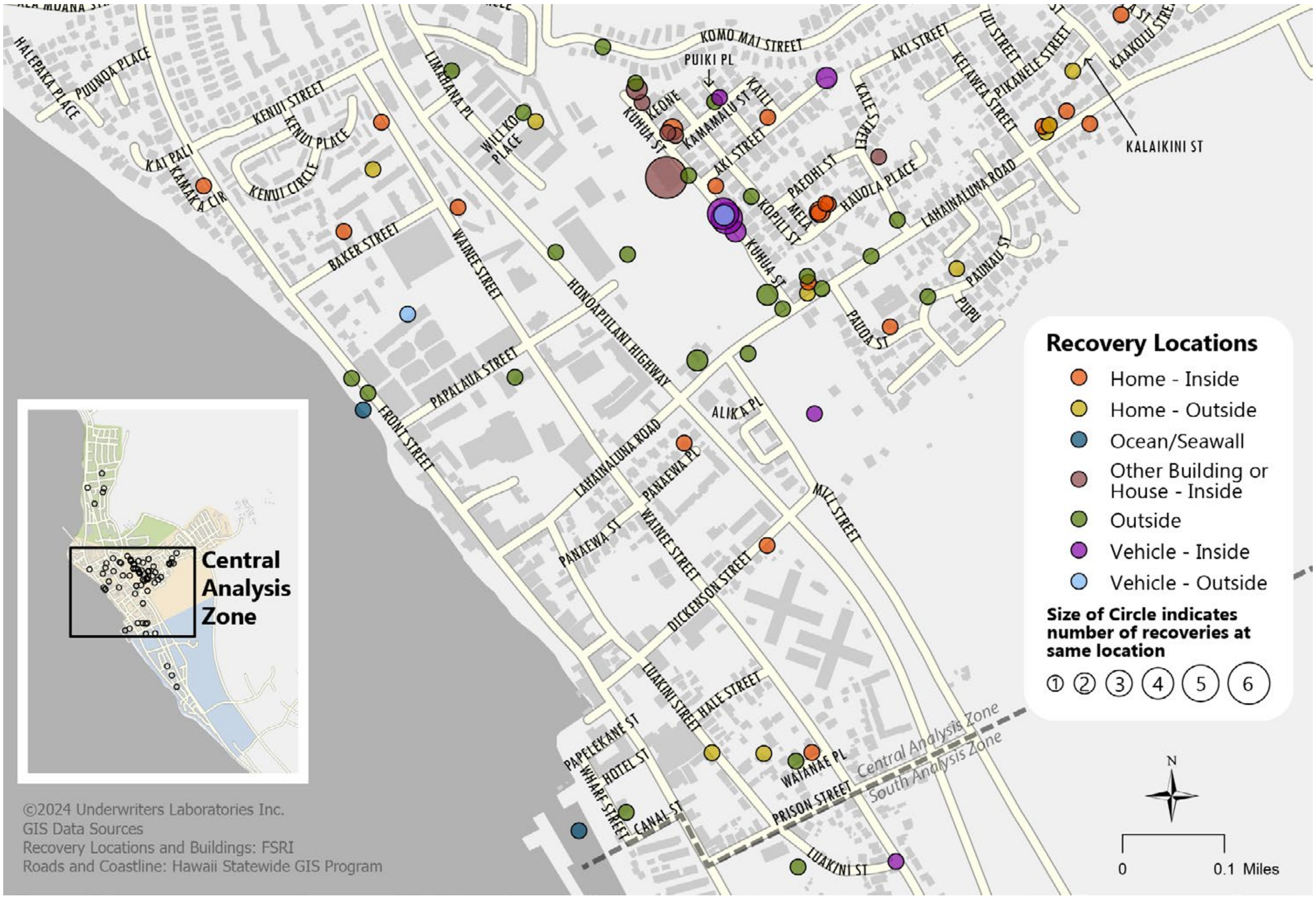


Figure 3.8.10.1 Recovery locations and descriptions of fire fatalities for the central analysis zone.

Several characteristics of victims were documented from the available data sources, including age, gender, home address, location recovered, whether there was evidence indicating the person was attempting to evacuate, and other circumstances around their death (Appendix Section 6.13).

- The average age of the victims was 65 years old
- The median age of the victims was 68 years old
- The age of the victims ranged from 7 to 97 years old

The largest number of fatalities, 82 (80%), took place in the central part of Lahaina, the area bounded by Kahoma Stream to the north and Dickenson Street to the south (Figure 3.8.10.1). This area experienced rapid initial fire spread and the least available evacuation time. See the Phase One report (pages 45-83) for additional details on where and when the fire progressed.

Eleven (11%) fatalities occurred south of Dickenson Street and five (5%) fatalities occurred north of Kahoma Stream (Figures 3.8.10.2 and 3.8.10.3). Four (4%) victims died later due to injuries sustained during the fire.

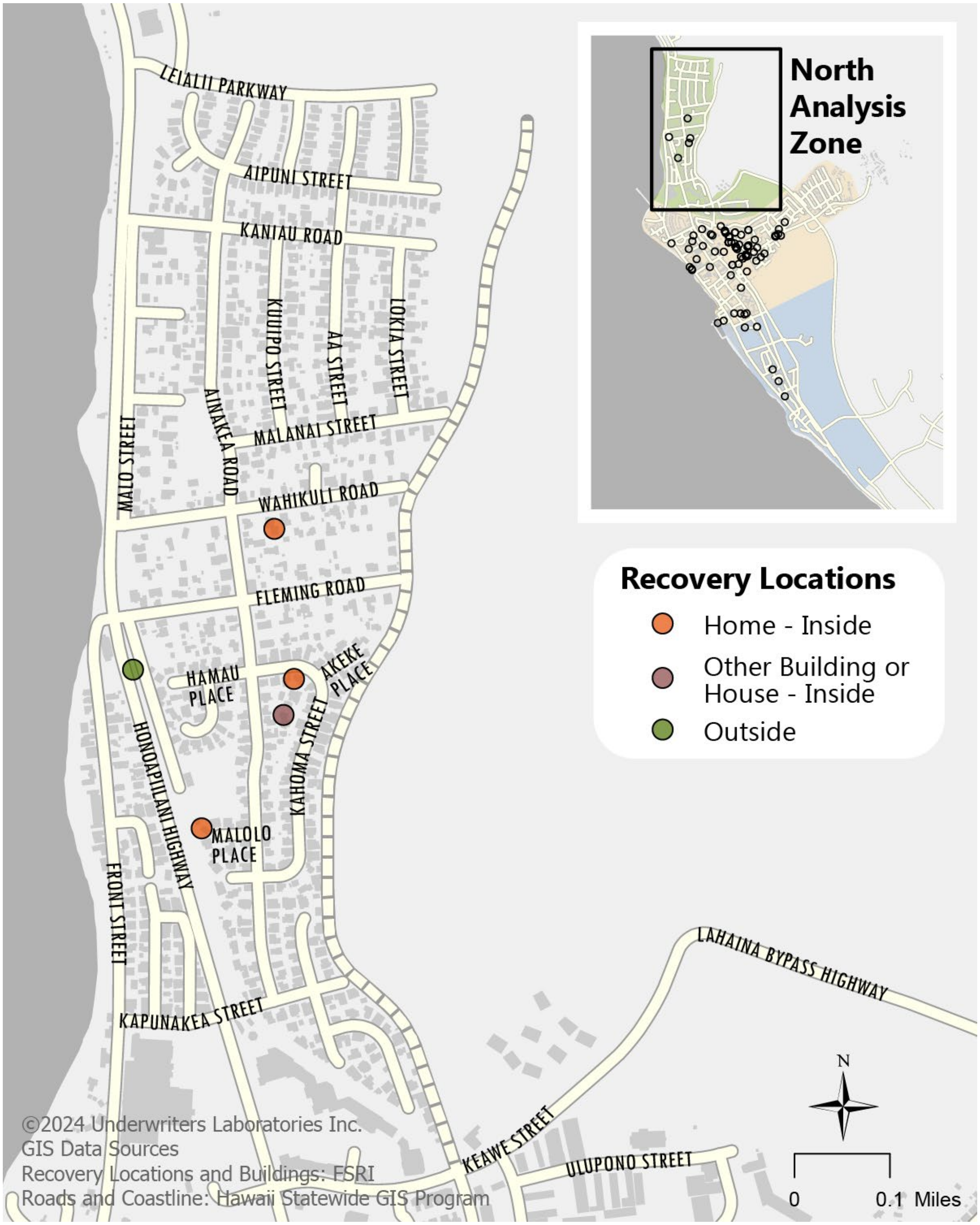


Figure 3.8.10.2 Recovery locations and descriptions of fire fatalities in the north.

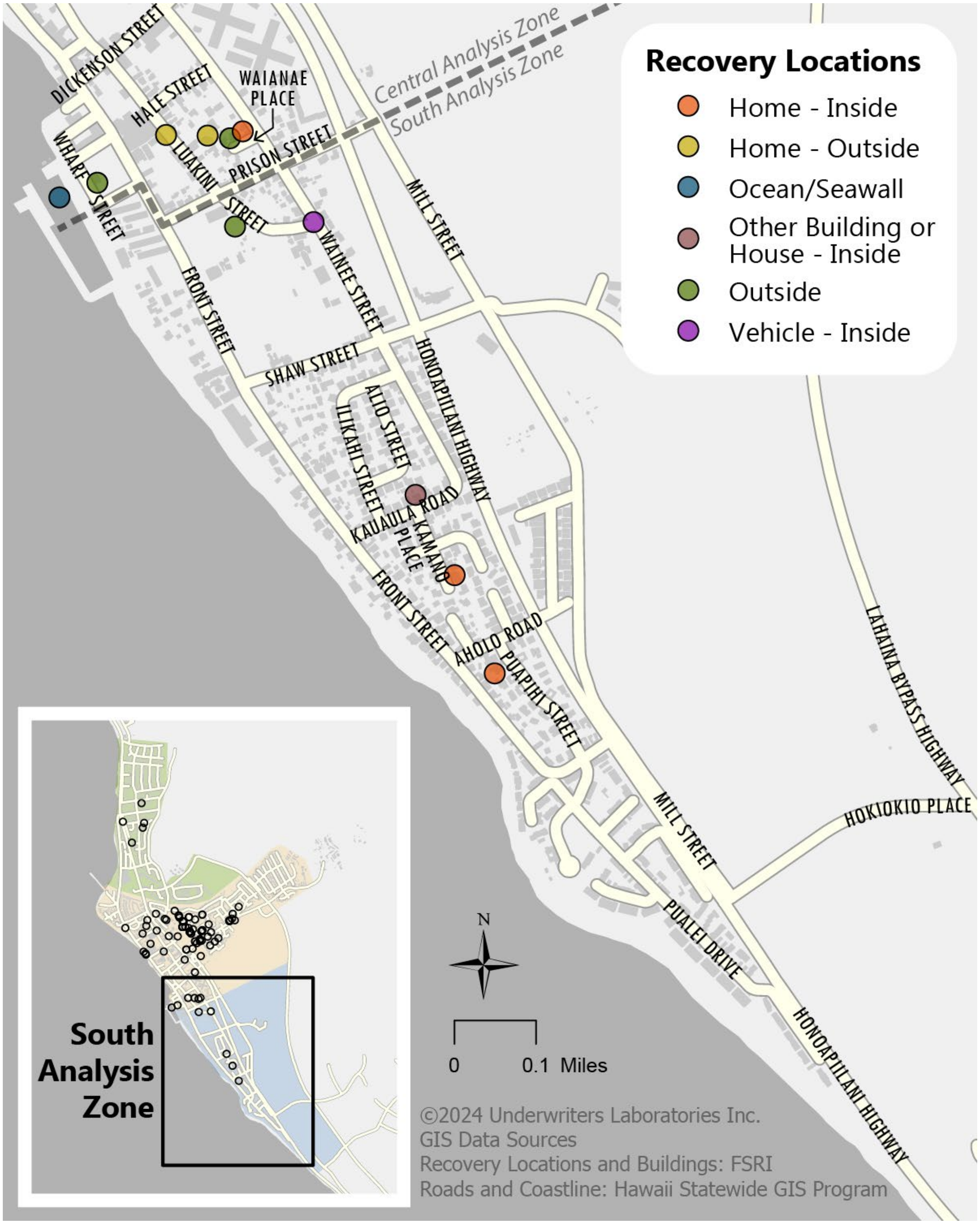


Figure 3.8.10.3 Recovery locations and descriptions of fire fatalities in the south.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Most fatalities, 37 (36%), were found in or just outside their homes (Table 3.8.9.1). Twenty-seven (26%) were located outside. Fourteen were located in buildings or houses that did not match their reported home address. Many were located in or right outside vehicles (17).

Based on available reporting of the circumstances of each victim, it appears that at least 65 of the 102 people (64%) were attempting to evacuate when they were overcome by the fire. Those who were found in or just outside their home were not classified as attempting to evacuate.

For those who were evacuating, examining the distance between the victims' home addresses and the locations where they were recovered yields an average evacuation distance of 0.15 mi (800 ft).[177] This suggests that those who were able to evacuate could not make it very far.

The following section utilizes the available data to examine the evacuation circumstances for all 102 victims. The amount of data is not the same for each person and, in some cases, context-informed assumptions are made, such as where they were when they became aware of the fire and how they ultimately got to where they were recovered.

Table 3.8.10.1 Summary of fatalities with respect to location found.

Summary of Fatality Recovery Locations		
Recovery Location	**Count**	**Percentage of Total**
Home – Inside	28	27
Home – Outside	9	9
Vehicle – Inside	15	15
Vehicle – Outside	3	3
Outside	27	26
Other Building or House – Inside	14	14
Ocean/Seawall	2	2
Hospital	4	4

For each person, we also examined the fire progression data from the Phase One report to begin to understand the speed at which the fire approached and the evacuation challenges the victims likely experienced. As a baseline for fire progression from Phase One, the Lahaina PM fire ignited at 14:55, jumping the Lahaina Bypass at approximately 15:21. The first homes along Lahainaluna Road began to ignite at 15:30.

There were three (3) clusters of fatalities located in the Lahainaluna neighborhood. The first was at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. Seven (7) residents were among the fatalities. Six (6) were recovered on the facility property and one (1) evacuated to the area of Lahainaluna Road and Kuhua Street and was recovered there (Figure 3.8.10.4).

The average age of those who did not evacuate this complex was 86. This complex was very close (approximately 200 feet to the closest point) to the first structures that ignited after the fire jumped the Lahaina Bypass. The MFD initially positioned several units to try to stop the fire's progression near the intersection of Kalena Street and Lahainaluna Road, but were unsuccessful. MPD officers worked to evacuate the complex, but were forced to fall back

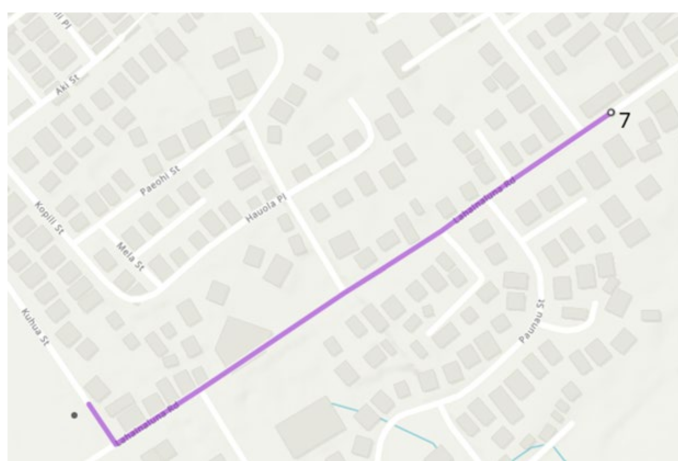


Figure 3.8.10.4 Evacuation path of the resident of the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street who was recovered on Kuhua Street.

at 16:08. At 16:43, a dispatch record stated, “Hale Mahaolu fully engulfed.”

The second cluster of fatalities was located inside 8[redacted] Kuhua Street. Six (6) people sought refuge inside a structure described in MPD documents as a “quonset hut.” This lightweight prefabricated structure of corrugated, galvanized steel with a semi-circular cross-section faced Kuhua Street. The remainder of Kuhua Street was lined with a security fence that residents described as well-reinforced due to previous vandalizations of the mill property that ran along most of the western side (makai) of Kuhua Street (Figure 3.8.10.5).

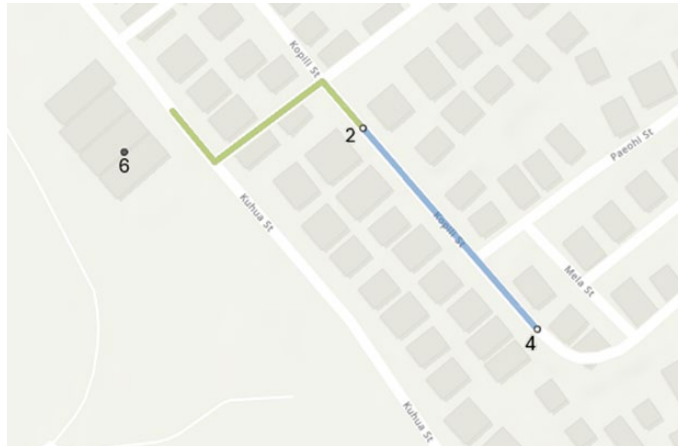


Figure 3.8.10.6 Potential egress routes for fatalities recovered from 8[redacted] Kuhua Street.

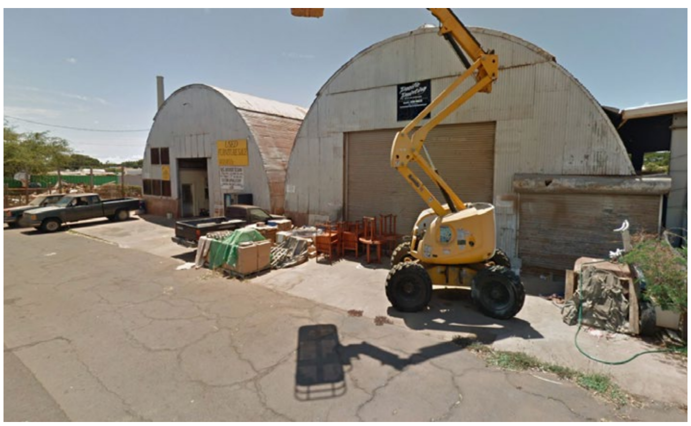


Figure 3.8.10.5 Front of 8[redacted] Kuhua Road from Google Street View (Sept 2011).

Figure 3.8.10.7 August 11, 2023, satellite image of 8[redacted] Kuhua Street and surrounding area.

Based on resident reports and media stories, a large tree came down blocking Kuhua Street just south of Aki Street, and a utility pole came down across Kuhua Street just north of Aki Street. All six (6) victims lived on Kopili Street and likely traveled north on Kopili Street, then west on Aki Street to Kuhua Street, where they became trapped, unable to go north or south without hitting an obstruction (Figure 3.8.10.6).

Once the fire spread to the Kuhua Street and Aki Street area at approximately 16:42, when a 911 caller advised the fire was getting closer to Kuhua Street and Aki Street, they were left with no evacuation route. Unfortunately, the structure did not resist the fire and was burned out, along with the six (6) victims (Figure 3.8.10.7).

The third cluster of fatalities was located in front of 8[redacted]-8[redacted] Kuhua Street. There were ten (10) victims located inside or just outside of vehicles. MPD records describe a car crash at this location and satellite images show at least two (2) cars involved in an accident, and possibly two more vehicles 75 feet further down Kuhua Street toward Lahainaluna Road.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

The Dychmans were found in a vehicle in front of 8[redacted] Kuhua Street. They possibly evacuated from Puiki Place. The other vehicles were in front of the neighboring home, 8[redacted] Kuhua Street.

This address is where two (2) of the victims (Terri Thomas and Dale Richter) were reported to have lived. Tony Takafua, Salote Tone, Fa‘aoso Tone, and Malui‘fonua Tone were presumably evacuating from 9[redacted] Kuhua Street in their car headed south on Kuhua Street toward Lahainaluna Road. Juan Deleon and Ediomede Castillo were presumably evacuating from their home at 3[redacted] Keone Street in their car, headed south on Kuhua Street toward Lahainaluna Road (Figure 3.8.10.8).

It is not known what time they all reached this area. However, they were able to get past the area on the corner of Aki Street and Kuhua Street. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area. The vehicles in front of 8[redacted] Kuhua Street were consumed by fire, while the vehicle in front of 8[redacted] does not appear to have been consumed by the fire (Figure 3.8.10.9).

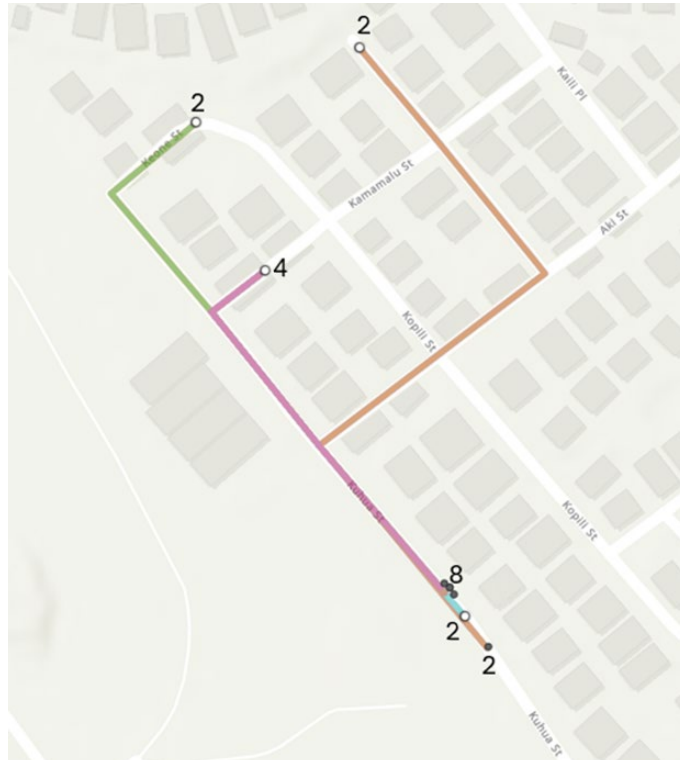


Figure 3.8.10.8 Potential egress routes for those recovered in vehicles in front of 8[redacted]-8[redacted] Kuhua Street.

Figure 3.8.10.9 August 11, 2023, satellite image of 8[redacted]-8[redacted] Kuhua Street and surrounding area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

3.8.10.1 List of Victim Evacuation Circumstances

Louise Abihai was 97 years old and was reportedly found inside her home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that she did not, or was not able, to evacuate.[178] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch record stated, “Hale Mahaolu fully engulfed.”

Laurie Allen was 65 years old and reportedly succumbed to her injuries at Straub Medical Center in Honolulu on September 29, 2023. She reported that she had delayed her own evacuation until the Sagudang family could gather their things and join her. When they were ready, she apparently followed their two (2) cars down the road until a falling tree branch forced them to abandon their cars and climb into hers, but she was unable to find a way forward. Allen presumably got out of the car and fled 100 yards (91 meters) across a field of burning grass (possibly in the area of Lahainaluna Road and Mill Street where Conchita Sagudang was reportedly recovered). A police officer and firefighter reported that they met her, and she was taken to an emergency shelter.[179,180,181] At 16:09, the MPD advised the fire was reaching Mill Street. At 16:24, the MPD advised, “We might have one (1) fatality. Homes rear of Mill Street,” indicating fatal conditions at that area. At 16:37, the MPD reported having a 65-year-old female with burns to her body.

June Anbe was 78 years old and was reportedly found inside her home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that she did not, or was not able, to evacuate.[182] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch record stated, “Hale Mahaolu fully engulfed.”

Angelica Baclig was 31 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street. It was reported that she was recovered with Junmark Quijano, Adela Villegas, Justin Recolizado, Maria Victoria Recolizado, and Eugene Recolizado. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street, which is adjacent to the industrial building.

Narciso Baylosis, Jr. was 67 years old and was reportedly found at 2[redacted] Lahainaluna Road next to the Shell Gas Station. He presumably departed his home in a vehicle with Vanessa Baylosis and possibly traveled down Pauoa Street to Lahainaluna Road. They may have turned left on Lahainaluna Road and drove west past Mill Street. At 16:09, the MPD advised the fire was reaching Mill Street.[183] At 16:24, the MPD advised, “We might have one (1) fatality. Homes rear of Mill Street,” indicating fatal conditions at that area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Vanessa Baylosis was 67 years old and was reportedly found at 2[redacted] Lahainaluna Road next to the Shell Gas Station. She presumably departed her home in a vehicle with Narciso Baylosis Jr. and traveled down Pauoa Street to Lahainaluna Road. They may have turned left on Lahainaluna Road and drove west (makai) past Mill Street. At 16:09, the MPD advised the fire was reaching Mill Street.[184] At 16:24, the MPD advised, "We might have one fatality. Homes rear of Mill Street," indicating fatal conditions at that area.

Melva May Benjamin was 71 years old and was reportedly found outside at 9[redacted] Puiki Place. She presumably departed her home with partner Edward Sato in their vehicle and traveled east (mauka) on Aki Street, turning left on Puiki Place.[185] At 16:25, a house in the 300 block of Aki Street was reported as on fire. At 16:58, a third-party 911 caller advised a house was on fire on Puiki Place.

Luz Bernabe was 64 years old and was reportedly found inside her home at 3[redacted] Hauola Place with Lydia Coloma and Salvador Coloma. It is presumed that she did not, or was not able, to evacuate. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road, which is to the south and west of this location.

Maurice Buen was 79 years old and was reportedly found across Waine'e Street from Lahaina Surf Apartments (10[redacted] Waine'e Street), where he was reported to have lived.[186] At 16:24, the MPD was evacuating this area. At 16:44, the MPD reported the Hale Ohana Apartments, below Hwy-30 and Kenui Street, was engulfed in flames.

Buddy Carter was 85 years old and was reportedly found adjacent to his home at 2[redacted] Kamaka Circle—unknown if inside or outside. At 17:59, the MPD reported multiple buildings fully engulfed in this area.

Kirk Carter was 44 years old and reportedly succumbed to his injuries at Straub Medical Center in Honolulu on September 19, 2023. It is unknown where he started his evacuation. The house he apparently lived in survived the fire, but he arrived at Safeway with burns.[187] The fire was in the area of Nahale Place after 22:00.

Ediomede Castillo was 35 years old and was reportedly found inside a vehicle in front of 8[redacted] Kuhua Street. He and Juan Deleon were apparently evacuating from their home at 3[redacted] Keone Street in their car, headed south on Kuhua Street toward Lahainaluna Road. It was reported that they appeared to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one other vehicle. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Rex Cole was 64 years old and was reportedly found across the street from his home in the area of 6[redacted] Luakini Street (Liberty Apartments). It was reported that he was seen walking near the Banyan tree, which is further from his home on Front Street.[188] The first report of fire near the Banyan tree was 16:24. Structures were reported on fire in this area at 17:44.

Lydia Coloma was 70 years old and was reportedly found inside her home at 3[redacted] Hauola Place with Luz Bernabe and Salvador Coloma. It is presumed that she did not, or was not able, to evacuate.[189 190] At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road, which is just beyond this location.

Salvador Coloma was 77 years old and was reportedly found inside his home at 3[redacted] Hauola Place with Luz Bernabe and Lydia Coloma. It is presumed that he did not, or was not able, to evacuate. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road, which is to the south and west of this location.

Allen Constantino was 25 years old and was reportedly found inside his home at 9[redacted] Kuhua Street with Letcia Constantino. It is presumed that he did not, or was not able, to evacuate. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Leticia Constantino was 56 years old and was reportedly found inside her home at 9[redacted] Kuhua Street with Allen Constantino. It is presumed that she did not, or was not able, to evacuate. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Theresa Cook was 72 years old and was reportedly found in the ocean by the Coast Guard. It was reported that she was last seen by the Banyan tree on foot.[191 192] The first report of fire near the Banyan tree was 16:24. Structures were reported on fire in this area at 17:44.

Juan Deleon was 45 years old and was reportedly found inside a vehicle in front of 8[redacted] Kuhua Street. He and Ediomede Castillo were presumably evacuating from their home at 3[redacted] Keone Street in their car, headed south on Kuhua Street toward Lahainaluna Road. They appear to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one other vehicle. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Marilou Dias was 60 years old and was reportedly found inside her home at 14[redacted] Komohana Place. It is presumed that she did not, or was not able, to evacuate. The fire was reported by the MPD to be in this area after 21:30.

Virginia Dofa was 90 years old and was reportedly found inside her home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that she did not, or was not able, to evacuate.[193] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch note said, “Hale Mahaolu fully engulfed.”

Bette Jo Dyckman was 73 years old and was reportedly found inside her vehicle in front of 8[redacted] Kuhua Street with Robert Dyckman. Together, they presumably evacuated from 9[redacted] Puiki Place in their pickup truck. They may have made their way south and west (makai) to Kuhua Street. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Robert Dyckman was 74 years old and was reportedly found inside his vehicle in front of 8[redacted] Kuhua Street with Bette Jo Dyckman. Together, they presumably evacuated from 9[redacted] Puiki Place in their pickup truck. They may have made their way south and west (makai) to Kuhua Street. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Jeanne Eliason was 57 years old and was reportedly found inside a home at 5[redacted] Ka‘akolu Place. She lived close to where the fire began on Ka‘akolu Place. It is unknown if she evacuated to this location. At 19:38, the MPD reported the fire jumped Shaw Street and was entering this neighborhood.

Keyiro Fuentes was 14 years old and was reportedly found in his bedroom at 8[redacted] Ka‘akepa Street. According to his family, Keyiro was home alone. The fire progressed quickly from where it first ignited (14:55) to this location at approximately 15:37, where the MFD reported homes on fire in this area. This was 16 minutes after the fire jumped the Lahaina Bypass. A resident video at 16:32 shows homes on this street on fire.[194]

Alfredo Galinato was 79 years old and was reportedly found adjacent to 1[redacted] Komo Mai Street. It appears he evacuated his home on Kopili Street on foot to Komo Mai Street. At 16:07, the MPD reported the flames reaching Komo Mai Street.[195 196]

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Douglas Gloege was 59 years old and was reportedly found outside behind a Subway restaurant. He presumably evacuated with partner Rebecca Rans on foot from 3[redacted] Paeohi Street and made it to the area of 9[redacted] Honoapiʻilani Highway (Subway Restaurant).[197] [198] At 16:22, a 911 caller advised the fire was right behind the Subway.

Donna Gomes was 71 years old and was reportedly found in or near her home at 3[redacted] Lahainaluna Road with Coleen Jones.[199] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:08, the MFD was working to extinguish homes reported to be on fire in this area.

Michael Gordon was 68 years old and was reportedly found inside his home at 6[redacted] Waineʻe Street. It is presumed that he did not, or was not able, to evacuate. At 18:00, a civilian video shows fire moving through this area.

George Hall III was 67 years old and was reportedly found in or near a McDonalds. He lived across the street at 8[redacted] Waineʻe Street. At 17:44, the post office up the street from the McDonalds was reported to be on fire.

Carole Hartley was 60 years old and was reportedly found outside her home at 3[redacted] Hauola Place. She was seemingly unable to escape.[200] At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road, which is just south of this location.

Claudette Heermance was 68 years old and reportedly died on March 28, 2024, following 119 days of hospice care. She apparently left her senior housing complex on Waineʻe street on her mobility scooter and headed to Front Street. She was badly burned when she was found by paramedics.[201]

Roxanne Ibara-Hinao was 68 years old and was reportedly found inside her home at 10[redacted] Waineʻe Street. It is presumed that she did not, or was not able, to evacuate. At 16:44, the MPD reported buildings on fire in this area.

Rafael Imperial was 63 years old and was reportedly found in the area of 9[redacted] Kuhua Street near where he presumably lived at 8[redacted] Kopili Street. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Buddy Jantoc was 78 years old and was reportedly found in his home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that he did not, or was not able, to evacuate.[202] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch note said, “Hale Mahaolu fully engulfed.”

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Coleen Jones was 59 years old and was reportedly found in or near her home at 3[redacted] Lahainaluna Road with Donna Gomes. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:08, the MFD was working to extinguish homes reported to be on fire in this area.

Morris Kaita was 74 years old and was reportedly found inside his home at 2[redacted] Panaewa Street. It is presumed that he did not, or was not able, to evacuate. At 16:14, the MPD advised there was fire in the median and they could no longer safely stay in this location.

Richard Kam was 88 years old and was reportedly found in the area of 5[redacted] Lahainaluna Road. This is the area where the first homes caught fire at approximately 15:28.

Mark Kaminsky was 59 years old and was reportedly found across the street from his presumed home in the area of the Sly Mongoose Bar/Restaurant. There were reports of fire in this area beginning 16:22 through 16:53.

Paul Kasprzycki was 76 years old and was reportedly found in the rubble of a large furniture store on Limahana Place. It was reported that he ditched his bike and sought shelter in this building.[203] [204] There were reports of fire in this area beginning 16:22 through 16:53.

Valerie Kauffman was 78 years old and was reportedly found in her apartment complex at 10[redacted] Wainee Street, outside of a building. At 16:44, the MPD reported buildings on fire in this area.

Albert Kitaguchi was 62 years old and was reportedly found inside his home at 1[redacted] Wahikuli Road. It is presumed that he did not, or was not able, to evacuate. At 22:25, the MPD reported a fire in this area.

Joseph Lara was 86 years old and was reportedly found outside of his purple 2003 Ford Ranger pickup truck at the Outlets of Maui parking structure. He apparently lived at 7[redacted] Paunau Street and could have been trying to go north on Front Street before he was stuck in the traffic.[205] [206] There were a few reports of fire reaching this area between 16:59 and 17:44.

Poomaikai Losano was 28 years old and was reportedly found inside 8[redacted] Kale Street. He was reported to live on Hauola Place, which intersects Kale Street.[207] Spot fires were reported in this area at 15:40 and houses were reported on fire at approximately 16:25.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Bibiana Lutrania was 58 years old and was reportedly found inside a burned vehicle with her 82-year-old stepmother, Revelina Baybayan Tomboc, in the same area as a car accident at 8[redacted] Kuhua Street. They presumably traveled from their home on Mela Street via Kopili Street and Aki Street. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Rogelio Mabalot was 68 years old and was reportedly found outside in a field behind 1[redacted] Prison Street, very far from his known home address of 9[redacted] N Laalo Place.[208] A civilian video shows fire progressing through this area at 16:00.

Michael Mahnensmith was 80 years old and was reportedly found outside his home at 2[redacted] Wili Ko Place. There were reports of fire in this area beginning 16:22 through 16:53.

Lynn Manibog was 74 years old and was reportedly found outside in the area of Lahainaluna Road and Kuhua Street, just west (makai) of Glenn Yoshino. She presumably evacuated from 3[redacted] Pauwala Place with Glenn Yoshino. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57.

Douglas Matsuda-Boucher was 65 years old and was reportedly found outside his home at 6[redacted] Luakini Street. It is presumed that he did not, or was not able, to evacuate. A civilian video shows fire progressing through this area at 16:00.

John Joseph McCarthy III was 74 years old and was reportedly found inside his home at 2[redacted] Dickenson Street. It is presumed that he did not, or was not able, to evacuate. At 16:36, the MPD advised that this area was fully engulfed in fire.

Michael Misaka was 61 years old and was reportedly found in the doorway of 9[redacted] Kuhua Street, a block from his known home at 9[redacted] Puiki Place. (It was reported that he was recovered close to Leticia Constantino, Allen Constantino, and Rafael Imperial). The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Antonia Molina was 63 years old and was reportedly found inside her home at 7[redacted] Pauoa Street. It is presumed that she did not, or was not able, to evacuate.[209] At 16:08, the MFD was fighting structures on fire in this area.

Michael Morinho was 61 years old and was reportedly found inside his home at 3[redacted] Hauola Place. It is presumed that he did not, or was not able, to evacuate. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road, which is just south of this location.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Tim Nakamoto was 69 years old and was reportedly found inside his home at 8[redacted] Kaili Place. It is presumed that he did not, or was not able, to evacuate. At 16:25, houses were reported to be on fire in this area.

Todd Nakamura was 61 years old and was reportedly found in the driveway of 8[redacted] Kopili Street. He presumably evacuated from 4[redacted] Aki Street in his vehicle, which was found at Paeohi Street and Mela Street. At some point, he apparently left his vehicle and fled west (makai) to Kopili Street. At 16:25, homes were reported to be on fire in this area.

David Nuesca Jr. was 59 years old and was reportedly found inside his home at 1[redacted] Malolo Place. It is presumed that he did not, or was not able, to evacuate.[210] At 22:09, a civilian video captured fire progressing through this area.

Carolyn Ono was 73 years old and was reportedly found outside 7[redacted] Paunau Street. She presumably evacuated from 4[redacted] Pāʻūʻū Place. At 16:08, the MFD was fighting structures on fire in this area.

Matsuyuki Osato was 83 years old and was reportedly found inside his home at 8[redacted] Kuhua Street. It is presumed that he did not, or was not able, to evacuate. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Pablo Pagdilao III was 75 years old and was reportedly found outside in the area of 9[redacted] Front Street. He presumably evacuated to Front Street, but he could not evacuate to safety.[211] There were a few reports of fire in this area between 16:59 and 17:44.

Tau Ponali was 66 years old and was reportedly recovered from outside of 1[redacted] Waineʻe Street. This is closer to the origin of the fire than her home at 6[redacted] Front Street. There were multiple reports of fire in this area between 16:36 and 16:53.

Bernard Portabes was 75 years old and was reportedly found outside near Kale Street and Lahainaluna Road. He apparently evacuated from 4[redacted] Hauola Street to the area of Kale Street and Lahainaluna Road, one (1) block west (makai) and one (1) block south. Fire was reported in this area at 15:56.

Gwendolyn Puou was 83 years old and was reportedly found outside, across from 8[redacted] Kuhua Street (there were several cars in this area, and outside 8[redacted] Kuhua Street, where several people were recovered.) She possibly evacuated from 8[redacted] Mela Street, west (makai) to Kopili Street, left on Aki Street, and west (makai) on Kuhua Street. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Felimon Quijano was 60 years old and was reportedly found with Glenda Yabes inside a home at 9[redacted] Kuhua Street. Joel Villegas (another relative) was also reportedly found in the vicinity. It is unknown what their relation to the house was, as they apparently lived together at 3[redacted] Hauola Place with other relatives. The MFD reported the fire was reaching this area around 16:25.

Junmark Quijano was 30 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street with Angelica Baclig, Adela Villegas, Justin Recolizado, Maria Victoria Recolizado, and Eugene Recolizado. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

Sharlene Rabang was 78 years old and reportedly succumbed to her injuries at an unnamed hospital on September 4, 2023. She presumably evacuated and traveled to a family member's home on O'ahu.[212]

Rebecca Rans was 57 years old and was reportedly found outside behind a Subway restaurant with Douglas Gloege. They apparently evacuated on foot from 3[redacted] Paeohi Street and made it to the area of 9[redacted] Honoapi'ilani Highway (Subway Restaurant).[213 214] At 16:22, a 911 caller advised the fire was right behind the Subway.

Alfred Rawlings was 84 years old and was reportedly found inside his home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that he did not, or was not able, to evacuate.[215] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch note said, "Hale Mahaolu fully engulfed."

Eugene Recolizado was 50 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street. Eugene, Maria Victoria, and Justin Recolizado apparently left home as a family and drove down Aki Street, turning right on Kuhua Street. At some point, they presumably left their car and went into 8[redacted] Kuhua Street (industrial building/ Quonset Hut) to seek shelter. They were apparently found alongside Junmark Quijano, Adela Villegas, and Angelica Baclig.[216] At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Justin Recolizado was 11 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street. Eugene, Maria Victoria, and Justin Recolizado left home as a family and drove down Aki Street, turning right on Kuhua Street. At some point, they presumably left their car and went into 8[redacted] Kuhua Street (industrial building/Quonset Hut) to seek shelter. They were apparently found alongside Junmark Quijano, Adela Villegas, and Angelica Baclig.[217] At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

Maria Victoria Recolizado was 51 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street. Eugene, Maria Victoria, and Justin Recolizado left home as a family and drove down Aki Street, turning right on Kuhua Street. At some point, they presumably left their car and went into 8[redacted] Kuhua Street (industrial building/Quonset Hut) to seek shelter. They were apparently found alongside Junmark Quijano, Adela Villegas, and Angelica Baclig.[218] At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

Dale Ann Ritcher was 66 years old and was reportedly found inside a vehicle in front of his presumed home at 8[redacted] Kuhua Street. Ritcher and Terri Thomas were presumably evacuating together with their dogs. They appear to have been involved in a car crash at this location. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Rodolfo Rocutan was 76 years old and was reportedly found outside, across from 3[redacted] Lahainaluna Road. He presumably evacuated from 4[redacted] Pāʻūʻū Place to Paunau Street, to the left on Lahainaluna Road. Fire was reported in this area at 15:56.

Lee Rogo was 76 years old and was reportedly found outside the Old Lahaina Courthouse Building (6[redacted] Wharf Street). Spot fires were reported in this area as early as 16:24 and structure fires were reported at 17:44.

Conchita Sagudang was 75 years old and was reportedly found near the intersection of Lahainaluna Road and Mill Street. She presumably evacuated with her son, Danilo Sanubang, and Laurie Allen. Each was apparently in their own vehicle. They reportedly drove toward Lahainaluna Road until a falling tree branch forced them to abandon their cars and climb into Allen's vehicle. Allen apparently couldn't find a way forward. Ms. Sagudang is believed to have run with Allen toward Mill Street. At 16:09, the MPD advised the fire was reaching Mill Street.[219] At 16:24, the MPD advised, "We might have one fatality. Homes rear of Mill Street," indicating fatal conditions at that area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Danilo Sagudang was 55 years old and was reportedly found outside at Kuhua Street and Lahainaluna Road against a fence and in front of a vehicle with Joseph Schilling. He presumably evacuated with his mother, Conchita Sagudang, and Laurie Allen. Each was apparently in their own vehicle. They reportedly drove toward Lahainaluna Road until a falling tree branch forced them to abandon their cars and climb into Allen's vehicle. Allen apparently couldn't find a way forward. Mr. Sagudang apparently made his way down Lahainaluna Road to Kuhua Street.[220] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57.

Edward Sato was 76 years old and was reportedly found outside with Melva May Benjamin on Puiki Place, just past Kamamalu Street. Sato and Benjamin presumably departed their home in their vehicle. They likely traveled east (mauka) on Aki Street and turned left on Puiki Place.[221] At 16:25, a house in the 300 block of Aki Street was reported on fire. At 16:58, a third party 911 caller advised a house was on fire on this street.

Joseph Schilling was 67 years old and was reportedly found outside at Kuhua Street and Lahainaluna Road against a fence and in front of a vehicle with Danilo Sagudang. He apparently lived at the Hale Mahaolu Eono independent-living apartment complex on Lahainaluna Road.[222] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57.

Anthony Simpson was 43 years old and was reportedly found inside, across the street from his apparent home at 9[redacted] Kuhua Street. He reportedly lived at the same address as Ediomede Castillo and Juan Deleon.[223] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

James Smith was 79 years old and was reportedly recovered from the seawall. He likely evacuated from his reported home at 7[redacted] Waine'e Street to the area of 9[redacted] Front Street. There were a few reports of fire in this area between 16:59 and 17:44.

Leslie Smith was 80 years old and was reportedly found inside her home at 3[redacted] Kamano Place. It is presumed that she did not, or was not able, to evacuate. There were reports of fire in this area at 20:46.

Jonathan Somaoang was 76 years old and was reportedly found outside behind 3[redacted] Lahainaluna Road. He likely evacuated from his apparent home at 7[redacted] Pupu Place. He may have then proceeded north on Pauoa Street and turned left on Lahainaluna Road. At 16:08, the MFD was working to extinguish homes reported to be on fire in this area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Floyd St. Clair was 75 years old and was reportedly found in his vehicle at the dead-end of Aki Street with Janet St. Clair. They presumably evacuated from their reported home at 9[redacted] Puiki Place, likely turning on Aki Street. In their attempt to evacuate, they reportedly drove toward the direction of the fire. At 16:25, homes were reported to be on fire in this area.

Janet St. Clair was 75 years old and was reportedly found in her vehicle at the dead-end of Aki Street with Floyd St. Clair. They presumably evacuated from their reported home at 9[redacted] Puiki Place, turning on Aki Street. In their attempt to evacuate they reportedly drove toward the direction of the fire. At 16:25, homes were reported to be on fire in this area.

Tony Takafua was seven (7) years old and was reportedly found outside a vehicle at Kuhua Street and Lahainaluna Road. Tony Takafua, Salote Tone, Fa‘aoso Tone, and Malui‘fonua Tone were likely evacuating from 9[redacted] Kuhua Street in their car headed south on Kuhua Street toward Lahainaluna Road. They appear to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one (1) other vehicle and possibly more.[224] [225] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Freeman Tam Lung was 80 years old and was reportedly found outside in the area of 9[redacted] Front Street. He presumably evacuated from 7[redacted] Luakini Street toward Front Street. There were a few reports of fire in this area between 16:59 and 17:44.

Terri Thomas was 62 years old and was reportedly found inside a vehicle in front of her home at 8[redacted] Kuhua Street with Dale Ann Richter. Thomas apparently lived with Dale Ann Richter and was presumably evacuating with their dogs. They appear to have been involved in a car crash at this location. The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Carlo Tobias was 54 years old and was reportedly found inside his home at 14[redacted] Kahoma Street. It is presumed that he did not, or was not able, to evacuate. At 21:46, the MPD reported structures on fire in this area.

Revelina Tomboc was 81 years old and was reportedly found inside a vehicle in the same area as the car accident, 8[redacted] Kuhua Street, along with her stepdaughter, Bibiana Lutrania. They reportedly traveled from their reported home on Mela Street via Kopili Street and Aki Street.[226] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

3.8.10 ANALYSIS OF SYSTEM COMPONENTS

Fa'aoso Tone was 70 years old and was reportedly found inside a vehicle at Kuhua Street and Lahainaluna Road. Fa'aoso Tone, Tony Takafua, Salote Tone, and Malui'fonua Tone were presumably evacuating from 9[redacted] Kuhua Street in their car headed south on Kuhua Street toward Lahainaluna Road. They appear to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one (1) other vehicle.[227 228] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Malui'fonua Tone was 73 years old and was reportedly found inside a vehicle at Kuhua Street and Lahainaluna Road. Malui'fonua Tone, Tony Takafua, Salote Tone, and Fa'aoso Tone were presumably evacuating from 9[redacted] Kuhua Street in their car headed south on Kuhua Street toward Lahainaluna Road. They appear to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one (1) other vehicle.[229 230] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Salote Tone was 39 years old and was reportedly found inside a vehicle at Kuhua Street and Lahainaluna Road. Salote Tone, Tony Takafua, Fa'aoso Tone, and Malui'fonua Tone were presumably evacuating from 9[redacted] Kuhua Street in their car headed south on Kuhua Street toward Lahainaluna Road. They appear to have been involved in a car crash in front of 8[redacted] Kuhua Street with at least one (1) other vehicle.[231 232] The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57. At 16:25, homes were reported to be on fire in this area.

Franklin Trejos was 68 years old and was reportedly found inside his vehicle in an open area east (mauka) of Mill Street and south of Lahainaluna Road with the remains of a friend's golden retriever. Trejos apparently tried to help others and save his home.[233 234] The fire was reported in this area at 16:13.

Nicholas Turbin was 71 years old and was reportedly found inside a home at 13[redacted] Kahoma Street. He had a reported address of 8[redacted] Puiki Place, which was in the middle of the area where fire was moving fast. It is unknown if he was at this address or evacuated to here. At 21:28, the MPD reported the fire to be in this area.

Linda Vaikeli was 69 years old and was reportedly found inside her home at 10[redacted] Waine'e Street. It is presumed that she did not, or was not able, to evacuate.[235] At 16:44, the MPD reported buildings on fire in this area.

Angelita Vasquez was 88 years old and was reportedly found inside her home at the Hale Mahaolu Eono independent-living apartment complex at 8[redacted] Kelawea Street. It is presumed that she did not, or was not able, to evacuate.[236] MPD officers worked to evacuate the complex, but were forced to fall back at 16:08. At 16:43, a dispatch note said, “Hale Mahaolu fully engulfed.”

Adela Villegas was 53 years old and was reportedly found inside an industrial building at 8[redacted] Kuhua Street with Angelica Baclig, Junmark Quijano, Justin Recolizado, Maria Victoria Recolizado, and Eugene Recolizado. Villegas reportedly lived with Angelica Baclig, Junmark Quijano, and Joel Villegas. At 15:57, a 911 caller advised the fire reached Kuhua Street and Lahainaluna Road. At 16:42, another 911 caller advised the fire was getting closer to Kuhua Street and Aki Street.

Joel Villegas was 55 years old and was reportedly found in the area of 9[redacted] Kuhua Street (far end of Kuhua Street approaching Komo Mai Street). Villegas reportedly lived with Angelica Baclig, Junmark Quijano, and Adela Villegas. The fire was reported to have reached this area around 16:25.

Leroy Wagner was 69 years old and was reportedly found inside his home at 7[redacted] Paunau Street. It is presumed that he did not, or was not able, to evacuate.[237] At 16:08, MFD was fighting structures on fire in this area.

Clyde Wakida was 74 years old and was reportedly found inside his home at 2[redacted] Puapihi Place. It was reported that he was trying to protect his home, and as such, did not evacuate.[238] Fire was reported in this area at 20:37.

Glenda Yabes was 48 years old and was reportedly found with Felimon Quijano inside a home at 9[redacted] Kuhua Street. Joel Villegas (another relative) was also apparently found in the vicinity. It is unknown what their relation to the house was, as they reportedly lived together at 3[redacted] Hauola Place with other relatives. It is unknown if they evacuated to this address. The fire was reported to have reached this area around 16:25.

Todd Yamafuji was 68 years old and was reportedly found inside a vehicle at the intersection Luakini and Waineʻe. He likely evacuated from his home at 6[redacted] Luakini Street and traveled south to the intersection of Waineʻe. A civilian video shows fire moving through this area around 17:52.

Glenn Yoshino was 75 years old and was reportedly found in the area of Lahainaluna Road and Kuhua Street, just east (mauka) of Lynn Manibog. He likely evacuated from 3[redacted] Pauwala Place (presumably with Lynn Manibog). The fire first reached the area of Kuhua Street and Lahainaluna Road at 15:57.

3.8.11 ANALYSIS OF SYSTEM COMPONENTS

3.8.11 Findings & Recommendations

71. **FINDING:** Unified coordination of evacuation procedures among the MPD, MFD, and other agencies may have facilitated more efficient egress of residents.	**RECOMMENDATION:** Create, review, and implement an interagency comprehensive evacuation plan based on risk and resources. Integrated emergency response plans involving local, state, and federal agencies, as well as non-governmental organizations, should be developed, with regular joint training exercises to ensure smooth coordination during actual emergencies. **RECOMMENDATION:** The MPD should regularly train for wildfire evacuations, familiarizing themselves with evacuation procedures and protocols. This training enhances response capabilities and ensures a swift and organized evacuation process when wildfires threaten communities.
72. **FINDING:** During the evacuations, there were lapses in coordination and communication that could have reduced efficiency.	**RECOMMENDATION:** Pre-plan evacuation routes. Effective evacuations during a wildfire, such as the Lahaina PM fire, require planning, coordination, and adherence to best practices. A key aspect is comprehensive pre-event planning, which involves identifying evacuation routes (including unnamed dirt roads), establishing communication protocols, and conducting drills to ensure readiness. **RECOMMENDATION:** Sufficient personnel are needed to manage traffic, provide assistance to evacuees, and maintain public safety. Adequate staffing levels enable timely and orderly evacuations, reducing the risk of congestion and confusion. **RECOMMENDATION:** Create and implement comprehensive traffic management plans that account for limited access and egress routes, including pre-planned alternate routes and strategies to manage congestion.

3.8.11 ANALYSIS OF SYSTEM COMPONENTS

3.8.11 Findings & Recommendations

72. FINDING (CONT.): During the evacuations, there were lapses in coordination and communication that could have reduced efficiency.	**RECOMMENDATION:** Ensuring gates blocking potential evacuation routes are equipped with standardized locks and that emergency responders have the necessary keys or access codes is also vital. **RECOMMENDATION:** Develop comprehensive support systems for residents who need to evacuate—especially those with access and functional needs—including temporary housing, transportation assistance, and access to essential services. By addressing these key areas, the Maui community can improve its preparedness for future wildfires and other emergencies, ensuring better protection of lives and property. **RECOMMENDATION:** Volunteer training programs, such as those for Community Emergency Response Teams (CERT), should be expanded to assist with evacuation efforts and provide support during emergencies. Additionally, specific evacuation plans for vulnerable populations, including the elderly, disabled, and those without transportation, should be created, with community support networks established to assist these individuals during evacuations. Engage community organizations and CERT teams to provide additional support in evacuation efforts.
73. FINDING: While some Body-Worn Cameras (BWC) were activated (in keeping with the current policy), several files provided by the County of Maui were unreadable.	**RECOMMENDATION:** Update the MPD's G.O. 304.12 policy to have BWCs activated upon dispatch and include a quality-control program to ensure all equipment is functioning properly and producing usable audio visual assets (Appendix Section 6.12.17). **RECOMMENDATION:** The MPD should follow G.O. 304.12 (Appendix Section 6.12.17).

3.8.11 ANALYSIS OF SYSTEM COMPONENTS

3.8.11 Findings & Recommendations

74. FINDING: MPD officers experienced difficulty hearing radio traffic due to the wind and noise from the fire.	**RECOMMENDATION:** Issuing radio earpieces to all officers will enhance communication, allowing them to stay informed and coordinate effectively during incidents. Officers should receive training on the proper use and maintenance of these earpieces to maximize their benefits.
75. FINDING: The alert systems in place did not adequately inform residents of inherent dangers.	**RECOMMENDATION:** Developing and implementing multiple alert systems, including sirens, radio broadcasts, and door-to-door notifications, can ensure that evacuation orders reach all residents, especially when cell service and electrical power are lost. **RECOMMENDATION:** Expand community engagement and preparedness efforts with public awareness campaigns that emphasize the importance of evacuation and the risks of staying behind during wildfires, encouraging residents to have a personal evacuation plan that includes considerations for pets and family members with special needs. **RECOMMENDATION:** Educate the public about evacuation procedures and safe routes, and the importance of establishing family evacuation plans and having prepared “go-bags.” Regular drills and informational sessions can reinforce this knowledge, while localized communication networks, such as neighborhood watch groups or community liaisons, can assist in disseminating information.

3.8.11 ANALYSIS OF SYSTEM COMPONENTS

3.8.11 Findings & Recommendations

76. FINDING: MPD officers encountered barriers to roads that could have been (and eventually were) used as alternate egress routes and lacked equipment to navigate these barriers.	**RECOMMENDATION:** Perform annual status checks of emergency gates throughout the community. **RECOMMENDATION:** Equip police vehicles with disaster response kits, including appropriate PPE, to be able to facilitate evacuations and remove barriers from potential escape exits, such as chain link fences, gates, and boulders. **RECOMMENDATION:** The MFD to establish new policy/General Order for the provision of fire- and disaster-related emergency tools for patrol, such as bolt cutters, tow straps, etc.

4.0 Fire Impact on the Built Environment

The Lahaina PM fire's rapid spread to residential, commercial, and industrial structures ultimately caused it to become an urban conflagration. The speed of the fire's progression was influenced by various factors, including winds and receptive fuels (vegetative and structural). The Red Flag Weather, especially the hurricane force winds blowing downslope into a densely developed Lahainaluna subdivision, quickly accelerated the fire's progression to the coastline.

This section explains the impact the built environment, vegetation, and the fire suppression efforts of firefighters and residents had on the fire's progression, and connects this experience to codes, standards, guidelines, and national best practices.

Mitigating risk in the built environment—the human-made surroundings that provide the setting for human activity—is crucial for fire management and the Cohesive Strategy.

Ignition-resistant structures and communities can help mitigate fire risk and decrease demands on emergency firefighting response, protecting homes and reducing overall impact by slowing fire progression and creating buffer zones. Coordinated efforts are required among homeowners, developers, local governments, land managers, planning departments, and emergency services.

Emphasis should be placed on best practices like enforcing defensible space (an area around a building in which vegetation, debris, and other types of combustible fuels have been treated, cleared, or reduced to slow the spread of fire to and from the building) and using fire-resistant building materials.

In resilient landscapes, integrating land-use planning, natural resource management, and community design helps reduce fire spread between wildlands and developed areas.

For fire-adapted communities, ignition-resistant structures and robust defensible space strategies enhance safety against rapid fire advancement by helping control fire spread and protecting properties. Improving wildfire response capabilities involves lowering fire intensity and ensuring accessibility for firefighters. This approach also safeguards critical infrastructure, ensuring continuous operation during wildfires and supporting broader landscape management efforts.

4.1 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.1 Lahaina Built Environment

Lahaina's built environment has a number of characteristics that likely contributed to the devastation caused by the fires that occurred on August 8-9, 2023.

When all three (3) ignition mechanisms (ember attack, direct flame contact, and radiant heat) act in unison in a built-environment conflagration, any weak point in the building envelope (the physical barrier that separates the interior and exterior of a building) makes the entire structure, and surrounding ones, vulnerable to fire spread.

In the following sections, we will explore how a variety of factors within the built environment of Lahaina, including building construction, structure separation, building coverage, and adjacent vegetation, played interconnected roles in the devastation of the August 2023 fires.

4.1.1 Building Construction

As reported in the Phase One report, both Lahaina's residential and commercial regions are densely packed areas with narrow streets. Many of the structures in Lahaina were constructed in the 1960s and 1970s, or earlier.

Several of the resident structures in the north and south (particularly those built in the 1980s and before) had at least some masonry components. Wood construction was used in roofs and other portions of the structures, but there were a fair number of block walls still standing in the older residential areas.

While many homes in Lahaina had some type of wildfire-resistant components included in their construction, such as Class A roofs and/or noncombustible wall material, the majority of housing stock in Lahaina was constructed, at least partially, using older materials and architectural designs that may have contributed to the fire's spread. For example, older buildings, especially those constructed prior to the common use of central air conditioning systems, were designed for cooling and ventilation by easy airflow, which make such structures particularly vulnerable to ember, or even direct flame, entry. These design features include louvered windows and open eaves.

Local codes[239] require newer construction to have high-wind protection elements, which might have helped decrease the fire's spread caused by the gale-force winds that preceded the fire. However, there is no evidence the structures in the Lahaina area were constructed explicitly with wildfire prevention in mind.

Other factors also contributed to the fire's devastation, such as surrounding vegetation; population, vehicle, and building density; and building exposure. For example, the areas surrounding the built environment are covered with highly flammable invasive grasses.[240]

Based on real estate and appraisal data the housing stock before the fire in Lahaina was approximately 80% single-family residential construction and multi-family housing units, such as duplexes, low-rise condominiums, and multi-structure apartment complexes. The dominant era of construction for this housing stock was the 1960s to the 1980s, although some newer residential structures of all types were built using current building codes. Commercial construction included retail primarily in the downtown area along Front Street, the Lahaina Business Plaza off Kupuohi Street, shopping centers at Keawe Street and Hwy-30, and a few other areas in central Lahaina.

4.1 FIRE IMPACT ON THE BUILT ENVIRONMENT

Foundations consisted of a mixture of raised and slab. Homes were elevated to reduce the intrusion of water and facilitate natural ventilation. In some cases, this under-building area was used for storage with minimal skirting.

Wall construction included concrete masonry unit (CMU) block walls, wood panel siding, concrete fiber board, stucco, and, less commonly, vinyl or aluminum siding.

Most of the roofing was composed of common asphalt shingles, although a number of structures throughout Lahaina had roofs constructed using tile, metal, and wood shake.

4.1.2 Building and Fire Codes

Building codes regulated the construction and materials of buildings relevant for resistance to exterior fire hazards. See Section 3.4.1 for more information on codes and standards at the time of the fire.

At the time of the fire, the County of Maui's fire code addressed exterior vegetation determined to pose a fire hazard. This code language requires the removal of flammable vegetation within 30 feet of buildings or structures.[241] See Section 3.3.8 for more information on policy changes relating to vegetation management.

4.1.3 Structure Separation

Structure separation distance is the distance between two structures, either on the same parcel or between parcels. Setbacks are the distances between structures and property lines. Aerial imagery can be used to measure the distance between roof lines of structures (Figure 4.1.3.1).

Figure 4.1.3.1 Example of distance measurement capabilities with aerial imagery and potential reference point for set back and separation distances.

For structures with eaves, which is typical for structures in Lahaina, the separation distance between roof lines is less than the separation distance between exterior walls. The separation distances reported in this analysis are conservatively low (underestimates) of the true separation distance.

Residential structures in Lahaina were separated by as little as six (6) feet, and in many cases, the distance between primary and accessory structures was even less. This continuity of fuel contributed to the easy spread of fire throughout Lahaina.

See Section 3.4.1 for more information on planning, codes, and standards.

4.1.4 Building Density

According to the 2020 Decennial Census, the number of housing units for the Lahaina Census County Division (CCD) is 12,410,[242] with approximately 4,180 housing units in Lahaina.[243] See Section 3.4.1.2 for more information related to building density.

4.1.5 Vegetation Adjacent to the Built Environment

Following the abandonment of sugar plantations on Maui in the 1950s, several invasive grass species spread rapidly, including plants native to Africa, such as guinea grass, buffelgrass, and molasses grass, which are particularly fire-prone.[244] About a quarter of Maui's landscape is dominated by non-native grasses,[245] which surround many of the built environments within the county.

4.1.6 Wildfire Risk

The USDA Forest Service, under the direction of Congress, developed "Wildfire Risk to Communities,"[246] a free, easy-to-use website with interactive maps, charts, and resources to help communities understand, explore, and reduce wildfire risk. It was created to help community leaders, such as elected officials, community planners, and fire managers. The tool is built from a variety of nationally consistent data, including vegetation and fire-behavior fuel models, topography, recent weather patterns, and long-term simulations of large wildfire behavior.

The current "Wildfire Risk to Communities" tool classifies Lahaina as having a very high wildfire risk—greater than 98% of all communities in the U.S.[247] The risk to homes on the landscape in Lahaina is very high, which represents the potential consequence of fire to residential structures. This considers wildfire likelihood and intensity, which represent hazard, and a generalized susceptibility for all homes. The classification assumes all homes that encounter wildfire will be damaged, and the degree of damage is directly related to wildfire intensity.

Risk-reduction zones are based on wildfire likelihood, flammable vegetation, and populated areas. The four zones are: wildfire transition, direct exposure, indirect exposure, and minimal exposure.

Wildfire transition zones are areas where flammable vegetation may expose homes to wildfire. Direct exposure zone hazards include adjacent flammable vegetation, embers, and nearby structures. Indirect exposure zone hazards include embers and building-to-building ignition. Minimal exposure zones are not likely to be subjected to wildfire. Based on currently available data, the majority (86%) of buildings in Lahaina are in the indirect exposure zone and 13% are in the direct exposure zone, while only 1% are considered to be in the minimal exposure zone.

192

4.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.2 Built Environment Analysis Methodology

FSRI utilized maps developed by the Pacific Disaster Center (PDC) and FEMA, in conjunction with an evaluation of damage assessment data compared against pre- and post-fire imagery, to create an accurate map reflecting the actual structural damage caused by the Lahaina PM fire.

Post-fire imagery includes those presented in the Phase One report and other open sources (e.g., EagleView), as well as ground- and air-based images captured during FSRI's field work, which was primarily collected between August 24-September 4, 2023.

Pre-fire imagery was used to understand the condition of adjacent vegetation and the built environment. Because some of this imagery was taken up to two (2) years prior to the fire, it only provides an estimate for potential conditions at the time of the fire.

A team from the University of Hawaiʻi, National Disaster Preparedness Training Center used a 360-degree panoramic camera to collect street view imagery of Lahaina.[248] They developed a tool that matches pre-fire Google Street View imagery with the post-fire imagery collected in October 2023 (Figure 4.2.1).

Figure 4.2.1 Screen capture of University of Hawaiʻi, National Disaster Preparedness Training Center tool. Map on the left shows the exact location, the lower right image is before the fire and the upper right image is after the fire.[249]

4.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

FSRI personnel surveyed the incident area and captured video and photographic evidence depicting fire spread and damage in the built environment. This field work was primarily conducted after rescue and recovery efforts were underway/completed that necessitated altering the scene—a known limitation of the analysis presented here. The burned area of Lahaina has been divided into three (3) distinct zones—Central, South, and North—reflecting the general direction of fire's progression.

Within each zone, areas consisting of structures that suffered the full spectrum of damage, from total loss to undamaged, were identified. Each of these areas were then analyzed by referencing data on the fire's progression, using both the Phase One report and pre- and post-fire imagery to pinpoint the key factors that contributed to the fire's movement.

Data collection efforts were particularly focused on the structures that survived immediately adjacent to those that were destroyed in order to understand factors that may have contributed to structure survivability in this urban conflagration.

It should be noted that priority actions taken immediately post-fire were search and rescue and recovery, which required the alteration of factors relevant for the analysis conducted in this work (e.g., clearing roadway of vehicles, demolishing unsafe structures, etc.). Additionally, the incident area was not secure from residents who may have re-entered after evacuating. The analysis presented here is based on the best-available data and information.

This work is not an origin-and-cause investigation, which is in the purview of the County of Maui aided by the ATF. The analysis presented here focuses on fire progression in the built environment, including spread from vegetation to built environment fuels and between built environment fuels.

4.2.1 Structure Damage Classification Map

Shortly after the fire, multiple groups provided maps of impacted and damaged structures. PDC and FEMA released fire damage assessment maps early in the morning on August 10, 2023, which showed the estimated fire perimeter and structure status (destroyed, heavy damage, light damage, and undamaged).[250] The most recent PDC map is dated August 23, 2023 (Phase One report, Figure 4.1.3).

The New York Times published a map on August 12, 2023, (four days after the fire) based on the analysis of satellite images by Planet Lab that indicated structures visibly damaged or destroyed.[251] Subsequently, several research groups have attempted to use artificial intelligence (AI) to analyze satellite and other remote sensing data to determine structure damage.[252]

FEMA conducted a Geospatial Damage Assessment by reviewing pre- and post- incident imagery, assigning damage classifications (No Visible Damage, Affected, Major, Minor, and Destroyed) to each structure in the imagery. There is specific description for flood damage and general guidance for non-flood damage, including fire.

This dataset is generally more robust than others that solely use remote sensing data and computer vision. A limitation of this dataset is that it uses point locations for structures instead of structure shapes, which better convey the spatial size and distribution of structure damage.

4.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

As a result, FSRI conducted an independent review of the available structure damage datasets and determined there were discrepancies between the assigned damage classification and evidence collected in Phase One, including ground-based, post-fire imagery and technical discussions with citizens and emergency responders.

To establish an updated record of structure damage, FSRI built a map starting with the Building Footprint shapes found online at the REST service,[253] dated October 2022. Although the complete origination information of the REST service shapes is not known, the polygons offer a more detailed and accurate representation than OpenStreetMap structures (the other potential source) and have been reviewed and coded by FSRI.

Figure 4.2.1.1 is the structure damage assessment based on data available and current understanding that combines information gleaned from previously published datasets with ground truth from Phase One evidence.

For this analysis four (4) damage classifications were used: Destroyed, Wind Damage, Fire Damaged, and No Visible Damage; the three (3) classifications for damage magnitude used in FEMA classifications (Major, Minor, and Affected) were combined to focus classification on the source of the damage (Fire or Wind Damaged).

The current damage classification dataset was used to produce a map with color-coded structures based on the damage classification. This visual depiction of the spatial structure damage data allows for the identification of transition from “destroyed” to “damaged” to “no visual damage”—these locations warrant additional review and analysis included in this report.

“Destroyed” indicates the structure is a total loss or damaged to such an extent that repair is not feasible. “Wind damage” indicates the structure sustained damage from wind, but there was no visible evidence of fire damage. Examples of wind damage include missing roof covering and broken windows with no visible evidence of thermal exposure.

“Fire Damaged” indicates a structure that sustained fire damage, but was not destroyed. For instance, when a structure sustained both wind and fire damage, it was classified as “ Fire Damaged.”

Structures with no visible damage were classified as such.

Further analysis will be conducted in Phase Three of this work.

Table 4.2.1.1 Comparison between FEMA and FSRI structure damage datasets.

	FEMA GSDA	FSRI
Total # Structures	**2807**	**3335**
Destroyed	**1791**	**2117**
Damaged	**283**	**431**
No Visible Damage	**733**	**787**

4.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

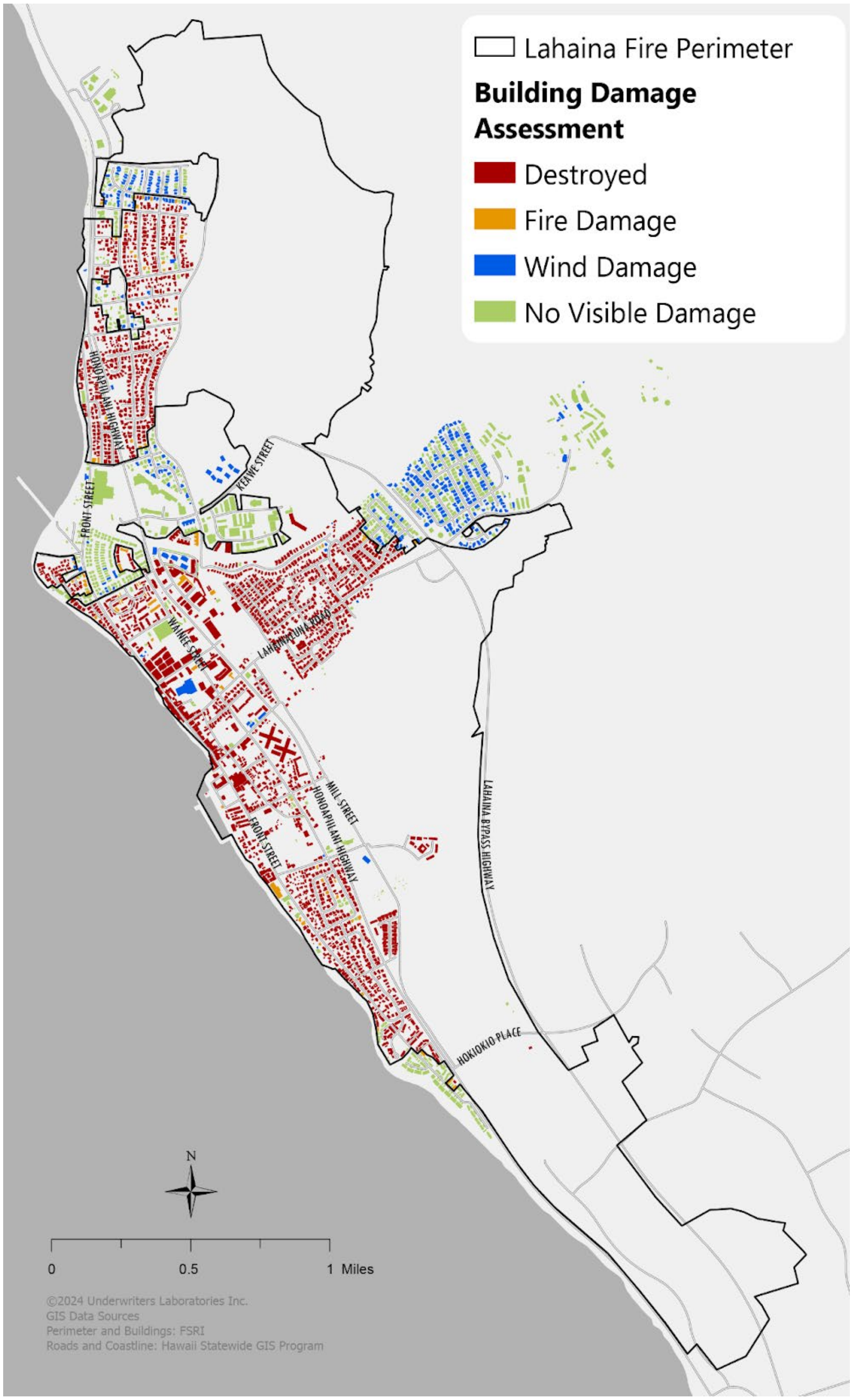


Figure 4.2.1.1 Structure damage assessment map of Lahaina as a result of the August 8-9, 2023 fire.

4.2.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.2.2 Vehicles

Vehicles are an often overlooked, yet meaningful contributor, to the fuel load in the built environment. The expected number of vehicles and their impact on parking and evacuation were previously discussed in the context of Infrastructure (Section 3.4).

FSRI conducted a visual survey using post-fire aerial imagery captured August 11-13, 2023, to create a dataset of vehicle locations and damage classification (Figure 4.2.2.1). It is evident from the imagery (and as reported) that vehicles, both destroyed and undestroyed, were moved at some point during or after the incident.

Despite this limitation, the dataset provides insight on the contribution of vehicles to the fuel load in the built environment. A more detailed ground-based assessment of each vehicle's condition was also conducted by insurance investigators.

The data collected with this effort includes make, model, year, location/direction, and damage imagery. As per Table 6.4.1 (Subpoena No. 2024-046), FSRI has requested this information, but has not yet received it. This information can be useful in further analyzing vehicle impact on fire progression.

4.2.3 Roadways

Roads and streets were discussed previously in the Infrastructure and Evacuations sections. In the context of fire progression, roads may be considered a fuel break. Asphalt, concrete, gravel, and dirt roads can serve as fuel breaks to help stop the spread of wildfire. However in Lahaina, the number of vehicles and narrow road widths did not create sufficient discontinuity in fuel to hinder the wind-driven fire spread.

4.2.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

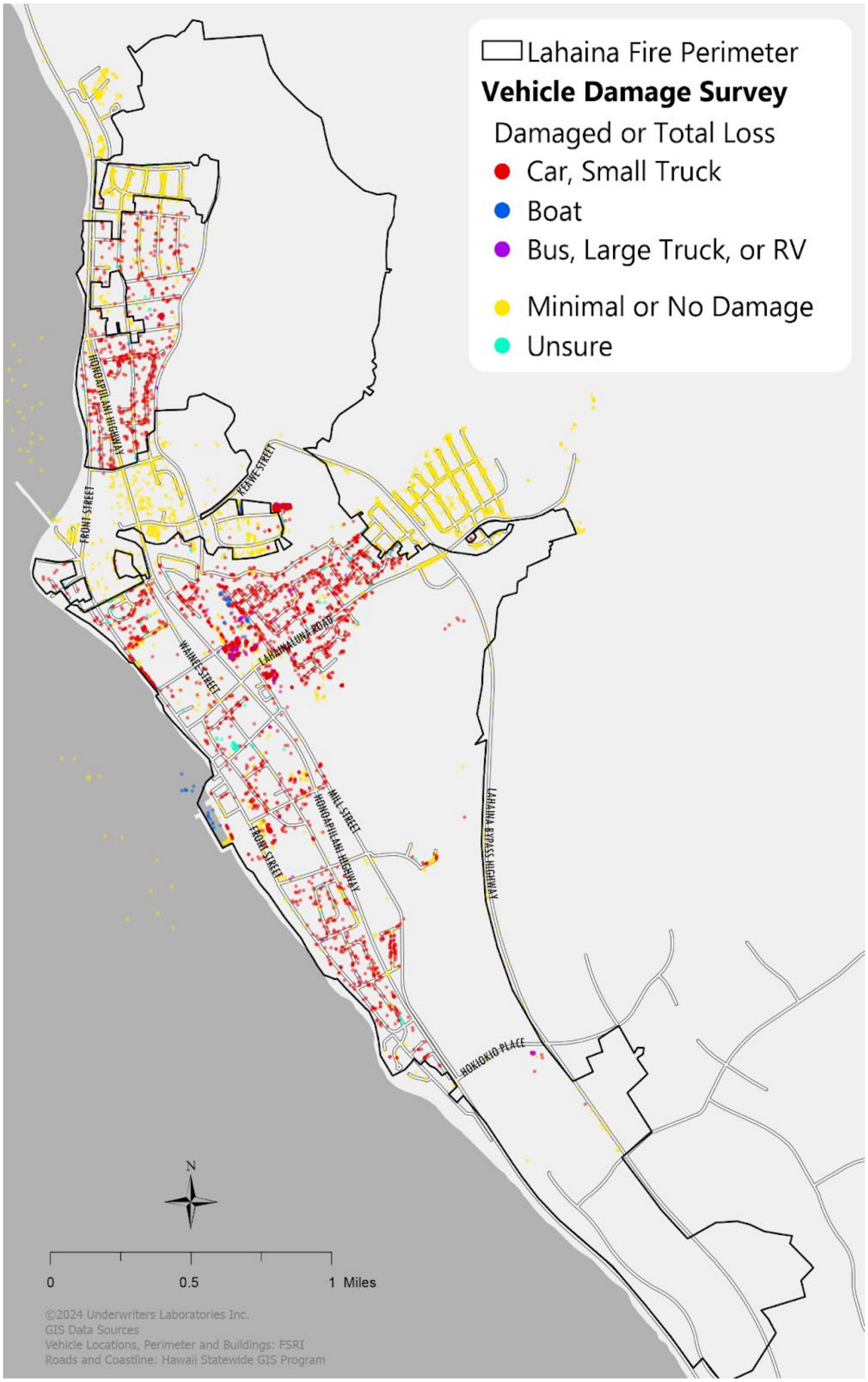


Figure 4.2.2.1 Overview of incident area with location of vehicles identified in aerial imagery captured August 11-13, 2023.

4.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3 Fire Spread in the Built Environment

4.3.1 Structure Damage and Fire Spread Analysis

Unlike other natural disasters, damage from wildfires is typically binary (e.g., a structure is either completely destroyed or there is no visible damage with relatively few instances of partial damage). Where a structure, or a group of structures, falls within this damage classification, evidence may be available to reveal the impact of defensive actions taken by citizens and/or emergency responders,[254] changes in fire behavior (e.g., wind shift), and/or structural features (e.g., design, materials, construction).[255]

Destroyed structures are most often void of combustibles (which burned) that can serve as physical evidence. The transition from “destroyed” to “undestroyed” indicates a change in fire behavior (exposure) and/or wildfire-resistance (hardening) of structures.

In the built environment, fire spread needs to be considered at the structure, parcel, and community scale.[256] In the simplest terms, fire spreads from fuel package (source) to fuel package (target), by radiant heat, flame contact, and/or embers.

In the built environment anything combustible is potential fuel, including fences, vehicles, household belongings, vegetation, and structures. The distance over which the different mechanisms (radiant heat, direct flame contact, and embers) will impact fire spread depends on several factors, including the material and amount of fuel burning, wind strength and direction, and susceptibility of adjacent fuels to ignition. Fuel continuity can span across jurisdictional and property boundaries, making mitigation and hazard reduction a community effort. The fire spread analysis reported here focuses on plausible, evidence-based explanations for how the Lahaina PM fire spread from grassland to structures and between structures. Where evident, defensive actions (both civilian and emergency responder) are considered.

Evidence described in the Phase One report corroborates a predominantly easterly (mauka) wind impacting the fire during August 8, 2023, with damage patterns and radio traffic indicating strong winds. Notable, distinct shifts in wind direction were also identified on several occasions.

With this analysis, we attempted to address the following questions:

1. **Prior to the fire, what types of fuels (structures and vegetation) existed? Specifically, what construction types, occupancy class, and common building materials and/or features used contributed to embers entering the structure and starting a fire.**
2. **Did the high winds cause structural damage thus contributing to fire spread?**
3. **From what direction did the fire enter the area? What did it impact first, and how did it spread from there?**
4. **What role did structure to structure spacing play in fire spread? What role did vegetation near structures play in fire spread?**
5. **How did the fire spread through structures differ from when it burned in the vegetation on the north and south?**
6. **What role did resident firefighting and MFD and MPD fire suppression have on structures surviving, or at least sustaining less damage?**
7. **What role did the fire have on victim survivability?**
8. **What form of heat transfer was in play to enhance fire spread?**

4.3.2 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.2 Central, South, and North Zones

The area within the burn perimeter was divided into three (3) zones—Central, South, and North—for the purpose of this analysis (Figure 4.3.2.1). These divisions mark the general fire spread direction.

The fire started in the east end (mauka) of the Central zone and burned west (makai) to the coastline. As the fire's flanks widened, it progressed first to the south and then to the north.

The map in Figure 4.3.2.1 shows the boundaries of each zone and the parcels within these areas. Specific structures or clusters of structures within these areas were selected for analysis because they contain a transition in damage classification. Post-fire analysis of completely destroyed structures often provides limited insights on the fire behavior and factors that impacted it. These areas offer evidence of fire behavior (what burned) and other factors that may have contributed to the transition (e.g., defensive actions).

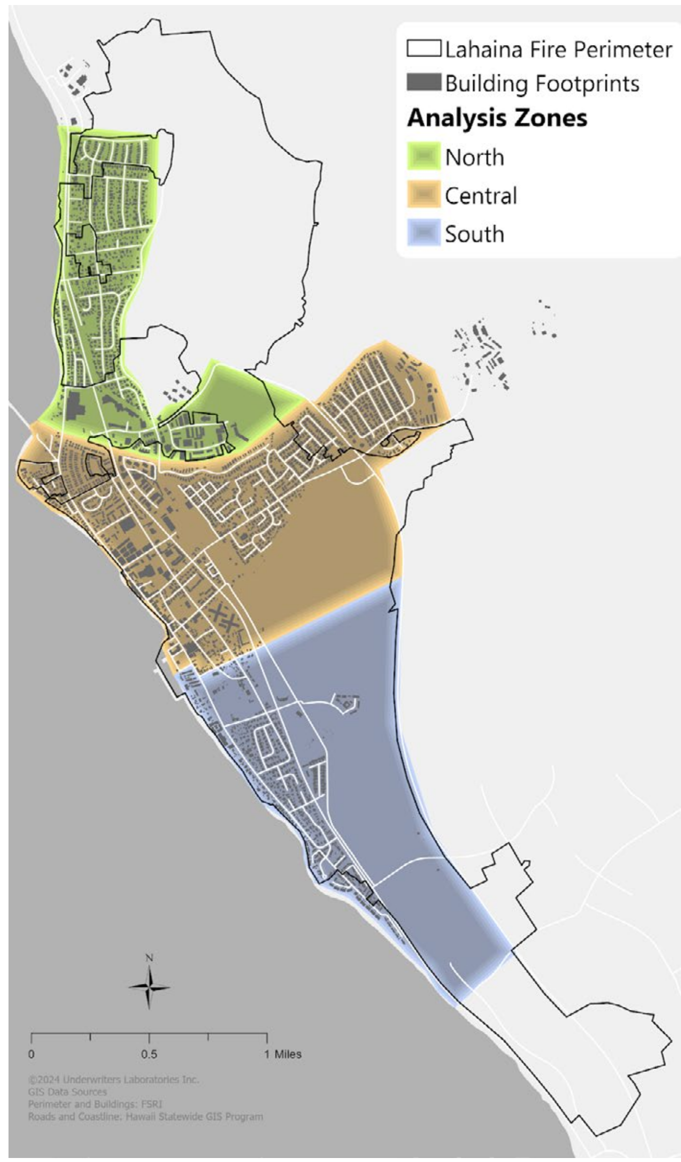


Figure 4.3.2.1 Overview map of Lahaina depicting North, Central, and South zones.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.3 Central Zone

The Central zone is the incident area south of Kahoma Stream and north of Canal Street and Prison Street (Figure 4.3.2.1).

Within the Central zone, six (6) areas of interest were identified for analysis:

- Kuhua Street and Paunau Street (near Lahainaluna Road)
- Kelawea Mauka III subdivision east (mauka) of Lahaina Bypass
- Kahoma Subdivision
- Opukea Apartments
- Kahoma Village
- West (makai) of Front Street between Ala Moana Street and Kamaka Circle

4.3.3.1 Kuhua Street and Paunau Street (near Lahainaluna Road)

The Kuhua Street and Paunau Street area is predominantly residential and located at the western end (makai) of the Kelawea Mauka III subdivision (Figure 4.3.3.1.1). This area suffered a high concentration of civilian fire deaths during the Lahaina PM fire. It was also where MFD units E1 and E6, and their crews, were burned over.

Figure 4.3.3.1.1 Pre-fire aerial imagery of Kuhua Street in the Kelawea Community taken August 26, 2021. The area this section is focused on is approximately 45 acres.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

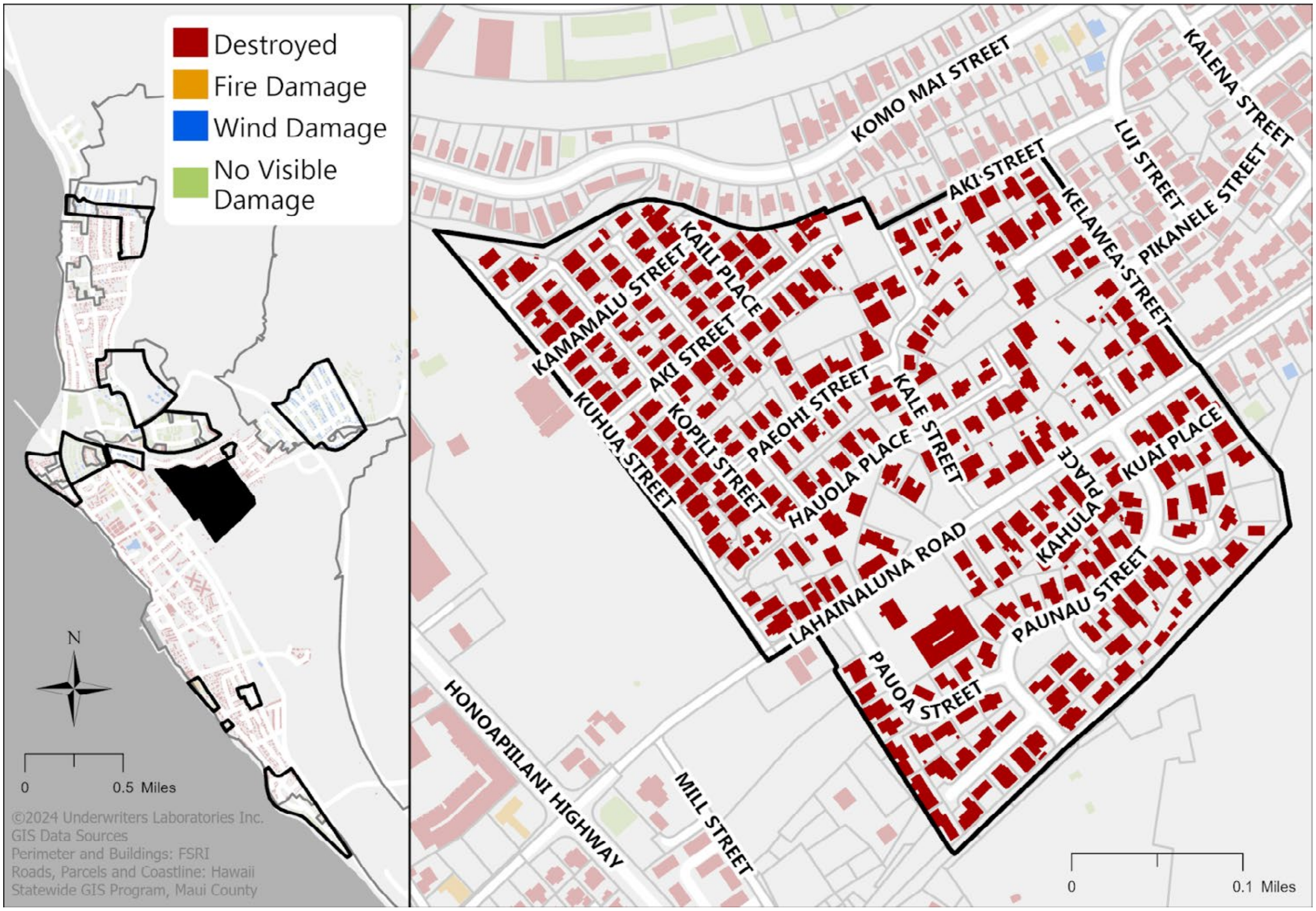


Figure 4.3.3.1.2 Damage classification assessment map of Kelawea Community analysis area.

The neighborhood is bound on the west (makai) by a large industrial area that had once been the Pioneer Sugar Mill, and was originally constructed as employee housing for the mill. All of the structures in this area were destroyed (Figure 4.3.3.1.2).

The area is made up of a very high density of houses, auxiliary structures, sheds, cars, shrubs, grasses, and other items stored on residents' properties (see Section 3.4.1.2). Some structures were so densely located that their roofs were just a few feet apart (Figure 4.3.3.1.3).

Plans for the original homes in this community (Figure 4.3.3.1.4) show they were designed to be less than 1,000 feet^2. Figure 4.3.3.1.5 shows that by 2022, additional structures had filled the empty spaces between these original structures, causing very little separation distance between buildings.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.1.3 EagleView image taken August 26, 2021 showing the high community density.

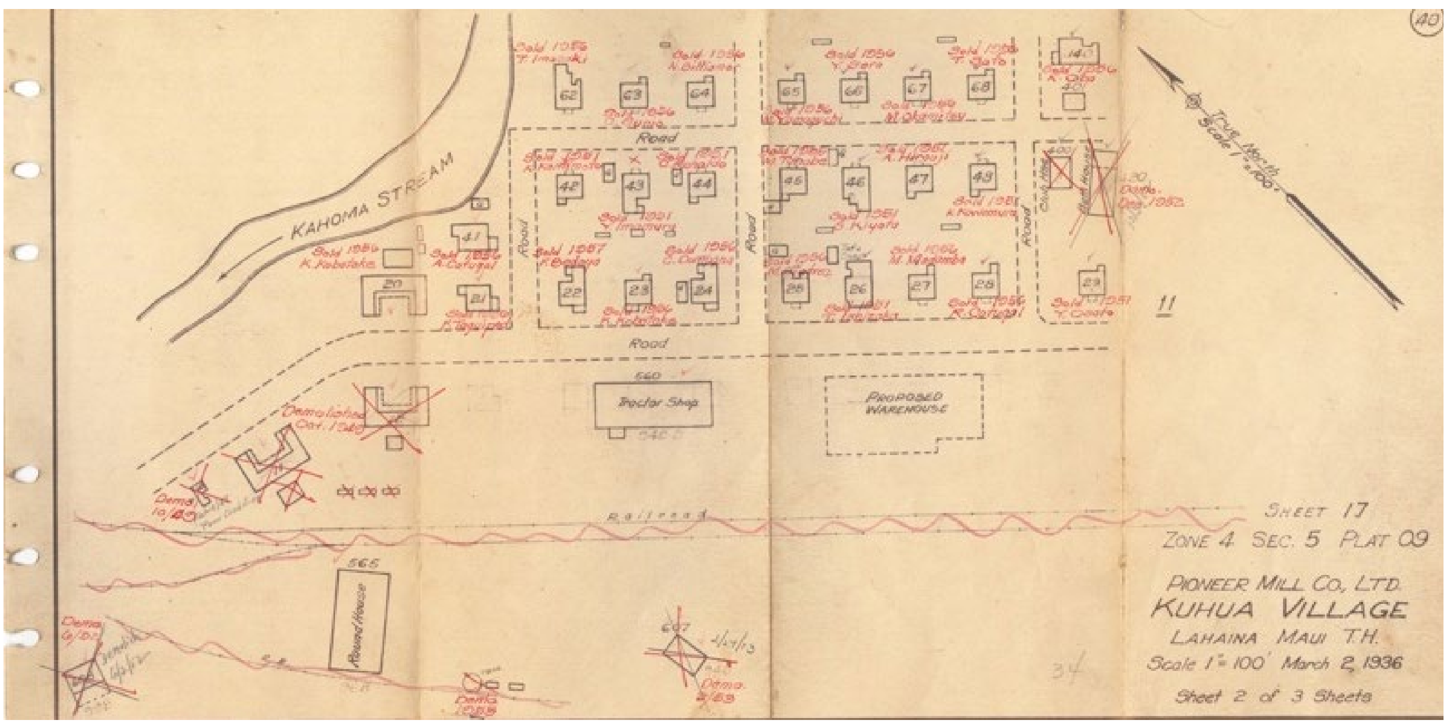


Figure 4.3.3.1.4 Historical planning document showing the northern area of Kahua St in 1936.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.1.5 Pre-fire aerial imagery captured August 2021 of the area along Kuhua Street depicted in FIgure 4.3.3.1.4.

Many factors have influenced this trend over the years, including increased housing costs, multigenerational living, and lack of zoning and/or enforcement.

The first homes within the neighborhood to catch fire were on Lahainaluna Road across from Kalena Street at approximately 15:28. At 15:38, multiple 911 callers indicated their homes, fences, and sheds were on fire near Paunau Street (4[redacted] and 4[redacted] Pāʻūʻū Place). At 15:40, an MPD officer (499) advised of fire in the brush at 4[redacted] Kauhi Place, approximately 1,000 feet west (makai) of the structure fires the MFD was working on.

Due to the close proximity of many homes within the area, as well as the addition of many ladder fuels (vegetation and structures that allow a fire to climb up from the ground level landscape), such as vehicles, fences, trees, shrubs, sheds, propane tanks, and additional outbuildings, the fire spread rapidly ahead of suppression efforts.

Spot fires were also burning around and in homes as embers from numerous burning fuels were carried by strong winds ahead of the structure fires.

With many structures on fire, the smoke thickened, and the plume could be seen making its way all the way to the ocean. The heavy wind drove the smoke to the ground, limiting the visibility of those in the path.

The fire continued to spread quickly west (makai) on Lahainaluna Road. At 15:41, MFD command advised of several houses catching fire west (makai) on Lahainaluna Road, toward Kelawea Street. At 15:42, command confirmed the fire was all the way down to Kelawea Street.

At 15:48, a 911 caller stated her yard was on fire at 4[redacted] Pauwala Place. At 15:56, an MPD officer indicated that the fire had reached the transformer area, across from the intersection of Lahainaluna Road and Kuhua Street. One (1) minute later, another 911 caller advised that the fire was starting up at Lahainaluna Road and Kuhua Street.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

E1, E6, WL6, and RE1 were operating on Pauoa Street, south of Lahainaluna Road. They declared emergency traffic (i.e., critical life safety radio communications that take priority over all other transmissions) at 16:17, and at 16:22, they became trapped by a combination of the advancing fire and other vehicles trying to evacuate. Video from the firefighters on the scene shows many structures on fire in the area and embers being driven through their location by strong winds.

The interval from first home ignition to the emergency conditions experienced by the MFD was approximately 49 minutes. During this time, the fire had spread at least 1,800 feet down Lahainaluna Road to the firefighters' position on Pauoa Street. This is likely the time Kuhua Street also became untenable for unprotected civilians.

Due to the fire's intensity, firefighters were forced out of their apparatus while they were wearing firefighting PPE and SCBA. The firefighters also shared that their water application was having no impact on the fire conditions and that it was hot enough for their hoseline to burn through.

At 16:24, Officer 401 radioed, "We might have one (1) fatality, homes rear of Mill Street." This indicates that IDLH fire conditions had progressed to the area of Mill Street and Hwy-30. This location is further west (makai) than the firefighters and just south of Kuhua Street.

No structures survived in this area due to the extreme fire conditions (Figure 4.3.3.1.6). All three (3) fire spread mechanisms—embers, radiant heat transfer, and direct flame contact—played important roles in the speed at which the fire spread within the neighborhood.

Figure 4.3.3.1.6 Post-fire aerial imagery (captured August 11-13, 2023) of Kuhua Street in the Kelawea Community.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

In this area, there were two (2) ways to evacuate to Hwy-30: via Lahainaluna Road and via Komo Mai Street. There were trees down and sections of roofs down in the road on Aki Street, west (makai) of Kelawea Street, which blocked people from using Komo Mai Street as an exit.

A large mango tree also fell on Kuhua Street, just south of Aki Street (described during a 911 call at 16:41), which blocked an exit to Lahainaluna Road (Figure 4.3.3.1.7). The roads were narrow and further clogged with many parked cars. The smoke would have been thick and blinding due to the high winds driving the smoke towards the ground, at or below eye-level. See Section 3.8.2 for more information on Traffic Management and Egress Challenges.

The fire and smoke conditions straight down Lahainaluna Road would have been untenable, particularly for civilians trapped in their vehicles and/or without protection from the hot and toxic gasses from the fire.

Fifty citizens perished in this area or after exposure to conditions in this area (Figure 4.3.3.1.8). Fifty-five of those killed in the fire had addresses in the neighborhood. Many people narrowly escaped and there are many stories of neighbors helping neighbors to escape the fast spreading urban conflagration. For more information on the circumstances surrounding the fatalities, see Section 3.8.10.

Figure 4.3.3.1.7 Map showing egress route at 16:41 after the fire cut off the westbound exits via Komo Mai Street and Lahainaluna Road. Orange dots represent the location of the fallen trees and debris blocking Kuhua and Aki Streets. Red dots represent locked gates that police officers and residents forcibly opened to gain access to alternative egress routes depicted by the yellow lines.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

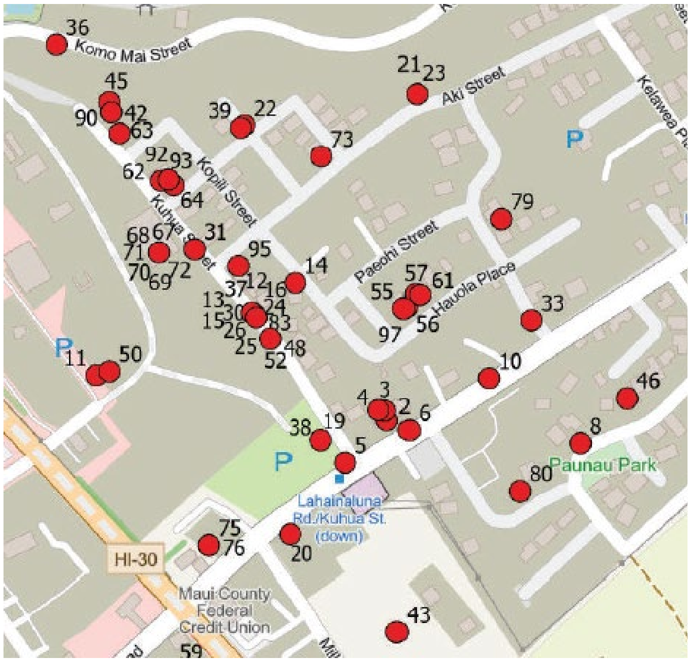


Figure 4.3.3.1.8 Fatality locations in this area as provided by the MPD.

4.3.3.2 Kelawea Mauka III subdivision east (mauka) of Lahaina Bypass

The Kelawea Mauka III subdivision is a group of approximately 300 structures, mostly residential homes, east (mauka) of the Lahaina Bypass (Figure 4.3.3.2.1). The average year of construction for this subdivision is 1985 with some newer construction and additions as recent as the 2010s.

The area of origin is just behind the homes on Ho'okahua Street, but does not appear to have damaged any of the structures. Several residents indicated they engaged in firefighting activities, including fighting spot fires and defending structures. Without these actions it is likely structures would have ignited and resulted in similar destruction that occurred west (makai) of the bypass. Most of these structures were outside of the fire perimeter, but many sustained damage due to high winds before and during the fire. Of the 276 properties,162 (59%) have visible damage due to wind (Figure 4.3.3.2.2).

Figure 4.3.3.2.1 Post-fire aerial imagery Kelawea Mauka III subdivision, east (mauka) of Lahaina Bypass.

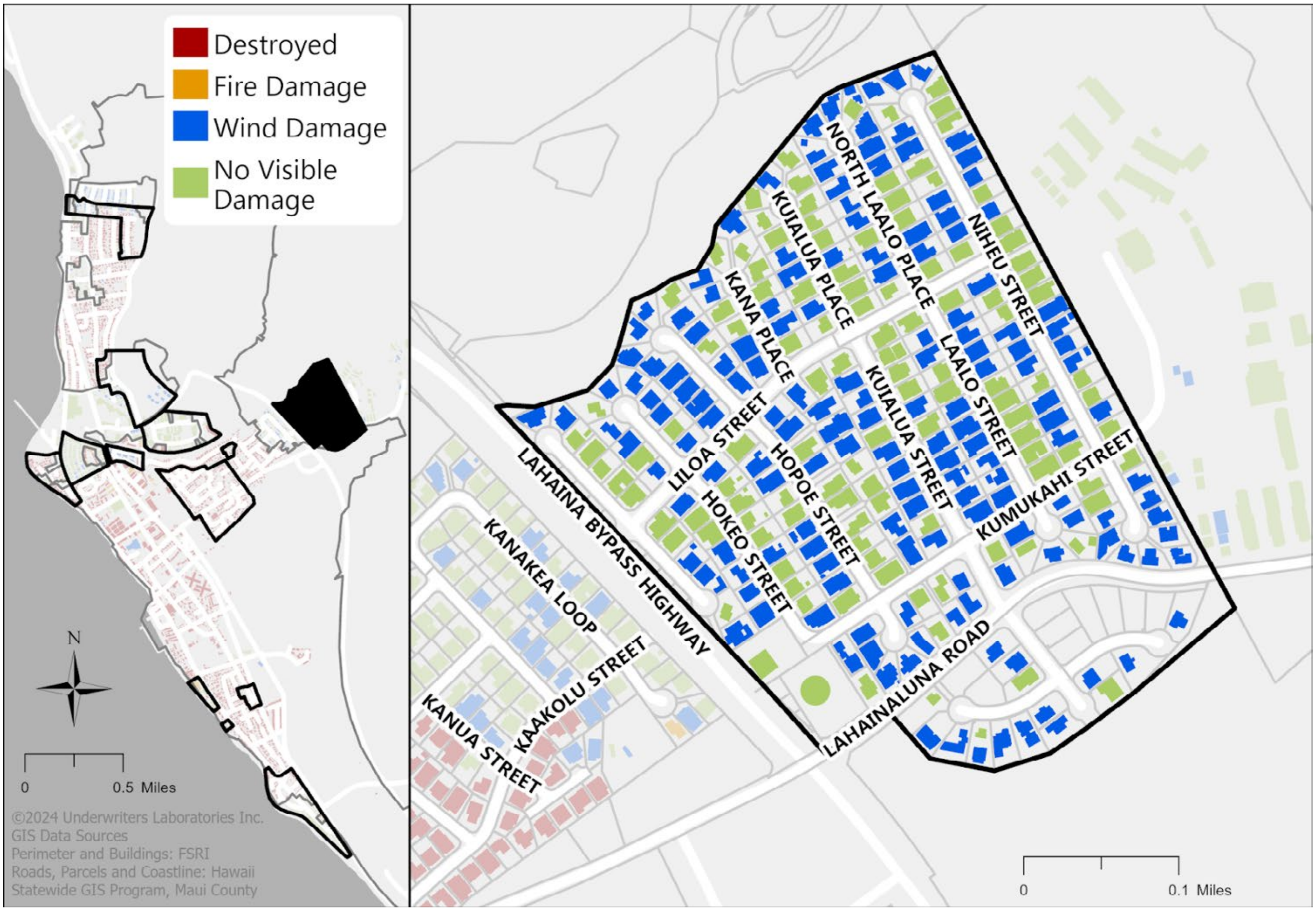


Figure 4.3.3.2.2 Damage classification assessment map of Kelawea Mauka III subdivision analysis area.

Residents living west (makai) of the bypass, off of Kanakea Loop and Kaʻakolu and Kanua Streets, also engaged in fire suppression efforts. Those living in the cul-de-sac of Kanakea Loop used garden hoses and hand tools to extinguish the grass fire located on the north end of Kelawea Mauka Makai Park. Others cooled spot fires, and used water curtains, in an attempt to protect their homes from the radiant heat.

The most common wind damage was to roof coverings (displaced or totally removed) and/or roof-mounted solar panels. According to the County of Maui assessor data, the most common roof material used within the Kelawea Mauka III subdivision was metal (44%), composite shingle (34%), and wood shake (17%).

The magnitude and orientation of roof damage from high winds is typically impacted by several factors, including average wind gust speed, wind direction, and vulnerability (roof shape, covering material and attachment, and age).

Based on aerial imagery, approximately 84% of properties in the subdivision had roof-mounted PV panels, which may have increased the susceptibility of these structures to wind damage.[257]

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.2.3 shows examples of wind damage in the Kelawea Mauka III subdivision, including loss of roof covering and structural components.

These structures are located outside of fire plume and thermal exposure, which may affect the susceptibility of roof coverings to wind damage and wind-borne debris that can cause damage. Additionally, the construction (age, materials, etc.) and location of these structures is not necessarily representative of all structures impacted during the incident.

Given these caveats, this sample of wind damaged structures provides insight into the plausible damage to other structures before and during the fire, which would subsequently impact their vulnerability to fire damage, particularly for entry of airborne embers.

Figure 4.3.3.2.3 Example of wind damage in the Kelawea Mauka III subdivision—(bottom left) damaged roof sheathing and (bottom right) loss of roof covering.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.3.3 Kahoma Subdivision

The Kahoma subdivision, in the area of Luʻi Street at Komo Mai Street, features relatively new construction compared to the Kelawea Mauka III subdivision (Figure 4.3.3.3.1). The homes along Komo Mai Street were constructed in or after 2017. Komo Mai Street was used as an evacuation route out of the Lahainaluna subdivision. MPD officers 4B10 and 4B30 operated in the area coordinating evacuations.

Shortly before 16:00, reports came in that structures on Kalena Street and Luʻi Street near Komo Mai Street were on fire. Civilian video shows fire spreading west (makai) along Komo Mai Street at 18:14 (Phase One report, Figures 4.3.1.14-17).

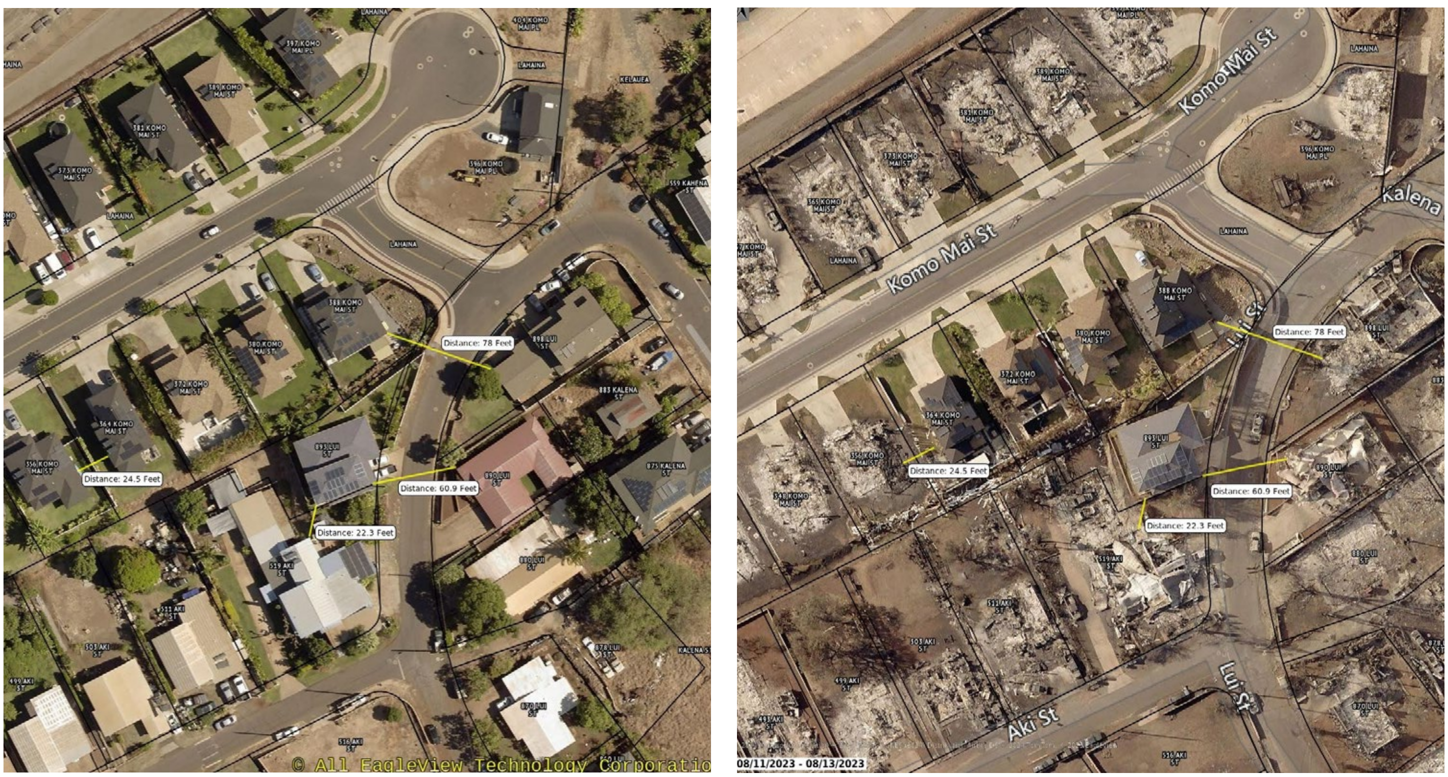


Figure 4.3.3.3.1 Pre- and post-fire aerial imagery of homes that survived the fire on Komo Mai Street and Luʻi Street. Annotations depict separation distances between perimeter structures and nearest destroyed structure.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Five (5) structures at the corner of Komo Mai Street and Lu‘i Street were not destroyed, while all adjacent ones were destroyed (Figure 4.3.3.3.2). The western-most (makai) home that was not destroyed—3[redacted] Komo Mai Street—was impacted by the adjacent (downwind) structure, including what appears to be discoloration of the fiber cement siding and damage to windows on the fire-exposed side of the structure (Figure 4.3.3.3.3).

Figure 4.3.3.3.2 Damage classification assessment map of Kahoma subdivision analysis area.

Figure 4.3.3.3.3 Damage classification assessment map to 3[redacted] Komo Mai Street from (destroyed) 3[redacted] Komo Mai Street; approximately 24 foot separation distance. Top left image shows both addresses, top right indicates the radiant heat vector in the generally opposite direction of fire spread. Bottom images show discoloration of fiber cement siding and deformation of vinyl window frames.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Based on the incident timelines (see Phase One report), MFD units E3, L3, and other personnel were in the area of Lu‘i Street and Komo Mai Street from approximately 16:00 to 19:00 on August 8, 2023. During this time, firefighting units implemented structure defense tactics, including fire suppression and exposure protection (Figure 4.3.3.3.4). These defensive actions were likely the primary reason that these structures were not destroyed.

Several of the structures in the subdivision sustained damage due to wind, including uplift and removal of roof shingles. Fences were also damaged, possibly due to a combination of wind and defensive actions taken by MFD units at the scene.

Figure 4.3.3.3.4 Isolated fire damage to 3[redacted] Komo Mai Street. Spot fire (ember ignition) caused localized damage, but did not spread to the structure, likely due to defensive actions.

Potential contributing factors in undestroyed structures

Newer construction homes:

- **As buildings age, they naturally degrade, which can create openings and penetrations in the structure’s envelope, creating pathways for ignition.**
- **Newer homes tend to have fewer additional structures and vegetation on their parcels, which creates less opportunity for fuel continuity, limiting fire spread.**

Suppression efforts and defensive actions:

- **L3 deployed an aerial master stream, but reported, due to wind, the water application had limited effectiveness.**
- **E3 was deployed in the area protecting structures and putting out spot fires.**

4.3.3.4 Opukea Apartments – Limahana Circle

The Opukea apartment complex comprises seven (7) apartment buildings and one (1) office/amenity building along and south of Kahoma Stream (Figure 4.3.3.4.1). The complex was built in 2008 and construction features include stucco exterior walls and composition shingle roofs.

Within the complex, several structures were destroyed, including two (2) apartment buildings and the office/amenity building, while the remaining five (5) apartment buildings sustained wind damage, but were not destroyed (Figure 4.3.3.4.2).

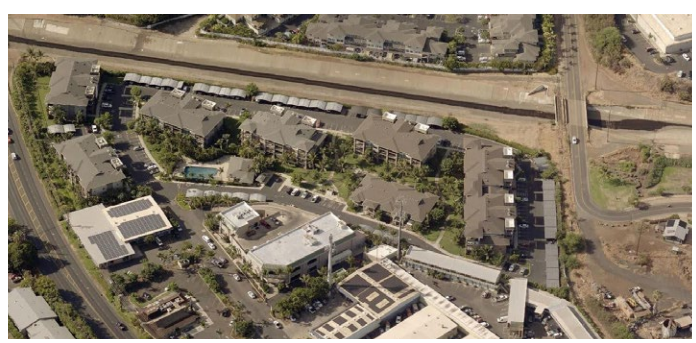


Figure 4.3.3.4.1 Pre-fire aerial imagery (captured August 10, 2021) of Opukea Apartments.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.4.2 Damage classification assessment map of Opukea apartment complex analysis area.

Radio traffic from MFD unit RE11 at 16:49 on August 8, 2023, indicates fire was impacting the complex:

"I've got a view of Opukea. It's being impacted on the cars, on the outside, extending to the building; it needs to get evacuated."

Based on fire progression, the vehicles and Based on fire progression, the vehicles and buildings being referenced are most likely those that back up to Komo Mai Street and the east (mauka)-most apartment building.

At this point in the incident, most of the structures on Komo Mai Street (other than those described in Section 4.3.3.3) were burning and generating embers that were likely capable of spreading fire over the 150-foot distance to resident vehicles and 40 to 50 feet further from the vehicles to the east (mauka)-most apartment building (Figure 4.3.3.4.3).

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.4.3 Distance between nearest destroyed structure on Komo Mai Street, destroyed vehicles, destroyed apartment building, and undestroyed apartment building.

After 18:00, the crew from U3B responded to this area to assist with evacuation and suppress small fires in the area. The crew recalled that all buildings were intact, but there was fire activity around the building with limited visibility.

While conducting searches of the buildings, U3B crew used fire extinguishers to put out spot fires around and inside units where exterior doors had been left open, likely during evacuation. Upon completion of the search, U3B crew gathered civilians who were sheltering in place and evacuated north across Kahoma Stream to the Walgreens parking lot and then to the Civic Center shelter.

A photo of one of the destroyed apartment buildings (Figure 4.3.3.4.4) provides additional information on their construction style and materials, which may be assumed common for the other apartment buildings within the complex.

The first floor exterior walls are concrete masonry block (CMU) blocked with stucco cladding, while upper floors were constructed with gypsum sheathing and similar stucco cladding.

Figure 4.3.3.4.4 Destroyed apartment building showing CMU block exterior wall construction (first floor) and noncombustible sheathing with stucco finish coat and fiber cement siding.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

These noncombustible exterior wall materials likely contained the fire within the burning structures and reduced exposure to adjacent buildings. Additionally, the 40- to 50-foot separation distance between the burning buildings, and nearby structures, could also have been a contributing factor in why fire did not spread to the adjacent apartment buildings.

The non-destroyed structures within the complex were those closest to, or along, Kahoma Stream, just west (makai) of the point where the fire jumped the stream and spread north (Phase One report, Figure 4.3.1.13).

The combination of fire spread direction (north), potentially caused by wind direction, and the effect of the eastern (mauka)-most apartment building creating an ember cast shadow, were also likely contributing factors as to why those apartment buildings were not destroyed.

However, these surviving structures sustained substantial wind damage, including detachment of roof coverings, as well as the removal of roof sheathing (Figure 4.3.3.4.5) and broken windows (Figure 4.3.3.4.6), which could create potential pathways for embers into the structures.

Figure 4.3.3.4.5 Wind damage to undestroyed apartment buildings, including significant roof covering (composition shingle) loss and roof sheathing.

Figure 4.3.3.4.6 Broken window on third floor of eastern (mauka) side of apartment building, likely caused by windborne debris.

There is evidence of some firebrand/ember ignitions of ornamental vegetation (Figure 4.3.3.4.7), but a notable lack of spot fires in grasses in the community, compared to spot fires in the grasses adjacent to Kahoma Stream.

This evidence suggests the ember exposure was sufficient, but most fuels in the apartment complex, including vegetation, were not receptive to ignition. The lack of ignition in the vegetation may be attributed to the apparent lushness caused by irrigation.

Figure 4.3.3.4.7 Ornamental vegetation (palm bracts) ignited by embers and burned without igniting adjacent vegetation.

Figure 4.3.3.5.1 Pre-fire aerial imagery (captured August 10, 2021) of Kahoma Village before the fire.

Figure 4.3.3.5.2 Damage classification assessment map of Kahoma Village analysis area.

4.3.3.5 Kahoma Village

Kahoma Village is a 20.5-acre master planned community comprising 32 single family homes, 69 courtyard single family homes, and 102 villas (townhomes) across 17 buildings (Figure 4.3.3.5.1). The development was built between 2017 and 2020. One (1) of the courtyard homes and four (4) townhomes were destroyed by fire; two (2) townhomes sustained fire damage and nine (9) buildings sustained wind damage (Figure 4.3.3.5.2).

All of the buildings were constructed using modern materials, including asphalt shingle roofs and non-combustible wall sheathing, and maintained green vegetation landscape. The village was further protected by a concrete barrier wall, which extended along the full east (mauka) side of the village, along Hwy-30 between Kenui Street and Kahoma Stream (Figure 4.3.3.5.3).

Figure 4.3.3.5.3 Concrete barrier wall along Hwy-30.

Notably, this was the side of the village that received the bulk of the ember exposure from the fire to the east (mauka), driven by westerly (makai) winds. Although all of the grasses along the concrete barrier wall had burned, the homes behind the wall did not appear to have any thermal damage.

There was one (1) single family home (2[redacted] Kahoma Village Loop) that was ignited by embers on the southeast corner of the village (Figure 4.3.3.5.4). The house fire was recorded by Central at 16:44:56. MPD BWC footage shows the house's roof on fire at 17:41 and water being applied from the Kenui Street side (Figure 4.3.3.5.5).

The MFD, with support from private tankers, kept the fire from extending to adjacent structures. There was no thermal damage to the home to the east (mauka), even though this house was only approximately 14 feet away from the neighboring home.

Figure 4.3.3.5.4 Destroyed single family home at 2[redacted] Kahoma Village Loop from the front (north).

Figure 4.3.3.5.5 Body worn camera image captured by an MPD officer on August 8, 2023, at 17:41:23, showing the house fire in Kahoma Village.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

As the fire was spreading quickly from east (mauka) to west (makai), including burning the entire Front Street apartment complex across Kenui Street to the south, there were resources in Kahoma Village, protecting homes from ember ignitions. Numerous residents remained in Kahoma Village throughout the entire incident and shared stories with FSRI team members of extinguishing spot fires.

The MPD had several officers in Kahoma Village evacuating residents and suppressing spot fires. The MFD also had several units suppressing spot fires and extinguishing fires around Kahoma Village. During the post-incident walkthrough, evidence of ember damage was found on patio furniture in backyards of several houses.

In addition to the house, four (4) townhome buildings located in the center of the village were destroyed (buildings 11, 12, 14, 15). There is no recorded evidence as to when these structures ignited.

These fires likely ignited after the MFD and the MPD relocated their resources north to support evacuations in the Wahikuli Area. With the MFD supporting operations further north, the fire eventually stopped spreading without intervention.

Examining the areas around the townhouse buildings that survived provides useful insights, pointing out how construction and design features can impact the fire-susceptibility of a particular structure.

Building 13 was damaged (melted window trim, cracked windows, dried out shrubs, and melted vinyl fence) by adjacent Buildings 12 and 14, but did not ignite (Figure 4.3.3.5.7). Building 14 (destroyed) caused damage to windows and a vinyl fence (Figure 4.3.3.5.8 and Figure 4.3.3.5.9).

Figure 4.3.3.5.6 Destroyed single family home from the rear on the other side of the concrete wall.

Figure 4.3.3.5.7 Aerial imagery of distances between Building 13 (damaged), Building 12 (destroyed), and Building 14 (destroyed).

Figure 4.3.3.5.8 Ground-based photograph of space between Building 13 (shown on the left of the image) and Building 14 (shown on the right), showing damaged windows and heat damaged/dried (but not ignited) vegetation.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.5.9 Ground-based photograph of space between Building 13 (shown on the left of the image) and Building 14 (shown on the right).

Building 13 was approximately 20 feet away from Building 12, which was also a total loss. Each townhouse building had vinyl fenced-in backyards, which could be as close as 10 feet from one another (Figure 4.3.3.5.9). The combustible materials (e.g., outdoor furniture) between the buildings measured 12 feet between their vinyl fences (Figure 4.3.3.5.9).

Building 16 was damaged (melted window trim, cracked windows, bubbled paint, dried out shrubs, melted vinyl fence) but did not ignite (Figure 4.3.3.5.11). Building 16 was located approximately 16 feet from Building 15, which was destroyed (Figure 4.3.3.5.12). Several vehicles were also destroyed. Those vehicles were approximately 22 to 30 feet from the nearest window opening in the building.

Figure 4.3.3.5.10 Photograph of space between Building 12 (shown on the right of the image) and Building 13 (shown on the left), showing minimal damage to the vinyl fence.

Examining these buildings post-fire highlighted some trends:

- There were multiple locations where vinyl windows were the potential weak link for fire spread from structure-to-structure. Cracked windows and warped vinyl frames were seen even where there was no or little thermal damage to siding or roofing. Windows were double-paned with plain glass; when window glass cracking occurred in these surviving structures, only the outer pane cracked and the inner remained intact.
- The shrubs located between all of the townhouse buildings show signs of drying out without signs of ignition. If these shrubs were not maintained, they could have ignited and acted as ladder fuel that helped spread the fire to more structures.
- There was little evidence of large amounts of embers down wind from the four (4) townhouse buildings. The wind may have died down when these structures burned, suggesting that they might have ignited late on August 8, 2023, or early August 9, 2023.

Figure 4.3.3.4.11 Thermal damage (window) to the front of Building 16, across from Building 15 (destroyed).

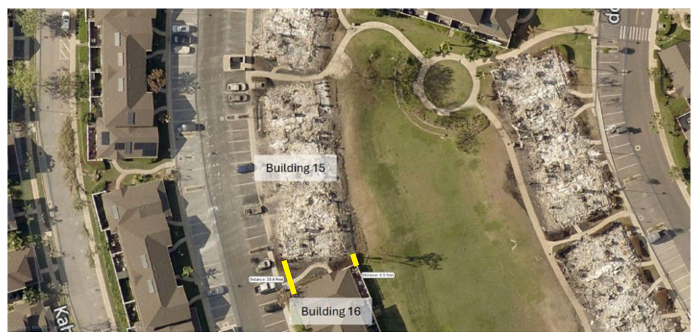


Figure 4.3.3.5.12 Distance between Building 15 (undestroyed) and Building 16 (destroyed) and several vehicles lost during the fire.

4.3.3.6 West (Makai) of Front Street Between Ala Moana Street and Kamaka Circle

The area along and west (makai) of Front Street to the beach between Ala Moana Street and Kamaka Circle has mixed construction, including single-family residential housing, ADUs, multi-family residential housing (condominiums), and places of worship (Figure 4.3.3.6.1). This area is the western (makai)-most point of the fire perimeter and damage to the built environment (Figure 4.3.3.6.2).

Figure 4.3.3.6.1 Post-fire aerial imagery of Ala Moana Street to Kenui Street.

Figure 4.3.3.6.2 Damage classification assessment map of Front Street to the beach between Ala Moana Street and Kamaka Circle analysis area.

The mix of construction included structures from the early 1900s to 2022 and a range of building materials. These structures are situated west (makai) of Kahoma Village (leeward during the wind-driven fire event), which provided a buffer for fire spread from the east (mauka).

The first report of fire in this area was at 19:49, when MPD officer T34 reported multiple houses on fire south of Ala Moana along Front Street. Shortly after (at 19:51) they stated, “The back of 11[redacted] Front is on fire, coming from Māla Wharf, guess it jumped Ala Moana from the back.”

A private driveway off Ala Moana Street (Figure 4.3.3.6.3) is generally a line of demarcation between destroyed and surviving structures. West (makai) side of the driveway homes were destroyed all the way to the ocean, including the Lahaina Jodo Mission.

Two buildings, 4[redacted]Ala Moana Street and 5[redacted] Ala Moana Street, were damaged by a destroyed accessory structure in the backyard of 4[redacted]Ala Moana Street. The accessory structure was most likely ignited by embers, due to the lack of continuous fire spread. The destroyed burning accessory structure

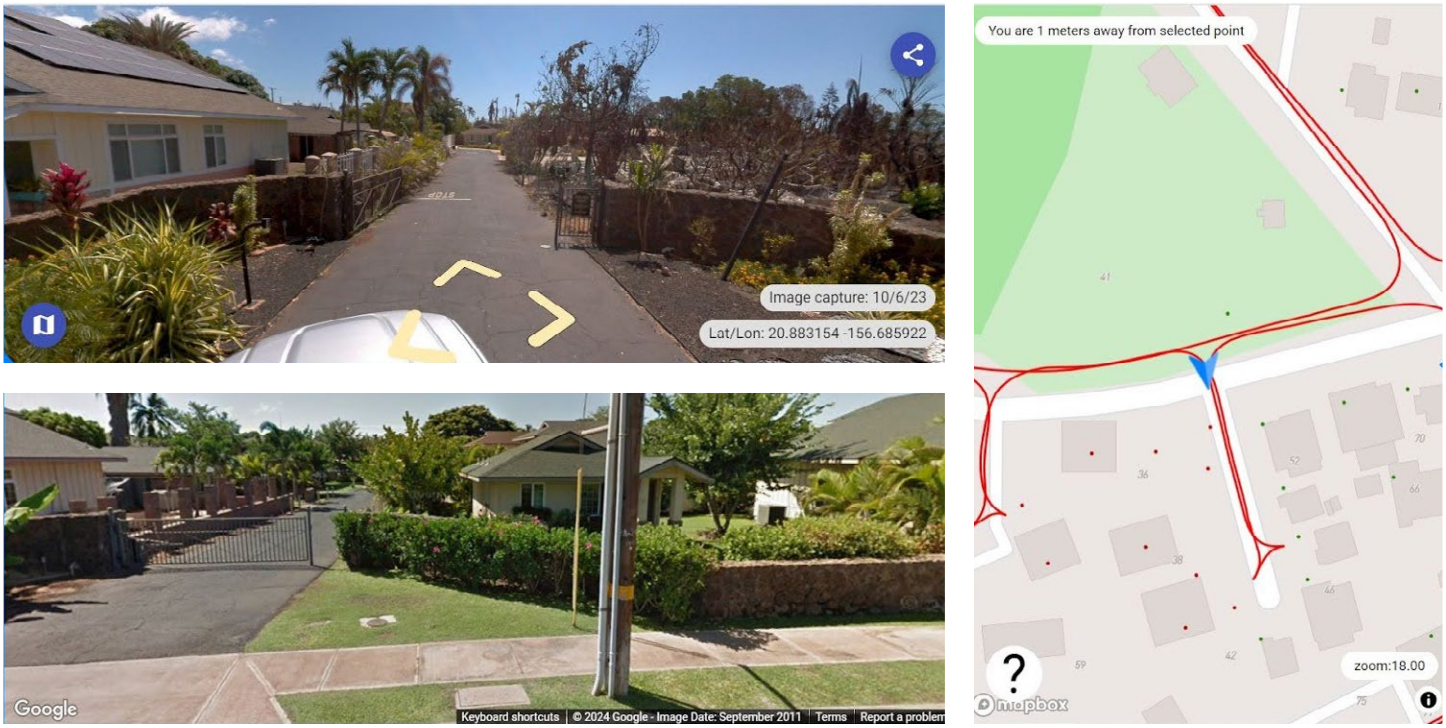


Figure 4.3.3.6.3 Pre- and post-fire Google Street View imagery of Ala Moana Street private driveway. This road is a demarcation of destruction, nearly all of the structures on the ocean (makai) side are destroyed.

caused damage to both 4[redacted] Ala Moana Street (burned fascia and broken windows) and 5[redacted] Ala Moana Street (burned fascia and a damaged storage container) (Figure 4.3.3.6.4).

The distance between the destroyed and adjacent structures was less than six (6) feet. However, there are masonry walls between the accessory structure and the surrounding buildings. These walls likely provided some level of containment/resistance that limited the fire's spread to other structures on the parcel.

E11 reported being in this area and recalled extinguishing a fire on Ala Moana where an ohana dwelling (accessory structure) had ignited. The crew patrolled this area, suppressing spot fires and protecting structures.

There is evidence that defensive actions (connected residential hoses flaked out in the area) to suppress the burning structure and/or protect adjacent structures, which could have been a contributing factor to why the fire did not spread further on the parcel.

4.3.3 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.3.6.4 Destroyed accessory structure at 4[redacted] Ala Moana Street (top left). The burning structure caused damage to 4[redacted] Ala Moana Street (top right and bottom left) and 5[redacted] Ala Moana Street (bottom right).

During the post-fire damage survey, FSRI team members spoke with a resident of an undestroyed home. The resident stated they returned to the home on Wednesday, August 9, 2023, after evacuating the day before. They found both electricity and water utilities were turned off and that a structure in the backyard was burning (Figure 4.3.3.6.5). The resident was able to suppress the fire before it spread to any adjacent structures.

Slightly further south, the burning structures on Lahilahi Place caused damage to the rear side exposures at 11[redacted] and 11[redacted] Front Street, 20 to 40 feet away. The vinyl siding and window frames were damaged by the radiant heat, but did not ignite (Figure 4.3.3.6.6). A garden hose found behind 11[redacted] Front Street may have been used by the residents described above to protect these structures from ignition.

Figure 4.3.3.6.5 Post-fire aerial imagery (captured August 13, 2023) of the area of Puunoa Place.

Figure 4.3.3.6.6 Destroyed structure on Lahilahi Place caused damage to the rear side of 11[redacted] (top) and 11[redacted] (bottom) Front Street structures.

Figure 4.3.3.6.7 Post-fire aerial imagery of 1[redacted] Kamaka Circle (damaged), surrounded by destroyed structures.

At the south end of this analysis area, an isolated structure at 1[redacted] Kamaka Circle was impacted, but survived, while adjacent structures were all destroyed (Figure 4.3.3.6.7). On the southeast (or "B") side of the structure, there is approximately 30 feet of foliage and a fence, and the adjacent structure (1[redacted] Kamaka Circle) is approximately 50 feet away.

There is evidence of ground fire in the vegetation, potentially from embers, but limited fire spread. The dense, lush (apparently well-watered) foliage and fence may have provided some shielding of the radiant heat from the burning adjacent structure, a contributing factor for the reduced thermal exposure (Figure 4.3.3.6.8).

Figure 4.3.3.6.8 Vegetation and fence on "B" side exposure of 1[redacted] Kamaka Circle.

The burning structure and vehicles at 2[redacted] Kamaka Circle impacted 1[redacted] Kamaka Circle (approximately 12 feet) on the northeast side and caused damage to window frames and glass, exterior vinyl, and the thatch roof covering (Figure 4.3.3.6.9).

Figure 4.3.3.6.9 Close-up images of the structure at 1[redacted] Kamaka Circle, showing that the extent of damage varied by multiple factors. Yellow arrow indicates the vinyl window frame that was impacted by radiant heat and fell out. Red arrow indicates ember ignition of wooden deck for what appears to be an outdoor shower.

The entire window sash in the exposed side fell out onto the ground, leaving an open path for flame or embers to enter the structure. However, this window was oriented opposite the prevailing wind direction, which may have provided some level of protection for this opening. The ember exposure was sufficient to cause ignition of wooden deck boards for what appears to be an outdoor shower.

Given the separation distance and likely wind direction, the mechanism of heat transfer was radiation; the masonry wall would have provided some shielding (shadowing) from the source and reduced the thermal impact. The exposure was sufficient to cause deformation of vinyl window frames that fell outward.

In addition to the thermal exposure from adjacent burning structures, there was considerable ember exposure evident at this location. The hot tub cover and sun shade had numerous burn marks from embers that were energetic enough to pyrolyze these materials after they landed. Ember size characteristics, such as size and shape, can be measured based on the burn marks they leave,[258] such as those shown in Figure 4.3.3.6.10.

Figure 4.3.3.6.10 Ember damage of a hot tub cover reveals the noticeable size variation of embers encountered during the fire.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.4 South Zone

The South zone is the incident area south of Canal Street and Prison Street (Figure 4.3.2.1). Within the Central zone, four (4) areas of interest were identified for further analysis:

- 400 Block of Front Street
- 400 Block of ʻĀlīʻō Street and Waineʻe Street
- 300 Block of Front Street
- Puamana Community

4.3.4.1 400 Block of Front Street

The 400 block of Front Street is an oceanfront section of Front Street that features commercial and residential structures (Figure 4.3.4.1.1). Six (6) of the seven (7) primary structures in this area survived the fire on the west (makai) side between Shaw Street and Kauaʻula Road, while all other structures adjacent to this analysis area were destroyed (Figure 4.3.4.1.2).

Figure 4.3.4.1.1 EagleView image of the 400 block of Front Street showing the survival of six (6) primary structures on the west (makai) side of the street.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.2 Damage classification assessment map of the 400 block of Front Street analysis area.

Many structures on this block were originally constructed in the 1950s and 1960s, though several new structures were built between 2009 and 2020.

Fires were reported in this area beginning at 16:58, when an unidentified MPD Officer advised the fire was near a shelter for the unhoused located east (mauka) of the Lahaina Recreation Center on Shaw Street.

A civilian video recorded at 18:47 near Shaw Street and Front Street shows both 1[redacted] Shaw Street (Salvation Army Building) and another structure on fire just north on Front Street (Phase One report, Figures 4.3.1.22 and 4.3.1.23).

At 19:11, MPD Officer 6B40 advised there was zero visibility by the Shops at 505 mall and that the 400 block of Front Street was impassable.

At 19:38, on the eastern (mauka) end of Shaw Street near the highway, MPD Officer 4Z20 advised the fire “jumped” Shaw Street to the south and was extending into the surrounding neighborhood (Phase One report, Figure 4.3.1.20).

At 20:29, a civilian photo shows the fire impacting structures in the area of Hwy-30 and ‘Aholo Road (Phase One report, Figure 4.3.1.34) south of the 300 block of Front Street.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

At 20:37, an unidentified MPD officer advised the fire was starting to cross over into the structures at Aulike Street, which runs slightly parallel to Mill Street. By this time, the fire was one (1) structure north and to the east (mauka) of Lahaina Shores Beach Resort (4[redacted] Front Street), a six-story condominium.

By 20:46, MPD Officer 4A40 advised there were a few houses engulfed on Aulike and Leoleo Streets, which is along the 300 block, east (mauka) of Hwy-30.

The Lahaina PM fire likely impacted the 400 block of Front Street initially from the north through structure-to-structure spread. As the fire continued, it spread south through structures between Hwy-30 and Front Street, radiant heating and embers from the east (mauka) likely impacting structures through prevailing northeasterly winds.

There has been no confirmed evidence that fire suppression operations were conducted in this area.

This grass fire encroached on the highway at ‘Aholo Road (south end of the 300 Block) a couple of hours after the fire was first reported to have crossed Shaw Street at the north end of the 400 block. This fire front may have contributed to both structure-to-structure spread from the south and the embers cast from the south and east (mauka).

These visual signs of damage suggest winds impacting this area were predominantly from the east (mauka), laying trees and poles to the west (makai) and driving spot fires in the same direction (Figure 4.3.4.1.3).

Downed utility poles can be seen along Mill Street to the east (mauka) of the Lahaina Aquatic Center and Boys & Girls Clubs of Maui (Figure 4.3.4.1.4). One (1) of these poles hit and damaged the roof of the Boys & Girls Clubs of Maui (Figure 4.3.4.1.4).

Figure 4.3.4.1.3 The orientation of wind impacting the 400 block of Front Street in Lahaina can be visualized in the grass fields on either side of Mill Street, around the Lahaina Aquatic Center and Boys & Girls Clubs of Maui (middle). Representative damage to trees oriented towards the west (makai) (bottom). Spot fire damage in the softball field, where the heel of the fire can be identified towards the east (mauka), indicating spread to the west (makai)—assuming flat terrain on the grass field (top).

The vegetation fire spreading from north to south near the Boys & Girls Clubs likely caused fire spotting on the west (makai) softball field (Figure 4.3.4.1.3, bottom) later in the day.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.4 Utility pole south of Mill Street that hit and damaged the roof of the Boys & Girls Clubs of Maui.

Structure-to-structure fire spread from the north was interrupted at the Lahaina Shores Beach Resort (Figure 4.3.4.1.5). The Shops at 505, immediately north of this structure, were completely destroyed, resulting in notable radiant heat damage to the balconies and windows of the condominium on the north side (Figures 4.3.4.1.7 and 4.3.4.1.8).

The bulk of the damage to the condominium includes bubbling and flaking of paint on its balconies, which is more severe along the upper two (2) floors. Windows, screens, and patio furnishings were also damaged on the second through sixth floors on the western (makai)-side rooms. Screen and window damage is only noted on the fifth floor in the eastern (mauka)-side rooms (Figures 4.3.4.1.7-4.3.4.1.8).

Also on the fifth floor, the door to an western (makai)-side room appears to have been opened with smoke/fire damage above the sliding glass door indicating smoke emanated from this compartment (Figure 4.3.4.1.9). The sliding glass door is more heavily damaged than the others on floors above and below. This damage does not appear to have spread on the exterior of the structure, except as noted, indicating the fire likely came from within the interior.

Several screens on the sliding doors dropped from their frame. Cracked glass in windows and doors was noted, but did not appear to cause large pieces of glass to fall out. There was also some radiant damage to furnishings on the sixth-floor balcony, though these items did not appear to ignite.

Tall, lush vegetation was present between the condominium and shopping mall, particularly at the eastern (mauka) and central portions. This vegetation potentially provided some protection from radiant heating and possible ember attack and did not ignite, protecting the condominium from significant damage.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.5 Lahaina Shores Beach Resort (4[redacted] Front Street) in southern Lahaina. Top panel depicts the street location and robotic street imagery before and after the fire. (bottom left) Overall view of structure from southeast (note fenced area in bottom left where trash bins and materials are typically stored) (bottom right). View from northeast beyond the destroyed Shops at 5[redacted] Front Street.

No radiant heat damage was noted for any of the east (mauka) facing portions of the surviving structures or vehicles on the 400 block of Front Street. There was some indication of embers and potentially radiant heating impacting fuels between the street and structures on these properties.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.6 Radiant heat damage to the north end of the Lahaina Shores Beach Resort (4[redacted] Front Street). More severe bubbling to the paint is noted on the western (makai) portion of the structure (middle right) compared to that on the east-mauka (middle left) for the bottom four (4) floors, though more bubbling is noted on the fifth and sixth floors on the west (makai). Larger amounts of lush vegetation between the eastern (mauka) portions of the building compared to the western-side (makai) may have aided in locally reducing radiant heat impacting the north face of this structure. Inset: Viewpoint showing the area depicted in the photographs above.

A garbage can/disposal area in the southeast parking lot of 4[redacted] Front Street was ignited and destroyed everything inside the fence (Figure 4.3.4.1.5, Figure 4.3.4.1.10).

This fire was likely ignited through embers impacting the combustibles stored in this area, which may have been enhanced by radiant heating from the structures across the street. This fire subsequently impacted the railing on the north end of 4[redacted] Front Street, but either self-extinguished or had water applied from a nearby garden hose and did not further spread to the structure.

Spot fires were noted in the front lawn of 4[redacted] Front Street, but these also did not spread further to the structure or vehicles (Figure 4.3.4.1.11).

Remnants of embers were also noted in the open garage of 4[redacted] Front Street, but no receptive fuel bed was encountered, so they did not spread fire into this structure (Figure 4.3.4.1.12).

Figure 4.3.4.1.7 Increased window damage on the lower floor windows on the west-makai (right) compared to the east-mauka (left). Cracking is noted on the second and fourth floor windows with screens partially dropped on the third and fourth floors for the rooms on the west (makai).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.8 Close up of window damage on the second floor windows on the west (makai) room of 4[redacted] Front Street.

Figure 4.3.4.1.9 Close up of the open compartment on the fifth floor and thermal damage to furnishings on the sixth floor of 4[redacted] Front Street.

Figure 4.3.4.1.10 Ember and/or radiant heat ignited and destroyed the 475 Front Street garbage can/disposal area, which subsequently damaged a light post and the wood railing/fence on the northwest corner of 4[redacted] Front Street. Inset: Viewpoint showing the area depicted in the photograph above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.11 Ember-created spot fires in the front lawn of 4[redacted] Front Street (top). Bottom panel shows the map location and street image before and after the fire at 4[redacted] Front Street.

Figure 4.3.4.1.12 Debris in the open garage of 4[redacted] Front Street. Inset: Viewpoint showing the area depicted in the photograph above.

The furthest south surviving structure on this block was 4[redacted] Front Street, which shared an entry from Front Street with the 4[redacted] Front Street structures that were destroyed. The south/southeast facing portions of 4[redacted] Front Street were substantially impacted by radiant heat from the fire in the 4[redacted] Front Street structures.

While some bubbling and flaking of the paint on the first floor and slight warping of the metal fascia trim was noted, the most substantial damage was observed on the south-facing windows, particularly on the first floor (Figure 4.3.4.1.13).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The five (5) double-pane windows on the first floor of the structure (closer to the larger 4[redacted] Front Street structure) had the outer pane cracked and with several large pieces of glass that dropped out.

However, in all cases, the inner pane remained intact. Considering the orientation of these windows relative to prevailing winds, and evidence of embers landing near these windows with enough energy to char footwear left outside, these panes remaining intact may have been important to limit embers from entering into the house.

The windows in this structure were in aluminum frames, which are less likely to warp than vinyl frame windows that were commonly found in other structures, which may have been important in the survival of the glass panes in these windows.

Even though the structures on the west (makai) side of the 400 block of Front Street were adjacent to the coast with no addressed structures to the west (makai), post-fire damage assessment suggests fire spread through vegetation to the west (makai) of several of these structures, which was likely responsible for some thermal damage to these properties (Figure 4.3.4.1.14).

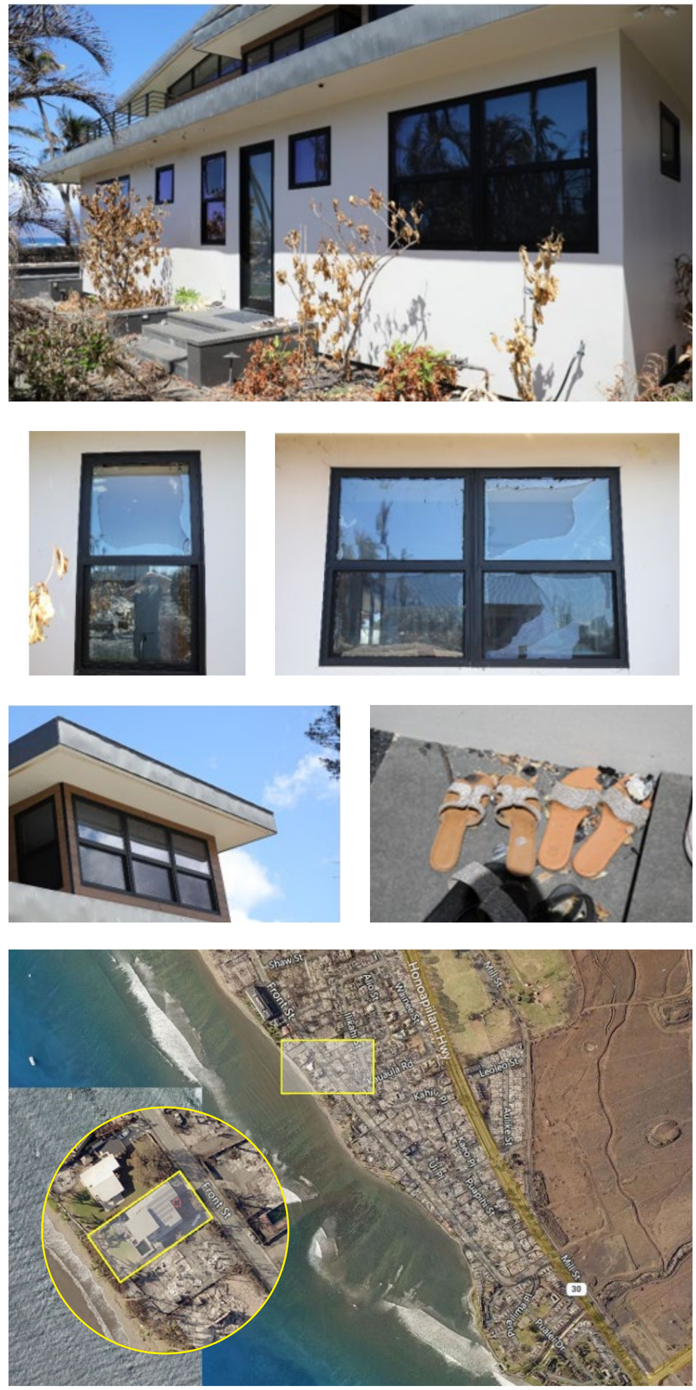


Figure 4.3.4.1.13 Window damage on the south side of 4[redacted] Front Street. Ember damage to shoes on doorstep indicates energetic embers were present in the area, which could have increased risk for ignition of interior combustibles had windows completely failed. Inset: Viewpoint showing the area depicted in the photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

A vegetation fire propagated along the west (makai) side of the low stone wall border to the west (makai) of several properties in this area, with indications of crossing into the backyard of 4[redacted] and 4[redacted] Front Street at a gap in the wall (between these two (2) property lines) and when palm trees crossover low to the wall toward the ocean (Figure 4.3.4.1.15-4.3.4.1.16).

The prevailing easterly (mauka) winds may aid fire propagation along the northwest orientation of these property lines. But intermittent shifts in wind direction, or obstructions caused by local vegetation and breaks in the fence, could have supported embers moving back to the east (mauka) as seen by the wood fence damage to the east (mauka) of this wall at the 4[redacted]-4[redacted] Front Street property line (Figure 4.3.4.1.16), the ignition of the accessory structure in the northwest corner of the 4[redacted] Front Street property, and the ignition of an outdoor chair near the rear patio door/window assembly of this structure.

Figure 4.3.4.1.14 Overhead view of 4[redacted]-4[redacted] Front Street showing potential path of fire progression along a low stone wall west (makai) of the property lines and then east (mauka) along 4[redacted]-4[redacted] property line wood fence, into an accessory structure and a chair by on the patio of 4[redacted] Front Street (see Figures 4.3.4.1.15, 4.3.4.1.16, 4.3.4.1.17, 4.3.4.1.18).

Figure 4.3.4.1.15 Vegetation and fence fire west (makai) of the low stone walls along 4[redacted] and 4[redacted] Front Street. The vegetation fire remained west (makai) of the stone wall other than at the 4[redacted]-4[redacted] property line, where a gap is present.

Figure 4.3.4.1.16 Vegetation fire west (makai) of the property line for 4[redacted] Front Street appears to cross into the backyard at the 4[redacted]-4[redacted] Front Street property fence line and near large trees proximate to the wall. Note destroyed accessory structure to the left of the bottom, right image.

The fire in the accessory structure resulted in the burning of synthetic turf in the backyard of the property to the north (4[redacted] Front Street), which spread toward the west (makai) and northwest with limited spread to the east by the noncombustible patio around the pool (Figure 4.3.4.1.17).

An outdoor chair fire in close proximity to the patio door/window assembly glass resulted in failure of the outer pane of a full-length, fixed window, while the inner pane remained intact (Figure 4.3.4.1.18).

In this specific instance, the glass near this fire was tempered (as can be seen by the many small pieces of glass after failure). This type of glass can withstand more intense fire exposure prior to failure compared to plain (annealed) glass,[259] which is common in other window failures noted in this section.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.1.17 Destroyed accessory structure in northwest corner of 4[redacted] Front Street (top) and spread into backyard turf in 4[redacted] Front Street due to embers and/or radiant heating (middle). Inset: Viewpoint showing the area depicted in the photographs above.

Figure 4.3.4.1.18 Destroyed chair proximate to rear patio door/window assembly on 4[redacted] Front Street, where the outer pane failed and inner pane remained intact. Note the indications of tempered glass in this assembly.

4.3.4.2 400 Block of ʻĀlīʻō and Waineʻe Street

The 400 block of ʻĀlīʻō and Waineʻe Street features primarily residential homes abutting maintained, grassy playing fields (Figure 4.3.4.2.1). A cluster of ten (10) structures survived the fire to the west (makai) of Hwy-30 in between Ilihaki Street (to the north) and just south of Kauaʻula Road (Figure 4.3.4.2.2).

Many of the structures in this area were constructed in the 1970s with masonry exterior walls and wood shake roofing (though most of the surviving structures had composite or metal roofing). For these legacy structures, tall openings were designed in the masonry walls to allow for doors and windows. Spaces around these openings were typically clad with wood siding.

The structures south of Kauaʻula Road are part of the 300 block, but are in the last row of structures alongside the playing fields to the east (mauka) of Hwy-30 with the rest of the 400 block. As such, they were included in this group for analysis (Figure 4.3.4.2.3).

Figure 4.3.4.2.1 EagleView image of the 400 block of Waineʻe and ʻĀlīʻō Streets, showing a cluster of ten (10) surviving structures located west (makai) of Hwy-30 (see text for further details).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.2.2 Damage classification assessment map of the 400 block of ʻĀlīʻō and Waineʻe Street analysis area.

The fire progression timeline described for the 400 block of Front Street (Section 4.3.4.1) likely applies to this section of the same block farther east (mauka). The most relevant emergency radio traffic to establish the timeline for the 400 block of ʻĀlīʻō and Waineʻe Streets comes from MPD Officer 4Z20, who was on the eastern (mauka) end of Shaw Street near Hwy-30 at 19:38 and advised at 19:38 the fire had "jumped" Shaw Street to the south and was extending into the neighborhood (Phase One report, Figure 4.3.1.20).

As the fire extended into this section of the block, radiant heat transfer from structure-to-structure increased the risk of fire spreading from the north in the structures along Waineʻe, ʻĀlīʻō, and ʻIlikahi Streets. At 20:46, MPD Officer 4A40 advised there were a few houses on fire on Aulike and Leoleo Streets. Leoleo Street is located east (mauka) of Hwy-30, and parallels Kauaʻula Road, just south of this analysis area.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.2.3 Surviving cluster of structures along the 400 block of ʻĀliʻō Street and Waineʻe Street including east (mauka)-west (makai) separation distances on (top right) pre-fire image and (bottom right) post-fire image. Inset: Viewpoint showing area depicted in photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

At this location, there are concrete walls on both sides of Hwy-30 near Leoleo Street, which potentially blocked radiant heat transfer and embers moving along the ground. However, the prevailing easterly (mauka) winds may have supported moving airborne embers above concrete walls and toward the 400 (and 300) block of homes west (makai) of Hwy-30.

This section of the 400 block was likely impacted by fires moving through structures from the north and the south. The fire did progress on either side of this cluster of surviving structures, along the east (mauka) side of Waine‘e Street and the west (makai) side of ‘Ālī‘ō Street. These destroyed structures likely impacted the surviving structures through radiant heating, though from a distance across these streets.

The fuel break created by the well-maintained green grass fields, along the width of Hwy-30 and the height of the nearby concrete wall, provided a fuel break from the south flank vegetation fire.

The northmost structure that did not burn in this group of surviving structures is 4[redacted] ‘Ālī‘ō Street (Figure 4.3.4.2.4), which sustained structural damage to the roof and eaves along the northside and northwest corner. The property to the north of this lot, 4[redacted] ‘Ālī‘ō Street, is approximately 12 feet from the corner of this roof. Heavy charring at the northwest end gradually decreased by about two-thirds toward the northeast end where paint remains on the soffit (Figure 4.3.4.2.5).

The soffit and roof deck above the eaves burned completely through, but the fire did not continue to propagate.

This structure is one of the few that noted more extensive damage to the eaves/roof than to the windows, which showed no indications of damage, possibly due to the relatively large eaves extending the roofline well past the windows, the presence of a heavy screen between the exposure and the windows, and/or the design of the louvered windows that allowed glass more flexibility to expand when heated without creating enough stress to fracture.

Figure 4.3.4.2.4 Northernmost surviving structure in the cluster of homes along the 400 block of ‘Ālī‘ō Street and Waine‘e Street was located at 4[redacted] ‘Ālī‘ō Street.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The grass around the 4[redacted] and 4[redacted] ‘Ālī‘ō Street properties was heavily charred—Figures 4.3.4.2.4 (left) and 4.3.4.2.5 (second to top).

These grass fires may have been ignited either by fire brands blown to the west (makai) from destroyed properties to the east (mauka), which could have found a receptive fuel bed in the dry grasses or through failure of the wooden fence along the property lines.

Several separate starts appear to begin in the grass where smoldering sections of the wood fence (which sits on top of a low block wall) on the 4[redacted] ‘Ālī‘ō Street property lines came off there posts and landed in the dry grass along the length of 4[redacted] ‘Ālī‘ō Street (Figure 4.3.4.2.6) and west (makai) yard of 4[redacted] ‘Ālī‘ō Street (Figure 4.3.4.2.7).

However, neither of these structures ignited from these grass fires that propagated very near the structures.

Under the eaves on the west (makai), north, and east (mauka) of the 4[redacted] ‘Ālī‘ō Street structure, a wide concrete pathway separated the structure from the grass, which provides an ample buffer to keep the grass fire from reaching the structure.

To the south, the grass was very near the wooden portion of the walls and louvered windows, but the fire did not propagate to the structure. Shifts in wind and/or water from a nearby hose may have aided reducing this spread to the structure. In the west (makai) yard of 4[redacted] ‘Ālī‘ō Street, dried grasses ignited, yet islands of unburned grass remained where sprinklers had been set out.

Figure 4.3.4.2.5 Eave and roof damage to the structure at 4[redacted] ‘Ālī‘ō Street.

Figure 4.3.4.2.6 Grass fire to the south of 4[redacted] ‘Ālī‘ō Street appears to have ignited in multiple locations where charred sections of the fence from the 4[redacted]-4[redacted] ‘Ālī‘ō Street property line landed in dry grass. While it propagated near the wooden structure on the southside of 4[redacted] ‘Ālī‘ō Street, it did not transition to the structure.

Figure 4.3.4.2.7 Grass fire in the northwest yard of 4[redacted] ‘Ālī‘ō Street appears to have been ignited where charred sections of the fence from the 4[redacted]-4[redacted] ‘Ālī‘ō Street property line landed in dry grass, which then backed up to the fence and gate connected to the structure. Sprinklers were distributed throughout the yard, including in the center of this section of undamaged grass.

The grassfire appeared to back up toward the gate and spread along the gate toward the house. However, the fence broke off the post because it was weakened through mass loss due to the fire. The fire did not continue to propagate along the fence after this point.

In several of the properties in this cluster, there was some localized ignition of landscaping materials that did not propagate to the structure (Figure 4.3.4.2.8).

A small fire appears to have started at the southwest corner of the front porch on 4[redacted] ‘Ālī‘ō Street. This fire did not propagate from what appears to be a single item ignited despite a number of other combustible materials in the area, possibly aided by a garden hose in the area (Figure 4.3.4.2.10).

Figure 4.3.4.2.8 Localized ignition of landscaping materials in the backyards of (top) 4[redacted] ‘Ālī‘ō Street and (bottom) 4[redacted] Waine‘e Street, including a section of deeply charred dimensional lumber that does not appear connected to any other structures in the immediate vicinity.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.2.9 Viewpoint depicting the area shown in Figures 4.3.4.2.5 through 4.3.4.2.8.

To the south of this cluster of surviving structures, 6[redacted], 6[redacted] and 6[redacted] Kāhili Place were all destroyed by the fire. While the structures along Kāhili Place were located close to the northwest property lines, the surviving structures along Kauaʻula Road had relatively deep backyards, separating the structures from the south property lines (Figure 4.3.4.2.3 and 4.3.4.2.12).

The 7[redacted] and 7[redacted] Kauaʻula Road properties had sheds, outdoor structures/furnishings, and combustible materials in the south yard that were ignited by fires from the south. At 7[redacted] Kauaʻula Road, these exterior fires propagated all the way to under an overhang at the south side of the structure (Figure 4.3.4.2.13).

The south yard fire consumed a portion of the rear deck, some outdoor furnishings, and a number of other belongings located near the exterior of the structure, but the only indication of fire impact on the south side of this structures through radiant heat is melting and deformation of a plastic gutter in the southwest corner.

Figure 4.3.4.2.10 A spot fire near the southwest corner of the 4[redacted] ʻĀlīʻō Street porch was confined to a small area, possibly through water application from the garden hose on the porch. Insert: Viewpoint of 4[redacted] ʻĀlīʻō Street.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.2.11 South Zone—Kaua'ula Road showing the area shown in Figures 4.3.4.2.12 and 4.3.4.2.13.

Figure 4.3.4.2.12 Deep yards to the south of (top) 6[redacted] and (bottom) 7[redacted] Kaua'ula Road separated these surviving structures from destroyed structures to the south. A shed in the southeast corner of 7[redacted] Kaua'ula Road was destroyed, yet this fire did not appear to create thermal damage on the main structure.

Figure 4.3.4.2.13 Exterior fire in the south yard of 7[redacted] Kaua'ula Road destroyed outdoor furnishings and structures up to the corner of the main residential structure. However, these fires did not spread to the south of the residence and appeared to result only in damage to the plastic gutter in the southwest corner.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The west side (makai) of 6[redacted] Kaua‘ula Road is approximately 12 feet from the destroyed structure on 5[redacted] Kaua‘ula Road (Figure 4.3.4.2.16), and suffered heavy thermal damage from radiated heat. The facia was heavily charred on the outer layer, though did not appear to propagate through its thickness or into the roof (Figure 4.3.4.2.14).

Figure 4.3.4.2.14 West (makai) side of 6[redacted] Kaua‘ula Road was severely impacted by radiant heat from the destroyed structure at 5[redacted] Kaua‘ula Road, located 12 feet to the west (makai). Heavy charring was noted in the fascia board at the end of the eave and plastic conduit melted, exposing a penetration through the exterior wall for AC access. Windows and screens on the sliding glass patio door were also damaged. Inset: Viewpoint showing the area depicted in the photographs above.

Figure 4.3.4.2.15 West (makai) side of 6[redacted] Kaua‘ula Road withstood extensive damage to windows, including three (3) casement style windows where frames were severely warped and both panes of glass failed and dropped out of the frame. The interior screen remained in place for all three (3) windows, and appears to have blocked some materials from entering the structure.

An air conditioning unit was heavily damaged along with the conduit around refrigerant lines along and through the structure. This melted plastic component uncovered a penetration through the exterior wall that could provide a pathway for embers that might reach this area. The windows on the west (makai) facing side of 6[redacted] Kaua‘ula Road experienced extensive damage (Figure 4.3.4.2.15).

Two (2) windows in the middle of the structure had both panes of plain glass fail and fall out of the deformed frame. In both cases, the window screens remained intact and appear to have limited the ingress of some debris including some material that appeared hot enough to stick to the screen. These windows and screens were oriented opposite the prevailing wind direction, which may have also provided some level of protection for this opening.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

A wood fence between the two (2) structures was also severely damaged and eventually fell toward 6[redacted] Kauaʻula Road (Figure 4.3.4.2.16).

Several panels of the wood fence between the property line fence and the 6[redacted] Kauaʻula Road structure were destroyed by fire, but the last panel that remained attached to the structure was still largely intact. Had fire continued along this fence, it would have come in direct contact with the structure.

While the walls of this structure are stucco, which would have provided some resistance to direct spread, the fence continues directly below wood eaves on the roof and is closely located near two (2) windows that were already deformed by radiant heat from the destroyed structure on 5[redacted] Kauaʻula Road.

Near this cluster of surviving structures, two (2) additional properties addressed on the 400 block of ʻĀlīʻō Street, were damaged, but survived the fire (Figure 4.3.4.2.17).

4[redacted] ʻĀlīʻō Street sustained radiant heat damage on the north side to the structure eaves and gable vent, along with furnishings, belongings, garbage cans, and a large support beam in the covered parking area (Figure 4.3.4.2.18).

The parking area created a large distance from the destroyed structure at 4[redacted] ʻĀlīʻō Street to the windows in this structure, which showed no visual signs of thermal damage. Much less damage was observed on the south side of the structure, where only softening and deformation of plastic trim around the windows was noted.

The distance between 4[redacted] ʻĀlīʻō Street and the structures to the north and south were similar (approximately 17 feet). However, the structure to the north was two (2) stories, which likely provided more fuel and increased flux to 4[redacted] ʻĀlīʻō Street compared to the single story structure to the south.

Figure 4.3.4.2.16 A wood fence connecting the west (makai) side of 6[redacted] Kauaʻula to the wood fence on the 6[redacted]-5[redacted] property line was destroyed up to the easternmost (mauka) panel that was connected to the structure. Had fire continued along this fence, it could have directly exposed wood eave structure and increased heat flux to the already damaged window immediately south of the fence.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The distance between 4[redacted] ʻĀlīʻō Street and the structures to the north and south were similar (approximately 17 feet). However, the structure to the north was two (2) stories, which likely provided more fuel and increased flux to 4[redacted] ʻĀlīʻō Street compared to the single story structure to the south.

Sprinklers were noted at several locations throughout the property, which may have improved survivability of the structure through increased moisture in the grass and/or protection before/during fire approach to the structure.

There were no visual indications of thermal damage to the west (makai), north, or east sides (mauka) of 4[redacted] ʻĀlīʻō Street, which is situated on a corner lot at the intersection of ʻIlikahi Street and ʻĀlīʻō Street. However, the south exterior wall, proximate to the destroyed structure at 4[redacted] ʻĀlīʻō Street, was severely damaged. Deep charring of wood eaves and siding are noted, along with considerable paint bubbling (Figure 4.3.4.2.19).

Figure 4.3.4.2.17 Surviving structures at 4[redacted] and 4[redacted] ʻĀlīʻō Street, dimensioned from the pre-fire image (top) superimposed on the post-fire image (bottom right). Inset: Viewpoint showing the area depicted in the photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Windows were deeply charred and glass was broken in at least one (1) pane. Four (4) of the sliding glass window assemblies had glass from the fixed sash fall completely out of the frame (moving sash may have been partially protected by a screen that was present between the destroyed structure and the window).

A window treatment in a bedroom and outdoor lamp in the garage showed signs of deformation due to heating, but no interior materials appeared to have ignited. The timing of these window failures relative to other structure fires in the area and shifting winds all impacted the relative risk created by these openings.

Figure 4.3.4.2.18 Radiant heat damage to the structure and household belongings at 4[redacted] ʻĀlīʻō Street was noted primarily on the north side.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

These large openings in the building envelope would have provided relatively easy access for embers to enter and accumulate inside this structure if enough energetic materials were transported to this area after the windows failed.

Figure 4.3.4.2.19 Radiant heat damage to the structure at 4[redacted] ‘Ālī‘ō Street was noted only on the south side. Windows were severely damaged across the entire exterior wall, including four (4) windows where both panes failed and/or sashes fell out. Window screens over the sliding sash were less damaged than the fixed sashed with no screens.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Typical openings in buildings for entrance/egress (doors), venting of living spaces (windows), and venting of attic/roof spaces can provide a route for embers and/or flames to enter a structure if they are not appropriately closed or covered.

The orientation of windows and doors (open, closed, ajar) or roof/attic venting (screened or unscreened) for the destroyed structures cannot be determined after the fire.

However, in the post-fire analysis, the condition of some window openings in surviving structures that could provide a route for entry through open/broken glass and/or screens were noted. For the examples shown in Figure 4.3.4.2.20, these openings were facing structures that also survived, which would likely result in a lower radiant heat and ember exposure than if oriented upwind from destroyed structures.

Figure 4.3.4.2.20 Examples of open/broken windows and/or screens in this cluster of surviving homes.

4.3.4.3 300 Block of Front Street

The 300 block of Front Street primarily features residential homes (Figure 4.3.4.3.1). Two (2) structures (3[redacted] and 3[redacted] Front Street) on the west (makai) side of this section of the block, south of Kaua‘ula Road, survived (Figure 4.3.4.3.2).

Figure 4.3.4.2.20 Examples of open/broken windows and/or screens in this cluster of surviving homes. *(Figure 4.3.4.3.1 continues on page 254.)*

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.3.1 Surviving structures at 3[redacted] and 3[redacted] Front Street, including approximate separation distances determined from pre-fire images (left), which were superimposed on post-fire images (right).

Figure 4.3.4.3.2 Damage classification assessment map of analysis area.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Both 3[redacted] Front Street (built 1953) and 3[redacted] Front Street (built 1981) were constructed with wood siding over framed construction and a composite shingle roof. Other structures on this block were built between 1933 and 2016, most of which were frame constructed with wood or stucco exterior, though one structure was masonry.

Civilian video and emergency responder reports described in the Phase One report are limited with respect to this area of Lahaina. The timeline of events described for the 400 block of Front Street in section 4.3.4.1 also encompasses this group of houses just to the south.

The fire likely impacted the 300 block of Front Street from the north and south through structure-to-structure fire spread.

As the fire continued to spread south, radiant heating and embers from burning structures east (mauka) of Front Street would likely have impacted these structures through prevailing easterly (mauka) winds. They were also at risk for impact from smoldering and/or flaming fires and potential embers produced from vegetation along the beach at the western edge (makai) of 3[redacted] Front Street.

The post-fire damage assessment documented the impact of winds that resulted in damage to the roof of the main and secondary structure on 3[redacted] Front Street (Figures 4.3.4.3.3 and 4.3.4.3.4).

The heaviest wind damage was noted on the east (mauka)-northeast facing aspects of the roof on the primary structure and southeast facing aspects of the roof on the secondary structure. Much of the displaced roofing material was located in the west (makai) yard of this property. This damage is consistent with strong winds from the east (mauka).

Figure 4.3.4.3.3 Strong winds removed shingles and tar paper from the roof of 3[redacted] Front Street (top) and deposited much of this material in the west (makai) rear yard (middle).

The destroyed structures at 3[redacted] Front Street are the closest buildings to both 3[redacted] and 3[redacted] Front Street. Portions of 3[redacted] Front Street were 35 to 52 feet from 3[redacted] Front Street. The main residence and structure by the pool at 3[redacted] Front Street were ~54 feet and ~17 feet, respectively, from 3[redacted] Front Street (Figure 4.3.4.3.1).

Dense, tall, and lush vegetation was planted between these structures along a block half wall (Figure 4.3.4.3.4 - 4.3.4.3.5). The vegetation likely aided in shielding 3[redacted] Front Street from some of the radiant energy from the fire at 3[redacted] Front Street, while also blocking some of the airborne embers. The block half wall would have also reduced these mechanisms of fire spread, particularly for embers moving along the ground under the force of wind.

Figure 4.3.4.3.4 Tall, lush vegetation was planted along block walls on either side of the driveway to 3[redacted] Front Street, which may have provided protection to the 3[redacted] and 3[redacted] Front Street lots. The block wall south of 385 Front Street also influenced the ember movement. Note pile up in corner of wall (bottom left) and wind driven burn scar in grass around the wall toward the front of the structure showing the likely path of ground based embers deflected towards the north and away from the open garage (bottom right).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Immediately to the north of 3[redacted] Front Street, the structures at 3[redacted] Front Street were completely destroyed. The main portion of the structure on 3[redacted] Front Street was more than 55 feet from the 3[redacted] Front Street. Despite being a longer distance than the destroyed structure to the south, the radiant heat exposure on the north side of 3[redacted] Front Street was sufficient to crack the glass in several windows and deform portions of the vinyl window frame material.

In all cases, it appears that only the outer pane of the windows were cracked and the inner pane remained intact (Figure 4.3.4.3.6). Paint on the wood siding was bubbled in a few locations, but no thermal damage was visible on the roof.

A wooden fence running perpendicular from the property line wall/fence to 3[redacted] Front Street was heavily damaged in the fire (Figure 4.3.4.3.7). A portion of the northmost panel was consumed and could have provided a pathway for fire propagation between structures. However, the fence became dislodged and came off the next support post.

There were no obvious signs that this fence panel was forcibly removed by human intervention. However, this possibility cannot be ruled out at this time. In previously published wildfire investigations, it has been shown that combustible fences can act as a "wick," allowing fire to travel between different structures or between structures and nearby vegetation.[260]

This displaced fence panel may have interrupted the fire spreading from the north to 3[redacted] Front Street.

Figure 4.3.4.3.5 The east (mauka) facing exterior wall of 3[redacted] Front Street did not have any indication of radiant heat damage and there were relatively limited signs of embers along the ground. Tall, lush vegetation plated along a block half-wall between 3[redacted] and 3[redacted] Front Street was still standing, including some plants that remained green at the time of the post-fire analysis. Inset: Viewpoint showing the area depicted in the photographs above.

Figure 4.3.4.3.6 Window damage along the north wall of 3[redacted] Front Street.

Figure 4.3.4.3.7 Burnt, charred, and broken wooden fence from the 3[redacted]-3[redacted] Front Street property line directly connected to the structure at 3[redacted] Front Street. Wooden fences can act as a "wick," carrying fire from one structure to the next. The northernmost panel was disconnected from the rest of the fence, removing this mechanism of fire spread.

A wooden fence that physically connected the 3[redacted] Front Street property line and the exterior wall of the 3[redacted] Front Street structure also appeared to have been ignited by embers that landed in the dead leaves near the block half-wall base. While several pickets and rails were consumed in this spot fire, the support post for the gate appears to have been broken off and leaned against the structure.

As discussed above, wooden fences have been shown to provide a pathway for fire to spread along a continuous fuel to a structure, so the physical break provided by removing this gate from the path likely interrupted this mechanism of fire spreading to 3[redacted] Front Street (Figure 4.3.4.3.8).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Based on inspection of the physical damage to the post, the orientation of the gate and fence, and the char marks on the portion of the post remaining in the ground, it is likely the broken support post was caused by the gate being forced open while burning or smoldering was occurring in the area.

If an individual (emergency responder, resident, or passer-by) were present to force this gate open, they may have conducted other defensive actions to mitigate the risk to this property. While this possibility cannot be ruled out, at the time of this report, there are no confirmed reports of such activities.

Embers with enough energy to char the lawn were notably present in the front and side yards of 3[redacted] Front Street. Several areas of scorched grass were noted in the yard to the east (mauka) of the structure, inside the front block half wall (Figure 4.3.4.3.9).

Burned areas appeared to be typically located closer to the east (mauka) and north wall and northeast corner, though there was one (1) spot very near the southeast corner of the structure that did not spread to the residence.

Accumulation of embers was also found in the open garage and side yard between the garage and block wall between this property and the driveway to 3[redacted] Front Street (Figure 4.3.4.3.10). Embers collected in these areas did not have enough energy to ignite the combustibles present and eventually cooled down or burnt out.

Figure 4.3.4.3.8 Gate and post moved away from burning fence pickets that interrupted the continuous wooden fuel from the 3[redacted]-3[redacted] property line to the east (mauka) wall of 3[redacted] Front Street. The charred end of the post remaining in the ground is indicated by the red arrow in the bottom right image.

The block wall between the entrance to the 3[redacted] Front Street driveway and 3[redacted] Front Street east (mauka) yard (Figure 4.3.4.3.11) may have played an important role in reducing some of the ember accumulation in the open garage and under the primary structure.

There is evidence of embers piling up in the corner of this wall and those that went around the wall were deflected toward the north (Figure 4.3.4.3.11).

The foundation of the residential structure at 3[redacted] Front Street is elevated from ground level, allowing access to the underside of the structure from three (3) sides. However, the east (mauka) yard is higher than on the others, limiting access to the underside of the structure from the address (front) side oriented towards the prevailing wind direction (Figure 4.3.4.3.11).

If enough embers could pile up and come into contact with a receptive fuel bed, such as dried leaves and vegetation, a spot fire could ignite under the house.

For this structure, it is possible that the block walls and elevated east (mauka) yard limited ember accumulation (and accumulation of a receptive fuel bed) under the residence. However, this mechanism of fire spread may have been present in other similar structures with different orientation relative to ember spread or different protection provided by landscaping.

Figure 4.3.4.3.9 Multiple burn scars on grass in the east (mauka) yard of 3[redacted] Front Street, particularly along the east (mauka) and north block half wall. One (1) spot formed near the southeast corner of the residence (bottom right), but did not extend to the structure.

Figure 4.3.4.3.10 Embers accumulated in both the side yard and open garage area but did not have enough energy (individually or accumulated) to create sustained ignition of combustibles. There are some indications of localized burning/melting, such as a tine on the plastic rake, but these did not spread.

Figure 4.3.4.3.11 Vegetation fire to the west (makai) of 3[redacted] Front, largely confined west (makai) of the low block wall at the edge of the grass yard.

These two structures were adjacent to the coast with no structures to the west (makai). However, vegetation between the structures and the beach was involved in the fire. In particular, vegetation west (makai) of 3[redacted] Front Street was ignited and largely consumed (Figure 4.3.4.3.11).

The low block wall to the west (makai) of 3[redacted] Front Street appears to have provided an effective buffer between this vegetation fire and the west (makai) yard of this structure.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.4.1 Post-fire aerial imagery (captured August 13, 2023) of the north (top) and central (bottom) sections of Puamana community in southern Lahaina.

4.3.4.4 Puamana Community

The Puamana neighborhood is bordered by Hwy-30 to the east (mauka), by Front Street to the north (as it turns mauka to intersect with Hwy-30), and the Pacific Ocean mauka and to the south (Figure 4.3.4.4.1).

Structures in the Puamana community consist of multifamily dwellings and open parking structures (roof and supports only). Within the community, there is a transition from destroyed to undestroyed structures (Figure 4.3.4.4.2). Residential structures contain between two (2) and six (6) housing units, with two (2) and four (4) unit structures being the most common (Figure 4.3.4.4.3).

Nearly all units in the community were built between 1968 and 1973, though 1[redacted] Pualei Drive was constructed in 1985. All structures were frame constructed with cast walls, plywood exterior siding, and wood shake roof shingles. For several structures, a cast wall was also present as an exterior wall.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The Puamana community was impacted in the early morning hours of August 8, 2023, with multiple reports of downed utility infrastructure due to strong winds.

As described in the Phase One report, Hawaiian Electric received a report from the MPD at approximately 05:51 on August 8, 2023, that a stretch of poles fell onto Hwy-30 south of Lahaina near Hōkiokio Place. The MPD reported several more poles down in this location at approximately 06:13.

Hawaiian Electric personnel observed eight (8) poles down in the Puamana area by Hwy-30, south of Hōkiokio Place, around 09:45. These poles were located some distance away from the highway and were not blocking traffic flow.

As late as 18:28, a civilian photo taken from Pualei Drive shows continued strong winds blowing palm tree fronds westward-makai (Phase One report Figure 4.3.1.21).

Figure 4.3.4.4.2 Damage classification assessment map of the Puamana Community analysis area.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Hawaiian Electric personnel observed eight (8) poles down in the Puamana area by Hwy-30, south of Hōkiokio Place, around 09:45. These poles were located some distance away from the highway and were not blocking traffic flow.

As late as 18:28, a civilian photo taken from Pualei Drive shows continued strong winds blowing palm tree fronds westward-makai (Phase One report Figure 4.3.1.21).

The post-fire damage assessment in Puamana documented the impact of winds that resulted in uprooting of several trees in this area, with the fallen trees most often oriented westward (makai) or northwestward (Figure 4.3.4.4.4).

Additionally, roof damage to 1[redacted] Pualei Drive appears on a southeasterly facing (mauka) ridge that would have been impacted by easterly (mauka) winds (Figure 4.3.4.4.5). However, at least one (1) tree near 1[redacted] Pualei Drive fell oriented toward the southeast, possibly impacted by varying wind direction and velocity. The relative timing of the tree damage and the fire reaching Puamana has not been established.

Based on the evidence available, the fire likely impacted the Puamana community from the north through structure-to-structure spread, as well as through dry vegetation along roadways and from the east (mauka) from embers created by south flank vegetation fire along and to the east (mauka) of Hwy-30.

At 18:28, civilian video showed heavy smoke moving east (mauka) to west (makai) north of the community (Phase One report, Figure 4.3.1.21), though it appears fire had not yet impacted structures in this area.

Figure 4.3.4.4.3 Example construction features of Puamana community built between 1968 and 1973.

By 21:01, MPD Officer 4B30 advised the fire was within 200 yards of Hōkiokio Place. MPD Officer W2 advised the fire had jumped Hōkiokio Place at 22:29, and Command assigned MFD unit E11 and a private tanker to take the Lahaina Bypass and check on the status of Hōkiokio Place.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.4.4 Trees downed by wind facing west (makai)-northwest in the vicinity of 6[redacted] and 7[redacted] Puakukui Place. Red arrows identify the approximate location and orientation of fallen trees. The overview image (top left) is oriented with north facing towards the bottom. Inset: Viewpoint showing the area depicted in the photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

At 22:41, E11 advised Command the fire had jumped Hōkiokio Place and was making its way west (makai) toward Puamana. E11 reported the tanker needed to refill at Hōkiokio Road and E11 would advise further. The location of this transmission (Phase One report, Figure 4.3.1.40) roughly coincides with the end of the charred grass on the bank east (mauka) of Mill Street (Figure 4.3.4.4.1) and the fenceline fire west (makai) of Hwy-30, which was impacting Puamana.

At 23:01, MPD Officer 4B30 advised the fire was moving slowly south and was nearing Puamana. At approximately 00:49 on August 9, 2023, officers advised the fire had now moved eastbound (mauka) of the Lahaina Bypass.

North of Kaua‘ula Stream (the concrete drainage just south of, and roughly parallel to, Puapake Place from Hwy-30 to the ocean), there were three (3) residential structures in this community that were not destroyed. North of Puamana, from ‘Aholo to Front Street, all structures between Hwy-30 and the ocean were destroyed—except one (1) relatively isolated structure at 2[redacted] Front Street.

Figure 4.3.4.4.5 Wind damage in the vicinity of 1[redacted] Pualei Drive, including east-facing (mauka) corner of roof on to 1[redacted] Pualei Drive, a tree downed by wind facing south-southeast (middle left), and a tree facing west (makai)-southwest located to the south of 1[redacted] Pualei Drive (middle, right). Red arrows identify the approximate location and orientation of fallen trees. Inset: Viewpoint showing the area depicted in the photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The northernmost surviving structure in Puamana—3[redacted] Pualoke Place—is next to a sweeping 90-degree corner of Front Street, providing a long distance from the destroyed structures to the northeast (Figure 4.3.4.4.6).

There is also lush vegetation along Front Street that may have provided some shielding from radiant heat and absorption of energy through dehydration (Figure 4.3.4.4.7).

This surviving structure is also immediately adjacent to the destroyed structure at 2[redacted] Front Street. There was no apparent damage from radiation heat to 3[redacted] Pualoke Place, most likely due in some part to the tall, leafy vegetation standing between the two (2) structures (Figure 4.3.4.4.7).

The grass surrounding 3[redacted] Pualoke Place was also green and healthy, preventing the fire from spreading along the ground. The westernmost (makai) corner of this structure does not have any apparent radiant heat damage from the other adjacent destroyed structure at 3[redacted] Pualoke Place.

Figure 4.3.4.4.6 Three (3) surviving structures in the north part of Puamana (3[redacted], 4[redacted], and 5[redacted] Pualoke Place).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

The rear porches of 3[redacted] Pualoke Place had notable deposition of soot, ash, and burned particles/embers that self-extinguished. These materials were not energetic enough to ignite the combustibles present on the porches (outdoor furnishings, decorations, dry leaves, etc).

The westernmost (makai) surviving structures in the Puamana community—4[redacted] and 5[redacted] Pualoke Place—are immediately west (makai) and across from destroyed structures at 3[redacted] and 5[redacted] Pualoke Place. The width of Pualoke Place and a parking structure near the homes appear to have reduced any radiant heat from the west (makai), as there is no apparent radiant heat damage on this side of the structures.

However, the north end of 4[redacted] Pualoke Place (unit 4[redacted]) was heavily damaged by radiant heat from the destroyed 3[redacted] Pualoke Place, including bubbling of paint on the first and second floor and melted gutters and plastic vent covers on the second floor (Figure 4.3.4.4.8).

There was also extensive damage to windows (glass cracking, frame warping) on the north side of the structure, including a large double pane (plain glass) window on the northwest corner that fell out from the frame. The vertical blinds inside this window appeared to have some warping possibly due to radiant heat, but they remained intact without charring.

Very little soot was noted inside this window. Prevailing winds were typically easterly (off-shore), so this opening may not have been in the path to receive embers from 3[redacted] Pualoke Place or other structures/vegetation fires further east (mauka).

The tree standing to the east (mauka) of unit 4[redacted] is deeply charred on several west (makai) and southwest aspects of large branches (Figure 4.3.4.4.8, top left), which is likely from embers blown into fissures, openings, or scars. This damage suggests embers with enough energy to create a smoldering fire in wood were present in this area.

Figure 4.3.4.4.7 Vegetation surrounding 3[redacted] Pualoke Place, including address-side view showing vegetation along Front Street (to the right of the structure) and rear view showing standing leafy vegetation immediately behind the rear porches of the surviving structure.

All residential structures between Pualoke Place and Kauaʻula Stream and west (makai) of Hwy-30 were destroyed. The concrete drainage may have helped limit additional spread from the north, particularly for structures southwest (makai) of Pualei Drive (Figure 4.3.4.4.9).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.4.8 Damage to the north end of 4[redacted] Pualoke Place immediately adjacent to the destroyed structure at 3[redacted] Pualoke Place. A tree to the east (mauka) of the structure sustained deep charring, likely from embers gathering in cracks, fissures, or scars in the tree bark (top left). Window damage on the north structure wall (top right) ranges from single pane cracking to vinyl frame warping (middle left) to complete pane fallout (middle center). Plastic vent cover and gutters melted and fell. Paint bubbled and peeled across most of the surface. No apparent indication of charring or damage to wood shake roofing materials or wood wall substrate (top right and middle right). Grass remained green between the destroyed and damaged structure. Garden hose noted at the corner of the structure (bottom left). Inset: Viewpoint showing area shown in the photographs above.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

South and east of Kauaʻula Stream, a vegetation fire in the brush and duff surrounding a fenceline along Hwy-30 likely contributed to the destruction of structures to the northeast of Pualei Drive (Figure 4.3.4.4.10).

Figure 4.3.4.4.9 Kauaʻula Stream running through Puamana provided a physical separation between the northern section (where structures were destroyed between Hwy-30 and the coast) and the rest of the community (where destroyed structures were limited to the area between Hwy-30 and Pualei Drive).

Extensive burning and charring is noted in the vegetation between Puakukui Place and Hwy-30 all the way to the location where Pualei Drive shifts east (mauka) and then runs adjacent to Hwy-30. At this location east (mauka) of Mill Street, the charred grass also appears to terminate, possibly due to either water application from the E11 with the private tanker and/or shifting winds.

The underbrush appears more completely consumed farther north (closer to Kauaʻula Stream), likely due to a combination of longer burn times as the fire moved south, as well as radiant heat from consumed structures across Puakukui Place. Structure numbers 2[redacted], 4[redacted], 5[redacted], and 6[redacted], all of which were immediately adjacent to the fenceline or across Puakukui Place from the fenceline, were destroyed. 7[redacted] Puakukui Place, along with 1[redacted] and 1[redacted] Pualei Drive, were also separated from the fenceline by Puakukui Place, but did not ignite. Spot fires in light fuels on the west (makai) side of the road and parking structures did ignite in a few locations, but did not continue to these structures (Figure 4.3.4.4.11).

Figure 4.3.4.4.10 Images along Hwy-30 and Mill Street indicating the southern termination of the grass fire on the bank east (mauka) of Mill Street coincides with the southern end of damaged vegetation along fence line west (makai) of Hwy-30. Approximate location of E11 radio transmission at 22:41 roughly coincides with this area (See Phase One report, Figure 4.3.1.40). Yellow siren provides a common orientation in each picture. Vegetation appears more heavily consumed around the drainage but remains more dense (yet damaged) further south until this transition to green foliage.

Along the northeast side of Pualei Drive, structures 9[redacted], 1[redacted], and 1[redacted] did not sustain any damage despite their proximity to the destroyed structures along Puakukui Place. A relatively large open field, pool, and pool house between the structures resulted in limited radiant heat damage to the east (mauka) side of the surviving buildings. The northeast exterior wall of 8[redacted] Pualei Drive was impacted by radiant heat from the destroyed structure across Puakukui Place that was approximately 40 feet (compared to more than 100 feet to 4[redacted] Puakukui to the east).

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.4.11 Spotting across Puakukui Place in front of structures (top left) 1[redacted] and (top right) 1[redacted]. Embers found a receptive fuel bed to ignite, but not sustain burning through the green grass. Inset: Viewpoint showing above images.

1[redacted] Pualei Drive is the southernmost structure destroyed in Puamana (Figure 4.3.4.4.12). While, structures immediately adjacent to the north, west (makai), and south were not destroyed, 1[redacted] Pualei Drive (northwest) received extensive thermal radiation damage, including bubbled paint, melted plastic conduit and vent covers (some vent covers fell off), and broken windows (Figure 4.3.4.4.13).

One (1) broken window was boarded up prior to documentation, so someone had accessed the area prior to the analysis. For the windows that were visible, at least one pane of the double pane windows remained intact. Horizontal blinds behind some of these windows appear warped, possibly due to radiant heating, though no charing/melting was noted behind the window.

1[redacted] Pualei Drive is situated closer to the destroyed structure than 1[redacted] Pualei Drive, but radiant heat damage on this structure was limited to paint bubbling with no visible damage to windows or other components. This difference in damage between the two (2) nearby structures may suggest the wind at the time that 1[redacted] Pualei Drive was burning may have directed flames more toward the northwest than south or that more fuel was present in the northern part of the structure than the south.

4.3.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.4.4.12 1[redacted] Pualei Drive is the farthest south structure destroyed in Puamana. It is bounded by 1[redacted] Pualei Drive to the northwest and 1[redacted] Pualei Drive to the south and parking structures to the west (makai). Inset: Viewpoint shows the area appearing in the photograph above.

Figure 4.3.4.4.13 Radiant heating damage on the southeast side of 1[redacted] Pualei Drive. Window damage includes cracking and drop out of some panes, melting and deformation of frames and screens, and potentially deformation of blinds behind windows due to transmitted radiant heating. Damage was noted to plastic vent covers and charring of fascia board on the end of the roof line. Inset: Viewpoint showing the area depicted in the photographs above.

As described earlier, the orientation of windows and doors or roof/attic venting for the destroyed structures in Puamana cannot be definitively determined in the post-fire analysis. However, images collected from the surviving structure shows some windows may have been left partially open. For example, a louvered window was found partially open with debris and ash build up, but a screen was in place that appeared to keep the material from entering the structure (Figure 4.3.4.4.14).

Other windows through this community were found open or potentially broken, though it is possible these were opened after the fire but prior to images being collected (Figure 4.3.4.4.15). Several of these windows did not have screens behind them, which if left open, would have allowed direct entry of embers that may impact the structures if they were present at this orientation.

Figure 4.3.4.4.14 Louvered windows left partially ajar where debris collected, including charred remains of possible embers. An intact screen behind this window kept these materials from entering the structure and possibly igniting interior contents.

Figure 4.3.4.4.15 Examples of open/broken windows on surviving structures in Puamana.

4.3.5 North Zone

The North zone boundary is the incident area north of Kahoma Stream (Figure 4.3.2.1). Within the North zone, three (3) areas of interest were identified for further analysis:

- Lahaina Business Park—adjacent to Kahoma Stream and east (mauka) of Kuhua Street
- Keawe Street Apartments at the Villages of Leialiʻi Construction Site and surrounding neighborhood
- Northern-most damaged and destroyed buildings in the zone.

4.3.5.1 Lahaina Business Park

The Lahaina Business Park is a mixed-use, commercial complex that sits in a loop created by Kupuohi Street and Ulupono Street (Figure 4.3.5.1.1). Access to the business park is from Keawe Street on the northwest corner of the loop. Kuhua Street borders the west side (makai) and Kahoma Stream runs the entire southern boundary of the park.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

On the east (mauka) and north sides of the park is an undeveloped open field consisting of unmanaged vegetation (buffelgrass and haole koa). Three (3) structures were destroyed (Figure 4.3.4.1.2) in addition to numerous vehicles and adjacent fuels.

The business park comprises many businesses, including a gas station, grocery store, church, warehouses, an adventure park, liquor store, numerous retail stores, and a newer apartment building (Kaiāulu o Kupuohi apartment complex). The apartment complex, located on the east side (mauka) of the park, was five (5) stories high with

Figure 4.3.5.1.1 Post-fire aerial imagery of Lahaina Business Park.

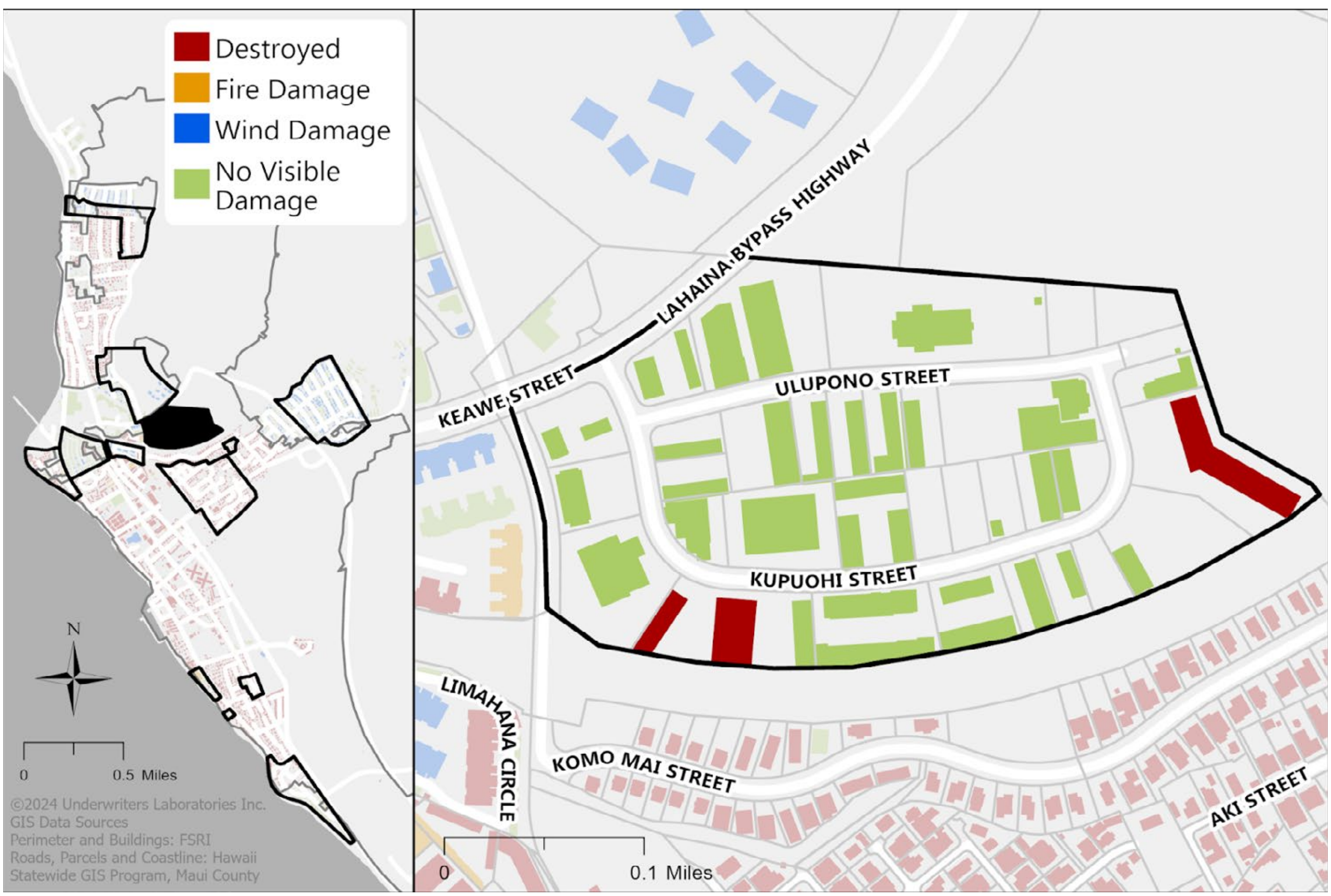


Figure 4.3.5.1.2 Damage classification assessment map of the Lahaina Business Park analysis area.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

89 apartments (Figure 4.3.5.1.3). The apartment complex and two commercial structures were destroyed by the fire.

The first evidence of the fire impacting the business park occurred at 16:43 on August 8, 2023, when Command advised E11 of a vacant lot on fire in the business park, exposing the warehouses (Figure 4.3.5.1.4). E11 had egressed down Komo Mai Street, where the fire was engulfing homes on the west (makai) end of the street, and was looking for a defensive position to slow the spread of the fire.

They relocated into the business park and began to extinguish the grass fires adjacent to 2[redacted] Kupuohi Street (Figure 4.3.5.1.5 and 4.3.1.6).

Figure 4.3.5.1.3 Kaiāulu o Kupuohi Apartment complex prior to the August 8, 2023, fire (Source: https://www.civilbeat.org/2024/04/a-low-income-housing-complex-is-ready-to-rebuild-after-lahaina-fire-it-just-needs-36m/)

Figure 4.3.5.1.4 Grasses burned looking east (mauka) toward the Kaiāulu o Kupuohi Apartment complex.

Figure 4.3.5.1.5 Grasses burned along Kahoma Stream and behind 2[redacted] Kupuohi Street (Tamura's Fine Wine & Liquors).

Figure 4.3.5.1.6 Grass lot burned at 2[redacted] Kupuohi Street, one of the first fires reported on the north side of Kahoma Stream.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

At 17:22:25, MPD Officer 4SA2 radioed, “Island Grocery Depot, rear area catching on fire, towards Minit Stop gas station, and 1[redacted] Kupuohi Street, truck fully engulfed.” RE11 was also in this area and extinguished a brush fire to the rear of 4[redacted] Kupuohi Street (Figure 4.3.5.1.7). The fire was stopped at the rear of where 4[redacted] Kupuohi Street and the Minit Stop building come together.

At 17:41:56, MPD officer 4SA2 notified Central of a vehicle engulfed in fire in the parking lot of 1[redacted] Kupuohi Street (Figure 4.3.5.1.8 and Figure 4.3.5.1.9).

Between 19:13:30 and 20:00:09, RE1 advised Command there was an “ember wash” (airborne and ground traveling embers) exposing the Island Grocery Depot and a warehouse in the area. Unit E11 was fighting a truck fire next to the warehouses on Kupuohi Street. E3 attempted to engage the fire near the Church of Jesus Christ of Latter-day Saints building at 8[redacted] Ulupono Street (Figures 4.3.5.1.10, 4.3.5.1.11, and 4.3.5.1.12).

Figure 4.3.5.1.8 Trailer and building materials ignited by embers (1[redacted] Kupuohi Street).

Figure 4.3.5.1.9 Vehicles consumed by fire in the parking lot of 1[redacted] Kupuohi Street.

Figure 4.3.5.1.7 Location where the brush fire spread stopped behind 4[redacted] Kupuohi Street.

Figure 4.3.5.1.10 Large spot fire west (makai) of the church (8[redacted] Ulupono Street).

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

By 20:00, the visibility in the area of the business park had worsened and units began to reposition to extinguish the fire that was now spreading in the brush toward Keawe Street and the Lahaina Bypass.

Several factors led to many of the buildings in the Lahaina Business Park surviving the fire. First, during the initial few hours of the fire the business park was not in the primary direction of fire spread. Secondly, the park was separated from the original fire neighborhood by the Kahoma Stream (an 80-foot wide concrete waterway with a 20-foot gravel road on either side).

The business park was also elevated above Kahoma Stream with a concrete wall, running short lengths on both banks of the stream. There was dry vegetation along this wall, which may have contributed to the fire extending up into other brush areas in the business park.

Thirdly, the building construction consisted of mostly metal roof buildings with metal or concrete walls. Lastly, there was no direct flame spread or radiation hazards across the long distance of the stream. The only mechanism to spread fire to these structures was embers transport. The presence of MFD units in this area allowed them to control the fire's size north of Kahoma Stream, which, in turn, diminished the amount of embers that traveled downwind, limiting their ability to ignite other structures.

This activity allowed MFD units to suppress numerous spot, vehicle, building material, and structure fires before they spread (Figures 4.3.5.1.13, 4.3.5.1.14, 4.3.5.1.15, 4.3.5.1.16, 4.3.5.1.17, 4.3.5.1.18, and 4.3.5.1.19).

Figure 4.3.5.1.11 Vehicles consumed by fire west (makai) of the church (8[redacted] Ulupono Street).

Figure 4.3.5.1.12 Additional vehicles consumed by fire west (makai) of the church (8[redacted] Ulupono Street).

Figure 4.3.5.1.13 Materials storage area burned by embers (1[redacted] Kupuohi Street).

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.5.1.14 Materials storage area burned by embers (1[redacted] Kupuohi Street).

Figure 4.3.5.1.15 Dumpster fire to the west (makai) of 2[redacted] Kupuohi Street.

Figure 4.3.5.1.16 Box truck consumed by fire behind 1[redacted] Kupuohi Street.

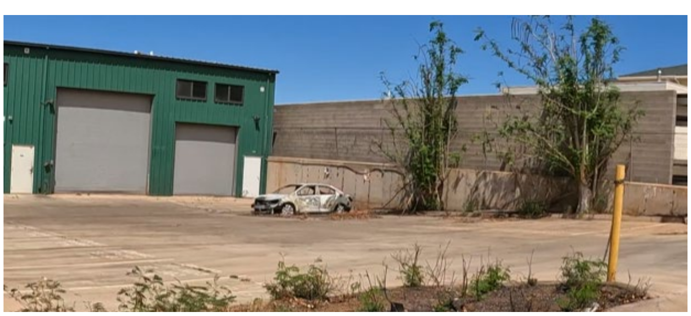


Figure 4.3.5.1.17 Car consumed by fire next to 2[redacted] Kupuohi Street..

Figure 4.3.5.1.18 Vehicles consumed by fire in the middle of Emerald Plaza Place (near 1[redacted] Kupuohi Street).

Figure 4.3.5.1.19 Van consumed by fire with thermal damage to 1[redacted] Kupuohi Street.

The two (2) warehouse buildings that burned (Figure 4.3.5.1.20 and Figure 4.3.5.1.21) had several open vents that may have allowed embers to enter the structure and ignite combustible materials. These buildings were also on the southwestern edge of the business park where large wind-borne plumes of embers likely traveled from nearby engulfed homes on the other side of the Kahoma Stream.

The ignition of the Kaiāulu o Kupuohi apartment complex (Figure 4.3.5.1.22) and the vehicle lot on the northeast corner of the business park (Figure 4.3.5.1.23) began later in the incident. There were no reports of the building or vehicle fires on MPD or MFD radio, so they likely ignited between the time units evacuated north of the Lahaina Civic Center and the following morning.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.5.1.20 Emerald Plaza Building A consumed by fire.

The first known resident video of the apartment complex on fire was recorded at 05:35 on August 9, 2023. At this time, the north wing of the building was on fire. The fire spread to the south and completely destroyed the structure within two (2) days, according to news reports (Figure 4.3.5.1.24).

Figure 4.3.5.1.21 Emerald Plaza Building B and C consumed by fire.

Figure 4.3.5.1.23 Lot of vehicles consumed by fire in the northeast corner of the business park.

Figure 4.3.5.1.22 Kaiāulu o Kupuohi Apartment complex consumed by fire.

Figure 4.3.5.1.24 Kaiāulu o Kupuohi Apartment complex continuing to burn following the August 8, 2023, fire.[261]

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.5.2 Keawe Street Apartments at the Villages of Leialiʻi Construction Site and surrounding neighborhood

The Keawe Street Apartments at the Villages of Leialiʻi construction site is an approximately 50-acre construction site near Keawe Street and the Lahaina Bypass (Figure 4.3.5.2.1). Keawe Street borders the south end of the construction site and Oil Road borders the west side (makai).

Just west (makai) of Oil Road are residential homes from Keawe Street, north to Kahoma Street (Figure 4.3.5.2.2). Undeveloped open fields consisting of unmanaged vegetation (buffelgrass and haole koa) are situated on the east (mauka) and north sides of the construction site.

Figure 4.3.5.2.1 Post-fire aerial imagery of the Keawe Street Apartments at the Villages of Leialiʻi construction site and surrounding neighborhood.

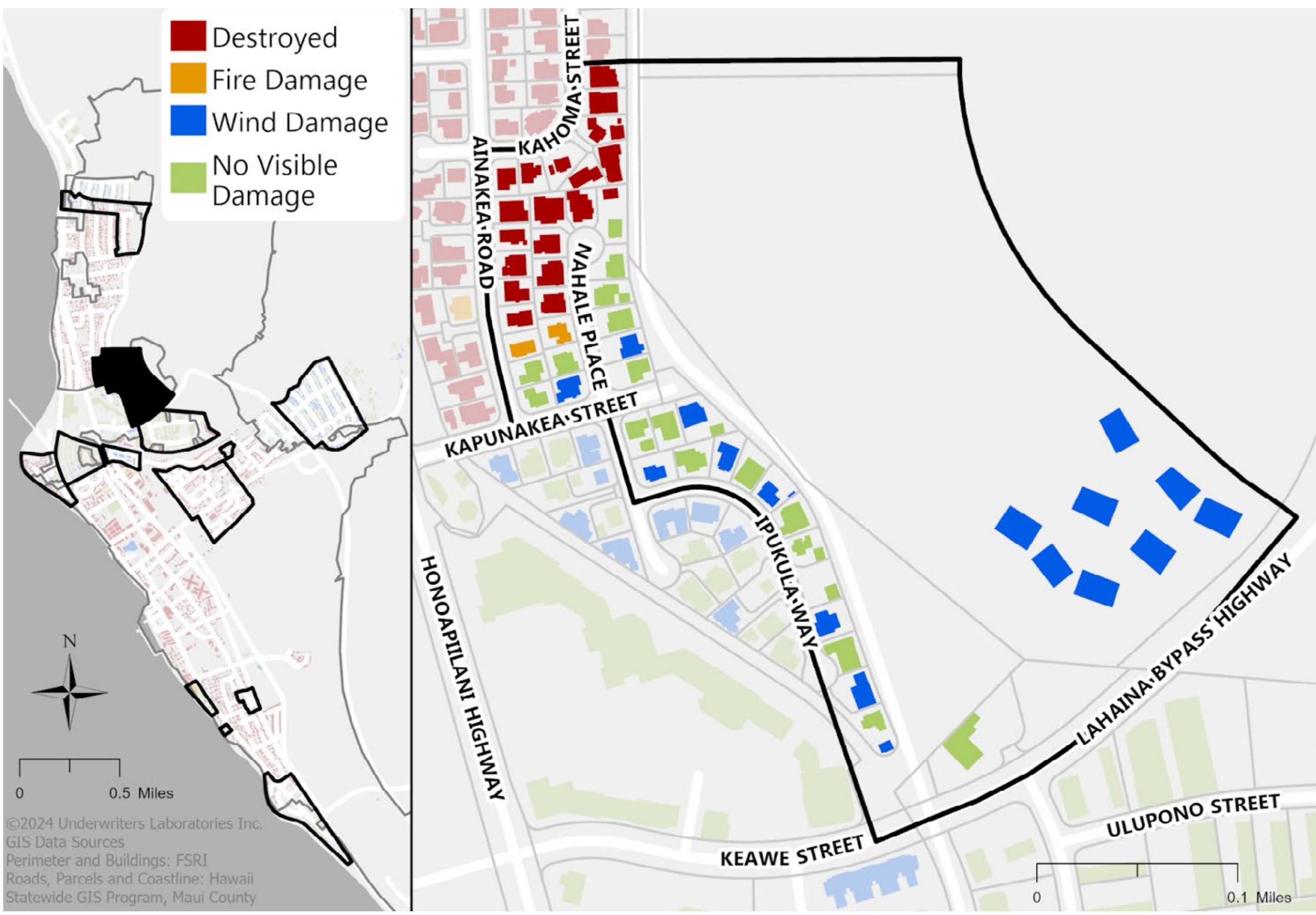


Figure 4.3.5.2.2 Damage classification assessment map of the Keawe Street Apartments at the Villages of Leialiʻi analysis area.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

The entire construction site had been cleared to mineral soil prior to the fire. Eight (8) apartment buildings were in some state of construction prior to August 8, 2023, with two (2) concrete foundations completed and several others were being prepared. High winds impacted the construction site, resulting in notable wind damage (Figure 4.3.5.2.3), but there was no observable fire damage.

Grasses had been removed to make way for the construction, creating a fuel break that offered some protection to nearby homes, the Lahaina Gateway Shopping Center located west (makai) of the homes, and the Cannery Mall located further west (makai) (Figure 4.3.5.2.4 and 4.3.5.2.5). The Cannery Mall was an important refuge area for civilians, firefighters, and police officers during the fire.

Without this fire break, the fire department would have been challenged to keep the fire from spreading into homes and the shopping centers located to the west (makai).

Around 20:00 on August 8, 2023, the fire had spread over the area surrounding Kahoma Stream and into the grasses east (mauka) of Lahaina Business Park. It also began to spread over the Lahaina Bypass and Keawe Street, heading north. MFD units were able to extinguish the fire spread between the Lahaina Business Park and the construction site, but the fire was still able to spread to the north along the east side (mauka) of the construction site.

At 20:43, E3 advised they were trying to scalp the brush in this area, utilizing the construction site as a buffer. They requested a bulldozer, but Command responded that acquiring one would take hours—an example of the challenges the MFD encountered when attempting to secure access to heavy equipment that could have made a dramatic impact in limiting the spread of the northern flank vegetation fire. With little water available for fire suppression, the fire was able to spread into the Wahikuli neighborhood, north of the construction site.

Figure 4.3.5.2.3 Wind damaged apartments at the construction site.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.5.2.4 Pre-fire aerial imagery (taken July 2021-December 2022) of the Keawe Street Apartments at the Villages of Leiali'i construction site prior to construction and surrounding neighborhood (Source: Microsoft).

Figure 4.3.5.2.5 Pre-fire imagery (August 2021) depicting invasive grasses up to community before construction site.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

A resident living on Nahale Street captured numerous videos showing how the grass fire extended to a vehicle located on the northwest corner of the construction site, where it jumped Oil Road and into the homes on Kahoma Street (Phase One report, pages 71-78) (Figure 4.3.5.2.6 and Figure 4.3.5.2.7).

From there, the fire spread west (makai) toward the ocean, southwest toward Kapunakea Street, and then northwest toward Fleming Road. Due to the protection provided by the construction site, actions taken by both residents and the MFD, and a shift in wind direction, some of the homes located on Nahale Street and at the southern end of ‘Ainakea Road, as well as all the structures located between Kapunakea Street (north), Oil Road (east - mauka), Keawe Street (south), and Hwy-30 (west - makai), survived the fire.

Figure 4.3.5.2.8 provides an overhead view of the northwest corner of the construction site, highlighting the interface where the fire stopped. Structure-to-structure fire spread that started from this location spread south until it reached the top of Nahale Street.

Figure 4.3.5.2.9 shows 12[redacted] Nahale Street on left (destroyed) and 12[redacted] Nahale Street on right (survived). An ancillary structure on the property was destroyed by fire, but the fire did not extend to the house. The fire did not propagate further south on the east side of Nahale Street, in part, due to the distance between structures, defensive actions taken by a neighbor to stop the fire, and a shift in wind direction.

Figure 4.3.5.2.6 Car located at edge of construction site that supported the fire jumping Oil Road from the east-mauka (right to left).

Figure 4.3.5.2.7 Resident video of car on fire at the northeast end of the construction site with heavy winds driving the fire toward 13[redacted] Kahoma Street.

Figure 4.3.5.2.8 Overhead view of the area at the northwest corner of the construction site, highlighting the interface where the fire stopped. To the north, the fire stopped at the top of Nahale Street (Source: EagleView).

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

On the west side (makai) of Nahale Street, the fire propagated further south and destroyed 12[redacted] Nahale Street, but 12[redacted] Nahale Street survived (Figure 4.3.5.2.10). The fence separating the structures was burned, and 12[redacted] Nahale Street was damaged (windows cracked and paint bubbled) due to radiant heat. However, the fire did not extend through the main structure.

The structure to the rear of 12[redacted] Nahale Street (12[redacted] ‘Ainakea Road) also survived the fire (Figure 4.3.5.2.11), though it also sustained radiant heat damage from the structure next door at 12[redacted] ‘Ainakea Road, including blistered paint and cracked windows (Figure 4.3.5.2.12).

Figure 4.3.5.2.9 12[redacted] Nahale Street on the left and 12[redacted] Nahale Street on the right.

Figure 4.3.5.2.10 12[redacted] Nahale Street on the left and 12[redacted] Nahale Street (destroyed) on the right.

Figure 4.3.5.2.11 (Left) Post-fire aerial image with annotated distance, 39 feet, between (destroyed) 12[redacted] ‘Ainakea Road and (damaged) 12[redacted] ‘Ainakea Road. (Right) Ground-based image of separation between destroyed and damaged structures.

Figure 4.3.5.2.12 Northeast corner of 12[redacted] 'Ainakea Road with blistering paint from radiant heat exposure (indicated by red arrow).

Figure 4.3.5.2.14 12[redacted] 'Ainakea Road (Front view, oriented west).

Figure 4.3.5.2.15 12[redacted] 'Ainakea Road (side view, oriented north).

Figure 4.3.5.2.16 12[redacted] 'Ainakea Road (rear view, oriented northeast).

Figure 4.3.5.2.13 Post-fire aerial imagery of 12[redacted] 'Ainakea Road with distances to adjacent (destroyed) buildings.

Diagonally across ‘Ainakea Road is 12[redacted] ‘Ainakea Road. This house survived even though structures on all four (4) sides of it were destroyed (Figure 4.3.5.2.13-4.3.5.2.16). The side of the house facing north toward 12[redacted] ‘Ainakea Road had blistered paint and cracked windows, but it showed no signs of ignition.

The other sides of the house were further from the neighboring homes that were destroyed. There also appeared to be maintained green vegetation that provided a buffer to the front and rear of the home and a concrete wall/fence that helped shield the home on all sides.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.3.5.3 Northeast Damage Assessment (Lokia,Kanaiu, ‘Aipuni)

In the North zone, structures between Kaniau Road and ‘Aipuni Street were the northernmost structures to be destroyed by the fire (Figure 4.3.5.3.1). Only 13 of the 31 structures on the north side of Kaniau Road survived the fire, with most of the surviving structures grouped toward the west (makai) end of this road (Figure 4.3.5.3.2).

Figure 4.3.5.3.1 Aerial imagery of the North Zone, between Kaniau Road and ‘Aipuni Street, which is the most northern area of Lahaina affected by the August 2023 Maui fires.

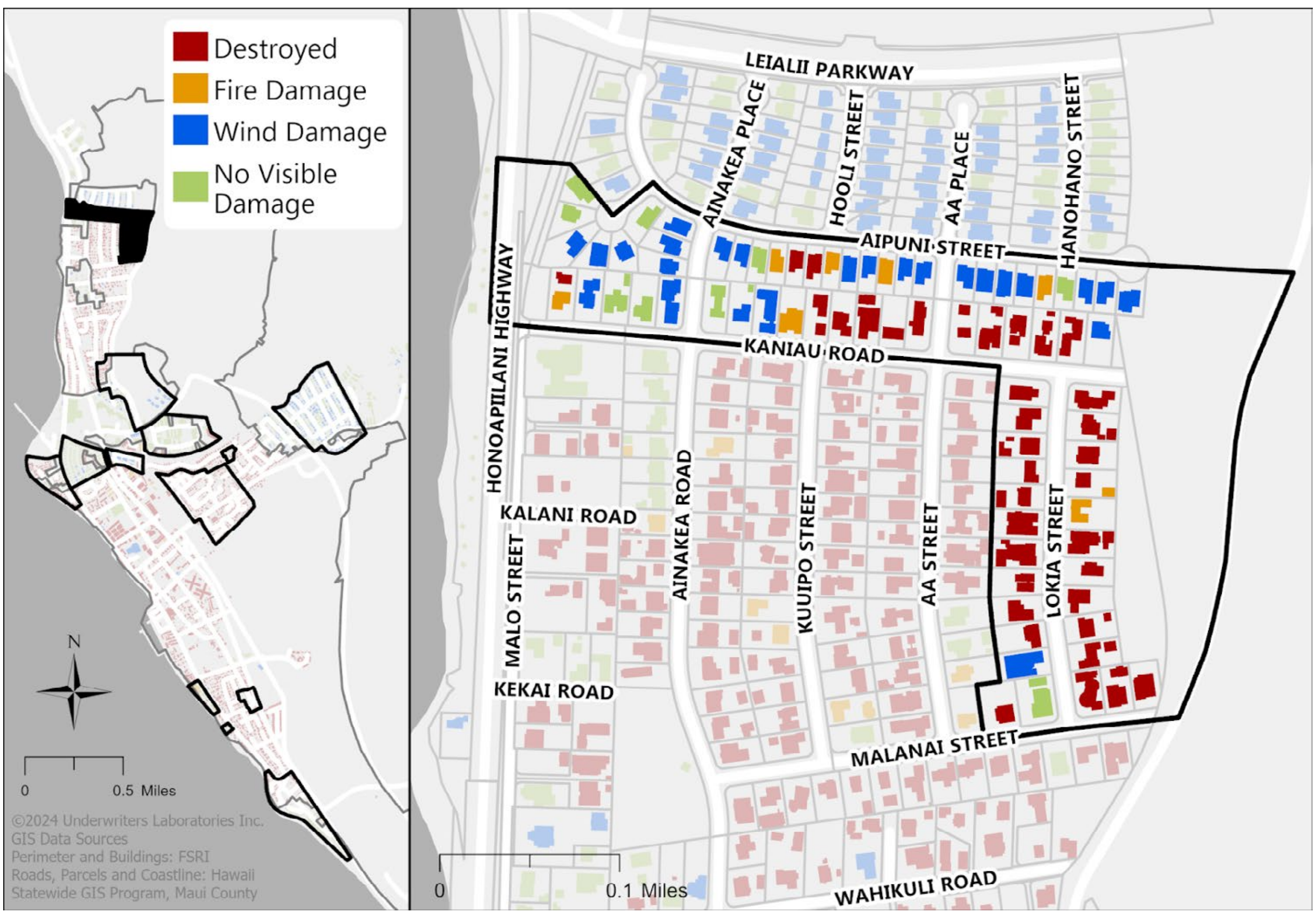


Figure 4.3.5.3.2 Damage classification assessment map of analysis area.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

The north property line of the Kaniau Road structures is shared with the south property line of the ‘Aipuni Street structures, yet 22 of the 24 structures along ‘Aipuni Street survived, as well as 16[redacted], 16[redacted], and 16[redacted] ‘Ainakea Road and all six (6) of the structures addressed off Wahinoho Way.

Properties along Lokia Street between Malanai Street and Kaniau Road were the easternmost (mauka) destroyed and fire-damaged structures in this zone. Two (2) of the 18 structures east (mauka) of Lokia Street survived, while three (3) out of the 13 structures addressed on the west side (makai) of this street survived.

Kaniau Road and Lokia Street are part of the Wahikuli neighborhood. Initial construction of these lots was completed between 1972 and 1981, with a mix of masonry and frame construction employing stucco, wood, or masonry exterior walls. The homes also had a variety of roof covering materials including composite, wood, metal, masonry (concrete tile, ceramic), and composite shingle.

Accessory structures (approximately 500 to 600 square feet each) were built on 13 of these lots between 1984 and 2004 (10 frame construction, 3 masonry) with similar exterior wall and roofing materials.

All structures on the Hawaiian Homes lots addressed along ‘Aipuni Road were constructed in 2006, with some additions constructed on a few properties (typically on the south side of these structures) over the years.

Fire began impacting this portion of Lahaina in the late evening of August 8, 2023. At 20:29, RE14 advised the fire was north of Oil Road and making its way into Wahikuli. MPD Officer 4Z20 advised the fire had crossed Wahikuli Road and was headed north at 22:54.

At 23:39, the MFD Support Group Leader advised the brush was on fire above Malanai Street, and the fire was making its way to Kaniau Road, impacting several homes in that area.

At 01:10 on August 9, 2023, U3B headed back to Leiali‘i from Kā‘anapali. U3B recalled two (2) engines using handlines fed by unit T3. MPD officer 401 radioed that the fire was slowly surrounding Leiali‘i Village at 01:54.

At 04:18, U5 was requested to return to the Leiali‘i Parkway area of Hawaiian Homes. A U5 officer recalled that when they arrived at Leiali‘i, they saw a MFD apparatus already working in the area.

The U5 crew stretched a 1 ½” handline to the rear of the houses near the cul-de-sac of ‘Aipuni Street. They were joined by another engine and wildland unit.

At 04:34, U3B/Support Group advised T3 to bring all personnel and report to Leiali‘i Parkway so they could pull lines from Hawaiian Homes (the homes off ‘Aipuni Street) to the Wahikuli side to stop radiant heat from igniting more homes.

At 04:58, Command directed all units to relocate to Leiali‘i Parkway to assist with structure protection and triage in Hawaiian Homes. RE1 crew recalled spending the morning extinguishing fires and hot spots in and around the structures along ‘Aipuni Street in the Hawaiian Homes area, including exposure protection to 7[redacted] ‘Aipuni Street.

RE14 responded to ‘Aipuni Street and a RE14 officer recalled seeing at least three (3) engines along ‘Aipuni Street putting out fires within and around ‘Aipuni Street.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

The E1/Mini1 crew recalled driving around ‘Aipuni Street into the cul-de-sac. They pulled a handline between houses and extinguished hot spots in the backyard that backed up to the houses on Kaniau Road (most of the houses on Kaniau Road had burned and were smoldering).

At 06:30, U5 reported they had gone through the backyards of Hawaiian Homes with E1/Mini1 and the area looked good.

This section of the North zone was likely to have been impacted by vegetation fires on both the east (mauka) and west (makai) of the community and by fires moving through structures from the south.

As structures east (mauka) of Lokia and Aa Streets ignited, radiant heating and embers would likely have impacted structures to the west (makai) and north through prevailing winds.

Homes east (mauka) of Lokia Street and those on the eastern (mauka) end of Kaniau Road and E ‘Aipuni Place abut grassland. The north flank vegetation fire, progressing from south to north in this grassland area, began impacting the North zone between 20:00 and 22:00 and continued to spread throughout the night of August 8, 2023, into the morning of August 9, 2023.

When the vegetation fire crossed over Oil Road, it continued to spread west (makai) to the eastern (mauka) property lines of these lots (Figure 4.3.5.3.3). Some of the structures on these properties were buffered by gardens, maintained (e.g., mowed and/or watered) lawns, and fences. Four (4) structures on the eastern (mauka) border of this area survived the fire with varying levels of damage.

Two (2) structures on the east side (mauka) of Lokia Street were damaged by the fires, but survived (Figure 4.3.5.3.4), including an accessory structure on 16[redacted] Lokia Street located to the far east (mauka) of the property (Figure 4.3.5.3.5) and the structure at 16[redacted] Lokia Street (Figure 4.3.5.3.6). Both had notable damage to the windows, some of which were boarded up from the inside.

The structure at 16[redacted] Lokia Street was elevated from the ground and was buffered by a garden to the east (mauka) of the property line fence. The southwest corner of the fence appeared to have caught fire at some point, but was broken out and burning was stopped.

Hoses were noted near the garden, which may have been used during the fire or may have been used to water and maintain the garden, providing a buffer of fuels with increased moisture and reduced burning potential.

Figure 4.3.5.3.3 Fire in the grassland along the eastern edge (mauka) of the northern zone crossed over Oil Road to the eastern edge (mauka) of properties on Lokia Street and Kaniau Road. The north flank vegetation fire remained east (mauka) of Oil Road between ‘Aipuni Street and Leiali‘i Parkway, after which the fire moved back west (makai). Note: North is to the right on these images.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

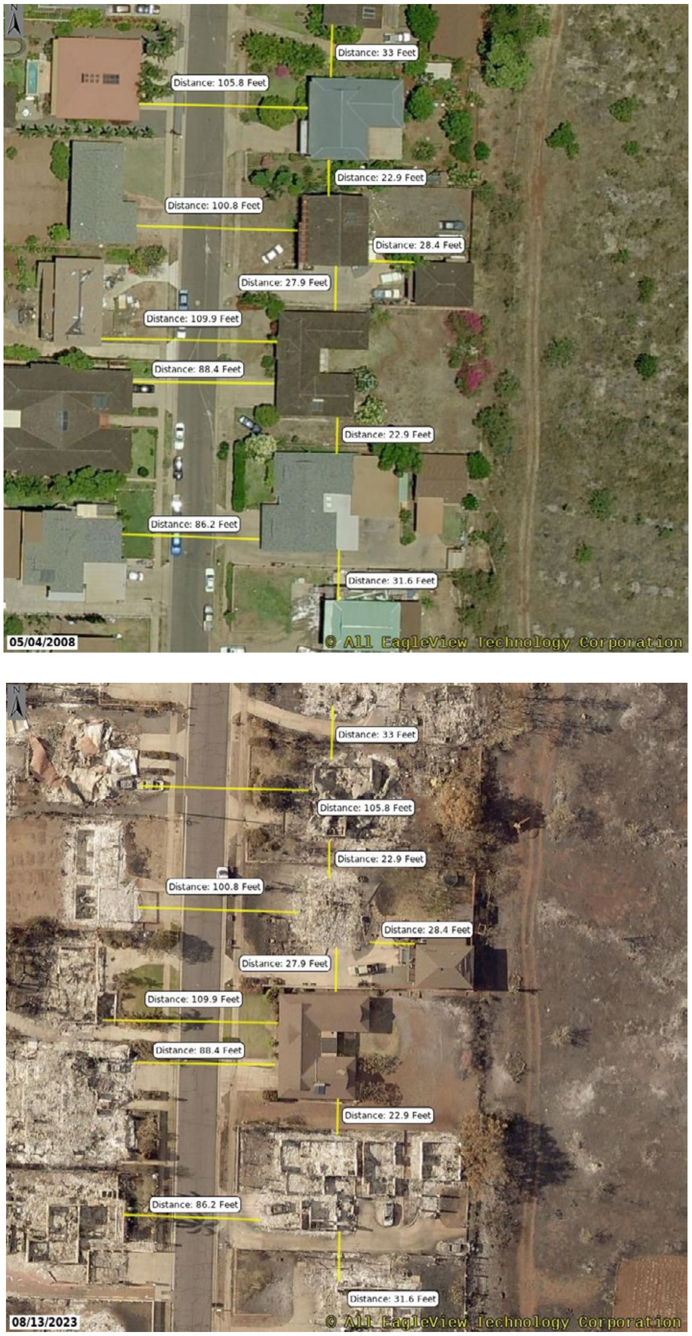


Figure 4.3.5.3.4 Structure spacing along Lokia Street in the vicinity of the surviving structures on the east side (mauka) of the street, abutting the grassland fire.

The vegetation fire in the grassland propagated into the east (mauka) yard of 16[redacted] Lokia Street, but had limited impact on the structure itself. A sprinkler was noted in the east (mauka) yard in the vicinity of where the vegetation fire ended.

This sprinkler may have applied water during the fire either in preparing the property for the oncoming fire or prior to the fire to maintain the grass in this area (Figure 4.3.5.3.7). Regardless of when water was applied, fire-spread toward the structure was halted.

Figure 4.3.5.3.5 The surviving accessory structure at 16[redacted] Lokia Street was near the eastern (mauka) property line, but was buffered from the grassland by a garden (note intact hoses and stone landscaping separating from the grass) and a fence. The structure was elevated such that the damaged windows were a longer distance from the burning vegetation than a single-story structure. Charred sections of fence were broken away from the posts and burning was stopped. Broken windows were boarded up from the inside by the time images were collected.

Figure 4.3.5.3.6 The 16[redacted]Lokia Street structure did not appear damaged by the grass fire to the east (mauka) sides (top left) or destroyed structure west (makai) of Lokia Street (top right). The structure was heavily damaged from radiant heating from the destroyed structure to the south (bottom left) and north (bottom, right).

Structures at 1[redacted] Kaniau Road and 1[redacted] E ‘Aipuni Place both survived, despite the grass fire progressing to the edge of these lots (Figure 4.3.5.3.3). The 1[redacted] Kaniau Road property had a maintained grass yard and concrete driveway between the structure and grass fire to the east (mauka), which helped restrict the vegetation fire from propagating directly to the structure.

The home at 1[redacted] E ‘Aipuni Place was separated from the grass fire by a vinyl fence, which may have stopped embers and flames for a period of time prior to pickets softening, deforming, and falling out along much of the southern and eastern (mauka) sections.

Figure 4.3.5.3.7 (top) Overhead view of 16[redacted]Lokia Street lot with approximate location of sprinkler that may have been used to prepare the property for the fire and/or defend the property during the fire.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

Firefighters were working in this area throughout the morning of August 9, 2023, specifically operating near the cul-de-sac of ‘Aipuni Street around 04:18. Their actions could have stopped the spread of this fire towards the structures on ‘Aipuni Street.

The northern spread of the grass fire on the west side (makai) of Oil Road may have been slowed near Kaniau Road by a dirt path (free of vegetation) that connects the dead end of Kaniau Road with Oil Road, creating a discontinuity in the vegetation. Additionally, Oil Road also shifts toward the east (mauka) in this area, away from the residential area.

A vegetation fire also impacted structures on the west (makai) end of Kaniau Road. A single residential structure (accessory structure at 1[redacted] Kaniau Road) was destroyed by this fire, despite being surrounded by at least two (2) surviving structures to the north, east (mauka), and south with no fire damage noted to the west (makai) of Hwy-30 (Figure 4.3.5.3.8).

Tall grasses on the northeast corner of Kaniau Road and Hwy-30 would likely have provided a receptive fuel bed for embers that may have gathered there. If these grasses had dried out to the state shown in Figure 4.3.5.3.9, they would have more easily ignited the green, mowed lawns in the surrounding properties west (makai) of this location.

Fire traveling along the railroad tracks that parallel Hwy-30 between Kapunakea Street and Leiali‘i Parkway could have carried embers or flames to this location and ignited dry grasses. Embers may also have reached these grasses if they were carried by wind down Kaniau Road.

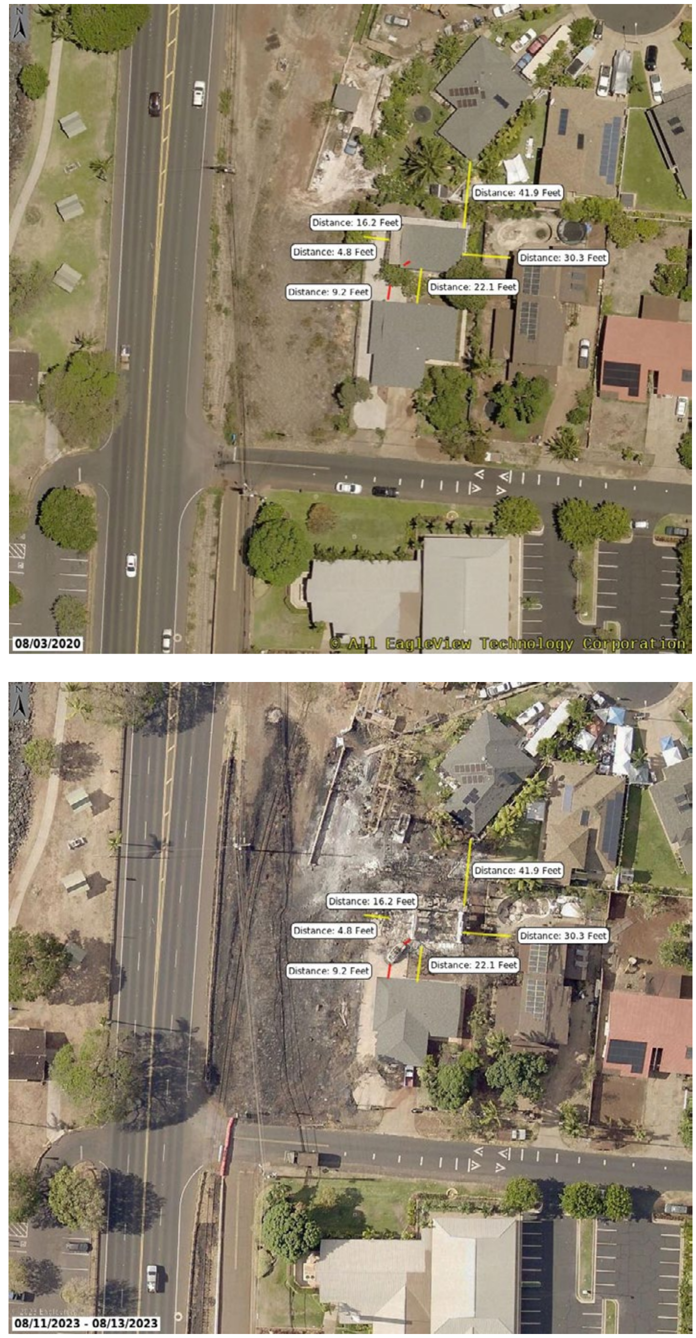


Figure 4.3.5.3.8 Structure spacing near destroyed accessory structure at 1[redacted] Kaniau Street.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

The prevailing winds were typically from the east (mauka)/southwest, which could have driven fires along the tracks toward the north (particularly in areas where a concrete barrier between Hwy-30 and Malo Street might have restricted embers from blowing further to the west-makai).

However, wind shifts were noted throughout the timeline of the fire, so it cannot be ruled out that embers from the grass fire north of Leialiʻi Parkway could have been blown toward the southwest, which may have propagated the fire to the south along the railroad tracks.

While the accessory structure on the 1[redacted] Kaniau Road was destroyed by the fire, windows in the north side of the primary structure that was 20 to 25 feet to the south were damaged and spot fires were noted in outdoor furnishings to the west (makai) of this structure (Figure 4.3.5.3.10).

A vehicle between these two (2) structures was destroyed by the fire and may have played an important role in heat transfer to/from the vegetation and/or structure fire. The most extensive window damage was noted on the northwest corner, which was closest to the destroyed vehicle. However, damage to plastic molding on the windows was also noted on the west side (makai), proximate to the vegetation fire.

None of the other structures in this part of the North zone had visible damage from radiant heat. This relatively isolated fire was likely contained by defensive actions conducted by citizens and MFD personnel.

Figure 4.3.5.3.9 Tall dry grasses are noted on the northeast corner of Kaniau Road and Hwy-30 in August 2020 (top), which could have provided a receptive fuel bed for fires fires along the railroad tracks or embers moving down (makai) Kaniau Road to ignite these grasses in August 2023 and travel to structures in the immediate vicinity (bottom). Note: North is to the left of these images.

Figure 4.3.5.3.10 The primary structure at 1[redacted]Kaniau Road, in close proximity to the destroyed secondary structure and vehicle, had damaged windows, particularly close to the vehicle fire and ember damage to outdoor furnishings that did not extend to the structure.

A garden hose was stretched from a hose bib on a structure in 1[redacted] Kaniau Road and remained deployed near 1[redacted] Kaniau Street. Conversations with local residents revealed neighbors used a pump to control the fire that was progressing along a plastic fence on the north property line. A pump was located next to a swimming pool in the south yard of 1[redacted] Kaniau Road (Figure 4.3.5.3.11).

Defensive actions that appeared to utilize a residential swimming pool were also noted on the west side (makai) of Lokia Street, near the south end of the road where it intersects Malanai Street (Figure 4.3.5.3.12).

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

The structure at 15[redacted] Lokia Street survived, despite being in close proximity to the destroyed structure at 15[redacted] Lokia Street (Figure 4.3.5.3.13). The partially closed front, wood gate to this lot ignited and a vehicle was destroyed behind the stone wall. However, this fire did not spread further to the structure.

Additional spot fires were noted along the north and south fences, particularly in the southwest corner where the property line is shared with the north yard of the destroyed structure at 2[redacted] Malanai Street.

These fires consumed some household outdoor furnishings, but did not spread to the structure. Evidence suggests this property was defended, in part, by using a battery system to power a submersible pump to apply water from the residential pool through a garden hose stretched around the structure.

The defense of this structure most likely improved the survivability of nearby structures, including the five (5) structures immediately to the west (makai) of this lot on Aa Street. Additionally, during data collection for this analysis, conversations with residents in the area indicate water from this pool was later used by some returning to the area in the days following the fire to put out spot fires on their properties and neighbors' properties.

Once the north flank vegetation fire crossed Oil Road near Kahoma Street, the fire continued to spread structure-to-structure as an urban conflagration, eventually moving from the south to the north in this area. At the same time, structure-to-structure fire spread and embers also moved the fire from the east (mauka) to the west (makai).

Figure 4.3.5.3.11 Water resources from 1[redacted] Kaniau Road were utilized to help control the fire from propagating farther east (mauka) from 1[redacted] Kaniau Road. Garden hose was deployed from a hose bib with the terminal end remaining at the next lot. Neighbors reportedly used the pump to control a fire along the plastic fence at the north property line of this lot.

This northern/northwestern spread continued to the edge of the Wahikuli neighborhood to the north of Kaniau Road and the Hawaiian Homes lots to the south of ‘Aipuni Street. As noted previously, MFD intervention throughout the early morning hours of August 9, 2023, were critical in stopping the progress of the fires.

The northernmost destroyed structures in Lahaina were addressed at 8[redacted] and 9[redacted] ‘Aipuni Street (Figure 4.3.5.3.14).

Structures to the east (mauka) and west (makai)—1[redacted] and 7[redacted] ‘Aipuni Street—of these destroyed structures were damaged by the fire through radiant heat transfer, but survived, due, in part, to defensive actions conducted by firefighters and citizens.

Two (2) outbuildings in the south yard of 1[redacted] ‘Aipuni Street, along the property line shared with 8[redacted] and 9[redacted] Kaniau Road, were destroyed by the fire. The fire did not propagate to the rear of 1[redacted] ‘Aipuni, but paint bubbling was identified on the south porch along with vinyl trim melting on a window assembly and cracking of an outer pane.

The west side (makai) of the structure was more heavily damaged, particularly deformed window frames and broken window glass along with the deformation of window blinds on the interior of the structure (Figure 4.3.5.3.15). Considering the roofline of the destroyed structure at 9[redacted] ‘Aipuni was approximately 10 feet from the roofline of 1[redacted] ‘Aipuni, the amount of damage noted to the west side (makai) of this structure could have been more severe if it were not for defensive actions undertaken by firefighters and citizens.

The radiant heat impacting this structure may also have been reduced if the prevailing west (makai)/ northwest winds had pushed flames and smoke plumes away from this structure.

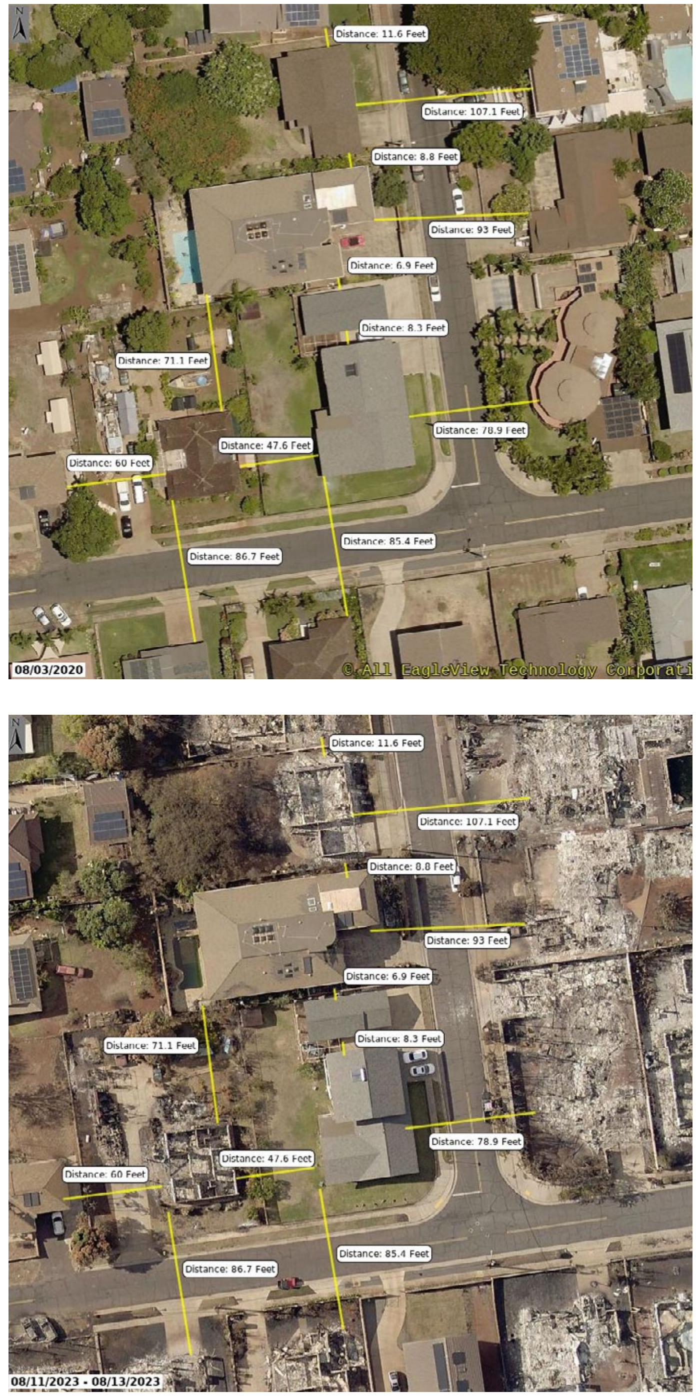


Figure 4.3.5.3.12 Structure spacing near surviving structures on the west side (makai) of the south end of Lokia Street.

4.3.5 FIRE IMPACT ON THE BUILT ENVIRONMENT

Figure 4.3.5.3.13 The 15[redacted] Lokia Street lot experienced fire damage to the front entrance gate and destroyed a vehicle, but did not extend to the structure (top). The structure appears to have been defended, in part, by pumping water from the pool in the rear of the structure, powered by a battery system (middle). Damage to fences on the north and south sides of the properties (bottom), showing the end of the hose from the pump in the pool and along with a bucket (bottom left).

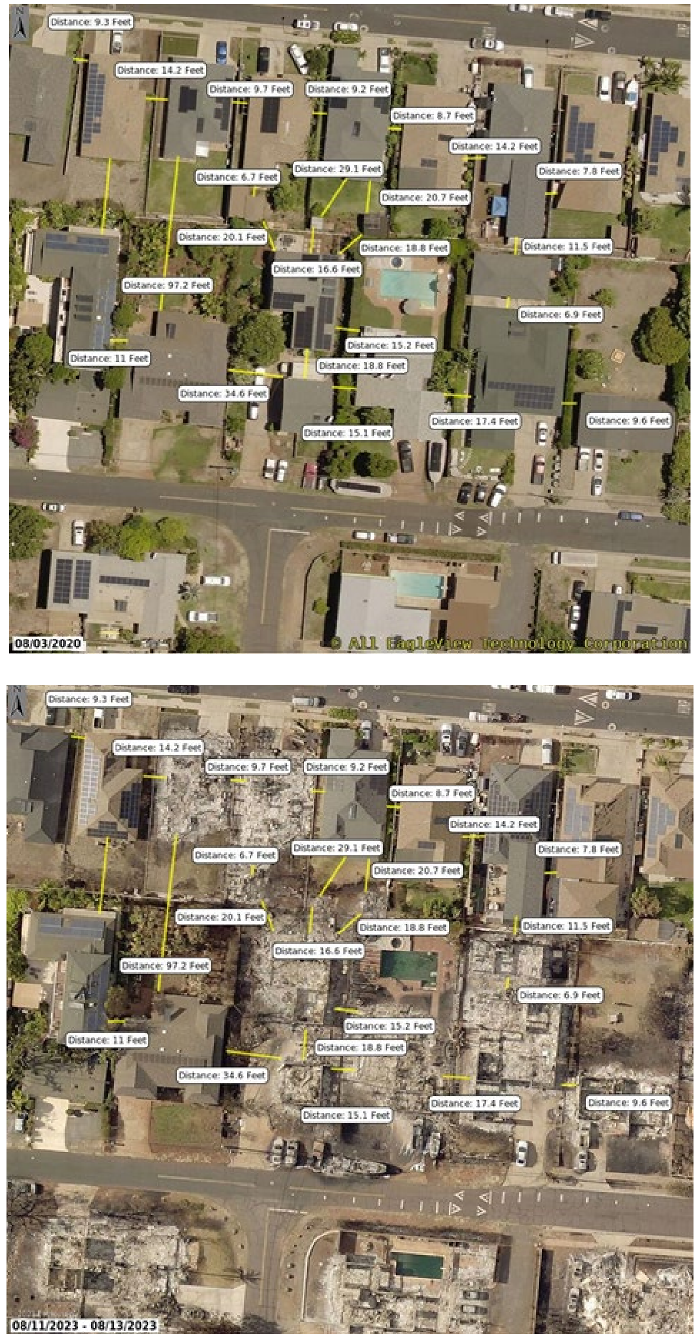


Figure 4.3.5.3.14 Structure spacing near surviving structures on the north side of Kaniau Street and south side of ʻAipuni Street.

Figure 4.3.5.3.15 West side (makai) of 1[redacted] ‘Aipuni showing melted plastic components, damaged/broken window assemblies, and deformed window blinds likely caused by radiant heat transfer.

4.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.4 Findings & Recommendations

77.	**FINDING:** Numerous stakeholder organizations (state, county, community, HWMO) have collaborated to evaluate wildfire risk per West Maui CWPP.	**RECOMMENDATION:** Hold a statutory organization accountable for executing the preparedness plans commensurate with the risk identified through these efforts. **RECOMMENDATION:** Adopt and enforce contemporary codes and standards for building construction in wildfire prone areas.
78.	**FINDING:** Codes and standards exist for addressing fire hazards of exterior vegetation (16.04D Subsection 10.13.10), but they require enhancement based on risk and current guidelines.	**RECOMMENDATION:** Update, implement, and enforce fuel management and defensible space around structures.
79.	**FINDING:** Some vegetation adjacent to structures survived where the structure was not destroyed.	**RECOMMENDATION:** Additional research is necessary to understand the potential for lush, well-watered, and well-maintained vegetation to provide benefits (e.g., radiation shielding) that is not outweighed by the hazard.
80.	**FINDING:** Ember penetration through building envelopes, including roofs, vents, and windows, is a common pathway for building ignition.	**RECOMMENDATION:** Buildings should be constructed and maintained to resist ember intrusion. This will include construction features (vents, roofs, etc.). **RECOMMENDATION:** Adopt stronger WUI codes (e.g., ICC International Wildland-Urban Interface Code[262] and NFPA 1140: Standard on Wildland Fire Protection[263]) or WUI Structure/Parcel/Community Hazard Mitigation Methodology[264] guidance.
81.	**FINDING:** Window and doors were left open prior to evacuation.	**RECOMMENDATION:** Residents and citizens should be educated on the importance of closing building openings as an important component of preparation for, and departure from, a home during an evacuation —part of a “Ready, Set, Go: Close Before you Go” campaign.

4.4 FIRE IMPACT ON THE BUILT ENVIRONMENT

4.4 Findings & Recommendations

82. **FINDING:** Age of construction is not a primary indicator of structure survival (correlation not causation).	**RECOMMENDATION:** Ensure properties and areas around structures are well-maintained, despite the structures' age (i.e., newer structures are not exempt).
83. **FINDING:** Defensive actions appear to have lessened fire impact in the built environment.	**RECOMMENDATION:** Identify fire suppression strategies and tactics commensurate with resources and infrastructure capabilities and availability. Preplan based on these limitations and local conditions.
84. **FINDING:** Fuel breaks, such as Kahoma Stream, Kaua'ula Stream, Keawe Street Apartments at the Villages of Leiali'i construction site, and grass athletic fields by the Boys and Girls Club/Lahaina Recreation Center, appear to have impacted fire progression.	**RECOMMENDATION:** Investigate zoning changes to incorporate fuel breaks in areas within the community to slow fire progression and to act as safe refuge areas for evacuating residents.

5.0 Summary

In the United States of America, the destruction and loss of life caused by the Maui fires of August 8-9, 2023, are unprecedented in modern times.

Recognizing the complexity of this incident, FSRI used a systems analysis methodology to comprehensively examine the many contributing factors to the August 2023 fire event in Lahaina. It is vital to reiterate, as demonstrated throughout this report, that no single factor, or set of factors, is directly responsible for the tragic outcome.

The pre-conditions for these fires have been in the making for decades, stemming from the changing landscape of Maui Nui, more frequent extreme weather events, and the increased frequency of vegetation-fueled fires. It is important to note these same conditions exist across the State of Hawai‘i, in countless other locations throughout the United States, and around the globe.

The risk of wildfire in Maui was extensively documented in the years leading up to August 2023. Many recommendations from these reports were not addressed, potentially due to the complications of implementation, competing policy priorities for scarce resources, and—it appears—the cost of taking these recommended actions. Residents’ and policymakers’ perceptions of risk, roles, and responsibilities also likely contributed to years of inaction.

Responsibility for fire protection has almost exclusively been left to the MFD. In fact, response data from the past decade suggests that, overall, the MFD has been very successful at extinguishing wildfires, even with the increased frequency of these events. At the same time, the 2018 Lahaina fire during Hurricane Lane exemplified what was possible, and was, by many accounts, a harbinger of the August 2023 tragedy.

At time of publication, the official origin-and-cause report on the August 2023 Maui fires has not been released by the County of Maui. Stating the obvious, however, if the Lahaina fires had not started in the first place, then the subsequent destruction of Lahaina on August 8-9, 2023, would not have happened.

The State of Hawai‘i is among a handful of states at moderate to high risk for almost the full range of natural disasters, including drought, earthquakes, fires, hurricanes, landslides, tsunamis, and volcanic eruptions. Historical records strongly suggest that weather conditions in Maui Nui and across the Hawaiian Islands are changing, contributing to an increased frequency of wildfires.

This pattern, combined with the decline of agriculture and an increasing prevalence of unmanaged vegetative fuels, helped set the stage for the August 2023 fires around Maui.

The vulnerabilities of the County of Maui’s infrastructure were exposed on August 8, 2023. Extreme winds toppled numerous utility poles and downed overhead electrical wires, which ignited the dry grass along Lahainaluna Road resulting in the start of the Lahaina AM fire. The subsequent degradation of other critical systems (e.g., roads, water, and telecommunications) would also contribute significantly to the challenges faced by emergency responders to control the Lahaina PM fire.

The Lahaina AM fire burned in rocky terrain with vegetation growing in hidden void spaces with downslope winds blowing in excess of 60 miles per hour. These were extreme conditions that the MFD had never experienced or trained for. All the factors for the AM fire to resist extinguishment were in alignment. Dry vegetation, low RH, wind, time of day, and slope aspect created optimal conditions to support fire at 14:55 when the PM fire was reported.

5.0 SUMMARY

The Lahaina PM fire jumped the Lahaina Bypass and ignited the first structures along Lahainaluna Road—essentially the transition point from a wildfire to an urban conflagration.

Tragically, the first area of Lahaina to be impacted by the fire was also the most densely populated, providing the fire with ample fuel from tightly-packed burning structures and vehicles, along with exposing a high concentration of residents to toxic smoke, fast-moving flames, and waves of burning embers. Exacerbating the conditions were downed trees and utility poles, and other materials blown off structures, blocking roads and resulting in significant evacuation challenges.

During the first few hours, the fire's rapid progression through the Lahainaluna neighborhood resulted in all MFD resources being overrun by fire. Even before the hydrants lost pressure, the firefighters were simply overmatched by the numerous structure fires igniting almost simultaneously around them. Several fire apparatus were destroyed during this same period and there was also a Mayday that demanded the attention of command and other resources.

Resource limitations are a common theme across all of the agencies and organizations responsible for preparing for and responding to the August 8-9, 2023, fires throughout Maui.

Without question, these—and other— responders worked in the most challenging circumstances one can imagine; many lives were saved as a result of their actions. Trying to put themselves between the constantly-changing fire front(s) and vulnerable residents, the operating positions that many MFD units and MPD officers took were extremely dangerous and often untenable.

As with many other crisis events, communication challenges—with the public and among responders —played a major role throughout this incident. Incident management lacked unified coordination amongst assisting agencies and overhead personnel to fill critical operational roles.

These baseline resource limitations, however, especially given the Upcountry fires and additional service demands from the severe weather, proved insurmountable. At the end of the day, there simply were not enough firefighters, police officers, and functional firefighting apparatus/equipment.

The lack of available resources due to three (3) other Maui wildfires happening at the same time, fires burning on other Hawaiian islands, and the extreme weather restricting the movement of resources from island to island, impacted what could have been done to limit the spread of the fast-moving Lahaina PM fire.

The effectiveness of emergency evacuations, and their attendant plans and planning functions, is an open question for many types of disasters. Experience suggests that, once a major incident is underway, it can be difficult to evacuate residents amid dynamic and changing conditions.

Extreme conditions across both the natural and built environments during these days in August 2023 combined to create a complex set of circumstances that overwhelmed many systems that are often taken for granted in local jurisdictions around the United States.

The need for additional fire-prevention and fire-suppression resources throughout Maui Nui will be addressed in Phase Three of this report series. This phase will yield a forward-looking report to help answer the question, "How do we prevent this from happening again?"

5.0 SUMMARY

The Phase Three report will include the following discrete, albeit interrelated, elements:

Standards of Cover Analysis
A comprehensive, independent Standards of Cover (SOC) analysis will assess the deployment and performance of the MFD and will quantify the MFD's ability to deliver the capabilities described in National Fire Protection Association (NFPA) 1710—Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.

This assessment will be conducted utilizing state-of-the-art dynamic deployment modeling software that considers the activity level of MFD emergency units and the interaction of these units with the county's emergency ambulance transportation provider, along with current/potential mutual-aid partners.

Community Risk Assessment
A comprehensive Community Risk Assessment (CRA) for the County of Maui will evaluate and enumerate natural, technological, and societal contributors to the health and safety of county residents, businesses, and visitors. The CRA will be conducted in accordance with NFPA Standard 1300—Standard on Community Risk Assessment and Community Risk Reduction Plan Development.

This assessment will benefit from the active involvement of local residents and businesses in community-centered discussions of risk perception, societal and cultural contributors to risk, and the impact of multiple factors in the county's overall fire and all-hazards risk profile.

Community Risk Reduction Plan
Based on the CRA, a comprehensive Community Risk Reduction (CRR) plan will be developed—in concert with the local community—that provides realistic strategies to increase the resiliency of Maui residents, businesses, and visitors. This plan will describe actions that can be taken by individuals, community organizations, governmental agencies, and other groups to mitigate risk, prepare to actively address hazards, and make long-term progress on addressing overall risk in the community.

The CRR planning process will recognize the vital cultural and historic attributes of Maui communities by including residents and local businesses at every stage.

Fire and Building Code Review
A comprehensive independent review of the efficacy of current fire and building codes in Maui will be performed, including the present status of code implementation, education, and enforcement. This assessment is intrinsically related to the CRR planning outlined previously, and is an essential element of any long-term strategy to address risk in Maui Nui and across the State of Hawaiʻi.

The entire FSRI team joins the survivors of this tragedy in mourning the loss of Maui residents.

From the very start of this comprehensive independent analysis, FSRI has desired to work collaboratively with state, county, and federal officials, community members, and other interested parties. We appreciate the cooperation received from so many individuals/organizations and sincerely hope for continued collaboration in Phase Three.

6.0 APPENDIX

6.0 Appendix (See full list spreadsheet here)

6.1 Full List of Findings and Recommendations

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
2.0 Analysis of Background	• State of HI	Policy, Organizational	**1. Lack of state policy-making and investment addressing Cohesive Strategy components.**	**1.** Pursue integrated solutions using a multidisciplinary team to address the entire system of factors that influence wildfire risk and outcomes, including land use and subdivision planning, agriculture, forestry and environmental protection, emergency response, economists and tax experts, and policy-makers. Use the existing and established plans and studies as starting points for discussion and action. **2.** Learn from states that already have existing advanced wildfire-fighting policies and procedures in place that are more mature in their work on wildfire prevention, preparedness, and response.
2.0 Analysis of Background	• State of HI	Policy, Organizational	**2. Statewide wildfire prevention is led by the non-profit Hawaii Wildfire Management Organization (HWMO) without state funding.**	**1.** Establish dedicated and sustained funding for HWMO to support the coordination and implementation of wildfire prevention and preparedness efforts, especially for communities and land stewards.
2.0 Analysis of Background	• State of HI	Policy	**3. Lack of standardized and consistent wildfire data collection and report submissions to federal organizations.**	**1.** Standardize wildfire data collection process for all counties and require Incident Status Summary, Form 209 completion for wildfires meeting reporting criteria. **2.** Leverage the impending release of the National Emergency Response Information System (NERIS) to institutionalize fire reporting while ample resources are available and focused to onboarding and supporting fire agencies in this new federal program.
2.0 Analysis of Background	• MFD • MPD	Policy, Organizational	**4. The MFD and MPD did not initiate an AAR for the 2018 Lahaina Fire. MEMA did not finalize an AAR for the same incident.**	**1.** MEMA, the MFD, and the MPD should create policies that include incident parameters requiring an AAR to ensure learnings are documented and changes required for improvement are implemented.
3.2 Weather	• MFD • MPD • NWS • MEMA	Policy, Organizational, Preparedness	**5. Actionable extreme weather forecasts were provided to fire chiefs and emergency managers prior to the August 2023 fires. However, adjusting staffing for extreme weather events and their resultant risk of extreme fire behavior was not standard.**	**1.** Assign a point of contact within the MFD who is tracking weather conditions, and is disseminating that information to the rest of the department and across partner agencies. **2.** Establish standard operating procedures for Red Flag and severe fire weather warning conditions, to include: preparing and pre-positioning supplies, equipment, vehicles, and personnel in high-risk areas; ensuring clear and open lines of communication within and among agencies to optimize for rapid and coordinated deployment of resources; and communicating with the public to aid residents in translating the forecasted conditions and risks into evacuation readiness. The California Fire Weather Annual Operating Plan is a good place to start developing a Hawai‘i plan.
3.2 Weather	• State of HI • NWS	Research, Policy, Preparedness	**6. There is little perceptible difference between Hawai‘i Red Flag criteria and a typical summer day, which may have contributed to the emergency manager’s response to the forecast.**	**1.** Engage federal partners to assist in refining Red Flag criteria to be commensurate with appropriate fire danger that is actionable by policymakers, emergency managers and responders, and the public.
3.2 Weather	• NWS • HI-EMA	Policy, Organizational, Preparedness	**7. NWS-Honolulu fire weather forecast briefings to fire and emergency managers should occur on a more frequent basis.**	**1.** Engage policymakers, emergency managers and responders, and the public with more frequent fire weather forecast briefings. This will elevate understanding of the weather, while informing the community of the risk.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.2 Weather	• State of HI • NWS	Equipment, Organizational, Preparedness	**8. A lack of RAWS in West Maui, and other high wildfire risk areas, limits the capability to determine where Red Flag conditions may locally exist. The lack of resolution of fire weather data and monitoring yields uncertainty at the local level due to fire weather forecasts and Red Flag Warnings being based on data collected at the Honolulu airport, which is on O'ahu (not Maui). It does not represent the conditions observed in the diverse and numerous microclimates across all high fire risk areas across the state, including Lahaina, and therefore, serves as a point of reference (or inference, at best) for other regions.**	**1.** Install and fund the maintenance for a strategic set of RAWS that can provide information with resolution across the microclimates of high fire risk locations in the state.
3.3 Vegetative Fuel	• State of HI	Policy, Organizational, Preparedness	**9. A lack of vegetation management programs, including policy, regulation development and enforcement, and funding support to address vegetation management needs across the variety of landowner types contributed to a prevalence of unmanaged vegetation on the wildland and urban areas impacted by the August 8, 2023, fire.**	**1.** Develop comprehensive vegetation management programs that address the many types of land ownership and risk-reduction needs, to include thinning vegetation, removing invasive species, and creating strategic fuel breaks: - On public lands, funding for vegetation management must be commensurate with the personnel, equipment, and maintenance costs needed to strategically and consistently reduce risk. - On private lands, a combination of tax incentives and penalties for active land management, as well as a robust and proactive defensible space code inspection and enforcement programs are needed. - Such programs must be funded and staffed at a level appropriate to adequately ensure risk-reduction measures are implemented and effectively mitigate the potential for fire ignition and rapid spread through unmanaged lands. **2.** Establish specific governmental authorities, responsibilities, and goals for the management of vegetative fuels. (Currently, authority to address vegetation hazards is covered by a vague responsibility by the mayor and fire chief to address any number of hazards). **3.** Establish a system of penalties to address owners of agricultural land who are not participating in active agriculture or vegetation management. **4.** Develop programs that support coordination and implementation of an "All Hands, All Lands" approach, where vegetation management strategies and projects reduce risk across land ownerships, according to topography and anticipated fire behavior, rather than in fragmented or siloed parcels. **5.** Implement and expand use of targeted grazing for non-native forage grass removal and fuels reduction at landscape scale.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.3 Vegetative Fuel	• State of HI	Policy, Organizational, Preparedness	**10. Fire risk and protective measures are not generally considered or integrated into land use planning, ordinances, or permitting processes to ensure adequate defensible space or consistent management of vegetative fuels in and around communities.**	**1.** Require integrated land use planning through zoning regulation that requires vegetation management in high-risk areas. **2.** Educate homeowners on how to create defensible space around their properties, and require them to maintain these spaces. **3.** Incorporate community-scale, maintained green spaces that are multi-use and could act as fuel breaks and public safe refuge areas.
3.3 Vegetative Fuel	• State of HI	Policy, Organizational, Preparedness	**11. The existing landowner and land steward risk-reduction programs, which include best practices for vegetative fuels management, have limited capacity and have not been invested in by the government at a level that meets the current need.**	**1.** Provide land steward and community education regarding vegetation management best practices. Invest in, and grow, the existing programs of Firewise USA(TM) and educational programs for land stewards offered by existing groups, such as those already led (but underfunded) by the HWMO, University of Hawaiʻi, and their established partners.
3.3 Vegetative Fuell	• State of HI	Policy, Organizational, Preparedness, Research	**12. There is no adequate system for monitoring fuel loads, fuel moisture, and other relevant characteristics.**	**1.** Improve monitoring of fuels and utilize drones, satellite imagery, and ground-based monitoring systems to detect and assess vegetative fuel loads, fuel moisture, and high fire risk conditions. **2.** Establish an information dissemination system to fire and emergency managers to communicate high-risk locations and periods.
3.3 Vegetative Fuel	• State of HI	Policy, Organizational, Preparedness, Research	**13. There is a need for additional public and private investment in long-term ecosystem restoration and sustainable land management practices that promote healthy ecosystems, maintain active agriculture, reduce fire risk, and control erosion.**	**1.** This investment can be accomplished as key components of integrated land use planning, financial incentive and assistance programs, and land steward education (all described above). **2.** Invest in watershed partnerships, conservation groups, and other existing ecosystem conservation and agricultural initiatives. **3.** Invest in and bolster plant material supply chain for bulk seed production to support adequate fuel conversion and post-fire mitigation. For example, these programs could include common native seed collection, plant propagation, and outplanting.
3.4.1 Planning, Zoning, and Codes	• County of Maui	Policy, Prevention, Organizational, Preparedness	**14. At the time of the fire, zoning in some areas of Lahaina was not commensurate with the modern built environment, environmental risks, and population growth.**	**1.** Review and adjust zoning laws to better reflect the actual occupancy levels in Lahaina. **2.** Implement stricter enforcement to ensure compliance with occupancy limits. **3.** Enforce building codes and zoning regulations that require sufficient road width and access points in new developments to ensure better planning for future developments. **4.** Increase the availability of off-street parking solutions to reduce the reliance on narrow streets for vehicle parking. **5.** Emergency responders should have pre-determined plans, as well as uniquely adapted equipment (if available), tactics, and strategies for specific areas with narrow streets, outlining alternative access points, water supply strategies, and evacuation procedures.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.4.1 Planning, Zoning, and Codes	• County of Maui	Policy, Prevention, Organizational	**15. At the time of the fire, the County of Maui was enforcing the 2006 edition of the International Residential Code and International Building Code.**	**1.** Review and ensure adoption process meets requirements of state statute (HRS 107-28).
3.4.2 Road Networks	• MFD • MPD	Preparedness, Training, Equipment, Operational	**16. Emergency responders did not have ready capability to unlock emergency gates at various locations, including schools, to facilitate evacuations. They were often forced to rely on a third-party response for such access.**	**1.** The MPD and MFD should develop an assessment of its ability to access local utilities (Hawaiian Electric), flood control, waterworks, farms, resorts and public facilities (ex. private and public schools), flood control roads and gates, agricultural roads and gates, harbor areas, etc.) for emergencies. Create a system of universal lock security access that is available to all emergency responders and landowners.
3.4.2 Road Networks	• MPD • County of Maui	Preparedness, Policy, Preparedness, Operational	**17. Severe congestion due to parked cars along neighborhood streets hindered evacuation and response efforts.**	**1.** The MPD and county authorities should assess the parking needs and challenges within neighborhoods. This may include evaluating factors, such as population density, housing types, availability of off-street parking, street width, proximity to commercial areas or public transportation, and existing parking issues.
3.4.2 Road Networks	• MPD • County of Maui • MEMA	Preparedness, Policy, Organizational, Operational	**18. Limited written traffic plans or guidelines for emergencies and escalating incidents.**	**1.** Develop a pre-incident plan for the MPD to manage traffic during a wildfire that involves coordinating efforts to ensure public safety, facilitate evacuation if necessary, and maintain traffic flow in affected areas. Update MPD G.O. 405.1 Traffic Section and G.O. 405.7 Traffic Direction and Control to include instruction on wildfire evacuation. **2.** Implement and enforce strict no-parking zones on critical streets and encourage the use of off-street parking solutions to reduce the number of vehicles parked on narrow streets. **3.** Where possible, redesign traffic flow in congested areas, including implementing one-way street systems, to optimize vehicle movement. **4.** Residents in areas with narrow streets should be educated on fire safety procedures, importance of clear buffer zones/ defensible spaces, and evacuation plans to ensure a more coordinated response.
3.4.2 Road Networks	• County of Maui • MPD • MFD	Preparedness, Operational	**19. Roadways and evacuation routes were not adequately maintained prior to August 8, 2023, to sustain effective evacuation efforts during the fire event.**	**1.** Identify, name, map, and provide signage on dirt roads that serve as alternate egress/evacuation routes so residents and emergency responders refer to them by the same name. **2.** Inspect and maintain dirt roads annually. Modernize, standardize, and maintain barriers on dirt roads to help ensure they can be used during emergencies. **3.** Where feasible, widen roads to accommodate more parking, traffic, and provide room for emergency vehicles.
3.4.3 Water	• State of HI • Maui Water	Operational	**20. The County of Maui Department of Water Supply was seemingly in compliance with the Water System Design Standards for the State of Hawaiʻi in August 2023.**	**1.** Given the increasing threat of wildfires and wildfire-initiated urban conflagrations, it may be necessary for the State of Hawai'i to revisit its design standards and guidelines for storage and distribution systems that could be used for firefighting purposes.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.4.3 Water	• Maui Water	Operational, Equipment	**21. No pumps are used outside of the water production facilities to provide pressure in the system. Both systems had uninterrupted electrical power during the August 2023 fires and produced water at capacity for the duration of the fire.**	N/A
3.4.3 Water	• Maui Water	Operational, Equipment	**22. The amount of drinking water in storage tanks at the beginning of the August 2023 fires seemingly met standard design requirements as required by the Water System Design Standards for the State of Hawaiʻi.**	N/A
3.4.3 Water	• Maui Water	Operational, Equipment	**23. As per the Phase One report (pages 237-239), the water supply monitoring system failed at 15:30 (3:30 p.m.) on August 8, 2023, and no storage tank data was recorded for the duration of the fire event. Once this data connection was lost, the County of Maui Department of Water Supply did not know how much stored water was available for firefighting during the fire.**	**1.** Develop, install, and maintain a resilient drinking water tank level monitoring system for the Lahaina and Māhinahina storage and distribution systems that can be monitored from the County of Maui EOC and other locations.
3.4.3 Water	• Maui Water	Operational	**24. As homes and other structures were damaged and destroyed by fire, household plumbing (e.g., plastic and other piping) inside of the buildings failed, allowing unrestricted flow of water from one (1) or more locations in each home or structure, resulting in water freely flowing from more structures and diminishing the overall water pressure and flow in the fire area.**	N/A
3.4.3 Water	• Maui Water	Operational, Training, Equipment	**25. As per the Phase One report (page 239), County of Maui Department of Water Supply employees were unable to enter the fire area to assist firefighters due to multiple factors, including traffic congestion and the danger presented by the fire. Firefighters did not have the time, training, or tools to shut off water.**	**1.** Develop a plan to coordinate with the County of Maui Department of Water Supply to address water system needs at the incident command post (ICP).
3.4.3 Water	• Maui Water	Operational	**26. Due to the hydraulics of the drinking water storage and distribution system, and given the excessive demand caused by the flow from damaged/destroyed structures, water was not provided with sufficient volume and sufficient pressure (i.e., the system could not meet the required demand) for use in firefighting for the entire August 2023 fire event.**	**1.** Perform a hydraulic analysis of both the Lahaina and Māhinahina storage and distribution systems. Use the results of this analysis to design larger and/or multiple interconnected pipes between the two (2) drinking water storage and distribution systems. Consider the use of pumps, as appropriate, to supplement pressure and volume. Determine pressure and volume limits for a major fire event that stakeholders understand and can operate to.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.4.3 Water	• Maui Water	Operational	**27. Water quality and cost concerns make it impractical to size a drinking water treatment, storage, and distribution system to accommodate the firefighting demands for a urban conflagration event similar to the one that occurred in August 2023.**	**1.** Provide alternate means of firefighting water supply for extreme events. This may include portable pumps to draw water from public and private pools, ponds, and other bodies of water (including sea water), large diameter hose equipped apparatus, sites, or connections for marine vessels to draw water from the Pacific Ocean, and other means.
3.4.4 Electrical	• Hawaiian Electric	Organizational, Operational	**28. Hawaiian Electric (in partnership with the MFD and MPD) did not have an adequate staffing plan to prepare for the wildfire conditions of August 8, 2023.**	**1.** Hawaiian Electric should work closely with the MFD and MPD to develop a staffing plan in preparation for high fire danger days. The plan should include implementing spotters and an artificial intelligence-enabled camera network, which can assess vulnerable areas of the infrastructure so failure points can be addressed quickly; operating a dedicated phone line to the MFD and MPD to communicate power and repair status; and assigning a representative to the ICP.
3.4.4 Electrical	• Hawaiian Electric • MFD • State of HI	Prevention, Policy	**29. A lack of electrical utility vegetation abatement regulations and enforcement may have contributed to vegetation at the base of utility poles and near transmission lines, creating a receptive fuel source for arcing electrical wires.**	**1.** Hawaiian Electric should continue to work closely with the PUC to execute the Climate Adaptation Transmission and Resilience Program and develop a long-term investment plan to protect infrastructure from high wind events and wildfire. The plan should include immediate vegetation management and enforcement requirements, a phased approach for undergrounding transmission lines in vulnerable areas, strategic replacement of bare overhead wires with covered conductors, and a Public Safety Power Shut-off program.
3.4.4 Electrical	• Hawaiian Electric • County of Maui • State of HI	Prevention, Policy	**30. Hawaiian Electric did not have a Public Safety Power Shut-Off program in place at the time of the fire.**	**1.** Establish a Public Safety Power Shut-Off and communication protocol in collaboration with the community. Shutting off power to vulnerable areas of the grid reduces the chance of ignition due to electrical infrastructure failure.
3.4.4 Electrical	• Hawaiian Electric • Maui Water	Preparedness, Policy, Organizational, Operational	**31. The lack of execution of a Hawaiian Electric pre-event organizational plan led to having to staff more field positions during the event to address problems with electrical and water infrastructure.**	**1.** Hawaiian Electric to prepare a staffing plan that is coordinated with the pre-event incident action plan (IAP).
3.5 Communications	• MFD • MPD	Preparedness, Organizational, Operational	**32. Central Dispatch (“Central”) was limited by the availability of equipment and personnel.**	**1.** Expand Central’s surge capacity by increasing the terminals/necessary equipment for call taking and dispatching operations and consider training personnel (including members from the MFD or MPD) to serve as “call takers” capable of transferring emergency 911 calls, and managing the non-emergency/administrative calls. **2.** Complete a comprehensive study of Central Dispatch to assess staffing, workloads, and technology to identify any gaps or additional resource needs to help ensure resilient communication during major emergencies and disasters.
3.5 Communications	• MFD • MPD • County of Maui • MEMA	Organizational, Policy, Operational	**33. Central Dispatch, and many other responding personnel, were deeply affected by this incident.**	**1.** Continue providing opportunities for individuals and crews to meet for a “report back/debrief.” Ensure members know warning signs for PTS, PTSD, depression, suicide, and related impacts on personnel mental health. Provide access to Employee Assistance Programs (EAP) and peer support networks—encourage use when warning signs are present.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.5 Communications	• MFD • MPD	Organizational, Operational	**34. Dispatchers were responsible for monitoring multiple large fires and other associated events. Most of the dispatchers were experienced, but all dispatchers were overwhelmed and some expressed lack of adequate knowledge, ready access to needed information, and concern about the safety of the instructions they were providing callers. There were persistent communication challenges between Central, the MPD's Department Operations Center (DOC), and the EOC.**	**1.** Staff a MFD fire officer and a MPD officer at the rank of lieutenant (or higher) in Central Dispatch to aid with operational monitoring, EOC/DOC coordinations, incident tracking, communications, and assistance with command decisions when the EOC is activated.
3.5 Communications	• MFD • County of Maui • State of HI Organizational, Operational	Equipment, Organizational, Operational	**35. Private equipment operators primarily communicate with response entities and field personnel using personal cell phones.**	**1.** Create a formal communication plan for private contractors to use during emergency situations that includes resilient hardware and appropriate training.
3.5 Communications	• County of Maui • State of HI	Preparedness, Organizational, Operational	**36. Many residents did NOT receive a text notification from the county regarding the high winds and high fire danger.**	**1.** Assess the resiliency of communication systems and establish redundant public alert program and warning processes, including best practice messaging guidance.
3.5 Communications	• Hawaiian Electric • County of Maui • State of HI	Preparedness, Organizational, Operational	**37. Only one (1) siren from the All-Hazard Outdoor Warning Siren System was operable within the burn perimeter of the Lahaina area on August 8, 2023.**	**1.** Implement a statewide sustainable program for the All-Hazard Outdoor Warning System, which includes functioning hardware resilient against mass communications failure, regular maintenance, public education, additional resources and staffing.
3.5 Communications	• County of Maui • State of HI • MEMA	Preparedness, Operational	**38. The All-Hazard Outdoor Warning Siren System had not been utilized for warning of WUI fires prior to August 8, 2023. As of the publication date of this report, MEMA has implemented a process for activating sirens for wildfires.**	N/A
3.5 Communications	• MFD • MPD • MEMA • County of Maui	Preparedness, Policy, Organizational, Operational	**39. Even when people were told to evacuate and conditions seemed obvious that evacuation was necessary, many refused because there did not appear to be official notification that danger was imminent.**	**1.** Engage the community to provide additional public education regarding the importance of what to do in an emergency and to heed all evacuation instructions.
3.6 Incident Management	• MFD	Policy, Organizational, Operational	**40. Although there were opportunities for the MFD to provide staff support for the battalion chief(s) managing the incident, a formal command team was not established. The ICs were overwhelmed with the demands of the event and possessed limited situational awareness during a rapidly expanding emergency, which included a mayday; these factors contributed to challenges with tactical decision-making throughout the Lahaina PM fire.**	**1.** Review and modify the dispatch algorithm to reflect the resource availability. **2.** Provide the resources and training necessary to establish and maintain effective support for the initial incident commander (IC). **3.** Within MFD Hazard Zone Command SOG, include requirements for all chief officer engagement within the incident command structure for large complex incidents.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.6 Incident Management	• MFD • MPD • Hawaiian Electric • Maui Water	Policy, Organizational, Operational	**41. The MFD and MPD never connected to establish a unified command.**	**1.** The MFD, MPD, and other assisting and cooperating agencies should include guidance within their respective incident management SOGs on when unified command should be considered and how it could be established.
3.6 Incident Management	• MFD • MPD	Organizational, Operational	**42. Available public safety resources were inefficiently utilized. This resulted in the failure to establish and scale an effective incident management organization during the first 24 hours of the incident.**	**1.** Provide sufficient staffing to establish and maintain an effective incident management organization, while maintaining the capacity to conduct unit-level tactical actions. Once established, develop a robust incident action plan (IAP). An IAP should outline objectives, strategies, and tactics for managing the incident, including evacuation procedures, traffic management, and resource allocation. Communicating the IAP to all responding personnel and stakeholders ensures a shared understanding of roles, responsibilities, and priorities.
3.6 Incident Management	• MFD • MPD	Policy, Organizational, Operational	**43. There was no comprehensive plan for the MPD‘s wildfire response.**	**1.** Develop a comprehensive plan in coordination with the MFD for MPD's response to a wildfire that prioritizes public safety, efficient evacuations, and effective traffic management.
3.6 Incident Management	• MPD	Policy, Organizational, Operational	**44. Limited sharing of critical information occurred between field operations units, the MPD Department Operations Center (DOC), and the EOC.**	**1.** Review and update policies and develop new processes for information flow between MPD Command Personnel on site, command staff, dispatch, and the EOC. **2.** All commanders, captains, and above should receive training on activation of the DOC and a Department Operations Center quick reference guide should be developed for commanders to be utilized for any crisis.
3.6 Incident Management	• MPD	Policy	**45. The MPD Natural and Man-Made Disaster Plan, G.O. 411.4, does not include wildfire incidents.**	**1.** Update policy to include plans specifically related to wildfires.
3.6 Incident Management	• MFD • MPD • MEMA	Preparedness, Policy	**46. There was limited pre-event incident action planning for anticipated events or incidents by the MFD, MPD, and MEMA.**	**1.** The MFD, MPD, and MEMA should update the current policies and procedures regarding pre-event planning (including preparing pre-event incident action plans), staffing, and equipment.
3.6 Incident Management	• MFD • MPD • MEMA	Policy, Preparedness, Organizational	**47. There were no written procedures or guidelines for Continuity of Operations (COOP).**	**1.** The County of Maui, MPD, and MFD to prepare Continuity of Operations Plans (COOP) that outline procedures to ensure essential functions can continue during and after various types of emergencies or disruptions.
3.6 Incident Management	• MEMA • HI-EMA	Preparedness, Organizational	**48. Communication was limited between MEMA and HI-EMA EOC.**	**1.** Additional resources are needed to have a persistent durable communication link prior to, and during, a major emergency or disaster event.
3.6 Incident Management	• MEMA	Preparedness, Operational	**49. Given the known conditions forecasted for the County of Maui on August 8, 2023, agency representatives self-reported to the EOC throughout the day, but full activation of the EOC did not occur until 16:30.**	**1.** Under similar conditions, and given appropriate resources, consider full activation earlier to aid collaboration between all relevant emergency support functions.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.6 Incident Management	• MEMA	Preparedness, Policy, Organizational, Operational	**50. MEMA does not have a sufficient budget/personnel allocation to effectively and sustainably perform the wide range of preparedness, response, and recovery missions assigned to it.**	**1.** EOCs fulfill essential functions during emergencies and must be properly staffed and operationalized with (A) qualified overhead personnel to perform emergency management-related functions and (B) designated representatives from all cooperating/involved agencies/organizations to provide subject matter expertise, resource coordination/tracking, and immediate information relays to ICs in the field.
3.6 Incident Management	• MEMA	Organizational, Training, Operational	**51. During the EOC activation on August 8, 2023, there was a lack of clarity regarding the roles and responsibilities among MEMA personnel.**	**1.** Provide clearly defined roles and responsibilities for each staff member during EOC activations. Staff members should be trained and fully competent to fulfill their designated role. MEMA should also ensure staff training for secondary roles and responsibilities for when personnel are expected to shift to a different position (e.g., when vacancies occur).
3.6 Incident Management	• MEMA	Training, Operational	**52. Some MEMA personnel were unfamiliar with the software platform used for documentation and incident tracking during EOC activations.**	**1.** Ensure all personnel are fully trained and proficient with use of the designated EOC software program (WebEOC or any other software program designated by the MEMA Administrator). **2.** Ensure all MEMA EOC personnel understand the NIMS-ICS requirements for documentation during EOC activations.
3.6 Incident Management	• MEMA	Operational	**53. The EOC was overcrowded and personnel had to find alternative work locations.**	**1.** MEMA should examine the needs for the physical location and expand the EOC.
3.6 Incident Management	• MFD • MPD	Policy, Operational, Equipment	**54. Both the MPD and MFD were unable to maintain personnel accountability for officers, firefighters, and crews during the Lahaina PM fire.**	**1.** MPD roll calls should be initiated by dispatch and/or command staff as needed to maintain accountability. A policy should be established with defined roll call procedures. **2.** Ensure sufficient resources are available to support MFD Cs and division/group/unit-level supervisors with all functions of command/management, including personnel accountability. **3.** Adoption and consistent use of a common and resilient AVL platform on all MPD, MFD, and cooperators' (e.g., DOFAW, ARFF, and EMS) vehicles would assist dispatchers and command officers with personnel accountability and incident management.
3.6 Incident Management	• MFD	Operational, Training	**55. The MFD sponsors a Type 3 IMT that was not used August 8-9, 2023.**	**1.** Consider pre-deploying the Type 3 IMT when severe weather and/or fire danger conditions are forecasted. **2.** Enhance training and expand participation to include personnel from multiple disciplines, reinforcing the value of an all-hazards IMT and fostering collaboration across agencies. Consider securing training and experiences for Ocean Safety personnel to be able to perform in specific IMT overhead roles.
3.6 Incident Management	• Hawaiian Electric	Policy, Operational	**56. Hawaiian Electric should be at the incident command post (ICP), or tied in closely with the incident commander if an ICP is not established, to inform command of safety issues, other coordination opportunities, and act as a liaison to their organization.**	**1.** Create and follow a protocol to embed Hawaiian Electric representatives in the incident command post (when established) as liaisons.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.6 Incident Management	• MFD • MPD	Operational, Equipment	**57. The MPD and MFD did not deploy or use the mobile command vehicle as per MPD G.O. 304.11. Deployment and use of the vehicle in Lahaina before the PM fire may have initiated the unified command organization that was absent throughout the PM fire.**	**1.** Follow G.O. 304.11 to ensure the mobile incident command vehicle is used for appropriately sized incidents, such as the Lahaina PM Fire. **2.** Deploy the mobile command vehicle at planned events to exercise the deployment process and equipment.
3.6 Incident Management	• MFD • MPD	Policy, Operational	**58. There were no established unit identifiers for off-duty MPD officers or supplemental MFD units.**	**1.** Create a call sign procedure for identification of off-duty MPD officers who self-deploy and MFD personnel assigned to supplemental MFD units. The existing MPD G.O. 301.5 policy should be revised regarding the establishment of call signs for incoming off-duty officers and self-deploying officers. The MFD should establish a policy to standardize identification of staffed supplemental resources.
3.7 Fire Supression	• MFD • MPD • MEMA • Maui Water • DLNR-DOFAW • Hawaiian Electric	Preparedness, Policy, Organizational	**59. The MFD did not have an organizational pre-plan for an anticipated high wind or extreme fire weather event.**	**1.** Ensure effective sensemaking of forecasts and real-time conditions through training and pre-planning. **2.** Implement organization-wide start-of-shift briefings to discuss extreme fire weather conditions. **3.** Ensure the ICS can scale up quickly, integrating additional support, including personnel normally serving in administrative roles or other functions (e.g., fire prevention, ocean safety, and training), as needed. Provide training and protocols for pre-deployment. **4.** Communicate anticipated environmental conditions, risks, and performance expectations across organizations. This includes the MPD, MEMA, County of Maui Department of Water Supply, DLNR-DOFAW, and Hawaiian Electric, who reacted to environmental conditions only after problems arose. **5.** Develop a system for ongoing situational awareness that includes continuous monitoring of weather forecasts, fuel moisture levels, and fire behavior through real-time data and predictive models.
3.7 Fire Supression	• MFD • MPD • DLNR-DOFAW • Hawaiian Electric • Maui Water	Preparedness, Policy, Operational, Equipment	**60. With the impending forecast of severe fire weather, there was limited pre-deployment of additional public safety resources prior to the first fire event.**	**1.** With the potential impact of hurricanes like Dora and Red Flag conditions, the MFD, MPD, DLNR-DOFAW, and their cooperators should consider deploying additional resources across Maui Nui. **2.** Identify fire apparatus, incident management, and law enforcement resources for upstaffing and pre-deployment when severe conditions are forecasted. **3.** Ensure sufficient fire apparatus, response vehicles, portable equipment, PPE, and radios are available to resource the pre-deployment of additional response units and overhead assets. Whenever possible, standardize the equipment loadout on similar apparatus/vehicles to facilitate use by callback personnel. **4.** Consider providing dedicated personnel and resources for staffing management and callback, on a daily basis and before/during major incidents, to make command-level resources readily available for strategic/tactical ICS roles.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.7 Fire Supression	• MFD • MPD • County of Maui • State of HI • HI-EMA • MEMA	Preparedness, Prevention, Policy, Organizational, Training, Operational	**61. There appears to be a statewide culture of dismissing and/or under-recognizing wildfire risk. The underfunding and under-addressing of preparedness, planning, and mitigation efforts significantly impacts all parts of the system and fire outcomes. This cannot be overstated.**	**1.** Establish a culture of respect for extreme conditions and the need for operational adjustment.
3.7 Fire Supression	• MFD • MPD • DLNR-DOFAW	Preparedness, Policy, Organizational, Operational	**62. DLNR-DOFAW resources, specialized wildfire equipment, and trained personnel were underutilized due to restrictive fire response zone guidelines.**	**1.** Incorporate land ownership maps into incident reporting and tracking to ensure that state and federal agencies with response duties and wildland firefighting capacity are notified and activated. **2.** Review and revise master mutual aid agreements for all fire suppression resources on Maui Nui, including, but not limited to, the MFD, ARFF, DLNR-DOFAW, and National Park Services to ensure optimal readiness and response for multi-hazard disasters.
3.7 Fire Supression	• MFD • MPD • County of Maui	Preparedness, Policy, Operational	**63. Densely populated and narrow roadways hindered both MFD and MPD movement during suppression (as well as evacuation and rescue) efforts. Apparatus positioning was not always optimal, due in large part to an overall lack of situational awareness about the location, severity, and trajectory of the fire(s).**	**1.** Responding MFD units should have pre-determined plans and operating practices for specific areas with narrow streets, outlining alternative access points, water supply strategies, evacuation procedures, and addressing the needs of vulnerable members of the community. **2.** Place hardcopy maps, mapbooks, and pre-incident plans in all response vehicles to provide redundancy if cellular network communication is unavailable.
3.7 Fire Supression	• MFD • MPD • Hawaiian Electric	Policy, Operational	**64. The uncertainty around the status of power in the area created numerous impacts on MPD and MFD response to the incident.**	**1.** As previously mentioned, Hawaiian Electric should have a representative at the ICP (when established).
3.7 Fire Supression	• MFD • DLNR-DOFAW	Policy, Operational, Equipment, Training	**65. Private heavy equipment contractors lacked appropriate training, PPE, equipment, and communications.**	**1.** Strengthen the coordination with private contractors and address limitations in training, equipment (including standardizing equipment to ensure compatibility with all fire suppression resources), PPE, and communication.
3.7 Fire Supression	• MFD • DLNR-DOFAW	Policy, Operational, Training	**66. A portion of the mopup area was difficult to access and posed safety threats.**	**1.** Include DLNR-DOFAW resources on initial response to vegetation and WUI fires. **2.** Ensure all personnel have the training to identify and establish safety zones and escape routes, and have protocols in place for communicating this to crews. **3.** Communicate the wildfire risk to all department members to set and/or reinforce expectations related to fire mopup procedures.
3.7 Fire Supression	• MFD	Policy, Operational, Training	**67. MFD firefighters performed mopup as proven successful under typical weather conditions. However, under the severe weather conditions on August 8, 2023, this level of mopup appears to have been insufficient.**	**1.** Revise policies, procedures, and trainings (E.O. 302.14) that address wildland firefighting (specifically mopup operations) to be in alignment with NWCG guidelines. **2.** Implement schedules to manage responder fatigue, ensuring adequate rest periods and meals.

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.7 Fire Supression	• MFD	Policy, Operational, Training	**68. MFD wildland firefighting training, equipment, and staffing should be commensurate with the level of wildfire risk faced by firefighters.**	**1.** Conduct a comprehensive audit and gap analysis of existing MFD operating procedures/practices against relevant Occupational Safety and Health Administration (OSHA) regulations, National Fire Protection Association (NFPA) standards, fire service best practices, and NWCG standards/guidelines to help ensure compliance with industry regulations and best practices. By conducting an audit and implementing recommended improvements, the MFD can create a safer working environment for its personnel and enhance the effectiveness of its firefighting and rescue efforts for all incident types. **2.** Review the implementation of the MFD's 36-hour rule for alignment with operational needs during disasters and major emergencies. **3.** Consider developing a WUI firefighting playbook to address the increasingly severe wildfire threat across Maui Nui. Look to departments that respond to WUI incidents for expertise and protocols, such as California. **4.** Deliver training on, and provide a copy in all response vehicles, the NWCG Incident Response Pocket Guide (IRPG), PMS 461. **5.** Provide additional wildfire and WUI firefighting training and experiences (such as shadowing incident management personnel in other areas) for MFD personnel. **6.** Continue providing medical monitoring and behavioral health support for responders and support personnel.
3.7 Fire Supression	• MFD	Policy, Training, Operational	**69. Many initial attack resources were burned over due to fighting fire from a downwind position.**	**1.** Train firefighters about the impact of wind on fire progression and fire suppression techniques as per evidence based information and best practices.
3.7 Fire Supression	• MFD • DLNR -DO-FAW	Policy, Training, Operational	**70. Standard wildland firefighting operating procedures for the DLNR-DOFAW and MFD are not in alignment.**	**1.** The DLNR-DOFAW and MFD should collaborate to update and integrate standard operating guidelines and training for wildland firefighting.
3.8 Evacuation	• MFD • MPD	Policy, Training, Operational	**71. Unified coordination of evacuation procedures among the MPD, MFD, and other agencies may have facilitated more efficient egress of residents.**	**1.** Create, review, and implement an interagency comprehensive evacuation plan based on risk and resources. Integrated emergency response plans involving local, state, and federal agencies, as well as non-governmental organizations, should be developed, with regular joint training exercises to ensure smooth coordination during actual emergencies. **2.** The MPD should regularly train for wildfire evacuations, familiarizing themselves with evacuation procedures and protocols. This training enhances response capabilities and ensures a swift and organized evacuation process when wildfires threaten communities.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.8 Evacuation	• MFD • MPD • County of Maui	Preparedness, Policy, Operational	**72. During the evacuations, there were lapses in coordination and communication that could have reduced efficiency.**	**1.** Pre-plan evacuation routes. Effective evacuations during a wildfire, such as the Lahaina PM fire, require planning, coordination, and adherence to best practices. A key aspect is comprehensive pre-event planning, which involves identifying evacuation routes (including unnamed dirt roads), establishing communication protocols, and conducting drills to ensure readiness. **2.** Sufficient personnel are needed to manage traffic, provide assistance to evacuees, and maintain public safety. Adequate staffing levels enable timely and orderly evacuations, reducing the risk of congestion and confusion. **3.** Create and implement comprehensive traffic management plans that account for limited access and egress routes, including pre-planned alternate routes and strategies to manage congestion. **4.** Ensuring gates blocking potential evacuation routes are equipped with standardized locks and that emergency responders have the necessary keys or access codes is also vital. **5.** Develop comprehensive support systems for residents who need to evacuate–especially those with access and functional needs–including temporary housing, transportation assistance, and access to essential services. By addressing these key areas, the Maui community can improve its preparedness for future wildfires and other emergencies, ensuring better protection of lives and property. **6.** Volunteer training programs, such as those for Community Emergency Response Teams (CERT), should be expanded to assist with evacuation efforts and provide support during emergencies. Additionally, specific evacuation plans for vulnerable populations, including the elderly, disabled, and those without transportation, should be created, with community support networks established to assist these individuals during evacuations. Engage community organizations and CERT teams to provide additional support in evacuation efforts.
3.8 Evacuation	• MPD	Policy, Operational, Equipment	**73. While some Body-Worn Cameras (BWC) were activated (in keeping with the current policy), several files provided by the County of Maui were unreadable.**	**1.** Update the MPD's G.O. 304.12 policy to have BWCs activated upon dispatch and include a quality-control program to ensure all equipment is functioning properly and producing usable audio visual assets. **2.** The MPD should follow G.O. 304.12.
3.8 Evacuation	• MPD	Equipment, Training	**74. MPD officers experienced difficulty hearing radio traffic due to the wind and noise from the fire.**	**1.** Issuing radio earpieces to all officers will enhance communication, allowing them to stay informed and coordinate effectively during incidents. Officers should receive training on the proper use and maintenance of these earpieces to maximize their benefits.

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
3.8 Evacuation	• County of Maui • MEMA	Preparedness, Policy, Equipment, Operational	**75. The alert systems in place did not adequately inform residents of inherent dangers.**	**1.** Developing and implementing multiple alert systems, including sirens, radio broadcasts, and door-to-door notifications, can ensure that evacuation orders reach all residents, especially when cell service and electrical power are lost. **2.** Expand community engagement and preparedness efforts with public awareness campaigns that emphasize the importance of evacuation and the risks of staying behind during wildfires, encouraging residents to have a personal evacuation plan that includes considerations for pets and family members with special needs. **3.** Educate the public about evacuation procedures and safe routes, and the importance of establishing family evacuation plans and having prepared “go-bags.” Regular drills and informational sessions can reinforce this knowledge, while localized communication networks, such as neighborhood watch groups or community liaisons, can assist in disseminating information.
3.8 Evacuation	• MFD • MPD	Preparedness, Policy, Equipment, Operational	**76. MPD officers encountered barriers to roads that could have been (and eventually were) used as alternate egress routes and lacked equipment to navigate these barriers.**	**1.** Perform annual status checks of emergency gates throughout the community. **2.** Equip police vehicles with disaster response kits, including appropriate PPE, to be able to facilitate evacuations and remove barriers from potential escape exits, such as chain link fences, gates, and boulders. **3.** The MFD to establish new policy/General Order for the provision of fire- and disaster-related emergency tools for patrol, such as bolt cutters, tow straps, etc.
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Preparedness, Policy	**77. Numerous stakeholder organizations (state, county, community, and HWMO) have collaborated to evaluate wildfire risk per West Maui CWPP.**	**1.** Hold a statutory organization accountable for executing the preparedness plans commensurate with the risk identified through these efforts. **2.** Adopt and enforce contemporary codes and standards for building construction in wildfire prone areas.
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Preparedness, Policy	**78. Codes and standards exist for addressing fire hazards of exterior vegetation (16.04D Subsection 10.13.10), but they require enhancement based on risk and current guidelines.**	**1.** Update, implement, and enforce fuel management and defensible space around structures.
4.0 Built Environment	• MFD • County of Maui • State of HI	Research, Prevention, Policy	**79. Some vegetation adjacent to structures survived where the structure was not destroyed.**	**1.** Additional research is necessary to understand the potential for lush, well-watered, and well-mainted vegetation to provide benefits (e.g., radiation shielding) that is not outweighed by the hazard.
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Policy	**80. Ember penetration through building envelopes, including roofs, vents, and windows, is a common pathway for building ignition.**	**1.** Buildings should be constructed and maintained to resist ember intrusion. This will include construction features (vents, roofs, etc.). **2.** Adopt stronger WUI codes (e.g., ICC International Wildland-Urban Interface Code and NFPA 1140: Standard on Wildland Fire Protection) or WUI Structure/Parcel/Community Hazard Mitigation Methodology guidance.

6.1 APPENDIX

Reference Section	Relevant Department	Actionable Areas	Finding	Recommendations
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Policy	**81. Window and doors were left open prior to evacuation.**	**1.** Residents and citizens should be educated on the importance of closing building openings as an important component of preparation for, and departure from, a home during an evacuation—part of a "Ready, Set, Go: Close Before You Go" campaign.
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Policy	**82. Age of construction is not a primary indicator of structure survival (correlation not causation).**	**1.** Ensure properties and areas around structures are well-maintained, despite the structures' age (i.e., newer structures are not exempt).
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Policy, Operational	**83. Defensive actions appear to have lessened fire impact in the built environment.**	**1.** Identify fire suppression strategies and tactics commensurate with resources and infrastructure capabilities and availability. Preplan based on these limitations and local conditions.
4.0 Built Environment	• MFD • County of Maui • State of HI	Prevention, Policy	**84. Fuel breaks, such as Kahoma Stream, Kaua'ula Stream, Keawe Street Apartments at the Villages of Leiali'i construction site, and grass athletic fields by the Boys and Girls Club/Lahaina Recreation Center, appear to have impacted fire progression.**	**1.** Investigate zoning changes to incorporate fuel breaks in areas within the community to slow fire progression and to act as safe refuge areas for evacuating residents.

6.2 Lahaina Fire Comprehensive Timeline Report and Minute-by-Minute Timeline

Fire Safety Research Institute
Steve Kerber and Derek Alkonis
April 17, 2024

https://doi.org/10.54206/102376/VQKQ5427

This is a collection of data points gathered from Maui County dispatch records and transcriptions, body camera recordings, weather reports, social media posts, emergency management logs, and other sources. These data points occur prior to and during the fire of August 8-9, 2023, in Lahaina, Hawaii.

The information collected for this spreadsheet is sorted chronologically and represents the data provided to Fire Safety Research Institute (FSRI) by Maui County and cooperating agencies and should not be considered a complete record of events.

Records highlighted in blue are referenced in the Lahaina Fire Comprehensive Timeline Report (Phase 1) prepared by FSRI.

The Lahaina Comprehensive Timeline Report is available free of charge from: https://ag.hawaii.gov/maui-wildfire-investigation-resources-page/ or https://doi.org/10.54206/102376/VQKQ5427

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6.3 Lahaina Resident Technical Discussion Summary – March 3, 2024

Lahaina Resident Summary March 3, 2024

#1) How long have you lived in Lahaina?

70 Responses

Mean	29.79 years	(average)
Median	30 years	(middle value)
Mode	30 years	(most frequently repeated value)
Longest	82 years	
Shortest	2 years	

#2) Was the 8th the windiest day you've ever experienced in Lahaina?

70 Responses

Yes	95.71%	(67/70)
No	4.29%	(3/70)

Most were around during the 2018 Wind/Fire event and many were there during multiple tropical storms and stated 8/8 was the windiest and most destructive wind event they have experienced

#3) Were you aware the 8th was going to be a windy day?

74 Responses

Yes	59.46%	(44/74)
No	40.54%	(30/74)

Those that did know it was going to be windy stated that they did not expect it to be as strong

#4) Were you without electricity? If so, when?

71 Responses

98.36% (60/61) stated they lost power

52 Responses gave a time they lost power

30.76% - "Early or AM"
23.08% - Before 0400
19.23% - 0401-0500
5.77% - 0501-0600
13.46% - 0601-0700
7.70% - 0701-0900

Lahaina Resident Summary March 3, 2024

0% - After 0900

Due to the early hours of the power outages, most of the respondents became aware when they woke up or when their AC units tripped off causing them to wake up.

97.22% (35/36) that gave a time lost power at or before 0800,
88.88% (32/36) lost power before 0700.
69.44% (25/36) that gave a time lost power at or BEFORE 0600.

#5) Were you without water? If so, when?

44 Responses
86.36% (38/44) reported they lost water
24 Responses gave a time they lost water/pressure

8.3% - BEFORE 1400
12.5% - 1401 and 1500
12.5% - 1501 and 1600
37.5% - 1601 and 1700
16.7% - 1701 and 1800
12.5% - AFTER 1800

14 Responses - Lost water, No time given

Determining when/if water/water pressure was lost is more difficult than other utilities. Many who may not have had water at their residence might not have noticed unless they tried to use their garden hoses to protect their property. Also they may have evacuated before their area lost water/pressure.

#6) Did you receive a text notification from the county regarding the high winds and high fire danger? If so, what day and time? Can we see it?

62 Responses

Lahaina Resident Summary March 3, 2024

87.32% (62/71) stated they did NOT receive a text notification

12.68% (9/71) stated they DID receive a text notification

There were a lot of comments regarding text notifications. Vast majority stated they received no notification prior to or during the event. Some stated that they did not receive texts/alerts while the person next to them did. As the event progressed power and mobile service was lost there was no communication possible even if alerts were being sent. Another concern was those who did receive alerts during the fire, many reported that it did NOT come in a text rather in a scrolling message that came across their screen and could not be retrieved/reread. Overall did not increase awareness or urgency of need to evacuate in those that did receive and was ineffective at reaching the broader population.

#7) Did you see or hear TV or radio newscasts regarding the high winds and high fire danger?

71 Responses

66.20% (47/71) Did NOT see or hear newscasts

33.80% (24/71) DID see or hear newscasts

Almost 2/3 of residents did NOT see or hear warnings.

Those that did stated overwhelmingly they did not expect the severity of the wind event after watching/hearing newscasts.

All TV and most radio broadcasts would have been on the day prior 8/7 as there was no power or cell service in most of Lahaina from early AM on the day of the fire.

#8) When and where did you first see the fire?

59 Responses

16 First saw the AM fire	0634 Mean
	0630 Median
	0630 Mode

Lahaina Resident Summary March 3, 2024

43 First saw the PM fire 1514 Mean
1526 Median
1500 Mode

Most that witnessed the AM fire were at their residences in the area of Ku'ialua St. and Lahainaluna Rd.

Identified individual (Survey 15) that witnessed ignition of AM fire

Mix of residence and work locations for the PM fire

Many of the PM responses did not see active flame only Smoke

All that saw the AM fire also saw the PM fire

#9) Were you instructed to evacuate? If so, by who and when?

79 Responses

No – 59.49% (47/79)

Yes – 40.51% (32/79)

Majority indicated they did not receive an order to evacuate (56.1%)

Those that did were urged by friends/neighbors or MPD.

MPD was driving around on loudspeakers notifying residents they needed to leave area. Many commented they could not hear what was being said and there were no instructions on evacuation route to take, direction to head, or destination to head to.

#10) If you evacuated, which direction did you go and which road did you use and were there any obstructions, like trees and/or power poles or wires?

75 Responses

Yes – 81.33% (61/75)

No – 18.67% (14/75)

The route taken was most often determined by their start location.

Most headed North toward the Lahaina Civic Center as that is the Shelter most often used during emergency evacuations.

Lahaina Resident Summary March 3, 2024

Downed power poles and lines were the most common obstruction regardless of direction taken. There were long lines and delays on roads heading West (Makai) toward Honoapi'ilani highway and North and South leaving Lahaina town. Traffic was so bad on Komo Mai that many turned around and went up towards the bypass. Reports of downed power poles and lines all over Lahaina town. Traffic along Front St. was described as a "parking lot"

#11) Did you encounter police officers? If so, where and what were they doing?

68 Responses

Yes 79.41% (54/68)

No 20.59% (14/68)

Police were most often encountered by residents during the evacuation from their residence/business directing traffic. The second most common occurrence was driving around alerting residents to evacuate.

#12) Did you encounter fire fighters? If so, where and what they were doing?

67 Responses

No 53.73% (36/67)

Yes 46.8% (31/67)

Firefighters were most often encountered by residents who witnessed the morning fire or initial phases of the afternoon fire. FF were most often seen during the AM fighting the fire off Lahainaluna Rd. East of the bypass.

FF were most often seen during the PM fighting fires in the residential neighborhoods West of the bypass, North of Lahainaluna.

In the PM, FF's were working in areas most heavily involved which were evacuated or evacuating. Residents stated they either heard or saw FF's responding.

#13) Did you participate in firefighting? If so, where and what did you do?

70 Responses

Lahaina Resident Summary March 3, 2024

No	68.57%	(48/70)
Yes	31.43%	(22/70)

The majority of the residents did not participate in any firefighting actions. Those that did primarily extinguished small fires around their homes or wet down home/vegetation.

There were varying degrees of success. Those living near the origin of the PM fire were much more successful in saving their homes than those whose residence/business were impacted later.

6.4 APPENDIX

6.4 Subpoena Requests

Table 6.4.1 Subpoena Requests.

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
2023-084 Maui Emergency Management Agency	Nov. 27, 2023	(1a) Current editions, as of August 2023, for all emergency management-relatedplans for Maui County. Including, but not limited to: (1b) the Maui County Emergency Operations Plan (EOP), (1c) the West Maui Emergency Plan, and (1d) any operational and/or tactical plans addressing wildfire, wind, tsunami, evacuation, emergency notification, alert/warning, and other related planning documents. (Note: We have the May 2021 EOP, and the May 2018 West Maui Emergency Plan. We are mostly interested in specific operational and/or tactical plans addressing specific emergencies, and more specifically wildfire or wildland-urban interface (WUI) fires.)	Dec. 11, 2023	Sept. 24, 2023	All Items: Oct. 13, 2023 Nov. 21, 2023 Confirmed latest via Prod. Log note
		(2) All drafts, updates, and/or revisions to the West Maui Emergency Plan draft document dated May 14, 2018.		Oct. 20, 2023	(2) Oct. 13, 2023 Nov. 21, 2023 Confirmed latest via Prod. Log note
		(3) All drafts, updates, and/or revisions to the Maui County Emergency Operations Plan, May 2021 edition (“Basic Plan”).		Oct. 20, 2023	(3) Oct. 13, 2023 Nov. 21, 2023 Confirmed latest via Prod. Log note
		(4) All “Functional and Hazard Annexes” included/referenced in Sections III and IV of the Basic Plan, May 2021 edition.		Oct. 20, 2023	(4) Oct. 13, 2023 Nov. 21, 2023 Confirmed latest via Prod. Log note
		(5) All draft and completed “Functional and Hazard Annexes,” to the Basic Plan, for wildfire-related activities and/or WUI fires.		Oct. 20, 2023	(5) Nov. 14, 2023 None
		(6) All after-action reviews (AARs) and records of any Maui County exercises (table-top, functional, full-scale) conducted for wildfire and/or WUI fires from 2013-2023.		Oct. 20, 2023	(6) Nov. 14, 2023 None recorded in Production Log

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(7) All Maui County departmental strategic plans, policies, or procedures that support the Maui County Emergency Operations Plan.		Oct. 20, 2023	(7) Nov. 27, 2023
		(8) Records of daily Maui County Emergency Operations Center (EOC) activation status for the period 1-15 August 2023.		Oct. 20, 2023	(8) Dec. 13, 2023 Comms Test Log
		(9) Identification and contact information for the Maui County officials listed in Figure 5 "Lines of Succession" of the Maui County EOP, May 2021 edition, from 7-10 August 2023.		Oct. 20, 2023	(9) Dec. 13, 2023
		(10) Daily EOC organizational chart(s), by National Incident Management System Incident Command System (NIMS-ICS) role(s) and/or emergency support function(s) (ESF) for the period August 7-10, 2023		Oct. 20, 2023	(10) None recorded in Production Log
		(11) Rosters, sign-in sheets, logs, and documents, physical or electronic, listing all personnel that staffed the EOC from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023, as well as an accounting of the time(s) that each person was present in the EOC.		Aug. 31, 2023, Sept. 24, 2023, Oct. 20, 2023	(11) Nov. 27, 2023 Update Dec. 6, 2023 Still missing info.
		(12) All documents, physical or electronic, that were developed in the EOC during the time period from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023.		Oct. 20, 2023	(12) Dec. 13, 2023 Missing many Update Feb. 8, 2024 Still missing info.
		(13) Records of all communications made to or by the MEMA Administrator from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023. These records may include but are not limited to: texts, phone calls, and emails.		Oct. 20, 2023	(13) Dec. 13, 2023
		(14) Transcripts and records maintained by any electronic emergency management system, such as WebEOC, from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023.		Oct. 20, 2023	(14) Dec. 13, 2023 RFAs only. Missing info.

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(15) Copies of all incident action plans (IAPs) for the fire events that occurred in Maui County on August 7-10, 2023 ("Maui Fires") that were developed from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023.		Oct. 20, 2023	(15) Dec. 6, 2023 Update on Dec. 21, 2023
		(16) Recordings of all EOC operations and of images from cameras located in the community that were viewed in the EOC from 8:00 p.m. on August 7, 2023, through 8:00 p.m. on August 10, 2023.		Oct. 20, 2023	(16) Dec. 6, 2023
		(17) Training/certification and exercise records for MEMA and MEMA employees for the past two (2) years (NIMS-ICS and other), including individual qualifications, local exercises, statewide exercises, and coordinated exercises with Federal and NGO partners.		Oct. 20, 2023	(17) Dec. 13, 2023
		(18) Information on all preparedness messaging addressing the August 2023 wind event that may have been distributed by MEMA and/or Maui County prior to the Maui Fires. This includes, by way of illustration and not limitation, media releases, outreach campaigns, social media, Integrated Public Alert and Warning System (IPAWS), Wireless Emergency Alerts (WEA), and/or directives.		Oct. 20, 2023	(18) Nov. 30, 2023
		(19) All maintenance and testing logs for the statewide alert and warning siren system in Maui County.		Oct. 20, 2023	(19) Dec. 13, 2023
2023-085 Maui Public Works	Nov. 27, 2023	(1) Maui County DPW or Hawaiʻi Department of Transportation Brush Clearance Standard Operating Guidelines (SOG)	Dec. 11, 2023	Sep. 24, 2023	(1) Oct. 23, 2023 None as per DPW Hwy Divs
		(2) Maui County DPW Brush Clearance Records in Lahaina are from January 1, 2020 to August 8, 2023		Sep. 24, 2023	(2) Nov. 24, 2023

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
2023-086 Maui Department of Water Supply	Nov. 27, 2023	(1) All records describing (size, location, permitted and operating capacity, etc.) the drinking water production facilities feeding the storage and distribution system;	Dec. 11, 2023	Oct. 25, 2023	(1) Dec. 13, 2023
		(2) The typical operating methodology for the drinking water treatment, storage, and distribution system in Maui County;		Oct. 25, 2023	(2) Dec. 13, 2023
		(3) Documentation giving a general description of the water storage and distribution system components;		Oct. 25, 2023	(3) As per County of Maui, sharing information requires approval of the Department of Homeland Security (DHS). Discussed during site visit Jan. 22-23, 2023 (accompanied by Deputy Director Landgraf).
		(4) All records showing the water levels in the storage tanks under normal operating conditions, just before the fire event and during the fire event;		Oct. 25, 2023	(4) Dec. 13, 2023
		(5) Design and operating information for the storage system including locations of the storage tanks and distribution system pumps;		Oct. 25, 2023	(5) For DHS approval see above. Discussed during site visit Jan. 22-23, 2023
		(6) Available fire storage capacity in the system under normal operating conditions;		Oct. 25, 2023	(6) For DHS approval see above. Discussed during site visit Jan. 22-23, 2023
		(7) All documentation showing distribution system connections between the East (mauka) and West (makai) sides of Maui;		Oct. 25, 2023	(7) For DHS approval see above. Discussed during site visit Jan. 22-23, 2023
		(8) Documentation showing the size of the distribution system pipes connected to the fire hydrants in the primary area of the Lahaina fire system;		Oct. 25, 2023	(8) For DHS approval see above. Discussed during site visit Jan. 22-23, 2023
		(9) Documentation showing the types of pipe materials used in the distribution		Oct. 25, 2023	(9) Dec. 13, 2023

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(10) Documentation showing the typical depth of the pipes in the distribution system;		Oct. 25, 2023	(10) Dec. 13, 2023
		(11) The emergency operating plan, if any, for a major water usage event;		Oct. 25, 2023	(11) For DHS approval see above. Discussed during site visit Jan. 22-23, 2023
		(12) All records of how the storage and distribution system was brought back online assuming a loss of pressure during the fire event.		Oct. 25, 2023	(12) No docs available. Comms via non recorded radio trans.
		*Unless stated otherwise, all requests pertaining to regularly updated plans, procedures, or other documents, are for the version that was in use on August 7-9, 2023.		Oct. 25, 2023	
2023-101 Maui Police Department	Dec. 29, 2023	(1) Automated Vehicle Location data for Aug. 8, 2023	Jan. 4, 2024	Sep. 24, 2023	All items: Jan. 18, 2024
		(2) Computer Aided Dispatch record for Aug. 8-10, 2023		Aug. 31, 2023 & Oct. 24, 2023	
2023-102 Maui Fire Department	Dec. 29, 2023	(1) Automated Vehicle Location data for Aug. 8, 2023	Jan. 4, 2024	Sep. 24, 2023	(1) Jan. 18, 2024
		(2) Computer Aided Dispatch record for Aug. 8-10, 2023		Aug. 31, 2023 & Oct. 24, 2023	(2) Jan. 18, 2024
2023-103 Maui Police Department	Dec. 29, 2023	(1) Definitions of MPD dispatch codes and identifiers, including abbreviations found in MPD Event Chronologies and Dispatch Reports for Aug. 8-10;	Jan. 12, 2024	Nov. 16, 2023	(1) Jan. 24, 2024
		(2) Documents describing unit codes;		Nov. 16, 2023	(2) Jan. 18, 2024
		(3) Policies for assigning “UDTH” event types;		Nov. 16, 2023	(3) Jan. 18, 2024
		(4) Documents defining UDTH event types;		Nov. 16, 2023	(4) Jan. 18, 2024
		(5) All recorded MPD radio comms for 8/8 – 8/10;		Aug. 31, 2023	(5) Jan. 17, 2024
		(6) Staffing rosters for 8/7, 8/8, 8/9;		Aug. 31, 2023	(6) Jan. 24, 2024
		(7) Training records for MPD personnel from date of hire to 8/8/23;		Subpoena only	(7) Jan. 24, 2024 (Not in proper format)

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(8) Records of mandatory/ recommended educational and training requirements for each MPD position;		Subpoena only	(8) Jan. 24, 2024 (Does not match request - produced general travel records only
		(9) Personnel deployment assignments, 2018 – 2023;		Subpoena only	(9) Jan. 24, 2024 (Does not match request)
		(10) Policies and procedures for responding to wildfire or wildland-urban interface (WUI) events;		Subpoena only	(10) Jan. 18, 2024 (partial, and records are not responsive – Natural and Manmade Disaster Plan is only record produced)
		(11) Evacuation plans and analyses;		Subpoena only	(11) Jan. 24, 2024 (Does not match request)
		(12) After Action Reports related to any and all wildfire incidents, WUI incidents, or mass evacuations;		Subpoena only	(12) No documents produced to date
		(13) Powerpoint presentation shared by Sgt. Chase Bell during Maui Police Commission meeting, Sep. 20, 2023		Subpoena only	(13) Jan. 24, 2024
2023-104 Maui Fire Department	Dec. 29, 2023	(1a) Current Fire and Rescue Operations Division personnel training/certification records for wildland firefighting, WUI firefighting, structural firefighting, incident management/command/organization, emergency medical care and/ or first aid, and radio operations;		Subpoena only	(1a) Jan. 24, 2024 (training completion records) Jan. 30, 2024 (XML and CSV provided)
		(1b) Current Fire and Rescue Operations Division personnel qualifications pertaining to wildfire, WUI, and All Hazard incidents		Subpoena only	(1b) Jan. 24, 2024 (Partial – training records provided; no qualifications)
		(2) Mandatory and/or recommended educational and training requirements for each position within Fire and Rescue Operations Division		Subpoena only	(2) Jan. 17, 2024 (Partial- course sign in sheets provided)
		(3) Records of personnel deployment for all Fire and Rescue Operations Division personnel from 2018 - 2023		Subpoena only	(3) Partial documents produced to date.
		(4) Evacuation plans and analyses		Subpoena only	(4) No documents produced to date
		(5) After Action Reports related to any and all wildfire incidents, WUI incidents, or mass evacuations;		Subpoena only	(5) Jan. 17, 2024

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(6) Draft or completed fire incident reports for the Lahaina, Kula, Kīhei, and Olinda fires		Subpoena only	(6) Jan. 17, 2024
2023-105 County of Maui	Dec. 29, 2023	(1) Information regarding the wildfire damage assessment map posted on the County of Maui website on August 12, 2023		Subpoena only	(1) Jan. 24, 2024 (Email received stating no documents responsive to this request)
		(2) Documents regarding multi-agency training exercises, drills, and other multi-agency training activities from 2018 - 2023		Subpoena only	(2) No documents produced to date
2023-106 County of Maui Department of Finance	Dec. 29, 2023	(1) As of Aug. 8, 2023, the most current and highest definition aerial imagery of all areas impacted by the Lahaina fire		Subpoena only	(1) Jan. 30, 2024 (Provided access to EagleView)
		(2) All information on improved properties within the areas of Olinda, Kula, Kīhei, and Lahaina that were destroyed or damaged by the Maui fires on Aug. 8, 2023, including date each structure built and modified		Subpoena only	(2) Partial documents produced to date
2023-107 County of Maui Department of Water Supply	Dec. 29, 2023	(1) Operational records for water supply and distribution systems for the island of Maui from Aug. 7 – 10, 2023		Subpoena only	(1) Jan. 17, 2024
		(2) Records of water production rates for all treatment plans within the water supply and distribution systems for the island of Maui from Aug. 7 – 10, 2023		Subpoena only	(2) Jan. 17, 2024
		(3a) System information obtained during the wildfires, including but not limited to (a) loss of system pressure		Subpoena only	(3a) No documents produced to date
		(3b) empty water storage tanks		Subpoena only	(3b) No documents produced to date
		(3c) lack of power at the treatment plant resulting in loss of water production		Subpoena only	(3c) No documents produced to date

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
2023-123	Dec. 29, 2023	(1) Actions taken by MPD personnel to confirm fatalities and to document the locations and identities of the deceased during and after the fire event that took place in Lahaina beginning on August 8, 2023, including:	Jan. 04, 2024	Subpoena only	(1) Jan. 4, 2024
		(2) actions taken to staff and organize MPD's efforts to confirm and document fatalities and			(2) Jan. 4, 2024
		(3) the progression of MPD's efforts as the number of confirmed fatalities increased.		Subpoena only	(3) Jan. 4, 2024
2024-045	Mar. 18, 2024	For any and all positively identified victims of the Lahaina wildfire: (1) Records documenting the last known residential address of each decedent.	Apr. 03, 2024	Subpoena only	(1) May 23, 2024
		(2) Records documenting the location that the remains of each decedent were recovered (e.g., inside structure, outdoors, inside vehicle, etc.), including all documents used to prepare Chart 3 on page 65 of the MPD Preliminary After Action Report, "Maui Wildfires of August 8, 2023."		Subpoena only	(2) May 23, 2024
		(3) Records documenting the cause of death of each decedent, where known.		Subpoena only	(3) No documents produced to date
2024-046	Mar. 18, 2024	(1a)Any and all information collected by the County of Maui regarding each and every fire-damaged or destroyed vehicle found on public roadways and other right-of-way areas following the August 2023 Maui wildfires, including but not limited to: Data on the location of the vehicle, including without limitation: • Latitude and longitude, • Address and nearest cross streets, • Whether in the public right of way or other public area.	Apr. 03, 2024	Subpoena only	(1a) Partial documents produced Aug. 29, 2024.

6.4 APPENDIX

Subpoena No.	Service Date	Description (Summary)	Response Deadline	*Email Requests	Actual Response Date
		(1b) Vehicle manufacturer, model, year manufactured, and all images of the vehicle.		Subpoena only	(1b) Partial documents produced Aug. 29, 2024.
		(1c) Damage assessment.			(1c) No documents produced to date
		(2) Any and all records or documents setting forth the process used to collect the above data, including but not limited to the method for assessing the damage to each vehicle.			(2) No documents produced to date
2024-094	Jul. 9, 2024	(1) For any and all documents, records, and/or information relating to requests, directives, or notices of violation issued by the County of Maui Department of Fire & Public Safety pursuant to the Maui County Code or Ordinances Sections 16.04D.230, 16.04D.240, and 16.04D.250, as amended, to property owners in or around the area of Lahaina, Maui within five (5) years up to and including August 2023 regarding vegetation management (e.g. the removal or clearing of flammable vegetation, combustible materials, and/or combustible growth), and records, information, and/or data relating to the subject properties including, but not limited to, pictures, photographs, drawings, sketches, videos, notes, inspection notes, voice recordings, emails, letters, text messages, spreadsheets, and/or surveys.	Jul. 24, 2024	Subpoena only	(1) Partial documents produced Aug. 29, 2024.

6.5 2018 Lahaina Fire – Incident Commander Technical Discussion Questions

FSRI is prepared to ask the following questions of the 2018 Lahaina Fire Incident Commander during a technical discussion in September 2024, date and time to be determined.

1. What was your rank at the time of this fire?
2. What was your regular work assignment?
3. Who did you report to?
4. What was your assigned work location on the day of the 2018 Lahaina Fire?
5. Were you aware of the weather forecast calling for fire weather with strong winds?
6. If so, when were you made aware? How many days prior to the arrival of the event?
7. Explain your response to the fire starting from when you received the call.
8. List MFD and other (DOFAW, private heavy equipment, ?) resources responded.
9. Where did the fire start? Show on a map and explain verbally to capture on recording.
10. Describe the weather conditions - wind? RH? temp?
11. Describe structural damage due to wind - electrical infrastructure? Roofs? Trees?
12. Did FFs have water throughout the incident?
13. Describe and explain the incident management organization used to manage the incident.
14. Were there higher level individuals you interacted with during the incident? Did you brief someone? If so, who, and what did you share?
15. Describe the strategy and tactics used to address the incident priorities.
16. Identify the fire's progression and position of resources during fire suppression.
17. Were evacuations necessary?
18. Describe your interactions with the MPD and the evacuation effort.
19. Did the MFD complete an AAR? If so, who completed it?
20. What were the lessons learned from the incident?
21. Did the MFD make any policy, procedural or equipment changes due to the 2018 Lahaina Fire, and if so, what were they and when were they implemented?

6.6 APPENDIX

6.6 National Weather Service (NWS) – Honolulu Product Verification*

Table 6.6.1 National Weather Service Product Verification Leading up to August 8, 2023.

National Weather Service Product Verification Leading up to August 8, 2023							
Forecast	**Date/time Product Released**	**Date/ Time Accuracy***	**Date/ Time Accuracy Rating**	**Forecasted Location**	**Location Accuracy****	**Location Accuracy Rating**	**Was the weather forecast Accurate (Y/N)**
Windy, very gusty, & dry conditions; Fire Weather Watch 8/7 AM through late 8/9 PM; High Wind Watch 8/7 AM through 8/9 PM	8/6/2023 3:33AM	gusts of up to 80 mph 8/8 12:22 AM3; 8/8 10:50:00 FF crew reported wind gusts up to 80 mph & downed powerlines[10]	Yes	Maui Leeward West (makai) - Maui Central Valley for Fire Weather Watch; High Wind Watch (same time-frame) for Maui Central Valley North - Maui Central Valley South - South Maui/Upcountry	Yes; gusts of up to 80 mph 8/8 12:22 AM[3]	Yes	Yes for both severity and location
High Wind Watches 20-50 mph & localized gusts >60 mph 8/7 AM through 8/9 PM	8/6/2023 3:33AM	8/8 11:35-16:35 RAWS wind speed 40 mph with 70-82 mph gusts[7]	Yes	Portions of Maui	N.D. (location is vague)		Yes for sever-ity; N.D. for location (too vague)
Red Flag Warnings: Wind 20-30 kt & higher gusts; RH 40-45% afternoon & evening	8/6/2023 3:33AM	; Multiple spot fires reported[16]	Yes	Leeward portions of all Hawaiian Islands	Yes; Multiple spot fires reported[16]	Yes	Yes for both severity and location
Fire Weather Planning Forecast; Moderate trade winds; showers may increase on 8/6 with highest rainfall chances over windward areas; Windy, very gusty, & dry conditions 8/7-8/9	8/6/2023 3:34 AM	Multiple reports of wind damage[14,15]	Yes	Maui Leeward West - Including, Lahaina, Kāʻanapali; Fire Weather Watch in effect from 8/7 AM through 8/8 PM	Yes: Multiple reports of wind damage[14,15]	Yes	Yes for both severity and location
Red Flag Warning -Critical fire weather conditions possible 8/7 AM through 8/8 late PM	8/6/2023 4:01AM	8/8 06:42 E3 crew measured 40 mph winds, gusting to 60 mph[5]	Yes	Across Leeward areas of all Hawaiian Islands	Yes; Multiple spot fires reported[16,17]	Yes	Yes for both severity and location
Moderate trade winds prevail, but from 8/7-8/9, dry air with potentially damaging wind gusts enter the area.	8/6/2023 10:02 AM	8/8 10:50:00 FF crew reported wind gusts up to 80 mph & downed powerlines[10]	Yes	Various parts of the Hawaiian Islands, including Maui Central Valley North, Maui Central Valley South, South Maui/Upcountry.	Yes; Multiple reports of wind damage[14,15]	Yes	Yes for both severity and location

6.6 APPENDIX

National Weather Service Product Verification Leading up to August 8, 2023							
Forecast	**Date/time Product Released**	**Date/ Time Accuracy***	**Date/ Time Accuracy Rating**	**Forecasted Location**	**Location Accuracy****	**Location Accuracy Rating**	**Was the weather forecast Accurate (Y/N)**
High Wind Watches - Strong & gusty winds (>65 mph possible) caused by High pressure to the north of Hawaiʻi and Dora to the south creating a pressure gradient 8/7-8/8 inclusive. Predicts downed trees & powerlines, leading to possible power outages &/or travel challenges.	8/6/2023 10:05 AM	Yes 8/8 7:51 E3 officer observed multiple downed powerlines6; 8/8 10:35:23 & 18:40 broken utility poles/ downed powerlines[8,9]	Yes	Portions of various Hawaiian Islands, including the central valley of Maui.	N.D. (location is vague)		Yes for severity; N.D. for location (too vague)
Same as above.	8/6/2023 3:24 PM	Same as above.		Portions of various Hawaiian Islands, including Maui.	N.D. (location is vague)		Yes for severity; N.D. for location (too vague)
Red Flag Warnings - Critical fire weather conditions possible 8/7 AM - 8/8 late PM across leeward areas. KBDI ≥ 600. RH 40-45% - fires apt to spread quickly; avoid outdoor fires.	8/6/2023 3:33 PM	Yes [4]KDBI≅600, as predicted for 8/6	Yes	Across leeward areas [of the Hawaiian Islands].	Yes; Multiple spot fires reported	Yes	Yes for both severity and location
8/7 AM - 8/9 dry air with strong winds with potentially damaging gusts enters the region. High pressure will build to the north as Dora passes westward about 500 miles south of the Big Island, driving strong gusty winds into the area. KBDI ≥ 600.	8/6/2023 3:48 PM	Yes; [4]KDBI≅600, as predicted for 8/6	Yes	Fire weather watch: critical conditions highly likely for 8/7 for several Hawaiian Islands, including Maui (Leeward west-makai) and central valley). High wind watch 8/7 AM - 8/8 late PM same areas.	gusts of up to 80 mph 8/8 12:22 AM[3]		Yes for both severity and location
Same as above.	8/6/2023 9:13 PM	Same as above		Same as above.	Same as above.		Yes for both severity and location

6.6 APPENDIX

National Weather Service Product Verification Leading up to August 8, 2023							
Forecast	**Date/time Product Released**	**Date/ Time Accuracy***	**Date/ Time Accuracy Rating**	**Forecasted Location**	**Location Accuracy****	**Location Accuracy Rating**	**Was the weather forecast Accurate (Y/N)**
Red Flag Warning from 8/7 6 AM - 8/9 6 AM due to gusty winds & low RH=40-45%; East (mauka) winds 30-45 mph, gusting to >65 mph.	8/7/2023 3:15 AM	gusts of up to 80 mph 8/8 12:22 AM[3]		Leeward areas [of the Hawaiian Islands].	gusts of up to 80 mph 8/8 12:22 AM[3]		Yes for both severity and location
Red Flag Warning (through 8/9 6 AM) KDBI≅600 with low RH<45%, producing critical fire weather conditions 8/7 PM through 8/8 PM; very windy: NE 30-45 mph	8/7/2023 3:30 AM	Yes; [4]KDBI≅600, as predicted for 8/6;	Yes	Maui Leeward West (makai), including Lahaina & Kāʻanapali	Yes; Multiple spot fires reported[16,17]	Yes	Yes for both severity and location
Red Flag Warning: East (mauka) winds 30-45 mph, gusting >60mph; RH 35-45% afternoons & evenings.	8/7/2023 4:42 AM	Yes; 8/8 10:50:00 FF crew reported wind gusts up to 80 mph & downed power-lines[10]	Yes	Leeward areas [of the Hawaiian Islands].	Yes; Multiple spot fires reported[16,17]	Yes	Yes for both severity and location
High Wind Watches - Strong & gusty winds through 8/8 night.	8/7/2023 3:40 PM	Yes; Multiple reports of wind damage[14,15]	Yes	Not specified.	N.D. (no location)		Yes for severity; N.D. for location (too vague)
Red Flag & High Wind Warnings:. Critical fire weather conditions expected for 8/8; dry fuels with expected KBDI≥600 & RH below 45%. Potential exists for extreme fire behavior of any wildfires that ignite.	8/7/2023 3:53 PM	Yes; 4KDBI≅600, as predicted for 8/6	Yes	Hawaiian Islands, including Maui - Windward West, Maui Central Valley North and South, South Maui/ Upcountry	Yes; Multiple spot fires reported16	Yes	Yes for both severity and location
Peak wind gusts surged into the 45-55 mph range across the state, peaking on 8/8 & RH dipped to mid 40s. Winds & low RH should continue through midweek.	8/7/2023 8:55 PM	Yes; Multiple reports of wind damage[14,15]	Yes	Not specified.	N.D. (no location)		Yes for severity; N.D. for location (too vague)

6.6 APPENDIX

National Weather Service Product Verification Leading up to August 8, 2023							
Forecast	**Date/time Product Released**	**Date/ Time Accuracy***	**Date/ Time Accuracy Rating**	**Forecasted Location**	**Location Accuracy****	**Location Accuracy Rating**	**Was the weather forecast Accurate (Y/N)**
Strengthening easterly (mauka) trade winds becoming potentially damaging through 8/8; dry air from east (mauka) will limit rainfall through 8/9.	8/7/2023 9:20 PM	Yes; Multiple downed power-lines[10,11,12,13]	Yes	Not specified.	N.D. (no location)		Yes for severity; N.D. for location (too vague)
Red Flag Warning through 8/9 6 AM for Leeward areas: 30-45 mph, gusting to 60 mph and RH 35-45% through afternoon; fires likely to spread rapidly	8/8/2023 3:17 AM	Yes; Multiple downed power-lines[10,11,12,13]	Yes	Not specified.	N.D. (no location)		Yes for severity; N.D. for location (too vague)
High Wind Warning through 8/9 6 AM; damaging winds may down trees/powerlines & damage roofs, leading to power outages.	8/8/2023 3:18 AM	Yes; 8/8 7:51 E3 officer observed multiple downed powerlines[6]	Yes	Across mountain terrain and downslope into leeward sections of the Hawaiian Islands, including Maui.	5; 8/8 7:51 E3 officer observed mul-tiple downed powerlines6	Yes	Yes for both severity and location
Fire Weather Planning Forecast: Red Flag Warn-ing through 8/9 6 AM; Very dry fuels (KDBI≅600 & RH<45%) & very windy (35-45 mph).	8/8/2023 4:00 AM	Yes; [4]KDBI≅600, as predicted for 8/6	Yes	Maui Central Valley	5; 4KDBI≅600, as predicted for 8/6	Yes	Yes for both severity and location
High Wind (30-45 mph, gusting to 60 mph) & Fire Weather Alerts	8/8/2023 9:26 AM	Yes; 8/8 11:41 downed powerlines at 20.802157 [11]	Yes	Not specified.	N.D. (no location)	Yes	Yes for severity; N.D. for location (too vague)
High Wind (30-45 mph, gusting to 60 mph) & Fire Weather (Red Flag Warning - NO outdoor burning) Alerts	8/8/2023 9:27 AM	Yes; 8/8 11:41 downed powerlines at 20.802157 11	Yes	Not specified.	N.D. (no location)		Yes for severity; N.D. for location (too vague)
Red Flag Warning through 6 AM 8/9; High wind Warning until 6 AM 8/9	8/8/2023 9:40 AM	Yes; 8/8 10:50:00 FF crew reported wind gusts up to 80 mph & multiple downed power-lines[10,11,12,13]	Yes	Hawaiian Islands, including Maui Windward West, Maui Central Valley North & South, South Maui/Upcountry	Yes; several reports of downed powerlines, substantiating damaging wind prediction	Yes	Yes for both severity and location

6.6 APPENDIX

National Weather Service Product Verification Leading up to August 8, 2023							
Forecast	**Date/time Product Released**	**Date/ Time Accuracy***	**Date/ Time Accuracy Rating**	**Forecasted Location**	**Location Accuracy****	**Location Accuracy Rating**	**Was the weather forecast Accurate (Y/N)**
Red Flag Warning until 6 AM 8/9; Fire Weather: Very dry fuels (KDBI≅600) and High Wind Warning Strong & gusty easter-ly (mauka) winds with RH<45%	8/8/2023 3:38 PM	Yes; [4]KDBI≅600, as predicted for 8/6	Yes	Hawaiian Islands, including Maui Leeward West (makai), Maui Central Valley (North and South)	Yes; Multiple spot fires reported[16,17]	Yes	Yes for both severity and location
High Wind Watches: strong (30-45 mph) & gusty (≅60 mph) winds through 8/9 afternoon	8/8/2023 3:39 PM	Yes; Multiple downed power-lines[10,11,12,13]	Yes	Across mountain terrain and downslope into leeward sections of several Hawaiian Islands, including Maui.	Yes; several reports of downed power-lines, substanti-ating damaging wind prediction	Yes	Yes for both severity and location
Red Flag Warnings until 6 PM 8/9 for 30-45 mph winds, gusting to ≅60 mph and very dry fuels (RH 35-45%).	8/8/2023 3:39 PM				Yes; Multiple spot fires reported[16,17]	Yes	Yes for both severity and location
Red Flag Warning through 6 PM 8/9: Strong & poten-tially damaging easterly (mauka) winds: 8/9 RH 40%	8/8/2023 3:41 PM	Yes; Multiple downed power-lines[10,11,12,13]	Yes	Maui Leeward West - Including Lahaina, Kāʻanapali	Yes; several reports of downed power-lines, substanti-ating damaging wind prediction	Yes	Yes for both severity and location

[1]KBDI Keetch-Byram Drought Index2
[2]Keetch, John J; Byram, George. 1968. A drought index for forest fire control. Res. Paper SE-38. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 32 pp. (Revised 1988).
[3]Los Angeles Times Satellite imagery: Mapping how the Maui fires destroyed Lahaina - Los Angeles Times
[4]National Oceanic and Atmospheric Administration & National Weather Service Hawaiian Fire Weather Products
[5] Phase One p. 91 Table 4.3.2.4
[6] Phase One p. 91 Table 4.3.2.4
[7] Phase One p.44 4.3 Fire and Response Timeline
[8] Lahaina Fire Comprehensive Timeline, entry line 853
[9] Lahaina Fire Comprehensive Timeline, entry line 1942; Fire4 unit to Dispatch 10:35:23
[10] Lahaina Fire Comprehensive Timeline, entry line 2038; 8/8 10:50:00 Firefighter crew reporting on Kula Fire Update #2
[11] Lahaina Fire Comprehensive Timeline, entry line 2295; 8/8 11:41 downed powerlines reported at 20.802157
[12] Lahaina Fire Comprehensive Timeline, entry line 2431; 8/8 12:04:55 downed powerline reported by Unit 4B40
[13] Lahaina Fire Comprehensive Timeline, entry line 3001; 8/8 14:19:00 downed powerlines reported at 20.877851
[14] Lahaina Fire Comprehensive Timeline, entry line 1196; 8/8 07:28:23 neighbor's roof detached & damaged vehicles
[15] Lahaina Fire Comprehensive Timeline, entry line 2070; 8/8 10:56:31 neighbor's roof detached & damaged vehicles
[16] Lahaina Fire Comprehensive Timeline, entry line 1067; 8/8 07:05:55 Help requested from Command to Air2 to extinguish spot fires
[17] Lahaina Fire Comprehensive Timeline, entry line 7615; 8/8 22:18:39 Help requested from to extinguish spot fires
* Reviewed by NWS-Honolulu forecasters.

6.7 APPENDIX

6.7 Brush & Vegetation Clearance Records

Table 6.7.1 County of Maui Lahaina Brush Clearance Records.

County of Maui Lahaina Brush Clearance Records						
No.	Work Order Number	Date of Clearance	Nearest Street Address of Problem	Sq Ft	Equipment Used	Total Cost
1	41453	3/9/23	Lwr Honoapiʻilani Road	32,940	weedeat	$2,720
1	41453	3/9/23	Lwr Honoapiʻilani Road	8,040		$0
1	41453	3/9/23	Lwr Honoapiʻilani Road	10,808		$0
1	41453	3/9/23	Lwr Honoapiʻilani Road	22,180	stand up mower	$0
2	41519	3/14/23	Front Street	40,952		$1,269
2	41520	3/14/23	Dickenson Street	3,206		$423
3	41589	3/15/23	Malo Street	6,820		$0
3	41589	3/15/23	Malo Street	5,070		$676
4	41595	3/16/23	Shaw Street	11,406	weedeat	$381
5	41632	3/21/23	Prison St parking lot	13,156	weedeat	$405
6	41633	3/21/23	Luakini parking lot	15,268	weedeat	$405
7	41637	3/21/23	Lahainaluna Road	25,525	stand up mower	$494
8	41638	3/21/23	Kahoma FC	18,937	mowing	$1,260
9	41644	3/22/23	Hui A Road	23,965	brush cutting	$0
9	41644	3/22/23	Hui A Road	32,521		$2,630
10	41645	3/22/23	Kahoma FC	23,981	mower	
10	41645	3/22/23	Kahoma FC	29,672		
10	41645	3/22/23	Kahoma FC	15,637		$4,205
11	41646	3/22/23	Lahainaluna Road	36,709		
11	41646	3/22/23	Lahainaluna Road	31,130		
11	41646	3/22/23	Lahainaluna Road	23,366	weedeat	$2,038
12	41716	3/24/23	Waineʻe / Prison	?		$1,073
13	41824	3/30/23	Kaopala FC	58,592		
13	41824	3/30/23	Kaopala FC	20,110		$980
14	41825	3/30/23	Kaopala FC	8,500		
14	41825	3/30/23	Kaopala FC	15,342		$822
15	41827	4/3/23	Kahananui FC	25,364		

6.7 APPENDIX

County of Maui Lahaina Brush Clearance Records						
No.	**Work Order Number**	**Date of Clearance**	**Nearest Street Address of Problem**	**Sq Ft**	**Equipment Used**	**Total Cost**
15	41827	4/3/23	Kahananui FC	24,568		$1,644
16	41828	4/3/23	Kahananui FC	45,364		
16	41828	4/3/23	Kahananui FC	38,909		$1,306
17	42334	5/10/23	Kahoma Service Road	4,500		
17	42334	5/10/23	Kahoma Service Road	2,000		
17	42334	5/10/23	Kahoma Service Road	2,000		
17	42334	5/10/23	Kahoma Service Road	99,305		
17	42334	5/10/23	Kahoma Service Road	17,856		
17	42334	5/10/23	Kahoma Service Road	13,296		$15,665
18	42531	5/15/23	Keawe Street	8,201		$861
19	42532	5/15/23	Lahainaluna Road	10,690		$861
20	42575	5/19/23	Wahikuli Ditch	44,168		
20	42575	5/19/23	Wahikuli Ditch	2,608		$2,566
21	42601	5/22/23	Wahikuli Terrace	7,667		$2,297
22	42884	6/9/223	Wahikuli Terrace	7,500		$1,067
23	42885	6/9/23	Keawe Street	8,210		$355
24	42982	6/28/23	Lahainaluna Road	30,880		$1,732
25	43015	7/3/23	Lahaina Civic Center	15,868		$422
26	43131	7/11/23	Lower Honoapiʻilani Hwy	34,153		
26	43131	7/11/23	Lower Honoapiʻilani Hwy	128,000		
26	43131	7/11/23	Lower Honoapiʻilani Hwy	46,201		
26	43131	7/11/23	Lower Honoapiʻilani Hwy	22,364		$5,420
27	43244	7/20/23	Keawe Street	8,210		$543
28	43432	8/1/23	Māhinahina FC	13,670		
28	43432	8/1/23	Māhinahina FC	57,455		$2,010
29	43480	8/3/23	Lahainaluna Road	23,366		$1,982
				844,917	sq.ft.	$58,511
				19.4	acres	

6.7 APPENDIX

Table 6.7.2 State of Hawai'i, Department of Transportation Lahaina Brush Clearance Records.

State of Hawai'i, Lahaina Brush Clearance Records											
Date of Clearance	**Hwy Worked On**	**RTE No**	**Beginning Location**	**End Location**	**Start at Mile Marker No.**	**End at Mile Marker No.**	**Total Miles Cleared**	**Type of Clearance**	**No. of Acres Cleared**	**Workers & Description of Clearance**	**Total Cost**
1/18/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	22	2	Mechanical Mowing	8	R.PALMEIRA MECHANICAL MOWING	$548.68
2/1/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	22	2	GRASS TRIMMING	0.000184	K.PASTRANA - G.FEVELLA - R.PALMEIRA - D.RHODEN WEEDEAT GUARD RAILS INTERSEC-TIONS LAHAINA TOWN .	$1,048.79
2/2/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	22	2	GRASS TRIMMING	0.000184	K.PASTRANA-G.FEVELLA-R.PALMEIRA-D.RHODEN CON-TINUE WEE-DEAT GUARD RAILS AND MEDIANS .	$1,042.89
5/17/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	21	1	GRASS TRIMMING, CONTINUE WEED-EATING GUARD RAILS AND SIGNS AND SIGHT DISTANCE .	0.000184	C.SOUZA - K.NEEDHAM - G.FEVELLA - R.PALMEIRA	$1,238.95
6/28/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	22	2	Mechanical Mowing	8	G.FEVELLA - R.PALMEIRA - CONTINUE MOWING	$1,225.85
7/10/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	21	1	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$422.40

6.7 APPENDIX

State of Hawaiʻi, Lahaina Brush Clearance Records											
Date of Clearance	Hwy Worked On	RTE No	Beginning Location	End Location	Start at Mile Marker No.	End at Mile Marker No.	Total Miles Cleared	Type of Clearance	No. of Acres Cleared	Workers & Description of Clearance	Total Cost
7/11/23	Hwy-30	30B	Wahikuli Rd	Prison St	21	22	1	Mechanical Mowing	8	R.PALMEIRA - G.FEVELLA - CONTINUE MOWING	$1,342.14
8/3/23	Hwy-30	30B	Wahikuli Rd	Prison St	20	21.5	1.5	Mechanical Mowing	8	K.NEEDHAM - CONTINUE BUSHWHACKING	$680.80
1/19/23	Hwy-30	30C	Prison St	Kīhei Rd	4.9	20	15.1	HWY-30, PRISON ST TO Kīhei RD MAINTENANCE OF SHOULDERS AND MEDIAL K.NEEDHAM - CLEAN SHOULDERS WITH LOADER ON PALI. D.RHODE - TRAFFIC CONTROL & CLEAN SHOULDERS WITH WATER TRUCK. K.PASTRANA - WEEDEAT AND PICK UP RUBBISH ON HIGHWAY.	8 LF	K.PASTRANA - WEEDEAT AND PICK UP RUBBISH ON HIGHWAY	$1,387.61
1/25/23	Hwy-30	30C	Prison St	Kīhei Rd	15	18.5	3.5	Mechanical Mowing	8	R.PALMEIRA - TRACTOR MOWING SHOULDERS AND MEDIANS	$543.37

6.7 APPENDIX

State of Hawai'i, Lahaina Brush Clearance Records											
Date of Clearance	Hwy Worked On	RTE No	Beginning Location	End Location	Start at Mile Marker No.	End at Mile Marker No.	Total Miles Cleared	Type of Clearance	No. of Acres Cleared	Workers & Description of Clearance	Total Cost
1/25/23	Hwy-30	30C	Prison St	Kīhei Rd	17	19	2	GRASS TRIMMING	0.000184	G.FEVELLA - K.PASTRANA - WEEDEAT GUARD RAILS & MEDIANS	$528.88
1/27/23	Hwy-30	30C	Prison St	Kīhei Rd	14	16.5	2.5	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK SHOULDERS BANCKES AND SITE DISTANCE	$621.86
1/27/23	Hwy-30	30C	Prison St	Kīhei Rd	4.9	17	12.1	GRASS TRIMMING	0.000184	C.SOUZA - D.RHODE - K.PASTRANA - WEEDEAT GUARD RAILS SHOULDERS AND PICK UP TRASH AND DEBRIS	$875.34
1/31/23	Hwy-30	30C	Prison St	Kīhei Rd	4.9	20	15.1	Mechanical Mowing	8	C.SOUZA - BUSHWHACK SITE DISTANCE AND SHOUL-DERS	$532.52
2/1/23	Hwy-30	30C	Prison St	Kīhei Rd	17	20	3	Mechanical Mowing	8	C.SOUZA - CONTINUE BUSHWHACK-ING SHOUL-DERS AND GUARDRAILS , SITE DISTANCE	$709.95
2/2/23	Hwy-30	30C	Prison St	Kīhei Rd	17.5	20	2.5	Mechanical Mowing	8	C.SOUZA - CONTINUE BUSHWHACK-ING SHOUL-DERS AND SITE DISTANCE	$689.30
2/3/23	Hwy-30	30C	Prison St	Kīhei Rd	19	20	1	GRASS TRIMMING	0.000184	K.PASTRANA - D.RHODEN WEEDEAT GUARD RAILS AND PICK UP TRASH ON ROADWAYS	$570.99

6.7 APPENDIX

State of Hawai'i, Lahaina Brush Clearance Records											
Date of Clearance	**Hwy Worked On**	**RTE No**	**Beginning Location**	**End Location**	**Start at Mile Marker No.**	**End at Mile Marker No.**	**Total Miles Cleared**	**Type of Clearance**	**No. of Acres Cleared**	**Workers & Description of Clearance**	**Total Cost**
2/6/23	Hwy-30	30C	Prison St	Kīhei Rd	4.9	20	15.1	Mechanical Mowing	8	R.PALMEIRA - TRACTOR MOWER SHOULDERS AND MEDI-ANS. C.SOUZA - CONTINUE BUSHWHACK-ING	$1,146.93
2/10/23	Hwy-30	30C	Prison St	Kīhei Rd	0	20	20	MAINTE-NANCE OF SHOUL-DERS AND MEDIAL	7 LF	C.SOUZA-K. NEEDHAM-D. RHODEN-K. PASTRA-NA CLEAN ROADWAYS SHOULDERS FROM ROCKS BRANCHES AND DEBRIS. SUCK OUT WASH RACK WITH VAC TRUCK	$1,164.01
3/24/23	Hwy-30	30C	Prison St	Kīhei Rd	15.5	16.5	1	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING SHOULDERS	$386.96
3/28/23	Hwy-30	30C	Prison St	Kīhei Rd	17.5	18.5	1	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$338.96
3/29/23	Hwy-30	30C	Prison St	Kīhei Rd	18.5	19.8	1.3	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$476.20
3/29/23	Hwy-30	30C	Prison St	Kīhei Rd	15.5	22	6.5	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK BEHIND GUARDRAILS IN FRONT OF OLD PEOPLES HOME BRUSH FIRE COM-PLAINT . CLEAN SHOULDERS IN FRONT OLU-WALU WITH BACKHOE .	$467.17

6.7 APPENDIX

State of Hawai‘i, Lahaina Brush Clearance Records											
Date of Clearance	Hwy Worked On	RTE No	Beginning Location	End Location	Start at Mile Marker No.	End at Mile Marker No.	Total Miles Cleared	Type of Clearance	No. of Acres Cleared	Workers & Description of Clearance	Total Cost
5/9/23	Hwy-30	30C	Prison St	Kīhei Rd	14.5	15.5	1	GRASS TRIMMING	0.000184	C.SOUZA - D.RHODEN - G.FEVELLA - R.PALMEIRA WEEDEAT GUARDRAILS AND SIGNS AND CUT KOAS WITH CHAIN-SAWS .	$1,225.38
5/11/23	Hwy-30	30C	Prison St	Kīhei Rd	20.5	21	0.5	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK LAHAINA TOWN FIRE HAZARD COMPLAINT .	$584.10
5/11/23	Hwy-30	30C	Prison St	Kīhei Rd	17	17.9	0.9	GRASS TRIMMING	0.000184	G.FEVELLA - R.PALMEIRA CONTINUES WEEDEATING GUARD RAILS AND SIGNS .	$578.91
5/15/23	Hwy-30	30C	Prison St	Kīhei Rd	17.8	18.6	0.8	GRASS TRIMMING	0.000184	K.NEEDHAM - D.RHODEN - G.FEVELLA - R.PALMEIRA CONTINUE WEEDEATING GUARD RAILS AND SIGNS .	$1,230.11
5/22/23	Hwy-30	30C	Prison St	Kīhei Rd	20	22	2	GRASS TRIMMING	0.000184	C.SOUZA - K.NEEDHAM - G.FEVELLA - R.PALMEIRA WEEDEAT LAHAINA TOWN GUARDRAILS AND SIGHT DISTANCE	$1,122.47
6/22/23	Hwy-30	30C	Prison St	Kīhei Rd	17	19	2	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$524.20

6.7 APPENDIX

State of Hawai'i, Lahaina Brush Clearance Records											
Date of Clearance	**Hwy Worked On**	**RTE No**	**Beginning Location**	**End Location**	**Start at Mile Marker No.**	**End at Mile Marker No.**	**Total Miles Cleared**	**Type of Clearance**	**No. of Acres Cleared**	**Workers & Description of Clearance**	**Total Cost**
6/26/23	Hwy-30	30C	Prison St	Kīhei Rd	18.9	19.5	0.6	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$412.96
6/27/23	Hwy-30	30C	Prison St	Kīhei Rd	18	20	2	Mechanical Mowing	8	R.PALMEIRA - CONTINUE MOWING	$556.70
6/30/23	Hwy-30	30C	Prison St	Kīhei Rd	18	19	1	GRASS TRIMMING	0.711662	WEED WHACK-ING AROUND TRAFFIC SIGNS AND GUARD-RAILS	$361.75
7/5/23	Hwy-30	30C	Prison St	Kīhei Rd	15.5	17	1.5	GRASS TRIMMING	0.000184	G.FEVELLA - R.PALMEIRA WEEDEAT SIGNS AND INTERSECTION AND ELEC-TRICAL BOX . D.RHODEN - WEEDEAT SIGNS	$977.12
7/6/23	Hwy-30	30C	Prison St	Kīhei Rd	16	16.5	0.5	GRASS TRIMMING	0.000184	G.FEVELLA - R.PALMEIRA - WEEDEAT GUARD RAILS AND SIGNS	$614.80
8/2/23	Hwy-30	30C	Prison St	Kīhei Rd	19	20	1	Mechanical Mowing	8	C.SOUZA - SETUP SIGNS AND CONES AND ESCORT FOR KIMO ON BUSHWHACK-ER K.NEEDHAM - BUSHWHACK SHOULDERS AND SIGHT DISTANCE	$1,005.87

6.7 APPENDIX

State of Hawai'i, Lahaina Brush Clearance Records											
Date of Clearance	Hwy Worked On	RTE No	Beginning Location	End Location	Start at Mile Marker No.	End at Mile Marker No.	Total Miles Cleared	Type of Clearance	No. of Acres Cleared	Workers & Description of Clearance	Total Cost
2/8/23	Lahaina Bypass	3000	Hwy-30	Keawe St	3.5	4.6	1.1	GRASS TRIMMING	0.000184	G.FEVELLA-K. PASTRANA-R. PALMEIRA-C. SOUZA-D. RHODEN WEEDEAT BY-PASS GUARD RAILS, SIGNS AND MEDIANS BLOW DEBRIS AND CUT KOAS WITH CHAIN-SAW	$1,420.99
2/9/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK SHOULDERS AND SIGHT DISTANCE R.PALMEIRA - TRACTOR MOWER SHOULDERS AND MEDIANS	$1,154.61
2/13/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	C.SOUZA - CONTINUE BUSHWHACK SHOULDERS HILL SIDES & SIGHT DIS-TANCE	$650.17
2/14/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK BYPASS ROAD SHOULDERS GUARD RAILS SIGHT DISTANCE . R.PALMEIRA - TRACTOR MOWER SHOULDERS MEDIAN.	$1,139.86

6.7 APPENDIX

State of Hawai‘i, Lahaina Brush Clearance Records											
Date of Clearance	**Hwy Worked On**	**RTE No**	**Beginning Location**	**End Location**	**Start at Mile Marker No.**	**End at Mile Marker No.**	**Total Miles Cleared**	**Type of Clearance**	**No. of Acres Cleared**	**Workers & Description of Clearance**	**Total Cost**
2/14/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	GRASS TRIMMING	0.000184	C.SOUZA-K. PASTRANA-D. RHODEN WEE-DEAT GUARD RAILS & SIGNS	$897.81
2/15/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	K.NEEDHAM CONTINUE BUSHWHACK R.PALMEIRA CONTINUE TRACTOR MOWING	$1,123.93
2/15/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	GRASS TRIMMING	0.000184	D.RHODEN-G. FEVELLA-K. PASTRANA WEED EAT LA-HAINA BYPASS GUARD RAILS AND INTER-SECTIONS	$974.95
3/8/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	4	R.PALMEIRA - TRACTOR MOWING BY-PASS SHOUL-DERS AND MEDIANS.	$94.48
3/9/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	R.PALMEIRA - CONTINUE TRACTOR MOWING BYPASS ROAD LAHAINA	$536.20
3/10/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	1.5	1.5	GRASS TRIMMING	0.000161	R.PALMEIRA - G.FEVELLA WEEDEAT GUARD RAILS INTERSECTION AND MEDIANS	$507.39

6.7 APPENDIX

State of Hawai‘i, Lahaina Brush Clearance Records											
Date of Clearance	**Hwy Worked On**	**RTE No**	**Beginning Location**	**End Location**	**Start at Mile Marker No.**	**End at Mile Marker No.**	**Total Miles Cleared**	**Type of Clearance**	**No. of Acres Cleared**	**Workers & Description of Clearance**	**Total Cost**
5/23/23	Lahaina Bypass	3000	Hwy-30	Keawe St	0	1	1	GRASS TRIMMING	0.000184	C.SOUZA - G.FEVELLA - R.PALMEIRA CONTINUE WEED EATING GUARDRAILS AND SIGNS AND INTER-SECTION	$877.91
5/24/23	Lahaina Bypass	3000	Hwy-30	Keawe St	1	2	1	GRASS TRIMMING	0.000184	G.FEVELLA - R.PALMEIRA - D.RHODEN CONTINUE WEED EATING LAHAINA BY-PASS .	$729.98
6/2/23	Lahaina Bypass	3000	Hwy-30	Keawe St	1.5	2.5	1	GRASS TRIMMING	1.033058		$266.38
6/21/23	Lahaina Bypass	30	Hwy-30	Keawe St	0	2	2	Mechanical Mowing	8	G.FEVELLA - CONTINUE MOWING	$593.10
6/22/23	Lahaina Bypass	30	Hwy-30	Keawe St	2	3	1	Mechanical Mowing	8	G.FEVELLA - CONTINUE MOWING	$599.10
6/23/23	Lahaina Bypass	30	Hwy-30	Keawe St	2	4.6	2.6	Mechanical Mowing	8	G.FEVELLA - R.PALMEIRA - CONTINUE MOWING	$999.08
6/26/23	Lahaina Bypass	30	Hwy-30	Keawe St	0	0.5	0.5	GRASS TRIMMING	0.000184	D.RHODEN - WEEDEAT SIGNS AND IN-TERSECTION	$361.75
6/28/23	Lahaina Bypass	30	Hwy-30	Keawe St	0	2.1	2.1	GRASS TRIMMING	0.000184	K.NEEDHAM - WEEDEAT SIGNS AND IN-TERSECTIONS .	$348.10
8/4/23	Lahaina Bypass	30	Hwy-30	Keawe St	0	4.6	4.6	Mechanical Mowing	8	K.NEEDHAM - BUSHWHACK SHOULDERS AND BEHIND GUARD RAILS	$520.71

6.7 APPENDIX

State of Hawai‘i, Lahaina Brush Clearance Records											
Date of Clearance	Hwy Worked On	RTE No	Beginning Location	End Location	Start at Mile Marker No.	End at Mile Marker No.	Total Miles Cleared	Type of Clearance	No. of Acres Cleared	Workers & Description of Clearance	Total Cost
7/6/23	Hwy-30	30 area 6	Ka-punakea St	Fleming Rd			0	Tree pruning and removal.		Coconuts Including Similar Palm Trees - Removal 25 to 35 Feet Tall	$980.00
5/26/23	Hwy-30	30 area 6	Ka-punakea St	Fleming Rd			0	Tree pruning and removal.		Coconuts Including Similar Palm Trees - Pruning 18- over 35 feet tall	$3,240.00
4/20/23	Hwy-30	30 area 7	Leiali'I Pkwy	Lower Hwy-30			0	Tree pruning and removal.		Hardwood and Conifer Trees - Pruning Crown Raising 18- over 12”-24” Diameter 11- over 24”-36” Diameter Shrub Trees - Removal 1- 4’-8 wide x 1’ long	$6,613.00
3/9/23	Hwy-30	30 area 6	Hōkiokio Pl	Puama-na			0	Tree pruning and removal.		Hardwood and Conifer Trees - Pruning Heavy Pruning 9- over 12”-24” Diameter 19- over 24”-36” Diameter 2- over 36”-48” Diameter	$12,015.00
							183.2				
											$63,829.42

6.8 Drinking Water Treatment, Storage, and Distribution Systems

The County of Maui Department of Water Supply has two (2) drinking water treatment plants that produce drinking water for the Lahaina area. The Lahaina membrane filtration treatment plant has a capacity of 1.8 MGD equivalent to 1,250 GPM (gallons per minute). The Māhinahina deep bed direct filtration treatment plant to the north has a capacity of 2.0 MGD (1,390 GPM). These two (2) drinking water treatment plants are also supplemented by a system of three (3) small groundwater well/tank combinations that enter directly into the system and supplement water production in the two (2) storage and distribution systems.

The following paragraphs provide a detailed description of the drinking water treatment plants along with their associated storage and distribution systems in use at the time of the fire.

Lahaina Membrane Filtration Drinking Water Treatment Plant

The Kanaha Stream is the source water for the Lahaina membrane filtration drinking water treatment plant (elevation approximately 800 feet). Water is conveyed by gravity from the stream to the screen box at the treatment plant by 300 feet of 10-inch galvanized steel pipe. A 12-inch pipe conveys water by gravity from the screen box to the 0.5 MG (million gallon) pre-sedimentation reservoir (not named). Water from the screen box is also used to supply untreated water to Lahainaluna High School and the Pioneer Mill Company.

Raw water from the pre-sedimentation reservoir (not named) is conveyed by gravity to the treatment plant building and passes through a 500-micrometer strainer. The strained water is then pumped through five (5) Memcor Continuous Microfiltration (CMF) units to remove particles greater than 0.1 micrometers in diameter. The filtered water is then chlorinated, using low-strength, on-site generated sodium hypochlorite, before passing through the 0.3 MG clearwell that provides sufficient contact time for disinfection. The disinfected water is then pumped through a 12-inch diameter pipe into the 1.0 MG Lahainaluna Tank (TK 116) which is used as a finished water storage reservoir and completes the drinking water treatment process.

This treated water is conveyed by gravity from the Lahainaluna Tank (TK 116) to the 0.3 MG Kanaha Tank (TK108). The flow to the Kanaha Tank is controlled by an influent control valve on the inlet line to the Kanaha Tank that prevents the Lahainaluna Tank (TK116) from draining. Other storage tanks within the distribution system are also filled by gravity. Pressure within the distribution system is the result of elevation change within the storage and distribution system and water level in the storage tanks. Pumps are not used to provide pressure within the distribution system. All pressure is a result of elevation change and water level in the storage tanks.

The next tank to be filled is the 0.5 MG Waipuka Tank (TK110) located along Lahainaluna Road. The 0.05 MG Waipuka Well Tank (TK101) with deepwell groundwater pumps is located adjacent to the Waipuka tank. This tank uses pumps to fill the well tank and supplement the finished water produced by the Lahaina Treatment Plant. After the Waipuka Tank, the next tank to be filled by the distribution system is the 1.0 MG Lahaina Tank (TK108) which is also located adjacent to Lahainaluna Road downgradient of the Waipuka Tank (TK110).

The last tank in the south system to be filled is the 1.5 MG Wahikuli Tank (TK102) which is located to the north of the other tanks in the storage and distribution system. Again, all storage tanks within the distribution system are filled by gravity and distribution system pressures are the result of elevation change within the system and water level in the storage tanks.

6.8 APPENDIX

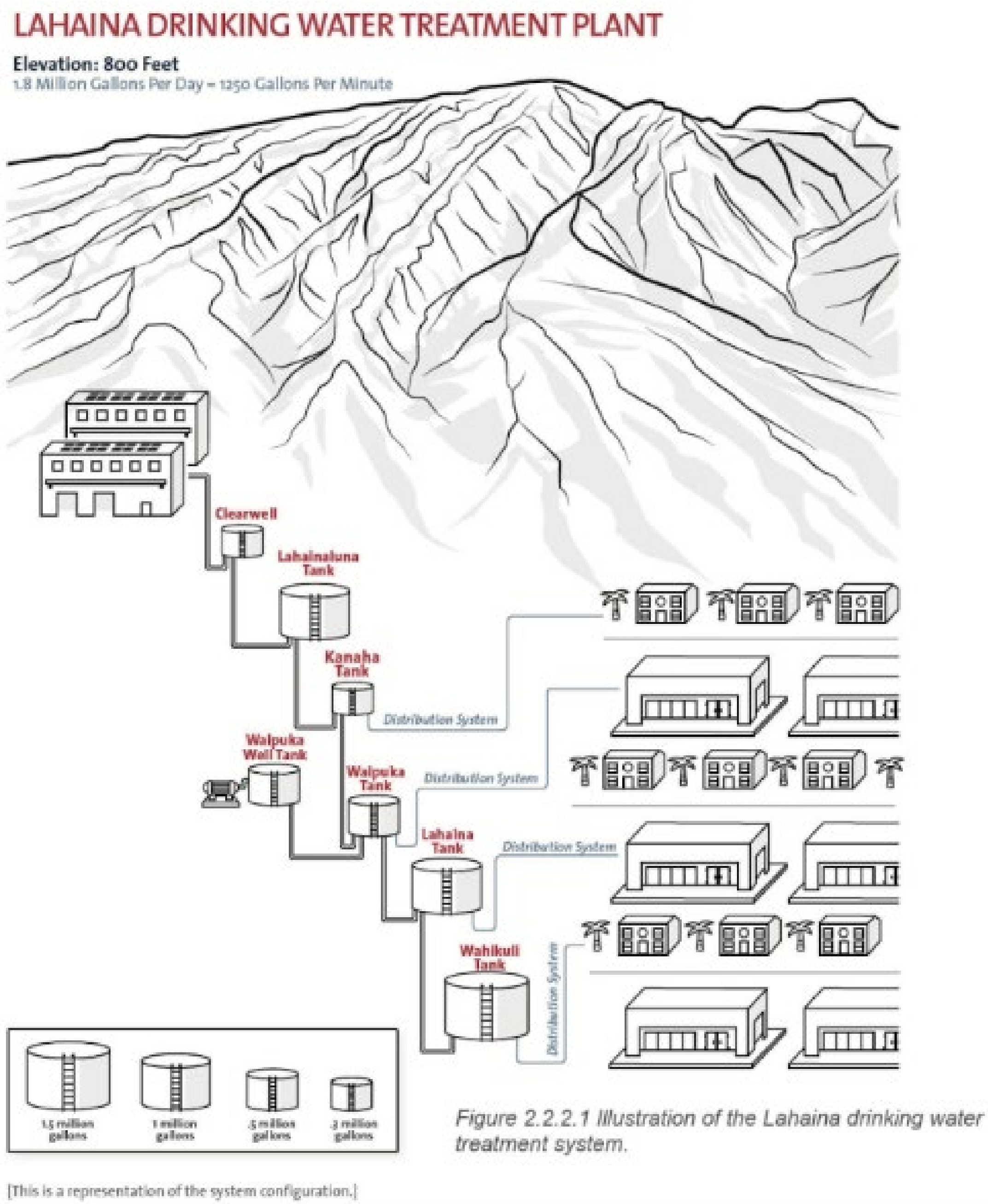

Figure 6.8.1 Lahaina drinking water treatment system.

6.8 APPENDIX

The Māhinahina deep bed direct filtration drinking water treatment plant is located on the western (makai) slopes of the West Maui Mountains at an elevation of approximately 700 feet. The source water is generated by surface runoff and transported by gravity from the watershed via the Honolua Ditch and a 24-inch diameter pipe into the 20 MG Māhinahina Raw Water Hypalon Reservoir (TK117). This reservoir is used for pre-sedimentation of particles and flow equalization. A 16-inch diameter pipe transports the water by gravity into the flash/rapid mixing process and then into the flocculation process.

Water exits the flocculation process through a 20-inch diameter wall casting and enters the filter influent channel through a 16-inch diameter pipe. Water then exits the dual-media deep bed filters using a 16-inch diameter pipe into the chlorine contact channel where it is chlorinated using low-strength, on-site generated sodium hypochlorite. The chlorine contact channel is incorporated into the 2.0 MG Māhinahina WTP Clearwell (TK118).

The treated drinking water leaves the Māhinahina Clearwell (TK118) through a 16-inch diameter pipe where it flows to the 2.0 MG Honokōwai Concrete Storage Tank (TK114), and then enters the rest of the storage and distribution system to the north and south of the Honokōwai Tank due to water level in the storage tanks and elevation change within the distribution system.

The storage tanks to the North of the Honokōwai Tank (TH114) are filled in the following order:

- Alaeloa 1.0 MG Concrete Tank (TK104);
- Alaeloa Mid-Level aka Kahana Ridge 1.0 MG Concrete Tank (TK115);
- Nāpili A Mix Tank 0.05 MG (TK106); and
- Nāpili A #2 0.3 MG Concrete Tank (TK423).

In addition to the tanks listed above, two (2) tanks in the north system are filled using groundwater well pumps similar to the Waipuka Well Tank (TK101) in the Lahaina storage and distribution system. These tanks are:

- Nāpili A #1 0.1 MG Concrete Tank w/ deepwell pump (TK105)
- Nāpili C 0.1 MG Concrete Tank w/ deepwell pump (TK111)

As in the Lahaina system, pumps are not used to provide pressure within the Māhinahina distribution system. All pressure is a result of elevation change and water tank/reservoir water levels.

The Māhinahina system to the north and the Lahaina system to the south in West County of Maui are connected using water main(s) with a maximum diameter of 16-inches located along Lower Honoapiʻilani Road and Hawaiʻi Route 30 (Hwy-30). Again, pressure generated in the drinking water distribution system is a result of elevation change and water tank/reservoir levels. Pumps are not used to provide pressure within either the Lahaina or Māhinahina drinking water distribution systems.

6.8 APPENDIX

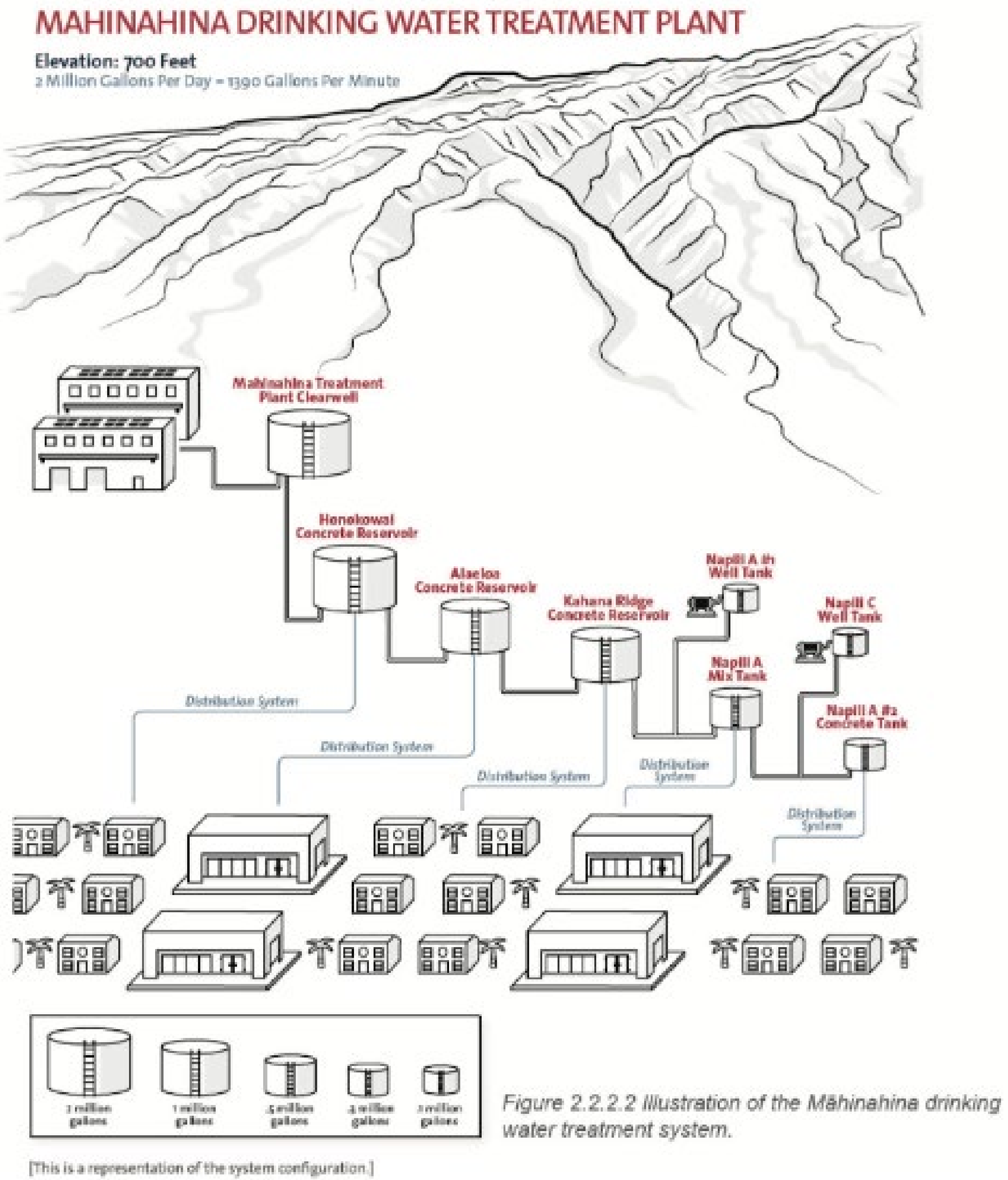

Figure 6.8.2 Māhinahina drinking water treatment system

6.8 APPENDIX

A data recording system for the County of Maui Department of Water Supply routinely records the water level in each of the water storage tanks in both the Lahaina and Māhinahina storage and distribution systems. The graph below shows the time variation of water volume stored versus time for the Lahaina, Māhinahina and the two (2) systems combined. The recording of water level data by the county ceases at 3:30 p.m. on August 8, 2023, for all storage tanks in both the Lahaina and Māhinahina systems. The reason given by the county for the simultaneous loss of all tank level data was a power outage.

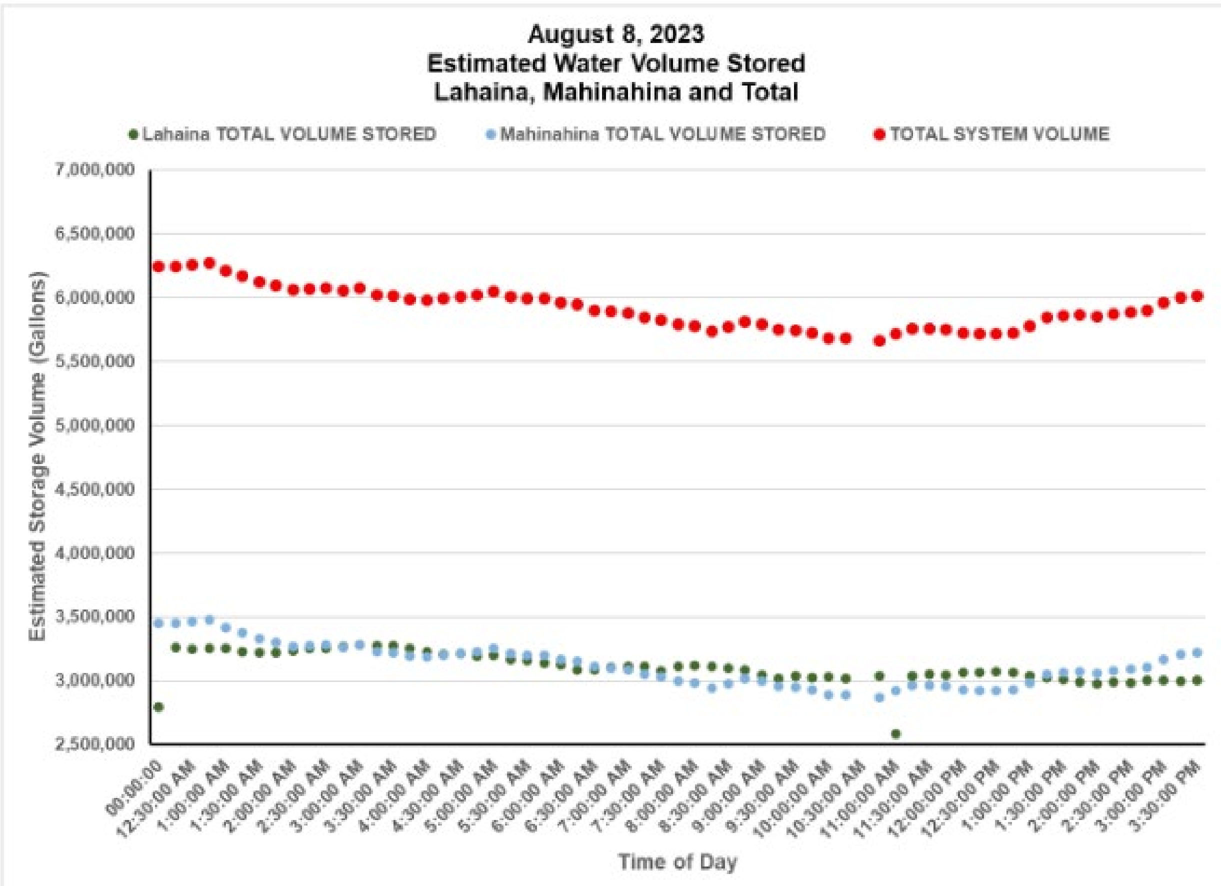

Figure 6.8.3 Estimated water volume stored in Lahaina and Māhinahina on August 8, 2023.

Note: The volumes calculated in the graph above are preliminary estimates based upon the tank capacity and the tank level recorded by the system. The recording system stopped recording data at 15:30 on August 8, 2023.

AWWA M42 entitled Steel Water Storage Tanks (2013) discusses the sizing of water storage tanks in Chapter 5. This chapter provides insight into the calculation of the peak flow for the system in addition to the fire flow requirements for the system. This industry publication also discusses the changing storage capacity of storage tanks with water level within the tanks. Additionally, the adverse impact of excess water storage on water quality is also highlighted.

6.9 Amendments to the 2002 Water System Standards. Source: Hawai‘i Board of Water Supply

Amendments to the
2002 Water System Standards

Description	WSS Section Modified	Approval Date
Approved Material *PowerSeal*	Division 400, Section 402 Sub-Section I Pipes and Appurtenances	12/14/2023
Manhole Rungs	Division 200, Section 207, Sub-section 207.03 Manhole Rungs	9/26/2023
Non-Potable Water System	Division 600, Non-Potable Water System Standards	3/13/2023
Chlorination of Pipelines	Division 300, Section 302, Sub-section 302.29 Chlorination of Water Pipeline	9/1/2022
Pipe Cushion	Division 200, Section 209, Sub-section 209.02 Pipe Cushion	8/22/2022
Deadline to Comply with All Amendments	None	2/9/2022
Controlled Low Strength Material (CLSM)	Division 200, Section 209, Sub-section 209.06 Controlled Low Strength Materials (CLSM) and Division 300, Section 302, Sub-section 302.03 Trench Backfill	11/8/2021
Off-Site Fire Protection	Division 100, Section 111, Sub-section 111.03 Fire Flows, Duration and Hydrant Spacing	7/30/2021
Turbine Meter Splice Length	Division 400, Section 403 Standard Details	3/25/2021
Approved Material *J&S Valve, Inc.*	Division 400, Section 402 Sub-Section II Valves and Appurtenances	2/26/2021
Chlorination of Pipelines	Division 300, Section 302, Sub-section 302.29 Chlorination of Water Pipeline	12/16/2020
Bonded Dielectric Coating	Division 500, Water System External Corrosion Control Standards, Volume 3, dated 1991	10/5/2020
Type and Classes of Mains, and Pipe Cushion	Division 100, Section 102, Sub-section 102.05 Type, Class and Division 200, Section 209, Sub-section 209.02 Pipe Cushion	7/29/2019
Expanded Metal Fencing	Division 100, Section 105, Sub-section 105.08 Perimeter Fence and Division 300, Section 303, Sub-section 303.34 Expanded Metal Fence and Gate	8/2/2018
Polyethylene Encasement and Exterior Coating	Division 200, Section 202 - Ductile Iron Pipe, Fittings, and Appurtenances	11/17/2016
Approved Material *The Ford Meter Box Company, Inc.*	Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	5/6/2016

6.9 APPENDIX

Description	WSS Section Modified	Approval Date
Trench Backfill	Division 400, Section 403 Standard Details	4/29/2016
Ductile Iron Pipe	Division 200, Section 202 - Ductile Iron Pipe, Fittings, and Appurtenances	4/15/2016
Approved Material *DFW Plastics, Inc.*	Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	5/13/2015
Plastic Pipe	Division 200, Section 204 Plastic Pipe; Division 300, Section 302 Water Mains and Appurtenances, Sub-sections 302.14 Plastic Pipe & 302.15 Fittings and Specials	4/23/2015
Water Main Clearances	Division 100, Section 102 Mains, Sub-section 102.01 Location	4/23/2015
3/4" Meter Splice Length	Division 400, Section 403 Standard Details	12/8/2014
Approved Material *Christy's*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	9/19/2014
Approved Material *Clow Valve Company*	Division 400, Section 402, Sub-section IV Fire Hydrants	6/20/2014
Brass Products - Lead Free	Division 200, Section 211 Brass Products & Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	10/22/2013
Approved Material *Jensen Precast*	Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	1/4/2013
Rescinding Approval for Polyethylene (PE) Pipe	Division 200, Section 208 - Service Laterals and Appurtenances, 208.03 Plastic Tubing	12/14/2012
Brass Products	Division 200, Section 211 Brass Products & Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	6/5/2012
Approved Material *Armorcast*	Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	5/14/2012
Approved Material *Romac*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	11/9/2011
Approved Material *IPEX*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	9/14/2011
Rescinding Approval for Concrete Cylinder Pipe	Division 200, Section 203 Concrete Cylinder Pipe and Fittings	7/15/2011
Rescinding Approved Material *Royal Pipe Systems*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	4/29/2011
Approved Material *METCO*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	11/4/2010
Approved Material *Advance Products and Systems*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	5/6/2010
Approved Material *Garlock*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	1/19/2010

Description	WSS Section Modified	Approval Date
Approved Material *North American Pipe Corporation*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	11/10/2009
Approved Material *Multi Fittings*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	10/27/2009
Approved Material *Diamond Plastics*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	8/14/2009
FM Meter & Box Standard Details	Division 400, Section 403 Standard Details	5/18/2009
Approved Material *Polytubes*	Division 400, Section 402, Subsection III Service Laterals, Fittings and Appurtenances	2/24/2009
Minimum Utility Depth	Division 100, Section 102 Mains, Sub-section 102.03 Cover & Division 400, Section 403 Standard Details	12/31/2008
Approved Material *American R/D*	Division 400, Section 402 Sub-Section II Valves and Appurtenances	12/18/2008
Approved Material *Armorcast*	Division 400, Section 402, Sub-section III Service Laterals, Fittings and Appurtenances	12/4/2008, amended 6/26/2015
Distance between main valves	Division 100, Section 103 Sub-section 103.01 Location, Type, Working Pressure	10/21/2008
Nuts and bolts for flanged joints and fire hydrant break-off bolts	Division 200, Section 202.04 Flanged Joint and Section 206.1 General	3/18/2008
Approved Material *Sigma Corporation*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	10/31/2007
Approved Material *Star Pipe Products, Inc.*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	5/4/2007
Electronic Markers	New requirement	8/25/2006
Approved Material *Pratt & Lambert*	Division 400, Section 402 Sub-section V Paints and Coatings	1/27/2004
Cathodic Protection	See 2021 Update of the Water System External Corrosion Control Standards ~~Division 500, Section 1.2 (Part 2), Table 3~~	~~10/15/2003~~
Approved Material *Tripac Fasteners & NSS Industries*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	8/12/2003
Nuts and bolts for mechanical joints	Division 200, Section 202.02 Mechanical Joint	7/22/2003
Approved Material *Romac*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	6/20/2003
Approved Material *Sherwin Williams*	Division 400, Section 402 Sub-section V Paints and Coatings	5/23/2003

Description	WSS Section Modified	Approval Date
Rescinded 4/29/2011 ~~Approved Material~~ ~~Royal Pipe Systems~~	~~Division 400, Section 402 Sub-Section I Pipes and Appurtenances~~	~~5/19/2003~~
Approved Material *FSC Coatings*	Division 400, Section 402 Sub-section V Paints and Coatings	5/12/2003
Dis-approved Material *Powerseal*	Division 400, Section 402 Sub-section I Pipes and Appurtenances	3/24/2003
Approved Material *James Jones*	Division 400, Section 402 Sub-section III Service Laterals, Fittings and Appurtenances	11/27/2002
Approved Materials for Globe Valves	Division 400, Section 402 Sub-Section II Valves and Appurtenances	11/22/2002
Approved Material *PPG Industries*	Division 400, Section 402 Sub-section V Paints and Coatings	7/11/2002

6.10 Comparison of MFD, MPD, and Hawaiian Electric's AVL Timepoints

Lahaina Assigned Vehicles Automatic Vehicle Location Timepoint Data Comparison

The following table displays MFD, MPD, and Hawaiian Electric AVL data for Lahaina assigned vehicles within the given hourly blocks. The table compares the number of vehicles, corresponding AVL timepoints, and timepoints per vehicle for each hour timeframe starting at 14:55 when the Lahaina PM fire was reported.

The data in the table was transferred from Excel spreadsheets provided by the County of Maui and Hawaiian Electric that included data in its native form (date, time, vehicle identification, latitude/longitude) for vehicles assigned to the Lahaina area. The County of Maui also provided AVL timepoint data for vehicles not assigned to Lahaina. This data is not included within the table.

The MFD provided the least amount of data, while the MPD provided the most. The timeframe of 18:00–19:00 and 22:00–23:00 included the least amount of timepoints/vehicle. Understanding why timepoints per vehicle declined at times is beyond the scope of this study, but should be considered for further study.

Number of Agency Vehicles and AVL Timepoint Comparison

Hourly Blocks	MFD			MPD			Hawaiian Electric		
	Vehicles	Timepoints	Tp/Veh	Vehicles	Timepoints	Tp/Veh	Vehicles	Timepoints	Tp/Veh
14:55 - 16:00	3	86	28.7	10	960	96.0	14	494	35.3
16:00 - 17:00	3	45	15.0	11	1732	157.5	14	564	40.3
17:00 - 18:00	0	0	0.0	14	1102	78.7	14	467	33.4
18:00 - 19:00	1	1	1.0	15	858	57.2	12	313	26.1
19:00 - 20:00	0	0	0.0	16	1168	73.0	9	352	39.1
20:00 - 21:00	0	0	0.0	15	1067	71.1	8	129	16.1
21:00 - 22:00	2	4	2.0	15	967	64.5	7	73	10.4
22:00 - 23:00	1	5	5.0	16	821	51.3	7	17	2.4
23:00 - 24:00	2	4	2.0	12	1078	89.8	0	0	0.0
Totals	12	145	12.1	124	9753	78.7	85	2409	28.3

6.11 APPENDIX

6.11 Statewide Siren Test Reports

6.11.1 Statewide Siren Test Report (May 2023)

404 **STATEWIDE SIREN REPORT SUMMARY - MAY 2023**

CCH -OAHU

41 Sirens reported as No Sound by County/State or Out of Service (OOS) **77.22%**

of 180

21 Requires maintenance

20 OOS

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	OA118A-Ala Wai Yacht Harbor	Reported by County. Confirmed on Commander by RS. Battery fail	X	X		SOH HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	OA120-McKinley High School	Activation fail per RS on Commander. Battery fail		X		
3	OA122-Booth Park	Activation fail per RS on Commander.		X	Dam Breach	
4	OA137-Moanalua Valley	Reported by County. TBD by onsite inspection by HI-EMA Radio Technician's		X		
5	OA300A-Halawa Dist Park	Activation fail per RS on Commander. Battery fail		X		
6	OA311A-Honouliuli	Activation fail per RS on Commander. Comm fail		X		
7	OA311B-Coral Creek	Activation fail per RS on Commander. Battery fail	X	X	Hazmat	
8	OA312C-Hoakalei #1	Activation fail per RS on Commander. Audio/Current fail			Hazmat	
9	OA313-Makakilo BWS	Activation fail per RS on Commander. Comm fail		X		
10	OA314-Campbell Ind Park	Activation fail per RS on Commander.	X	X	Hazmat	
11	OA314B-Barbers Pt.Deep Draft	Activation fail per RS on Commander.	X	X		
12	OA316-Nanaikapono School	Activation fail per RS on Commander. Comm fail	X	X		
13	OA318A-Maili North	Activation fail per RS on Commander. Comm fail	X	X		
14	OA333-Hoopili #1	Activation fail per RS on Commander. Amp fail		X		
15	OA403A-Maunawili Valley PK	Activation fail per RS on Commander.		X		
16	OA412-Heeia Playground	Activation fail per RS on Commander. Amp fail	X	X		
17	OA414-Heeia Kea Pier	Activation fail per RS on Commander. Battery fail	X	X		
18	OA419-Kalae Oio Beach PK	Activation fail per RS on Commander. Amp fail	X	X		
19	OA426A-PCC	Activation fail per RS on Commander. Amp fail	X	X		
20	OA327-Keaau Beach Park	Vandalism - Within tech repair.	X	X		SOH HI-EMA RS Action - Radioshop fix siren.
21	OA328-Makua Cave	Activation fail per RS on Commander. Comm fail. Needs Yagi antenna.	X	X		SOH HI-EMA RS Action - Radioshop to install yagi. Await new sat upgrade.

	OUT OF SERVICE	REASON	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
22	OA101-Koko Head	Siren head rusted off		X		SOH HI-EMA Action - Schedule for HIePro solicitaion.
23	OA109-Maunalani Park	Legacy siren. Mechanical issue beyond repair.		X		
24	OA110-Palolo valley Park	Bad solar panels		X		
25	OA206-Kawailoa Beach	Bad solar panels	X	X		
26	OA211-Dillingham Airfield	Bad solar panels	X	X		
27	OA212A-Mokuleia BP	Bad solar panels	X	X		
28	OA229-Mililani Mauka HECO	Bad solar panels		X		
29	OA323-Mauna Lahilahi Beach	Vandalism - Beyond tech repair. Upgrade to UV-HSO.	X	X		
30	OA329-Kaena Point	Vandalism - Beyond tech repair. Conduits.	X	X		
31	OA331A-Kalaeloa USCG	Siren head rusted off	X	X	Hazmat	
32	OA402B-Waimanalo Town BWS	Lighting Strike Damage	X	X		
33	OA307-Palisades Elem school	Legacy siren. Frozen Motor		X		SOH DAGS Action -Scheduled for WO#3
34	OA319-Maili Beach Park	Vandalism - Beyond tech repair	X	X		
35	OA124-Alewa Heights	Legacy siren. Mechanical issue beyond repair.		X		
36	OA115-Dole St	Siren removed due to rotten wooden pole.		X		
37	OA312D-Hoakalei #2	Lighting Strike Damage	X	X	Hazmat	
38	OA115-Dole St	Legacy siren. Mechanical issue beyond repair.		X		SOH DAGS Action -Scheduled for future workorder (WO)
39	OA400A-Kaiona Beach Park	Bad solar panels	X	X		
40	OA402A-Waimanalo Valley	Bad solar panels	X	X		
41	OA422-Punaluu Beach Park	Bad solar panels	X	X		

Maui County

18 Sirens reported as No Sound by County/State or Out of Service (OOS) 76.62%

of 77

12 Maui - Requires maintenance

0 Molokai - Requires maintenance

0 Lanai - Requires maintenance

6 OOS

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	MA115-Wells Park	Activation fail per RS on Commander. Comm fail		X		SOH HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	MA117-Maui Comm College	Activation fail per RS on Commander. Battery fail	X	X		
3	MA125-Makena	Activation fail per RS on Commander. Comm & Audio/Current fail	X	X		
4	MA126-Upper Kula, Copp Rd	Activation fail per RS on Commander. Comm fail		X		
5	MA127-Waikapu	Activation fail per RS on Commander. Audio/Current fail		X		
6	MA130-Kamaole Park III	Activation fail per RS on Commander. Audio/Current fail	X	X		
7	MA131-Haiku	Activation fail per RS on Commander. Battery fail.		X		
8	MA132-Sugar Beach	Activation fail per RS on Commander. Audio/Current fail	X	X		
9	MA155-Kualono Subdivision	Activation fail per RS on Commander. Comm fail		X		
10	MA303-Wailua Valley	Activation fail per RS on Commander. Bad cell RF signal		X		Yagi antenna installed and no improvement. Await new sat upgrade.
11	MA304A-Hamoa #2	Activation fail per RS on Commander. Battery fail	X	X		SOH HI-EMA RS Action - To be scheduled on upcoming siren maintenance trip by Radioshop Techs.
12	MA101-Waiehu	Degraded with multiple bad driver lines per RS.	X	X		SOH HI-EMA PM Action - Add to future HI-ePro Siren Repair

6.11 APPENDIX

	OUT OF SERVICE	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
13	MA120-Kahakuloa	Satellite Service discontinued. No cell coverage in area.	X	X		SOH DAGS Action - Satellite Upgrade Project pending NTP.
14	MA105-Naska	Electrical Issues	X	X		SOH DAGS Action - Scheduled for next Maui Lump Sum Project
15	MA108-Kuau Store	Legacy siren. Frozen Motor. Site removed due to fall hazard.	X	X		
16	MA402-Maluuluolele	Legacy siren. Frozen Motor	X	X		
17	MA403-Kapunakea	Legacy siren. Frozen Motor	X	X		
18	MA410-Puamana	Electrical Issues	X	X		

Kauai County

27 Sirens reported as No Sound by County/State or Out of Service (OOS) 51.79%

of 56

19 Requires maintenance

8 OOS

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	KA112-Kilauea Park	Reported by County. Confirmed on Commander by RS. Battery fail		X		SOH HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	KA201-Anahola Village Park	Reported by County. TBD by onsite inspection by HI-EMA Radio Technician's	X	X		
3	KA202-Anahola Aliomanu South	Reported by County. Confirmed on Commander by RS. Audio/Current fail	X	X		
4	KA211-Wailua	Activation fail per RS on Commander. Battery fail	X	X		
5	KA301-Lydgate	Activation fail per RS on Commander. Audio/Current fail	X	X		
6	KA302-Wailua Golf Course	Reported by County. Confirmed on Commander by RS. Battery fail	X	X		
7	KA304-Hanamaulu Park	Activation fail per RS on Commander. Battery fail	X	X		
8	KA305-Isenburg Field	Activation fail per RS on Commander. Audio/Current fail				
9	KA503-Poipu Crater	Activation fail per RS on Commander. Audio/Current fail				
10	KA508-Omao Park	Activation fail per RS on Commander. Battery fail				
11	KA512-Waha Park	Activation fail per RS on Commander. Audio/Current fail				
12	KA513-Kalaheo	Activation fail per RS on Commander. Audio/Current fail				
13	KA515-Numila	Reported by County. TBD by onsite inspection by HI-EMA Radio Technician's	X	X		
14	KA517-Eleele School	Activation fail per RS on Commander. Audio/Current fail				
15	KA519-Port Allen	Activation fail per RS on Commander.				
16	KA603-Makawela-Pakala	Reported by County. Confirmed on Commander by RS. Battery fail	X	X		
17	KA701-Lucy Wright Park	Activation fail per RS on Commander. Audio/Current fail				
18	KA703-Waimea Canyon	Activation fail per RS on Commander. Audio/Current fail	X	X		

6.11 APPENDIX

19	KA103-Wainiha	Activation fail per RS on Commander. Comm fail	X	X		SOH HI-EMA RS Action - Radioshop to install yagi. Await new sat upgrade.

	OUT OF SERVICE	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
20	KA101-Haena	Solar panels blocked by mountain. Convert to electrical charge.	X	X		SOH DAGS Action - Scheduled for next Kauai Lump Sum Project
21	KA105-Hanalei	Legacy siren. Frozen Motor	X	X		
22	KA207-Kapaa Neighborhood Ctr	Bad solar panels	X	X		
23	KA208-Kealia Kai	Lighting Strike Damage	X	X		
24	KA210-Wailua STP	Siren removed-Vehicle Collision	X	X		
25	KA303-Hanamalu	Bad solar panels	X	X		
26	KA310-Pua Loke	Bad controller. Needs to be upgraded to a UV-HSO.		X		
27	KA315-Puhi	Bad solar panels		X		

Hawaii County

23 Sirens reported as No Sound by County/State or Out of Service (OOS) **74.73%**

of 91

15 OOS

8 OOS

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	HA112-Kolekole	Reported by County. Confirmed on Commander by RS.	X	X		SOH HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	HA201-Laupahoehoe	Reported by County. Confirmed on Commander by RS.	X	X		
3	HA403-Kawaihae #1, Spencer Park	Activation fail per RS on Commander.	X	X		
4	HA603Alii Kai Sub Division	Activation fail per RS on Commander.	X	X		
5	HA609-Old Kona Airport	Reported by County. TBD by onsite inspection by HI-EMA Radio Technician's	X	X		
6	HA610-Honokohau Harbor	Activation fail per RS on Commander.	X	X		
7	HA909-Pohoiki	Reported by County. Confirmed on Commander by RS.		X	Lava Zone #2	
8	HA911-Hawaiian Beaches #2	Reported by County. TBD by onsite inspection by HI-EMA Radio Technician's		X	Lava Zone #3	
9	HA913-Paradise Park #3	Reported by County. Confirmed on Commander by RS.		X	Lava Zone #3	
10	HA505-Kapaa Beach Park	Reported by County. Confirmed on Commander by RS. Poor cellular connection.	X	X		SOH HI-EMA RS Action - Radioshop to install yagi. Await new sat upgrade.
11	HA908-Kaimu	Activation fail per RS on Commander.		X	Lava Zone #2	
12	HA116-Hilo SOB	Reported by County. Confirmed on Commander by RS. RF Interference suspected.	X	X		SOH HI-EMA RS Action - Radioshop to move antenna from existing location or install yagi antenna. Await new sat
13	HA303-Waipio Valley	Degraded with multiple bad driver lines per RS.	X	X		SOH HI-EMA PM Action - Add to future HI-ePro Siren Repair

14	HA916-Kehana	Poor cellular coverage in area.		X	Lava Zone #2	SOH HI-EMA PM Action - Work with Verizon Engineering. Await new sat upgrade.
15	HA806-Hawaiian Ocean View #2	Reported by County. Degraded with multiple bad driver lines per RS.		X	Lava Zone #2	SOH DAGS Action -Scheduled for future workorder (WO)

	OUT OF SERVICE	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
16	HA404-Hapuna Beach	Comms offline due to legacy equipment	X	X		SOH DAGS Action -Scheduled for WO#2
17	HA706-Milolii	Bad solar panels	X	X	Lava Zone #2	SOH DAGS Action -Scheduled for future workorder (WO)
18	HA807-Waiohinu	Siren head rusted off		X		
19	HA910-Ainaloa	Bad solar panels		X	Lava Zone #2	
20	HA501-Hawi	Bad solar panels		X		SOH DAGS Action - Site entitlement planning & design phase
21	HA904-Kapoho Beach Lots	Destroyed/overrun by 2018 Lava	X	X	Lava Zone #1	SOH DAGS Action - In site entitlement planning and design engineering phase of the procurement process.
22	HA917-Ahalanui Beach Park	Destroyed/overrun by 2018 Lava	X	X	Lava Zone #1	
23	HA926-Kapoho Vacation Land	Destroyed/overrun by 2018 Lava	X	X	Lava Zone #1	

6.11 APPENDIX

6.11.2 Statewide Siren Test Report (June 2023)

404 **STATEWIDE SIREN REPORT SUMMARY - JUNE 2023**

CCH -OAHU

37 Sirens reported as No Sound by County/State or Out of Service (OOS) **79.44%**

of 180

15 Requires maintenance

22 OOS/SEVERELY DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	OA120-McKinley High School	Reported by County. TBD by onsite inspection. Asked DOE office staff to monitor July 3rd Test.		X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	OA203-Sharks Cove	Reported by County. Confirmed by RS. (Digital Board?)	X	X		
3	OA204-Waimea Bay South	Activation fail per RS. Comm fail	X	X		
4	OA311B-Coral Creek	Reported by County. Confirmed by RS. TBD by onsite inspection.		X		
5	OA314-Campbells Ind Park	Activation fail per RS. Comm fail	X	X	Hazmat	
6	OA300A-Halawa Dist Park	Activation fail per RS. Battery fail		X		
7	OA311A-Honouliuli	Activation fail per RS. Comm fail		X	Hazmat	
8	OA313-Makakilo BWS	Reported by County. Activation fail per RS. Comm fail (reflash)		X		
9	OA430-Kahuku Shrimp	Activation fail per RS. (Amp#4, #6)	X	X		
10	OA318A-Maili North	Activation fail per RS. Comm fail (batteries stolen)	X	X		
11	OA331C-UH West Oahu	Activation fail per RS. Comm fail (battery replacement)		X		
12	OA414-Heeia Kea Pier	Activation fail per RS. Battery fail (backplane)	X	X		
13	OA419-Kalae Oio Beach PK	Activation fail per RS. Amp fail	X	X		
14	OA327-Keaau Beach Park	Vandalism - Awaiting parts.	X	X		HI-EMA RS Action - Radioshop will attempt to fix siren.
15	OA328-Makua Cave	Activation fail per RS. Comm fail. (saturation of cell signal. Needs more troubleshooting onsite. Controller?)	X	X		HI-EMA RS Action - Radioshop to install yagi. Await new sat upgrade.

	OOS/SEVERELY DEGRADED	REASON	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
16	OA101-Koko Head	Replace bad speaker array and solar panels.		X		HI-EMA Action - HIePro solicitation. "Need additional staffing to support"
17	OA110-Palolo valley Park	Replace bad solar panels.		X		
18	OA137-Moanalua Valley	Replace bad speaker array.		X		
19	OA109-Maunalani Park	Legacy siren. Mechanical issue beyond repair.		X		
20	OA115-Dole St	Siren removed due to rotten wooden pole.		X		
21	OA124-Alewa Heights	Legacy siren. Mechanical issue beyond repair.		X		
22	OA206-Kawailoa Beach	Replace bad solar panels and upgrade to UV controller.	X	X		
23	OA208-Wailua	Replace bad solar panels and upgrade to UV controller.		X	Dam Breach	
24	OA211-Dillingham Airfield	Replace bad solar panels and upgrade to UV controller.	X	X		

25	OA212A-Mokuleia BP	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action -Scheduled for DAGS Indefinite Quantities Contract Workorder
26	OA229-Mililani Mauka HECO	Replace bad solar panels and upgrade to UV controller.		X		
27	OA307-Palisades Elem school	Legacy siren. Frozen Motor		X		
28	OA312D-Hoakalei #2	Lighting Strike Damage	X	X	Hazmat	
29	OA319-Maili Beach Park	On going "Vandalism" - Beyond tech repair	X	X		
30	OA323-Mauna Lahilahi Beach	On going "Vandalism" - Beyond tech repair. Upgrade to UV-HSO.	X	X		
31	OA329-Kaena Point	On going "Vandalism" - Beyond tech repair. Conduits.	X	X		
32	OA331A-Kalaeloa USCG	Siren head rusted off	X	X	Hazmat	
33	OA400A-Kaiona Beach Park	Replace bad solar panels.	X	X		
34	OA402A-Waimanalo Valley	Replace bad solar panels and upgrade to UV controller.	X	X		
35	OA402B-Waimanalo Town BWS	Lighting Strike Damage	X	X		
36	OA403A-Maunawili Valley PK	Replace bad solar panels and upgrade to UV controller.		X		
37	OA422-Punaluu Beach Park	Replace bad solar panels.	X	X		

Maui County

20 Sirens reported as No Sound by County/State or Out of Service (OOS) **74.03%**

of 77

13 Maui - Requires maintenance

0 Molokai - Requires maintenance

0 Lanai - Requires maintenance

7 OOS/SEVERELY DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	MA115-Wells Park	Activation fail per RS. (Bad MCP Backplane. Convert to UV? Request for MEMA to monitor onsite July 3rd)		X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	MA117-Maui Comm College	Activation fail per RS. Battery fail	X	X		
3	MA122-Waimea #2	Activation fail per RS. Battery fail - 23.4V (Tripped AC?)				
4	MA125-Makena	Activation fail per RS. Comm & Audio/Current fail	X	X		
5	MA126-Upper Kula, Copp Rd	Activation fail per RS. Comm fail		X		
6	MA130-Kamaole Park III	Activation fail per RS. Audio/Current fail	X	X		
7	MA131-Haiku	Activation fail per RS. Comm fail (Verizon to install new site nearby)		X		
8	MA132-Sugar Beach	Activation fail per RS. Audio/Current fail (battery change)	X	X		
9	MA155-Kualono Subdivision	Activation fail per RS. Comm fail (modem?)		X		
10	MA302-Keanae	Activation fail per RS. Battery fail (battery change)				
11	MA304A-Hamoa #2	Activation fail per RS. Battery fail (battery change)	X	X		
12	MA411-Flemming Beach	Activation fail per RS. Battery fail (battery change)				
13	MA303-Wailua Valley	Activation fail per RS. Bad cell signal in area. Awaiting sat modem upgrade.		X		Yagi antenna installed and no improvement. Await new sat upgrade.

	OOS/SEVERELY DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
14	MA101-Waiehu	Degraded with multiple bad driver lines per RS.	X	X		DAGS Action - Scheduled for DAGS Lump Sum Contract.
15	MA105-Naska	Electrical Issues	X	X		
16	MA108-Kuau Store	Legacy siren. Frozen Motor. Site removed due to fall hazard.	X	X		
17	MA402-Maluuluolele	Legacy siren. Frozen Motor	X	X		
18	MA403-Kapunakea	Legacy siren. Frozen Motor	X	X		
19	MA410-Puamana	Ongoing electrical Issues	X	X		
20	MA120-Kahakuloa	No cell coverage in area. Sat modem upgrades in progress	X	X		DAGS Action - DAGS Satellite Upgrade Project in progress.

6.11 APPENDIX

Kauai County

16 Sirens reported as No Sound by County/State or Out of Service (OOS) **71.43%**

of 56

8 Requires maintenance

8 OOS/SEVERELY DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	KA107-Anini	Reported by County. TBD by onsite inspection.	X	X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	KA112-Kilauea Park	Reported by County. Confirmed on Commander by RS. Battery fail (backplane change?)		X		
3	KA202-Anahola Aliomanu South	Reported by County. Confirmed on Commander by RS. Audio/Current fail	X	X		
4	KA203-Kealia	Reported by County. Confirmed on Commander by RS. Battery fail (battery change)	X	X		
5	KA204-Kapahi Park	Reported by County. TBD by onsite inspection.		X		
6	KA508-Omao Park	Activation fail per RS. Battery fail		X		
7	KA603-Makawela-Pakala	Reported by County. Confirmed on Commander by RS. Battery fail	X	X		
8	KA103-Wainiha	Activation fail per RS. Comm fail	X	X		HI-EMA RS Action - Radioshop to install yagi. Await new DAGS sat upgrade.

	OOS/SEVERELY DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
9	KA101-Haena	Solar panels blocked by mountain. Convert to electrical charge.	X	X		DAGS Action - Scheduled for DAGS Lump Sum Contract.
10	KA105-Hanalei	Legacy siren. Frozen Motor	X	X		
11	KA207-Kapaa Neighborhood Ctr	Replace bad solar panels and upgrade to UV controller.	X	X		
12	KA208-Kealia Kai	Lighting Strike Damage	X	X		
13	KA210-Wailua STP	Siren removed-Vehicle Collision	X	X		
14	KA303-Hanamalu	Replace bad solar panels and upgrade to UV controller.	X	X		
15	KA304-Hanamaulu Park	Replace bad solar panels		X		
16	KA310-Pua Loke	Replace bad solar panels and upgrade to UV controller.		X		

6.11 APPENDIX

Hawaii County

21 Sirens reported as No Sound by County/State or Out of Service (OOS) **76.92%**

of 91

10 Requires maintenance

11 OOS/SEVERELY DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	HA105-Kawailani Street	Reported by County. TBD by onsite inspection.		X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	HA112-Kolekole	Reported by County. Confirmed on Commander by RS. (battery change)	X	X		
3	HA306-Kukuihaele Park	Reported by County. No response in Commander. (Flash?) TBD by onsite inspection.		X		
4	HA403-Kawaihae #1, Spencer Park	Activation fail per RS (Solar Charger?).	X	X		
5	HA911-Hawaiian Beaches #2	Reported by County. TBD by onsite inspection.		X		
6	HA913-Paradise Park #3	Reported by County. Confirmed on Commander by RS.		X		
7	HA505-Kapaa Beach Park	Activation fail per RS. Poor cellular coverage in lower Puna. Install Yagi? Awaiting sat modem upgrade.	X	X		HI-EMA RS Action - Radioshop to install yagi. Work with Verizon Engineering. Await new sat upgrade.
8	HA908-Kaimu	Activation fail per RS. Poor cellular coverage in lower Puna. Install Yagi? Awaiting sat modem upgrade.		X	Lava Zone #2	
9	HA909-Pohoiki	Reported by County. Confirmed on Commander by RS.		X	Lava Zone #2	
10	HA916-Kehana	Activation fail per RS. Poor cellular coverage in lower Puna. Install Yagi? Awaiting sat modem upgrade.		X	Lava Zone #2	

	OOS/SEVERELY DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
11	HA404-Hapuna Beach	Comms offline due to legacy equipment	X	X		DAGS Action - Scheduled for WO#2
12	HA303-Waipio Valley	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		DAGS Action -Scheduled for DAGS Indefinite Quantities Contract Workorder
13	HA609-Old Kona Airport	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		
14	HA706-Milolii	Replace bad solar panels	X	X	Lava Zone #2	
15	HA806-Hawaiian Ocean View #2	Degraded with multiple bad driver lines per RS.		X	Lava Zone #2	
16	HA807-Waiohinu	Siren head rusted off		X		
17	HA910-Ainaloa	Replace bad solar panels		X	Lava Zone #2	
18	HA501-Hawi	Bad solar panels. Site to be moved to County base yard.		X		
19	HA904-Kapoho Beach Lots	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	
20	HA917-Ahalanui Beach Park	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	
21	HA926-Kapoho Vacation Land	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	

6.11.3 Statewide Siren Test Report (July 2023)

404 STATEWIDE SIREN REPORT SUMMARY - JULY 2023

Statewide — last month

82	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	79.15%	75.46%
of	404		
35	Requires maintenance		
56	OOS/DEGRADED		

CCH -OAHU — last month

35	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	80.56%	79.44%
of	180		
12	Requires maintenance		
23	OOS/DEGRADED		

Maui County — last month

17	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	77.92%	74.03%
of	77		
7	Maui - Requires maintenance		
0	Molokai - Requires maintenance		
0	Lanai - Requires maintenance		
10	OOS/DEGRADED		

Kauai County — last month

13	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	76.79%	71.43%
of	56		
4	Requires maintenance		
9	OOS/DEGRADED		

Hawaii County — last month

17	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	81.32%	76.92%
of	91		
3	Requires maintenance		
14	OOS/DEGRADED		

6.11 APPENDIX

CCH -OAHU

35 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **80.56%**

of 180

12 Requires maintenance

23 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	OA100A-Kalama Valley Park	Comm fail. Radiotech's to replace batteries this month.		X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	OA108A-Fort Ruger	Comm fail (Needs DMR reflash).		X		
3	OA112-Kuulei Cliffs	Comm fail. Radiotech's to replace batteries this month.		X		
4	OA300A-Halawa Dist Park	Battery fail. Radiotech's to investigate onsite 7/14.		X		
5	OA311A-Honouliuli	Comm fail. Radiotech's to invesitgfate onsite this month.		X	Hazmat	
6	OA313-Makakilo BWS	Comm fail (reflashed/visited 6/30). Will moinitor onsite 8/1.		X		
7	OA318A-Maili North	Comm fail. Possible batteries stolen? Radiotech's to investigate onsite this month.	X	X		
8	OA331C-UH West Oahu	Comm fail. Radiotech's to replace batteries this month.		X		
9	OA414-Heeia Kea Pier	Activation fail. Possible "backplane" needs to be replaced.	X	X		
10	OA419-Kalae Oio Beach PK	Comm fail. Radiotech's to replace batteries this month.	X	X		
11	OA327-Keaau Beach Park	Vandalism - Awaiting parts (power cable).	X	X		HI-EMA RS Action - Radioshop will attempt to fix siren.
12	OA328-Makua Cave	Comm fail. (saturation of cell signal. Needs more troubleshooting onsite. Controller?)	X	X		HI-EMA RS Action - Radioshop to install yagi. Await new sat upgrade.

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
13	OA101-Koko Head	Replace bad speaker array and solar panels.		X		HI-EMA Action - HIePro solicitation. "Need additional staffing to support"
14	OA110-Palolo valley Park	Replace bad solar panels.		X		
15	OA137-Moanalua Valley	Replace bad speaker array.		X		
16	OA109-Maunalani Park	Legacy siren. Mechanical issue beyond repair.		X		DAGS Action -Scheduled for DAGS Indefinite Quantities Contract Workorder
17	OA115-Dole St	Siren removed due to rotten wooden pole.		X		
18	OA124-Alewa Heights	Legacy siren. Mechanical issue beyond repair.		X		
19	OA203-Sharks Cove	Replace bad solar panels, drivers, and upgrade to UV controller.	X	X		
20	OA206-Kawailoa Beach	Replace bad solar panels and upgrade to UV controller.	X	X		
21	OA208-Wailua	Replace bad solar panels and upgrade to UV controller.		X	Dam Breach	
22	OA211-Dillingham Airfield	Replace bad solar panels and upgrade to UV controller.	X	X		
23	OA212A-Mokuleia BP	Replace bad solar panels and upgrade to UV controller.	X	X		
24	OA229-Mililani Mauka HECO	Replace bad solar panels and upgrade to UV controller.		X		
25	OA307-Palisades Elem school	Legacy siren. Frozen Motor		X		
26	OA312D-Hoakalei #2	Lighting Strike Damage	X	X	Hazmat	
27	OA319-Maili Beach Park	On going "Vandalism" - Beyond tech repair	X	X		
28	OA323-Mauna Lahilahi Beach	On going "Vandalism" - Beyond tech repair. Upgrade to UV-HSO.	X	X		
29	OA329-Kaena Point	On going "Vandalism" - Beyond tech repair. Conduits.	X	X		
30	OA331A-Kalaeloa USCG	Siren head rusted off	X	X	Hazmat	
31	OA400A-Kaiona Beach Park	Replace bad solar panels.	X	X		
32	OA402A-Waimanalo Valley	Replace bad solar panels and upgrade to UV controller.	X	X		
33	OA402B-Waimanalo Town BWS	Lighting Strike Damage	X	X		
34	OA403A-Maunawili Valley PK	Replace bad solar panels and upgrade to UV controller.		X		
35	OA422-Punaluu Beach Park	Replace bad solar panels.	X	X		

Maui County

17 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **77.92%**

of 77

7 Maui - Requires maintenance
0 Molokai - Requires maintenance
0 Lanai - Requires maintenance
10 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	MA116-Kahului School	Comm fail. Radiotech's to investigate onsite (charger?)	X	X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	MA117-Maui Comm College	Comm fail. Radiotech's to replace batteries.	X	X		
3	MA122-Wailea #2	Comm fail. Radiotech's to replace batteries.				
4	MA125-Makena	Comm fail. Radiotech's to replace batteries.	X	X		
5	MA126-Upper Kula, Copp Rd	Activation fail. Radiotech's to investigate onsite.		X		
6	MA132-Sugar Beach	Activation fail. Radiotech's to investigate onsite.	X	X		
7	MA302-Keanae	Comm fail. Radiotech's to replace batteries.				

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
8	MA101-Waiehu	Degraded with multiple bad driver lines per RS.	X	X		DAGS Action - Scheduled for DAGS Lump Sum Contract.
9	MA105-Naska	Electrical Issues	X	X		
10	MA108-Kuau Store	Legacy siren. Frozen Motor. Site removed due to fall hazard.	X	X		
11	MA115-Wells Park	Upgrade to UV controller.		X		
12	MA131-Haiku	Comm fail. Pending Verizon to install new site nearby.		X		
13	MA402-Maluuluolele	Legacy siren. Frozen Motor	X	X		
14	MA403-Kapunakea	Legacy siren. Frozen Motor	X	X		
15	MA410-Puamana	Ongoing electrical Issues	X	X		
16	MA303-Wailua Valley	Activation fail per RS. Bad cell signal in area. Awaiting sat modem upgrade.		X		Yagi antenna installed and no improvement. Await new sat upgrade.
17	MA120-Kahakuloa	No cell coverage in area. Sat modem upgrades in progress	X	X		DAGS Action - DAGS Satellite Upgrade Project in progress.

6.11 APPENDIX

Kauai County

13 **Sirens reported as No Sound or Out of Service (OOS)/DEGRADED** **76.79%**

of **56**

4 **Requires maintenance**

9 **OOS/DEGRADED**

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	KA107-Anini	Activation fail. Radiotech's to investigate onsite.	X	X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	KA112-Kilauea Park	Activation fail. Possible "backplane" needs to be replaced.		X		
3	KA603-Makawela-Pakala	Battery fail. Radiotech's to replace batteries.	X	X		
4	KA103-Wainiha	Activation fail per RS. Comm fail	X	X		HI-EMA RS Action - Radioshop to install yagi. Await new DAGS sat upgrade.

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
5	KA101-Haena	Solar panels blocked by mountain. Convert to electrical charge.	X	X		DAGS Action - Scheduled for DAGS Lump Sum Contract.
6	KA105-Hanalei	Legacy siren. Frozen Motor	X	X		
7	KA203-Kealia	Bad drivers. Refer to DAGS.	X	X		
8	KA207-Kapaa Neighborhood Ctr	Replace bad solar panels and upgrade to UV controller.	X	X		
9	KA208-Kealia Kai	Lighting Strike Damage	X	X		
10	KA210-Wailua STP	Siren removed-Vehicle Collision	X	X		
11	KA303-Hanamalu	Replace bad solar panels and upgrade to UV controller.	X	X		
12	KA304-Hanamaulu Park	Replace bad solar panels		X		
13	KA310-Pua Loke	Replace bad solar panels and upgrade to UV controller.		X		

6.11 APPENDIX

Hawaii County

17 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **81.32%**

of 91

3 Requires maintenance

14 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	HA112-Kolekole	Comms fail. Radiotech's to replace batteries (or charger issue).	X	X		HI-EMA RS Action - To be scheduled on upcoming siren maintenance by Radioshop Techs.
2	HA306-Kukuihaele Park	Comm fail. Radiotech's to investigate onsite.		X		
3	HA913-Paradise Park #3	Comm fail. Replace Cell Modem (not powered on per HCDA onsite visit 7/13)		X		

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
4	HA404-Hapuna Beach	Comms offline due to legacy equipment	X	X		DAGS Action - Scheduled for WO#2
5	HA908-Kaimu	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	DAGS Action -Scheduled for DAGS Indefinite Quantities Contract Workorder
6	HA909-Pohoiki	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	
7	HA916-Kehana	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	
8	HA303-Waipio Valley	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		
9	HA609-Old Kona Airport	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		
10	HA706-Milolii	Replace bad solar panels	X	X	Lava Zone #2	
11	HA806-Hawaiian Ocean View #2	Degraded with multiple bad driver lines per RS.		X	Lava Zone #2	
12	HA807-Waiohinu	Siren head rusted off		X		
13	HA910-Ainaloa	Replace bad solar panels		X	Lava Zone #2	
14	HA501-Hawi	Bad solar panels. Site to be moved to County base yard.		X		
15	HA904-Kapoho Beach Lots	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	
16	HA917-Ahalanui Beach Park	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	
17	HA926-Kapoho Vacation Land	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	

6.11.4 Statewide Siren Test Report (August 2023)

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404 **STATEWIDE SIREN REPORT SUMMARY - AUGUST 2023**

	Statewide		last month
86	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	78.98%	79.15%
of	404		
27	Requires maintenance		
59	OOS/DEGRADED		
	CCH -OAHU		last month
39	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	78.33%	80.56%
of	180		
14	Requires maintenance		
25	OOS/DEGRADED		
	Maui County		last month
16	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	79.22%	77.92%
of	77		
6	Maui - Requires maintenance		
0	Molokai - Requires maintenance		
0	Lanai - Requires maintenance		
10	OOS/DEGRADED		
	Kauai County		last month
11	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	80.36%	76.79%
of	56		
1	Requires maintenance		
10	OOS/DEGRADED		
	Hawaii County		last month
20	Sirens reported as No Sound or Out of Service (OOS)/DEGRADED	78.02%	81.32%
of	91		
6	Requires maintenance		
14	OOS/DEGRADED		

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FOR OFFICIAL USE ONLY (FOUO) - CONFIDENTIAL

CCH -OAHU

39 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **78.33%**

of 180

14 Requires maintenance

25 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	OA100A-Kalama Valley Park	Comm fail. Radiotech's to troubleshoot. Possible bad cell modem.		X		HI-EMA Radioshop
2	OA120-McKinley HS	Comm fail. Radiotech's to replace batteries.		X		
3	OA122-Booth Park	Activation fail. Radiotech's to troubleshoot onsite.		X		
4	OA128-Kokea Street	Activation fail. Radiotech's to troubleshoot onsite.	X	X		
5	OA209-Silva Pump	Comm fail. Posisbly batteries stolen.	X	X		
6	OA214-Leilehua HS	Comm fail. Radiotech's to troubleshoot. Possible cell modem reset.				
7	OA311A-Honouliuli	Comm fail. Radiotech's to investigate onsite.		X	Hazmat	
8	OA317-Nanakuli Maili	Resident reported	X	X		
9	OA327-Keaau Beach Park	Vandalism - Awaiting parts (power cable).	X	X		
10	OA328-Makua Cave	Comm fail. (saturation of cell signal. Needs more troubleshooting onsite. Controller?)	X	X		
11	OA331C-UH West Oahu	Comm fail. Radiotech's to replace batteries.		X		
12	OA414-Heeia Kea Pier	Activation fail. Possible "backplane" needs to be replaced.	X	X		
13	OA419-Kalae Oio Beach PK	Comm fail. Radiotech's to replace batteries.	X	X		
14	OA426A-PCC	Activation fail. Radiotech's to troubleshoot onsite.	X	X		

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami Zone	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	OA101-Koko Head	Replace bad speaker array and solar panels.		X		HI-EMA Action - **HIePro solicitation
2	OA109-Maunalani Park	Legacy siren. Mechanical issue beyond repair.		X		DAGS Action - Workorder Contract
3	OA110-Palolo valley Park	Replace bad solar panels.		X		HI-EMA Action - **HIePro solicitation
4	OA112-Kuulei Cliffs	Replace bad solar panels.	X	X		HI-EMA Action - **HIePro solicitation
5	OA115-Dole St	Siren removed due to rotten wooden pole.		X		DAGS Action - Workorder Contract
6	OA124-Alewa Heights	Legacy siren. Mechanical issue beyond repair.		X		DAGS Action - Workorder Contract
7	OA137-Moanalua Valley	Replace bad speaker array.		X		HI-EMA Action - **HIePro solicitation
8	OA203-Sharks Cove	Replace bad solar panels, drivers, and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
9	OA206-Kawailoa Beach	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
10	OA208-Wailua	Replace bad solar panels and upgrade to UV controller.		X	Dam Breach	DAGS Action - Workorder Contract
11	OA211-Dillingham Airfield	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
12	OA212A-Mokuleia BP	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract

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6.11 APPENDIX

FOR OFFICIAL USE ONLY (FOUO) - CONFIDENTIAL

13	OA229-Mililani Mauka HECO	Replace bad solar panels and upgrade to UV controller.		X		DAGS Action - Workorder Contract
14	OA303-Aiea Heights	Legacy siren. INOP Blower and Chopper		X		DAGS Action - Workorder Contract
15	OA307-Palisades Elem school	Legacy siren. Frozen Motor		X		DAGS Action - Workorder Contract
16	OA312D-Hoakalei #2	Lighting Strike Damage	X	X	Hazmat	DAGS Action - Workorder Contract
17	OA319-Maili Beach Park	On going "Vandalism" - Beyond tech repair	X	X		DAGS Action - Workorder Contract
18	OA323-Mauna Lahilahi Beach	On going "Vandalism" - Beyond tech repair. Upgrade to UV-HSO.	X	X		DAGS Action - Workorder Contract
19	OA329-Kaena Point	On going "Vandalism" - Beyond tech repair. Conduits.	X	X		DAGS Action - Workorder Contract
20	OA331A-Kalaeloa USCG	Siren head rusted off	X	X	Hazmat	DAGS Action - Workorder Contract
21	OA400A-Kaiona Beach Park	Replace bad solar panels.	X	X		DAGS Action - Workorder Contract
22	OA402A-Waimanalo Valley	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
23	OA402B-Waimanalo Town BWS	Lighting Strike Damage	X	X		DAGS Action - Workorder Contract
24	OA403A-Maunawili Valley PK	Replace bad solar panels and upgrade to UV controller.		X		DAGS Action - Workorder Contract
25	OA422-Punaluu Beach Park	Replace bad solar panels.	X	X		HI-EMA Action - **HIePro solicitation

**NOTE: "Need additional staffing to support"

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6.11 APPENDIX

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Maui County

16 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **79.22%**

of 77

6 Maui - Requires maintenance

0 Molokai - Requires maintenance

0 Lanai - Requires maintenance

10 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	MA115-Wells Park	Comm fail. Radiotech's to replace batteries. Upgrade to UV controller.		X		HI-EMA Radioshop
2	MA116-Kahului School	Comm fail. Radiotech's to investigate onsite (charger?)	X	X		
3	MA117-Maui Comm College	Comm fail. Radiotech's to replace batteries.	X	X		
4	MA122-Wailea #2	Comm fail. Radiotech's to replace batteries.	X	X		
5	MA125-Makena	Comm fail. Radiotech's to replace batteries.	X	X		
6	MA302-Keanae	Comm fail. Radiotech's to replace batteries.	X	X		

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	MA101-Waiehu	Degraded with multiple bad driver lines per RS.	X	X		DAGS Action - Workorder Contract
2	MA105-Naska	Electrical Issues	X	X		DAGS Action - Workorder Contract
3	MA108-Kuau Store	Legacy siren. Frozen Motor. Site removed due to fall hazard.	X	X		DAGS Action - Workorder Contract
4	MA131-Haiku	Comm fail. Verizon site is installed as of July. Awaiting to be online.		X		Awaiting Verizon/DAGS Sat Project
5	MA303-Wailua	Comm fail. No cell coverage in area. Awaiting sat upgrade.		X		DAGS Action - DAGS Sat Project
6	MA402-Maluuluolele	Legacy siren. Frozen Motor	X	X		DAGS Action - Workorder Contract
7	MA403-Kapunakea	Legacy siren. Frozen Motor	X	X		DAGS Action - Workorder Contract
8	MA410-Puamana	Ongoing electrical Issues	X	X		DAGS Action - Workorder Contract
9	MA303-Wailua Valley	Activation fail. Bad cell signal in area. Awaiting sat modem upgrade.		X		DAGS Action - DAGS Sat Project
10	MA120-Kahakuloa	No cell coverage in area. Sat modem upgrades in progress	X	X		DAGS Action - DAGS Sat Project

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Kauai County

11 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **80.36%**

of 56

1 Requires maintenance

10 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	KA112-Kilauea Park	Activation fail. Possible "backplane" needs to be replaced.		X		HI-EMA Radioshop

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	KA101-Haena	Solar panels blocked by mountain. Convert to electrical charge.	X	X		DAGS Action - Workorder Contract
2	KA103-Wainiha	Comm fail. Needs yagi for cell and awaiting sat upgrade.	X	X		DAGS Action - DAGS Sat Project
3	KA105-Hanalei	Legacy siren. Frozen Motor	X	X		DAGS Action - Workorder Contract
4	KA203-Kealia	Bad drivers. Refer to DAGS.	X	X		DAGS Action - Workorder Contract
5	KA207-Kapaa Neighborhood Ctr	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
6	KA208-Kealia Kai	Lighting Strike Damage	X	X		DAGS Action - Workorder Contract
7	KA210-Wailua STP	Siren removed-Vehicle Collision	X	X		DAGS Action - Workorder Contract
8	KA303-Hanamalu	Replace bad solar panels and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
9	KA304-Hanamaulu Park	Replace bad solar panels		X		DAGS Action - Workorder Contract
10	KA310-Pua Loke	Replace bad solar panels and upgrade to UV controller.		X		DAGS Action - Workorder Contract

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Hawaii County

20 Sirens reported as No Sound or Out of Service (OOS)/DEGRADED **78.02%**

of 91

6 Requires maintenance

14 OOS/DEGRADED

	NO SOUND REPORTED BY COUNTY/STATE	SUSPECTED ISSUE	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	HA114-Carvalho Park	Comm fail. Batteries stolen - Need to make police report and replace.		X		HI-EMA Radioshop
2	HA306-Kukuihaele Park	Comm fail. Radiotech's to investigate onsite.		X		
3	HA405-Puako #1	Comm fail. Radiotech's to investigate onsite.	X	X		
4	HA704-Palipoko	Battery fail. Radiotech's to replace batteries.		X		
5	HA806-HOVE #2	Activation fail. Radiotech's to investigate onsite.	X	X	X	
6	HA913-Paradise Park #3	Comm fail. Replace Cell Modem (not powered on per HCDA onsite visit 7/13)		X		

	OOS/DEGRADED	REASON	Threat Level 1 - Tsunami	Threat Level 2 - Hurricane	Threat Level 3 - Lava, Brush Fire, Dam Breach, Hazmat	ACTION
1	HA303-Waipio Valley	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
2	HA404-Hapuna Beach	Comms offline due to legacy equipment	X	X		DAGS Action - Workorder Contract
3	HA501-Hawi	Bad solar panels. Site to be moved to County base yard.		X		DAGS Action - Workorder Contract
4	HA609-Old Kona Airport	Replace bad drivers with 6024b speaker array, bad solar panels, and upgrade to UV controller.	X	X		DAGS Action - Workorder Contract
5	HA706-Milolii	Replace bad solar panels	X	X	Lava Zone #2	DAGS Action - Workorder Contract
6	HA806-Hawaiian Ocean View #2	Degraded with multiple bad driver lines per RS.		X	Lava Zone #2	DAGS Action - Workorder Contract
7	HA807-Waiohinu	Siren head rusted off		X		DAGS Action - Workorder Contract
8	HA904-Kapoho Beach Lots	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	DAGS Action - Workorder Contract
9	HA908-Kaimu	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	DAGS Action - DAGS Sat Project
10	HA909-Pohoiki	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	DAGS Action - DAGS Sat Project
11	HA910-Ainaloa	Replace bad solar panels		X	Lava Zone #2	DAGS Action - Workorder Contract
12	HA916-Kehana	Comm Fail. No cellular coverage in lower Puna after East Rift Zone Eruption. Awaiting sat modem upgrade.		X	Lava Zone #2	DAGS Action - DAGS Sat Project
13	HA917-Ahalanui Beach Park	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	DAGS Action - Workorder Contract
14	HA926-Kapoho Vacation Land	Destroyed by 2018 Lava East Rift Zone	X	X	Lava Zone #1	DAGS Action - Workorder Contract

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6.12 County of Maui Policies

6.12.1 Traffic Operations G.O. 405.1

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 405
TRAFFIC OPERATIONS

Effective date: 7/07/21 Revision date: 6/07/21 Rescinds: GO 405.1 (10/14/94)

Accreditation Standards:

TRAFFIC SECTION
G.O. 405.1

I. PURPOSE

The purpose of this directive is to establish the Department's Traffic Section.

II. POLICY

The primary responsibility for traffic law enforcement and traffic control activities rest within the Uniformed Services Bureau. The Traffic Section supplements traffic enforcement activities.

III. FUNCTION

A. The Traffic Section is organized within the Maui Police Department to be primarily responsible for traffic functions and specialized traffic needs.

B. Traffic Section officers conduct general investigations and technical accident investigations of serious, liability, or fatality accidents.

C. The Traffic Section coordinates the Adult Crossing Guard program and the Junior Police Officer Program.

D. The Solo Bike Detail assists with the funeral escorts and dignitary escorts, as well as selective enforcement of traffic laws.

IV. ORGANIZATIONAL STRUCTURE

A. Section Commander

The Commander of the Traffic Section is an officer holding the rank of Lieutenant.

1. The Section Commander reports to the Assistant Chief of the Uniformed Services Bureau.

B. Sergeants

1

Three sergeants are assigned to the Traffic Section. They report to the Section Commander. The sergeants oversee the Vehicle Homicide Unit, the Solo Bike Detail, and the OUI Task Force.

C. Police Officers

Officers assigned to the Vehicle Homicide Unit, the Solo Bike Detail, and the OUI Task Force report to their respective supervisor.

DEAN M. RICKARD
Acting Chief of Police

6.12.2 Traffic Operations G.O. 405.7

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 405
TRAFFIC OPERATIONS

Effective date: 08/27/21 Revision date: 07/08/21 Rescinds: GO 405.7 (03/28/03)

Accreditation Standards:

TRAFFIC DIRECTION AND CONTROL
G.O. 405.7

I. PURPOSE

To establish on and off-duty procedures and guidelines for safe and efficient traffic direction and control.

II. POLICY

To provide for the safe and efficient movement of vehicle and pedestrian traffic within the County of Maui.

III. FUNCTIONS

A. Traffic direction and control functions are performed by sworn and nonsworn personnel to various extents to provide for the orderly and safe flow of vehicular and pedestrian movements. Traffic control and direction may be by unmanned mechanical devices, signals and signs.

B. Sworn personnel shall perform traffic direction and control activities at times and places where police intervention is required until the traffic flow problem is solved or until a temporary traffic control device can be set up/installed.

1. Officer may be assigned to perform specific traffic control functions at special events or for temporary special needs, such as parades, funeral processions, etc.

IV. PROCEDURES

A. Manual Traffic Direction

1. Personnel performing manual traffic control shall ensure that they are visible by using available equipment to enhance their safety. This equipment may include, but is not limited to the following: vehicle auxiliary lighting, flashlights, and cones. This is especially important during adverse weather or lighting conditions. A reflective vest shall be worn when the officer is on a roadway controlling or directing traffic. Personnel shall utilize uniform hand signals and gestures for manual traffic control as dictated by training.

B. High Visibility Clothing

1. The Department will provide high visibility reflective outerwear to all personnel who may have to perform manual traffic direction. The use of high visibility reflective outerwear when directing traffic enhances officer safety and driver's recognition and response.

   a. This reflective outerwear shall be worn in addition to the full uniform at all times when an officer is directing traffic or investigating major or minor collisions. In emergency situations, non-uniformed officers may direct traffic however, reflective outwear shall be worn.

2. Department issued service cap and high visibility reflective gloves shall be worn at all times when an officer is directing traffic at a stationary traffic post, funeral post, or off-duty post.

C. Traffic Direction at Fire Scenes

1. The primary task of Department personnel engaged in traffic direction and control at fire scenes will be to maintain access to and from the scene of the fire for the fire department and other emergency vehicles. Officer shall ensure that all private vehicles, including those belonging to volunteer fire fighters, do not obstruct emergency operations.

2. Officers will coordinate their efforts with the Fire Department to provide crowd control and adequate safety measures for vehicular and pedestrian traffic.

D. Traffic Direction at Traffic Collision Scenes

1. Upon arrival at the scene, officers should park police vehicles in such a manner to provide maximum protection to the scene, but without endangering the public.

2. Officers shall utilize appropriate traffic control devices and manual traffic direction procedures to redirect traffic and to provide for a safe collision scene.

E. Traffic Direction – Adverse Road and Weather Conditions

1. Adverse road conditions may include, but not be limited to:

   a. Objects that have fallen onto the roadway.

   b. Acts of nature, i.e., fog, snow, ice, flooding, etc.

   c. Engineering hazards, exposed guardrail ends, down power lines, etc.

2. Upon discovering an adverse road or weather-related condition, officer shall take appropriate action, which includes, but is not limited to:

   a. Notifying the district's communications section to contact the appropriate agency to assist or correct the hazard.

   b. Provide traffic control, as necessary.

   c. Immediately rectify the situation, where feasible.

DEAN M. RICKARD
Acting Chief of Police

6.12.3 MFD Policy: Radio Communications E.O.300.04

RADIO COMMUNICATIONS	E.O. 300.04

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	7	1	1/3/2019
9/1/2020	7	2	7/17/2020

PURPOSE: Provide guidance to consistent and effective communication over the radio.

GUIDELINE:

I. ROUTINE RADIO TRAFFIC

Routine radio traffic should be the most common communication performed on the emergency scene. In most instances, routine radio traffic should only be initiated by the IC.

A. Command must structure all routine radio traffic using the Order Model.

B. Once a Unit is assigned into the hazard zone, they should maintain radio silence unless they are contacted by Command.

C. All communications that details the routine work that Units perform in their assigned work areas should be done face to face and must not be transmitted over the tactical channel.

D. "Good News" reporting should only be reported when requested by command as operational benchmarks in a C.A.N. report. The following are examples:

- Fire knock down
- Primary all-clears
- No fire extension
- Fire control
- Loss control
- Ventilation complete
- PAR's

II. PRIORITY RADIO TRAFFIC

Unit/members with priority traffic are allowed to break into the order model of routine radio traffic to deliver their priority traffic report. Once the IC has acknowledged the priority traffic report, they should conclude their radio transmission with the unit whose traffic was broken into.

A. All Priority traffic reports are to be direct to and acknowledged by the IC.

B. Priority traffic reports include the following:

1. Unable to complete a critical assigned task/tactical objective
2. Urgent need to be reinforced/backed-up to complete an assigned task/tactical objective
3. Victims encountered
4. Working concealed space fires not easily controlled by the locating unit
5. A roof report that includes: attic fire, unsafe roof structure, imminent collapse threat
6. Sudden, significant incident events (i.e. flashover, back draft, collapse, unstable structure, live power line down)

C. Dispatch does not repeat priority traffic messages

III. EMERGENCY TRAFFIC

A. The IC is the only person who can initiate an emergency traffic report. Companies operating in and around the hazard zone will contact the IC with priority traffic reports and the IC will determine the need for emergency traffic.

B. Emergency traffic should be structured in the following manner:

1. The IC will contact fire ground units via radio and announce "Emergency Traffic."
2. IC will communicate emergency traffic message.

   Example: IC – "Emergency Traffic," "Emergency Traffic, Wailuku Command to all units, we are going defensive on this structure. All units operating in the fire structure exit the structure and report PAR's upon exiting."

C. All other units operating at the incident site will maintain radio discipline until the emergency traffic has been cleared by the IC.

D. Once the situation that caused the emergency traffic has been mitigated the IC should clear the emergency traffic with a brief report stating why.

Example: "Command to all units, all units have exited the structure with PAR's. Command is clearing emergency traffic and will remain in the defensive strategy. All units return to routine radio traffic."

E.O. 300.04

IV. STATUS CHANGE

A status change is defined as: moving from an assigned work location to a different geographic work location or exiting the structure to recycle or rehab.

A. If a Unit has completed their entire work assignment, they should contact Command and request another assignment.

Example: "Command from E-1, Engine 1 has a primary all-clear, there is no fire extension to the 2nd floor or the attic space, we are at 75% air, and are ready to be reassigned."

B. A status change report should be made as soon as possible if a unit is unable to gain access to an assigned work area (access or building arrangement).

Example: "Command from E-2" – "E-2 has it made it to the Charlie side and there is no access to the interior from the Charlie side. E2 needs to be reassigned."

V. PROTOCOLS FOR RADIO MESSAGES

A Use Clear Text

1. No 10-codes should be used.

2. Standard words and phrases indicate the following

3. When designating items by letter, the following should be used:

A = Alpha	**J** = Juliet	**S** = Sierra
B = Bravo	**K** = Kilo	**T** = Tango
C = Charlie	**L** = Lima	**U** = Uniform
D = Delta	**M** = Mike	**V** = Victor
E = Echo	**N** = November	**W** = Whiskey
F = Foxtrot	**O** = Oscar	**X** = X-ray
G = Golf	**P** = Papa	**Y** = Yankee
H = Hotel	**Q** = Quebec	**Z** = Zulu
I = India	**R** = Romeo	

B. Radio Discipline

1. Know exactly what you're going to say before clicking the microphone to talk.

2. Only communicate information on the tactical channel that pertains to the completion of the tactical priorities and firefighter safety.

3. Always let communication loops close before clicking the microphone button to talk.

4. Let the IC be the one to contact you.

5. Always end every CAN report with a NEED assessment (or with “No Needs”).

6. Never get on the radio to give good news

C. Use Order Model

1. When the sender is ready to transmit a message, they call the receiver to determine if they are ready to receive the message.

2. The receiver then acknowledges the sender.

3. When the sender receives the readiness reply, they can transmit the message.

4. The receiver then gives a brief restatement of the message to acknowledge the receipt of the message.

5. The sender restates the message if misunderstood.

D. Communications should focus on the completion of the tactical priorities and firefighter safety.

VI. RADIO DESIGNATIONS

A. Supervisors

1. The radio designation for the person in charge of any organizational element shall be the name of the organizational element.

- Captain of Engine 11 will be “Engine 11”
- Division 3 Supervisor will be “Division 3”
- Food Unit Leader will be “Food Unit”

2. Same radio designation remains with the organizational element on mobile and portable radio.

E.O. 300.04

3. Same radio designation remains with the supervisor of an organization element on primary and secondary vehicles (mini, utility).

4. If Rescue 10 personnel board Air-1, their radio designation remains as "Rescue 10"

5. The names of organizational elements and the titles for the person in charge shall comply with NIMS ICS

B. Fire Apparatus Operators

1. FAO's shall be designated as "Operators" (i.e., E1 FAO shall be designated as "E1 Operator").

2. Same radio designation remains on mobile and portable radio.

3. When the FAO is not functioning as an FAO (i.e. handling utilities, advancing a hoseline), his/her designation shall be "Pac 2" (i.e., E1 FAO shall be designated as "E1 Pac 2").

C. Firefighters

1. Radio designation for any given firefighter shall correspond to the portable radio number assigned. A firefighter working on Engine 1 and assigned portable 3 shall be designated as "Engine 1 Pac 3".

2. When a firefighter is reassigned to work with another company, he shall maintain his original radio designation.

D. Bureau Personnel

Bureau personnel shall each be assigned a number within their respective bureaus. (i.e., Training Bureau personnel shall be designated as Training 1, 2, 3, 4, etc...)

E. Chief Officers

Chief Officer's radio designations are as follows:

- Fire Chief .... Fire 1
- Deputy Fire Chief .... Fire 2
- Assistant Chief of Operations .... Fire 3
- Assistant Chief of Support Services .... Fire 4
- Fire Services Officer .... FSO

E.O. 300.04

- Battalion Chief, Battalion 1, A-watch................ BC1
- Battalion Chief, Battalion 1, B-watch................ BC2
- Battalion Chief, Battalion 1, C-watch................ BC3
- Battalion Chief, Battalion 2, A-watch................ BC4
- Battalion Chief, Battalion 2, B-watch................ BC5
- Battalion Chief, Battalion 2, C-watch................ BC6

F. Base Station

Base station radios shall be designated by their station number (i.e., "Station 6").

VII. ASSIGNMENT OF PORTABLE RADIOS

A. The department shall make every effort to ensure that all line personnel are provided a portable radio. At a minimum, every firefighter working in a hostile environment should have a portable radio.

B. Assignments of portable radios are at the discretion of the company commander.

C. Each member shall be responsible to account for his/her portable radio at the start of the work shift.

D. Each member shall be responsible to have a fully charged radio that is operational.

E. At the end of shifts, radios should be "handed off" to personnel who are coming on to shift.

F. Available battery chargers and batteries should be kept on board all in-service apparatus.

VIII. RADIO CHANNELS

A. The following table lists department radio channels

Zone	Channel Name / Talkgroup	Description
Fire	FD 1	Maui dispatch channel.
Fire	FD 2	First back up channel / Tactical Operations.
Fire	FD 3	Second back up channel / Tactical Operations.
Fire	FD 4	Third back up channel / Tactical Operations.
Fire	FD 5	Molokai & Lanai dispatch channel.

E.O. 300.04

Fire	FD 6	Molokai Tactical Operations.
Fire	D3 PD	Hana dispatch channel (incl. Police & Public Works).
Fire	TALK FD	Fire Dept. conventional channel (radio to radio)
Fire	FD DVRS	Fire Dept. digital vehicular repeater system.
Fire	HONO DVR	Honokohau digital repeater system.
Fire	CNTY WD	County Wide Talkgroup.
Fire	EMERGY	Emergency Talkgroup.
Mutual TAC	ITAC1D	National Mutual Aid Operations - conventional channel.
Mutual TAC	ITAC2D	National Mutual Aid Operations - conventional channel.
Mutual TAC	ITAC3D	National Mutual Aid Operations - conventional channel.
Mutual TAC	ITAC4D	National Mutual Aid Operations - conventional channel.

B. For incidents involving multiple companies, communications should be switched from FD1 to the next available back up channel as soon as practical.

C. For large or complex incidents, the incident commander may consider multiple back up channels.

1. One or more channels may be designated as "command channels", reserved for communications to, from and between the command staff and general staff.

2. One or more channels may be designated as "tactical channels", reserved for communications between personnel within the operations section.

3. To ensure timely assistance in the event of an emergency, any and all designated tactical channels must be monitored by someone outside of any hazardous zone.

4. A designated "support" channel can be designated for personnel operating within support functions.

5. For incidents utilizing multiple helicopters, the Incident Commander should consider designating air-to-air and air-to-ground channels.

E.O. 300.04

6.12.4 MPD Policy: Radio Communications G.O. 301.5

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 301
COMMUNICATIONS

Effective date: 02/28/22	Revision date: 12/23/21	Rescinds: GO 301.5 (07/31/19) New material underlined

Accreditation Standards: 41.1.1, 81.1.2, 81.2.3, 81.2.5 c, 81.2.8 a-c, 81.3.1 a, 81.3.4

RADIO COMMUNICATIONS
G.O. 301.5

I. PURPOSE

To establish uniform policies and procedures in radio communications.

II. POLICY

The policy of the Communications Section is to ensure prompt, efficient response and assistance to citizens requesting service, as well as the support and safety of all field units, and to disseminate uniform procedures in two-way radio communications.

III. PROCEDURE

A. Accountability

1. All radio communications utilizing Federal Communications Commission (FCC) assigned radio frequencies shall be subject to FCC rules and regulations addressed to Public Safety Systems. Refer to Part 90, FCC Rules and Regulations.

2. All users of radio frequencies assigned to the Maui Police Department shall be subject to these policies and procedures.

B. Authority

1. Communications Section personnel shall self-initiate decisions concerning call priorities, assignments, and cover units, dependent upon the circumstances surrounding the incident in conjunction with training and standard operating procedures. Field units will carry out the assignments received by Communications Section personnel as if they were directly received by the Chief of Police.

2. If a unit has reason to object to the communication, the unit will make the objection through appropriate channels, after fulfilling the assignment. A watch Commander or Field Supervisor on duty, will have the ultimate authority to override any decision made by an Emergency Services Dispatcher. A lawful order or directive issued by the Watch Commander

1

or Field Supervisor shall be followed or obeyed. Any conflicts of orders or policies and procedures may be addressed at a later time, if necessary, through the established chain of command.

3. The Emergency Services Dispatcher shall be responsible for clearing radio traffic as quickly as possible, maintaining discipline on the air and determining message priority. A report shall be submitted to the Communications Section Commander via the Supervising Emergency Services Dispatcher, regarding all violations of policy, procedure, rules and regulations. This report shall be submitted before the end of shift. Unsafe conditions shall be reported to the Supervising Emergency Services Dispatcher immediately.

4. Supervising Emergency Services Dispatchers shall oversee the operations of the communications center on a daily basis and ensure that policy, procedures, and rules and regulations are followed. They shall report directly to the Communications Section Commander.

C. Functions of the Communications Section

1. Receipt of calls for service by telephone and two-way radio.

2. Two-way radio transmissions to field units.

3. Transmission and reception of teletype law enforcement communications.

4. Initiation of data processing functions.

5. Assign all case and incident report numbers.

6. Information referral to citizens and other law enforcement agencies.

7. Central dispatching for police, fire and medic operations.

D. Access to the Communications Section Center

1. The communications center is considered an emergency dispatch center. Access to the center is limited to personnel assigned to the Communications Section, departmental command staff, on duty watch commander or supervisor.

2. The Supervising Emergency Services Dispatcher may limit the number of non-divisional persons in the center.

3. For security reasons, the main door to the center shall remain locked. The door shall be locked and opened for personnel only after adequate identification is received.

E. Communications Recordings

1. All radio channels and telephones monitored in the Communications Center are digitally recorded twenty-four hours a day by the Department's recording system and stored onto the system's hard disk drive. Recordings are voice, fax or TDD transmissions that are captured and stored on the recording system. The system is designed to provide an authentic record of telephone calls and radio broadcasts and may be used to verify conversations or complaints.

2. All recordings are converted digitally as a WAV file and automatically archived in the recording system's hard drive by the year, month, and day. Recordings shall be stored and available for review or reproduction for one year and can only be accessed through designated licensed workstations. All workstations are password protected for security measures.

3. Retrieve, Listen to, or Duplicate Recordings

   a. Only authorized and trained Department personnel are allowed to retrieve, listen to, or duplicate recordings. Instructions are provided in the recording system's operator guide, located at the Supervising Emergency Services Dispatcher's workstation.

   b. Duplication of Recordings

      (1) Department personnel requesting copies of recordings shall submit their requests to the Communications Section Commander, via channels. Only trained Department personnel are authorized to duplicate recordings.

      (2) Trained personnel from the Prosecutor's Office requesting copies of recordings shall obtain verbal approval from the Communications Section Commander or his/her designee. The authorized person duplicating the recording shall be responsible for completing the Recording System Duplication Log.

      (3) All other requests to listen to or duplicate a recording shall be made in writing, to the Chief of Police. If the duplication of a recording is approved by the Chief, the requesting party is responsible for reproduction costs.

4. Duties and Responsibilities

a. The Communications Section Commander shall be responsible for the overall operation and proper maintenance of the Department's recording system and for selecting a Recording System Administrator.

b. The Recording System Administrator shall be responsible for training users of the recording system, issuing passwords, and setting user capabilities.

c. The on-duty Supervising Emergency Services Dispatcher shall be responsible for reporting any mechanical breakdown or apparent malfunctioning of the recording system.

d. Communications Section personnel who receive training on the recording system shall playback recorded audio when clarification is needed.

F. Assignment of Radio/Car Designators

1. It is the responsibility of the Communications Section Commander to assign radio designators to all radio users who require radio identification.

2. It is the responsibility of the Supervising Emergency Services Dispatcher to ensure that the communications center has a current and accurate list of radio designators.

G. Equipment Repair

1. It is the responsibility of the Radio Shop Coordinator to coordinate the repair of Department mobile and portable radios. All requests for repair will be submitted to the Radio Shop Coordinator in writing, via channels and approved by the respective division commander.

2. It is the responsibility of the Supervising Emergency Services Dispatcher to ensure that all equipment within the communications center is maintained and functioning properly and to request repair of any equipment when necessary.

H. Communications Standards

1. The Communications Section coordinates the accurate exchange of information between the Emergency Services Dispatcher and mobile units, or between mobile units. The Maui Police Department provides twenty-four hour two-way radio capability between communications personnel and field units.

2. Transmissions shall be definite, comprehensive, and distinctly spoken. Utilize simple working phrases, speak at a moderate speed, using normal conversational tones. Users should speak distinctly and clearly. Loud voices will only distort transmissions. Superfluous broadcasting shall be avoided. Any user should, prior to transmitting, monitor the channel to avoid interrupting a transmission. Users, while on a channel, should be cognizant of what is occurring to avoid interrupting priority or emergency transmissions.

3. Communications Section personnel and field units shall omit personal greeting and pleasantries. Do not address users by name; use their unit numbers or stations numbers. Users shall be courteous, however, expressions of courtesy will be avoided in the interest of brevity. Indecent or profane language is prohibited on the radio system. Avoid displaying humor.

4. Radio conversations shall be brief and concise, without unnecessary radio traffic, and shall be transmitted by telephone whenever possible. If the transmission is lengthy, the message should be broken every ten seconds for a period of three to four seconds to allow for urgent radio transmissions.

5. All field units shall adhere to the following format when requesting information from the communications center (state call sign of station being called).

   a. Traffic Stops:

      (1) Unit ID, type of stop, location, license plate (repeated twice), and number of occupants.

   b. Subject Stops:

      (1) Unit ID, type of stop, location, description of subject; male/female, race, and approximate age.

   c. License Checks:

      (1) Unit ID, driver's license number, and State that issued license.

      (2) Unit ID, last name, first name, date of birth, and State that issued license.

d. Registered Owner(s) of Vehicle:

(1) Unit ID, license plate number (repeated twice), State that issued plate.

(2) Unit ID, vehicle identification number (VIN), (repeated twice).

e. NCIC/RAP/OBTS Checks:

(1) Unit ID, last name, first name, date of birth, social security number (repeated twice).

6. Communications are used in conjunction with the "ten code" and shall be utilized when transmitting and accepting assignments.

CODE NO.	MESSAGE
10- 1	Return to station
10- 2	Call by phone
10- 3	Meet officer
10- 4	Confirm call
10- 5	Your location
10- 6	Repeat message
10- 7	Arrival at scene
10- 8	Back on Road
10- 9	Off vehicle(state reason)
10-10	Ambulance needed
10-11	Make fast call
10-12	Lavatory break
10-13	Call home
10-14	Lunch hour
10-15	Officer in trouble
10-16	Cancel last assignment
10-17	Change radio channel
10-18	Burglary alarm/no reset
10-19	Cover vacant beat

a. Procedure for Code 10-19

(1) In the event an officer is absent from his beat for a long period of time due to an arrest, court appearance, or other assignment, the Emergency Services Dispatcher shall use the Radio Code; 10-19, to assign the adjoining beat officer to cover that vacant beat.

Example: "1A21, 10-19 beat 20"- means that unit 1A20 will be off his beat and the dispatcher is assigning unit 1A21 to cover that vacant beat.

(2) The Emergency Services Dispatcher will clear the "10-19" with the Field Supervisor.

(3) Upon return of the absent field unit, the radio code, 10-16 (cancel last assignment) shall be transmitted to the officer covering the vacant beat, informing that officer that the original beat officer has returned to beat and further coverage of that vacant beat is no longer required.

7. Radio Frequencies

a. The Maui Police Department utilizes an E.F. Johnson 800-Mhz analog trunked radio system. The trunking system utilizes frequencies within the FCC regulated 800-Mhz band that is reserved for public safety and managed by the National Public Safety Planning Advisory Committee.

b. Acquisition or purchase of all communications equipment shall meet authorized frequencies and be approved by the Chief of Police.

8. Criminal Codes

a. The following Criminal Codes shall be used whenever possible:

Code	Meaning
1	Traffic accident
2	Drug violation
3	Investigation (unknown)
4	Homicide
5	Sexual Assault
6	Robbery
7	Burglary
8	Assaults
9	Thefts
10	Vehicle theft
11	(Vacant)
12	Indecent exposure
13	(Vacant)
14	Runaway juvenile
15	Public nuisance
16	Criminal property damage

17	Offensively armed
18	Spouse/family abuse
19	Harassment
20	Forgery
21	Disorderly conduct
22	Escaped prisoner
23	Trespass
24	Terroristic threatening
25	Mentally ill person
26	Criminal littering
27	Impersonating a police officer
28	Gambling
29	Riot
30	Hit and run accident
31	DUI liquor/drugs
32	Unlicensed driver
33	Burglar alarm
34	Holdup alarm
35	Bomb threat

9. Phonetic Alphabet

a. The following phonetic alphabet shall be used to make clear any radio transmission:

A-ALPHA	N-NOVEMBER
B-BRAVO	O-OSCAR
C-CHARLIE	P-PAPA
D-DELTA	Q-QUEBEC
E-ECHO	R-ROMEO
F-FOX TROT	S-SIERRA
G-GOLF	T-TANGO
H-HOTEL	U-UNIFORM
I-INDIA	V-VICTOR
J-JULIET	W-WHISKEY
K-KILO	X-X-RAY
L-LIMA	Y-YANKEE
M-MIKE	Z-ZULU

b. Numbers shall be pronounced as follows to make clear any radio transmission:

0-Zee-row	5-Fiyiv
1-Wun	6-Siks
2-Too	7-Sev-ven
3-Thuree	8-Ate
4-Fo-wer	9-Niyen

(1) Users shall not use the phonetic alphabet to excess. Rather, depend on proper pronunciation and enunciation of common words.

(2) All numbers such as licenses, case record numbers, VIN numbers, etc., shall be read in series of three's, counting from the left. For example; 654238122 shall be read 645 238 122.

10. Talk Groups are listed in Appendix A

11. Unit Call Signs:

a. Administrative Staff

Chief of Police	A-1
Deputy Chief of Police	A-2
Assistant Chief, Uniformed Services Bureau	A-[~~4~~]3
Assistant Chief, Investigative Services Bureau	A-[~~3~~]4
Assistant Chief, Support Services Bureau	A-5
Captain, Technical Services	A-10
Captain, Quality Assurance	A-11

b. Patrol Unit Identification

District	Shift	Beat
1	A,B,C	10-19 (WAILUKU) 20-29 (KAHULUI) 30-39 (UP-COUNTRY)
2	A,B,C,D,E	10-19 (LANAI)
3	A,B,C,D,E	10-19 (HANA)
4	A,B,C	10-19 (LAHAINA-SECTOR1) 20-29 (LAHAINA-SECTOR 2) 30-39 (LAHAINA-SECTOR 3) 40-49 (LAHAINA-SECTOR 4) 50-59 (LAHAINA-SECTOR 5)
5	A,B,C,D,E	10-19 (MOLOKAI-EAST END) 20-29 (MOLOKAI-WEST END)
6	A,B,C	40-49 (KIHEI)

(1) All personnel shall use the full call number of a unit beginning with the district number, then the shift designator, and the beat designator (example; 1A10,2B10,3C10 etc.).

(2) Beat officers shall be assigned the mobile unit call sign of the beat to which they are assigned. If two or more units are assigned to the same beat, subsequent units shall be assigned the next highest unit number for that specific area.

(3) For Police Districts utilizing an eight (8) hour workday shift, the A shift will always indicate the hours of 2230-0715 hours. The B shift will always indicate the hours of 0630-1515 hours. The C shift will always indicate the hours of 1430-2315 hours. The D and E shift hours will vary according to demand for service. For Police Districts utilizing a twelve (12) hour work day shift, the A shift will indicate the evening to the following morning shift, and the B shift will indicate the morning to the evening shift. Starting and ending hours may vary among Police Districts.

c. Superior officers (patrol):

(1) Superior officers within the Patrol Division shall be identified by the "hundred series" corresponding to the respective district number beginning with the hundred and first number assigned to the District Commander. Lieutenants and Sergeants shall be assigned permanent unit numbers as directed in this directive.

(a) District 1 - Wailuku Patrol (100 Series)

Captain--------------------------101
Lieutenants----------------------102-114
Sergeants------------------------115-170

(b) District 2 - Lanai (200 Series)

Lieutenant-----------------------201
Sergeant-------------------------202

(c) District 3 - Hana (300 Series)

Lieutenant-----------------------301
Sergeant-------------------------302

(d) District 4 - Lahaina (400 Series)

Captain--------------------------401
Lieutenants----------------------402-414
Sergeants------------------------415-470

(e) District 5 - Molokai (500 Series)

Captain--------------------------501
Lieutenant-----------------------502
Sergeants------------------------508-520

(f) District 6 - Kihei (600 Series)

Captain--------------------------601
Lieutenant-----------------------602
Sergeants------------------------615-625

d. Superior Officers (other units)

(1) Superior Officers of all other units shall be identified by their district, then division or section alphabetic designator, then by a single digit, with the lowest digit (1) indicating a command position.

e. Communications Section (Oscar)

Lieutenant----------------------------------	1-O-1
Supervising ESD-------------------------	1-O-2-7
Receiving Desk Sergeants--------------	161-169

f. Community Relations Section (Golf)

Lieutenant----------------------------------	1-G-1
Sergeant-----------------------------------	1-G-2
Officers------------------------------------	1-G-10-15

g. Criminal Intelligence Unit (Yankee)

Lieutenant----------------------------------	1-Y-1
Sergeant-----------------------------------	1-Y-2
Officers------------------------------------	1-Y-10-15

h. Criminal Investigation Division (Kilo)

Captain-------------------------------- 1-K-1

Lieutenants (District 1)------------	1-K-2 through 1-K-5
Detectives (District 1)------------	1-K-10-40
Evidence Specialist----------------	1-R-2 through 1-R-10
Lieutenants (District 4)------------	4-K-2 through 4-K-5
Detectives (District 4)------------	4-K-10-20

i. Internal Affairs (India)

Lieutenant-------------------------------	1-I-1
Detectives or Investigators	1-I-10 through 1-I-15

j. Juvenile Section (Juliet)

Lieutenant----------------------------	1-J-1
Sergeants-----------------------------	1-J-2-4
Officers (District 1)----------------	1-J-10 through 1-J-15
(District 4)---------------------------	4-J-10 through 4-J-15

k. Patrol Division (special units)

Crime Reduction Unit----------------	1-U-5 through 1-U-10
	4-U-5 through 4-U-10
Parks/Beach Unit---------------------	1-P-10 through 1-P-15
	4-P-11
Community Police Officers------------	1-Z-10 through 1-Z-49
	4-Z-10 through 4-Z-59
	5-Z-10
	6-Z-40 through 6-Z-42

l. Plans, Training, Research and Development Section (Quebec)

Lieutenant---------------------------------	1-Q-1
Sergeants---------------------------------	1-Q-2 through 1-Q-5
Officers------------------------------------	1-Q-6 through 1-Q-10

m. Records Section (Romeo)

Records Manager-----------------------	1-R-1
Warrants Officers----------------------	1-R-11 through 1-R-15

n. Vice Division (Victor)

Captain----------------------------------	1-V-1

Lieutenant--------------------------------1-V-2
Sergeant (Gambling)------------------ 1-V-3
Sergeants (Narcotics)------------------1-V-4 through 1-V-5
Sergeant (Canine/Narcotics)-----------1-V-6
Officers (Narcotics)--------------------1-V-10 through 1-V-19
(Canine/Narcotics)------------ 1-V-20 through 1-V-25
(Gambling)--------------------- 1-V-26 through 1-V-30
Officers - District 4 (Narcotics)-------4-V-10 through 4-V-15

o. Traffic Section (Tango)

Lieutenant--------------------------------1-T-1
Sergeant----------------------------------1-T-2
Sergeant (DUI Task Force)------------ 1-T-3
Officers-----------------------------------1-T-10 through 1-T-19
(Traffic Enforcement/TAIS)-----------1-T-20 through 1-T-29
(DUI Task Force)----------------------- 1-T-30 through 1-T-39
Reconstructionist-----------------------1-T-40

p. Miscellaneous Call Signs

Patrol Wagon (all districts)------------ "Wagon"
Parking Enforcement (District 1)----- 199
Parking Enforcement (District 4)----- 499
Police Chaplains------------------------ Chaplain-1 through 8
School Resource Unit-- (District 1) 1-S-2 through 1-S-30

(District 2)	2-S-10
(District 3)	3-S-10
(District 4)	4-S-10
(District 5)	5-S-10
(District 6)	6-S-10

Visitor Oriented Police Unit-----------VOP1 through VOP8
Radio Shop-------------------------------RS-1 through RS-10
Motor Pool-------------------------------MP1 through MP10

q. Other Departments

Mayor---------------------------------------CM-1
Managing Director-----------------------CM-2

Public Works Director------------------CM-27

Civil Defense Director------------------CD-1
Civil Defense Assistant-----------------CD-2

Prosecutor---------------------------------K-1

Deputy Prosecutors---------------------K-2 through K-40

Animal Control Office------------------ACO-Base
Animal Control Officers----------------ACO-1 through 20

County Lifeguards-----------------------LG-1-20

r. Other Agencies

Airport Manager (State of Hawaii)--- AIRPORT-1

Conservation Officers (State of Hawaii) CR-1-20
Conservation Officer (State of Hawaii) CR-7 (Molokai)
Conservation Officer (State of Hawaii) CR-35 (Molokai)

Department of Public Safety Sheriffs
(State of Hawaii)------------------------SD 1-20

Drug Enforcement Agency (Federal) F-10-15

Federal Bureau of Investigation------- F-1-9

Motor Vehicle Safety Officer (State)- MVS-1

Park Enforcement (County)----------- PE1-PE6

Park Rangers (Federal)-----------------PR-1-6

State Harbors/Marine Police (State)--ME-1-10

U.S. Coast Guard-----------------------CG Base
CG 1- 3

U.S. Immigration Department---------F-16-20

U.S. Marshals---------------------------- F-21-30

U.S. (Others)------------------------------ F-31-40

Helicopters--------------------------------- AIR-1-5

12. Priority of Calls

a. Priority 1 - A call for service that requires immediate response (police, fire, & medics). Priority 1 calls will be aired immediately upon receipt.

(1) Any in-progress crime is a priority 1 call.

(2) Any crime just occurred where there is still risk to safety of citizens or suspect apprehension is highly possible. Priority 1 cases are those cases that are in progress or just occurred, meaning within the past 15 minutes. Examples:

(a) Officer needs help
(b) Homicide/suicide
(c) Robbery (any type)
(d) Assaults/injuries
(e) Kidnapping
(f) Accidental injuries or deaths
(g) Disturbances (all types)
(h) Ambulance/fire calls
(i) Traffic accidents with injuries
(j) Hostage situations
(k) Child abuse cases
(l) Burglary (in progress)
(m) Alarms (Hold up, Fire)
(n) Escapees
(o) Bomb threats

b. Priority 2 - A call for service that requires quick response for preservation of crime scenes, collection of evidence or to protect property and assure continued citizen safety. Example:

(1) Assaults (no injury-delayed reports)
(2) Criminal trespass
(3) Auto theft
(4) Prowler
(5) Traffic Accident (with property damage or hit/run-no injuries).
(6) Alarms
(7) Lost/missing persons
(8) Theft
(9) Suspicious vehicle/incident
(10) Telephone threats
(11) Check well being of persons

c. Priority 3 - Calls requiring a report or information that will be taken by the officer (cold calls). Examples:

(1) Auto theft
(2) Burglary
(3) Animal calls
(4) Shoplifting
(5) Telephone harassment

(6) Abandoned vehicle
(7) Lost or found property
(8) Noise complaints

13. Emergency Traffic

a. When communications personnel are airing a Priority 1 call, utilizing the alert tone, the dispatcher will state; "Emergency Transmissions Only". All units shall remain off the air unless they become involved in a high priority situation, or are involved in the priority itself. Supervising Emergency Services Dispatchers or field supervisors shall determine if units involved in the priority situation should change to a tact channel or remain on the radio channel the incident is occurring on.

b. Supervising Emergency Services Dispatchers or field supervisors may initiate "Emergency Transmissions Only" or cancel same.

14. Alert Tone

a. The alert tone will be utilized prior to broadcasting emergency calls. In general, emergency calls are those which threaten life. Emergency calls include "in-progress" or "just occurred" calls of:

(1) Homicide
(2) Attempted suicide involving a weapon
(3) Barricaded subject or hostage situation
(4) Sexual assault
(5) Assault involving a weapon
(6) Robbery
(7) Burglary
(8) Domestic disturbance
(9) Emergency officer assistance
(10) Riot

b. The alert tone shall be depressed approximately three seconds and simulcast on channels needed for the broadcast.

15. Change of Shifts/Signing Off

a. Communications Section personnel will recall units of a particular shift when sufficient man power has reported "in-service" for the next tour of duty. This procedure will ensure proper beat coverage during the change of shifts. Communications Section personnel shall state the following when sufficient coverage has occurred; "all units of the ----- shift, 10-1 and sign off". No unit shall sign off or leave their respective beats without proper authority.

b. Patrol supervisors may authorize an early sign off of any unit and shall inform communications personnel of this matter.

JOHN PELLETIER
Chief of Police

G.O. 301.5
RADIO COMMUNICATIONS

APPENDIX A

TALK GROUPS	DESCRIPTION
D-1	WAILUKU PATROL DISTRICT
D-2	LANAI PATROL DISTRICT (FUTURE GROWTH)
D-3	HANA PATROL DISTRICT
D-4	LAHAINA & LANAI PATROL DISTRICT
D-5	MOLOKAI PATROL DISTRICT
D-6	KIHEI PATROL DISTRICT
TAC 1	CENTRAL TACTICAL
TAC 2	CENTRAL TACTICAL
UTILITY	UTILITY CHANNEL (DL&R, DW, HARBORS, etc.)
SRT	SPECIAL RESPONSE TEAM
VICE	VICE PERSONNEL
TALK PD	TALK AROUND
SRT T	TALK AROUND
CTYWD	COUNTY WIDE (EMERGENCY ONLY)
FIRE ALL	PAGING FOR ALL FIRE STATIONS
FIRE 1	OPERATIONS CENTRAL MAUI, LAHAINA, LANAI
FIRE 1A	OPERATIONS BACKUP #1
FIRE 4	OPERATIONS BACKUP #2
FIRE 5	D5 OPERATIONS (MOLOKAI)
	*NOTE: HANA FIRE TO OPERATE ON D-3 POLICE
TALK FD	TALK AROUND
MEDIC ALL	PAGING FOR ALL MEDICS (FUTURE GROWTH)
MEDIC 1	FUTURE GROWTH
MEDIC 2	FUTURE GROWTH
MEDIC 3	FUTURE GROWTH
MEDIC 4	FUTURE GROWTH

MEDIC 5	FUTURE GROWTH
PW 1	CENTRAL LOCAL GOVERNMENT
PW 1A	MAKAWAO LOCAL GOVERNMENT
PW 2	LANAI LOCAL GOVERNMENT
PW 3	HANA LOCAL GOVERNMENT
PW 4	LAHAINA LOCAL GOVERNMENT
PW5	MOLOKAI LOCAL GOVERNMENT
PW ALL	ALL LOCAL GOVERNMENT
WW	WASTEWATER DIVISION
TALK PW	TALK AROUND
CD SIREN	ALL CD SIRENS IN MAUI COUNTY
CD	CD PERSONNEL
MAINT	MPD RADIO SHOP CHANNEL
UID	UNIQUE ID CALL GROUP
TEL	TELEPHONE CALL GROUP
MUTUAL	MUTUAL AID

6.12.5 MFD Policy: Maui Incident Management Team D.O. 600.05

MAUI INCIDENT MANAGEMENT TEAM	D.O 600.05

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	5	1	1/3/2019

PURPOSE: The Maui Incident Management Team (MIMT) was established to ensure the County is prepared to direct, coordinate, and support complex or major incidents that exceed routine response capability. The MIMT consist of personnel who assume Command and General Staff positions within the framework of the Incident Command System.

GUIDELINE:

I. OPERATIONAL CONCEPT

The MIMT consists of personnel who have received specialized training in Command and General Staff functions of the Incident Command System (ICS) to manage complex or major incidents. For a major incident, the MIMT is activated and reports to an incident scene or location designated by the Incident Commander.

II. STAFFING PATTERN

The MIMT assigns personnel trained and experienced in incident management during major incidents, regardless of routine staffing patterns. Personnel assigned to the MIMT have the responsibility and authority of the ICS position they fill, regardless of their administrative title. The on-scene chain-of-command follows ICS structure and principles.

A. The standard IMT configuration consists of the following ICS positions:

1. Incident Commander
2. Deputy Incident Commander
3. Safety Officer
4. Liaison Officer
5. Public Information Officer
6. Operations Section Chief
7. Deputy Operations Section Chief
8. Planning Section Chief
9. Deputy Planning Section Chief
10. Resource Unit Leader
11. Situation Unit Leader
12. Logistics Section Chief
13. Deputy Logistics Section Chief
14. Facilities Unit Leader
15. Supply Unit Leader
16. Medical Unit Leader
17. Communications Unit Leader
18. Finance Section Chief
19. Incident specific positions

III. TEAM STAFFING SELECTION

A. MIMT positions may be staffed by sworn or non-sworn MFD personnel; individual participation is subject to the approval of the MIMT Program Manager and the Incident Commanders. Criteria for selection include:

1. Succession planning/career development.

2. Aptitude and demonstrated ability to fulfill responsibilities of assigned position.

3. Approval by peer review committee.

B. Upon approval of the Fire Chief, positions may be staffed by personnel from partner organizations.

1. By definition, personnel filling DIC positions are considered fully qualified to serve as IC. The Fire Chief or designee has ultimate authority to limit control of incident resources.

IV. SCHEDULING AND NOTIFICATION

A. The MIMT is divided into two teams. Teams rotate on-call shifts on a bi-weekly basis.

B. The current on-call schedule and staffing roster are posted on the MIMT's website. The MIMT Program Manager is responsible for ensuring that both the staffing roster and schedule are accurate.

1. Team members may "trade" coverage with each other as they desire, as long as positions are covered throughout the on-call period. Team-members are responsible for ensuring that their respective teams are aware of any changes.

C. Once Activated, MIMT members should report to the designated location. Members requiring specific direction or clarification should contact the IC. Team members should not contact Dispatch unless specifically directed to do so. The MIMT is responsible for making necessary notifications and requesting additional personnel.

V. MAUI INCIDENT MANAGEMENT TEAM ACTIVATION

A. Activation

1. The MIMT is activated for complex or major incidents that strain or exceed the County's routing response.

D.O. 600.05

B. Discretionary Activation

1. The Fire Chief, Deputy Chief, or Assistant Chiefs may activate the MIMT based on existing, imminent, or projected hazardous conditions.

2. The MIMT may be activated to plan for or manage a scheduled or other non-emergent event.

VI. TRAINING REQUIREMENTS

A. All MIMT members must complete the following training:

1. ICS-100, ICS-200, ICS-300, and ICS-400

2. IS-700, IS-701, IS-703, IS-800

3. USFA Type 3 IMT Course

4. Position-specific classes and (as applicable) task books

B. In addition to the general MIMT requirements, all Incident Commanders and Deputy Incident Commanders must complete the following classes:

1. Operations Section Chief

2. Planning Section Chief

3. Safety Officer

4. On-scene Hazardous Materials Incident Commander*

**NOTE*: This is an OSHA requirement; Incident Commanders responding to a hazardous materials incident must have completed training.

C. In addition to standardized training requirements, all MIMT members must attend at least two MIMT meetings or team training sessions per year.

VII. EXERCISE/DRILL REQUIREMENTS

A. All MIMT members must participate in functional or full-scale exercises. Participation in a wildfire "shadow team" assignment may count as a functional exercise.

B. MIMT members must participate in drills that are specifically scheduled for the MIMT.

D.O. 600.05

C. The MIMT Program Manager is responsible for maintaining exercise/drill participation records.

VIII. MAUI INCIDENT MANAGEMENT TEAM MEMBER RESPONSIBILITIES

A. Responsibilities for all MIMT members

1. MIMT members are responsible for maintaining readiness to respond when their team is on call, including:

   a. Wearing appropriate personal protective equipment and having materials and supplies necessary to perform their assigned function.
   b. Being able to arrive to an incident scene or other identified site within two hours.
   c. Maintaining suitable preparedness (e.g. necessary family arrangements, spare clothing, and other supplies) to allow for relative self-sufficiency for extended response.

2. Team members who are unable to respond during their on-call rotation are responsible for finding an alternate who is fully qualified in the position.

3. MIMT members are responsible for ensuring they meet training and exercise/drill requirements of the program.

B. Responsibilities for MIMT Incident Commanders

1. Clearly communicating expectations of team members in terms of response protocols and maintaining readiness.

2. Promoting team-based training and drills.

3. Specific to external deployment:
   a. Assessing impacts of requested external deployments on MFD operations and staff.
   b. Determining and clearly communicating priorities for professional conflicts (e.g., projects, meetings, training, and travel), in consultation with senior management and the MIMT Program Manager.
   c. Establishing a realistic initial response timeline, with the goal of providing as much notice as possible to members, and allowing for extreme personal conflicts among individual team-members who are unable to find a replacement on short notice.

D.O. 600.05

IX. PROGRAM MANAGEMENT

The MIMT Program Manager is responsible for day-to-day program function and for making recommendations for program direction. This includes, but is not limited to, maintaining a current staffing pattern at acceptable levels, maintaining a current on-call rotation schedule, developing and revising operational guidelines, developing policy directives for dispatch relating to IMT notification and activation, developing and maintaining electronic resources such as the MIMT website and, scheduling of training and exercises/drills.

A. For deployments, the MIMT Program Manager is responsible for providing input to County executives, including staffing patterns and impact on MFD operations and staff.

6.12.6 MPD Policy: ICS and SRT Operations G.O. 412.1

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 412
SPECIAL RESPONSE TEAM

Effective date: 08/07/20	Revision date: 07/21/20	Rescinds: GO 412.1 (06/10/20) New materials underscored

Accreditation Standards: 46.1.2a c d g m n p s t, 46.1.4, 46.1.11 a-g, 46.2.1, 46.1.4, 61.3.3a

ICS AND SRT OPERATIONS
G.O. 412.1

I. PURPOSE

To establish the organizational structure and policies and procedures for the operations of the Incident Command System (ICS) and the Special Response Teams (SRT).

II. POLICY

The Maui County Police Department has available and will utilize the Incident Command System and the Special Response Teams when circumstances or events are beyond the capabilities of normally trained and equipped officers.

III. DEFINITIONS

COUNTER SNIPER TEAM: A counter sniper teams consists of a counter sniper and an observer who are paired together and supports the tactical team. They assist the tactical team by covering areas of approach, gathering detailed information, and engaging/neutralizing a threat only if necessary.

HAWAII INTERISLAND BOMB SQUAD: An interagency bomb squad composed of personnel from the Maui Police Department, Hawaii Police Department, and Kauai Police Department who use progressively developed practices and techniques involving suspected, explosive hazardous devices.

INCIDENT COMMAND SYSTEM (ICS): A system for command, control, and coordination of a response that provides a means to coordinate the efforts of individual persons and agencies as they work toward the common goal of stabilizing an incident while protecting life, property and the environment.

INCIDENT COMMANDER: Assistant Chief of Investigative Services Bureau

SPECIAL RESPONSE TEAM (SRT): A unit of specially selected, trained and equipped officers, generally from Districts I, IV and/or VI and organized into two teams identified as the Tactical Team and Negotiating Team.

1

NEGOTIATING TEAM: The Negotiating Team (NT) falls under the command of the Negotiations Commander. The team is comprised of two units that fall under the direction of a team leader, designated by the Negotiations Commander. The two units are made up of four members.

TACTICAL TEAM: The Tactical Team serves as the Department's Special Weapons and Tactics Team (SWAT) and falls under the command of the Tactical Commander. The team is comprised of two entry units that share collateral duties, and one marksman unit. Each of these units is under the direction of a team leader, designated by the Tactical Commander. The entry unit has a minimum of eight members each and the marksman unit has a minimum of four members.

TRACKING CANINE: The tracking canine is trained to detect the odor/scent of a human being. Every human being leaves scent/odor behind in the form of skin particles. The tracking canine is designed to track that particular scent/odor. The tracking canine can save lives by locating Alzheimer patients and lost children before they succumb to the elements of nature (hypothermia, dehydration, etc.) The tracking canine can also be used to track down suspect(s) who recently committed a crime.

IV. ORGANIZATION AND RESPONSIBILITIES

A. The Incident Commander is responsible for the Department's ICS during an unusual occurrence, which requires the services of SRT.

1. If the Incident Commander is not available, the designee shall be the Assistant Chief of Uniformed Services, followed by the Assistant Chief of Support Services.

2. The Incident Commander shall coordinate and control the activities of all Department personnel while an ICS event is occurring.

3. The Incident Commander shall respond to the scene of the incident and operate from a field command post.

a. The appearance of the Chief and/or Deputy Chief at an ICS Incident does not indicate they are assuming command.

4. In the event of an unusual occurrence that does not require the services of the SRT, but is of a scale that requires the activation of the ICS, the guidelines and procedures of General Order 411.4, Natural and Man-Made Disaster Plan shall apply.

B. Special Response Team

1. The Department shall have at its disposal personnel with specialized training to respond to unusual occurrences. The SRT is under the command of the Assistant

Chief of Investigative Services Bureau.

2. The Tactical Commander of the SWAT Team or his/her designee shall be responsible for the coordination and/or participation in an annual ICS training exercise and the documentation of this training in the form of an after action report. The report shall also contain an analysis of the effectiveness of the training. A copy of the report shall be forwarded to the Quality Assurance Section.

3. At least once every three years, the Tactical Commander of the SWAT Team or his designee shall complete a comprehensive analysis of all ICS incidents to which the SWAT Team responded. This report will also include an analysis of the effectiveness of annual ICS training. The original report shall be forwarded to the Office of the Chief for review, and a copy shall be forwarded to the Quality Assurance Section.

C. Tactical Commander

1. The Tactical Commander is the Lieutenant assigned to the Investigative Services Bureau Special Response Team.

2. He/she shall be responsible for supervising and directing the activities of the Team Leaders and SWAT members.

3. He will assume all duties and responsibilities, in accordance with S.O.P. 102.1, Organization and Management.

4. During an ICS incident, the Tactical Team Leader shall coordinate his/her activities through the Incident Commander.

5. The Tactical Commander shall direct the efforts of the tactical team during all training and actual incidents.

   a. The Tactical Commander will develop training for the tactical team. He/she will provide a training notice for each team member.

6. The Tactical Commander shall assign and direct personnel in order to implement the operational plan. He shall confer with the Incident Commander in carrying out tactical plans. No tactical plan shall be carried out without the approval of the Incident Commander.

7. The Tactical Team Leader shall have the authority to reassign personnel within the unit.

8. The Tactical Team Leader shall respond to the scene of the ICS incident.

D. Assistant Tactical Commander

1. The Assistant Tactical Commander is the Sergeant assigned to the Investigative Services Bureau Special Response Team.

2. The Assistant Tactical Commander shall assume the responsibilities of the team leader when the team leader is absent or unable to assume command of the team. In the event that the Tactical Commander and Assistant Tactical Commander cannot respond, the most senior member of the SRT Entry Unit or a team member assigned by the Tactical Commander shall assume command.

3. The Assistant Tactical Commander shall respond to the scene of the ICS incident.

4. The Assistant Tactical Commander shall assist with tactical planning for operations. He/she shall assist with the implementation of these plans.

5. The Assistant Tactical Commander shall be responsible for the assignment of equipment to tactical team members. He/she shall also be responsible for the care and condition of the equipment.

6. The Assistant Tactical Commander will, in the absence of the team leader, have the functional authority to direct the tactical team.

E. Negotiating Team Leader

1. The Negotiating Team Leader shall be appointed by the Chief of Police.

2. During an ICS incident, the Negotiating Team Leader shall coordinate his activities through the Incident Commander.

3. The Negotiating Team Leader shall direct the efforts of the negotiating team during all training and actual incidents.

4. The Negotiating Team Leader will develop training for the negotiating team members. He will provide a training notice for each member.

5. The Negotiating Team Leader shall assign and direct personnel to the implementation of the operational plan. He shall confer with the Incident Commander and Tactical Team Leader in carrying out tactical plans.

6. The Negotiating Team Leader shall have the authority to reassign personnel within the unit.

7. The Negotiating Team Leader shall respond to the scene of the ICS incident.

F. Assistant Team Leader of Negotiating Team

1. The Assistant Team Leader shall be a Police Sergeant, Detective, or Lieutenant appointed by the Negotiating Team Leader.

2. The Assistant Team Leader shall assume the responsibilities of the team leader when the team leader is absent or unable to assume command of the team.

3. The Assistant Team Leader shall assist with planning for negotiations. He shall also assist with the implementation of these plans.

4. The Assistant Team Leader shall be responsible for the assignment of equipment to members of the negotiating team and is responsible for the care and condition of the equipment.

5. The Assistant Team Leader will, in the absence of the team leader, have the functional authority to direct the negotiating team.

G. The Assistant Chief of the Investigative Services or his designee shall be responsible for the coordination and/or participation in an annual ICS training exercise and the documentation of this training in the form of an after action report. The report shall also contain an analysis of the effectiveness of the training. A copy of the report shall be forwarded to the Quality Assurance Section.

1. At least once every three years, the Assistant Chief of the Investigative Services Bureau or his/her designee shall complete a comprehensive analysis of all ICS incidents to which the personnel under his command responded. This report will also include an analysis of the effectiveness of annual ICS training. The original report shall be forwarded to the Office of the Chief for review, and a copy shall be forwarded to the Quality Assurance Section.

H. The Commander of the Specialized Emergency Enforcement Detail or his/her designee shall be responsible for the coordination and/or participation in an annual ICS training exercise and the documentation of this training in the form of an after action report. The report shall also contain an analysis of the effectiveness of the training. A copy of the report shall be forwarded to the Quality Assurance Section.

1. At least once every three years, the Commander of S.P.E.E.D. or his/her designee shall complete a comprehensive analysis of all ICS incidents to which S.P.E.E.D. responded. This report will also include an analysis of the effectiveness of annual ICS training. The original report shall be forwarded to the Office of the Chief for review, and a copy shall be forwarded to the Quality Assurance Section.

V. OPERATIONAL PROCEDURES

The ICS and the SRT act as a ready response and support group handling critical incidents. Hostages, barricaded suspects, witness protection, high-risk search warrants, and VIP protection are examples of incidents, but are not limited to, where the ICS and SRT may be deployed. The SRT may be deployed independently of the ICS.

A. Functional Activities

1. The SRT shall be called upon to assist with hostage situations, barricaded and armed persons, high-risk search warrants and arrests, bomb threats, missing persons, and any high-risk incidents. They shall be called out at the discretion of the Incident Commander.

2. Negotiations with hostage-takers and barricaded persons shall be the responsibility of the negotiating team whenever possible. This shall not relieve the initial police units from trying to make contact with the suspect.

3. The Tactical Team Leader shall be responsible for any special purpose vehicles assigned to the SRT. The use of any special purpose vehicles in hostage/barricaded persons situations shall be the responsibility of the Tactical Team Leader after consultations with the Incident Commander at the scene

4. Any requests for all or parts of the SRT at special events shall be the responsibility of the Incident Commander.

5. The SRT shall assist with the protection of governmental dignitaries and other VIPs as directed by the Chief of Police. They shall work in concert with the Criminal Investigation Division and other agencies that may have primary protective responsibilities.

6. As a specialized unit, the SRT shall not be involved with natural disasters, except as directed by the Chief of Police.

7. As a specialized unit, the SRT shall not be involved in civil disturbances, except as directed by the Chief of Police.

8. As a specialized unit, the SRT shall not be involved in civil defense emergencies, except as directed by the Chief of Police.

9. The SRT, when commanded, shall be involved in the extrication of officers and citizens.

B. Call out procedures

1. Notifying Watch Commander

When a patrol supervisor determines that he/she has become involved in an unusual incident that may require the services of the SRT team, he/she shall notify the on-duty Watch Commander.

2. Notifying Incident Commander

   a. The Watch Commander shall notify the Incident Commander of the situation.

   b. The Watch Commander shall notify the Assistant Chief of Uniformed Services of the incident and its status.

C. Initial responsibility of Incident Commander

1. It shall be the responsibility of the Incident Commander to make the decision to call out the SRT team and activate the ICS, if necessary.

2. The Incident Commander shall notify the Tactical Commander of his/her decision. If the decision is to activate the ICS and the SRT, the Tactical Commander shall coordinate the contact and deployment of SRT and, if necessary, the ICS.

D. Initial responsibility of Tactical Commander

1. Once the Tactical Commander has been activated, he/she shall be advised of the current situation. He shall determine the location of the staging area for the SRT.

2. The Tactical Commander shall be responsible for determining the minimum manpower that his/her unit shall need.

E. Call-Out Procedure

1. As members of the SRT Team respond to the call, they shall be informed of the location of the staging area and respond to that location and not to the field command post, unless instructed by the team leader.

2. Telephone notification will be done for all Call Out notification purposes. Should the Officer not answer his/her phone, a message will be left for the Officer to respond.

3. The Negotiating Team Leader will inform the Communication Section of the individuals from that team to be paged.

4. Any change in the incident that would affect the responding officers, shall cause the Communications Section supervisor to call the team members and advise them of the change in status. Text messaging shall serve this purpose.

F. Field command post

The selection of the initial field command post shall be the responsibility of the on-duty Watch Commander. The final location of the command post shall be the responsibility of the Tactical Commander. The location of the SRT tactical operations center shall be determined by the Tactical Commander or designee.

1. The Command Post shall be out of sight and out of the line of fire from the scene of the incident.

2. At the minimum, the Command Post shall be manned by the Incident Commander and Commanders of the tactical and negotiating teams (or their designees), the on-duty Watch Commander, and the Captain or Lieutenant from the Investigative Services Bureau involved in the incident. This shall not prohibit the Tactical and Negotiating Commanders or their designees from leaving the command post for other duties pertaining to the incident.

G. Incident Command

1. The on-duty Watch Commander shall respond to the SRT incident and act as the temporary Incident Commander until the arrival of the Incident Commander.

2. The Watch Commander shall transfer Incident Command to the Incident Commander upon his/her arrival. The Watch Commander shall then assist the Incident Commander with such things as:

    a. Evacuations

    b. Traffic and crowd control

    c. Special equipment and transportation

    d. Emergency staffing

3. Upon the arrival of the Incident Commander, the Watch Commander shall fall under his command.

4. During the normal SRT incident, the Incident Commander shall respond to the scene and assume overall command.

5. Upon the arrival of the SRT, the Tactical Commander shall fall under the command of the Incident Commander.

6. No tactical plan shall be implemented without the knowledge and affirmation of the Incident Commander and the Tactical Commander.

7. The SRT Team members shall only take directions from SRT command personnel.

H. Termination of assignment

1. The SRT members shall remain at their assigned duties until released by SRT command personnel.

2. The supervisor of an on-duty ICS or SRT member shall release the member from normal duty without unnecessary delay.

3. The on-duty supervisor shall be responsible to replace the on-duty ICS and SRT member by calling in another employee.

4. The on-duty supervisor shall notify on-coming shift supervisors if the on-coming shift is shorthanded due to the ICS Incident.

5. ICS shall release their members from the incident without unnecessary delay if they are no longer needed.

6. On-duty ICS and SRT members will return to their normal duty assignments, as quickly as possible, after release from the ICS incident.

7. It shall be the responsibility of the Tactical Team Leader to determine when the tactical team leaves the scene and returns to normal duty.

I. Debriefing

A debriefing of the SRT Team shall be held immediately after an ICS incident.

J. After action reports

All personnel whose observations or actions are pertinent to the incident (i.e. movement of evidence, use of force, etc.) shall submit a written report of their assignment and activities.

K. Handling of the news media

1. The Incident Commander shall appoint or serve as the news media contact until the duties of the public information function is delegated at which time this responsibility shifts to another person.

2. During normal business hours the Incident Commander shall assign the Public Information Officer (Lieutenant, Community Relations) to respond to the field command post.

   a. If the PIO officer is unavailable, or has not arrived at the scene, the Incident Commander shall designate another officer to assist the news media personnel.

b. After business hours the PIO officer may be assigned to respond, otherwise the Incident Commander may designate another officer to perform the public information function.

3. At the field command post and/or the scene of the incident, the PIO officer shall be responsible for assigning the news media personnel to a specific area for control and safety purposes.

4. For more details of procedures on dealing with the news media, refer to General Order 302.4, Public Information.

TIVOLI S. FAAUMU
Chief of Police

6.12.7 MPD Policy: Command Vehicle Standard G.O.304.11

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 304
FACILITIES AND EQUIPMENT

Effective date: 01/31/20	Revision date: 1/13/20	Rescinds: GO 304.11 (3/06/12) New materials underscored
Accreditation Standards: 41.1.3 abc		

COMMAND VEHICLE STANDARD OPERATING PROCEDURES
G.O. 304.11

I. PURPOSE

To establish procedural guidelines related to the operation and utilization of the Command Vehicle.

II. POLICY

It is the policy of the Maui Police Department to provide a Command Vehicle that shall be utilized in critical operations as deemed necessary. All departmental employees shall be guided by the rules, regulations, and procedures established herein.

III. DEFINITIONS

OPERATOR: The Primary Officer (highest ranking) in charge of the vehicle during training and call-out operations.

OPERATOR ASSISTANT: The Secondary Officer that will assist in other duties as needed to facilitate the operations of the Command Vehicle.

SECURED ENVIRONMENT: An area that is predetermined not to be in the zone of potential threat either by natural or manmade means. The Command Vehicle should be situated in a location that, if needed, can be relocated in a timely manner.

TECHNICAL SUPPORT: Members of the Maui Police Department's Radio Shop who is in charge of all the equipment utilized for communications.

MECHANICAL SUPPORT: The Maui Fire Department's mechanical team that is in charge of mechanical repairs to the Command Vehicle as agreed upon in the Memorandum of Understanding.

IV. PROCEDURES

A. It shall be the discretion of the Assistant Chief of the Uniform Services Bureau or his/her designee to utilize the Command Vehicle in critical operations. Upon request, the supervisor, of the Command Vehicle, shall call out a team of two (2) members, on (1) Operator, and one (1) Operator Assistant.

The supervisor will also call the supervisor of the Radio Shop to have his/her personnel respond for technical support and to verify their response.

B. The Operator and Operator Assistant shall conduct a pre-check of the Command Vehicle upon leaving and a post check upon returning to the truck bay.

C. The Operator and Operator Assistant shall plan a route to the scene and respond with lights and sirens. However, due to the size of the Command Vehicle, utmost discretion shall be used to maintain control. The driver shall maintain a safe speed regardless of the amount of time in responding to the scene.

D. The Command Vehicle shall be located at a safe and secure environment away from the scene. A perimeter shall be set around the Command Vehicle and an Entry Control Point shall be made for security measures. The Entry Control Point shall be manned by a sworn officer at all times throughout the operation.

E. A minimum of two (2) sworn officers trained in the Command Vehicle shall be present during the operation. Upon completion of the operation, the Command Vehicle shall be cleaned, inspected and prepared as soon as reasonably possible.

V. TRAINING

A. Training will be done at least twice a month to ensure driving proficiency as well as planning of routes due to changes in roadways, new subdivisions, and new commercial parks.

B. Cleaning, inspection, and preparation of the Command Vehicle shall be done at the end of each training for possible operations.

VI. TECHNICAL SUPPORT

A. It shall be the responsibility of the Radio Shop personnel to conduct any technical support of the Command Vehicle during the operation. At least one (1) person from the Radio Shop shall be present during the course of the operation.

VII. MECHANICAL SUPPORT

A. It shall be the responsibility under the Memorandum of Agreement that the Maui Fire Department mechanical support will be limited to the vehicle itself and to respond to the replenishment of fuel due to extended operations.

VIII. PROHIBITIONS

A. The Command Vehicle shall not be utilized as a personnel carrying vehicle. Personnel riding in the Command Vehicle shall only sit within the confines of the two (2) front seats and the dispatch area. For safety reasons, no one will be allowed to sit in the operations or meeting areas while the mobile command vehicle is in motion.

B. The Command Vehicle shall be used for meetings set by the highest ranking officer in charge. Permission for enter the Command Vehicle will be given by the Commander in Charge.

C. The Command Vehicle shall not be used as a comfort station.

IX. MEMORANDUM OF AGREEMENT

A. There is an agreement between the Maui Police Department and the Maui Fire Department for the use of the Command Vehicle.

B. The Fire Chief or his designee may call for the use of the Command vehicle when needed in support of their operations. In these situations, the Operators may be a member of the Maui Police Department or the Maui Fire Department.

C. It shall be the responsibility of the agency utilizing the Command Vehicle to follow their own Standard Operating Procedures.

Tivoli S Faaumu

TIVOLI S. FAAUMU
Chief of Police

6.12.8 MFD Policy: Hazard Zone Command E.O.302.01

HAZARD ZONE COMMAND	E.O. 302.01

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	8	1	1/3/2019
9/1/2020	8	2	8/4/2020

PURPOSE: Provide guidance to be employed in establishing components of the Incident Command System and applicable components of the National Incident Management System (NIMS).

GUIDELINE:

I. REASONS FOR COMMAND GUIDELINES

A. Fix the responsibility for Command on a specific individual through a standard identification system, dependent upon the arrival sequence companies and Chief Officers.

B. Ensure that a strong, direct, and visible Command will be established from the onset of the incident.

C. Establish an effective incident organization defining the activities and responsibilities assigned to the individuals operating within the Incident Command System.

D. Provide a system to process information to support incident management, planning, and decision-making.

E. Provide a system for the orderly transfer of Command to subsequent arriving officers.

F. Ensure a seamless transition from a Type 5/4 incident to a Type 3/2/1 (NIMS).

II. RESPONSIBILITIES OF COMMAND

The Incident Commander is responsible for the completion of the incident priorities. The Incident Priorities (listed in order of priority) are:

A. Remove endangered occupants and treat the injured.

B. Stabilize the incident and provide for life safety.

C. Protect property.

D. Provide for the safety, accountability, and welfare of personnel.

III. COMMAND FUNCTIONS

The Functions of Command are standard activities that are performed by the Incident Commander to achieve the Tactical Objectives. Functions of Command include:

A. Assume and announce Command and establish an effective initial command position (the Command Post).

B. Rapidly evaluate (size-up) the situation.

C. Initiate, maintain, and control effective incident communications.

D. Provide and manage a steady, adequate, and timely stream of appropriate resources.

E. Identify the incident strategy, develop an Incident Action Plan (IAP), and assign companies and personnel consistent with plans and SOGs.

F. Develop an effective incident organization using Divisions/Groups to decentralize and delegate geographic and functional responsibility.

G. Review the strategy and revise as needed to keep the IAP current.

H. Provide for the continuity, transfer, and termination of Command.

IV. MODES OF COMMAND

The first arriving unit or member is responsible for assuming Command of the incident and is presented with several command mode options, listed below. The command options are situation dependent and define the initial Incident Commander's level of direct involvement in tactical activities.

A. <u>Investigative Mode (Nothing Showing)</u>

An initial IC in investigative mode is mobile, moving around and evaluating conditions while looking for the incident problem, and runs Command from a portable radio. Guidelines for Investigative Mode include:

1. Provide an initial radio report (e.g. "Dispatch, Engine 1 is on scene of medium-sized, single-story, commercial, with nothing showing from the alpha, we will be investigating.)

2. Command must be established if conditions warrant an upgrade in response.

3. In Investigative Mode, your action plan is “investigating.”

4. The company officer / initial IC should go with the company to investigate while utilizing a portable radio to command the incident.

5. A portable extinguisher and halligan/flat head axe set shall be the minimum tools carried during the investigation.

B. Fast Attack Mode

Fast Attack Mode is used when fire conditions are present and the initial IC believes his direct involvement will be beneficial for the attack. Guidelines for Fast Attack Mode include:

1. Provide an initial radio report and quickly engage.

2. Next arriving units all go to Level 1 Staging.

3. Initial IC makes entry with a portable radio to supervise his/her crew. Examples of situations that may require the IC to make entry include:

   a. A visible working fire in a house or small commercial occupancy

   b. A critical life safety situation (e.g. a rescue that must be made in as short of a time frame as possible)

   c. Any incident where the safety and welfare of fire fighters in the hazard zone is a major concern

   d. Obvious working incidents that require further investigation by the company officer / initial IC

   e. Supervision of a crew with a low combined experience level

4. The initial IC must initiate and continue Command until another company officer arrives and the transfer of command is completed.

5. All responding resources must realize that the IC is in fast attack mode inside the hazard zone attempting to quickly solve the incident problem.

E.O. 302.01

6. Responding resources must critically listen to radio traffic; update, review, and reinforce the initial size up; verify the safety, welfare, and accountability of the fast attack crew; and be ready to support the initial attack.

7. Initial command in the Fast Attack Mode should not last more than a few minutes and will end with one of the following:

    a. Situation is stabilized.

    b. Command is transferred from the fast attack company officer / initial IC to a later arriving command officer.

    c. If the situation is not stabilized, the fast attack company officer / initial IC must move to an exterior, stationary command position and switch to Command Mode.

C. Command Mode (Stationary Command Post)

Certain incidents, by virtue of their size, complexity, or potential for rapid expansion, demand a strong, stationary Command from the onset. At these incidents, the first arriving company officer will assume Incident Command and stay out of the hazard zone in a stationary exterior command position from the beginning of the operation. The initial IC in Command Mode must remain there until the incident is terminated or Command is transferred.

If the initial IC is operating in Command Mode, the following options are available with regards to the assignment of remaining crew members:

1. "Move up" an acting officer within the Company. This is dependent upon the individual and collective capabilities and experience of the crew.

2. Assign the crew members to perform staff functions to assist the IC. Staff functions include recon/reporting, communications assistance, help with tactical worksheet tracking, etc.

3. Assign crew members to another company. This creates a larger work group assigned to the company officer. The reassignment of personnel to another company must be acknowledged by both the original and the receiving officer and must be reflected in the accountability system.

V. ESTABLISHING COMMAND

A. The first officer to arrive at the scene of a multiple unit response shall assume

Command of the incident and shall remain in Command until Command is transferred or the incident is stabilized and Command is terminated.

B. When a Chief Officer arrives at the scene at the same time as the initial arriving company, the Chief Officer should assume Command of the incident.

C. The officer assuming Command initiates the command process by giving an Initial Radio Report (IRR).

D. **Initial Radio Report (IRR)**

1. Clear the Alarm ("Engine 1 on scene of…")
2. Building/Area Description
   a. Size (small, medium, large, huge)
   b. Height (number of stories and/or sublevels)
   c. Occupancy type (house, apartment, strip mall, high-rise, etc.)
3. Problem Description and Location
   a. Nothing showing
   b. Light smoke showing
   c. Working fire
   d. Defensive fire conditions
4. Initial Incident Action Plan (IAP)
   a. The TASK(S) of the initial arriving unit
   b. The LOCATION of the task(s)
   c. The OBJECTIVE(S) of the task(s)
5. Declare the Incident Strategy (see the Fire Ground Strategy SOG)
   a. Offensive
   b. Defensive

6. Resource Determination to Dispatch

   a. Cancel the original assignment

   b. Hold the original assignment

   c. Upgrade the original assignment to a full alarm

   d. Upgrade with specific single resources

   e. Strike additional alarms

7. Assume and Name Command

E. **Follow-Up Report –** The initial IC should communicate a Follow-up Report after more on scene information is gathered, typically following a 360. Follow-Up Reports typically include the following information:

1. Any immediate safety concerns

2. Revision of the IAP

3. Accountability location

4. Tactical channel designation

VI. TRANSFER OF COMMAND

A. At working incident, it may be necessary to transfer Command from a fast attack position to a stationary command position. Transfers of Command will typically be done over the radio, as follows:

1. Verify that all operating positions match the current incident conditions.

2. Announce arrival on scene.

3. Contact the current IC.

4. Confirm the position and function of all on-scene resources with the current IC.

5. Inform the current IC that you are taking Command (e.g. “I’ll take it from out here”).

E.O. 302.01

6. Inform Dispatch that you are taking Command.

7. Announce to all units that you are assuming Command ("Battalion Chief 2 will be assuming Market Street Command").

8. Reevaluate and communicate fire ground strategy.

9. Reevaluate the adequacy of responding and on-scene resources.

10. Announce the command post (CP) location.

B. In some situations, it may be advantageous for the initial IC to transfer command to the next company officer to arrive on scene.

C. COMMAND SHALL NOT BE TRANSFERRED TO AN OFFICER WHO IS NOT ON THE SCENE.

D. Command is only transferred when the Transfer of Command process has been completed. The person being relieved of Command will be reassigned by the officer assuming Command.

VII. COMMAND SUPPORT

The incident scene is often dynamic and intense. As the incident grows into and past the requirements of a first alarm assignment, the IC can become overwhelmed with information management, assigning companies, filling out and updating a tactical worksheet, planning, forecasting, calling for additional resources, talking on the radio, and fulfilling all the other functions of Command. The immediate need of Command at this point is support. Two immediate positions that provide immediate command support are the IC aide and a Deputy IC.

A. <u>IC Aide:</u>

1. Define, evaluate, and recommend changes to the incident action plan.

2. Provide direction relating to tactical priorities and specific critical fire ground factors.

3. Become the Incident Safety Officer (Mandatory for MFD to establish a Safety Officer)

4. Evaluate the need for additional resources.

5. Assign logistics responsibilities.

E.O. 302.01

6. Assist with the tactical worksheet for control and accountability.

7. Evaluate the fire ground organization and span of control.

8. Other duties as necessary.

9. Work in the Command Post with the IC.

B. Deputy IC:

1. Review and evaluate the incident action plan, and recommend any needed changes.

2. Provide on-going review of the overall incident (THE BIG PICTURE).

3. Review the organizational structure, initiate change or expansion to meet incident needs.

4. Initiate Section and Branch functions as required.

5. Provide a liaison with other city agencies and officials, outside agencies, property owners and/or tenants.

6. Forecast and react to the affect this incident will have on surrounding neighborhoods, Public Officials, and city staffing.

7. Prepare to transition to long-term operations by establishing operational periods and advising the Assistant Chief of Operations as to the need for an All Hazards Incident Management Team (AHIMT), state or federal assistance.

8. Provide a transitional briefing to the incoming IMT if one has been assigned to the incident.

9. Work in the Command Post with the IC.

6.12.9 MFD Policy: Accountability E.O. 300.08

ACCOUNTABILITY	E.O. 300.08

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	3	1	1/3/2019
9/1/2020	3	2	8/4/2020

PURPOSE: Identifies a system to account for all fire fighters operating in the hazard zone.

GUIDELINE:

I. STRATEGIC ACCOUNTABILITY

Command will address accountability by:

A. Tracking of all crews and divisions/groups by location and function on a tactical worksheet.

B. Command must know who is in charge of each Division/Group, crews assigned to each Division/Group, where each Division/Group is located, and what each Division/Group is assigned to do.

C. Command will include accountability as a major element in strategy and attack planning, and must consider and react to any barriers to effective accountability.

D. Command will consider air supply when making tactical assignments including rotation of crews.

E. Command must obtain personal accountability reports (PAR) from Division/Group Supervisors and crews.

II. TACTICAL ACCOUNTABILITY

Division/Group Supervisors will address accountability by:

A. Tracking of crews assigned to their Division/Group.

B. Division/Group Supervisors must know the location and function of assigned crews.

C. Division/Group Supervisors must be in his/her assigned area to maintain close supervision of assigned crews.

D. Division/Group Supervisors must obtain PARs of all crewmembers of all companies assigned to his/her Division/Group.

III. TASK LEVEL ACCOUNTABILITY

Company officers will address accountability by:

A. Knowing where each firefighter is located, and what each firefighter is doing.

B. Company officers shall maintain a current PASSPORT of personnel responding on the apparatus at all times.

C. Company officers must ensure that all crewmembers have proper helmet, department ID, and nametags on helmet.

D. Company officers must obtain PARs for their crews, which is a confirmation that all members assigned to his/her crew are accounted for and have an adequate exit air supply.

E. Company officers must keep crew intact and maintain an awareness of the crews exit air supply.

F. Company officer must ensure that passport is delivered to their accountability location prior to entering the hot zone and retrieved upon exiting the hot zone.

IV. ACCOUNTABILITY LOCATION

Is defined as a designated apparatus (typically first due) used to organize and account for crew operations within a designated area.

A. The accountability location is communicated over the radio during the on scene follow up report “E1 will be the Alpha side accountability location.”

B. The accountability location is the physical placement of the apparatus in relationship to the fire building.

C. Multiple accountability locations may exist in fires at large buildings.

D. Fire Apparatus Operators on the fire apparatus identified and assigned as the Accountability Location will initiate accountability actions by collecting company accountability hardware.

E. Company identification working in the hazard zone may be achieved by utilization of a hose marking system done at the apparatus/accountability location.

E.O. 300.08

F. Companies will default to their designated accountability location when exiting the building.

G. The division supervisor will coordinate with the officer to account for crews in the hazard zone.

V. PERSONNEL ACCOUNTABILITY REPORT (PAR)

The Personnel Accountability Report (PAR) involves a roll call of all personnel assigned to crews and Divisions/Groups that are working in the hazard zone. The PAR is a confirmation that all members are accounted for and have an adequate exit air supply.

A. For the Division/Group Supervisor, a "PAR" is an accounting for all crewmembers of all companies assigned to the Division/Group.

B. For the Company Officer, a PAR is an accounting of all crew members assigned to his/her company.

C. Reports of PAR's should be conducted face-to-face within the Division/Group or company whenever possible.

D. A personnel accountability report will be required for the following situations:

1. Any report of a missing or trapped fire fighter.

2. Any change from offensive to defensive.

3. Any sudden hazardous event at the incident - flash over, back draft, collapse, May Day, etc.

4. As companies report an all clear.

5. As companies report fire control.

6. Any time Command feels it is necessary.

E.O. 300.08

6.12.10 MPD Policy: Natural and Man-Made Disaster Plan G.O.411.4

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 411
UNUSUAL OCCURRENCES

Effective date: 06/01/21	Revision date: 05/04/21	Rescinds: GO 411.4 (04/15/04) New materials underscored

Accreditation Standards:

NATURAL AND MAN-MADE DISASTER PLAN
G.O. 411.4

I. PURPOSE

To establish guidelines to be used in the event of an unusual occurrence affecting Maui County that proves to be beyond the capabilities of the Department's normal daily operations.

II. POLICY

To respond to unusual occurrences with appropriate numbers of personnel and equipment in the attempt to establish control and the return of normalcy in a safe, effective, and efficient method.

III. DEFINITIONS

DISASTER: The result of flood, tornadoes, earthquakes, explosions, chemical/nuclear accidents or other natural disorders.

EOC: Emergency Operations Center

MCDA: Maui Civil Defense Agency

UNUSUAL OCCURRENCE: A situation that results from a disaster, whether natural or man- made.

IV. GENERAL PROVISIONS

A. In dealing with emergency situations, officers should be aware that state laws give additional powers to law enforcement officials for dealing with circumstances associated with unusual occurrences. See Chapter 127, Hawaii Revised Statutes (HRS), Disaster Relief Act, and Chapter 128, Hawaii Revised Statutes (HRS), Civil Defense and Emergency Act.

B. In the event of an unusual occurrence, the planned response of Department personnel is imperative since the occurrence will be beyond the capabilities of the Department's normal daily operations.

V. COMMAND AUTHORITY DURING UNUSUAL OCCURRENCES

A. In an attempt to provide for unity of command during those situations, the highest ranking Department member on the scene shall exercise command and control over all civil law enforcement resources committed to the resolution of the incident until relieved by a higher ranking Department authority. The order of command precedence during unusual occurrences situations shall be as follows:

1. Chief of Police,
2. Deputy Chief of Police,
3. Assistant Chief of Uniform Services,
4. Assistant Chief of Investigative Services,
5. Assistant Chief of Support Services,
6. Respective District Commanders,
7. Respective Watch Commanders, and
8. Respective Field Supervisors.

B. The on- scene commander will retain responsibility for law enforcement efforts and will also act as a liaison for other Departments and agencies involved in the operations, including local, state, and federal authorities.

VI. PLANNING RESPONSIBILITIES

A. The Department's Assistant Chief of Uniform Services shall be responsible for the development and review of the unusual occurrences plans and the County Disaster Plan. He shall oversee all phases of operations for the Department.

B. The Assistant Chief of Uniform Services shall annually review and update, when necessary, the Department's unusual occurrence plans.

1. As part of the annual review of the unusual occurrence plan, the Assistant Chief of Uniform Services will maintain liaison with other emergency management authorities. This will permit coordination with state and federal disaster agencies and provide a basis for their input related to the Department's plan.

C. Element Commanders are responsible for conducting a documented monthly inspection of equipment designated for use in unusual occurrence situations for operational readiness.

D. If another jurisdiction has an unusual occurrence (natural or man-made disaster), requests for mutual aid will be reviewed by the Chief of Police, or designee, prior to approval. For additional guidelines and procedures that may be applicable, refer to General Order 415.2, Jurisdiction and Mutual Aid.

VII. <u>NATURAL AND MAN-MADE DISASTER PLAN</u>

A. The Department's written plan for responding to natural and man-made disasters shall be issued to all command personnel and is a part of the overall County Disaster Plan developed for such emergencies. It is the policy of the Department to assist and expedite emergency operations during man-made or natural disasters. The Department may also be requested to supplement other agencies who have primary responsibility over an unusual occurrence or disaster. The following provisions shall apply during unusual occurrences or disasters.

1. Communications: During the initial phase of an unusual occurrence, the E 911 Central Dispatch Communications Center will play a vital part. At the direction of the Assistant Chief of Uniformed Services Bureau, the Department's Emergency Operations Center (EOC) will be activated. Without effective communications, the response of this Department could be significantly impaired. Some of the functions performed by the EOC are:

a. The <u>Information and Education Specialist</u> will be responsible for media releases and other rumor control functions. When the EOC is activated, the public information officer shall release coordinated press releases to reduce confusion.

b. Dedicating a radio channel(s) for the specific emergency traffic. A common frequency should be used, if available.

c. Ensuring communications are maintained with all effected personnel.

d. Completing all notifications and coordinations as ordered by the MCDA director.

e. Notifying all other agencies of the implementation and location of any Field Command Post.

f. Providing an accurate update of all incident details to the Department's command staff.

g. Providing detailed sectional maps of Maui County for use in plotting operational commitments during unusual occurrences.

2. Situation Maps: The Assistant Chief of Uniformed Services Bureau is

responsible for maintaining and issuing maps of the islands of Maui, Molokai, and Lanai to Department personnel involved in the planning of unusual occurrences.

3. Field Command Post: When a Field Command Post is activated, the senior ranking officer present will select an appropriate site. In all cases where there is a joint emergency operation involving other agencies, a consolidated command post will be established with all responding agencies. When warranted, a weather forecast should be obtained prior to determining a location, especially when the Department's Mobile Field Command Post is to be deployed. The Field Command Post will be deactivated when all operational phases cease and the incident is terminated.

4. Casualty Information: In those unusual occurrences where fatalities occur, the Maui Police Department in conjunction with other involved law enforcement agencies will coordinate and disseminate identification information. The Department will coordinate and disseminate all information related to injuries.

5. Public Information: In those unusual occurrences involving public safety personnel, the Department's Information and Education Specialist shall coordinate the issuance of information, instructions, and advice to the public. For additional guidelines and procedures that may be applicable, refer to General Order 104.8, Public Information.

6. Other Law Enforcement Agency Support: Mutual aid agreements are either signed or verbal between heads of government for reciprocal assistance in the event of an emergency or unusual occurrence. However, the Chief of Police recognizes the responsibility of the Department to provide assistance to any agency that requests it. Liaison must be established with all agencies involved since it is essential to prevent duplication of effort, confusion, and unnecessary delay.

7. Military Support (martial law): The deployment of the National Guard to aid local law enforcement authorities in the event of a disaster is accomplished only by order of the Governor of Hawaii. Assistance can only be obtained through proper channels to the Office of the Governor of Hawaii. All inquiries concerning deployment requests should be referred to the MCDA director.

8. Public facility security: In order to protect the integrity of an unusual occurrence area, perimeters may be established. The size and number of personnel needed to maintain any perimeter will be determined by the incident supervisor. There are two types of perimeters: 1) inner perimeter used to establish a strict control area, and 2) outer perimeter used to establish a larger area for security or evacuation.

a. Control of the perimeter around an emergency is a primary concern. The agency acting as the primary control force is responsible for determining whether public access is allowed into the endangered area and, if allowed, what criteria will be used for entry. To ensure decisions and communications regarding this matter are fully understood, all involved agencies should use liaison officers.

(1) Those officers assigned to the task for perimeter control shall direct all persons requesting access into the affected area to the entry control point.

b. An entry control point will be established as near as practicable to the Field Command Post and be manned by an MPD officer or other law enforcement officer. All persons will be directed to the entry control point for access. The entry control officers shall control access into the affected area by allowing entry only to those persons authorized by a competent authority.

(1) The type of access will depend upon the conditions as viewed by the incident supervisor. The two types of access determination is made, Department actions will include:

(a) No-Access prohibits unauthorized persons from entering the closed area. When a no access determination is made, Department actions will include:

i) Establishing the perimeter and entry control points of the closed area,

ii) Warning residents and directing concerned evacuees to evacuation centers,

iii) Aiding and rescuing endangered persons, and

iv) Patrolling the interior, when possible.

(b) Limited-Access allows persons into the closed area according to the criteria established by the incident supervisor. When a limited access determination is made, in addition to the above listed actions, entry authorization will be issued and the number of people allowed into the closed area will be monitored.

(2) If limited access is allowed through the perimeter, entry criteria will be established by the incident supervisor. Entry criteria shall define those persons allowed through the perimeter and any motor

vehicle restrictions. As a practical matter, selected persons may be admitted entry. Consideration should be given to individuals who could reduce the volume of duties assigned to officers and those who could assist in restoring the involved area to normal. These persons may include the following:

(a) Residents with valid identification;

(b) Public utility employees;

(c) Persons with press passes; and

(d) Owners, managers, and employees of business located within the perimeter.

9. Traffic Control: Certain officers may have the task of establishing traffic control points. A traffic control point may also be a perimeter point. Duties of establishing a traffic control point include: 1) keeping roadways/ intersections clear for emergency vehicles, and 2) preventing unnecessary traffic from entering the affected area. The incident supervisor will determine entry/ exit procedure into the affected area.

10. Equipment Requirements: An important duty of the Assistant Chief of Uniformed Services Bureau is to act as an expediter of resources during unusual occurrences. He shall coordinate any special equipment needs through the county EOC. Personnel being activated for the unusual occurrence will be advised of any special equipment they need to bring. A list of resources for specialized equipment and its availability is contained within the County Disaster Plan.

11. Transportation: After receiving an evacuation order, some residents may not have transportation to an evacuation center. When the need arises, the use of local school buses should be considered. This should be coordinated with the county EOC.

    a. After receiving an evacuation order, debris and other obstructions may impede the movement of vehicles in the evacuation area. Such conditions may require that evacuees board buses in specific areas. Consequently, evacuees should be kept informed of areas to assemble for transportation.

12. De-escalation Procedures: As the emergency lessens, the strategy is to employ an economy of force by reducing the number of personnel and amount of equipment in the involved area. Personnel reduction should coincide with the restoration of public services. Care should be exercised in the withdrawal of emergency personnel to ensure that involved areas

are protected. Some emergencies present special problems because of a greater potential for looting. Therefore, interior patrols should be maintained even after citizens are allowed limited access into closed areas. If withdrawal is too early, the emergency may be aggravated.

a. When law enforcement mutual aid is employed, the order of the emergency force withdrawal should be in the order of federal, state, and, finally, local. The withdrawal of these forces should be phased to:

(1) Relieve those forces which are the greatest distance from their jurisdiction;

(2) Relieve those forces which have been deployed the greatest length of time;

(3) Ensure that the assignments of remaining mutual aid forces are evenly divided; and

(4) Ensure that there is a reserve of sufficient personnel for immediate response to an escalating problem.

b. When emergency personnel are withdrawn from the occurrence, they should be directed to an assembly area and debriefed. The debriefing will serve to:

(1) Obtain intelligence for operations planning,

(2) Critique tactics employed for emergency control,

(3) Encourage the reporting of incidents not previously known or included in incident reports, and

(4) Ensure all participating agencies have an opportunity to contribute to after-action reporting.

c. Provisions must be made for service, repair or replacement of damaged equipment and the restocking of expended supplies. Damaged or lost equipment must be reported to the appropriate supervisor.

13. Rumor Control: Rumor control is the responsibility of every officer working during an unusual occurrence. To the extent that rumors may cause panic in the general public, it is important that officers be supplied with accurate, timely information. It shall be the responsibility of the <u>Information and Education Specialist</u> to confirm or deny rumors as they become known and to maintain contact with the incident supervisor, command staff, MCDA director, and personnel assigned to the EOC for the control

of rumors.

14. Availability For Command (order of precedence): In the event of an unusual occurrence, the command staff will be notified in the following order:

    a. Uniform Services Bureau commander,

    b. Deputy Chief of Police,

    c. Chief of Police,

    d. Investigative Services Bureau commander,

    e. Support Services Bureau commander.

15. Post-Occurrence (aftermath) Duties: The restoration of order occurs only after control is established, the severity of the emergency diminishes, and recovery operations begin. During major emergencies, large areas of the county may be affected. Therefore, it is likely a number of county Departments will be temporarily involved in different phases of operations including recovery operations. These measures should be employed as early as possible during the emergency. As control is established in the involved area, law enforcement response may be reduced. There still remains an obligation to assist and support other involved Departments and agencies working in the area in whatever law enforcement role necessary. Once order is established attention should be directed towards restoring public service. The faster public services <u>are</u> restored the sooner the community will return to normal.

16. After- Action Reports: An' After- Action' Report shall be prepared within seven (7) days of an unusual occurrence and will document the activities of individuals, units, sections, divisions, and/ or bureaus involved in the control of the unusual occurrence. The Assistant Chief of Uniform Services will have the responsibility for the coordination, preparation, and distribution of the After-Action' Report. Copies of the report will be provided to the Chief of Police, Deputy Chief of Police, other Bureau commanders and others as needed. The Chief or Deputy Chief of Police will determine which of the following categories need to be addressed in the report.

    a. The type of occurrence shall be indicated, i.e., fire, flood, etc.

        (1) A brief background/ intelligence summary,

        (2) The date(s) and time(s) and the duration of the unusual occurrence, and

        (3) The location of the unusual occurrence including the affected

area(s) and perimeters(s).

b. Field command post information:

(1) Location and type of field command post,

(2) Staffing of the field command post, and

(3) Personnel figures to show the total number of work hours expended during the occurrence, to include a breakdown indicating straight time and overtime.

c. Chronological narration of all significant events related to the unusual occurrence. Special emphasis should be placed on law enforcement strategy and tactics.

d. Crimes and arrest information will be reported in the following manner:

(1) Adult felony arrestees will be categorized by gender and listed alphabetically with the charge and case number.

(2) Adult misdemeanor arrestees will be categorized by gender and listed alphabetically with the charge and case number.

(3) Juvenile felony arrestees will be categorized by gender and listed numerically by case number and charge. There will be no reference to the names of the juveniles documented within the report.

(4) Juvenile misdemeanor arrestees will be categorized by gender and listed numerically by case number and charge. There will be no reference to the names of the juveniles documented within the report.

e. Deaths and injuries will contain significant information. Following the statistical summary, there should be a description of the circumstances surrounding each death or injury. The description should include names listed alphabetically, location of occurrence, the cause and type of death or injury, and, when applicable, a case number.

(1) The names of juveniles will be omitted from this section of the report. All references of juveniles will be listed by sex, age, location of occurrence, and the cause and type of death or injury.

f. When applicable, the report will contain a listing of all known property damaged. Department owned property will be listed separately from all other property damage.

g. The number of sworn and nonsworn Department personnel by rank who were assigned to the unusual occurrence. The report should provide the total work hours expended by rank for sworn and nonsworn personnel with straight time recorded separately from overtime.

h. Record all of the equipment and supplies used during the unusual occurrence. Include the costs incurred for the use of Department equipment and the cost of expended logistical items.

i. Summarize and evaluate the operations and procedures used during the unusual occurrence. Include suggestions for modifying procedures and/ or operations and suggestions for training when applicable. The summary will represent a compilation of all critiques related to the unusual occurrence. Any recommendations will be evaluated and any updates to this plan will then be made.

DEAN M. RICKARD
Acting Chief of Police

6.12.11 MFD Policy: Hurricane and High Wind Events D.O. 600.01

HURRICANE / HIGH WIND EVENTS	D.O. 600.01

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	5	1	4/24/2019
7/23/2020	5	2	7/22/2020

PURPOSE: To provide guidance prior to and during hurricanes and high wind events impacting Maui County.

GUIDELINE:

I. The following steps and procedures are expected to be implemented by the highest ranking officer at each of the fire stations within the Maui County Fire Department. Guidance from the Battalion Chief on duty shall be obtained if there are any questions or concerns regarding this process or policy. In most cases, there will be 48 to 72 hours of prior notice that a hurricane is approaching and action must be taken.

II. Securing of Families and Possessions

A. Department members who are scheduled to be on duty during a hurricane or high wind event must take steps to secure their family and possessions prior to reporting for duty. It is a good idea to implement these actions when a Hurricane Watch is announced by the National Weather Service. Member's families should have a shelter plan in place; whether it's with other nearby family members in a safe area or they may wish to bring their families to a designated facility (ie. Red Cross Shelter or Nearest Fire Station).

III. When a hurricane watch is announced, storm winds in excess of 74 mph may possibly arrive within 48 hours. At this announcement, all fire stations shall:

A. Fuel all fire department vehicles (top off)

B. Request emergency diesel fuel delivery for station fuel tank for generator & vehicles if time permits (does not apply to Kihei & Pukoo fire stations due to evacuation of these stations)

C. Secure loose items outside the fire station like furniture, equipment, tools etc.

D. Turn thermostat of refrigerator to coldest setting and keep door closed

E. Turn off propane tank valves

F. Fill clean, large containers with water for future sanitary purposes in case the water supply is shut off
G. Check portable radio batteries are charged

H. Install covering over windows in self-preservation areas of the fire station if pre-designed to do so

IV. When the hurricane watch is announced, the Assistant Chief of Operations shall begin to staff the seven Incident Facilities and fire stations as needed. An initial staffing roster and rotational schedule for relief personnel shall be in place prior to sustained winds exceeding 40 mph.

V. The MFD has identified the following seven facilities that may be used by the initial unified command structure at the following locations:

A. Central Maui – Wailuku Fire Station (Pali Tunnel to Kealia power plant to Kahakuloa and Sprecklesville)

B. Upcountry – Kula Fire Station (Kaupo Store, to Hailiimaile, Baldwin Park to Keanae)

C. West Maui – Lahaina Fire Station (Pali tunnel to Kahakuloa)

D. Molokai – Kaunakakai Fire Station (all of Molokai)

E. Lanai – Lanai Police Station (all of Lanai)

F. South Maui – Wailea Fire Station (Sugar Beach to Makena)

G. East Maui – Hana Fire Station (Keanae to Kaupo Store)

VI. When a Hurricane Warning is announced, storm winds in excess of 74mph are expected within 36 hours. Incident command staff shall be increased as directed by the command (IC or Unified). A plan to address objectives that have been identified by command must commence when all general staff have arrived.

VII. ICS positions must be filled by qualified members who have training and experience in their assigned position. ICS participants DO NOT need to be members of the MFD but must have knowledge of the positions duties and approval of the IC. The IC (or Unified) must communicate information to the Emergency Operations Center (EOC) in Wailuku as the incident dictates.

VIII. A map of the seven districts is provided for clarification.

D.O. 600.01

- 1-Central Maui
- 2- Upcountry
- 3- West Maui
- 4- Molokai
- 5- Lanai
- 6- South Maui
- 7- Hana

IX. Although not required, fire stations were selected for six of the seven command posts for the following reasons:

- Ability of ICP to resist a hurricane
- Large backup generator
- Large fuel tank for generator
- Sleeping quarters
- Computers & printers
- Food & ice

X. Coordination of evacuation is the responsibility of the Maui Police Department. MFD's responsibility is to assist the police department with evacuation. Outdoor evacuation activities shall continue until the sustained winds reach 40 miles per hour. Sustained winds are measured in excess of one minute. The EOC is responsible to announce when this threshold is met and communicate this to the incident facility in each district. When the 40mph wind threshold is achieved, firefighting personnel shall take self-preservation measures and report to their designated hurricane shelter (unless directed otherwise by the IC or EOC).

XI. The following are the designated self-preservation sites for each fire station.

- Station 1 Wailuku — in station
- Station 2 Paia — in station
- Station 3 Lahaina — in station
- Station 4 Kaunakakai — in station
- Station 5 Makawao — in station
- Station 6 Kihei — Wailea Fire Station
- Station 7 Hana — in station
- Station 8 Lanai — in station
- Station 9 Hoolehua — in station
- Station 10 Kahului — in station
- Station 11 Napili — in station
- Station 12 Pukoo — Kaunakakai Fire Station
- Station 13 Kula — in station

D.O. 600.01

- Station 14 Wailea in station

XII. For Kihei and Pukoo fire stations, evacuation for self-preservation shall be timed to permit ample travel time to the designated shelter site prior to meeting the 40mph wind threshold. The following items shall be secured and taken with you when leaving Kihei and Pukoo fire stations:

A. Take log book.

B. Secure utilities such as electric and gas.

C. Take reasonable food & water rations to shelter site.

XIII. Much thought and deliberation went in to deciding whether to include evacuating Paia Fire Station during a hurricane event. The possibility of a storm surge reaching Paia Fire Station is very remote. Most hurricanes form and approach Maui County from the south or southeast, per the Central Pacific Hurricane Center. Having a hurricane impact Paia Fire Station with a storm surge would require a hurricane to make landfall from the north or northeast. In general, waters north of Maui County tend to be cooler and not productive for hurricane creation or strengthening. If a hurricane does approach Maui from the north or northeast, Paia Fire Station personnel must be evacuated to a safe location.

XIV. Each of the command posts identified must have the following supplies available during a hurricane event.

- ICS forms
- Computer
- Printer
- Paper
- 5 portable radios & spare batteries (2 for IC, 1 each Ops, Logs and Planning)
- Satellite phone (if available)
- Food for 5 days
- Water for 5 days

XV. At the point the storm winds have fallen below the threshold, assistance to the public may continue. The EOC is responsible to announce when winds have fallen below 40mph. Captain's must be prepared to encounter roadways that are blocked by debris. Do your best to clear the roadway for your vehicle until Public Works crews arrive to do a more thorough job. Flat tires on emergency vehicles are a very common occurrence after a hurricane. Realize that roadway debris can cause damage to the apparatus.

D.O. 600.01

XVI. Although there is a calling to help everyone after a storm, it is highly important to conduct a damage assessment of the entire district so additional equipment can be identified and requested via the EOC immediately. There should be no delay in getting this information to the EOC. Sending a resource request list to the EOC in a timely fashion is one of the IC's highest priorities. The IC, or unified command staff, must allocate resources to accomplish the damage assessment process while also balancing the life safety assistance provided to the community.

XVII. EOC's Responsibility to the Incident Facilities

A. Communicate amongst the incident facilities (via 911or radio)

B. Identify & open shelters

C. Provide weather updates at specified intervals

D. Obtain resources as requested (USAR, heavy machinery, personnel, equipment etc.)

6.12.12 MFD Policy: Apparatus and Equipment Check, Management and Administration (M.A.) 100.25

APPARATUS AND EQUIPMENT CHECKS	M.A. 100.25

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	5	1	1/3/2019

PURPOSE: To ensure the readiness and maintenance of all apparatus (both front line and relief), and establish standardization, tracking and accountability guidelines for the use, maintenance, and loss prevention of emergency equipment.

GUIDELINE:

I. AUTHORITY & RESPONSIBILITY

Apparatus Operators are responsible for the proper inspection, maintenance, and documentation of their assigned apparatus and emergency-related equipment. Company Officers are responsible for ensuring all response apparatus within their facility are in good working order, clean, and ready for emergency response.

II. EQUIPMENT STANDARDIZATION

A. All types of Maui Fire Department apparatus shall maintain minimum standardized equipment inventories, compliments, and assemblies as identified within the most updated edition of the Maui Fire Department Apparatus Standardization Manual.

B. All personnel shall become familiar with capabilities and limitations of tools and equipment on the apparatus assigned to.

C. All personnel shall not alter or augment minimum standardized equipment inventories, compliments, and assemblies carried on fire apparatus without the approval of the Fire Chief.

D. Wherever possible, equipment shall be grouped on fire apparatus in standardized locations to enable efficient and effective equipment access and deployment for use at the task level.

E. A standard list of equipment has been established for each type of apparatus. All apparatus will be equipped as outlined in the inventories available on the Department's Shared drive. A copy of the standard inventory will be maintained in the Station files.

III. SECURING EQUIPMENT

A. All equipment must be secured to the apparatus, placed inside a compartment,

M.A. 100.25

secured inside pick-up beds, or tied down using straps, netting, or fastening devices that are appropriate for the type of load and apparatus.

B. All contaminated loose or rolled hose must be carried in the hose bed and secured with tie-downs or straps. Other non-contaminated hose may be carried in an enclosed compartment, not including the cab.

IV. FRONT LINE APPARATUS AND EQUIPMENT

A. General

1. The assigned Apparatus Operator is responsible throughout the course of the shift for ensuring that the apparatus is ready to respond and that all equipment is accounted for and operational.

2. Station personnel at a Battalion Chief's station will perform checks and routine maintenance on the Battalion Chief's vehicle.

3. Daily Apparatus Inspection Reports will be completed daily by Apparatus Operators and will document findings to ensure readiness of the apparatus. Completed Daily Apparatus Inspection Reports shall be submitted to the Deputy Fire Chief's Office on the 1st of every month.

4. Monthly Apparatus Inspection Reports will be completed by Apparatus Operators monthly and will be submitted to the Deputy Fire Chief's Office on the 1st of every month.

B. Daily Apparatus Checks

1. Pre-trip shall meet or exceed DOT regulations

- Apparatus appearance
- Fluid leaks
- All fluid levels
- Batteries
- DOT lighting
- Emergency lighting
- Emergency Audible Devices
- Wheels/Tires
- 7-step air brake check
- Windshield wipers

2. Fire Components and Equipment

- CAFS compressor fluid level (if applicable)

- Engage water pump and accessories
- Engage foam pump (if applicable)
- Engage CAFS compressor (If applicable)
- Check water tank level
- Check foam tank level (If applicable)
- Portable radios
- SCBA's
- Equipment inventory

3. Medical Equipment

   - First in medical boxes and other associated medical kits should be checked for proper inventory
   - Oxygen tanks shall be checked to ensure they have adequate O2 levels.

C. Weekly Apparatus Checks

1. Operate Hydraulic Ladder Rack (If Applicable)
2. Engage Aerial PTO (If Applicable)
3. Operate Aerial Device (If Applicable)
4. Operate Generators (If Applicable)
5. Engage PTO for Misc. Equipment (If Applicable)
6. Foam Pump Fluid Levels (If Applicable)
7. Hydraulic System (If Applicable)
8. Exercise Water Pump Drains
9. Exercise Discharge Relief Valve (If Applicable)
10. Exercise Primer
11. Ground Ladders
12. Hoses
13. Operate hydraulic ladder rack (if applicable)

D. Equipment Checks

1. At a minimum all small engine equipment shall be checked on the first day of each shift and after each use.

2. At a minimum all battery powered equipment shall be checked on the first day of each shift and after each use.

3. At a minimum all hand tools and misc. equipment shall be checked for cleanliness and damages on the first day of each shift and after each use.

M.A. 100.25

4. Rescue and Hazmat companies refer to your in company equipment check procedures regarding specialized equipment. **

V. FRONT LINE AND RELIEF APPARATUS TRANSFERS

A. The station that houses the relief apparatus is ultimately responsible for the accountability of that apparatus and equipment with the exception of Station 10.

B. When a company moves from a front line apparatus to a relief, they will:

1. Complete a thorough inventory of the relief apparatus on the same shift (preferably at the time of transfer) utilizing the Relief Apparatus Inventory form, and documenting any discrepancies.

2. If there are any equipment discrepancies at this time (missing, damaged, inoperable, etc.), the relief apparatus home station Company Officer, or Lead Fire Mechanic for apparatus stored at Station 10 will be notified immediately and they will be responsible for remedying the problem. This action should be documented on the form.

3. The front line apparatus personnel will record the items that had to be transferred due to missing, damaged, or inoperable equipment on the relief apparatus.

4. When a relief apparatus has been placed into front line status, all routine checks will be conducted as outlined in Section IV.

C. When a company moves from a relief back into a front line apparatus, they will:

1. Ensure the apparatus is clean and fueled. Prior to returning the relief to its home location, the company will conduct a final inventory, and document any discrepancies.

2. If any new equipment discrepancies (missing, damaged, inoperable, etc.) are identified, the company is responsible for remedying the problem, documenting their actions on the form, and notifying the home station Company Officer of the discrepancy.

D. When a relief apparatus is returned to the home station, the home station crew will:

M.A. 100.25

1. Complete a thorough inventory of the relief apparatus ***on the same shift*** (preferably at the time of transfer).

2. If any equipment discrepancies are found that were not documented by the company returning the relief apparatus, the home station Company Officer will contact the Company Officer who was in possession of the relief and immediately establish a plan to remedy the situation.

E. Clear and concise documentation for the Relief Apparatus is imperative as it will be used to track any equipment discrepancies and determine responsibility from both a repair/replacement (budget) impact and accountability standpoint.

VI. SERVICEABILITY

A. Apparatus will be taken out of service if there is any doubt or evidence of damage or malfunction of any of the components or systems that are critical to the mission of that apparatus.

B. During regular business hours, the Deputy Fire Chief, Assistant Chief of Operations and Lead Fire Mechanic will be notified immediately when an apparatus is taken out of service. After regular business hours, the on duty Battalion Chief and Lead Fire Mechanic shall be notified.

6.12.13 MFD Policy: Emergency Callout E.O. 300.12

EMERGENCY CALLOUT	E.O. 300.12

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	2	1	1/3/2019
9/1/2020	2	2	8/4/2020

PURPOSE: To provide a guideline for recalling off-duty MFD personnel during emergency operations.

GUIDELINE:

I. EMERGENCY RECALL

A. Upon authorization by the Fire Chief or their designee, the following will govern the recall of off-duty platoons:

1. Administrative staff shall, upon receipt of notice to recall the off-duty platoons, immediately refer to the Department Phone List for telephone numbers and notify all off-duty members to report.

2. Recalled members shall report to their regular place of assignment, unless otherwise specifically ordered. In the event of circumstances prohibiting or seriously curtailing vehicular traffic, they shall report to the nearest or most convenient fire station.

3. Members on suspension and/or sick leave shall not respond unless sick leave personnel call in as available and get BC approval prior to recall.

4. Personnel contacted to report for duty during an emergency recall who are ill, under the influence of medication, or under the influence of alcohol, to such an extent that their judgment and/or coordination is impaired, shall refrain from participating in the emergency recall.

5. Members on vacation leave or on their day off will report for duty.

6. Recall of off-duty platoons will, in each instance, be followed by a form letter from the Company Commander to the Battalion Chief, showing who reported and the time and date in each individual case.

7. Recalled members shall be listed in the Company journal and be entered into the Fire Records Management System (RMS) with the appropriate unit they are assigned to and their working dates and times.

II. CALLOUT

A. Whenever it is determined by a Battalion Chief or Incident Commander that an emergency will soon exceed or has already exceeded the capabilities of the entire on-duty staffing, that Battalion Chief or Incident Commander shall be able to obtain additional personnel by calling back off-duty personnel.

B. The Battalion Chief or Incident Commander shall refer to the Department Phone List for telephone numbers and notify members where report to. The use of gang paging" and/or mass notification programs such as Everbridge is also permissible.

C. Personnel contacted will report to an official staging area with full personal protective equipment or other equipment that was designated when contacted, unless otherwise specified.

D. Members on suspension and/or sick leave shall not be eligible for call back, unless the employee on sick leave called in "well" prior to the call back opportunity.

E. Personnel who are ill, under the influence of medication, or under the influence of alcohol, to such an extent that their judgment and/or coordination is impaired, shall refrain from participating in a callout.

F. Members on vacation leave may cancel their vacation leave and report for duty.

III. COMPENSATION

A. An employee on off-duty status who is called back to duty because of an emergency shall receive the greater of:

1. Four (4) straight time hours in the case of Employees on a twenty-four (24) hours shift and two (2) straight time hours in the case of Employees on other than twenty-four (24) hour work shifts; or

2. Overtime compensation at the applicable overtime rate calculated on the basis of actual time worked plus the time incurred in traveling from and to the Employee's home.

B. An Employee who is called out more than two (2) hours prior to the start of the Employee's next scheduled work shift and is required to continue working into such regular shift without eight (8) consecutive hours off, shall be released from routine station duty assignments for an equivalent period to rest at the station. However, the Employee shall be required to perform duties necessary to enable the unit to respond to emergencies.

E.O. 300.12

6.12.14 MFD Policy: Mayday E.O. 300.07

MAYDAY	E.O. 300.07

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	4	1	1/3/2019
9/1/2020	4	2	7/17/2020

PURPOSE: The purpose of this guideline is to provide action steps to be taken by the lost/trapped or in trouble firefighter(s), and the Incident Commander to initiate the Rapid Intervention Crew (RIC), for successful removal of the affected firefighter(s) from the hazardous environment.

GUIDELINE:

A mayday is defined as: Anytime a firefighter cannot safely exit an IDLH hazard zone.

I. MAYDAY PREVENTION

The best way to run a mayday incident is to operate in a manner that eliminates them from occurring in the first place. This is done by:

A. Perform a thorough size-up.

B. Operate in the correct strategy.

C. Maintain a tactical reserve.

D. Manage the work rest cycles.

E. All resources work within the IAP.

F. Manage air supplies (all members exit the hazard zone with at least 33% air reserve.)

II. HELP ORDER

The Help Order is the order in which an IC or a Division Supervisor will try to assist a firefighter who is experiencing a mayday. This order is:

A. Communicating to a lost firefighter self-rescue techniques to assist with the rescue.

B. Using a mayday firefighter(s) own company to assist with the rescue.

C. Using a company already located inside of the hazard zone to assist with the rescue.

D. Using an On-Deck company located outside of the hazard zone as a RIC crew.

III. FIREFIGHTER MAYDAY

A firefighter or interior unit having a mayday must:

A. Call for a mayday as soon as you realize you cannot safely exit the hazard zone.

B. Declare a mayday 3 times to ensure emergency radio traffic.

C. Give a CAN report that includes:

1. Name

2. Unit #

3. Assignment

4. Location

5. Needs

D. Calm down and begin self-help/self-rescue techniques.

E. Conserve air.

F. Activate PASS.

G. Make yourself as easy to find as you can, without using too much air or injuring yourself.

H. Maintain radio contact with the IC or Division supervisor as required.

IV. MAYDAY ALGORITHM

A. Mayday is declared.

B. IC acknowledges mayday and requests info for Rescue IAP.

C. IC provides any necessary self-help to mayday firefighter.

D. IC requests alert tones to dispatch.

E.O. 300.07

E. IC communicates "Emergency Traffic" report

1. Mayday update

2. Announce radio silence

3. Request resources as required

Example: "Emergency traffic, emergency traffic on the fireground, we have a mayday with Engine 1, maintain radio silence, communicate priority traffic only."

F. IC uses Help Order to address mayday.

G. Clear mayday when firefighter is found.

V. COMPANY RESPONSIBILITIES

Other Companies operating in the hazard zone during a mayday must:

A. Maintain radio silence.

B. Mayday announcements, priority traffic and status reports ONLY.

C. Be prepared to assist with the rescue if you are able to do so.

D. Interior crews that are actively addressing fire control when a mayday occurs should continue with their fire control efforts.

E. Perform accountability check with your crew. Do not communicate PAR unless requested to do so.

VI. COMMAND RESPONSIBILITIES

A. Take strong control of communication process.

B. Change the IAP to high priority rescue effort.

C. A NO PAR policy will take effect.

D. Request additional resources.

E. Take control of entry points: do not allow freelancing and self-deployment.

E.O. 300.07

F. Establish treatment.

G. Push control of the rescue operation down to the Division Supervisor where the mayday is occurring.

H. If there are no tactical level supervisors in place when a mayday is declared on the incident scene, the IC must continue to manage the entire tactical rescue effort required to resolve the mayday.

VII. CLEARING A MAYDAY

A. Once the mayday(s) have been controlled and there is adequate treatment under way, the IC should contact the Dispatch and clear the mayday radio traffic. This announcement should include:

1. A brief Mayday conclusion report

2. The strategy and IAP for the next operational period in the incident

3. Resource determination

Example: "Dispatch from Command: The mayday firefighter has been extricated from the building and is currently in treatment for fall injuries. I'm clearing the mayday radio traffic at 456 Main St. All units resume normal radio traffic. We will remain in the offensive strategy; we have primary and secondary all-clears and fire control in the fire structure. On-scene units will continue to overhaul and perform loss control. I am holding the current assignment."

6.12.15 MFD Policy: Brush and Wildland Fire Policy E.O. 302.14

BRUSH AND WILDLAND FIRES	E.O. 302.14

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	6	1	1/3/2019
9/1/2020	6	2	7/20/2020
7/1/2021	6	3	5/12/2021

PURPOSE: Establish guidance of operations to brush fires and wildland fire incidents.

GUIDELINE:

I. FIRST-IN UNIT RESPONSIBILITIES

A. Vehicles should be parked in a safe accessible location pointing away from the fire.

B. Determine the location of Safety Zones and Escape Routes.

C. Recon the fire thoroughly before committing to an attack strategy or committing resources.

D. Do an initial size-up upon arrival and provide an **Initial Radio Report (IRR)** based on the following considerations:

1. **S**ize of Fire — in feet or acres/small or large
2. **T**ype of Fuel — light, medium heavy, grass, brush, trees
3. **A**dvancing/Spread — creeping, running, crowning, spotting
4. **R**esidential/WUI — Homes involved or threatened
5. **W**ind — Speed and Direction
6. **A**ction/Access — Direct, indirect, point protection, access
7. **R**esources — on the way, on scene and require
8. **S**pecial Situations — People, utilities, livestock, traffic

E. Execute action plan

II. RESPONSE PACKAGE

A. Reported Brush Fire

- 1 Engine
- 1 Water tender

B. 1st Alarm Assignment

- 2 Engines
- 2 Mini's
- 2 Water tenders
- 1 Response Chief
- Air-1 on Stand-by

C. 2rd Alarm Assignment

- 4 Engines
- 2 Mini's
- 4 Water tenders (Public Works, Private)
- 2 Wildland Apparatus
- 2 Response Chiefs
- 2 Helicopters
- AHIMT on stand-by
- Rehab Unit
- Emergency call back

D. 3rd Alarm

- 6 Engines
- 2 Mini's
- 2 Wildland Apparatus (M42, M62)
- 4 Water tenders (Public Works, Private)
- 3 Response Chiefs
- AHIMT
- 3 Helicopters
- Rehab Unit
- Communications Unit
- Emergency call back
- Public Works notification (Water tenders, Heavy Equipment)
- Private Company notifications (West Maui Land Management, Lanai Company, Goodfellow, etc.)

E.O. 302.14

III. FIRE CONTROL STRATEGIES

A. Direct Attack:

Should be used whenever fire conditions allow fire personnel to work directly and safely on the fire perimeter.

1. Can be used initially on most small fires.

2. Personnel should “anchor and flank” a fire by first establishing a safe location, or anchor point, to start the attack without being out flanked by fire.

3. Fire suppression personnel on fires in light fuels should use the “one foot in the black” method in an inside out attack where the safety zone is the previously burned area adjacent to the burning fire perimeter.

4. A direct water attack is the fastest control evolution available to counteract wildfire spread. Brush trucks can accomplish this through pump-and-roll tactics.

5. Involves greater danger to personnel, especially when there is unburned fuel between you and the fire or you are working downwind of the fire.

6. Utilize class A foam when possible.

B. Indirect attack:

Used when fire personnel are prohibited from direct attack due to fire conditions or access to the fire. For indirect attack strategy, fire personnel work some distance away from the fire perimeter. This maybe in support of Wildland fire crew burning out and back fire operations, structure protection or other tactics.

1. Take advantage of natural and manmade barriers.

2. Fire control line should be continuous, to bare mineral soil.

3. Only set utilize back fires and burning out methods if properly trained and authorized to do so.

4. Use heavy equipment when possible.

C. Urban Interface Operations:

E.O. 302.14

Should be used when a brush fire threatens structures.

1. Structural triage is based on forecasted fire behavior, the surrounding area terrain, and defensible space.

2. Units assigned to protect a structure or improvement should first thoroughly size up the site to ensure firefighter safety can be maintained.

3. Entry into the structure through normal means or forcible entry should be established to utilize the interior of a structure as an emergency refuge area.

4. The company officer should ensure apparatus have good access and clearance and that the site is deemed safe to protect.

5. Apparatus should back into allow for quick egress if necessary.

6. During structure protection, crews should plan to remain as mobile as possible in case escape is necessary.

7. Hoselays should be as short as possible and limited to one or two at most.

8. If time permits, the exterior and interior of a structure should be prepared to limit the spread of fire and assist with fire control.

9. Utilize Dry CAFS for structural protection when necessary

IV. FIREFIGHTER SAFETY

A. <u>10 Standard Fire Orders</u>

1. Fight fire aggressively, but provide for safety first.

2. Initiate all actions based on current and expected fire behavior.

3. Recognize current weather conditions and obtain forecasts.

4. Ensure instructions are given and understood.

5. Obtain current information of fire status.

6. Remain in communication with crew members, your supervision, and adjoining forces.

E.O. 302.14

7. Determine safety zones and escape routes.

8. Establish lookouts in potentially hazardous situations.

9. Retain control at all times.

10. Stay alert, keep calm, think clearly, act decisively.

B. 18 Watch Out Situations

1. Fire not scouted or sized-up.

2. In country not seen in daylight.

3. Safety zones and escape routes not identified.

4. Unfamiliar with weather and local factors influencing fire behavior.

5. Uninformed on strategy, tactics and hazards.

6. Instructions and assignments not clear.

7. No communications link with crew members/supervisor.

8. Constructing line without a safe anchor point.

9. Building fire line downhill with fire below.

10. Attempting a frontal assault on the fire.

11. Unburned fuel between you and the fire.

12. Cannot see the main fire or not in contact with anyone who can.

13. You are on a hillside where rolling material can ignite fuel below.

14. Weather is getting hotter and drier.

15. Wind increases and/or changes direction.

16. Getting frequent spot fires across the line.

17. Terrain and fuels make escape to safety zones difficult.

E.O. 302.14

18. Taking a nap near the fire line.

C. Common Denominators of Fire Behavior on Tragedy Fires

1. On relative small fires or deceptively quiet areas of large fires.

2. In relatively light fuels, such as grass, herbs, and light brush.

3. When there is a unexpected shift in wind direction or wind speed.

4. When fire responds to topographical conditions and runs uphill. Alignment of topography and wind during the burning period should always be considered a trigger point to re-evaluate strategy and tactics

V. MOP-UP

A. On small fires, all fires should be extinguished in the mop up area, where quantities of burning materials are not so large as to make this impractical.

B. On large fires, completely mop enough of the area adjacent to the line to be certain no fire can blow, spot, or roll over the fire line under the worst possible conditions.

C. The areas or perimeter of the fire with the greatest chance for spread (e.g. head, uphill, flanks, downwind, or special hazards) should be given the highest priority for initial mop-up.

D. All smoldering material that is not put out should be spread well inside of the control line.

E. Eliminate all burned trees inside of the control line that could throw sparks over the control line.

F. Add Class A foam to water when possible for increased effectiveness.

G. Determine the distance inside the control line to be overhauled.

H. During rehab of mop-up crews, ensure at least two firefighters remain in the area to monitor for re-ignition or spread of fire.

I. Schedule for follow-up checks by crews to ensure the fire is contained, controlled, or extinguished inside of the control line.

E.O. 302.14

6.12.16 MPD Policy: Body-Worn Camera System G.O. 304.12

MAUI COUNTY POLICE DEPARTMENT

GENERAL ORDERS
CHAPTER 304
FACILITIES AND EQUIPMENT

Effective date: ***05/01/23*** Revision date: ***05/01/23*** Rescinds: GO 304.12 ***(10/14/21)***

Accreditation Standards:

BODY-WORN CAMERA SYSTEM
G.O. 304.12

I. PURPOSE

The purpose of this policy is to provide officers with instructions for the use of body-worn cameras (BWCs) in order to accurately record law enforcement actions and to capture evidence for investigations and court proceedings. This policy also sets forth guidelines for the management, storage, release, and retrieval of digital multimedia recorded by BWCs.

Officers shall utilize body-worn cameras in accordance with the provisions set forth in this general order in order to maximize the effectiveness of the audio/visual documentation to achieve operational objectives and to ensure evidentiary integrity.

BWCs provide additional information regarding investigative or enforcement contact with members of the public. BWC recordings however, provide a limited perspective of the encounter and must be considered with all other available evidence, such as witness statements, officer interviews, forensic analysis, and documentary evidence.

II. POLICY

It is the policy of this Department that officers shall activate their BWCs when such use is appropriate in the proper performance of their official duties and the recordings are consistent with this policy and the law. This policy does not apply to the use of covert recording devices, such as those used in undercover operations.

III. DEFINITIONS

AUDIT: The review of BWC recordings to ensure compliance with departmental directives.

BODY-WORN CAMERAS (BWCs): Body-worn cameras are camera systems issued by the Department and designed to be worn by police officers to capture digital multimedia evidence.

BUFFERING MODE: The BWC is on, but Event Mode has not been activated. While in the buffering mode, the camera will continuously record video only (no sound) in thirty (30) second loops.

BWC SYSTEM ADMINISTRATOR: The Quality Assurance Section Commander or

1

designee.

DIGITAL MULTIMEDIA EVIDENCE: Digital multimedia evidence, or digital evidence, consists of all digital recordings, including but not limited to: Audio, video, photographs, and their associated metadata. Metadata includes any digital identifiers that are captured as part of the actual recording, such as date/time, GPS coordinates, labeling, etc.

EVENT MODE: When the event button on the BWC is activated, the camera is recording both audio and video.

EVIDENCE DOCKING STATION (EDS): A portable multi-port docking station installed in each district. The EDS simultaneously recharges the BWC while uploading all digitally encrypted data from the device. The docking station then transfers the digitally encrypted data to Evidence.com.

EVIDENCE.COM: A digital evidence management service that stores digitally encrypted data in a secure environment accessible to authorized personnel based on security clearance.

IV. ADMINISTRATION

A. Only authorized personnel shall use, or be in possession of, a department issued BWC device.

B. All officers issued a BWC are required to wear, and use, their BWC while on duty.

C. Officers shall use only BWCs issued by the Department. The wearing of personally owned BWC equipment is not permitted.

D. BWC equipment is for official use only and shall not be utilized for personal use.

E. BWCs shall not be used to record:

1. Communications with other police personnel without the permission of the Chief of Police.

2. Encounters with undercover officers or confidential informants.

3. When on break or otherwise engaged in personal activities.

F. In any location where individuals have a reasonable expectation of privacy, such as a restroom or locker room.

G. Officers shall not alter, tamper with, or dismantle any hardware or software component of any BWC device.

H. All digital evidence collected using the BWC shall be considered government records pertaining to the prosecution or defense of any judicial or quasi-judicial action to which the State or any county is, or may be, a party. This provision includes records that, by their nature, must be confidential in order for the government to avoid the frustration of a legitimate government function, or other exemption from disclosure as may be appropriate.

I. Accessing, copying, forwarding, or releasing any digital evidence other than for official law enforcement use and is contrary to this procedure is strictly prohibited. Public release of digital evidence is prohibited unless approved by the Chief of Police, or designee.

J. Use of a secondary recording device (such as a video camera, cell phone, or other device) to record or capture digital evidence from Evidence.com or Axon View XL_is strictly prohibited.

K. It shall be deemed a violation of this policy for supervisors to review BWC recordings for the sole purpose of searching for violations of department policy or law not related to a specific complaint or incident.

L. Audits of BWC videos shall be initiated by the BWC System Administrator to ensure only authorized users are accessing the data for legitimate and authorized purposes.

M. Accidental Activation

In the event of accidental activation of the BWC, the recording officer may request the file be deleted by submitting an e-mail request, with sufficient information to locate the file, to the BWC System Administrator who shall review the file, and approve or deny the request, and take appropriate action accordingly.

1. The BWC System Administrator, or designee, will respond via e-mail to the requestor and indicate whether the request was approved or denied.

   a. The e-mail request and findings will be printed out and filed in the designated Accidental Activation BWC request folder.

b. Upon BWC System Administrator (or designee's) approval, the requested accidental activation will be accessed via Evidence.com.

(1) Once the requested video is accessed, an explanation for the deletion shall be documented in Evidence.com, and the audit log shall be printed.

(2) The printed audit log shall be filed in the designated Accidental Activation BWC request folder attached to the specified e-mail request and approval.

V. TRAINING

All officers assigned a BWC must complete Department provided training to ensure proper use and operation. Additional training may be required at periodic intervals to ensure continued effective use of the operation and performance of the BWC, as well as to incorporate changes, updates, or other revisions in policy and equipment.

VI. STORAGE

When not in use, BWCs shall be stored in the designated evidence docking station (EDS). Officers shall ensure the BWC is properly seated into the EDS to allow for downloading, charging, and updating.

VII. PRIVACY CONCERNS

A. Private Citizens do not have a reasonable expectation of privacy when talking with police officers during the scope of an officer's official duties, even when the contact is in a private residence. When officers are lawfully present in a home in the course of official duties, there is no reasonable expectation of privacy. Therefore, officers are not required to give notice they are recording. However, if asked, officers may advise citizens they are being recorded.

B. Officers shall activate or cease recording an event, in accordance with this policy and the law. Officers are not required to initiate or cease recording an event, situation or circumstance solely at the demand of a citizen.

C. Officers may cease recording at their discretion provided they state the reason for cessation prior to cessation as required in Article VIII, Paragraph B 7.

VIII. PROCEDURES

A. Camera Equipment

1. Prior to beginning a shift, officers shall retrieve their assigned BWC and conduct an operational inspection, then position the camera on their person to record video and audio from the officer's point of view.

2. Officers shall position the BWC at center mass on the chest to ensure the camera is in a position where the field of view provides for effective recording.

3. If at any time BWC equipment is not functioning properly, the officer shall immediately notify his or her on-duty supervisor and dispatch. The on-duty supervisor shall immediately contact, via phone, the BWC System Administrator, or designee, as soon as reasonably possible, to coordinate the repair of the BWC equipment.

    a. An e-mail shall also be sent by the notified on-duty supervisor to the BWC System Administrator, or designee, documenting date and time taken out of service, the name of the officer the camera is assigned to, and the malfunction the BWC is experiencing.

B. Officer Responsibility

1. Officer safety and public safety take precedence over recording events. Officers shall follow existing officer safety policies when conducting enforcement stops as outlined in Department policies and procedures. The ability to record an event shall not take precedence over officer safety and the safety of the public, which shall be the primary consideration when contacting citizens or conducting vehicle stops.

2. BWCs shall be used to capture audio and visual evidence for investigations and enforcement encounters. Police reports are still required and are the appropriate place to document the incident.

3. All officers who are issued a BWC shall keep their BWC on Buffering Mode while on duty, except during instances listed in this procedure under Privacy and Restricted Use.

4. Officers shall use the Event Mode to record enforcement related contacts. The Event Mode should be activated while driving to a call that has the potential to

involve an enforcement contact and continue recording until the contact is concluded or the contact transitions from an enforcement contact into intelligence gathering. Enforcement related contacts include: calls for service, law enforcement action, subject stop, traffic stop, and/or police services, provided that such activation does not interfere with officer safety or public safety.

5. Every officer at a scene shall activate their BWC and leave it on for the duration of the incident. This shall include transporting to, and entering the holding facility.

6. Officers on scene at intoxication checkpoints are not required to activate their BWC while flagging vehicles into the checkpoint or during the screening process, however the officer may do so at their own discretion.

7. Once an officer directs a motorist into the holding area of an intoxication checkpoint for further investigation, the investigating officer shall then activate their BWC. Officers that are not actively involved in the investigation being conducted in the holding area are not required to have their BWC activated as part of that specific investigation.

8. Officers utilizing the SELECT button when recording to intentionally enable the mute function shall state the reason prior to muting their recording (i.e. Confer).

9. Officers shall note that a BWC recording was made in the continuation section of the incident report or motor vehicle accident report (i.e., video captured utilizing my issued AXON Body Worn Camera).

10. If an officer fails to activate the BWC, or fails to record the entire contact, or interrupts/mutes the recording the officer shall document the reason the event was not recorded in the continuation section of the incident report or motor vehicle accident report.

11. It shall be deemed a violation of this policy when an officer intentionally fails to activate the BWC when such use is appropriate in the proper performance of his/her official duties and is consistent with this policy and the law, or intentionally terminates a recording having no documented or recorded reason.

12. Officers working plain clothes assignments are exempt from this policy.

C. BWC System Administrator Responsibilities

1. Operations and administration of the system.

2. System Evaluation.

3. Training.

4. Policy and Procedure review and evaluation.

5. Ensure all BWC recordings are retained per this policy.

6. Serve as Custodian of Records and manage requests for video evidence per this policy including requests pursuant to Hawaii Revised Statutes, Chapter 92F, Uniform Information Practices Act (HRS Chapter 92F.)

7. Manage requests for the deletion of accidental activation recordings.

8. Conducts a monthly audit of selected BWC video.

D. Category

1. Officers utilizing BWCs shall identify each video by category. In the event a video is taken and has no apparent evidentiary or administrative value, the officer may leave the video as uncategorized.

2. Categories

   a. Uncategorized

   b. Abuse

   c. Additional Information

   d. All Other

   e. Arrest

   f. Assault

   g. Assault – Felony

h. Burglary

i. Civil Matter

j. Disorderly Conduct

k. OUI

l. Face Page

m. Felony

n. Field Contact

o. Follow-up

p. Critical Incident

q. Harassment

r. Homicide

s. MVA

t. No Enforcement

u. Pending Review

v. Personal Assistance

w. Robbery

x. Suicide

y. Terroristic Threatening

z. Terroristic Threatening – Felony

aa. Theft

bb. Theft - Felony

cc. Traffic

dd. UCPV

ee. UEMV

ff. Use of Force

E. Entering Metadata

Each recorded segment requires metadata be entered, even if the segments are of the same event. All officers are required to add metadata at the conclusion of the event. The only exception is for officer safety reasons, at which time metadata should be added as soon as possible. Officer safety incidents may include critical incidents, exigent circumstances, and/or pending calls for service.

1. At a minimum, the metadata for each video shall include:

   a. The report number. Absent a report number, a citation number, or incident number.
   b. The category that most accurately fits the recording.

2. The information may be entered using a Department work station, via the Axon View XL application.

F. Retention of Digital Evidence

1. All recordings related to any criminal proceeding, claim filed, pending litigation, or a personnel complaint shall be securely stored until that matter is resolved and/or in accordance with the records and retention schedules for the State of Hawaii and/or the Maui Police Department.

2. Officers may make requests for the redaction of portions of a recording (e.g. in the event of a personal recording, conversations with confidential informants, etc.) in writing. The Chief of Police, or designee, via the BWC System Administrator, shall approve or deny requests in accordance with records and retention schedules. All requests for redactions and the final decision shall be

kept on file by the BWC System Administrator.

G. Accessing Digital Evidence

1. Evidence.com automatically date/time stamps, and records each access by officer name.

2. Once uploaded to Evidence.com, officers may view their own BWC recording for:
   a. The purpose of completing a criminal investigation and preparing official reports.

   b. Prior to courtroom testimony or for courtroom presentation.

   c. Prior to providing a statement pursuant to an administrative inquiry/investigation, including officer involved shooting investigations.

3. All other Departmental personnel shall request access to BWC evidence via the BWC Administrator in writing. The request should indicate the reason for the request, the identification number, date, time, and recording officer name(s). The request should be submitted via e-mail or To/From.

4. As defined herein, BWC evidence is exempt from disclosure pursuant to HRS Chapter 92F, but may be disclosed by the Chief of Police at his/her discretion, except where disclosure is prohibited by law.

H. Critical Incidents

1. The on-scene supervisor shall turn off and secure the involved officer(s) BWC and deliver the BWC to the BWC System Administrator. The BWC System Administrator, or designee, will upload the digital recordings and properly label them in Evidence.com.

2. Officers may review their video ***prior to*** making their preliminary verbal statement and writing their preliminary report.

I. Schools

1. While on any public or private school property, officers and School Resource Officers (SROs) shall only activate the recording function of their BWC when the

officer or SRO is investigating suspected criminal activity or during other enforcement activities. Contacts that become adversarial in nature should also be recorded.

2. SROs and officers should not activate the recording function of their BWCs during meetings, conferences, presentations or other routine interactions involving students and school staff that are of an administrative nature.

3. Officers shall activate the recording function of their BWC if any interaction at a public or private school evolves into an enforcement related contact or investigation.

4. Officers shall utilize their BWC as otherwise described in this directive.

IX. RANDOM AUDIT PROCEDURES

A. The BWC System Administrator shall conduct a monthly audit of selected BWC video to assess the camera is being utilized according to this directive, and to identify any video that may benefit future training.

1. The list of BWC videos shall be selected randomly, with a minimum of one video selected from each district and watch.

2. The random audit shall be conducted on a monthly basis.

3. This audit does not preclude the BWC System Administrator from reviewing video during the course of his or her duties as needed.

4. The monthly audit shall be documented and submitted to the Quality Assurance Captain for review and comment. Any video that may be used for training purposes shall be forwarded to the Plans and Training Section for review.

JOHN PELLETIER
Chief of Police

6.12.17 MFD Policy: Fire Ground Communication E.O. 302.02

FIRE GROUND COMMUNICATION	E.O. 302.02

Effective Date	Total Pages	Version Number	Revision Date
7/1/2019	6	1	1/3/2019
9/1/2020	6	2	7/20/2020

PURPOSE: To establish standardized communication and provide guidance for fire ground reporting.

GUIDELINE:

I. INITIAL RADIO REPORT

The initial IC begins the command, control, and communication process with an Initial Radio Report (IRR). This report provides Dispatch and all other resources responding to the scene with a size-up of conditions visible from the initial command position, typically from the seat of the apparatus.

A. Clear the Alarm

Clearing the alarm ensures that the IRR is delivered on the right channel, lets other responding units know that you are about to deliver the IRR and assume command, and automatically activates Level 1 Staging for other responding resources.

1. Call Dispatch (e.g. "Dispatch from Engine 1.") and wait for a response.

2. Clear the alarm and begin your IRR (e.g. "Engine 1 is on scene of a…")

B. Building/Area Description

1. Size

- Small – A 150 ft. interior line can access 100% of the potential fire area.
- Medium – A 150 ft. interior line can access 75% of the potential fire area.
- Large – A 150 ft. interior line can access 50% of the potential fire area.
- Huge/Gigantic/Mega - A 150 ft. interior line can access less than 25% of the potential fire area.

2. Height

- Number of stories
- Number of sublevels

3. Occupancy Type

- House
- Apartment (stand alone or complex)
- Commercial building
- Strip mall
- Restaurant
- High-rise

C. Problem Description and Location

1. Nothing showing
2. Light smoke showing
3. Working fire
4. Defensive fire conditions

D. Initial Incident Action Plan (IAP)

1. The TASK(S) of the initial arriving unit
2. The LOCATION of the task(s)
3. The OBJECTIVES of the task(s)

E. Declare the Incident Strategy (see the Fire Ground Strategy SOG)

1. Offensive
2. Defensive

F. Resource Determination to Dispatch

1. Cancel the original assignment
2. Hold the original assignment
3. Upgrade the original assignment to a full alarm

E.O. 302.02

4. Upgrade with specific single resources

5. Strike additional alarms

G. <u>Assume and Name Command</u>

II. FOLLOW UP REPORT

A. The follow up report provides additional information to responding units that was not included in the IRR, usually obtained as a result of a 360.

B. Information to be included in a follow up report:

1. <u>Any immediate safety concerns</u>

a. Potential collapse area

b. Hazardous roof structure

c. Power lines down or arching

d. Gas meter/tank exposed to fire

e. Swimming pools

f. Heavy roof coverings (ceramic or clay tiles)

g. Basement/sublevels

h. Number of stories on Charlie side (if different from the IRR)

2. <u>Revision of the IAP</u>

a. Physical rescue not seen from the initial command position

b. Sub-level fires

c. Fire located in a different area not seen from the initial command position

3. <u>Accountability location</u>

a. The initial arriving unit will be the initial accountability location for that area.

E.O. 302.02

b. The apparatus position (not the entry point) is used as the accountability location.

c. The accountability location is where later assigned units will drop off their tags

4. Tactical channel designation

III. ASSIGNING UNITS

A. Use TLO (task, location, objective) format to assign units.

B. Direct apparatus placement.

C. Direct which apparatus to pull hose lines from.

IV. COMMAND TRANSFERS

When a fast attacking IC transfers command to a subsequent arriving command officer, typically he/she is physically located in the hazard zone, so the transfer will take place using a portable radio. Command must be transferred in a standard manner, as follows:

A. Verify that all operating positions match the current incident conditions.

B. Announce arrival to scene.

C. Contact the current IC.

D. Confirm the position and function of all on-scene resources with the current IC.

E. Inform the current IC that you are taking command (e.g. “I’ll take it from out here”).

F. Inform Dispatch that you are taking command.

G. Announce to all units that you are assuming command (“Battalion Chief 2 will be assuming Market Street Command”).

H. Reevaluate and communicate the fire ground strategy.

I. Reevaluate the adequacy of on-scene and responding resources.

J. Announce the command post (CP) location.

E.O. 302.02

V. CAN REPORT

CAN reports should address the IC's assignment and the completion of the tactical priorities. Here is a basic list to choose from when providing a CAN report to command:

CONDITIONS	ACTIONS	NEEDS
What's burning	A/C progress	Reinforcement
Any obstacles	F/C progress	Relief
Smoke conditions	Can't find the fire	Support work
Fire conditions	Checking for extension	Tools or equipment
Heat conditions	PAR's	Cover other areas
Fire separation	All Clears	Urgent help
Fuel loads	Loss stopped	

VI. ROOF REPORT

Roof reports, communicated to command via radio from the company assigned to the roof, help to determine appropriate strategy, tactics and tasks.

A. The initial roof report should include the following:

1. Type of roof if not easily identified from the ground (peaked, flat, etc.)
2. Condition of roof (stable, unstable)
3. Fire or smoke conditions
4. Location of any firewalls
5. Unusual heavy roof loads (if present)
6. Conditions in the Attic (if known)
7. Basic blueprint of building if unusual
8. Action being taken

B. After venting the roof, the roof should communicate the following information.

1. Where you cut

E.O. 302.02

2. The affect on the fire

3. Conditions in the attic space

4. Roof stability

VII. OFFENSIVE TO DEFENSIVE STRATEGIC SHIFT

The announcement of a change to a defensive strategy will be made as follows:

A. Announce “Emergency Traffic, Emergency Traffic”

B. Announce the following: **“All units, we are switching to a defensive strategy. EXIT/ABANDON the structure and report PARs upon exit.”**

1. <u>“EXIT the Structure”</u> – Means an orderly retreat of personnel out of the hazard zone with interior lines and equipment being withdrawn and repositioned for defensive operations.

2. <u>“ABANDON the Structure”</u> – Means an emergency retreat of personnel with all interior lines and heavy equipment being left in place. All personnel in the hazard zone must exit the structure as quickly and safely as possible. Personnel Evacuation horn guidelines should be followed.

6.13 APPENDIX

6.13 Fatalities with Age, Sex, and Recovery Geolocation (Data Provided by MPD as per Table Subpoena 2024-045)

Table 6.13.1 Fatalities with age, sex, and recovery geolocation.

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
1	Abihai, Louise	97	F	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
2	Allen, Laurie	65	F	3[redacted] Pauwala Place, Lahaina, HI	N/A	N/A	Hospital (died due to injuries caused by the fire)
3	Anbe, June	78	F	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
4	Baclig, Angelica	31	F	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
5	Baylosis, Narciso Jr.	67	M	7[redacted] Pauoa Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
6	Baylosis, Vanessa	67	F	7[redacted] Pauoa Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
7	Benjamin, Melva May	71	F	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
8	Bernabe, Luz	64	F	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
9	Buen, Maurice	79	M	10[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
10	Carter, Buddy	85	M	2[redacted] Kamaka Circle, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
11	Carter, Kirk	44	M	12[redacted] Nahale Place, Lahaina, HI	N/A	N/A	Hospital (died due to injuries caused by the fire)
12	Castillo, Ediomede	35	M	3[redacted] Keone Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
13	Cole, Rex	64	M	6[redacted] Luakini Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
14	Coloma, Lydia	70	F	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
15	Coloma, Salvador	77	M	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
16	Constantino, Allen	25	M	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
17	Constantino, Leticia	56	F	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside

6.13 APPENDIX

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
18	Cook, Theresa	72	F	6[redacted] Wharf Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Ocean/Seawall
19	Deleon, Juan	45	M	3[redacted] Keone Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
20	Dias, Marilou	60	F	14[redacted] Komohana Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
21	Dofa, Virginia	90	F	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
22	Dyckman, Bette Jo	73	F	9[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
23	Dyckman, Robert	74	M	9[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
24	Eliason, Jeanne	57	F	5[redacted] Ka‘akolu Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
25	Fuentes, Keyiro	14	M	8[redacted] Ka‘akepa Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
26	Galinato, Alfredo	79	M	9[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
27	Gloege, Douglas	59	M	3[redacted] Paeohi Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
28	Gomes, Donna	71	F	3[redacted] Lahainaluna Road, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
29	Gordon, Michael	68	M	6[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
30	Hall III, George	67	M	8[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
31	Hartley, Carole	60	F	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
32	Heermance, Clau-dette	68	F	10[redacted] Waine‘e Street Lahaina, HI	N/A	N/A	Hospital (died due to inju-ries caused by the fire)
33	Ibara-Hinao, Roxanne	68	F	10[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
34	Imperial, Rafael	63	M	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
35	Jantoc, Buddy	78	M	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
36	Jones, Coleen	59	F	3[redacted] Lahainaluna Road, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
37	Kaita, Morris	74	M	2[redacted] Panaewa Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside

6.13 APPENDIX

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
38	Kam, Richard	88	M	Unknown	20.[redacted]	-156.[redacted]	Home - Inside
39	Kaminsky, Mark	59	M	10[redacted] Limahana Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
40	Kasprzycki, Paul	76	M	2[redacted] Wili Ko Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
41	Kauffman, Valerie	78	F	10[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
42	Kitaguchi, Albert	62	M	1[redacted] Wahikuli Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
43	Lara, Joseph	86	M	7[redacted] Paunau Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Outside
44	Losano, Poomaikai	28	M	1[redacted] Ipu ‘Aumakua Lane, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
45	Lutrania, Bibiana	58	F	___Mela Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
46	Mabalot, Rogelio	68	M	9[redacted] N Laalo Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
47	Mahnensmith, Michael	80	M	2[redacted] Wili Ko Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
48	Manibog, Lynn	74	F	3[redacted] Pauwala Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
49	Matsuda-Boucher, Douglas	65	M	6[redacted] Luakini Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
50	McCarthy, John Joseph III	74	M	2[redacted] Dickenson Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
51	Misaka, Michael	61	M	9[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
52	Molina, Antonia	63	F	7[redacted] Pauoa Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
53	Morinho, Michael	61	M	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
54	Nakamoto, Tim	69	M	8[redacted] Kaili Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
55	Nakamura, Todd	61	M	4[redacted] Aki Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
56	Nuesca, David Jr.	59	M	1[redacted] Malolo Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
57	Ono, Carolyn	73	F	4[redacted] Pā‘ū‘ū Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
58	Osato, Matsuyuki	83	M	8[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
59	Pagdilao, Pablo III	75	M	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
60	Ponali, Tau	66	F	6[redacted] Front Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
61	Portabes, Bernard	75	M	4[redacted] Hauola Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
62	Puou, Gwendolyn	83	F	8[redacted] Mela Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
63	Quijano, Felimon	60	M	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
64	Quijano, Junmark	30	M	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
65	Rabang, Sharlene	78	F	4[redacted] Alio Street, Lahaina, HI	N/A	N/A	Hospital (died due to inju-ries caused by the fire)
66	Rans, Rebecca	57	F	3[redacted] Paeohi Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
67	Rawlings, Alfred	84	M	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
68	Recolizado, Eugene	50	M	3[redacted] Aki Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
69	Recolizado, Justin	11	M	3[redacted] Aki Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
70	Recolizado, Maria Victoria	51	F	3[redacted] Aki Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
71	Ritcher, Dale Ann	66	F	8[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
72	Rocutan, Rodolfo	76	M	4[redacted] Pāʻūʻū Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
73	Rogo, Lee	76	M	5[redacted] Waineʻe Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
74	Sagudang, Con-chita	75	F	3[redacted] Pauwala Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
75	Sagudang, Danilo	55	M	3[redacted] Pauwala Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
76	Sato, Edward	76	M	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
77	Schilling, Joseph	67	M	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside

6.13 APPENDIX

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
78	Simpson, Anthony	43	M	3[redacted] Keone Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
79	Smith, James	79	M	7[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Ocean/Seawall
80	Smith, Leslie	80	F	3[redacted] Kamano Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
81	Somaoang, Jon-athan	76	M	7[redacted] Pupu Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
82	St. Clair, Floyd	75	M	9[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
83	St. Clair, Janet	75	F	9[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
84	Takafua, Tony	7	M	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Outside
85	Tam Lung, Free-man	80	M	7[redacted] Luakini Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
86	Thomas, Terri	62	F	8[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
87	Tobias, Carlo	54	M	14[redacted] Kahoma Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
88	Tomboc, Revelina	81	F	___Mela Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
89	Tone, Fa‘aoso	70	F	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
90	Tone, Malui‘fonua	73	M	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
91	Tone, Salote (Takafua)	39	F	9[redacted] Kuhua Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Outside
92	Trejos, Franklin	68	M	Unknown - Lived with Geoff and Shan-non Bogar	20.[redacted]	-156.[redacted]	Vehicle - Inside
93	Turbin, Nicholas	71	M	8[redacted] Puiki Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
94	Vaikeli, Linda	69	F	10[redacted] Waine‘e Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
95	Vasquez, Angelita	88	F	8[redacted] Kelawea Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
96	Villegas, Adela	53	F	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside

6.13 APPENDIX

#	Name	Age	Gender	Home Address	Latitude of Recovery	Longitude of Recovery	Recovery Location
97	Villegas, Joel	55	M	8[redacted] Kopili Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside
98	Wagner, Leroy	69	M	7[redacted] Paunau Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Outside
99	Wakida, Clyde	74	M	2[redacted] Puapihi Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Home - Inside
100	Yabes, Glenda	48	F	3[redacted] Hauola Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Other Building or House - Inside
101	Yamafuji, Todd	68	M	6[redacted] Luakini Street, Lahaina, HI	20.[redacted]	-156.[redacted]	Vehicle - Inside
102	Yoshino, Glenn	75	M	3[redacted] Pauwala Place, Lahaina, HI	20.[redacted]	-156.[redacted]	Outside

7.0 Glossary

Term	Definition
1015	Firefighter Mayday signal
AVL Timepoints	A moment in time when an event or measurement takes place
Burnover	An event in which a fire moves through a location or overtakes personnel or equipment where there is no opportunity to utilize escape routes and safety zones
Central	911 Center
Contraflow	A traffic management system that involves directing traffic in one or more lanes to travel in the opposite direction to normal flow
Department Operations Center (DOC)	Location used by the Department as a coordination point for agency resources and facilities during major incidents and planned events.
Ember	A small piece of burning or glowing coal or wood
Ember wash	Airborne and ground traveling embers
Egress	Path of travel or means of exiting
El Niño	Long-term weather events that greatly exacerbate dry/wet season patterns, often increasing rainfall at the start of the event followed by severe, region-wide drought
Formal Briefings	Where all agency representatives gather during regular intervals to report priority information regarding the incident
Gated wye	A type of firefighting hose valve with gateable valves on each outlet, which gives the firefighter maximum control over the water flow
Handline	A firefighting hose that is operated and maneuvered by firefighters (usually a 1 ¾” in diameter)
Headloss	The pressure, or energy lost by water flowing in a pipe or channel as a result of turbulence caused by the velocity of the flowing water and the roughness of the pipe
Hoʻoilo	Native Hawaiian for winter season
Kau	Native Hawaiian for summer season
Kauaʻula winds	A strong wind from the mountains, occasioned by the breaking over of the trade winds; often destructive at Lahaina
Kuʻialua fire	See “Lahaina PM fire” in the glossary
Lahaina AM fire	Fire that occurred in Lahaina August 8, 2023, between 06:34 and 14:17 HST
Lahaina PM fire	Fire that occurred in Lahaina on August 8-9, 2023, between 14:55 and 06:00 HST. Also referred to as the Kuʻialua fire in some dispatch reports
Makai	Directional queue meaning “toward the ocean”
Maui Nui	The islands that make up Maui County: Maui, Molokaʻi, Lānaʻi, and Kahoʻolawe (and the islet of Molokini)
Mauka	Directional queue meaning “toward the mountain”

7.0 GLOSSARY

Term	Definition
Med Comm	Emergency medical services for American Medical Response
Orographic Effect	Also known as the “rain shadow” effect, this term refers to the drier southern and western sides of Maui caused by the mountain shielding of those leeward sides
Red Flag Warning	Used to warn of an impending or occurring Red Flag event. Its issuance denotes a high degree of confidence that weather and fuel conditions consistent with Red Flag event criteria are occurring or will occur in 48 hours or less
Relief Apparatus	Older apparatus that were no longer front line
Systems Approach	A holistic and interdisciplinary method for understanding and solving complex problems
Upstaff	Increase staffing in anticipation of increased call volumes
Urban Conflagration	A large, destructive fire that spreads rapidly through a community, often beyond natural or artificial barriers
Utility Expert	Someone who has advanced electrical detection and management tools
Utility Vehicles	Typically standard pickup trucks - no water tank or pump - used to transport personnel into the operational area
WebEOC	Portal for resource tracking and incident communication that is maintained/monitored by HI-EMA and available to all county-level emergency management agencies across the State of Hawai‘i
Wildland-Urban Interface	The wildland–urban interface is a zone of transition between wilderness and land developed by human activity–an area where a built environment meets or intermingles with a natural environment

8.0 Acronyms and Abbreviations

Acronym	Meaning
AAR	After Action Report/Review
ADU	Accessory Dwelling Units
AG	Hawaiʻi Attorney General
AI	Artificial Intelligence
ALS	Advanced Life Support
AMR	American Medical Response
ARFF	Aircraft Rescue and Firefighting
ASOS	Automated Surface Observation System
ATF	United States Bureau of Alcohol, Tobacco, Firearms, and Explosives
AVL	Automatic Vehicle Locator/Location
AWWA	American Water Works Association
BC	Battalion Chief
BWC	Body-Worn Camera
CAD	Computer Aided Design
CAP	Civil Air Patrol
CAT	Crisis Action Team
CBA	Collective Bargaining Agreement
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
CGSB	Coast Guard Honolulu Small Boat
CMF	Continuous Microfiltration
CONUS	Continental United States
COOP	Continuity of Operations
COP	Common Operating Picture
CPR	Cardiopulmonary Resuscitation
CRA	Community Risk Assessment
CRR	Community Risk Reduction
CWPP	Community Wildfire Protection Plan
CWS	Community Water Systems

8.0 ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
DLNR	Department of Land and Natural Resources
DOAG	Hawai'i Department of the Attorney General
DOC	Department Operations Center
DOFAW	Hawai'i Division of Forestry and Wildlife
DOI	United States Department of Interior
DPW	County of Maui Department of Public Works
EAP	Employee Assistance Programs
EAS	Emergency Alert System
EMC	Emergency Management Center
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EO	Emergency Operations
E.O.	Executive Order
EOC	Maui County Emergency Operations Center
EOP	Emergency Operations Plan
EPA	United States Environmental Protection Agency
ERT	Emergency Response Teams
EVOC	Emergency Vehicle Operations Course
FD	Fire Department
FEMA	Federal Emergency Management Agency
FS	Fire Station
FMAG	Fire Management Assistance Grant
FPS	Feet per Second
FRSI	Fire Safety Research Institute
GRM	Gallons per Minute
G.O.	General Order
GPS	Global Positioning System
HAWAS	Hawai'i Warning System
HC&S	Hawaiian Commercial & Sugar Company

8.0 ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
HDOT	Hawaiʻi Department of Transportation
HECO	Hawaiian Electric Company
HFO	Honolulu Field Office, National Weather Service
HI-EMA	Hawaiʻi Emergency Management Agency
HANG	Hawaiʻi Air National Guard
HIARNG	Hawaiʻi Army National Guard
HIG	Hawaiʻi Institute for Geophysics
HING	Hawaiʻi National Guard
HWMO	Hawaiʻi Wildfire Management Organization
IBC	International Building Code©
ICC	International Code Council
IAP	Incident Action Plans
ICP	Incident Command Post
ICS	Incident Command System
IDLH	Immediately Dangerous to Life and Health
IMS	Incident Management System
IMT	Incident Management Team, HI-EMA
IPAWS	Integrated Public Alert and Warning System
IRC	International Residential Code©
IRPG	Incident Response Pocket Guide
IWI	Incident Within an Incident
JFSP	Joint Fire Science Program
KBDI	Keetch-Byram Drought Index
LMR	Land Mobile Radio
LG	Lieutenant Governor
LPG	Liquid Propane Gas
MCC	Maui Corporation Counsel
MDD	Major Disaster Declaration
MECO	Hawaiian Electric (slang)

8.0 ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
MEMA	Maui Emergency Management Agency
MFD	County of Maui Fire and Public Safety, aka Maui Fire Department
MG	Major General
MG	Million Gallons
MGD	Million Gallons per Day
MDP	Maui Police Department
NACTO	National Association of City Transportation Officials
NCEI	National Centers for Environmental Information
NFIRS	National Fire Incident Reporting System
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRT	National Response Team
NWCG	National Wildfire Coordinating Group
NWS	United States National Weather Service
OSHA	Occupational Safety and Health Administration
PA	Public Address
PAR	Personnel Accountability Report
PDC	Pacific Disaster Center
PFX	Pacific Fire Exchange
PHNL	Honolulu International Airport
PIO	Public Information Officer
POTS	Plain Old Telephone System
PPE	Personal Protective Equipment
PSI	Pounds per Square Inch
PSPS	Public Safety Power Shutoffs
POV	Privately-Owned Vehicle
PUC	Hawaiʻi Public Utilities Commision
PV	Photovoltaic

8.0 ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
RAWS	Remote Automatic Weather Stations
RBM	Response Boat - Medium
RFA	Request for Assistance
RFI	Requests for Information
RH	Relative Humidity
SAAO	State Aviation Action Officer
SAR	Search and Rescue
SCBA	Self-Contained Breathing Apparatus
SDWA	Safe Drinking Water Act
SEOC	State Emergency Operations Center
SITREP	Situation Report
SOC	Standards of Cover
SOP	Standard Operating Procedure
SRV	Special Response Paramedic Unit
SWP	State Warning Point
TAG	The Adjutant General
TD	Technical Discussions
UHM-CTAHR	University of Hawaiʻi at Mānoa College of Tropical Agricultural and Human Resources
UL	Underwriters Laboratories
ULRI	UL Research Institutes
USAR	Urban Search and Rescue
USCG	United States Coast Guard
USDA	United States Department of Agriculture
VoIP	Voice over Internet Protocol
VTC	Video Teleconference
WAS	Weather Alert System
WEA	Wireless Emergency Alert
WebEOC	Data management system used to manage EOC staffing and operations
WUI	Wildland-Urban Interface

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As this report deals with topics related to Hawaiian culture, geography, environment, and language, FSRI chose to include Hawaiian diacritical marks, such as the ʻokina (ʻ) and kahakō (macron) over vowels, throughout this report when writing Hawaiian words. These markings are essential features of modern, written Hawaiian language, serving to represent the proper pronunciation and meaning.

While we have made our best effort to use these marks properly, we acknowledge there may be unintentional errors. We did not include diacritical markings where we were unable to identify the proper spelling of a particular Hawaiian word (eg., Aa Street) or in instances where the information is from a third party's direct record (e.g., social media posts).

By including these marks, we aim to honor the Hawaiian language and show respect for its linguistic traditions – and for the people of Maui.

Lahaina Fire Incident Analysis Report

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