RESOLUTION NO. 6221

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CARPINTERIA APPROVING AND ADOPTING THE 2022 HAZARD MITIGATION PLAN FOR THE CITY OF CARPINTERIA, PURSUANT TO THE DISASTER MITIGATION ACT OF 2000

WHEREAS, the Federal Disaster Mitigation Act of 2000, as described in 44 CFR Section 201.6 mandates local governments to submit and maintain a Federal Emergency Management Agency (FEMA) approved local hazard mitigation plan; and

WHEREAS, the City of Carpinteria has participated in a county-wide multi-jurisdictional planning process with Santa Barbara County as the lead agency; and

WHEREAS, the City of Carpinteria sought and received a grant from the California Office of Emergency Services for an in-depth update; and

WHEREAS, the City formed a team of department representatives and held a public forum in order to identify and prioritize local hazards; and

WHEREAS, the draft LHMP has been available for public review on the City's website since July 2022; and

WHEREAS, the City Council held a public meeting on August 8, 2022 to review and comment on the Local Hazard Mitigation Plan (LHMP) draft; and

WHEREAS, the LHMP identifies the City's risk assessment and mitigation strategies to reduce the impacts of natural disasters on the public and local government; and

WHEREAS, identification of hazards in the City assists with response planning, exercise development, public education, and awareness, and other emergency management functions; and

WHEREAS, this Resolution enables the City of Carpinteria to qualify for additional mitigation funding after a disaster; and

WHEREAS, in 2006, the state adopted Assembly Bill (AB) 2140 which added provisions specifying what is to be included in a LHMP and requiring a linkage between a local jurisdiction's LHMP and the Safety Element of their General Plan; and

WHEREAS, AB 2140 provides the City the authority to adopt by reference the Local Hazard Mitigation Plan as part of the Safety Element of its General Plan and by doing so, become eligible for additional funding from the California Office of Emergency Services under the California Disaster Assistance Act, and

WHEREAS, the Local Hazard Mitigation Plan will be incorporated into the 2003 Safety Element of the General Plan by reference amending only the General Plan without creating a Local Coastal Plan Amendment; and

WHEREAS, the Local Hazard Mitigation Plan will be incorporated into the Safety Element of the General Plan with the next Safety Element update, in accordance with California Government Code Sections 8685.9, and 65302.6; and

WHEREAS, adopting the LHMP and amending the General Plan to incorporate the Local Hazard Mitigation Plan by reference is exempt from environmental review pursuant to the California Environmental Quality Act (CEQA) through the use of the "General Rule" Section 15061(b)(3) of the CEQA Guidelines as these actions will have no potential adverse impact upon the environment because the LHMP will act a guidebook for hazard mitigation strategies but does not implement any specific project, action, or funding; and

WHEREAS, The Federal Disaster Mitigation Act of 2000 requires the Local Hazard Mitigation Plan to be formally adopted by the City Council and provided to FEMA for formal approval.

NOW, THEREFORE, BE IT RESOLVED as follows:

SECTION 1. The above recitals are true and correct.

SECTION 2. The City Council approves and adopts the 2022 update to the City of Carpinteria Local Hazard Mitigation Plan (attached hereto as Exhibit 1) in accordance with the Disaster Mitigation Act of 2000.

SECTION 3. The City Council resolves to incorporate the updated Local Hazard Mitigation Plan by reference into the Safety Element of the General Plan without creating a Local Coastal Plan Amendment.

SECTION 4. The City Council resolves to incorporate the updated Local Hazard Mitigation Plan by reference into the Safety Element of the General Plan with the next Safety Element update in accordance with the requirements of Government Code Sections 8685.9, 65302, and 65302.6.

SECTION 5. This Resolution is effective upon its adoption.

PASSED, APPROVED AND ADOPTED on the 10th day of April 2023, by the following vote:

AYES: COUNCILMEMBER(S): Lee, Nomura, Solorzano, Alarcon, Clark

NOES: COUNCILMEMBER(S): None

ABSENT: COUNCILMEMBER(S): None

ABSTAIN: COUNCILMEMBER(S): None

Mayor, City of Carpinteria

ATTEST:

Brian C. Barrett, CMC, CPMC
City Clerk, City of Carpinteria

I hereby certify that the foregoing resolution was adopted at a regular meeting of the City Council of the City of Carpinteria held on April 10, 2023.

Brian C. Barrett, CMC, CPMC
City Clerk, City of Carpinteria

APPROVED AS TO FORM:

for

Jena Shoaf Acos, on behalf of Brownstein
Hyatt Farber Schreck, LLP acting as
City Attorney of the City of Carpinteria

EXHIBIT 1 TO RESOLUTION NO. 6221

City of Carpinteria
Local Hazard Mitigation Plan

An Annex to the Santa Barbara County Multi-Jurisdictional Hazard Mitigation Plan

February 2023

This Page Intentionally Left Blank

Table of Content

List of Figures

List of Tables

1.0 INTRODUCTION

Natural and human-caused disasters can lead to death, injury, property damage, and interruption of business and government services. When they occur, the time, money, and effort to respond to and recover from these disasters divert public resources and attention from other important programs and problems.

However, the impact of foreseeable yet often unpredictable natural and human-caused events can be reduced through mitigation planning. History demonstrated that it is less expensive to mitigate disaster damage than to repeatedly repair damage in the aftermath. A mitigation plan states the aspirations and specific courses of action jurisdictions intend to follow to reduce vulnerability and exposure to future hazard events.

The City of Carpinteria (City) recognizes the consequences of disasters and the need to reduce the impacts of all hazards, natural and human-caused. The City's 2022 Local Hazard Mitigation Plan (LHMP) update tiers from and refines the County of Santa Barbara (County) 2022 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Update in order to comprehensively identify, evaluate, and mitigate the known hazards that the City may face.

The LHMP was last comprehensively updated in 2017 as an annex to the 2017 MJHMP. Since 2017, the City has:

- Incorporated the LHMP goals, objectives, and mitigation actions into its local plans and processes, including the General Plan Safety Element by reference and specific hazard planning efforts (e.g., General Plan/Coastal Land Use Plan Update, Sea Level Rise Vulnerability Assessment and Adaptation Plan).
- Used the LHMP's assessment of capabilities, hazards, and vulnerabilities to inform planning, capital improvements, programs, decision-makers, and the public.
- Implemented mitigation actions through the City's general plan, capital improvement program, maintenance programs, grant programming, community outreach, and budget process.
- Reviewed and evaluated mitigation actions before and after disasters, including the Thomas Fire and Montecito debris flow.

The 2022 MJHMP Update was prepared and formulated with input and coordination from each of the eight incorporated cities, six special districts, the County, citizen participation, responsible officials, and support from the State of California Governor's Office of Emergency Services (Cal OES) and the Federal Emergency Management Agency (FEMA). The process to update the MJHMP included over a year of coordination with representatives from all participating agencies and County representatives which comprised the Mitigation Advisory Committee (MAC) (described further in Section 3.2 below). The City is a participating agency in the County's 2022 MJHMP Update.

The City's LHMP is used by local emergency management teams, decision-makers, and agency staff to implement needed mitigation to address known hazards. The LHMP can also be used as a tool for all stakeholders to increase community awareness of local hazards and risks and provide information about options and resources available to reduce those risks. Informing and educating

the public about potential hazards helps all county residents and visitors protect themselves against their effects.

Risk assessments were performed in order to identify and evaluate natural and human-caused hazards that could negatively impact the Carpinteria community. The LHMP describes historical hazard events, the future probability of these hazards, and their impact on the Carpinteria community. Vulnerability assessments summarize the identified hazards' impact on critical infrastructure, populations, and future development. Estimates of potential dollar losses to vulnerable structures are presented. The risk and vulnerability assessments were used to determine mitigation goals and objectives to minimize near-term and long-term vulnerabilities to the identified hazards. These goals and objectives are the foundation for a comprehensive range of specific attainable mitigation actions (see Chapter 8).

2.0 PLAN PURPOSE AND AUTHORITY

Federal legislation historically provided funding for disaster preparedness, response, recovery, and mitigation. The Disaster Mitigation Act (DMA) of 2000, also commonly known as "The 2000 Stafford Act Amendments," constitutes an effort by the Federal government to reduce the rising cost of disasters. The legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

Section 322 of the DMA requires local governments to develop and submit mitigation plans to qualify for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) funds. The 2022 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) is written to meet the statutory requirements of DMA 2000 (Public Law 106-390), enacted October 30, 2000, and 44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning, Interim Final Rule, published February 26, 2002. The Hazard Mitigation Assistance grants include the HMGP, Pre-Disaster Mitigation program, and the Flood Mitigation Assistance (FMA) program. Additional FEMA mitigation funds include the HMGP Post Fire funding associated with Fire Management Assistance Grant declarations and the Building Resilient Infrastructure and Communities funding associated with the 2018 Disaster Recovery Reform Act.

DMA 2000 specifically addresses mitigation planning at the state and local levels. It identifies requirements that allow HMGP funds to be used for planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced mitigation plan before a disaster. State, county, and local jurisdictions must have an approved mitigation plan in place before receiving post-disaster HMGP funds. These mitigation plans must demonstrate that their proposed projects are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities.

Local governments have certain responsibilities for implementing Section 322, including:

- Preparing and submitting a local mitigation plan;
- Reviewing and updating the plan every five years; and
- Monitoring mitigation actions and projects.

To facilitate implementation of the DMA 2000, FEMA created an Interim Final Rule (the Rule), published in the Federal Register in February of 2002 at section 201 of 44 CFR. The Rule spells out

the mitigation planning criteria for states and local communities. Specific requirements for local mitigation planning efforts are outlined in section §201.6 of the Rule.

In March 2013, FEMA released The Local Mitigation Planning Handbook (Handbook) as the official guide for local governments to develop, update and implement local mitigation plans. The Handbook complements and references the October 2011 FEMA Local Mitigation Plan Review Guide (Guide) to help "Federal and State officials assess Local Mitigation Plans in a fair and consistent manner." Local jurisdictions must demonstrate that proposed mitigation actions are based upon a sound planning process that accounts for the inherent risk and capabilities of the individual communities as stated in section §201.5 of the Rule. Throughout the 2022 update of the Plan, the Handbook and Guide were consulted to ensure thoroughness, diligence, and compliance with the DMA 2000 planning requirements.

DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network is intended to enable local and state governments to articulate accurate needs for mitigation, resulting in a faster allocation of funding and more effective risk reduction projects. As such, the Local Hazard Mitigation Plan (LHMP) was prepared as an annex to the County's MHHMP.

The following pages show the resolutions that adopt the City's 2022 LHMP.

[INSERT CITY RESOLUTION(S) ADOPTING PLAN UPDATE]

[INSERT CITY RESOLUTION(S) ADOPTING PLAN UPDATE]

3.0 PLANNING PROCESS

3.1 OVERVIEW

The planning process implemented for the County's 2022 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Update, including the City's Local Hazard Mitigation Plan (LHMP) update, utilized two different planning teams to review progress, inform and guide the update, and directly review and prepare portions of the plan, including each jurisdictional annex. The first team is the Mitigation Advisory Committee (MAC), and the second is the Local Planning Team (LPT).

All eight incorporated cities and the six special districts joined the County as participating agencies in the preparation of the 2022 MJHMP Update, including cities of Buellton, Carpinteria, Goleta, Guadalupe, Lompoc, Santa Barbara, Santa Maria, and Solvang; and special districts Cachuma Operation and Maintenance Board, Carpinteria Valley Water District (CVWD), Goleta Water District, Montecito Fire Protection District, Montecito Water District, and Santa Maria Valley Water Conservation District. Each of the participating agencies had representation on the MAC and was responsible for the administration of their own LPT. In addition, the MAC included representatives from other state and local agencies with an interest in hazard mitigation in Santa Barbara County, including local non-profit organizations, special districts, and state and federal agencies. This composition ensures diverse input from an array of voices representing all communities within Santa Barbara County.

Both the MAC and the LPTs focused on these underlining philosophies, adopted from the Federal Emergency Management Agency (FEMA) Local Mitigation Plan Review Guide:

- **Focus on the mitigation strategy**

  The mitigation strategy is the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.

- **Process is as important as the plan itself**

  In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan should also serve as the written record, or documentation, of the planning process.

- **This is the community's plan**

  To have value; the plan must represent the current needs and values of the community and be useful for local officials and stakeholders. Develop the mitigation plan in a way that best serves your community's purpose and people.

- **Intent is as important as Compliance**

  Plan reviews will focus on whether the mitigation plan meets the intent of the law and regulation; and ultimately that the plan will make the community safer from hazards.

As a result, the planning process for the County's MJHMP incorporated the following steps:

- **Plan Preparation**

- Form/validate planning team members
- Establish common project goals
- Set expectations and timelines

- **Plan Development**
  - Validate and revise the existing conditions/situation within the planning area;
  - Develop and review the risk to hazards (exposure and vulnerability) within the planning area;
  - Review and identify mitigation actions and projects within the planning area;

- **Finalize the Plan**
  - Review and revise the plan
  - Approve the plan locally and with state and federal reviewers
  - Adopt and disseminate the plan

3.2 MITIGATION ADVISORY COMMITTEE (MAC)

MAC Members

The MAC is a standing committee that works together throughout the year to discuss and provide input on a variety of activities. The City participated as a MAC member to prepare this LHMP as an annex to the 2022 MJHMP. The City was represented by Olivia Uribe-Mutal, Emergency Services Program Manager on the MAC.

The MAC meetings were designed to discuss each component of the MJHMP with MAC members and coordinate annex updates. Table 3-1 below provides a list and the main purpose and topics of each MAC meeting.

Table 3-1. Mitigation Advisory Committee (MAC) Meetings Summary

Date	Purpose
March 2021	**MAC Meeting #1 (virtual)** Provided an overview of the project and why the plan is being revised Reviewed FEMA guidance and processes Discussed roles and responsibilities of the participating jurisdictions
September 2021	**MAC Meeting #2 (virtual)** Reviewed goals of the project, role of the MAC Summarized public outreach results Presented hazards assessment and displayed select draft hazard maps Conducted interactive exercise to rank hazards
October 2021	**MAC Meeting #3 (virtual)** Provided results of hazard ranking methodology Presented vulnerabilities assessment Discussed mitigation goals, objectives, and strategies Reviewed County goals from 2017 and compared them to new goals

Date	Purpose
	Conducted interactive exercise on potential mitigation goals and strategies
October 2021	**MAC Meeting #4 (virtual)** Collected feedback on 2017 mitigation strategies Conducted interactive exercise on mitigation strategies for key hazards unaddressed in previous MJHMP Discussed annex updates
January 2022	**MAC Meeting #5 (virtual)** Presented draft plan Discussed key MAC/LPT review needs and key issues Discussed annex updates to dovetail with plan update
March 2022	**MAC Meeting #6 (virtual)** Reviewed and discussed public comments received on the draft plan Discussed coordination of LHMP annex updates

3.2.1 Local Planning Team (LPT)

Local Planning Team Planning Process

While the MAC provided feedback and guidance for the MJHMP, the LPT was crucial for reviewing data, informing the update of the annexes, and working towards local adoption. The MAC served as a liaison between the County and the LPTs for each participating agency, and then the LPTs of each participating agency would work independently on their local annexes and mitigation strategies. The team was created from key management and supervisory staff. The LPT is integrated into the development review process within the City. LPT members are responsible for sharing information for incorporation into the MJHMP and LHMP updates, as well as ensuring the LHMP is incorporated into other plans and planning efforts (e.g., General Plan, Capital Improvement Plans, etc.). The LPT reviewed the previous *Mitigation Strategy* and reported on progress made in implementing the listed actions. In addition, based on updates to the hazard identification, profiles, vulnerability assessment, and capability assessment, new mitigation actions were identified.

Local Planning Team Members

Table 3-2 lists the members of the Carpinteria LPT. These individuals collaborated to identify/validate the City's critical facilities, provide relevant information/material (i.e., plans), review/update sections, report on progress, and suggest new mitigation actions.

Table 3-2. City of Carpinteria Local Planning Team 2022

Department	Name	Title
General Government	Dave Durflinger	City Manager/Director of Emergency Services
General Government	Michael Ramirez	Assistant City Manager
General Government	Olivia Uribe Mutal	Program Manager
Community Development	Steve Goggia	Community Development Director
Community Development	Nick Bobroff	Principal Planner
Community Development	Dan Chepley	Chief Building Inspector and Plans Examiner
Public Works	John Ilasin	Public Works Director/City Engineer

Department	Name	Title
Public Works	Robert Howard	Public Works Supervisor
Public Works	Erin Maker	Environmental Program Manager
Parks, Recreation, and Public Facilities	Matt Roberts	Parks, Recreation, and Public Facilities Director
Law Enforcement	Ugo "Butch" Arnoldi	Police Chief, Santa Barbara County Sheriff's Department
Fire	Greg Fish	Fire Chief, Carpinteria-Summerland Fire Protection District
Utility, Potable Water	Robert McDonald	General Manager, Carpinteria Valley Water District
Utility, Wastewater	Craig Murray	General Manager/District Engineer, Carpinteria Sanitary District
Administrative Services	Licette Maldonado	Administrative Services Director

Overview of Local Planning Team Efforts

The Carpinteria LPT members worked directly with the County Office of Emergency Management (OEM) and the consultant team in order to provide data, recommended changes, and continually work on the MJHMP and LHMP updates throughout the planning process. The Carpinteria LPT met as needed during the planning process to discuss data needs and organize data collection. Table 1-4 below outlines a timeline of the Carpinteria LPT's activities throughout the planning process.

Table 3-3. Local Planning Team Activity Summary

Meeting Dates	Summary of Activity
February 2020	LPT kickoff meeting to discuss stakeholder and public involvement and refine the scope of hazard analysis
April 2021 to January 2022	Collated data to share with hazard mitigation planning team, including hazard identification, refreshed data layers for maps, and geographic settings. Completed Plan Update Guides to directly inform hazard priorities and mitigation capabilities
January to March 2022	Reviewed new maps, discussed local vulnerabilities. Developed data for new or expanded hazards, including debris flows, pandemics, and sea level rise. Provided input on the status of 2017 LHMP mitigation strategies. Reviewed draft mitigation strategies and provide feedback.

3.2.2 Public Outreach and Engagement

County OEM, the City, and the consultant worked together on public outreach throughout 2021 and early 2022. In addition to the outreach program undertaken by the County for the 2022 MJHMP update, the City also performed targeted local updates to stakeholders and City residents. The Public Outreach Plan (POP) employed a diversity of tools to maximize notification and participation from individuals throughout the Carpinteria community. The POP was responsive to limitations presented by the Coronavirus (COVID-19) pandemic and focused on direct bilingual outreach using a variety of digital tools, including a fact sheet, social media posts, emails, and press releases.

Multiple platforms and tools were used to publicize the project and opportunities to participate. All written notices were made available in English and Spanish. Throughout the process, emails were sent to the OEM's master contact list, which includes federal, state, and local government representatives, interested members of the public, neighboring counties, and relevant local organizations, all of whom were made aware of the survey and public workshops.

The 2022 LHMP update built on the County and City's existing techniques and adapted to the limitations imposed by the COVID-19 pandemic. All public and stakeholder meetings were hosted virtually through Microsoft Teams, and all outreach completed for the project was conducted via electronic communications. Many of the meetings used an interactive tool called Slido to collect feedback during meetings. Slido allows audience members to answer questions during presentations, helping the County collect direct detailed feedback and facilitate discussion.

The City's MAC and LPT members also participated in public outreach efforts for the MJHMP and LHMP update planning process by distributing notices for the County's 6-month-long community hazards survey (refer to Section 3.4.1 of the MJHMP) and three public workshops (refer to Section 3.4.4 of the MJHMP). The first MJHMP public workshop was hosted on April 7, 2021, focusing on hazard identification. The presenters provided an overview of the project and process for updating the MJHMP, and then provided time for the public to comment on hazard prioritization. The second MJHMP public workshop was hosted on November 4, 2021, focusing on mitigation strategies. During the workshop, the presenters summarized the results of the public survey, provided an overview of the hazards and vulnerability analysis, and then provided an overview of how the team would prepare the mitigation chapter. Presenters showed the draft mitigation goals and provided example mitigation strategies for each one. Then, the team used the interactive tool Slido to collect feedback from the audience about what mitigation strategies they would support. A third MJHMP public workshop was hosted in January 2022 to present the draft plan.

In January 2022, the City conducted additional outreach with a stakeholder meeting and a separate public workshop for the City. The stakeholder meeting was hosted on Thursday, January 27, 2022, with representatives from the City of Carpinteria, Carpinteria Valley Water District, Carpinteria Unified School District, Carpinteria Sanitary District, and Carpinteria-Summerland Fire Protection District (CSFPD). The City and the consultant presented relevant results from the MJHMP and goals for mitigation and facilitated a discussion on changes in capabilities of the stakeholders since 2017, recent hazards, and mitigations ideas that could be incorporated into the 2022 LHMP update.

On January 20, the City distributed a press release and social media post with information about the LHMP's public workshop on February 1 and how to attend. No participants attended the public workshop. Therefore, the City and the consultant recorded the presentation and uploaded the video to the City's website and YouTube channel. During the video recording, the consultant presented about the importance of the LHMP, provided an overview of the City's capabilities and hazard prioritization list, and showed key vulnerability maps of the City. The consultant also provided an example of a hazard mitigation action to inspire ideas for other mitigation actions to address hazards in the City. The City and the consultant asked viewers to send in comments, questions, and ideas for mitigation actions by Friday, February 11. Two members of the public responded to the video presentation with email comments regarding mitigation opportunities (see Section 7.0, *Mitigation Plan*.

In April 2022, the LHMP was completed and made available for public review, concurrent with review by FEMA and California Office of Emergency Services (Cal OES). The opportunity to review documents was announced on the City's website. Hard copies of the document were available at the City Hall and a digital copy of the document was posted on the City's website. The community was welcome to submit written or verbal comments to the Emergency Services Program Manager. In addition, the opportunity for the community to be heard was permitted during the City Council meeting before the adoption of this plan.

4.0 CAPABILITY ASSESSMENT

The City is a vibrant but easy-going, family-oriented small beach town with an economically and ethnically diverse population with proximity to strategic business centers and an idyllic seaside location.

4.1 GEOGRAPHY AND CLIMATE

The City is located within the South Coast region of Santa Barbara County and is both the southernmost and easternmost city in the county. The City covers a land area of approximately 2.6 square miles, and an ocean area of approximately 4.7 square miles, for a total of 7.3 square miles. Elevation ranges from sea level to approximately 700 feet above sea level. It is approximately 12 miles southeast of the city of Santa Barbara and approximately 80 miles northwest of Los Angeles.

The Carpinteria coastline faces south and is generally aligned in a northwest-southeast direction which transitions from sandy beaches in the northwest to uplifted cliffs in the southeast. The Channel Islands, located offshore and to the south, protect the coast from southerly waves. Photo: City of Carpinteria

The climate in the City is Mediterranean, characterized by dry summers and moderately wet winters. Temperatures in the region range from a low of approximately 63 degrees Fahrenheit (°F) in January to a high of approximately 75 °F in August and September. Precipitation typically falls between November and March, and the average annual rainfall is approximately 18 inches per year based on data from 1985-2016; however, there is a significant interannual and annual variation from this average with especially wet years attributed to El Niño conditions and drought conditions (City of Carpinteria 2019).

Three main creeks transect the City, including Carpinteria Creek, Santa Monica Creek, and Franklin Creek, along with other smaller drainages and tributaries. Santa Monica Creek and Franklin Creek within the City boundary are concrete-lined drainage channels that both terminate at the Carpinteria Salt Marsh, one of the area's prominent hydrologic features. Carpinteria Creek remains unlined and has been identified as a target for restoration to improve habitat for threatened and endangered southern steelhead trout and tidewater goby. The Carpinteria Sanitary District's

Wastewater Treatment Plant is located adjacent to the lower reach of Carpinteria Creek (City of Carpinteria 2019).

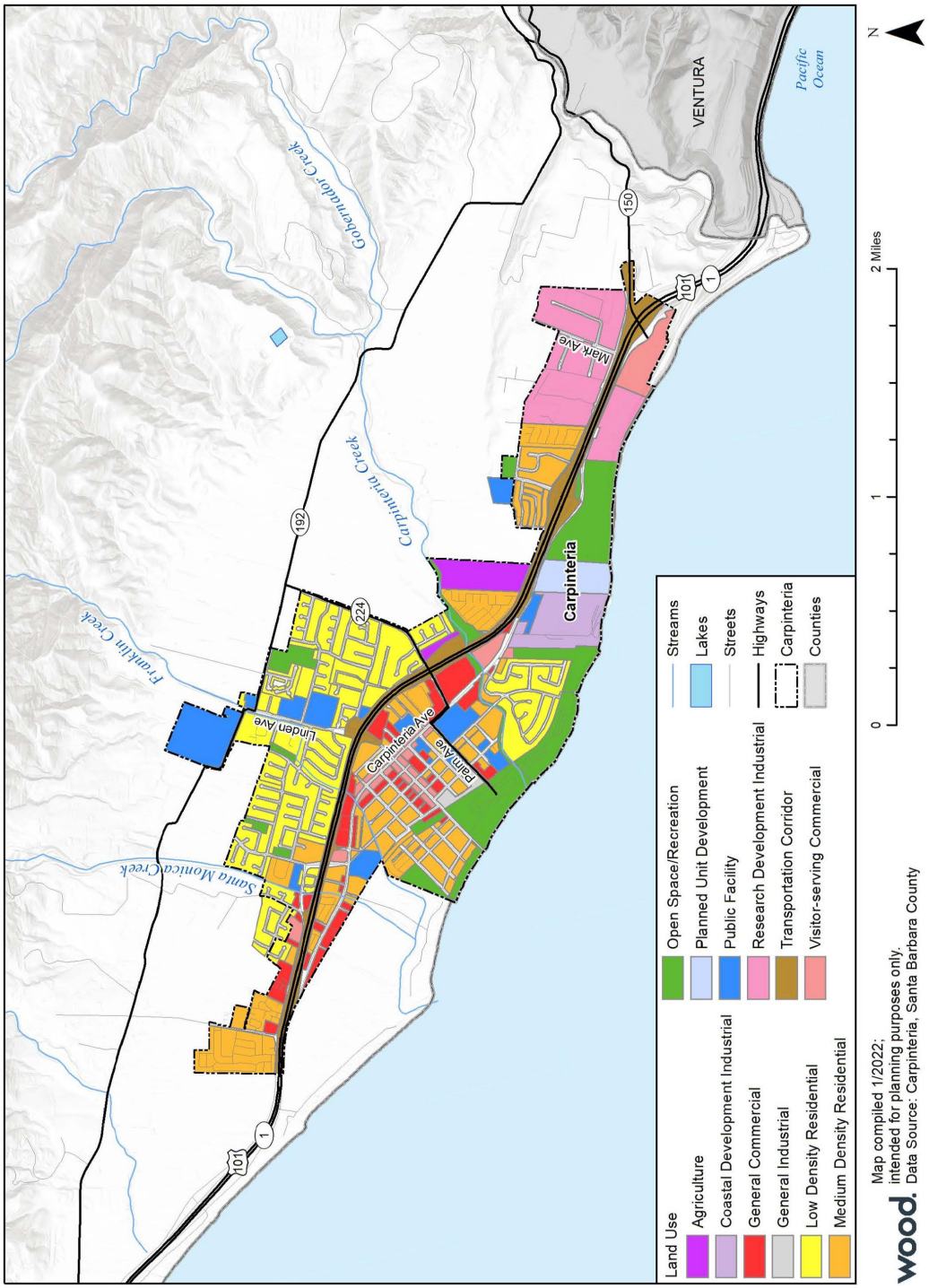
4.2 POPULATION AND DEMOGRAPHICS

According to the Carpinteria Valley 2021 Economic Profile, the City had 13,196 residents in 2021. Between 2016 and 2021, the overall population fell by approximately 350 residents as rising home prices resulted in out-migration. According to the Santa Barbara County Association of Governments (SBCAG), the projected 2050 population for the City is 14,602, an approximately 5.7 percent increase (SBCAG 2021). The largest proportion of the population, 51.1 percent, are people between the ages of 25 and 64. The City is also comprised of 18.7 percent of people aged 65 or older, and 15.7 percent of people aged 5 to 17 (City of Carpinteria 2021a).

Carpinteria Valley has evolved as a relatively affluent area where residents report higher incomes than the average Californian or average Santa Barbara County resident. In 2021, the median household income in the City of Carpinteria was $86,944, which was higher than Santa Barbara County ($83,714) or California ($82,053). More than 40 percent of households in the City earned $100,000 or more, and almost 18 percent earned more than $200,000. Approximately 3.9 percent of the City's population lives in poverty, as defined by the California Department of Finance (City of Carpinteria 2021a). Approximately 21 percent of residents aged 25 and older have a bachelor's degree in the City (compared to 20 percent countywide), and 14 percent have an advanced degree (compared to 15 percent countywide). Approximately 29 percent of Carpinteria residents have earned an associate's degree or have attended some college classes without graduating, while 36 percent have a high school diploma or less (City of Carpinteria 2021a).

The employment rate within the City is 62.4 as of 2019. During the height of the pandemic-related economic recession, the unemployment rate climbed to 12.7 percent but has improved to 4.9 percent as of August 2021. Just over 700 jobs were lost in the Carpinteria Valley labor market in 2020, a direct consequence of the pandemic. By mid-2021, most of these jobs had been restored, and full reinstatement of the workforce is expected to be complete by mid-2022. The biggest job losses occurred in the information, accommodation, and food services sectors, whereas the construction and cannabis industries have grown over the past few years (City of Carpinteria 2021a). The agriculture sector employs more people than any other industry, followed by manufacturing, the production of information (software), and the hotel and food services sector. The largest employer in the Carpinteria Valley is Procore followed by Agilent, the Carpinteria Unified School District, LinkedIn, and NuSil Silicone Technology (City of Carpinteria 2021a).

Figure 4-1. City of Carpinteria Land Use Map



4.3 LAND USE

The City's Land Use Element establishes the type and intensity of land uses and guides growth and development in the City. The Land Use Element is the basis of the Land Use Plan of the City's Local Coastal Program (California Coastal Act of 1976, §30108.5). The City encourages greater density and intensity development to take place along main transportation corridors and development that is compatible with surrounding land uses and protective of coastal resources unique to the area (see Section 4.9, *Legal and Regulatory Capabilities*).

Carpinteria is located almost entirely on a coastal plain between the Santa Ynez Mountains and the Pacific Ocean. In general, the area's topography slopes from the foothills of the Santa Ynez Mountains in the north towards the Pacific Ocean in the south. Between the foothills and the populated area of the City is an agricultural zone under the jurisdiction of County of Santa Barbara. Transportation corridors, including U.S. Highway 101 and the Union Pacific Railroad (UPRR), bisect the City. The entire City is located within the designated California Coastal Zone (City of Carpinteria 2019).

The western part of the City is made up of mostly Medium Density Residential areas interspersed by General Commercial closer to Highway 101. East of Santa Monica Road, the majority of housing is considered Low Density Residential with pockets of Public Facilities and Open Space/Recreation land uses north of Highway 101. Areas south of Highway 101 consist of Medium Density Residential and General Commercial land uses. Medium and Low Density Residential and Open Space/Recreation areas border the coastline to the south. The eastern wing of the City is comprised of Coastal Dependent Industrial, Research Development Industrial, and Visitor-Serving Commercial areas. The urban core of the City is located primarily along Carpinteria Avenue and Linden Avenue. The land uses in the vicinity of this urban Downtown District include primarily General Commercial, Visitor-Serving Commercial, Medium Density Residential, and Public Facility (City of Carpinteria 2016).

The commercial areas in the City have tight office leasing markets and are home to several of the region's top employers, such as Procor and LinkedIn. Industrial space within the City had vacancy rates that fluctuated from 7.8 to 3.6 percent from 2020 to 2021. The retail vacancy rate has remained stable since 2019, as the City has very few vacant storefronts and few facilities that would need to be repurposed in the event of a store closure (City of Carpinteria 2021a).

Since the last update of the City's LHMP in 2017, land use and population in the City has not substantially changed. As described above, modest development has occurred consistent with the adopted Land Use Element and has primarily comprised infill development and redevelopment within the City limits. There has been no expansion of the City boundary or its Sphere of Influence (SOI) and no comprehensive changes to the Land Use Element that would result in substantial densification. Further, as described in Section 4.2, *Population and Demographics*, City population has slightly reduced. As a result, the City's level of vulnerability to hazards analyzed in Section 6.0, *Vulnerability Assessment*, has not substantially changed due to land use, development, or population growth.

4.4 ECONOMY

Carpinteria's economy is based on agriculture, tourism/retail, light industry, and research & development. The community has evolved to become a diverse economy consisting of growing tech companies, manufacturers, and financial services firms. Software and IT development have flourished in recent years, as has the visitor-serving sector (City of Carpinteria 2021a).

Carpinteria Valley has been one of the primary regions for legal cannabis cultivation in California and cannabis growing makes up a large portion of the greenhouses on agricultural land within the Carpinteria Valley. As of September 2021, there were 29 legal cannabis companies in the Carpinteria Valley. All of these companies grow cannabis, and some also process cannabis that has already been harvested. Most growers operate in the greenhouses that previously grew orchids and other flowers (City of Carpinteria 2021a).

The City is home to nearly 300 retail storefronts, most of which are locally-owned stores. There are no big-box or regionally serving retail stores within the City. However, retail sales have been declining for several years, and store closures have been frequent for home furnishings, hardware, and garden supply stores. The most successful retail subsector has been food and beverage establishments. Over the last five years, the number of local food and beverage establishments has expanded by 24 percent and sales have grown by 17 percent (City of Carpinteria 2021a).

The City's retail environment is heavily dependent on tourism activity. It has been estimated that visitors to Carpinteria account for 65 percent to 85 percent of all retail sales. Since 2019, the City has collected a local sales tax of 1.25 percent, meaning that visitors could contribute more than $1 million to the City budget through sales taxes. The annual Avocado Festival, Carpinteria State Beach, and Carpinteria City Beach are the main tourist attractions in the City (City of Carpinteria 2021a).

In 2020 and 2021, taxable retail sales in the City declined sharply. Sales are down because of pandemic restrictions. For example, restaurants were forced to operate at reduced capacities and the Avocado Festival was canceled. At restaurants, taxable sales declined by more than 30 percent in 2020. Sales have rebounded sharply in 2021 but are still below their pre-pandemic levels. As fewer commuters are traveling through Carpinteria, taxable transactions at gas stations also declined during the pandemic. Further, the transition to online shopping has accelerated. (City of Carpinteria 2021a).

4.5 INFRASTRUCTURE

4.5.1 Transportation

The transportation infrastructure of the City supports its industries and residents. The City's Public Works Department operates and maintains approximately 32.2 roadway miles (64.8 lane miles) of surface streets, seven vehicular bridges, seven pedestrian bridges, 685 streetlights, and four traffic signals. In addition, there are 3.38 roadway miles (14.6 lane miles) of State-maintained freeway (City of Carpinteria 2003).

The transit system routes that serve the City are currently provided by the Santa Barbra Metropolitan Transit District (SBMTD) and the Ventura County Transportation Commission (VCTC), respectively (see Table 4-1).

Table 4-1. Transit Routes Serving the City of Carpinteria

Route Number	Route Description	Operating Days
Santa Barbra Metropolitan Transit District (SBMTD) Routes		
20	Carpinteria (Transit Center-Milpas-Montecito-Summerland-Carpinteria)	Weekdays and Weekends
36	Seaside Shuttle (Train Station-Linden-Carpinteria Avenue-Casitas Pass Road-El Carro Lane-Santa Ynez Road)	Weekdays and Weekends
Ventura County Transportation Commission (VCTC) Routes		
80	Coastal Express- Northbound to Santa Barbara; Southbound from Santa Barbara; Southbound to Ventura	Weekdays and Weekends
80C	Coastal Express- Southbound to Santa Barbara	Weekdays
84U	Coastal Express- Northbound to Santa Barbara	Weekdays
85C	Coastal Express- Northbound to Goleta	Weekdays

SBMTD Route 36 is the only intracity transit route which uses electric shuttles. The other transit routes are mainly intercity routes which use buses. Paratransit services are currently provided by Easy Lift Transportation and Help of Carpinteria.

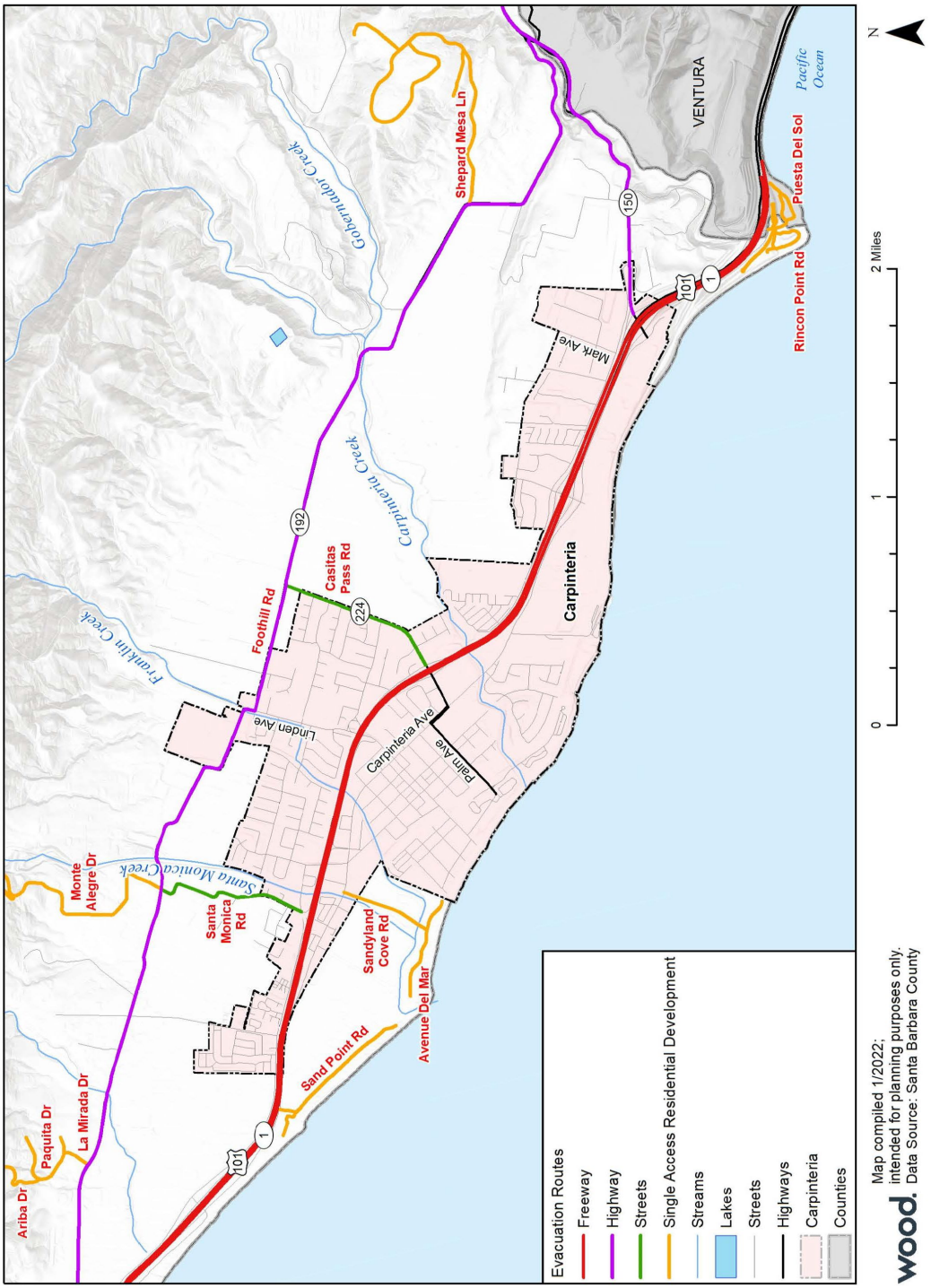
The county is also served by one federal and one state roadway. U.S. Highway 101 is the City's regional transportation corridor as described below:

- **Highway 101** serves as the primary transportation link between the City with other urban areas in the County (e.g., cities of Santa Barbara and Goleta) and with Ventura County to the south. It forms the foundation of the local transportation network, provides the primary freight artery through much of the central coast region, and is critical for the movement of people and goods statewide. Most trips along this route are related to business, government, recreation, tourism, and daily living, including the journey to work. In addition, Highway 101 carries the highest volumes of commercial trucks in the county, particularly between the Ventura-Santa Barbara County line and downtown Santa Barbara (SBCAG 2013).
- **State Route (SR-) 192** runs from SR-154 near Santa Barbara to SR-150 near the Santa Barbara–Ventura line. The two-lane road is better known as Foothill Road, as the route runs parallel to the foothills of the Santa Ynez Mountains.
- **SR 150** is a two-lane state highway that runs from Highway 101 near the Ventura/Santa Barbara County line to SR-126 in Santa Paula.

Highway 101, SR-192, and SR-150 are established as evacuation routes within the City as defined by the County's Climate Change Vulnerability Assessment (2021). The following local streets are also considered evacuation routes within the City boundaries (Figure 1-2):

- Santa Monica Road
- Casitas Pass Road
- Sandyland Cove Road

Figure 4-2. City of Carpinteria Evacuation Routes



4.5.2 Electricity and Natural Gas

Southern California Edison (SCE) provides electrical service to the City. In 2018, the City's residential energy usage was approximately 21,513,765 kilowatt-hours (kWh) of electricity, while non-residential facilities consumed approximately 48,411,607 kWh. The City is uniquely located near the end of the SCE power distribution grid. With most electric generation coming from only one southeasterly direction, Carpinteria is heavily dependent on a few key transmission lines. The 220-kilovolt (kV) lines going through the mountains provide most of the City's electricity, while 66-kV lines provide the remainder. Due to the set-up of the power distribution system, Carpinteria's power grid is less resilient to natural disasters. The Ellwood Natural Gas power plant is a backup capable of serving almost the entirety of southern Santa Barbara County but failed during the Thomas Fire and Montecito Debris Flows of 2018-2019. These events led to power outages for over 20,000 residents in the region; Carpinteria was left with decreased power supply for nearly a month. Due to these events, the City developed a Strategic Energy Plan (SEP) to improve emergency preparedness and the resiliency of the local electric distribution system (see Section 4.9.3, *City of Carpinteria Strategic Energy Plan*).

In addition to the recommendations found within the SEP, the City considers statewide renewable energy goals, such as Senate Bill (SB) 100 which sets a target of 100-percent carbon-free electricity by 2045. In 2019, the City became a member of Central Coast Community Energy (CCCE; formerly Monterey Bay Community Power), a locally managed public agency providing carbon-free and renewable energy to enrolled communities. CCCE is a Community Choice Energy Provider that partners with the local utility (i.e., SCE) which continues to provide service. However, the electricity supplied will be 100 percent carbon neutral and consist of approximately 35 percent renewable energy. The City enrolled in 2022, and the program aims to transition to 100 percent renewable energy, although a timeline has not yet been established (see also Section 5.3.6, *Energy Shortage & Resiliency*).

Regarding natural gas, the City and its surrounding areas receive natural gas from one supplier, the Southern California Gas Company (SoCal Gas). SoCal Gas pays a franchise fee as part of its agreement with the City and anticipates the resources necessary to sufficiently supply natural gas to the City for residential, commercial, and industrial uses.

4.5.3 Water Supply

The Carpinteria Valley Water District (CVWD) is the potable water purveyor for the Carpinteria community and serves a land area of approximately 11,098 acres located between the Santa Ynez Mountains and the Pacific Ocean. As of 2020, CVWD supplies potable water to approximately 15,966 people with a total of 4,531 service connections. Existing service connections under CVWD consist of the following account types: 3,265 single-family residential, 350 multi-family, 283 commercial/institutional, 58 industrial, 50 landscape irrigation, 386 agricultural, and 132 other (fire). Infrastructure to support 1,600 of these service connections was installed before 1964 (CVWD 2021a). Existing connections within the City primarily serve municipal uses (e.g., residential, commercial, and institutional), as very few agricultural parcels exist within City.

CVWD owns, operates, and maintains three potable water reservoirs with a combined storage capacity of approximately 10.68 acre-feet (AF). These reservoirs include Shepard Mesa (0.15 AF),

Foothill (9 AF), and Gobernador (1.53 AF). The Cachuma Operation and Maintenance Board, of which CVWD is a member unit, operates two additional reservoirs in the area, the Ortega Reservoir (60 AF) and Carpinteria Reservoir (44 AF). In addition, CVWD owns and operates approximately 88.8 miles of distribution pipelines, which consist of concrete (51 percent), steel (36 percent), and other materials (13 percent; CVWD 2021a). The existing pipeline infrastructure provides water to all developed parcels within the City. The CVWD obtains its water from the surface waters of the Cachuma Project and State Water Project (SWP) and groundwater from the Carpinteria Groundwater Basin. Lake Cachuma, located within the Santa Ynez River watershed, supplied approximately 41 percent of CVWD's water between 2016 and 2020 and has a maximum capacity of 195,600 AF. The SWP allocates up to 2,200 AF of water per year to CVWD, including a 200-AF drought buffer. Water from Lake Cachuma is treated at the Cater Water Treatment Plant north of the City of Santa Barbara before being conveyed to CVWD (CVWD 2021a).

The Carpinteria Groundwater Basin, which underlies the CVWD service area, provides the remaining water demand, extracted via groundwater wells. The Carpinteria Groundwater Basin spans approximately 16.6 square miles, with a maximum storage capacity of approximately 700,000 AF and a usable capacity of approximately 39,000 AF. Within the City, the CVWD owns, operates, and maintains five municipal wells, which have a combined capacity to produce approximately 3.98 million gallons per day. Two wells can extract and inject water, which helps meet peak water demand and provide some redundancy in the groundwater supply reliability (CVWD 2021a). See section 5.3.7, *Drought & Water Shortage* for further information regarding CVWD's water supply and drought management efforts.

4.6 SCHOOLS

The Carpinteria Unified School District (CUSD) provides public education services to students in the Carpinteria Valley, with district boundaries reaching south to the Ventura County line and west to Summerland. The CUSD serves approximately 2,200 students from transitional kindergarten through grade 12. The CUSD also provides early childhood programs to children three months to four years old. The CUSD has eight school sites: one comprehensive high school (Carpinteria High School), two small alternative high schools (Foothill Alternative High School, Rincon Continuation High School), one middle school (Carpinteria Middle School), three elementary schools (Aliso Elementary School, Canalino Elementary School, Summerland Elementary School), and a former public school site containing a public-private collaborative focused on early education and social services (Carpinteria Family School, which includes Canalino Early Childhood Learning Center and Special Education). Seven of the eight school sites are located within the City limits; Summerland Elementary School is located in Summerland outside the City's western boundary.

CUSD was one of the first school districts in California to open back up to in-person learning following school shutdowns amid the COVID-19 pandemic. In addition to difficulties with staffing within the District, student learning and the ability for teachers to engage with students were severely affected by the virtual learning environment during the pandemic. The ability of students to focus was also affected. The measurement of growth (i.e., grades) within CUSD has changed considerably as compared to the pre-pandemic environment to adapt to new learning approaches in schools (Pers. Comm. Maureen Fitzgerald 2022).

4.7 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

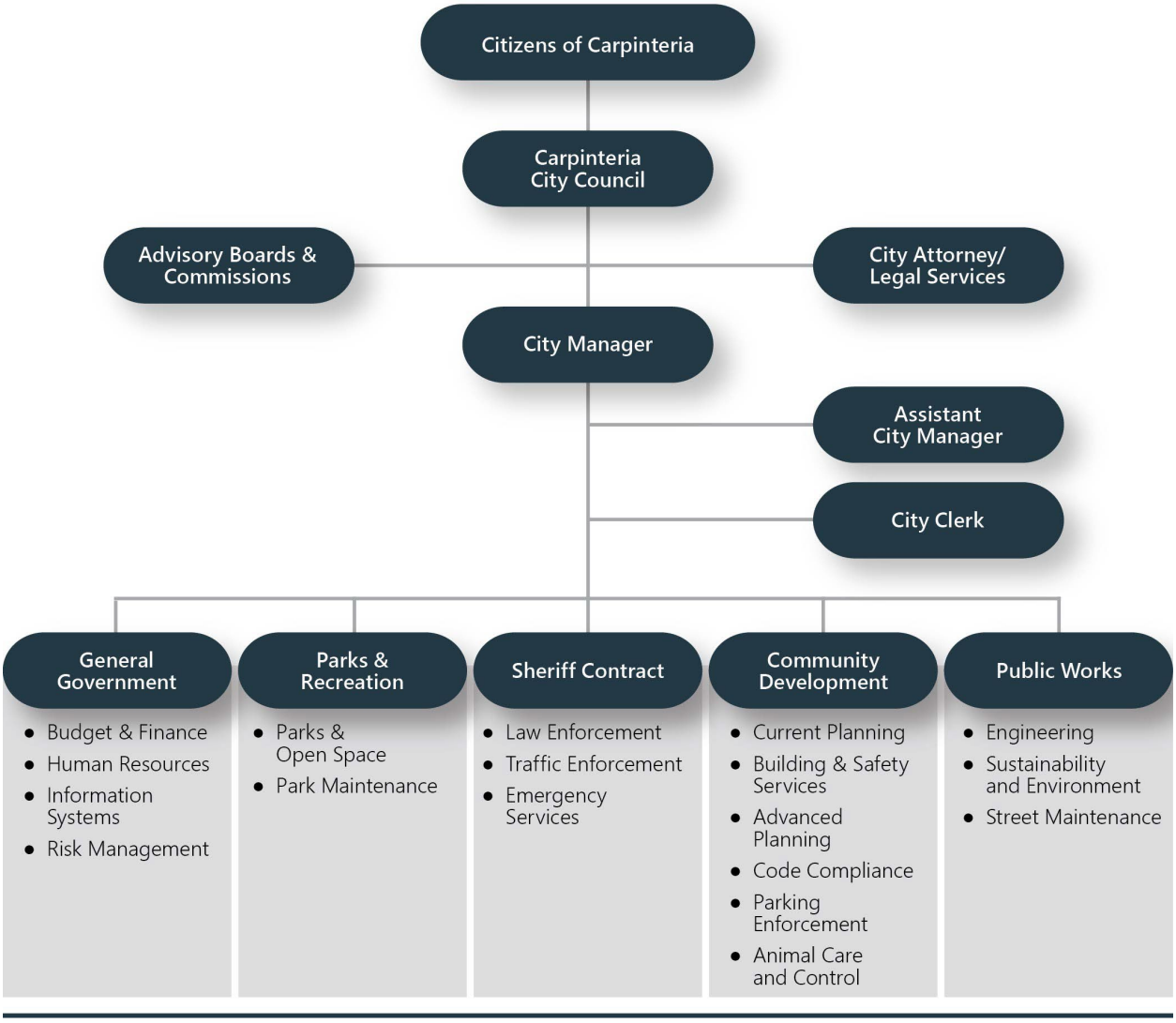
The City employs 32 full-time staff. The tourist season dictates the number of part-time staff, averaging 42 per year. The City has a robust volunteer program with approximately 200 volunteers participating in community and beach clean-up projects, docents, and the HOST Visitors Center. Over 270 community members have been Community Emergency Response Team (CERT) trained.

4.7.1 Governance

The City utilizes the Council-Manager form of local governance, which includes both elected officials and an appointed City Manager. Carpinteria has five City Council members, including a mayor and a vice mayor, which are appointed to represent the Carpinteria City Council.

The City Council is Carpinteria's legislative body, providing vision, setting and adopting policies, regulations, ordinances, and resolutions, approving budgets, and setting tax rates. City Council members hire the City Manager, who is responsible for the day-to-day administration of the City and serves as the Council's chief advisor. The City Manager prepares a recommended budget, recruits and hires most of the City's staff, and carries out the Council's policy. While the City Manager may recommend policy decisions, he is ultimately bound by the actions of the Council. The City Council also hires the City Attorney. The City's organizational chart is shown below.

Chart 4-1. City of Carpinteria Organizational Chart



4.7.2 City Administration

City Manager

The City Manager is responsible for overseeing the daily operations of the City and for organizational efficiency and effectiveness, for the preparation and presentation of the municipal budget, and keeping the City Council informed on other municipal financial matters, oversight of personnel matters, and for the oversight of municipal facilities. The City Manager leads the management team and all City departments.

The City Manager also serves as the Office of Emergency Services (OES) Director. The City Manager's office is responsible for the implementation of emergency management (including mitigation) programs for the City. As the OES Director, the City Manager oversees contracts with the Santa Barbara County Sheriff's Department for police services (see Section 4.7.3, *Police*

Department) and the Carpinteria-Summerland Fire District for fire services (see and Section 4.7.4, *Fire Department*).

4.7.3 Police Department

Police services in the City are provided via the Santa Barbara County Sheriff's Office Contract Service Bureau, which also provides services to the cities of Buellton, Goleta, and Solvang. Sheriff's deputies are responsible for responding to calls for service, conducting investigations, and providing crime prevention, community patrol, and public information services. The Sheriff's Office also actively participates in several programs, including Neighborhood Watch, youth school training, business training (e.g., educating merchants about fraud and site security), personal crisis consultation, and coordination with the California Department of Fish and Wildlife for wildlife and habitat violations. In addition, the Sheriff's Department develops and implements emergency response plans and policies, focusing on evacuation procedures and traffic control and including training for the Carpinteria CERT.

The Carpinteria Sheriff's Substation is located adjacent to City Hall at 5757 Carpinteria Avenue. The Sheriff's Office is contracted to support the City with at least two on-duty deputies on a 24/7 basis, in addition to one supervising deputy and administrative support, offering a deputy ratio of approximately one deputy per 4,500 City residents. During the more heavily visited summer months, the City employs additional deputies in the downtown corridor and Beach Neighborhood areas, with an additional two deputies working Friday through Sunday from approximately 10 a.m. to 8 p.m. When additional assistance is needed for patrol and incident response (usually no more than 2 to 5 percent of the time), the Carpinteria Sheriff's Substation receives assistance from Sheriff's deputies in nearby areas and assists with response in the nearby unincorporated County area.

Emergency Services Division

An Emergency Operations Center (EOC) provides a central location of authority and information and allows for face-to-face coordination among personnel who must make emergency decisions. The City's EOC, located at 1140 Eugenia Place, Suite A, provides centralized emergency management for when a major emergency or disaster strikes. The EOC includes a satellite phone, radios, conference rooms, and office areas. A generator provides emergency power to lighting panels, computers, wall circuits, telephones, and radios. The alternate EOC is located at Carpinteria City Hall Council Chambers (5775 Carpinteria Avenue). The alternate EOC is only be activated when the primary EOC is damaged, inaccessible, and/or evacuation of EOC staff members becomes necessary. When the use of the alternate EOC becomes necessary, those occupying the primary EOC will be asked to relocate to the alternative site.

When activated, representatives from City departments report to the EOC to coordinate City decision-making, simultaneously coordinate department activities, and liaise with different levels of government as well as with private entities. The following functions are performed in the City's EOC:

- Managing and coordinating emergency operations.
- Receiving and disseminating warning information.
- Developing emergency policies and procedures.
- Collecting intelligence from, and disseminating information to, the various EOC representatives and, as appropriate, to county and state agencies, military, and federal agencies.

- Preparing intelligence/information summaries, situation reports, operational reports, and other reports, as required.
- Maintaining general and specific maps, information display boards, and other data pertaining to emergency operations.
- Continuing analysis and evaluation of all data pertaining to emergency operations.
- Controlling and coordinating, within established policy, the operational and logistical support of departmental resources committed to the emergency.
- Maintaining contact and coordination with other local government EOCs and the Santa Barbara Operational Area.
- Providing emergency information and instructions to the public, making official releases to news media, and scheduling press conferences, as necessary.
- Resource ordering, dispatching, and tracking.

The City's Emergency Services Coordinator is responsible for management of the primary and alternate EOCs, including maintaining operational readiness of the EOCs. Positions assigned to the EOC will brief City decision-makers of the emergency situation and recommend actions to protect the public (e.g., alerting and warning the public, evacuation of risk area, activation of shelters, request for operational area/state/federal assistance, etc.). The Director of Emergency Services/EOC Director has the primary responsibility for ensuring that the City Council is kept apprised of the emergency situation.

The Emergency Services Division is organized into the following sections:

- **Management Section:** Responsible for overall emergency management policy and coordination through the joint efforts of governmental agencies and private organizations. Management will either activate appropriate sections or perform their functions, as needed.
- **Operations Section:** Responsible for coordinating all jurisdictional operations in support of the disaster response through implementation of the City's EOC Action Plan.
- **Planning & Intelligence Section:** Responsible for collecting, evaluating, and disseminating information and coordinating the development of the City's EOC Action Plan in coordination with other Sections.
- **Logistics Section:** Responsible for providing communications, facilities, services, personnel, equipment, supplies, and materials.
- **Finance & Administration Section:** Responsible for financial activities and other administrative aspects.

4.7.4 Fire Department

Fire protection service in the City is provided by the Carpinteria-Summerland Fire Protection District (CSFPD), which serves approximately 40 square miles along the coastline from the Santa Barbara-Ventura County line to the east and Montecito to the west. The CSFPD provides personnel and facilities to service the City in the event of a fire. As first responders, the CSFPD personnel also provide Emergency Medical Services (EMS) and are supported by ambulance services delivered through a public/private partnership, which includes American Medical Response. The CSFPD also provides non-emergency services that include fire and life safety inspections, building inspections, fire investigations, code compliance, and public education.

The CSFPD maintains two fire stations located at 911 Walnut Avenue in Carpinteria and 2375 Lillie Avenue in Summerland. Both stations provide response services to the City. Response times for fire services range from three minutes (inner City) to five minutes (City periphery). The CSFPD has a total of 27 firefighters, two fire engines, one squad, two water rescue wave-runners, two all-terrain vehicles (ATVs), and three command vehicles. All CSFPD apparatuses are staffed with a minimum of one licensed paramedic who provides advanced life support services as the EMS first responder. All fire fighters are trained in EMT-1 and fire suppression response.

At least one Ventura County Engine is available to the City for first alarm incidents through an automatic aid agreement. Additionally, the City's Emergency Operations Plan provides for the progressive mobilization of resources to and from local governments, operational areas, regions, and the state to provide requesting agencies with adequate resources. Using the Emergency Operations Plan, the City may request the assistance of additional fire engines as necessary, such as from the Montecito Fire Protection District (to the west) (City of Carpinteria 2014).

The Administration Section develops, implements, and monitors policies, procedures, budgets, fees, automatic aid agreements, mutual aid agreements, and liaisons with other City departments and outside agencies. The Fire Prevention Bureau coordinates the adoption of codes and ordinances, reviews site and building plans for fire code compliance, develops and presents public education programs, and manages the City's weed abatement program. The Suppression Section maintains the Department's personnel, apparatus, equipment, and fire stations in a state of readiness to respond to the community's needs, develops and implements standard operating procedures for various types of emergency responses, responds to all types of emergencies, and trains and interacts with neighboring jurisdictions and regional agencies.

4.7.5 Community Development Department

The Community Development Department (CDD) provides primary support to the Planning Commission and its advisory bodies, the Architectural Review Board and the Environmental Review Committee. CDD also provides staff support as needed to the City Council, City Manager, other City Departments, and other boards and committees as needed (Traffic Safety Committee, Tree Advisory Board, Downtown "T" Business Advisory Board, Technical Planning Advisory Committee and Joint Housing Task Group). Staff is also involved in reviewing and commenting on environmental documents prepared for projects in the County's jurisdiction as well as those proposed by Special Districts within and surrounding the City boundaries. All work is done with the goal of implementing the Department's Mission Statement. Individual Divisions are discussed below.

Building & Safety Division

The Building and Safety Division aids in applying for and reviewing Building Permit Applications, including site and building plans, for compliance with building codes and ordinances. The Building and Safety Division enforces the adoption of building, plumbing, electrical, seismic, and mechanical/structural codes and develops building ordinances. The Division also provides damage assessment of structures from multiple causes to facilitate the repair and future occupancy.

Planning Division

The Planning Division develops and maintains plans and permits, the City General Plan/Local Coastal Land Use Plan, zoning ordinances, and development standards. The Planning Division also provides oversight of the City development process assuring compliance with zoning and general plan, including environmental impact reports, design review, historic preservation, landscape review, habitat conservation, floodway prohibitions, and floodplain development standards.

Code Compliance

The Code Compliance Division investigates and resolves building and zoning compliance issues, enforces parking regulations, and implements the City's animal care and control programs.

4.7.6 Public Works Department

The Public Works Department is comprised of the following divisions and respective programs:

Engineering Division

- Public Works Administration
- Transportation, Parking, and Lighting
- Capital Improvements

Street Maintenance Division

- Street Maintenance
- Right-of-Way Maintenance

Sustainability and Environment Division

- Resource Conservation
- Solid Waste
- Watershed Management

The Public Works Administration Program is responsible for the planning, organizing, and directing of all services in the Public Works Department. The Public Works Department is augmented with contracts for professional (consulting) services, solid waste hauling, street sweeping, and street and right-of-way maintenance. The Public Works Administration Program also administers the Engineering Permits Service. Under this service, engineering permits are issued for grading, right-of-way encroachments, dumpsters, and oversize loads; and special event permits are issued for events held in the public right-of-way including temporary parking.

The Street Maintenance Program provides for the maintenance of all City streets. There are approximately 33 centerline miles of streets or 6 million square feet of pavement which now includes the new Via Real extension. Maintenance of City streets includes pavement, traffic control devices (traffic signals, signing, and striping), street lights, bikeways (bike paths, bike lanes, and bike routes), and bridges. Repairs of pavement potholes and traffic signing and striping are able to be performed by Street Maintenance Division staff. Maintenance contracts augment Street Maintenance Division staff for larger work involving pavement replacement, traffic signals, and street lights.

The Right-of-Way Maintenance Program provides for the maintenance of all City rights-of-way. Maintenance of City rights-of-way includes curbs, gutters, sidewalks, curb ramps, planter medians, benches, trash receptacles, bicycle racks, street trees, and graffiti removal.

The Resource Conservation Program provides for renewable energy development, energy efficiency, and strategic energy planning. The City is committed to providing equitable, clean resilient power for the community. The program involves the following services or activities: Community Choice Energy, Strategic Energy, and Energy Efficiency.

The Solid Waste Program provides for solid waste collection including handling, disposal, and recycling operations; and street sweeping. The City contracts with E.J. Harrison and Sons, Inc. to provide the solid waste collection and with Pacific Sweep, LLC to provide the street sweeping. The program also provides for the collection of antifreeze, batteries, oil, and paint; and an annual collection of household hazardous waste, household goods, and electronic waste (E-Waste). The Solid Waste Program is funded by Assembly Bill (AB) 939 fees which are collected by E. J. Harrison and Sons, Inc. and remitted to the City as part of the contract. The cost of the program is also offset with the Oil Payment Program Funds from the California Department of Resource, Recovery and Recycling (CalRecycle).

The Watershed Management Program provides for the public outreach and education of stormwater quality; tracking of illicit discharges; water quality testing at storm drain outfalls or discharge areas; implementation and enforcement of stormwater quality best management practices (BMPs) for development, redevelopment, and City operations; regional coordination; and the overall stewardship of local watersheds by regulating stormwater runoff into creeks and salt marsh. The program was created in response to a need to comply with the National Pollution Discharge Elimination System (NPDES) Phase II Small Municipal Storm Sewer System Permit. The program involves the following services or activities: Stormwater Management, Storm Drain Maintenance, Regional Watershed and Stormwater Funding Coordination, and State and Federal Permit Coordination.

4.7.7 Parks and Recreation Department

The City Parks and Recreation Department (PRD) provides the City's recreation programs and maintains the parks, the community pool, and the Veteran's Memorial Building. In total, there are 19 parks and recreation facilities within the City that are operated by the PRD. The PRD is responsible for responding to issues such as maintenance (e.g., weeding, graffiti) and street repairs (e.g., streetlight repairs, utility pole maintenance) associated with their facilities. Programs operated by PRD include Junior Lifeguards, adult coed softball, ocean recreation facilities such as the boathouse on Ash Avenue, and the operation of the Community Garden Park near the Amtrak train station. Privately sponsored sports leagues also exist for youth and adults such as baseball, football, and soccer.

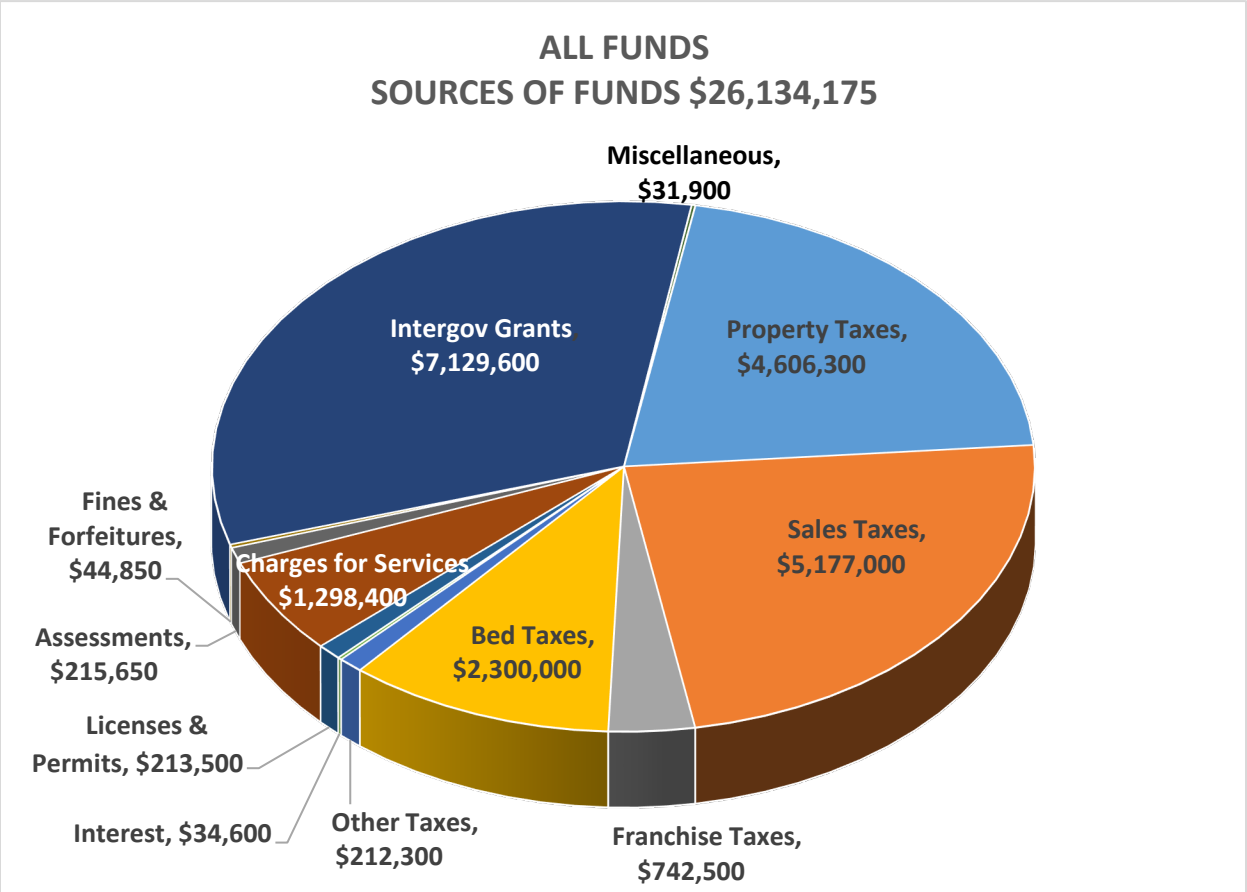
4.8 FISCAL MITIGATION CAPABILITIES

The Fiscal Year (FY) 2021-22 Adopted Budget of approximately $26.1 million, includes over $9 million in intergovernmental grants and City funds for capital improvements and major maintenance projects; a reflection of a growing demand for maintenance and replacement of the City

infrastructure and the City's interest in addressing those needs in a timely and strategic manner to minimize costs (City of Carpinteria 2021b). Chart 4-2 shows the City's All Funds Budget.

The General Fund Budget also includes general government administration services, public safety, planning, and environmental and public works services. The general fund balance is an important indicator of the financial strength of the jurisdiction.

Chart 4-2. City of Carpinteria All Funds Budget 2021-2022



4.9 EDUCATION AND OUTREACH CAPABILITIES

This type of local capability refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information. Examples include natural disaster or safety-related school programs; participation in community programs such as Firewise or StormReady; and activities conducted as part of hazard awareness campaigns such as an Earthquake Awareness Month (February each year), National Preparedness Month (September), or the Great California ShakeOut (a statewide earthquake drill that happens annually on the third Thursday of October). The City additionally offers the Community Emergency Response Team (CERT) trainings in Spanish and English and has over 200 CERT-trained volunteers throughout the city. The City also has resumed the LISTOS training in Spanish and English. The difference between CERT and LISTOS is that LISTOS focuses on the reading to respond to an emergency with relation to an individual or family unit whereas CERT focuses on a wider Community

response. The City can capitalize on its existing educational capacities, even non-hazard related such as school partnerships, and build new capabilities to educate the larger community on hazard risk and mitigation options.

In addition to the countywide resources described in Section 4.2.5, *County Education and Outreach Capabilities*, this section describes several existing outreach programs that are used to promote community awareness and readiness for natural disasters and hazards in the City. Additionally, the neighbor to neighbor program first piloted in 2019 will be a cornerstone program for a variety of services provided by the city including emergency preparedness, neighborhood watch and the development of an effective communication tree during emergencies.

As part of our communication and outreach, we have a website and page dedicate do Emergency Preparedness at https://carpinteriaca.gov/local-info/emergency-preparedness/. We have social media for ongoing communication about emergencies, as well as a bimonthly newsletter that is sent in English and one that is sent in Spanish. As part of the content the city publishes, we include emergency preparedness reminders for example warning system education, evacuation education, outreach about plans and policies including the City of Carpinteria LHMP update.

The City of Carpinteria has one staff member that is assigned to Emergency Services, including ongoing trainings and participation in coordination with the County of Santa Barbara Office of Emergency Management in any emergency and emergency planning.

The Emergency Services Program Manager receives and reviews all large events that require City permits and collaborates with named event coordinators for the development of emergency plans in coordination with law enforcement within the jurisdiction including but not limited to the Santa Barbara County Sherriff's Office, Carpinteria Fire District, State Parks, and the Carpinteria School District.

4.10 LEGAL AND REGULATORY CAPABILITIES

The legal and regulatory capabilities of the City are shown in Table 4-2, which presents the existing ordinances and codes that affect the physical or built environment of Carpinteria. Examples of legal and/or regulatory capabilities can include the City's building codes, zoning ordinances, subdivision ordinances, General/Coastal Land Use Plan, capital improvement plans, economic development plans, emergency response plans, and real estate disclosure plans.

Table 4-2. City of Carpinteria Capability Summary of Relevant Plans, Ordinances, and Programs

Relevant Plans, Ordinances, and Programs	
General Plan	X
Land Use Plan/Element	X
Zoning Ordinance	X
Subdivision Ordinance	X
Flood Damage Protection Ordinance (Floodplain Management Regulations)	X
Watershed Management Ordinance	X
Integrated Pest Management Plan	X

Relevant Plans, Ordinances, and Programs	
Building Code	X
Fire Department ISO Rating	
Stormwater Management Program	
Capital Improvement Program	
Economic Development Plan	
Emergency Operations Plan	X
Sea Level Rise Vulnerability Assessment and Adaptation Plan	X
Dune and Shoreline Management Plan	X
Strategic Energy Plan	
Transportation Emergency Preparedness Plan	
Santa Monica Debris Basin Emergency Action Plan	
Community Wildfire Protection Plan	X
Local Wildfire Mitigation Plan	
Local Wildland Fire Plan	
Tsunami Response Plan	

The City has a range of guidance documents and plans for each of its departments. These include capital improvement plans, emergency management plans, General Plan/Coastal Land Use Plan (GP/CLUP), Sea Level Rise Vulnerability Assessment and Adaptation Plan, and flood response guidelines. The City uses building codes, fire codes, zoning ordinances, subdivision ordinances, and various planning strategies to address how and where development occurs. One of the essential ways the City guides its future development and programs is through policies laid out in the General Plan, including the Safety Element. The LHMP directly informs these plans and is used to evaluate the need for adjustments or updates to existing plans and programs. The City considers the LHMP's assessment of capabilities, hazards, and vulnerabilities to inform planning, capital improvements, programs, decision-makers, and the public. The City also implements mitigation actions through the City's general plan, capital improvement program, maintenance programs, grant programming, community outreach, and budget process. The following plans were reviewed by the LPT and relevant information was incorporated into the LHMP.

4.10.1 City of Carpinteria General Plan

The GP/CLUP is the primary planning policy document for the City. The City is currently in the process of updating its GP/CLUP and expects it to be completed in 2024. The current General Plan was adopted in 2003. The content of the General Plan is arranged to achieve the community goal, which is to preserve the essential character of the beach town, its family-oriented residential neighborhoods, its unique visual and natural resources, and its open, rural surroundings while enhancing recreation, cultural, and economic opportunities for its citizens. The following are subject to change when the updated GP/CLUP is finalized in 2024.

The Carpinteria General Plan is organized into seven elements:

- Land Use

- Community Design
- Circulation
- Open Space & Conservation
- Safety
- Noise
- Public Facilities & Services

Post-2024, the updated General Plan will introduce two new elements:

- Healthy Community
- Coastal Resiliency

Land Use Element

The Land Use Element is the basis of the Land Use Plan of the City's Local Coastal Program (California Coastal Act of 1976, §30108.5). The Land Use Element establishes the type and density of land uses and guides growth and development by presenting a plan that reflects the community's desire to maintain and enhance an enjoyable, balanced quality of life. One land use objective that correlates with hazard mitigation is to reduce the density or intensity of a particular parcel if warranted by conditions such as topography, geologic, or flood hazards, habitat areas, or steep slopes. The Plan suggests that this can be achieved by establishing an environmentally sensitive overlay district in the City's Zoning Ordinance. The overlay district would have to include density and parcel size criteria for determining the appropriate intensity of these areas.

Safety Element

Specific to hazard mitigation, the Safety Element identifies known public safety hazards including seismic and other geologic hazards, flood hazards, slope stability, soil hazards, and fire hazards. Through the identification of various natural and manmade hazards, the City of Carpinteria aims to minimize the respective risks. Many of the identified risks can be avoided through adherence to standard policy while others may be lessened through the use of mitigation measures in the planning and land use review process. The LHMP is incorporated by reference in the Safety Element.

Key appliable policies are presented below.

- **Seismically Induced Hazards** All buildings requiring a building permit are to be reviewed by the City's Building inspector. Coastal installations require a wave action uprush study to demonstrate that the structure will withstand high surf.
- **Slope Stability Hazards** All developed areas at risk of bluff failure be protected from bluff retreat over a 100-year term.
- **Soil Hazards** New development on areas identified as having a high potential for expansive soil, soil settlement, or hydro compaction, then foundation recommendations shall be made by a qualified geotechnical engineer.
- **Flood Hazards** New development in flood hazard areas shall comply with the City's Floodplain Management Measures and obtain the necessary permits.

- **Fire Hazards** All new and redevelopment projects shall be reviewed and approved by the CSFPD.
- **Hazardous Materials** City policies concerning the use, storage, transportation, and disposal of hazardous materials shall reflect the County of Santa Barbara and the State Regional Water Quality Control Board policies and requirements and shall ensure that the use, storage, transportation, and disposal of hazardous materials does not result in hazardous discharge or runoff. Hazardous materials or wastes stored in closed containers at a facility should not be within 50 feet of an adjacent property. New residences should not be located adjacent to known handlers of acutely hazardous materials. Further, before the development of any site identified as having been used for the storage of hazardous materials, the City shall require the developer to submit documentation to demonstrate that testing has been conducted to determine the existence and extent of soil and/or groundwater contamination and that, based on the results, an appropriate clean-up program is established and completed. Habitable structures should not be located close to gas pipelines, railroad rights-of-way, oils wells, or other corridors that have the potential for hazardous materials leaks.

4.10.2 City of Carpinteria Emergency Operations Plan

This Emergency Operation Plan addresses the City's planned response to extraordinary emergencies associated with natural disasters, technological and intentional incidents, and national security emergencies. The document is divided into four parts:

- **Part I – Basic Plan.** Overall organizational and operational concepts relative to response and recovery, as well as an overview of potential hazards. The intended audience is the EOC Management Team.
- **Part II – Emergency Organization Functions.** Description of the emergency response organization and emergency action checklists. The intended audience is the EOC Management Team.
- **Part III – Hazard Appendix.** Provides threat assessments that identify and summarize the hazards which could impact the City.
- **Part IV – Supporting Documentation.** Provides supporting documentation to the City's Emergency Operation Plan that identifies Standardized Emergency Management System and National Incident Management System compliance as well as other required information.

With regards to hazards mitigation, the document cites that Section 322 of Public Law 106-390 (Disaster Mitigation Act [DMA] of 2000) requires, as a condition of receiving certain federal disaster aid, that local governments develop a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities in their jurisdiction. It also assigns key responsibilities to local government regarding hazard mitigation responsibilities. The City, in coordination with the County Office of Emergency Management (OEM), has prepared the 2022 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Update.

The City's emergency management organization is responsible for recovery policy and coordination through the joint efforts of governmental and private organizations. Following a major disaster, recovery actions would occur in two general phases: Short-Term and Long-Term Recovery. Recovery operations would be managed and directed by the City Manager.

The goal of short-term recovery is to restore local government to at least a minimum capacity. The major objectives of short-term recovery operations include rapid debris removal and clean-up as well as restoration of essential services, such as electricity, water, and sanitary systems. In contrast, the goal of long-term recovery is to restore facilities to at least pre-disaster conditions. the major objectives of long-term recovery operations include the delivery of social and health services, reviewing potential improvements to land use planning, re-establishing the local economy to pre-disaster levels, recovery of disaster response costs, and integrating mitigation strategies into recovery planning.

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.

The Emergency Operation Plan also includes an organizational matrix which would be used to designate responsibilities to various City departments and agencies. Checklists are provided for care and shelter needs, which would be administered by the Department of Social Services; additional checklists are provided to assist those with disabilities and other special needs, to inspect buildings for re-occupancy of key facilities, and to ensure the maintenance and restoration of utilities and critical infrastructure.

To enhance the capability for the City to respond to emergencies, a Planning/Intelligence section is provided. Its responsibility is to collect, evaluate, display and disseminate incident information and resource status. This Section functions as the primary support for decision-making to the overall emergency organization.

The Logistics Section's primary responsibility is to ensure the acquisition, transportation, and mobilization of resources to support the response effort at the disaster sites, public shelters, EOCs, etc. This Section provides all necessary personnel, supplies, and equipment procurement support. Its objectives include the collection of information to determine needs and prepare for expected operations, the coordination of logistical support with the EOC Director, and the preparation of reports required for identifying the activities performed by the Logistics Section.

The Finance and Administration Section's responsibility is to maintain the financial systems necessary to keep the City functioning during a disaster. These systems include payroll, payments, revenue collection, claim processing, and cost recovery documentation. The Finance/Administration Section acts in a support role in all disasters/emergencies to ensure that all required records are preserved for future use and that documentation is properly archived for California Office of Emergency Services (Cal OES) and Federal Emergency Management Agency (FEMA) filing requirements.

The City will continue to review this LHMP when determining updates to the Capital Improvement Plan, so that new/ongoing projects may take into consideration hazard mitigation measures (see also, Chapter 8, *Plan Maintenance*).

4.10.3 City of Carpinteria Strategic Energy Plan

The SEP was prepared in partnership with the County of Santa Barbara and the City of Goleta to prepare for emergencies by improving the resiliency of the local electric distribution system. Increasing resiliency by promoting local renewable energy, energy efficiency, and energy storage projects will allow the residents and businesses in Carpinteria to reduce their dependence on the local electric distribution system and increase electricity reliability during power outages.

The SEP includes solar photovoltaic (PV) energy considerations, which holds the most potential for electricity generation in the City. Due to a lack of developable land in the Carpinteria area for utility-scale installations, the City instead contains opportunities for residential and commercial distributed electricity installations. If implemented on existing City structures, an estimated 18,000 to 24,000 households could be powered by the 51 to 69 Gigawatt hours generated annually if barriers such as funding are overcome. With the utilization of PV energy resource options, the City would contain more reliable electricity during both emergency and non-emergency scenarios, supporting a cleaner and more resilient future.

The SEP recommends strategies to reach renewed energy goals and increase the overall resiliency of Carpinteria's energy system. Strategies include:

- Update residential and commercial solar and solar storage permitting procedures to reduce permitting barriers
- Institute energy benchmarks for existing large commercial buildings
- Create a backup inverter program to prepare for emergencies by improving the resiliency of the local electric distribution system.
- Develop a community solar project in partnership with investor-owned utilities or a community choice aggregation
- Creation of a new financing mechanism so that residents and businesses can afford to buy solar projects. This may be achieved through a partnership with a private foundation or government agencies.
- Introduce financial incentives for solar adoption
- Diversify City funding streams
- Create a formal Energy Assurance Plan to protect key sites so that they continue to operate in the event of any disaster or electricity outage.
- Support a Countywide One-Stop-Shop to lead education efforts in the City
- Advocate for City energy goals at a state and Federal level.

4.10.4 City of Carpinteria Watershed Management Ordinance

In 2014, the City adopted Ordinance No. 667, adding Chapter 8.10, *Watershed Management*, to the City of Carpinteria Municipal Code. This ordinance establishes water quality protections to all water entering storm drain systems or waters of the state, consistent with the Clean Water Act and Porter-Cologne Act. The ordinance prohibits the discharge of pollutants or waters containing pollutants into the municipal storm drain system or watercourses. The ordinance also describes the

responsibility of new development and redevelopment to identify and implement best management practices to reduce pollutants in any stormwater runoffs and the responsibility to comply with terms and provisions of applicable permits, including the NPDES permit. All potential development projects with the potential to generate discharge of pollutants that would degrade water quality must adhere to stormwater management controls included in the chapter.

4.10.5 City of Carpinteria Sea Level Rise Vulnerability Assessment and Adaptation Plan

The Sea Level Rise Vulnerability Assessment and Adaptation Plan (SLRVAAP) provide a comprehensive assessment of the vulnerabilities of City resources, structures, and infrastructure, as well as the potential for future damages to the City associated with various coastal hazards, including sea level rise. The plan is intended to support adaption planning by identifying a full range of potential future adaptation strategies that can be employed to reduce the risk of future damages as well as thresholds of impacts that can guide long-term land use and planning goals, policies, and programs, including implementation measures related to citywide physical development.

The plan summarizes the existing and future vulnerabilities of 11 key resource and infrastructure sectors, provides an overview of potential risks caused by coastal flooding, coastal erosion, and tidal inundation to these 11 resource sectors, and identifies potential adaption strategies to address potential coastal hazards related to sea level rise. Recommended adaption strategies include:

- Prepare a winter storm berm program
- Prepare and U.S. Army Corps of Engineers (ACOE) Stroma Damage and Shoreline Protection Feasibility Study
- City coordination and/or collaboration with Beach Erosion Authority for Clean Oceans and Nourishment (BEACON) to optimize protection of City resources from coastal hazards
- Create a cobble and vegetative dune system along the shoreline
- Work with BEACON to develop a sedimentation program along beaches and bluffs and opportunities for beach nourishment
- Develop sand retention structures
- Develop stormwater infrastructure improvements
- Establish policy and program framework for adaptation such as development standards for the accommodation of sea level rise. Additionally, place a special zone district over properties within defined coastal hazard areas with the provision of additional adaptation options to avoid the need for developers to seek costly variances for projects that are designed to avoid or accommodate sea level rise hazards but may not be consistent with existing zoning
- Relocate development subject to repetitive damage and highly vulnerable utility infrastructure
- Protect the UPRR and Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor by elevating the railroad in the downtown region, raising the railroad on a causeway in the Carpinteria Salt Marsh area, and armoring the Carpinteria bluffs.

4.10.6 Carpinteria-Summerland Fire Protection Master Plan 2012 – 2022

The Carpinteria-Summerland Fire Protection Master Plan outlines the roles, responsibilities, immediate and long-range goals of the four divisions of the CSFPD. The four divisions include the Administration Division, Operations Division, Training Division, and Fire Prevention Division. The Administration Division is responsible for planning, directing, and evaluating the functions of the Fire District including financial administration and budget preparation. The Operation Division, managed by the Battalion Chief of Operations, is responsible for meeting the day-to-day operations of the Fire District, including but not limited to structural fire suppression, wildland fire suppression, emergency medical services, rescue services, hazardous materials mitigation, and surf rescue. The Training Division, managed by the Battalion Chief of Training, is responsible for preparing the staff to deliver service. The Fire Prevention Division, managed by the fire marshal, is responsible for the implementation of adopted codes and standards as they relate to new and future development. This function includes but is not limited to plan review, new construction inspection, addressing and certifying of occupancies.

4.10.7 National Flood Insurance Program

The City of Carpinteria is participating community of the National Flood Insurance Program (NFIP). As stated by FEMA, "The NFIP aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically."

FEMA Flood Insurance Rates Maps (FIRMs) are developed as part of the NFIP and identify areas in the County that are vulnerable to flooding. The flood zones identified on the FIRMs are areas susceptible to 100-year and 500-year flood events. A 100-year and 500-year storm event is when storms have a 1 percent or 0.2 percent annual chance of occurrence. Another measure of the probability of occurrence of a 100-year storm is there is at least a 26-percent chance of a 100-year storm during the life of a 30-year mortgage. Estimated parcels are located within these 100-year floodplain areas (see Table 6-16).

The information in the Flood Insurance Study and resultant FIRMs is based on historic, meteorological, hydrologic, hydraulic, and topographic data, as well as open-space conditions, flood control works, and development within the study area. Other information included on the maps includes Special Flood Hazard Areas (SFHA), Base Flood Elevations (BFE), and insurance risk zones. FIRMs are used to determine the BFE at specific sites or if a specific property is located in a floodplain or SFHA to administer floodplain management regulations, determine potential locations for new development, and make flood insurance determinations.

In 2012, the City adopted Ordinance No. 658 amending Chapters 14.40 and 15.50 of the Carpinteria Municipal Code for consistency with NFIP requirements. The Public Works Department is the lead department in enforcing the Floodplain Management Regulations. All development projects located within a SFHA must comply with the Floodplain Management Regulations.

Repetitive Loss (RL) Properties

Repetitive loss properties are defined as property that is insured under the NFIP that has filed two or more claims above $1,000 each within any consecutive 10-year period since 1978. FEMA repetitive loss data shows that there have been 18 properties in Carpinteria with multiple claims against the NFIP. Four of these properties have had more than three insurance claims, and one of them has had a total of six claims (City of Carpinteria 2019).

4.11 OPPORTUNITIES FOR MITIGATION CAPABILITY IMPROVEMENTS

The City continuously strives to mitigate the adverse effects of potential hazards through its existing capabilities while also evaluating the opportunities for improvements. Based on the capability assessment, the City has existing regulatory, administrative/technical, education/outreach, and fiscal mechanisms in place that help to mitigate hazards. In addition to these existing capabilities, there are opportunities for the City to expand or improve on these policies and programs to further protect the community:

- **Regulatory Opportunities**: As part of this update, the City will comply with AB 2140 by amending its Safety Element to incorporate the LHMP by reference. The City will consider the LHMP in policy, land use plans, and programs, including coastal hazard and sea level rise planning. For example, the City's Sea Level Rise Vulnerability Assessment and Adaptation Plan recommends storm damage and shoreline protection strategies to study and develop to reduce coastal hazards in the City. The City aims to address emerging issues associated with shoreline management and protection, including continued implementation of the winter storm berm program and long-range planning for coastal resilience as part of the ongoing update of the City's General Plan and Coastal Land Use Plan.
- **Administrative/Technical Opportunities**: The City continues to improve its resilience to ensure emergency response operations are sustained during a hazardous event, including improvements to public safety facilities and planning. The City aims to improve its resilience to ensure emergency response operations are sustained during an hazardous event, including expanding participation in the NFIP and Repetitive Loss Program and ensuring emergency response supplies are stocked and available at City Hall. Enhancements to hazard training for staff in partnership with the County and other agencies or stakeholders would improve the City's ability to mitigate hazards with the latest knowledge and resources. The City can also include a review of the LHMP as part of its yearly Annual Plan development a yearly budget development so that the priorities in this planning document are accurately reflected in our actionable planning documents. This ensures that the mitigation priorities laid out, are adopted by the appropriate departments, and are adequately funded in the short and long terms.
- **Outreach Opportunities**: Enhanced community outreach, emergency notifications, and trainings would further enhance the City's capabilities to respond to and recover from hazards. The City could expand outreach through digital tools such as social media, participate in the Great California ShakeOut, and increase FireWise outreach events and media coverage. The City could also improve early warning systems to help with effective evacuation in the event of

wildfire or earthquake. The City's communication plan includes bilingual communication about our priorities as stated in its annual plan so that community leaders and community members understand the City's hazard mitigation needs and associated resources including staff time and financial priorities. Staff in emergency services for the City of Carpinteria continues ongoing collaboration with County Office of Emergency management on topics that directly impact the City including emergency alert systems, community education, emergency infrastructure and more. Staff continues ongoing training to respond to disasters and be prepared to respond to hazards that may potentially strike the area.

- **Fiscal Opportunities**: The City can update its CIP to include hazard mitigation actions from the LHMP and related documents such as the Sea Level Rise Vulnerability Assessment and Adaptation Plan and the General Plan/CLUP update. The City will continue to seek grants (e.g., HMGP, BRIC) to fund these CIP projects and related projects in the City's mitigation strategy. The City can seek opportunities to partner with the County and/or other stakeholder agencies in grant applications to address regional hazards more effectively. The City could also consider expanding its fiscal capabilities through its annual budget process and other revenue measures (e.g., raising taxes, property assessments, bonds).

5.0 HAZARD ASSESSMENT

5.1 OVERVIEW

The purpose of this section is to review, update, and/or validate the hazards identified for the 2022 City of Carpinteria Local Hazard Mitigation Plan (LHMP). The intent is to confirm and update the description, location and extent, and history of hazards facing the City of Carpinteria (City) now and in the future. This assessment also considers the potential exacerbating effects of climate change. The importance of this review is to ensure that decisions and mitigating actions are based on the most up-to-date information available.

Another purpose of this section is to screen the hazards to determine their relative probability and severity to inform the risk posed to various communities and resources. This assessment will provide an understanding of the significance by ranking hazards by their priority in the City.

5.2 HAZARD ASSESSMENT

In 2021, the Mitigation Advisory Committee (MAC) reviewed and revised 1) the list of hazards by community or geographic area; 2) the information and material presented for each hazard; and 3) the prioritization of the hazards. The City refined the list of hazards applicable to the City and confirmed the hazard prioritization. The following sections provide the results of this effort.

5.2.1 Hazard Identification

The City is susceptible to natural and human-caused hazards. This LHMP update identifies and screens these hazards. Screening hazards intends to help prioritize which hazards present the greatest risks to the community. In total, 23 hazards have been identified and investigated for this

LHMP update. In alphabetical order, the hazards identified and investigated for the City's LHMP update include:

- Agricultural Pests
- Civil Disturbance
- Coastal Hazards
- Cyber Threat
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Energy Shortage & Resiliency
- Extreme Heat/Freeze
- Flood
- Geologic Hazards
- Hazardous Materials Release
- Invasive Species
- Landslide
- Mudflow & Debris Flow
- Natural Gas Pipeline Rupture
- Oil Spill
- Pandemic/Public Health Emergency
- Terrorism
- Train Accident
- Tsunami
- Wildfire
- Windstorm

5.2.2 Hazard Screening/Prioritization

Historical data, catastrophic potential, relevance to the jurisdiction, and the probability and potential magnitude of future occurrences were all used to identify and prioritize the list of hazards most relevant in the City. The City completed the Plan Update Guide to start the process of screening and ranking hazards. The Plan Update Guide required scoring of the hazards based on the frequency/probability of occurrence, geographic extent, potential magnitude/severity of the hazard, and overall significance. As shown in Table 5-1, the scores for frequency/probability of occurrence, geographic extent, potential magnitude/severity of the hazard, and overall significance are assigned numerical points. Rankings with a greater impact, such as *Highly Likely* for Frequency/Probability of Occurrence and *Extensive* for Geographic Extent, are associated with a higher number of points, while rankings with a smaller impact are associated with a lower number of points (e.g., *Limited* for Geographic Extent). The hazard prioritization included in this LHMP update is primarily based on the numerical ranking completed with the City's Plan Update Guide. The City of Carpinteria Local Planning Team (LPT) refined the list of hazards identified in the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) to focus on the hazards with the potential to impact the City.

Table 5-1. Hazard Screening and Ranking

Hazard Type	Frequency/ Probability of Occurrence	Geographic Extent	Potential Magnitude/ Severity	Overall Significance	Total Score
Agricultural Pests	2 Occasional	1 Limited	1 Negligible	1 Low	5
Civil Disturbance	3 Likely	1 Limited	1 Negligible	1 Low	6
Coastal Hazards	4 Highly Likely	2 Significant	3 Critical	3 High	12
Cyber Threat	2 Occasional	2 Significant	2 Limited	2 Medium	9
Dam Failure	2 Occasional	2 Significant	3 Critical	2 Medium	9

Hazard Type	Frequency/ Probability of Occurrence	Geographic Extent	Potential Magnitude/ Severity	Overall Significance	Total Score
Drought & Water Shortage	3 Likely	3 Extensive	3 Critical	2 Medium	11
Earthquake	3 Likely	3 Extensive	4 Catastrophic	3 High	13
Energy Shortage & Resiliency	3 Likely	3 Extensive	2 Limited	3 High	11
Extreme Heat & Freeze	4 Highly Likely	3 Extensive	2 Limited	1 Low	10
Flood	4 Highly Likely	3 Extensive	4 Catastrophic	3 High	14
Geologic Hazards	2 Occasional	2 Significant	2 Limited	1 Low	7
Hazardous Materials Release	2 Occasional	1 Limited	2 Limited	2 Medium	7
Invasive Species	2 Occasional	2 Significant	1 Negligible	1 Low	6
Landslide	2 Occasional	1 Limited	3 Critical	2 Medium	8
Mudflow & Debris Flow	4 Highly Likely	2 Significant	4 Catastrophic	3 High	13
Natural Gas Pipeline Rupture	2 Occasional	1 Limited	2 Limited	3 High	8
Oil Spill	2 Occasional	1 Limited	2 Limited	3 High	8
Pandemic/Public Health Emergency	4 Highly Likely	3 Extensive	3 Critical	2 Medium	12
Terrorism	1 Unlikely	2 Significant	2 Limited	1 Low	6
Train Accident	2 Occasional	1 Limited	2 Limited	2 Medium	7
Tsunami	1 Unlikely	2 Significant	3 Critical	2 Medium	8
Wildfire	3 Likely	1 Limited	3 Critical	2 Medium	9
Windstorm	2 Occasional	2 Significant	1 Negligible	1 Low	6

Frequency/Probability of Occurrence:

4 - Highly Likely: Near 100% probability in next year

3 - Likely: Between 10 and 100% probability in next year or at least one chance in 10 years

2 - Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years

1 - Unlikely: Less than 1% probability in next 100 years.

Potential Magnitude/Severity:

4 - Catastrophic: Multiple deaths, a complete shutdown of facilities for 30 days or more, more than 50% of property within the City is severely damaged

3 - Critical: Multiple severe injuries, a complete shutdown of facilities for at least 2 weeks, more than 25% of property within the City is severely damaged

2 - Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of the property within the City is severely damaged

1 - Negligible: Minor injuries, minimal quality-of-life impact, a shutdown of critical facilities and services for 24 hours or less, less than 10 percent of the property within the City is severely damaged

Geographic Extent:

3 - Extensive: 50-100% of the City

2 - Significant: 10-50% of the City

1 - Limited: Less than 10% of the City

Overall Significance:

3 - High: Widespread potential impact

2 - Medium: Moderate potential impact

1 - Low: Minimal potential impact

The hazards that scored the most points were considered to have the highest priority and the hazards with the least points were considered to have the lowest priority. Table 5-2 lists the hazard

types in order of highest priority to lowest priority, using the scoring methodology described above. Given the overall prioritization of hazard types, as summarized in Table 5-1 above, the discussion of hazards in Section 5.3 is organized as shown in Table 5-2 in descending order with "*higher priority*" hazards listed at the top and the "*lower priority*" hazards at the bottom.

Table 5-2. Hazard Priority in the City of Carpinteria

County Hazards Prioritization	Total Number of Points
Flood	14
Mudflow & Debris Flow	13
Earthquake & Liquefaction	13
Coastal Hazards	12
Pandemic/Public Health Emergency	12
Energy Shortage & Resiliency	11
Drought & Water Shortage	11
Extreme Heat/Freeze	10
Dam Failure	9
Wildfire	9
Tsunami	8
Cyber Threat	8
Natural Gas Pipeline Rupture	8
Oil Spill	8
Train Accident	7
Landslide	7
Hazardous Materials Release	7
Geologic Hazards	7
Windstorm	6
Civil Disturbance	6
Terrorism	6
Invasive Species	6
Agricultural Pests	5

5.2.3 Approach and Methodology

This hazards assessment covers the entire geographical area of the City. The following material provides an overview of the hazards. More information can be found in the State of California Multi-Hazard Mitigation Plan and the Santa Barbara County 2022 MJHMP.

Section 5.3 contains detailed hazard profiles for the identified hazards. Each hazard profiled includes the following subsections:

Section 5.3 contains **"Incident Profiles"** to describe a recent example of a hazardous incident within the county that required response.

- **Description of Hazard** – This section gives a description of the hazard and associated issues followed by details on the hazards specific to the City of Carpinteria.
- **Location and Extent of Hazard in the City of Carpinteria** – This section gives a spatial description of the potential location or areas of the City of Carpinteria that the hazard is expected to impact. This section also describes the potential strength or magnitude of the hazard as it pertains to the City of Carpinteria.
- **History of Hazard in the City of Carpinteria** – This section contains information on historical incidents, including impacts where known.
- **Probability of Occurrence** – The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, the frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of an event happening in any given year (e.g., three droughts over 30 years equates to a 10 percent chance of a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:
  - **Highly Likely** – Near 100 percent chance of occurrence in next year or happens every year.
  - **Likely** – Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
  - **Occasional** – Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
  - **Unlikely** – Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.
- **Climate Change Considerations** – This section describes the potential for climate change to affect the frequency, intensity, and location of the hazard in the future.

5.3 HAZARD PROFILES

5.3.1 Flood

Description of Hazard

All flooding is a breakdown in surface water conveyance. **Flooding** happens when water surpasses the capacity of local water bodies to contain it, creeks and rivers to carry it, or soil to absorb it. When flood control infrastructure fails, water builds up and washes into normally dry areas, where it can cause significant harm to buildings, people, infrastructure, and ecosystems. Floods can be caused by heavy rainfall, long periods of moderate rainfall, or blocked-off drainage areas during rainfall. A break in a dam or levee, water pipe, or water tank can also cause flooding in rare instances (see also, Section 5.3.9, *Dam Failure*). Floods that develop very quickly are called flash floods; they are especially dangerous because they give little or no warning.

Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floodwaters can be deep enough to drown people and move fast enough to carry away people or heavy objects, such as cars. In some cases, floods have lifted buildings off their foundations (Santa Barbara County Planning and Development Department 2021). Certain health hazards are also common to flood events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When floodwaters contain sewage or decaying animal carcasses, a rise in infectious disease risk becomes a concern. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warnings and evacuation are critically important to reduce life and safety impacts.

The area adjacent to a river or stream channel is the floodplain. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to the area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. A 500-year flood event would be slightly deeper and cover a greater area than a 100-year flood event (Federal Emergency Management Agency [FEMA] 2020). The potential for flooding can change and increase through various land use changes and changes to the land surface, which can result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity. Inland flooding is measured by the size of the areas flooded per year, and this will likely increase as more precipitation falls in fewer storms (Santa Barbara County Planning and Development Department 2021).

The City of Carpinteria is susceptible to various types of flood events as described below.

- **Riverine flooding** - Riverine flooding, defined as the condition when a watercourse (e.g., river or channel) exceeds its "bank-full" capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water resistance of the surface due to urbanization. In the City, flooding is largely caused by heavy and continued rains, and heavy flow from tributary streams. The City's three main creeks (i.e., Carpinteria Creek, Santa Monica Creek, and Franklin Creek), along with other smaller drainages and tributaries can all present flood hazards. Intense storms can overwhelm the local waterways as well as the integrity of any flood control structures. The warning time associated with slow rise floods assists in life and property protection.
- **Localized flooding** - Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually

occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems.

- **Dam failure flooding** - Flooding from a failure of the Santa Monica Debris Basin is also a concern to the City. A catastrophic flood control structural failure could easily overwhelm local response capabilities to save lives and require mass evacuations towards the north and south of the City. Impacts on life safety will depend on the warning time and the resources available to notify and evacuate the public. Loss of life could result, and there could be associated health concerns as well as negative effects on local buildings and infrastructure. Dam failure is addressed in more detail under Section 5.3.9, *Dam Failure*.
- **Coastal flooding** - Coastal foods come from the Pacific Ocean where large waves are and can be affected by storm surges. Coastal foods can be very dangerous when high waters are combined with the destructive forces of waves. In low-lying coastal areas, storm surges and flooding can reach many miles from the shoreline, flowing up rivers and across flat land (FEMA 2021a). Coastal flooding hazards are addressed in more detail under Section 5.3.4, *Coastal Hazards*.

Additionally, mudflow and debris flow which can be caused by localized flooding are discussed further in Section 5.3.2, *Mudflow & Debris Flow*.

Location and Extent of Hazard in the City of Carpinteria

Floods usually occur during the rainy season, with the highest precipitation during December through March during heavy rainfall. Streamflow throughout the City is highly variable and directly impacted by rainfall with little snowmelt or base flow from headwaters. Watercourses can experience dramatic peak flows during high rainfall events. High amounts of sedimentation during wet years and high amounts of vegetative growth during dry and moderate years can affect stream or river channel capacity to carry floodwaters.

The drainages in the City are characterized by high intensity, short duration runoff events, due to the relatively short distance from the top of the Santa Ynez Mountains to the Pacific Ocean. Runoff from high intensity, short-duration storm events can cause inundation of overbank areas, debris including sediment, rock, downed trees in the water that can plug culverts and bridges, erosion and sloughing of banks, and loss of channel capacity due to sedimentation. The City is traversed by the floodplains of creeks that drain the Santa Ynez Mountains, with the degree of flood hazard varying substantially by creek. Some creeks in the City, such as Franklin and Santa Monica Creeks, have been channelized reducing but not eliminating flood hazards. Other creeks in the City, such as Carpinteria Creek, remain in a more natural condition with the corresponding potential for flood hazards. The Santa Monica Debris Basin was constructed on Santa Monica Creek to intercept sediment and debris, reducing the potential for plugging of downstream creek channels and associated flood hazards. Additionally, the City may be subject to flooding due to flash flooding, urban flooding, river channel overflow, and downstream flooding.

Another contributing factor to flooding is the City's location along the Pacific Ocean. Low-lying areas of the City are susceptible to wave attack, coastal flooding, and storm surge (see Section 5.3.4, *Coastal Hazards*).

History of Hazard in the City of Carpinteria

Flooding has been a major problem for communities and regions along rivers, creeks, and the shoreline throughout Santa Barbara County's history. Santa Barbara County has several hydrologic basins that have different types of flooding problems, including over bank riverine flooding, flash floods, tidal flooding/tsunamis, and dam failure. The most common flooding in Santa Barbara is due to riverine flooding and flash flood events.

Between 1907 and 2018, Santa Barbara County experienced 20 significant inland flood events. Eight of these floods received Presidential Disaster Declarations. Refer to Section 5.3.5, *Flood* of the MJHMP for a detailed discussion of these 20 significant inland floods in the county. More recent (since 1995) historical flood events and years, as well as information concerning the nature of the flooding and the extent of the damages, are described below for floods within the City or in the vicinity.

- **1995 Floods –** Two major storm-related flooding events occurred in the winter of 1995 – on January 10 and March 10. The floods of 1995 brought widespread flooding to Santa Barbara County, with the most severe flooding of creeks along on the South Coast while the rest of the county was largely spared from serious damages. Flooding occurred on most major streams in the cities of Goleta, Santa Barbara, and Carpinteria as well as the community of Montecito. Both floods caused closures of road and rail transportation for several hours and received Presidential Disaster Declarations. Estimated public and private damages were around $100 million. Flooding in the City was much less severe due to the installation of debris basins and channel improvements since 1969 in cooperation with the U.S. Department of Agriculture (USDA) National Resource Conservation Service (formerly USDA Soil Conservation Service) (Santa Barbara County Flood Control and Water Conservation District [County Flood Control] 1995).
- **January 1995 –** The January 10th flood affected approximately 510 properties along the South Coast and caused roughly $50 million of damage. Flooding occurred on most major creek channels in Goleta, Santa Barbara, Montecito, and Carpinteria. All modes of transportation in and out of the South Coast, including the Santa Barbara Airport, Highway 101, Union Pacific Railroad (UPRR), the harbor, and other major roads on the South Coast were cut off for several hours as a result of this flood. Highway 101 reopened to the north later that day; however, southbound roads, the airport, UPRR, and the harbor were not restored for several days (County Flood Control 1995). While flooding in Carpinteria was relatively minor compared to other South Coast areas, Arroyo Paredon Creek, to the west of Carpinteria, was the source of flooding at Via Real, Highway 101, and the UPRR (County Flood Control 1995).
- **March 1995 –** The storm event on March 10 caused flooding of most major channels in Goleta, Santa Barbara, Montecito, and Carpinteria. More than 300 structures were reported flooded and/or damaged, with many of the same structures flooded in January flooded again. Approximately $30 million of public and private property were damaged during the storm. Once again, the airport, Highway 101, and UPRR in and out of the South Coast were cut off for several hours. This flood received a Presidential Disaster Declaration (County Flood Control 1995).

- **1998 Floods –** The storm events of 1998 arrived on a strong El Niño and brought several record-breaking rainfalls with 50-year storm event intensities throughout February. By the end of the month, many areas in the county had received 600 percent of normal February rainfall. Flood-related damages within the county occurred during three major storm periods: February 1-4, February 6-9, and February 22-24. The cost to repair extensive flood damage to public and private property was estimated at $15 million. Just like in 1995, transportation throughout the county was disrupted through closures of roads, the Santa Barbara Airport, and train service. Flood damage was spread throughout the county and the county was declared a Federal Disaster Area on February 9. The floods received a Presidential Disaster Declaration (County Flood Control 1998).
- **February 2, 1998 –** During the first storm on February 2, winds with gusts as high as 63 miles per hour (mph) knocked over hundreds of trees and caused loss of power to thousands of homes across Goleta and Santa Barbara. The next day, 15-foot-high waves damaged pilings under Stearns Wharf and a broken sewer line near Arroyo Burro Beach, closing several nearby beaches due to high levels of bacteria buildup. Gaviota Creek overtopped and flooded the State Beach at the mouth of the creek. At the Gaviota Chevron plant, storm related damage caused a release of hazardous materials. The airport also closed down due to flood, and Highway 101 was shut down in Ventura, cutting off the City to the south (County Flood Control 1998).
- **February 6, 1998 –** With little time to recuperate, the South Coast was hit by a second major storm on February 6. Disruptions of transportation were widespread throughout the South Coast – a downed tree resulted in an accident that closed Highway 101. Along the coast, berms were hastily constructed to protect beachfront property (County Flood Control 1998).
- **February 22-24, 1998 –** Intense rain again hit the County on February 23 and 24 after several days of moderate rainfall. This time, it was the creeks of Montecito and Carpinteria that were most heavily affected. Among those creeks that overtopped their banks were Montecito, Romero, San Ysidro, Oak, and Arroyo Paredon. Transportation was again interrupted with the closure of the Highway 101 near Ventura, Sycamore Canyon Road, and Gaviota Road. Although the February 1998 storms had higher annual rainfalls, flooding in 1998 was considered less severe for the South Coast than other historical events, such as the 1995 event due to flood control improvements and channel and debris dam maintenance performed by the County (County Flood Control 1998).
- **2005 –** In January 2005, a powerful Pacific storm tapped into a subtropical moisture source to produce heavy rain, snow, flash flooding, high winds, and landslides to Central and Southern California. During the 5-day event, rainfall totals ranged from 4 to 8 inches over coastal areas to between 10 and 20 inches in the mountains. With such copious rainfall, flash flooding was a serious problem across Santa Barbara, Ventura, and Los Angeles counties. Flash flooding and mudslides closed Highway 101 at Bates Road in Carpinteria and Gibraltar Road at Mt. Calvary Road, stranding several vehicles. High winds gusting to 65 mph knocked down numerous trees and power lines (National Oceanic and Atmospheric Administration [NOAA] 2005).

- **2011** – A severe winter storm occurred March 19-21, 2011, that included flooding, debris flows, and mudflows throughout Santa Barbara County. The 2-day storm produced up to 11.5 inches of rainfall. The storm extremes were primarily located in the south county, especially Gibraltar and Cachuma. With all three primary Santa Ynez River-related county reservoirs full (as of March), the necessary water releases from Lake Cachuma added to the storm runoff to create relatively high discharge rates in the lower Santa Ynez River. This storm event resulted in moderate agricultural land flooding (approximately 200 acres) downstream of Cachuma. Several County Flood Control debris basins were filled and sustained some damage (County Flood Control 2011). According to County Insurance Claims, the storm cost approximately $1.7 million in damages (County Flood Control 2011).
- **2018** – Following the October 2017 Thomas Fire, heavy rains unleashed destructive rivers of water, mud, and debris in Santa Barbara County, particularly Montecito and Carpinteria, leaving at least 23 people dead, destroying over 100 homes, and damaging over 300 homes. Rain from the storm fell on hillsides and mountains stripped of trees and vegetation by the Thomas Fire. The National Weather Service, Los Angeles reported that 0.54 inches of rain had fallen in 5 minutes at Montecito and 0.86 inches in 15 minutes in the City (FloodList 2021) (see also, Section 5.3.2, *Mudflow and Debris Flow*).

Incident Profile: Carpinteria Creek Flooding

Southeast of the Montecito Debris Flows, the City of Carpinteria experienced hazardous conditions from intense floodwaters down Carpinteria Creek and isolation from communities to the north and south.

Source: California Water Environment Association

These flood flows triggered a chain of events in the City due to flooding in Carpinteria Creek. The surge of water and debris that came down Carpinteria Creek undermined and destabilized the concrete rock wall embankment that borders the southeast side of the City's Wastewater Treatment Plant. At the time of the storm, the California Department of Transportation (Caltrans) was in the process of building a new bridge over Carpinteria Creek. The intense storm dropped too much water too quickly and caused a massive debris flow, which built up enormous head pressure at this new bridge before breaking free. The velocity of the debris flow moved so quickly and with such force that boulders could be heard rolling down the creek from 5 blocks away. After the flood waters in the creek receded, the creek bed was scoured to a historical depth not previously seen and the wall embankment was noticeably impacted. Floodwaters surcharged the City's storm drain system. The road to the Wastewater Treatment Plant, its administration office, a preschool, and employee housing for California State Park employees was impassable due to the flooding. Highway 101 was also cut off to the northwest of the City for 3 weeks and to the southeast to Ventura for about a week, leaving the City isolated for an

extended amount of time. Both the supply chain (e.g., food, fuel) and staffing levels at the Treatment Plant as well as countless other businesses and offices in the City were compromised. Food from local grocery stores disappeared also immediately (California Water Environment Association 2022).

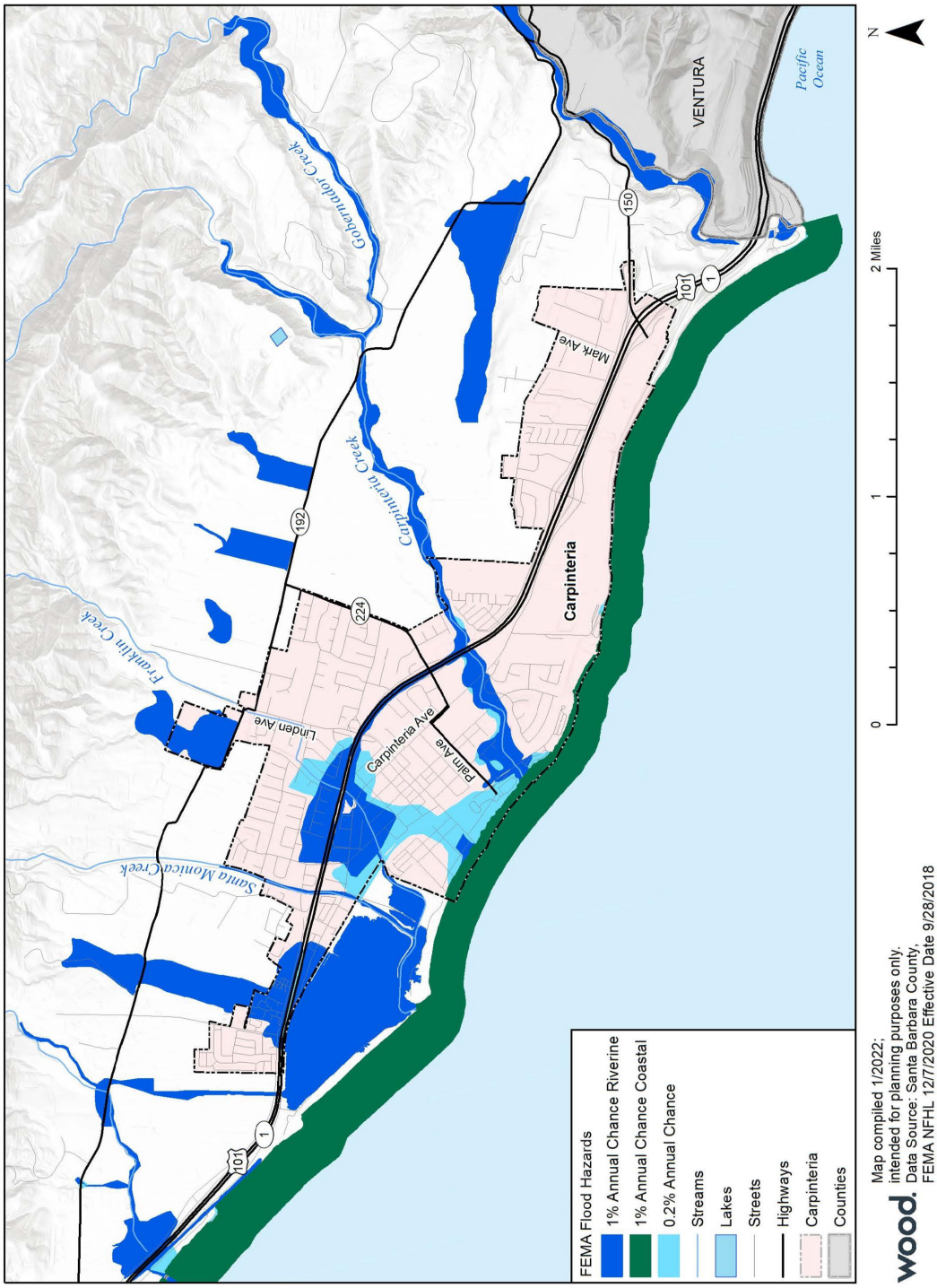
Probability of Occurrence

Likely – The 100-year flood is a flood that has a one percent chance in any given year of being equaled or exceeded. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. Figure 5-1 shows the location of the 100-year flood hazard zones in the City of Carpinteria as mapped by FEMA's Flood Insurance Rate Maps (FIRM). The floodplains shown delineate areas with potential exposure to flooding for 100-year storm flows.

Climate Change Consideration

As described in the County's Climate Change Vulnerability Assessment (CCVA), although climate change will increase the frequency and intensity of droughts (refer to Section 5.3.7, *Drought & Water Shortage*), scientists also project that it will increase the frequency and intensity of heavy rainstorms that cause inland flooding (Santa County Barbara Planning and Development Department 2021). Climate change is projected to amplify existing flood hazards through increased frequency and strength of El Niño events and rainfall intensity. Extreme weather events have become more frequent over the past 40 to 50 years and this trend is projected to continue. Up to half of California's precipitation comes from a relatively small number of intense winter storms, which are expected to become more intense with climate change. For example, what is currently a 200-year storm, or one that has a 1 in 200 chance of occurring in a given year, by 2100 would increase in frequency by 40 to 50 years (to a 1 in 150/160 chance in a given year). This means that the 100-year and 500-year floodplains may expand, and the current floodplains may become 40- to 50-year floodplains (Santa County Barbara Planning and Development Department 2021). The frequency and intensity of heavy rainstorms are projected to increase, causing fluvial flooding along the City's creeks, although overall annual precipitation levels are expected to increase only slightly. For discussion regarding the impacts of climate change on coastal flooding and sea level rise, see Section 5.3.4, *Coastal Hazards*.

Figure 5-1. City of Carpinteria FEMA Flood Hazards



5.3.2 Mudflow & Debris Flow

Description of Hazard

Mudflows are flows or rivers of liquid mud down a hillside on the surface of normally dry land. They occur when water saturates the ground, usually following long and heavy rainfalls or rapid snowmelt. Mud forms and flows down the slope if there is no ground cover such as brush or trees to hold the soil in place. To be considered a mudflow, more than half of the particles must be sand-sized or smaller that can flow very rapidly. A mud flow is the sandy, more water-saturated analog of a debris flow (Colorado Geological Survey 2021).

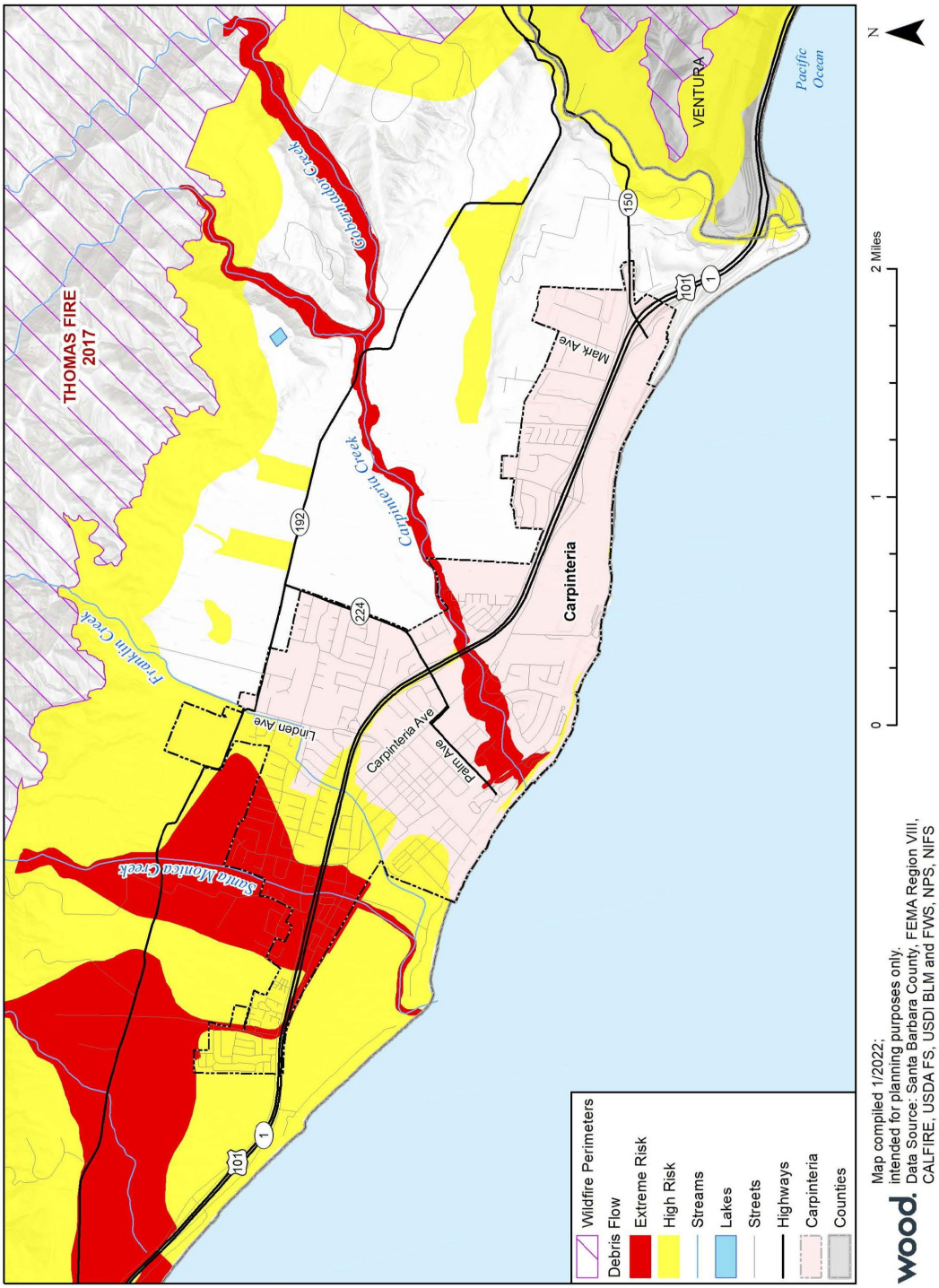
A **debris flow** is a soil flow where the majority of the materials are coarse-grained (fine sand to boulder size particles) and non-cohesive. Debris flow occurs when water begins to wash material from a slope or when water sheets off of a newly burned stretch of land. A debris flow is far more powerful and dangerous than a mudslide or mudflow. It can move faster and farther, and it's strong enough to carry enormous boulders and entire trees, not to mention cars, k-rails, and sandbags. Debris flows can move at rates ranging from meters per hour to meters per second and travel relatively long distances, making them a significant threat to life and property (California Geological Survey 2019a). The flow will pick up speed and debris as it descends the slope. As the system gradually picks up speed it takes on the characteristics of a basic river system, carrying everything in its path along with it. Chaparral land is especially susceptible to debris flows after a fire. Debris flows are most often triggered by intense rainfall following a period of less intense precipitation, or by rapid snowmelt (California Geological Survey 2019a).

Location and Extent of Hazard in the City of Carpinteria

Areas susceptible to mudflow and debris flow hazards are present throughout the City. For example, lowland areas of the City are prone to impacts from mudflows and debris flows as sediment, water, and debris slide down slopes towards these lowland areas. Vegetated upland areas within the City and Carpinteria Valley are prone to wildfires, which strips the land of vegetation that holds soil in place, and therefore, are susceptible to increased runoff, mudflows, and debris flows. Topographically steep areas of the City are also susceptible to mudflows and debris flows. Figure 5-13 of the MJHMP shows the debris flow hazard areas along the South Coast as of 2018, after the Thomas Fire. Figure 5-2 zooms in on the debris flow hazard areas within the City of Carpinteria. This hazard area may shift after a debris flow or landslide or other hazards have affected an area, such as wildfire, flooding, or drought (Santa Barbara County Department of Planning and Development 2021).

The Santa Monica Debris Basin, installed in 1970, was designed to capture 208,000 cubic yards of sediment, gravel, boulders, and vegetative debris that are washed Santa Monica Creek during storms. This allows water to flow downstream along the creek and into the City's municipal storm drain system, thereby reducing flood risk for neighborhoods downstream of the debris basin. The Santa Monica Debris Basin has prevented damages downstream on numerous occasions of severe rainstorms and associated flooding, including the floods of March 1995, "El Niño floods" of 1998, and floods in 2005 (refer to Section 5.3.1, *Flood*).

Figure 5-2. Debris Flow Risk in the City of Carpinteria



History of Hazard in the City of Carpinteria

As mentioned in Section 5.3.1, *Flood*, several historic storm and flood events in the county, particularly storms following intense wildfires, resulted in mudflows and debris flows. The most significant mudflow and debris flow events are described below.

- **1964** – Following the Coyote Fire, relatively light rain which fell on portions of the watershed burned by the fire, causing severe flooding in the areas surrounding Montecito, Hot Springs, and San Ysidro Creeks. Eyewitnesses reported 20-foot walls of water, mud, boulders, and trees moving down the channels at approximately 15 miles per hour. Bridges were swept away in seconds and flows inundated large areas damaging structures and depositing debris. Large boulders were carried along Montecito Creek by the flow and deposited upstream of the bridge near Hot Springs Road. A 20-inch high pressure gas line near Mountain Drive was bent by the force of the flow in San Ysidro Creek, although it did not break. County Flood Control estimated damages to public and private property at more than $300,000.
- **1980** – This flood, which also received a Presidential Disaster Declaration, consisted of severe flooding, mudslides, and high tides throughout the entire county.
- **1995 –** On January 10, flooding occurred on most major creek channels in Goleta, Santa Barbara, Montecito, and Carpinteria. This flood and mudslide affected approximately 510 properties along the South Coast and caused roughly $50 million of damage (County Flood Control 1995).
- **2005 –** In Santa Barbara County, flash flooding and mudslides closed down Highway 101 at Bates Road in Carpinteria. In Ventura County, SR 150 was closed at the Dennison Grade due to flash flooding and mudslides. Preliminary damage estimates from this storm range between $8-10 million with agricultural interests in Ventura County accounting for most of the monetary damage (NOAA 2005).
- **2018 –** Following the 2017 Thomas Fire, which burned approximately 281,893 acres in Ventura and Santa Barbara Counties, a reported 0.59 inches of rain fell within 30 minutes in the burn scars from the Thomas Fire in the foothills of Montecito on Tuesday, January 9, 2018. Four inches of rain fell in two days, causing massive debris flows and flooding that damaged or destroyed 400 homes, killed 23 residents, and led to the closure of Highway 101 and the UPRR for more than 3 weeks, cutting off the county from communities to the south. California Geological Survey scientists estimated the Montecito debris flow as having speeds of 10-15 mph, being up to 25-30 feet deep, and capable of carrying boulders as large as a tow truck. (California Geological Survey 2019b). In the City of Carpinteria, mudflows in Carpinteria Creek caused enormous pressure build-up and damage to the Wastewater Treatment Plant's retaining wall. Portions of Highway 101 were shut down to the northwest and southeast of the City, leaving the City and its residents isolated for weeks with limited food, fuel, and other resources (California Water Environment Association 2022). The Santa Monica Debris Basin was filled with debris during the January 2018 storms. This was the most significant test of the Basin since its construction and the first-time debris had filled the basin to the point of exceeding the crest of the emergency spillway. Fortunately, the basin capacity was adequate such that very little debris went through

the emergency spillway resulting in no significant debris flows downstream (National Watershed Coalition 2018; see also, Section 5.3.9, *Dam Failure*). Additionally, the County Flood Control District is undertaking operational improvements to the Santa Monica Debris Basin to allow more efficient basin clean-out and reduce basin repair and maintenance costs (refer to Section 7.3 of the MJHMP).

Probability of Occurrence

Highly Likely – Based on historical data and given the likelihood of wildfires and intense rainfall events, as well as steep slopes in the Carpinteria Valley upstream of the City, mudflow and debris flow hazards are likely to continue on an annual basis, with damaging mudflow and debris flow occurring less frequently. Mudflows and debris flows are usually a cascading effect of severe weather. The probability for more severe and damaging landslides increases during El Niño years or severe winter storms. The potential for debris flows dramatically increases following a wildfire (see also, Section 5.3.10, *Wildfire* and Section 5.3.16, *Landslide*).

Climate Change Consideration

As described in Section 5.3.10, *Wildfire*, California experiences wildfires nearly every year with most of them taking place immediately before the winter rainy season. The effects of climate change have the potential to impact wildfire behavior, the frequency of ignitions, fire management, and fuel loads. Increasing temperatures may intensify wildfire threat and susceptibility to more frequent wildfires in the county (USDA and U.S. Geological Survey [USGS] 2009).

Research dating back to the 1930s and 1940s shows an association between debris-flow occurrence and recent wildfires in mountain watersheds, commonly referred to as the "fire and flood cycle." Much of the burned areas near the City are on steep, brush-covered slopes drained by equally steep, short channels which facilitate debris flow occurrence. As previously described, the increased potential of wildfire occurrence also escalates the risk of mudflows and debris flows in the period following a fire, when slopes lack vegetation to stabilize soils and burned soil surfaces create more rainfall runoff. Therefore, greater wildfire frequencies result in an increased likelihood of precipitation-induced debris-flow events in recently burned areas (USDA and USGS 2009).

Additionally, as described in Section 5.3.7, *Drought & Water Shortage*, projected climate change-associated variance in rainfall events may result in more high-intensity events, which may increase landslide frequency. Landslides can result from intense rainfall and runoff events. As climate change affects the length of the wildfire season, a higher frequency of large fires may occur into late fall, when conditions remain dry, and then be followed immediately by intense rains early in the winter, as occurred with the Thomas Fire in December 2017 and subsequent Montecito and Carpinteria debris flow in January 2018 (California Office of Emergency Services [Cal OES] 2018). Mudflows and debris flows will likely increase as more precipitation falls during a storm event and hillsides more frequently have burned.

5.3.3 Earthquake & Liquefaction

Description of Hazard

An **earthquake** is a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the earth's surface or along fault lines. When the accumulated energy grows strong enough, the plates that form the Earth's surface break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet, commonly called faults; however, some earthquakes occur in the middle of plates.

A **fault** is a fracture in the earth's crust along which movement has occurred either suddenly during earthquakes or slowly during a process called creep. Damage associated with fault-related ground rupture is normally confined to a fairly narrow band following the trend of the fault. Structures are often not able to withstand fault rupture and utilities crossing faults are at risk of damage. Fault displacement involves forces so great that it is generally not feasible (structurally or economically) to design and build structures to accommodate this rapid displacement (Santa Barbara County Planning and Development Department 2015).

An earthquake is caused by a release of strain within or along the edge of the Earth's tectonic plates producing ground motion and shaking, surface fault rupture, and secondary hazards, such as ground failure. After just a few seconds, earthquakes can cause massive damage and extensive casualties. The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and destruction.

Most people are familiar with the Richter scale, a method of rating earthquakes based on strength using an indirect measure of released energy (Table 5-3). The Richter scale is logarithmic. Each one-point increase corresponds to a 10-fold increase in the amplitude of the seismic shock waves and a 32-fold increase in energy released. For example, an earthquake registering 7.0 on the Richter scale releases over 1,000 times more energy than an earthquake registering 5.0. Figure 6-1 is the ShakeMap produced for a hypothetical 7.4 magnitude earthquake if the epicenter was located below the Santa Ynez Mountains along the Red Mountain fault.

Table 5-3. Richter Scale

Richter Magnitudes	Earthquake Effects
Less than 2.0	Microearthquakes generally not felt
2.0-2.9	Generally not felt but recorded.
3.0-3.9	Often felt, but rarely causes damage.
4.0-4.9	Noticeable shaking of indoor items, rattling noises. Significant damage is unlikely.
5.0 -5.9	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.
6.0-6.9	Can be destructive in areas up to about 100 kilometers across residential areas.
7.0-7.9	Can cause serious damage to larger areas.
8 -8.9	Can cause serious damage in areas several hundred miles across.
9 or greater	Devastating in areas several thousand miles across.

Source: GNS Science 2021

Liquefaction occurs when ground shaking causes the mechanical properties of some fine-grained, saturated soils to liquefy and act as a fluid. It is the result of a sudden loss of soil strength due to a rapid increase in soil pore water pressures caused by ground shaking. For liquefaction to occur, three general geotechnical characteristics should be present: 1) groundwater should be present within the potentially liquefiable zone, 2) the potentially liquefiable zone should be granular and meet a specific range in grain-size distribution, and 3) the potentially liquefiable zone should be of low relative density. If those criteria are present and strong ground motion occurs, then those soils could liquefy, depending upon the intensity and duration of the strong ground motion. The duration of ground shaking is also an important factor in causing liquefaction to occur. The larger the earthquake magnitude, and the longer the duration of strong ground shaking, the greater the potential there is for liquefaction to occur.

Location and Extent of Hazard in the City of Carpinteria

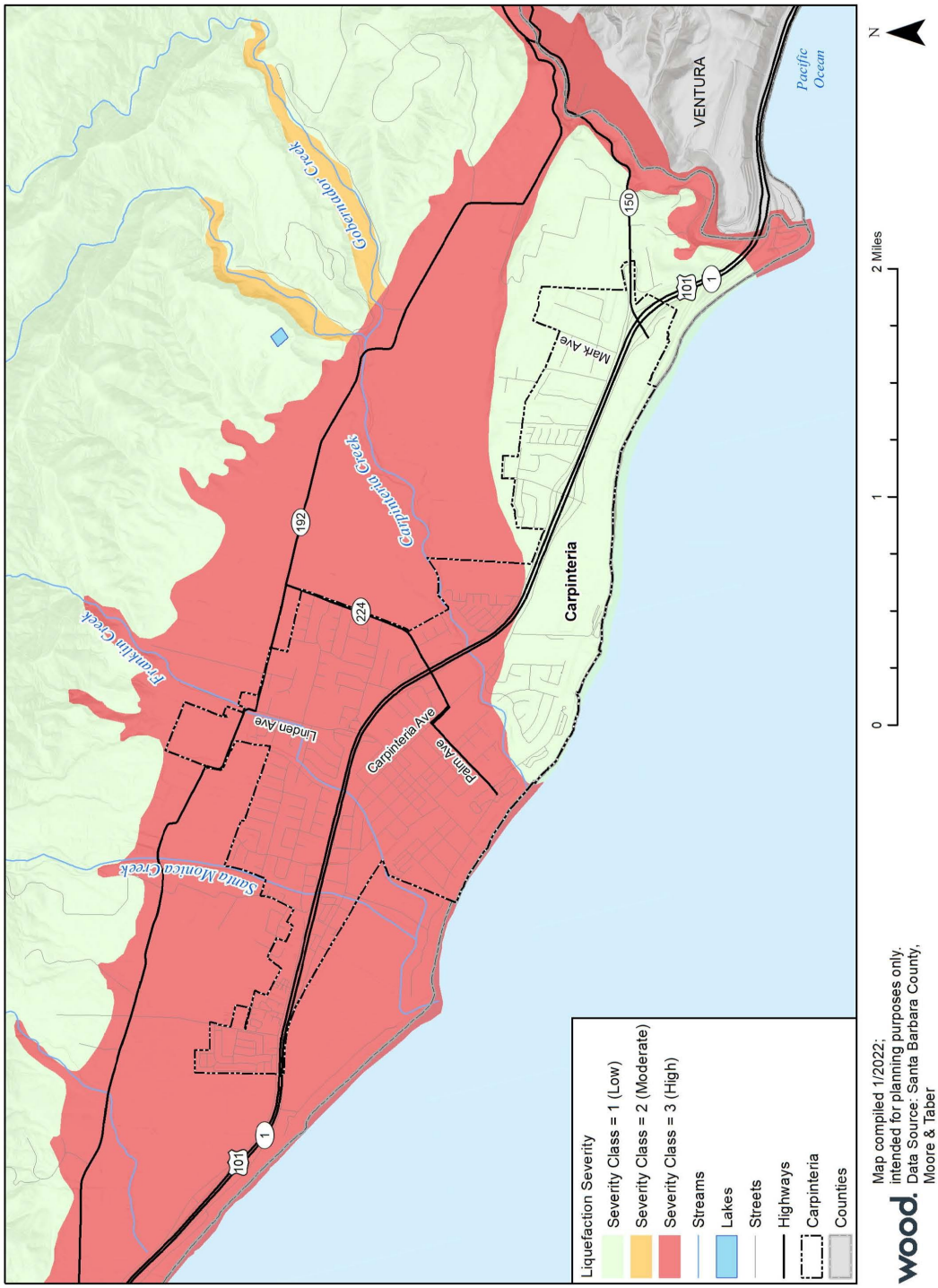
The City is located in a high seismic activity zone in the Transverse Range geologic province (Santa Barbara County 2015). According to the California Department of Conservation Division of Mines and Geology criteria for classifying the activity level for faults, none of the faults in the City are considered "active." Thus, the fault rupture potential is low. Nevertheless, for planning purposes, all of the following faults should be considered potentially active:

Carpinteria Fault, the Rincon Creek Fault, the Holloway Fault, an unnamed fault, the Red Mountain Fault, the Arroyo Parida Fault, and the Shepard Mesa Fault. All historically active, active, and potentially active faults are represented in Figure 5-8 of the MJHMP as mapped by USGS and the California Geological Survey.

After earthquakes, some regions may be prone to **liquefaction**. On level ground, liquefaction results in water rising to the ground surface. On sloping ground, liquefaction will usually result in slope failure, such as the event at the Sheffield Dam in the aftermath of the 1925 Santa Barbara earthquake.

Liquefaction is important to consider for planning purposes as it can lead to ground failure associated with moderate and large earthquakes and contribute to substantial building and infrastructure losses. There is no historic evidence of liquefaction in the City (Santa Barbara County Planning and Development Department 2015). Most of the low coastal plain and valley bottoms are underlain by alluvium and are at moderate risk with respect to liquefaction potential. This rating is largely based on the probable depth to groundwater with consideration given to probable soil characteristics (i.e., classification, grain size, density) and probable earthquake intensity and duration. Areas in the City that are more susceptible to liquefaction include the low coastal areas with high groundwater and poorly consolidated sandy soils in the Toro Canyon-Carpinteria areas south of Highway 101 (Figure 5-3; Santa Barbara County Planning and Development Department 2015).

Figure 5-3. City of Carpinteria Liquefaction Severity



History of Hazard in the City of Carpinteria

The City is located in a high seismic activity zone and as such has a long history of earthquakes. Although most seismic activity in California occurs within the San Andreas Fault system, most historic seismic events in the region have been centered offshore on an east-west trending fault between the county and the Channel Islands. Several smaller earthquakes in the county have taken place in the past years, including a magnitude 3.4 earthquake one mile off the coast of Carpinteria in December 2021 (Los Angeles Times 2021). Earthquakes approximately magnitude 2.0 are fairly common in the county. Refer to Section 5.3.3 of the MJHMP for an overview of significant earthquake events within the last 50 years.

More than half of the City is located in an area with high liquefaction potential, primarily the areas north of Carpinteria Creek (see Figure 5-3) . However, there is no historic evidence of liquefaction in the City of Carpinteria or Santa Barbara County (Santa Barbara County Planning and Development Department 2015).

Probability of Occurrence

Likely - The USGS and their partners, as part of the latest Uniform California Earthquake Rupture Forecast Version 3, have estimated the chances of having large earthquakes throughout California over the next 30 years. Statewide, the rate of earthquakes around magnitude 6.7 (the size of the 1994 Northridge earthquake) has been estimated to be one per 6.3 years (more than 99 percent likelihood in the next 30 years); in southern California, the rate is one per 12 years (93 percent likelihood in the next 30 years) (refer to Table 5-10 of the MJHMP). Given that there are no active faults in the City, the likelihood of serious damage from an earthquake is lower than in other areas of the county.

Climate Change Considerations

While climate change is not expected to directly affect earthquake frequency or intensity; it could exacerbate indirect or secondary impacts of earthquakes. For example, climate change could increase the frequency and intensity of extreme precipitation events, which in turn increases the probability of landslides and liquefaction events during an earthquake if the earthquake coincided with a wet cycle (California Natural Resources Agency 2018).

5.3.4 Coastal Hazards

Description of Hazard

Coastal hazards result from coastal processes, such as rising and falling water levels, breaking waves, and shifting sands that can alter the coastline, as well as those hazards projected to increase substantially with sea level rise including coastal erosion and coastal flooding. Within the City, development within coastal areas has been and will continue to be susceptible to various types of coastal hazards.

Sea level rise is defined as the rising of the level of the oceans. Globally, sea levels are rising as a result of two factors caused by human-induced climate change. The first factor is the thermal expansion of the oceans. As ocean temperatures warm, the water in the ocean expands and occupies more volume, resulting in a rise in sea levels. The second factor contributing to global sea

level rise is the additional volume of water added to the oceans from the melting of mountain glaciers and ice sheets on land. The rate at which sea levels will rise is largely dependent on the feedback loop between the melting of the ice, which changes the land cover from a reflective ice surface, and the open ocean water, which absorbs more of the sun's energy and increases the rate of ice melt.

Coastal erosion refers to beach, dune, and bluff erosion that results from winter storms, tidal action, wave action, and over time rising sea levels. Erosion cuts into dunes and bluffs, threatening development along the coast, and can wash away beach sand supplies, resulting in narrower beach conditions and the landward encroachment of ocean mean high-water mark. In the county, coastal erosion is heavily influenced by storm surges when water levels are higher than normal and wave attacks are particularly strong.

Coastal accretion refers to sand build-up on beaches. Sand beaches form upcoast of headlands and points, in the protected portion of bays, along the seaward portion of dunes, and on the open coast where there are rivers to maintain a supply of new sand to the coast. Engineering structures such as groins and jetties can cause sand to build up on the upcoast side. Breakwaters can provide a protected harbor area landward of the structure, but also can trap sand and build up beach areas. Structures such as groins and jetties will usually produce accretion in one area but may produce erosion in another. Beach nourishment, which takes sand from offshore deposits or inland reservoirs and dams, can add new sand to beaches and provide for beach accretion without causing erosion elsewhere.

Coastal flooding can result from waves and runup, high tides including" king tides", storm surge, and the confluence of heavy rainfall and storms. It can include tidal flooding from extremely high tides causing seawater to spill inland to low-lying areas, and storm surges and wave attacks where runup from storm waves overtops beaches, rock revetments, or seawalls and washes inland, sometimes in concert with heavy rain events. Such flooding can inundate homes, businesses, and public facilities in low-lying areas while storm surges and wave attacks can damage or destroy structures or facilities. Wave attacks can flood low-lying areas, erode the shoreline or cause bluff retreat with damage to structures (FEMA 2021a).

All coastal hazards in the City can be exacerbated by El Niño events. El Niño events, which occur every 2-5 years, vary in severity, but can substantially increase storm frequency and severity, with much, but not all, of past coastal damage and current coastal hazards related to these events. Coastal storms produce large ocean waves that sweep across low-lying coastlines making landfall. Storm surges can inundate coastal areas, destroy dunes, and cause flooding. If a storm surge occurs at the same time as high tide, the water height will be even greater. Historically, the City has also been vulnerable to storm surge inundation associated with El Niño events and a related increase in storm severity.

Location and Extent of Hazard in the City of Carpinteria

The South Coast has a long history of exposure to coastal hazards from bluff retreat to coastal erosion and flooding. Low-lying areas such as those within the Beach Neighborhood of Carpinteria have experienced coastal flooding due to storms surges and wave attacks. Bluff erosion is another serious local hazard with annual bluff erosion rates generally varying from 6 inches to one foot per year, depending upon location.

Because many factors influence coastal erosion, including human activity, sea level rise, seasonal fluctuations, and climate change, sand movement will generally be locally variable.
Photo: City of Carpinteria

Coastal hazards modeling efforts show that the coastal dunes and bluffs in Carpinteria are vulnerable to coastal erosion caused by exposure to waves, weathering, and runoff (Santa Barbara County 2017). In such areas, erosive processes slowly eat away at the beach and foundations of the bluffs, reducing beach widths, eroding dunes, and creating risk for bluff collapse. Bluff collapses threaten bluff-top property and create a safety risk to people visiting the lower beaches.

Shoreline changes (coastal erosion and accretion) result from a change in sediment supply, coastal processes including large storms, and human activities. When sediment supply exceeds the gross longshore sediment transport rates then the coast will accrete seaward; when more sediment is removed than supplied, the coast will erode. Long-term changes in the shoreline are caused by sediment supply and sea level rise, whereas short-term or event-based erosion is caused by large storm events (City of Carpinteria 2019). Sandy beach widths on Carpinteria City beach range between 65 and 200 feet, although width varies seasonally and along the coast. Carpinteria beaches experience seasonal cycles in which winter storms move significant amounts of sand offshore, creating steep, narrow beaches. In the summer, gentle waves return the sand onshore, widening beaches and creating gentle slopes. Each year, the City installs an approximately 1,300-foot-long seasonal storm berm out of sand along Carpinteria City Beach to buffer against large wave events in the fall and winter. When the storm wave season passes in the spring, the City pushes the sand back onto the beach (City of Carpinteria 2019).

In response to coastal hazards, private property owners and local governments have erected rock revetments and seawalls to attempt to protect public and private improvements from coastal hazard damage. The UPRR has also installed both concrete seawalls and rock revetments to protect the railroad tracks along the South Coast from Carpinteria to Gaviota. The long-term effects of such coastal protection structures are subject to debate, as well as their secondary impacts on natural coastal processes and sand supply.

For example, cobbles were once plentiful under the Carpinteria beaches, and typically visible during the winter storm season. Cobbles enabled the beaches to dissipate large destructive wave energy. However, large El Niño storms in 1982-1983 and 1997-1998 removed most of the

cobbles. While no definitive studies have identified the exact cause, factors may include a decline in the supply of cobbles and sediment due to changes in the watersheds, the Sandyland Revetment, construction of sediment debris basins, and upcoast coastal armoring that protects cliffs from erosion.

The Sandyland Reventment is a rock revetment fronting Sandyland Cove located within the County of Santa Barbara. The reventment was built by Sandyland Cove residents in the mid-1980s under an emergency permit issued by the County of Santa Barbara as a result of shoreline changes in the 1900s. The revetment partially encroached on the public beach seaward of the Sandyland Cove homes and resulted in the burial of the beach due to the structure's footprint. Additionally, coastal erosion caused by an increase in the longshore currents moves sand along the Sandyland Revetment and erodes sand near the Ash Avenue access to Carpinteria City Beach, narrowing the beach (Revell et al 2008).

The installation of the Santa Monica debris basins in 1970 has also interrupted the migration of natural course sediments to the Carpinteria shoreline, reducing the amount of cobble transported to the City's beaches. While the debris basins have prevented severe damage from mudflows and debris flows during flood and storm events, they effectively prohibit the natural process of sediment movement along the City's creeks to the shoreline.

In localized spots adjacent to Carpinteria City Beach, shoreline protection in the form of coastal armoring structures also causes seasonal impacts to the sandy beach width, including a narrowing of the beach, an acceleration of sand transport, and a seasonal erosion hotspot at the end of Ash Avenue near the lifeguard tower (Revell et al 2008). Armoring of the coastline upcoast from Carpinteria significantly reduces sediment input to the shoreline. Armored shoreline structures do not allow sediment to migrate offshore during storm events and thereby prevent sand bars from forming (City of Carpinteria 2019).

The Sandyland Revetment, Santa Barbara Harbor, upcoast armored coastline structures, and watershed debris basins have significantly reduced the sandy beach width on Carpinteria City Beach, with the unintended consequence of starving the Carpinteria shoreline of natural sediments that are critical to providing shoreline resiliency. Additionally, the lack of cobble significantly reduces the shoreline's natural resilience to wave attack during intense storm events (City of Carpinteria 2019).

Low lying waterfront and beach areas are currently vulnerable to coastal flooding, including wave inundation or heavy rainfall, and are mapped by FEMA Flood Insurance Maps as part of the NFIP (Figure 5-1). This program requires a highly specific technical analysis of watershed characteristics, topography, channel morphology, hydrology, and hydraulic modeling to map the extent of existing wave run-up-related flood hazards. These maps represent the existing 100-year and 500-year FEMA flood events (1 percent and 0.2 percent annual chance of flooding, respectively) and determine the flood extents and flood elevations across the landscape. FEMA flood maps are based on existing flood hazards and do not account for coastal processes, sea level rise, or climate change.

Figures 5-4 depicts projected sea level rise and tidal inundation at 200 cm with no 100-year flood event. Figures 5-5 depicts projected 2030 and 2060 sea level rise scenarios and tidal inundation, including projections that account for flood events.

Figure 5-4. City of Carpinteria Sea Level Rise Projections Tidal Inundations: No Flood Event

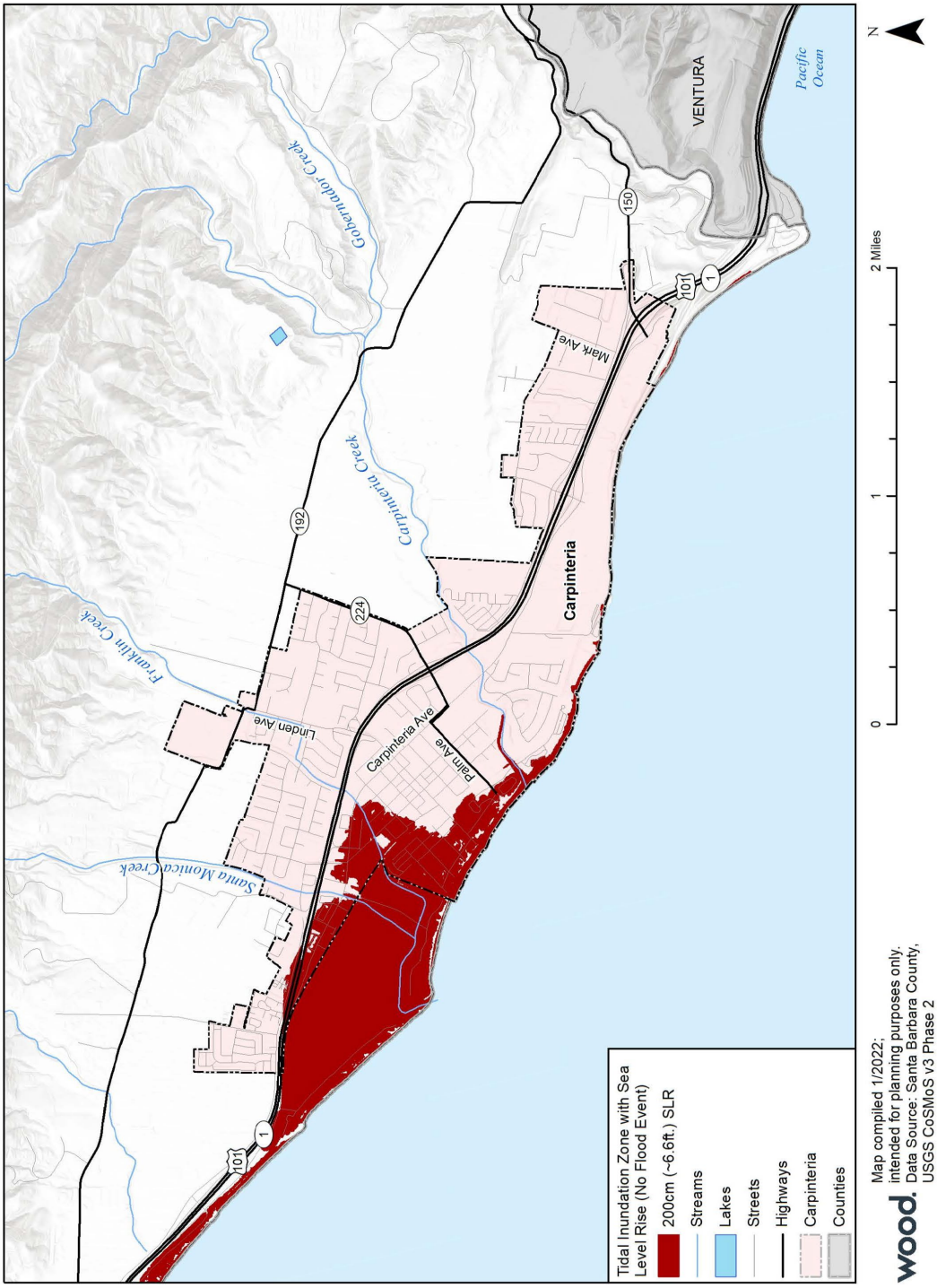
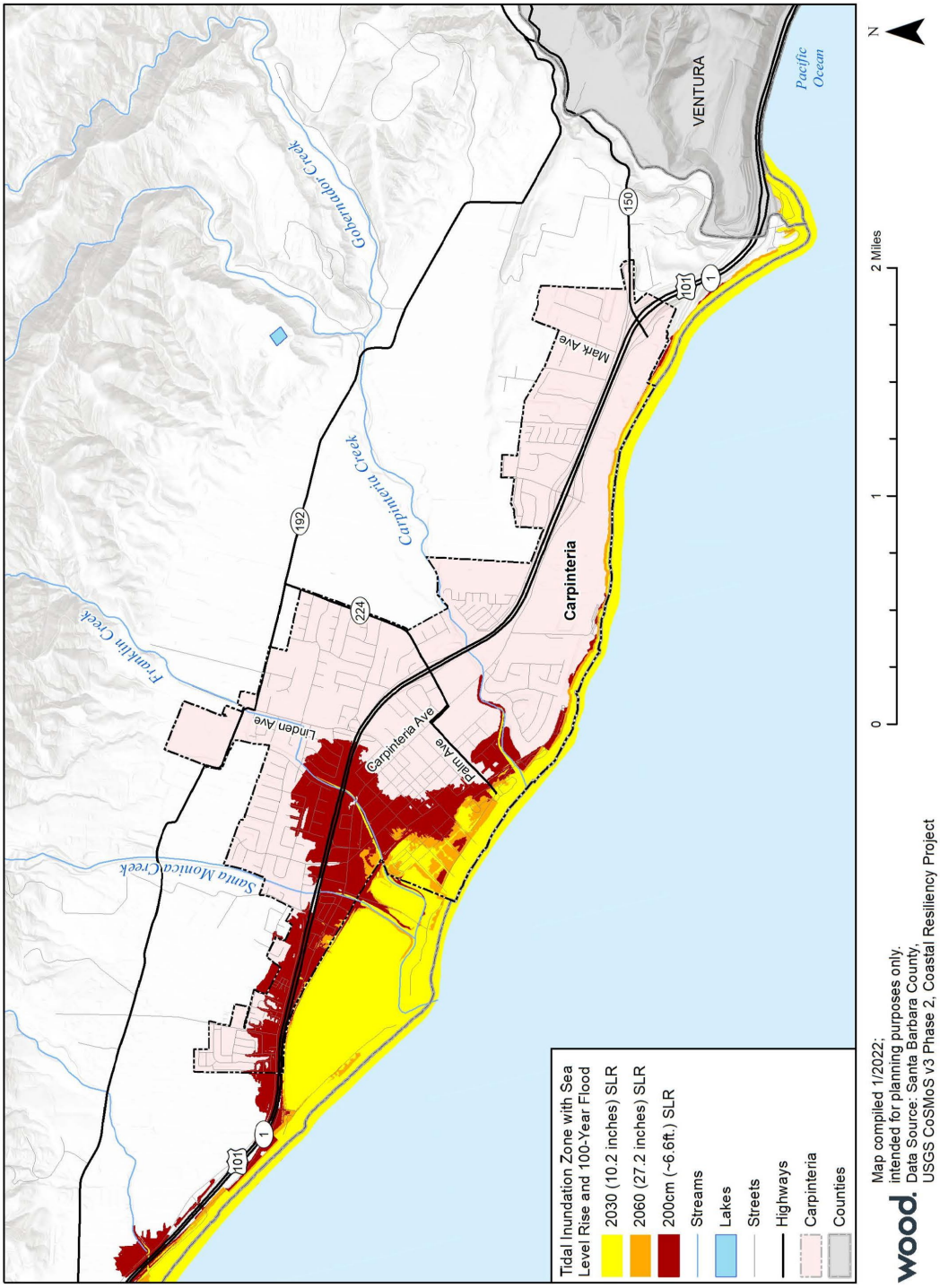


Figure 5-5. City of Carpinteria Sea Level Rise Projections Tidal Inundations: 100 Year Flood Event



History of Hazard in the City of Carpinteria

Typically, coastal hazards increase during periods of major storms that can coincide with high tides, causing coastal flooding, coastal bluff erosion, and landslides such as those that were experienced during the 1983, 1998, and 2015/2016 El Niño storms. Segments of the South Coast have been subject to significant damage from coastal hazards. Historic coastal flooding has occurred along the county's South Coast, particularly in the City of Carpinteria, since the mid-1800s. Significant wave events in 1938, 1943, 1958, 1982–83, 1988, 1997–1998, 2002, 2007, and 2015-2016 demonstrate the dynamic and hazardous coastal environment. Homes along Sandyland Cove and Padaro Lane in the City of Carpinteria suffered substantial damage during the 1983 and 2015/2016 El Niño events in particular. While many of these storm events and creek flooding hazards are associated with El Niño, other causes can threaten the environment including storm events post-wildfire. In such situations, due to an absence of vegetation and resultant soil erosion, large fluxes of sediment can be rapidly transported to the coast. For example, the January 2018 storms caused severe mudflows and debris flow in Montecito and Carpinteria (refer to Section 5.3.2, *Mudflow & Debris Flow*).

Incident Profile: Carpinteria Beach Coastal Erosion

In 1987, a seasonal erosion hotspot resulted in damage to the City lifeguard facility at the terminus of Ash Avenue. This storm also caused significant damage to the property located at the end of Ash Avenue; subsequent development was therefore raised on pier piles to make the structure more resilient to future storms.

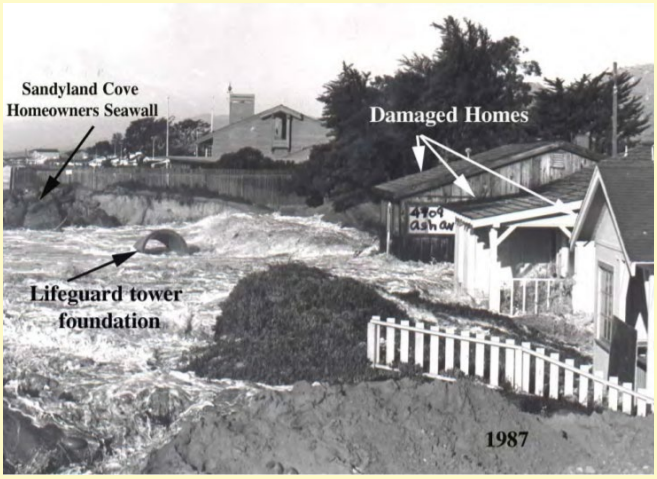


Photo: City of Carpinteria

The Carpinteria and Sandyland shoreline has changed dramatically since the late 1800s when a large dune field was present. These changes are mostly due to indirect or direct human impact or influences, including the downcoast erosion and loss of sediment supply as a result of the construction of the Santa Barbara Harbor approximately 10 miles to the west, and loss of dune and wetland habitat due to development along the Carpinteria shoreline. Breakwater construction at the Santa Barbara Harbor began in 1927 and was completed by 1930, during which approximately 2.6 million cubic yards of sand were impounded updrift of the Santa Barbara Harbor at Ledbetter Beach. Sand impoundment led to a well-documented erosion wave that migrated downcoast at a pace of approximately 1 mile per year. The arrival of the erosion wave to Sandyland and Carpinteria, combined with storm waves arriving from a hurricane that made landfall in Long Beach in 1938, resulted in the erosion of the historic dune field at Sandyland and the beach at Carpinteria in the late 1930s. In addition, the natural underwater sand peninsula (tombolo) between the dunes and Carpinteria Reef was eroded (City of Carpinteria 2019).

The effect of this erosion changed the longshore currents in Carpinteria and likely allowed more swell energy to rotate Carpinteria beaches in a slightly clockwise direction. The long-term shoreline and beach responses to this erosion event were to erode the beach in front of Sandyland Cove and accrete the beach in front of Tar Pits Park, effectively rotating the beach slightly to the southeast. Photogrammetric analysis of 16 historic aerial photographs shows long-term changes along the Carpinteria shoreline since the 1869 shoreline position was documented at Sandyland Cove Beach, Ash Avenue, Linden Avenue, and Tar Pits Park (City of Carpinteria 2019). Sandyland Cove Beach saw the largest changes, eroding by approximately 100 feet, and Ash Avenue narrowed by approximately 50 feet. Meanwhile, accretion occurred on the beach at Linden Avenue (approximately 30 feet) and Tar Pits Park (approximately 60 feet). These active erosion processes create a seasonal erosion hotspot which is shown in seasonal beach changes and a coarsening of the sediment grain size (Revell et al 2008). This erosion hotspot resulted in damage to the City lifeguard facility at the terminus of Ash Avenue in 1987. This storm also caused significant damage to the property located at the end of Ash Avenue; subsequent development was therefore raised on pier piles to make the structure more resilient to future storms (City of Carpinteria 2019).

Probability of Occurrence

Highly Likely - Coastal flooding from tidal inundation and wave attack and associated erosion of coastal bluffs and beaches occurs during many winters but is most pronounced during past major El Niño events, which have return intervals of 2 to 7 years. Although many private coastal properties and public facilities have been protected by rock revetments or seawalls, coastal flooding, beach and bluff erosion continue in the City of Carpinteria. While the existing probability of occurrence is typically confined to El Niño seasons or major storm events, as discussed below, climate change and sea level rise are projected to increase in frequency and severity of occurrence.

Climate Change Considerations

As of 2021, the most current sea level rise projections for California are from the Ocean Protection Council (OPC) 2018 *State of California Sea Level Rise Guidance* (OPC 2018). The California Governor's Office of Planning and Research 2018 *State of California Sea Level Rise Guidance* projections predict sea level in Santa Barbara County will rise 8.4 inches by 2030, 30 inches by 2060, and 79.2 inches by 2100 (Santa County Barbara Planning and Development Department 2021). OPC's 2018 guidance asserts the direction of sea level change is clear along coastal California and the coast is already experiencing early impacts including more extensive coastal flooding during storms, periodic tidal flooding, and increased coastal erosion (OPC 2018).

The County's 2017 Coastal Resiliency Project projects sea level in the county will rise by 10.2 inches in 2030, 27.2 inches by 2060, and 60.2 inches in 2100. The County's 2017 *Sea Level Rise and Coastal Hazards Vulnerability Assessment* used existing 2015 coastal hazards modeling from Jalama Beach to Rincon Point by Environmental Science Associates as well as additional coastal hazard modeling on the south coast by Revell Coastal, LLC with the same sea level rise scenarios and planning horizons. The County modeled coastal hazards for coastal armoring and no coastal armoring. Particularly susceptible areas of the county to sea level rise related impacts include segments of the UPRR and Highway 101 from the City of Carpinteria to the Gaviota Coast and the Beach Neighborhood and Downtown in Carpinteria (Santa Barbara County 2017).

More specific coastal hazard modeling was performed for the City of Carpinteria by Wood Environment & Infrastructure Solutions, Inc. and Revel Coastal, LLC as part of the City's 2019 Sea Level Rise Vulnerability Assessment and Adaptation Plan (SLRVAAP). This study similarly concluded that the most susceptible areas of the City include the Carpinteria Beach Neighborhood and Carpinteria Salt Marsh (City of Carpinteria 2019). Based on this study, sea levels are projected to rise by as much as 6.6 feet by 2100, though more extreme scenarios project sea levels rising as much as 7.1 feet by 2100; however, these extreme scenarios are based on worst-case greenhouse gas (GHG) emissions assumptions, are highly conservative, and considered to be very unlikely of occurring (see Table 5-4). While sea level rise projections will continue to change as scientific understanding increases and policy choices manifest, what is clear for the most current projections is that sea levels are bound to increase at a significant rate, further increasing both the probability and severity of coastal hazards throughout all of Santa Barbara County (OPC 2018).

Table 5-4. Projected State and Local Sea Level Rise Scenarios (inches)

Ocean Protection Council Rising Seas in California: An Update on Sea-Level Rise (2017)				
Year	*Sea Level Rise Scenario*			
	Median (50% Probability)	*Likely (67% probability)*	*Unlikely (5% Probability)*	*Very Unlikely (0.5% Probability)*
2030	1.2 – 6.0	0.0 – 7.2	4.8 – 8.4	6.0 – 10.8
2050	0.4 – 10.8	2.4 – 14.4	10.8 – 16.8	18.0 – 24.0
2010	8.4 – 31.2	1.2 – 43.2	27.6 – 55.2	57.6 – 85.2
County of Santa Barbara Sea Level Rise and Coastal Hazard Vulnerability Assessment (2017)				
Year	*Sea Level Rise Scenario*			
	Low Rate	*Medium Rate*	*High Rate*	--
2030	0.0 - 1.8	1.2 - 5.8	8.0 - 12.1	--
2060	0.0 - 6.3	7.2 - 11.8	22.5 - 30.8	--
2100	10.6 - 16.5	30.7 - 36.7	60.2 - 66.0	--
City of Carpinteria Sea Level Rise Vulnerability Assessment & Adaptation Plan (2019)				
Year	Sea Level Rise Scenario			
	Median (50% Probability)	*Likely (67% probability)*	*Unlikely (5% Probability)*	*Very Unlikely (0.5% Probability)*
2050	3.6 – 8.4	2.4 – 12.0	6.0 – 14.4	8.4 – 21.6
2080	8.4 – 16.8	4.8 – 25.2	16.8 – 32.4	26.4 – 51.6
2100	12.0 – 25.2	6.0 – 37.2	24.0 – 49.2	43.2 – 79.2

Source: OPC 2017; Santa Barbara County 2017; City of Carpinteria 2019.

Sea level rise will cause more rapid erosion of beaches, dunes, and bluffs, increasing the threat to shoreline development and infrastructure, including coastal homes in Carpinteria. Climate change will exacerbate the impacts of coastal hazards and erosion in the City. While sea levels are projected to increase globally, sea level rise will not occur uniformly, and along the Pacific Ocean, sea levels will depend partially on tectonic movements and weather patterns. The county's portion of the San Andreas Fault's tectonic plate is folded causing areas of uplift and subsidence. Local subsidence can lead to a slightly higher sea level rise in the county than global estimates and uplift can reduce the rate of sea level rise. Additionally, the City is affected by El Niño storm surge events,

particularly during some winter months. Sea level rise coupled with increased frequency, severity, and duration of high tide and storm events related to climate change will result in more frequent and severe extreme events along the coast. These events could expose the coast to severe flooding, damage to coastal structures and real estate, and salinity intrusion into delta areas and coastal aquifers (Cayan et al. 2006).

Further, the increased severity of coastal storms has the potential to increase coastal erosion events. More frequent storms will impact how frequently acute coastal erosion events occur, while more intense events will cause the erosion to extend further inland than before. Following a similar trend as projected rates of sea level rise, the rate of bluff-top erosion is also projected to increase by up to 140 percent on average with 6.6 feet of sea level rise and may increase from a current average rate of 6 inches to 1 foot per year to up to 3 feet per year along the South Coast. In addition, coastal flooding and tidal inundation will also become a more frequent and severe hazard, as coastal flooding is directly correlated with the mean average sea level.

5.3.5 Pandemic/Public Health Emergency

Description of Hazard

The amount of a particular disease that is usually present in a community is referred to as the baseline or endemic level of the disease. This level is not necessarily the desired level, which may be zero, but rather is the observed level. In the absence of intervention and assuming that the level is not high enough to deplete the pool of susceptible persons, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease (Center for Disease Control and Prevention [CDC] 2012).

Occasionally, the amount of disease in a community rises above the expected level. When diseases spread quickly and easily, they may be classified as an outbreak, epidemic, or pandemic. An **outbreak** is when there are more cases than would be normally expected, often suddenly, of an infectious disease in a more limited geographic area (e.g., a community or facility). An **epidemic** carries the same definition as an outbreak but affects a population of a large geographic area and may occur seasonally. A **pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people (CDC 2012). Pandemics are larger than epidemics in terms of geographic area and the number of people affected. Pandemics are most often caused by new subtypes of viruses or bacteria for which humans have little or no natural resistance. Consequently, pandemics typically result in more deaths, social disruption, and economic loss than epidemics. Examples include pandemic influenza, Severe Acute Respiratory Syndrome (SARS), and the Coronavirus (COVID-19).

Three conditions trigger a pandemic declaration:

1. A new virus subtype must emerge that has not previously circulated in humans (and therefore there is no pre-existing immunity);
2. This new subtype must be able to cause disease in humans; and
3. The virus must be easily transmissible from human to human.

Pandemics may be caused by:

- Naturally occurring diseases spread person to person (e.g., measles, mumps, meningococcal disease, tuberculosis);
- Food-borne (e.g., salmonella, E. coli, botulinum toxin, etc.);
- Vectors such as a mosquito that spread disease (e.g., West Nile virus, dengue, Zika, malaria);
- Newly emerging infectious diseases (e.g., Ebola, Zika, SARS, Middle East Respiratory Syndrome (MERS), avian influenza); and
- The intentionally caused spread of disease or toxins, known as bioterrorism (e.g., the contamination of restaurant food with E. coli in Oregon [1984] and the release of Sarin gas in the Tokyo subway [1995]).

Public health measures are used to control outbreaks, epidemics, or pandemics of infectious diseases, and are especially important for diseases with high morbidity or mortality and limited medical prophylaxis and/or rapid treatment. Measures to control disease include:

- Legal measures (e.g., isolation and quarantine of persons or products, and legal closure of food establishments);
- Control of contaminated food or water through recall of product or, for water, "Do Not Use", "Do Not Drink" or "Boil Water" orders issued by state or local health departments;
- Individual mandates (e.g., wearing masks) to prevent spreading respiratory droplets;
- Social measures (e.g., social distancing); and
- Vector control to eliminate vectors, such as mosquitos, that carry the disease from person to person.

Secondary impacts include significant economic disruption to a community's infrastructure due to loss of employee work time, essential services and products, and costs of treating or preventing the spread of the disease. The disease could affect the County's infrastructure, and the ability of the Emergency Operations Center (EOC) and other County departments to respond due to disease-related loss of staff.

The Vector-Borne Disease Section of the California Department of Public Health reports risk or potential risk of exposure to the following vector-borne disease in California, which may occur in the City (California Department of Public Health 2021):

- Mosquito-Borne Diseases:
  - Zika
  - Chikungunya
  - Dengue
  - West Nile Virus
  - St. Louis Encephalitis Virus
  - Malaria
- Flea-Borne Typhus
- Hantavirus Pulmonary Syndrome
- Plague
- Tick-Borne Diseases:
  - Lyme Disease
  - Anaplasmosis
  - Babesiosis
  - Ehrlichiosis
  - Rocky Mountain Spotted Fever
  - Pacific Coast Tick Fever
  - Tick Paralysis
  - Tularemia

Location and Extent of Hazard in the City of Carpinteria

Public health emergencies, such as infectious disease hazards or epidemics, occur not only on a local or state level but on a national and global scale. It is likely that most communities in the county, including the City, would be affected, either directly or by secondary impacts. Some indirect consequences may be the diversion of resources that may be otherwise available given the limited regional transportation opportunities and flow of goods and materials to the City.

The University of California (UC) Natural Reserve System has identified 10 species of mosquitos known to breed in Carpinteria Salt Marsh. Some of the native mosquito species can carry malaria (e.g., Anopheles sp.), or encephalitis (e.g., Culex sp.). The Carpinteria Valley Mosquito Abatement District monitors the estuary during the rainy season and treats various sites, especially those with ponded water, to reduce or eliminate mosquitoes. The most common practices of control are the application of oil in ponded areas to suffocate mosquitoes and the occasional draining of ponded water (UC Natural Reserve System 2022).

History of Hazard in the City of Carpinteria

Outbreaks, epidemics, or pandemics can occur when a new virus emerges to which the population has little immunity.

Pandemics

The 20th century saw three pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 40 to 50 million deaths throughout the world. Since the early 20th century, five pandemics have swept the globe. The most notable pandemic of the 21st century is the current COVID-19 pandemic, described further below:

- **1918** – The Spanish Flu, an H1N1 virus, was arguably the most severe pandemic in recent history. The number of deaths was estimated to be 40 to 50 million worldwide and 500,000 in the U.S. Its primary victims were mostly young, previously healthy adults. At one point, more than 10 percent of the American workforce was bedridden (U.S. Department of Health and Human Services 2005).

- **1957** – The H3N2 pandemic in 1957, which was referred to as the "Asian Flu," killed 1 to 2 million people worldwide, including approximately 70,000 people in the U.S., mostly infants, the elderly, and chronically ill. Fortunately, the virus was quickly identified, and vaccine production began in May 1957 (U.S. Department of Health and Human Services 2005).
- **1968** – Another H3N2 pandemic occurred in 1968, which was commonly referred to as the "Hong Kong Flu." This virus killed 34,000 in the U.S. Again, the elderly were more severely affected. This pandemic peaked during school holidays in December, limiting student-related infections, which may have kept the number of infections down. Also, people infected by the Asian Flu ten years earlier may have gained some resistance to the new virus (U.S. Department of Health and Human Services 2005).
- **2009** – In the spring of 2009, a novel influenza A (H1N1) virus "Swine Flu" emerged. It was detected first in the U.S. and spread quickly across the U.S. and the world. This new H1N1 virus contained a unique combination of influenza genes not previously identified in animals or people. This virus was designated as influenza A (H1N1) pdm09 virus. While a monovalent (H1N1) pdm09 vaccine was produced, it was not available in large quantities until late November – after the peak of illness during the second wave had come and gone in the U.S. From April 12, 2009, to April 10, 2010, the CDC estimated there were 60.8 million cases, 274,304 hospitalizations, and 12,469 deaths in the U.S. due to the (H1N1) pdm09 virus. Within Santa Barbara County, the County Public Health Department coordinated the distribution of the initially limited supplies of H1N1 vaccine to medical providers. The vaccine distribution was targeted so that those providers that served the highest risk patients received the vaccine first. In addition, the department held numerous community vaccine clinics countywide where free H1N1 vaccinations were given, including the Canalino School in Carpinteria. Together with community response providers, more than 126,000 dosages of the vaccine against pandemic H1N1 flu were distributed countywide (County Public Health Department 2010).
- **2019-Ongoing** – The COVID-19 pandemic has severely impacted the economic, political, social, and environmental conditions of the City, county, California, the U.S., and the world. Older adults and people who have severe underlying medical conditions like heart or lung disease or diabetes seem to be at higher risk for developing more serious complications from COVID-19 illness; however, numerous stories were reported of young and healthy people who developed the disease and had serious complications. People with COVID-19 have had a wide range of symptoms reported – ranging from mild symptoms to severe illness. Symptoms of COVID-19 include but are not limited to fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea, or vomiting, and diarrhea. Symptoms may appear 2-14 days after exposure to the virus. Anyone can have mild to severe symptoms (CDC 2021). On January 26, 2020, the CDC confirmed the first COVID-19 case in California, the third case in the U.S. As of January 2022, there have been 56,574 confirmed COVID-19 cases within the county and 575 deaths (Santa Barbara County Public Health Department 2022). The County Public Health Department tracks the number of cases in the City along with the South County unincorporated areas of Montecito and Summerland. This region has reported a total of 3,207 confirmed

COVID-19 cases and 28 deaths (Santa Barbara County Public Health Department 2022). As of January 2022, 74 percent of Santa Barbara County was fully vaccinated (Santa Barbara County Public Health Department 2021). In the City of Carpinteria, the County Public Health Department distributes COVID-19 vaccines at the Carpinteria Health Care Center and the Boys & Girls Club. Additionally, the City of Carpinteria, in partnership with the Carpinteria Unified School District (CUSD) and County Public Health Department, distributed approximately 7,000 antigen test kits.

Epidemics

- **2003** – SARS is a respiratory illness that affected many people worldwide in 2003. It was caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). SARS was first reported in China in February 2003. The illness spread to 29 countries, where 8,096 people got SARS, and 774 of them died. Only eight people in the U.S. got SARS and none of them died. The SARS global outbreak was contained in July 2003. Since 2004, there have not been any known cases of SARS reported anywhere in the world (CDC 2016).

Outbreaks

In addition to pandemics that impacted the world, food-borne and other outbreaks occur every few years in Santa Barbara County, commonly the result of Norovirus (refer to Section 5.5.1 of the MJHMP).

Probability of Occurrence

Likely – Even before the COVID-19 pandemic began, most public health experts considered another major pandemic to be inevitable. Given the effects of globalization, the intense mobility of human populations, and the relentless urbanization, it is likely that the next emerging virus will also spread fast and far. It is impossible to predict the nature of this virus or its source, or where it will start spreading. Some indicators will be present, but not every new virus turns into a pandemic (World Health Organization [WHO] 2018). Based on the five pandemics that have affected the U.S. in roughly the last 100 years, a pandemic occurs on average approximately every 20 years.

Disease outbreaks and flu epidemics occur on an ongoing basis. As described above, food-borne outbreaks occur every year in Santa Barbara County, commonly the result of Norovirus. Occasionally, these outbreaks require the initiation of the Santa Barbara County Public Health Department Infectious Disease Response Plan but have required little to no support from the County EOC. There is a continued threat from a novel influenza virus or other emerging epidemic diseases that would require a disaster response at the EOC level.

Climate Change Consideration

It is widely accepted that the effects of climate change will facilitate increases in the frequency of infectious diseases. According to the National Institute of Environmental Health Services (NIH), many vector-borne and zoonotic diseases are climate-sensitive and ecological shifts associated with climate change are expected to impact the distribution and incidences of these diseases (NIH 2018). While many vector-borne and zoonotic diseases, such as malaria, yellow fever, dengue, and murine typhus, are rarely seen in the U.S., the City is directly susceptible to vector-borne and zoonotic

diseases that are found in warmer climates and vulnerable due to global trade and travel. Changes in temperature and precipitation directly affect vector-borne disease transmission through pathogen-host interaction, and indirectly through ecosystem changes and species composition. As temperatures increases, vectors can spread into new areas that were previously too cold. During warm weather, animal species that carry diseases typically become more active and insects and other pests reproduce more rapidly. As climate change causes warmer temperatures earlier in the spring and later in the autumn, these animals may be active for longer periods, increasing the time that diseases can be transmitted (NIH 2018).

Further, climate-related natural disasters (e.g., wildfire, drought and water shortage, flood, coastal hazards) also increase the risk of infectious disease by disrupting health services and infrastructures and damaging water and sanitation networks (WHO 2018).

5.3.6 Energy Shortage & Resiliency

Description of Hazard

Energy shortages (or disruptions) are considered a form of lifeline system failure. While the electrical power industry does not have a universal agreement for classifying disruptions, disruptions can be the consequence of another hazard or can be a primary hazard, absent of an outside trigger. A failure could involve one, or a combination of the potable water system, power system, natural gas system, wastewater system, communication system, or transportation system. Most power blackouts are the result of situations involving unintended events, such as an overwhelming need for power due to weather conditions, equipment failure, or accidents. They may also fail due to natural hazards such as earthquakes, floods, and landslides. These outages can last anywhere from a few minutes to several weeks.

Southern California Edison (SCE) provides power to the southern parts of the county, including the City. SCE is aware of the restrictions on its systems and is making planned systematic changes to address the shortcomings. SCE offers several programs to customers experiencing outages, such as hotel discounts, rebates for portable power devices, and providing customers who rely on medical equipment with portable backup batteries (SCE 2021). SCE also offers power outage alerts via phone and email to alert customers of outages.

Unintentional or unplanned disruptions are outages that come with no advance notice. This type of disruption is the most problematic. The following are categories of unplanned disruptions:

- Accident by the utility, utility contractor, or others
- Malfunction or equipment failure
- Equipment overload (utility company or customer)
- Reduced capability (equipment that cannot operate within its design criteria)
- Tree contact other than from storms
- Vandalism or intentional damage
- Weather, including lightning, wind, earthquake, flood, and broken tree limbs taking down power lines
- A wildfire that damages transmission lines

Due to recent massive wildfires throughout California and their ignition originating from utility infrastructure and high winds, the electric utilities have initiated a program to conduct Public Safety Power Shutdowns to prevent wildfire ignitions. These are classified as intentional, unscheduled disruptions. The utilities are currently working with the County to minimize power delivery interruption while managing wildfire hazards.

Location and Extent of Hazard in the City of Carpinteria

The City and surrounding areas are subject to energy shortages, which can vary in size and area of disruption for electrical services from a large area to a small number of service connections. Electricity service is also highly vulnerable because it is highly dependent on electrical transmission lines and substations functioning properly.

Electrical substations are facilities that convert electricity from one voltage to another, making them suitable for long-distance transmission or use by homes, businesses, and other electrical customers. There is one SCE substation in the City located at 4918 Foothill Road. **Electrical transmission lines** carry high-voltage electricity over long distances between power plants and electrical customers. **Power plants** generate large amounts of electricity that are distributed through the state and regional electrical grid. There are no power plants located in the City.

Additionally, **communication facilities** in the county are run by electricity and therefore, are dependent on electricity. Communication facilities include public radio and television transmitters, cell phone towers, emergency communication antennae, and a wide range of other public and private communication infrastructure systems. The Rincon Peak Relay Station is located at 10151 Oceanview Road in the City.

As described in Section 4.5.2, *Electricity and Natural Gas*, the City enrolled in the Central Coast Community Energy (CCCE) program. Under the program, customers will continue to receive energy services from SCE, but CCCE will determine the source of the energy. CCCE prioritizes clean energy sources and has a goal of achieving 100 percent clean and renewable energy by 2030. CCCE maintains the Uninterruptible Power Supply Fund to accelerate the adoption of reliable backup power for eligible public and private entities operating critical facilities. The program helps customers maintain critical operations during prolonged power outages, such as those caused by Public Safety Power Shutoff events or other natural disasters (CCCE 2022).

History of Hazard in the City of Carpinteria

One of the largest events affecting electric and natural gas services in the City in recent years was the 2017 Thomas Fire, during which the transmission system running from Ventura County to the City of Goleta was shut down, leaving more than 85,000 customers without power for an extended period during the emergency (SCE 2017). Similar service disruptions, though not quite as extensive, occur in areas affected by wildfires and other disasters or emergencies. Small-scale energy disruptions have occurred regularly in the City.

Probability of Occurrence

Likely - In any given year, the City of Carpinteria can be subject to energy shortages. A large disruption due to a power failure or rotating brown out is highly likely.

Climate Change Considerations

With increased changes in weather and climate, energy demands will shift too. The increased prevalence of extreme heat can drive energy demand and increase the need for intentional, unscheduled power shutoffs. Further, the resiliency of power systems can be threatened during a wildfire. As wildfire occurrences associated with climate change increase so does the risk for utility failure. Energy demand and management are critical during disaster response.

5.3.7 Drought & Water Shortage

Description of Hazard

A **drought** occurs when climactic and weather conditions are drier than normal for a long period, making less water available for people, agricultural uses, and ecosystems. Drought and water shortages are a gradual phenomenon and generally are not signified by one or two dry years. Carpinteria Valley Water District's (CVWD's) extensive system of water supply infrastructure (e.g., reservoirs, groundwater basins, and conveyance facilities) generally mitigates the effects of short-term dry periods for most water users. However, drought conditions are present when a region receives below-average precipitation over an extended multiple-year period (e.g., 3 to 4 or more years), resulting in prolonged shortages in water supply, whether atmospheric, surface, or ground water (California Department of Water Resources [DWR] 2021a).

The magnitude of a drought's impact is directly related to the severity and length. The severity of a drought depends on water availability and moisture deficiency, the period, and the size and location of the affected area. The longer the drought persists and the larger the area impacted, the more severe the potential impacts. Droughts can be a short-term event over several months or a long-term event that lasts for years or even decades. Hot and dry conditions that persist into spring, summer, and fall can aggravate drought conditions, making the effects of drought more pronounced as water demands increase during the growing season and summer months. Impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline (DWR 2021b).

Longer-term droughts can impact surface water reservoir storage levels in major reservoirs, such as Lake Cachuma, which provides about 41 percent of CVWD's total water supplies (CVWD 2021a). Longer-term droughts can also impact water levels in major groundwater basins that are key to both urban and agricultural water supply. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Public health and safety impacts are primarily associated with catastrophic wildfire risks, drinking water shortages, and declines in water quality most frequently for small water systems in rural areas and private residential wells. The most significant impacts associated with drought in the City are those related to water-intensive activities such as wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. During a drought, voluntary water conservation measures are typically implemented during extended droughts. The City may face water restrictions during droughts, which are exacerbated by extreme heat days

Water quality deterioration can occur during droughts due to lower levels of precipitation and limited water storage supply (DWR 2021b). Increased groundwater pumping in combination with sea level rise can increase saltwater intrusion in groundwater aquifers (Environmental Protection Agency [EPA] 2021). Saltwater intrusion into the Carpinteria Groundwater Basin can also occur when groundwater levels fall below sea level proximate to the coast. This decrease in water quality also results in the subsequent degradation of riparian habitats (DWR 2021b).

Location and Extent of Hazard in the City of Carpinteria

As of May 2021, Governor Gavin Newsom declared a drought emergency in 41 California counties in northern and central California (CalMatters 2021). On July 13, the Santa Barbara County Board of Supervisors proclaimed a local emergency caused by current drought conditions within the county (Santa Barbara Independent 2021). The CVWD Board of Directors approved Ordinance 21-1 declaring a Stage 2 Drought Condition on October 13, 2021, in response to State and County of Santa Barbara drought emergency declarations issued in July 2021, continued dry conditions, possible surface water allotment reductions, and the likelihood of shortages within CVWD's service area of over 20 percent of average annual demand within the coming years (CVWD 2021b).

CVWD has a balanced water supply portfolio with groundwater from the Carpinteria Groundwater Basin, surface water supplies from the Cachuma Project, and imported surface water from the State Water Project (SWP). In 2020, the CVWD water demand was approximately 4,105 acre-feet (AF) of water (CVWD 2021a). Additional water supplies are pumped from the Carpinteria Groundwater Basin by private well owners primarily for irrigation purposes. During a normal water year with long-term sustainability considerations, the total water supply is estimated at 4,586 AF for 2025 and 5,586 AF for the period 2030 to 2045. During periods of prolonged drought, the CVWD water supply would be reduced compared to that of normal water-years. For instance, water supplies after four years of drought may be as low as 3,905 to 4,306 acre-feet per year (AFY) for the period 2025 to 2045, or approximately 600 to 1,300 AFY less than during normal conditions (CVWD 2021a).

Groundwater

Following the state declaration of a drought emergency in January 2014, the Governor signed a three-bill package (i.e., California Senate Bills [SBs] 1168 and 1319, and Assembly Bill [AB] 1739), known as the Sustainable Groundwater Management Act of 2014. The Sustainable Groundwater Management Act provides for the establishment of local Groundwater Sustainability Agencies to manage groundwater sustainability within the groundwater subbasins defined by the DWR. The DWR prioritized all groundwater basins in the state designating High and Medium priority basins to help identify, evaluate, and determine the need for additional groundwater level monitoring. High or Medium priority basins subject to critical conditions of overdraft are required to submit a Groundwater Sustainability Plan (GSP) by January 31, 2020, to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the state asserting its power to manage local groundwater resources. The state has identified the Carpinteria Groundwater Basin, which underlies the City and the CVWD district boundaries, as a high-priority groundwater basin (refer also to Table 4-7 and Figure 5-6 of the MJHMP).

CVWD overlays the Carpinteria Groundwater Basin (DWR Basin No. 3-018), a relatively large groundwater aquifer, that extends beyond the Ventura County line on the east, to Toro Canyon on the west, from the foothills of Santa Ynez Mountains to the north, and extending offshore to the southwest for over a mile. The Basin includes approximately 16.6 square miles of surface area and multiple water-bearing zones. Total storage in the aquifer is estimated to be approximately 700,000 AF (CVWD 1986), while usable storage for the Basin recharge area was estimated to be nearly 38,926 AF (Marks 2015). The estimated sustainable yield of the Basin Unit No. 1 is approximately 4,000 AFY. From Water Year 2015 to Water Year 2019, CVWD pumped an average of 1,953 AFY from the groundwater basin, which represents approximately 46 percent of CVWD's total supplies over that period (CVWD 2021a).

Groundwater rights in the Basin have not been adjudicated. CVWD adopted a Groundwater Management Plan in 1996 to establish its role as groundwater manager for the Carpinteria Groundwater Basin. The Groundwater Management Plan will ultimately be superseded by a GSP in 2024, which is currently under development (CVWD 2021a).

In years with little rainfall, higher levels of groundwater pumping can exacerbate ongoing overdrafts in the Carpinteria Groundwater Basin, accelerating groundwater draw down and potential water quality problems. Since groundwater level fluctuations are cyclical and sensitive to overdraft, groundwater withdrawal is closely monitored (Santa Barbara County Integrated Regional Water Management [IRWM] Cooperating Partners 2019).

Surface Water

Surface water found in streams and reservoirs are an important part of the regional water supply for domestic use. The development of reservoirs can reduce the threat of flooding and store stream runoff until it is needed, allowing society to use water from winter rains to meet our needs during the dry summer and fall months when streams cannot meet demand.

CVWD receives surface water supplies from the Cachuma Project and SWP. Over the period 2016 to 2020, CVWD has received an annual average of 2,448 AFY (62 percent of CVWD's water supplies) from these sources (CVWD 2021a). The Cachuma Project includes Lake Cachuma, Bradbury Dam, Tecolote Tunnel, and South Coast Conduit (SCC) and related distribution systems, which were constructed in the early 1950s. Lake Cachuma, the county's largest reservoir, is located on the middle Santa Ynez River about 25 miles northwest of Santa Barbara. During the most recent drought, Lake Cachuma was down to approximately 6 percent of its overall water holding capacity and although it has recovered, it is now only at approximately 48.1 percent capacity. Moreover, over the past 11 years and through five large fires, the watershed areas surrounding Lake Cachuma have been denuded of extensive amounts of vegetation, which will result in abundant amounts of sediment and debris during stormflows, much of which will end up in Lake Cachuma. The resultant debris flows have introduced large amounts of organic material into surface waters, and possible impacts could include increased nutrient loading, dissolved organic carbon, major ions, firefighting compounds, turbidity, and general treatability challenges in the region's largest drinking water source (Santa Barbara County IRWM Cooperating Partners 2019). CVWD purchased an annual average of 1,594 AF from the Cachuma Project over the period 2016 to 2020. This amount represents 41 percent of CVWD's total water supplies (CVWD 2021a).

Imported Water (State Water Project)

The SWP is the largest state-built, multi-purpose water project in the country. CVWD is an SWP participant in Santa Barbara County, with a maximum allocation set at 2,200 AFY in a normal year (including a 200 AF buffer) (CVWD 2021a). SWP water has helped reduce the use of groundwater in the Carpinteria Groundwater Basin. SWP water also has improved water quality in areas that directly receive SWP water and has increased the overall water supply in Santa Barbara County (Santa Barbara County 2017b). Since State Water is used primarily as a supplemental supply, the amount received by CVWD will vary each year. Actual SWP water deliveries to CVWD in 2020 were 0 AF. For the period 2016-2020, SWP water provided approximately 854 AFY, or 22 percent, of CVWD's water supplies (CVWD 2021a).

Recycled Water and Advanced Treatment

In addition to potable water supplies, several water purveyors in the county also use non-potable recycled wastewater to irrigate parks, schools, golf courses, and other large, landscaped areas. The CVWD is planning for future additional water supplies such as potable reuse via the Carpinteria Advanced Purification Project (CAPP). The CAPP will produce advanced treated recycled water that will be injected into the Carpinteria Groundwater Basin to be stored and later extracted to meet potable demands. The CAPP is expected to begin delivering water in 2026, and produce approximately 1,000 AFY of reliable, drought-proof local supply.

Water Conservation

To use all available water supplies wisely and efficiently, CVWD implements numerous water conservation or water use efficiency measures, including conservation tips, surveys, conservation programs, and rebate programs for residents, commercial users, and agricultural users. These measures are directed at helping water users minimize unnecessary use of water during times of plentiful supply and help stretch limited water resources during water shortages (see also Section 6.3.7, *Drought & Water Shortage*). The CVWD administers several demand management programs for municipal customers, including the following:

- Water waste prevention ordinances
- Metering
- Conservation pricing
- Public education and outreach
- Water loss control
- Conservation program coordination and staffing
- Other demand management measures that significantly impact water use.

During declared water supply shortages, the CVWD uses a six-stage rationing plan that includes voluntary and mandatory rationing, depending on the causes, severity, and anticipated duration of the shortage. The criteria for triggering the CVWD's water rationing stages and water usage reduction goals are summarized in Table 5-5 below.

Table 5-5 Water Shortage Stages and Goals

Shortage Condition	Stage	Customer Reduction Goal	Type of Rationing Program
Less than 10 Percent	1	10%	Voluntary
10 to 20 Percent	2	20%	Mandatory
20 to 30 Percent	3	30%	Mandatory
30 to 40 Percent	4	40%	Mandatory
40 to 50 Percent	5	50%	Mandatory
More than 50 Percent	6	>50%	Mandatory

Source: CVWD 2021a.

History of Hazard in the City of Carpinteria

California is no stranger to drought; it is a recurring feature of our climate. Three 20th century droughts were of particular importance from a water supply standpoint—the droughts of 1929–1934, 1976–1977, and 1987–1992. More recent multiyear droughts occurred in 2007–2009 and 2012–2017 (DWR 2021c). California's most recent multi-year drought occurred from 2012-2017, which was one of the documented driest consecutive water years in the county with 50.83 inches in cumulative rainfall (Santa Barbara County 2021; see also, Section 5.3.2 of the 2022 MJHMP for a detailed discussion of multi-year droughts that were identified as having significant impacts on the county). An iconic image of this drought was publicized in 2017 when the temporary emergency pumping plant and pipeline at Lake Cachuma were used to move water for the Santa Barbara area across the lake's dry bottom to the distribution system intake that had been stranded by falling lake levels. Lake Cachuma, which supplies 41 percent of CVWD's total water supplies as previously mentioned, had water levels so low a special barge fitted with large pumps had to be employed to access remaining water. On April 7, 2017, the Governor lifted the statewide drought emergency; however, given ongoing low water levels in local reservoirs, the County kept the local drought emergency in place until 2019. Effects of this drought included wetland and stream drying, impacts to agricultural land, and tree mortality across the Carpinteria Valley. Additionally, CVWD's water storage capacity and water quality were impacted at Lake Cachuma from increased sedimentation from the Thomas Fire in 2017 (Santa Maria Times 2021).

Probability of Occurrence

Likely - Droughts are a regularly recurring feature of Santa Barbara County weather that can be affected by overall regional or worldwide climactic patterns. El Niño and La Niña events are natural climate patterns over the Pacific Ocean often with global effects, with influence over the weather of the U.S. southwest that on average occur every two to seven years. In any given year, CVWD and the City can be subject to drought conditions and water shortages. However, out of the last 10 years, the county has been under a locally declared drought emergency for five years; therefore, it is likely drought and associated water shortages will continue and may increase due to climate change considerations, as described further below.

Climate Change Considerations

Climate change has the potential to make drought increasingly common along the west coast, including in the City of Carpinteria. DWR projects climate change will result in more variable weather patterns in California that may lead to more severe, frequent, and extended droughts,

which will impact the City's water supply (DWR 2021c). Extreme heat creates conditions more conducive for evaporation of moisture from the ground, thereby increasing the severity of drought as well as wildfires.

As described in the County's CCVA (Santa Barbara County Planning and Development Department 2021), "Two distinct metrics measure precipitation: 1) annual average precipitation and 2) seasonality. Although there will likely be a slight increase in precipitation throughout the 21st century, the seasonality may change (i.e., timing during a given year). There will likely be more rain during periods of precipitation (e.g., storms with higher rainfall totals), fewer total days with precipitation, and an increase in year-to-year variability. This means that more rain may fall during fewer storms throughout the year." Based on these projections, there will be a gradual increase in average annual precipitation in the South Coast (refer to Table 5-7 of the MJHMP; Santa Barbara County Planning and Development Department 2021).

Due to these changes in precipitation patterns, although episodic severe storm events may increase in severity, droughts will likely last longer and happen more frequently because of more variability in precipitation extremes. Average base flows in the City's creeks are projected to decline significantly in an early- and late-century (e.g., post-2050) extended drought scenario. This reduction in average base flows will affect two key local water supply sources (i.e., surface water reservoirs and groundwater), impacting urban and agricultural uses and natural resources (Santa Barbara County Planning and Development Department 2021).

Snowpack is the amount of snow that accumulates during the winter and is a natural reservoir that stores water during the winter. As it slowly melts in the spring and summer, it feeds streams and rivers that provide water to regions hundreds of miles away along the Central Coast and Southern California. The Sierra Nevada snowpack is important in terms of providing water storage and ensuring adequate supply in the summer to the SWP when water is most needed. A warming planet could lead to earlier melting of winter snowpacks, leaving lower stream flows and drier conditions in the Sierra Nevada during late spring and summer. In 2021, the snowpack in the Northern Sierra was 70 percent of the average, but the rain was less than 50 percent of the annual average, making it the third driest year on record. Loss of snowpack will increase as temperatures increase because of less precipitation during droughts, more precipitation falling as rain, and snow melting earlier in the spring (Santa Barbara County Planning and Development Department 2021). Changing precipitation distribution and intensity is projected to lead to increased run-off rather than be captured and stored exacerbating the potential for drought. The result of these processes is an increased potential for more frequent, longer-lasting, and more severe periods of drought (DWR 2021c).

5.3.8 Extreme Heat/Freeze

Description of Hazard

Extreme heat is defined by FEMA as temperatures that hover 10 degrees Fahrenheit (°F) or more above the regional average high temperature or over 100 °F in California and last for at least three days or even as long as several weeks (FEMA 2021b). Extreme heat is a function of heat and relative humidity. A heat index describes how hot the heat-humidity combination makes the air feel. As relative humidity increases, the air seems warmer than it is because the body is less capable of

cooling itself or regulating heat via evaporation of perspiration. As the heat index rises, so do health risks such as heat exhaustion, sunstroke, and heatstroke. Those at the greatest risk of heat-related stress and injuries include the elderly, small children, individuals who work outside, patients with chronic medical conditions, those on prescription medication therapy, and people with weight and alcohol problems, especially during heat waves in areas where moderate climate usually prevails.

While the effects of extreme heat on human health can be severe, so too can its effects be on natural ecosystems, services, infrastructure, and various economic sectors (e.g., agricultural sector). During periods of extreme heat, transportation, gas, power, and other services may be disrupted, and critical infrastructure may be destroyed or damaged (FEMA 2021b). The National Institute for Occupational Safety and Health (NIOSH), alongside the Occupational Safety and Health Administration (OSHA), provides a Heat Safety Tool App that offers occupational safety and health recommendations based on the heat index (NIOSH 2021; OSHA 2021). Each extreme heat day or heat wave can present additional risk of other hazards present within the City but is primarily a direct contributor to wildfire hazards and risks (see Section 5.3.10, *Wildfire*).

Freeze conditions are defined as particularly cold weather spells caused by cold fronts where temperatures are sustained at 32 °F or below for a period of two or three days. Typically, frost can occur when the temperature falls below 36 °F, especially in rural areas and in the early mornings. It is a localized phenomenon and can be quite variable across a small area, and though infrequent, it can severely affect unsheltered homeless individuals and individuals who work outside. Freeze conditions can also severely impact the agriculture sector, the largest economic sector in Carpinteria Valley and one of the largest economic sectors in the County, around the winter and spring growing seasons when freeze can cause extensive crop damage.

Location and Extent of Hazard in the City of Carpinteria

Extreme heat occurs when temperatures rise significantly above normal levels, and the key metric is the number of extreme heat events per year and heatwave duration. "Extreme heat" is a relative term—temperatures of 100 °F are normal in places like Palm Springs, but almost unprecedented in coastal areas of Santa Barbara County, such as the City.

Coastal communities on average have lower temperatures compared to communities in the inland areas of the county and could be less at risk to extreme temperatures although potentially less acclimatized to high temperatures if they occur. The highest average temperatures in the City occur in August and September. In coastal areas such as the City, average monthly high temperatures more moderately range from 65 °F to 75 °F (Western Regional Climate Center 2021).

The earliest median 32 °F freeze in the south county from 1980 to 2010 occurred between November 11-20. During inclement weather periods (very cold, or very cold with rain) Santa Barbara County contracts third parties to provide warming centers targeted at unsheltered homeless individuals. However, in the winter months of 2020, warming centers were severely limited amid safety concerns related to the COVID-19 pandemic (refer to Section 5.3.5, *Pandemic/Public Health Emergency*).

History of Hazard in the City of Carpinteria

Santa Barbara County has experienced several extreme heat events in the past; however, they are not well documented. One documented event reported as "simoon", occurred on June 17, 1859, where a record temperature of 133 °F was taken during an extreme heat and wind event that struck Santa Barbara in the early afternoon (Noozhawk 2020). This event set the world record for the hottest temperature ever recorded on Earth, which was held for 75 years until the record was broken by one degree in Death Valley on July 10, 1913 (Guinness World Records 2021). More recently, according to the NOAA Storm Events Database, a combination of high pressure and high humidity caused temperatures to spike to between 100 °F and 119 °F on July 22, 2006, throughout southern California, including the county (NOAA 2021a). In 2020, heatwaves in the Santa Ynez Valley with temperatures reaching 118 °F caused early grape harvests at wineries (Jervis 2020).

There have been two federally declared freeze events in the county. The first occurred from December 19, 1990, through January 3, 1991, and was federally declared on February 11, 1991 (DR-894-CA). The second occurred from January 11, 2007, through January 17, 2007, and was federally declared on April 20, 2007 (FEMA-1689-DR). Widespread freezing conditions were reported across agricultural areas of Santa Barbara County. Total crop damages in Santa Barbara County were estimated to be around $20 million (NOAA 2021a). In addition, the NOAA Storm Events Database reported a freeze event on December 21, 1998, that lasted three nights. The California Department of Food and Agriculture reported over $83 million in crop losses across a four-county area (NOAA 2021a).

Probability of Occurrence

Highly Likely - Nearly every summer, there are a few days of extreme heat. In any given year, the City can be subject to extreme heat or freeze conditions. As previously described, the hottest months in the City are August and September, while the coldest month is January. In Carpinteria, high temperatures are typically associated with offshore wind events and normally occur in the late summer and fall (see Section 5.3.19, *Windstorm*).

Climate Change Considerations

As temperatures rise due to climate change, residents, employees, and visitors in the City will face a greater risk of death from dehydration, heatstroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. By mid-century, extreme heat events in urban centers could cause two to three times more heat-related deaths than occurring today. Freezing spells are likely to become less frequent as climate temperatures increase (Climate Central 2019).

Historically, Santa Barbara County has experienced an average of four extreme heat days a year, however, this is expected to increase to 12 extreme heat events per year by 2030, 19 extreme heat events per year by 2060, and 34 extreme heat events per year by 2100 (Santa Barbara County Planning and Development Department 2021). Due to the rising temperatures, heat waves are likely to become more frequent, which will have direct impacts on human health in terms of heat-related illness. The City and Carpinteria Valley's large farming and viticulture production which employs hundreds of outdoor laborers will be vulnerable to the rising temperatures and most at risk for heat-related illnesses. Residents will also be vulnerable to rising temperatures, as many of the homes on the coast do not have air conditioning units, as there was less of a need in the past,

and therefore may be less prepared compared to the inland region of the county to adapt to extreme heat events.

Cascading impacts include increased stress on water quantity and quality, degraded air quality, and increased potential for more severe or catastrophic natural events such as heavy rain, droughts, and wildfire. Another cascading impact includes increased duration and intensity of wildfires with warmer temperatures.

Extreme heat has also been shown to accelerate wear and tear on the natural gas system and electrical infrastructure. Projected increases in summer demand associated with rising temperatures may increase risks to energy infrastructure and may exceed the capacity of existing substations and distribution line infrastructure and systems.

For California, most projections of heat events have been conducted with cooperation from the Scripps Institute of Oceanography, UC San Diego. Models have been consistent in projecting increases in the annual average temperature of up to 5 °F by the 2030s and up to 10 °F by the end of the century or sooner, although not every day will be hotter. This work has also indicated that extreme temperature events will occur more frequently. Minimum nighttime temperatures are also predicted to increase and should be considered.

5.3.9 Dam Failure

Description of Hazard

Dam failure can occur due to prolonged periods of rainfall and flooding that exceed a dam's design requirements. Dam failures can also result from any one or a combination of the following: old age, poor design, structural damage, improper siting, improper maintenance, landslides flowing into a reservoir, or terrorist actions. Structural damage is often a result of a flood, erosion, or earthquake. A catastrophic dam failure generates a substantial degree of energy and can cause flooding downstream with catastrophic impacts to life and property. The force of the water from dam failure is large enough to carry boulders, trees, automobiles, and even houses along a destructive path downstream. The potential for casualties, environmental damage, and economic loss is great. Damage to electric generating facilities and transmission lines could impact life support systems in communities outside the immediate hazard area. Additionally, the associated water supply and water quality may be affected resulting in supply challenges and potential health concerns.

Location and Extent of Hazard in the City of Carpinteria

Two of the 14 dams in the county would impact the City of Carpinteria should they catastrophically fail, namely the Santa Monica Debris Basin and Carpinteria Dam (Table 5-6). As described above, federal dams are not subject to DWR Division of Safety of Dams (DSOD) jurisdiction and are exceptions; however, the U.S. Bureau of Reclamation (USBR) uses its form of risk analysis and best practices guidance to avoid potential dam failure events (USBR 2021). These dams range in purpose from water supply to flood control.

Table 5-6. Santa Barbara County Dams That Impact the City of Carpinteria

Dam Name	Owner Name	Year Built	Reservoir Capacity
Santa Monica Debris Basin	County Flood Control District	1978	N/A
Carpinteria Dam	USBR	1953	40 acre-feet

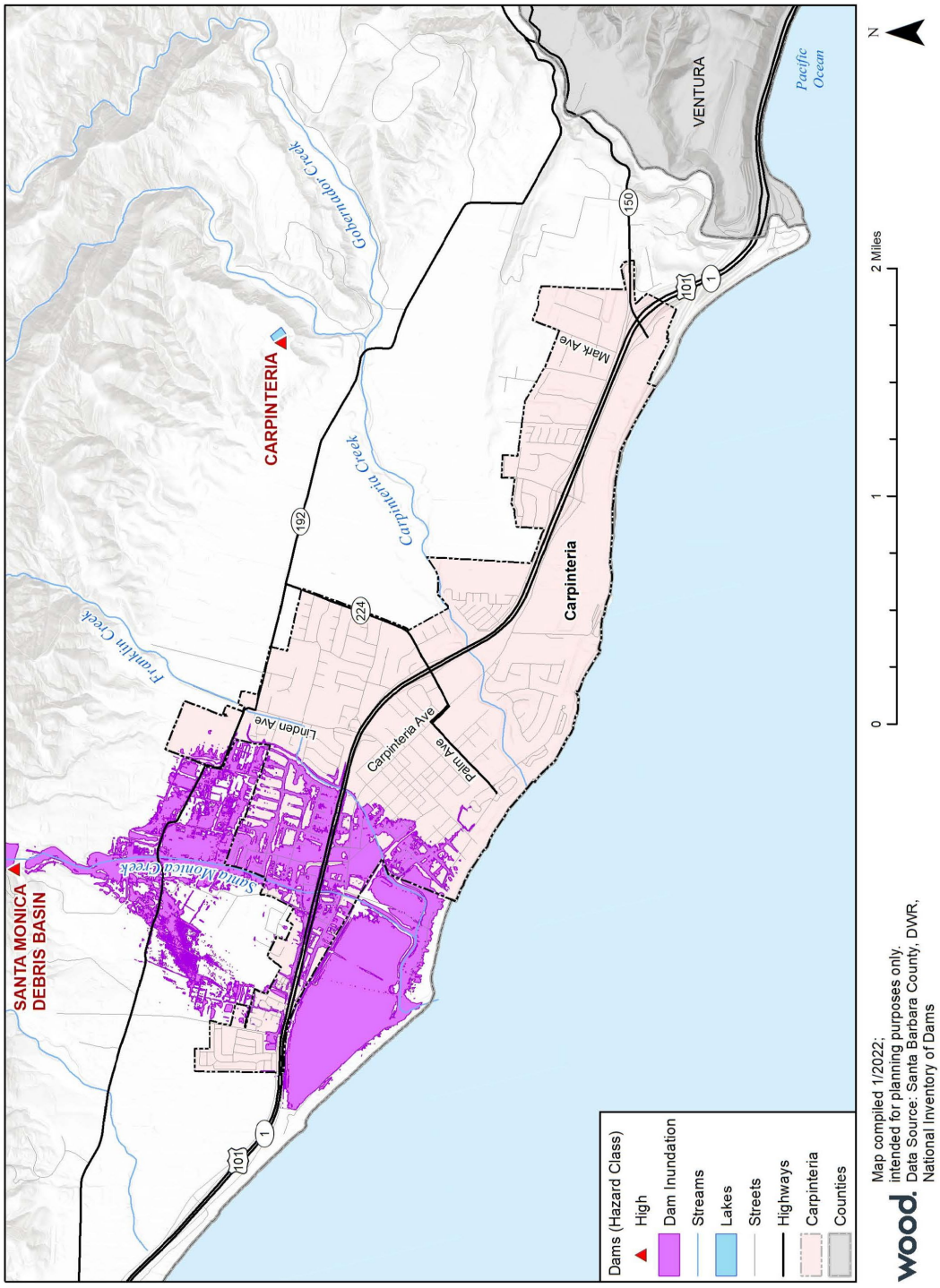
Source: DWR DSOD 2021b, USBR 2021.

The Santa Monica Debris Basin is a very large, engineered basin with a two-tiered dam face that was built in 1977 as an element of the Carpinteria Valley Watershed Project. It is owned and operated by Santa Barbara County Flood Control and is located on Santa Monica Creek, 2.3 miles north of the ocean. The debris basin was designed to trap 208,000 cubic yards of flood debris. The dam is over 60 feet high on the upstream and approximately 150 feet high on the downstream side. The dam is covered with large riprap and a concrete spillway located on the east side of the basin. The spillway is approximately 1,600 feet long and discharges into a plunge pool. The plunge pool is approximately 300 feet long, 150 feet wide, and 30 feet deep when clean and acts as a sediment catch basin and is cleaned and restored to full capacity after each storm event to be ready as needed for future storms (National Watershed Coalition 2018).

Carpinteria Reservoir is a concrete-lined basin built on Carpinteria Creek and serves as a terminal reservoir. The dam is an earthfill structure built 31feet high with a crest length of 1,350 feet and a capacity of 40 acre-feet. The dam, built in 1953, is owned by the USBR (USBR 2022).

Per California Code of Regulations Section 335.4, the DWR DSOD classifies dams into four categories (i.e., low, significant, high, and extremely high hazard potential) based on the size of the dam's reservoir and the population that would be impacted by a dam failure; it does not reflect the condition of the dam or its structures. All 14 dams in the county, including the Santa Monica Debris Basin and Carpinteria Dam, are identified by the DWR DSOD as high-hazard dams (i.e., dam failure would be expected to cause loss of at least one human life). Since 2017, California Legislature has required all state jurisdictional dams, except low hazard dams, to develop inundation maps and emergency action plans. The DWR DSOD mapped inundation zones show that portions of the City may be inundated should a dam catastrophically fail. Dam failure inundation zones mapped by the State of California indicate areas that would be inundated should a dam fail catastrophically. Figure 5-6 displays the dam locations and dam inundation areas in the City of Carpinteria.

Figure 5-6. City of Carpinteria Dam Inundation



History of Hazard in the City of Carpinteria

As described in the County MJHMP, the county has experienced one incident of catastrophic dam failure, which occurred in the community of Mission Canyon, approximately 10.5 miles northwest of the City. No historical dam failures have occurred within or in the vicinity of the City.

The DWR DSOD provides oversight of the design, construction, and maintenance of jurisdictional-sized and non-Federal dams. Due to the DWR DSOD, many potential dam issues have been addressed and/or resolved (DWR DSOD 2021a). Additionally, the USBR, responsible for oversight of the Carpinteria Dam and all other federal dams in the county, has improved systems to ensure that peak releases during heavy inflows do not result in excessive downstream flows, which reduces the possibility of inundation from overflows (Santa Barbara County Planning and Development Department 2015).

As described in Section 5.3.2, *Mudflow & Debris Flow*, the Santa Monica Debris Basin was filled with debris after the January 2018 storms. This was the most significant test of the Basin since its construction and the first time that debris had filled the Basin to the point of exceeding the crest of the emergency spillway. Fortunately, the basin capacity was adequate such that very little debris went through the emergency spillway resulting in no significant damage downstream. Local officials with assistance from FEMA and the U.S. Army Corps of Engineers (ACOE) responded rapidly in cleaning out the debris from the basin restoring its capacity to trap additional debris during the spring rains (National Watershed Coalition 2018). This was not the first year that the debris basin has functioned as designed and prevented damages downstream. Some of these memorable storms include the floods of March 1995, the "El Niño floods" of 1998, and floods in 2005 (refer to Section 5.3.1, *Flood*). After each of these events, major work was required and completed to clean and restore the basin as quickly as possible to be ready for future storms (National Watershed Coalition 2018).

Probability of Occurrence

Occasional - Dam failure events are infrequent and usually coincide with the events that cause them, such as earthquakes, landslides, and excessive rainfall and snowmelt; therefore, the probability of future occurrence is unlikely. There is a "residual risk" associated with dams; residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of occurrence of any type of dam failure event is considered to be low in today's regulatory and dam safety oversight environment.

Climate Change Considerations

The potential for climate change to affect the likelihood of dam failure is not fully understood at this point. There is potential for increased precipitation events as a result of climate change conditions to present a future increased risk of dam failure if large inflows to reservoirs occur. However, this could be offset by generally lower reservoir levels if storage water resources become more limited or stretched in the future due to climate change, drought, and/or population growth.

5.3.10 Wildfire

Description of Hazard

A **wildfire** is an unplanned fire that burns in a natural area or wildlands, such as the Los Padres National Forest or undeveloped ranchland, particularly in the Santa Ynez Mountains. Of critical concern is the wildland-urban interface (WUI). According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the WUI is defined as "…*the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.*" In WUI fires, the fire is fueled primarily by naturally occurring vegetation in the wildland and urban areas as well as the urban structural elements themselves. The WUI area in the City includes developed single-family neighborhoods immediately adjacent to the foothills of the Santa Ynez Mountains and larger estate homes within the wildland areas in Carpinteria Valley. A wildfire in the WUI could burn from wildlands into the urban area, which has happened during several fires in Santa Barbara County such as the Thomas, Paint (Painted Cave), Sycamore Canyon, Tea, and Jesusita wildfires during which over 1,000 homes were damaged or destroyed in the South Coast.

The majority of wildfires are caused by humans or lightning. Once ignited, wildfire behavior is based on three primary factors: fuel, topography, and weather. Fuel will affect the potential size and behavior of a wildfire depending on the amount present, its burning qualities (e.g., level of moisture), and its horizontal and vertical continuity. Topography affects the movement of air, and thus the fire, over the ground surface. The terrain can also change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire.

Mountainous terrain and limited road access to rural areas in the mountains inland of the City can sometimes prevent easy access by firefighting equipment. Weather as manifested in temperature, humidity, and wind (both short- and long-term) affect the probability, severity, and duration of wildfires. High winds, in particular, can cause a wildfire to rapidly advance through already dry vegetation posing a major challenge to fire fighting and may even at times limit the safe use of aircraft, which can greatly reduce firefighting capacity.

Location and Extent of Hazard in the City of Carpinteria

The California Department of Forestry and Fire Protection (CAL FIRE) Fire and Resource Assessment Program (FRAP) provides high-quality spatial data, maps, and online data viewers which provide critical information on the health and risk factors associated with forest and range lands within the State of California. These maps include but are not limited to Fire Hazard Severity Zones, WUI, and Fire Perimeters. Fire Hazard Severity Zones are areas of significant fire hazards based on fuels (vegetation), terrain, weather, and other relevant factors. These zones define the application of various mitigation strategies to reduce the risk associated with wildland fires. The most current Fire Hazard Severity Zone maps were created in 2007. Figure 5-7 shows the Fire Hazard Severity Zones located in the City of Carpinteria. CAL FIRE's FRAP also developed data that displays the relative risk from wildfire to areas of significant population density, known as the WUI. This data is created by intersecting residential housing unit density with proximate fire threat to give a relative measure of potential loss of structures and threats to public safety from wildfire. Figure 5-8 was generated using this data and shows the WUI areas in the City. This figure depicts areas where potential fuels treatments (e.g., controlled burns, vegetation thinning) should be prioritized to reduce wildland fire threats to population centers.

Many of the communities at risk contain relatively old homes that reflect the building materials and/or codes in effect at the time of construction (e.g., wood shake roofs and siding, open eaves, unscreened crawlspace, and attic vents), which research has shown to be important in most home losses during wildfires. As such, these homes are at increased risk of ignition due to structure vulnerabilities. In addition to hazard reduction through fuel reduction, education of homeowners and mitigation of structure ignition vulnerabilities is an important priority in these communities. Programs that support retrofits to existing structures, combined with building codes that make future structures more fire-resistant, are needed in many fire-prone areas.

History of Hazard in the City of Carpinteria

Because Santa Barbara County is prone to wildfires, there is a long history of wildfires in the county. Table 5-7 lists the major wildfires (1,000 acres or greater) in Santa Barbara County from 1932-to 2021. CAL FIRE's FRAP also compiles fire perimeters of wildfires and has established an ongoing fire perimeter data capture process. Figure 5-4 of the County MJHMP shows wildfire perimeters of significant wildfires within the last 50 years (1970-2020) in Santa Barbara County. Fire perimeters provide a reasonable view of the spatial distribution of past large fires. These historic fires are organized by decade to show the evolution of fire behavior over the years.

Table 5-7. Major Wildfires in Santa Barbara County

Year	Fire Name	Acres Burned		Year	Fire Name	Acres Burned
1932	North Shore	7,576		2002	Sudden	7,500
1971	Cielo	2,010		2004	Gaviota	7,197
1971	Romero	14,538		2004	Cachuma	1,115
1975	--	1,527		2006	Bald Fire	4,332
1977	Cachuma	2,250		2006	Perkins	14,923
1977	Hondo Canyon	8,526		2007	Zaca	240,807
1979	Wasioja	2,006		2008	Gap	9,443
1981	Rey	1,638		2008	Tea	1,940
1981	Oak Mountain	8,688		2009	Jesusita	8,733
1984	Minuteman	1,187		2009	La Brea	89,489
1985	Wheeler	122,687		2010	Bear Creek	1,252
1989	Cocheo	1,233		2013	White	1,984
1990	Paint	4,424		2016	Rey	32,606
1993	Marre	43,864		2016	Sherpa	7,474
1994	Aliso	3,244		2017	Alamo Fire	28,834
1996	Wasioja	2,812		2017	Whittier Fire	18,430
1996	Cuyama	1,400		2017	Thomas Fire	281,893
1997	Logan	49,490		2018	Front Fire	1,014
1997	Azaela	1,351		2019	Cave Fire	3,126
1997	Haloween	1,129		2020	Scorpion Fire	1,395
1998	Ogilvy	4,029		2021	Alisal Fire	16,962
2000	Harris	8,684				

Source: National Interagency Fire Center 2021.

Notes: Acreage represents total burned by fire; however, a number of these fires such as the Thomas Fire burned in other counties as well (e.g., Ventura County) so acreages burned in Santa Barbara County would be lower in some instances.

The Wheeler Fire, which occurred from July 1-15, 1985, was caused by arson in Wheeler Gorge, located approximately 15 miles northwest of Ojai. The area had not burned in over 40 years and was full of dense, dry brush. A change in the wind caused the fire to move from Ventura County into Santa Barbara County and threaten Carpinteria. It moved into Matilija Canyon, causing the fire to slop over into the Santa Ynez watershed above Jameson Reservoir.

Carpinteria High School became the staging area. There were 2,700 firefighters on the scene, some from as far away as Michigan and Arkansas. Four days later, 81,000 acres had burned, and critical watershed areas and sensitive California condor habitats were threatened (Lompoc Record 2021).

It was decided that the only way stop the fire was to start backfires to burn off 30,000 acres of dense brush. Throughout the rest of the week, the fire continued to burn in several major canyons feeding into the Santa Ynez River. Finally, the fire began to wane when a tropical storm off Baja California helped lower the temperature into the 70s. The fire was controlled on July 15. It burned 119,361 acres, 19 homes, 37 buildings, 32 vehicles and $3 million worth of orchards (Lompoc Record 2021).

Over the last 10 years, Santa Barbara County has experienced nine major fires. Four of these fires (i.e., Thomas, Cave, Sherpa, and Whittier) directly threatened the heavily populated Santa Barbara front country. Three of these fires (i.e., Thomas, Sherpa, and Whittier) resulted in destroyed structures, with over 1,000 structures destroyed in the Thomas Fire, including many in the vicinity of the City. The City has not been directly affected by many of these recent wildfires. The Thomas Fire was the only major recent wildfire that directly threatened the City, burning rural hillsides above the City, but not reaching City limits.

At the time in 2017, the **Thomas Fire** was the largest wildfire in modern California history, with a total burn area of 281,893 acres; destroying 1,063 structures and resulting in one civilian and one firefighter fatality (Ventura County Fire Department 2019). The Thomas Fire, which occurred in December, was fueled by decadent brush, 10 years of drought, and strong sundowner winds. The fire was ignited north of Santa Paula in Ventura County and burned into Santa Barbara County through the Santa Ynez Mountains and parts of the upper Santa Ynez River watershed. It was one of the first wildfires to burn from inland Ventura County into the Santa Barbara front country of the Santa Ynez Mountains. The perimeter of the Thomas Fire nearly reached the City's boundaries. The Thomas Fire required evacuations of all areas of the City north of Highway 192 and the City served as a key staging area for regional firefighting efforts, but no structures were lost due to the Thomas Fire in the City. The fire was active for 40 days and at one time involved more than 8,500 firefighters, 800 fire engines, and dozens of aircraft (National Interagency Fire Center 2021; Santa Maria Times 2021). Over 2,000 of these firefighters were in the South Coast communities and had been for three days prepping houses, laying lines, scouting escape routes, and becoming familiar with the landscape (Community Environmental Council 2020).

Figure 5-7. Santa Barbara County Fire Hazard Severity Zones

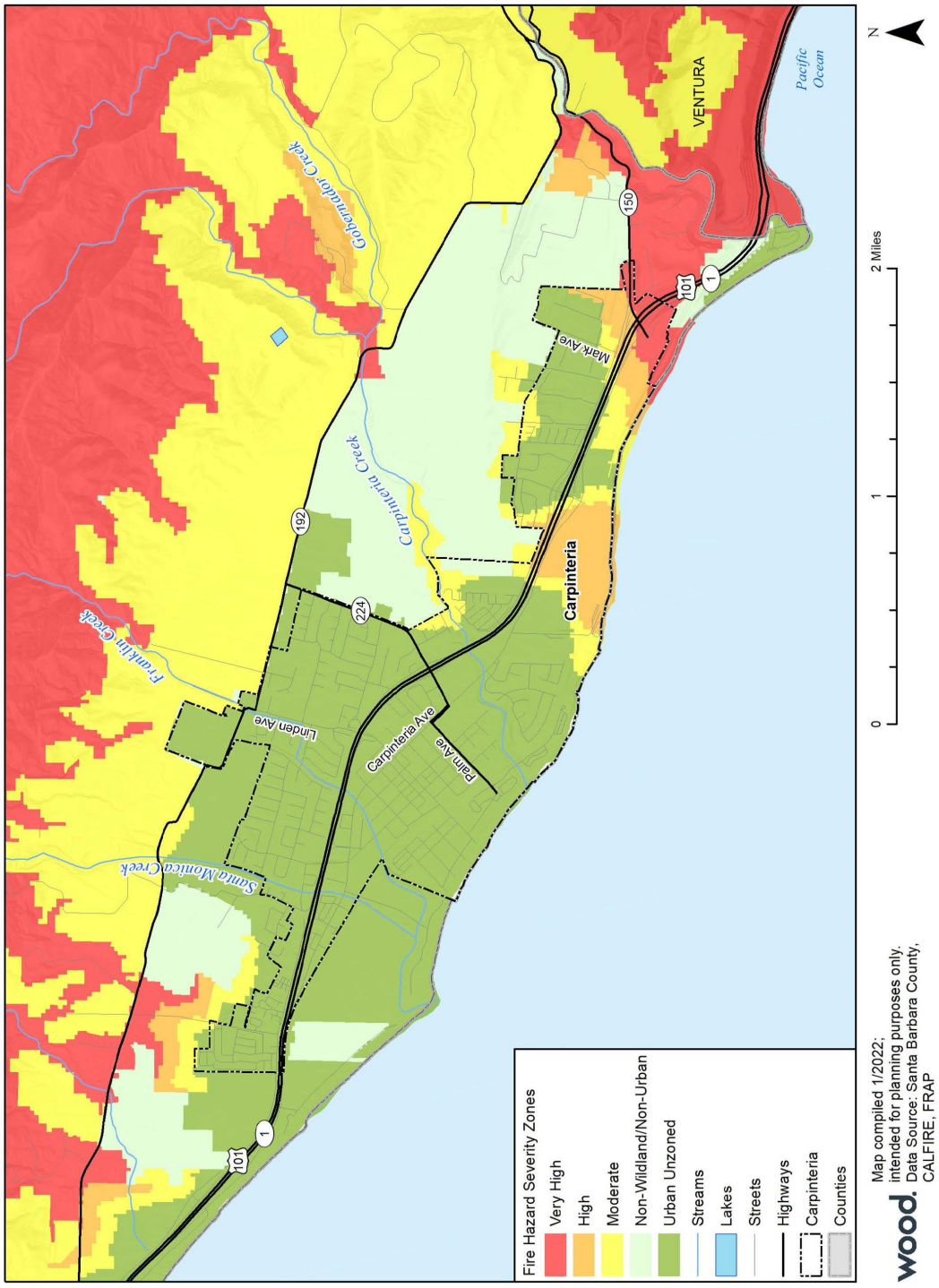


Figure 5-8. Wildland-Urban Interface (WUI)

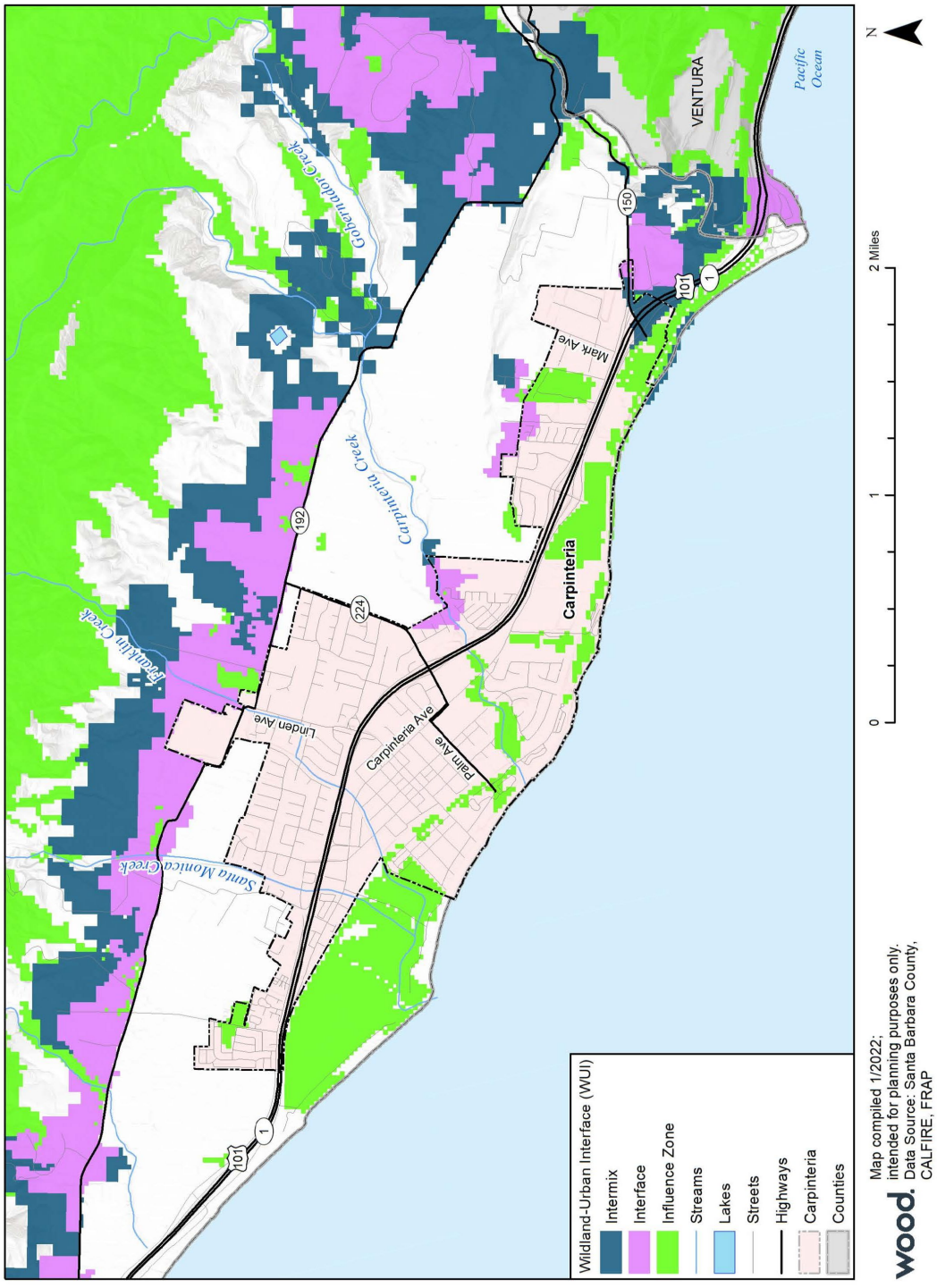
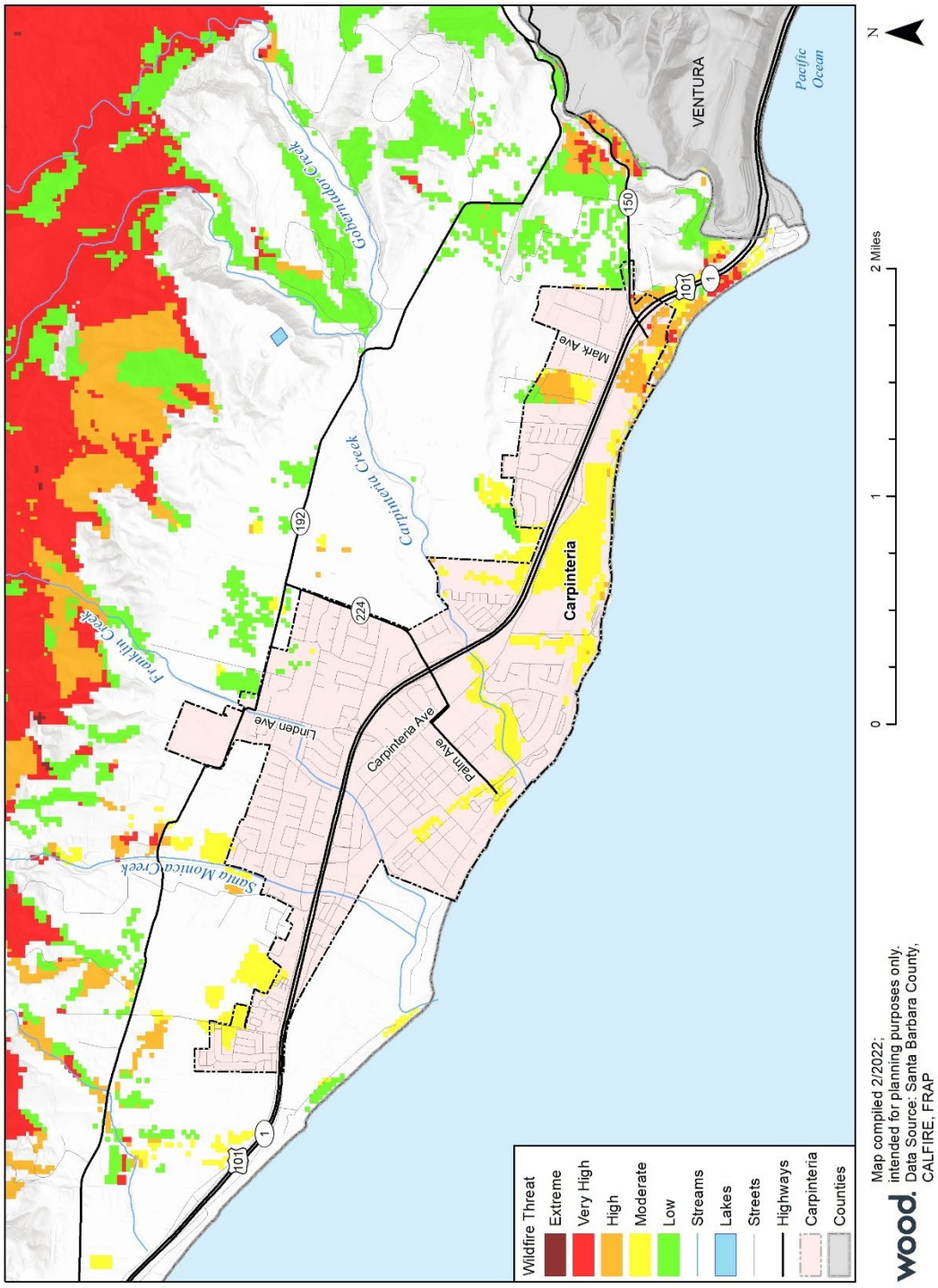


Figure 5-9. Wildfire Threat



Furthermore, large wildfires that burn hotter remove all vegetation and can melt surface soils creating hydrophobic soils which do not allow rainfall to percolate, increasing the threat of other disasters such as flooding and mud or debris flows. For example, the Thomas Fire was followed by the 2018 Debris Flows which severely damaged the community of Montecito, killed more than 20 residents, damaged or destroyed 400 or more homes, and led to a 3-week closure of Highway 101 and the UPRR, severing connections between the City and communities to the north and south (refer to Section 5.3.1, *Flood* and Section 5.3.2, *Mudflow & Debris Flow*).

In addition to larger wildfires, such as the Thomas Fire, on February 19, 2022, a small fire broke out in a storm drain pipe beneath Highway 101 within the City of Carpinteria. The fire started at the entrance of the storm drain near Carpinteria Creek, and spread hundreds of feet through the drain. Carpinteria-Summerland firefighters who responded to the scene found smoke and flames coming from two manhole covers and another opening under a bridge along Highway 101 between Bailard and Casitas Pass Rd, as well as along the 5700 block of Via Real. Highway 101 northbound from Bailard to Casitas Pass Road and the 5700 block of Via Real were closed to traffic due to safety concerns and firefighting efforts. Carpinteria-Summerland Fire was assisted by Montecito Fire Department, Santa Barbara City Fire Department and Ventura County Fire Department. Santa Barbara County Sheriff's deputies and CHP officers also responded to the scene to assist with traffic control (Edhat 2022).

Incident Profile: The Storm Drain Fire

A small fire broke out in the storm drain system beneath Highway 101 and the 5700 block of Via Real on the evening of February 19, 2022. The fire started at the entrance of the storm drain near Carpinteria Creek, and spread hundreds of feet through the drain.

Source: Edhat 2022. Photo: Montecito Fire Department

Southern California Gas Company (SoCal Gas) was called to the scene and determined no gas lines were involved in the incident. Carpinteria Sanitary District also responded to investigate whether a broken sewer line could be the source of the fire and that was also ruled out. The storm drain where the fire occurred is lined with a thick plastic material which caused the fire to continue burning with intensity for several hours. Firefighters were able to gain control and extinguish the flames that night by pumping large quantities of water into the storm drain. The northbound lanes of Highway 101 were reopened that night; however, Via Real remained closed (Edhat 2022).

At approximately 1:30 a.m. the next day, local road construction workers reported seeing smoke coming from the storm drain system in the same area. The closure of Highway 101 northbound from Bailard to Casitas Pass Road was reissued to allow for emergency operations. Carpinteria-Summerland firefighters responded to the scene and requested Montecito Fire's engine that is specially equipped with a Compressed Air Foam System. Firefighters sprayed the foam into the storm drain to eliminate the fire's oxygen source and successfully extinguish it. By 5 a.m., the closure

of Highway 101 northbound was lifted (Edhat 2022). No neighboring residences were exposed to risk during the blaze (Santa Barbara Independent 2022).

Probability of Occurrence

Likely - Vegetation and topography are significant elements in the identification of the fire threat zones, as well as areas subject to high winds such as sundowners (see Section 5.3.19, *Windstorm*). The City is set at the base of the Santa Ynez Mountains along the coast, which support chaparral vegetation, a shrubland habitat of dense and scrubby brush that has evolved to persist in a fire-prone habitat. Santa Barbara County was subject to 42 major wildfires over 88 years, resulting in a 48 percent chance of occurrence in any given year. While the likelihood that a wildfire affecting the City is lower given its coastal location and urban setting, it is highly likely that regional wildfires would require local action (e.g., evacuations, firefighting) and potential direct impacts (i.e., loss of structures) along the City's WUI.

Climate Change Considerations

Based on research performed by the California Governor's Office of Planning and Research and as noted by fire protection specialists, climate change is now playing a significant role in increasing the frequency and severity of wildfires (Office of Governor 2019). Growing amounts of GHGs coupled with population growth and development are expected to continue impacting forests and natural resources in the Carpinteria Valley. Likewise, the effects of climate change have the potential to impact wildfire behavior, the frequency of ignitions, fire management, and fuel loads. Increasing temperatures may intensify wildfire threat and susceptibility to more frequent wildfires affecting the City.

Current scientific models suggest that climate change will affect total precipitation and wind patterns, with a tendency for drier conditions in Southern California, increasing fuel loading and the flammability of vegetation (California Natural Resources Agency 2018). As such, studies expect California will be affected by increased numbers of forest fires with added intensity due to longer warmer seasons, reduced the distribution of biodiversity, lack of moisture, changes in ecosystems, drought impacts (e.g., pest diseases and continued spread of invasive species), and other impacts in coming years. Wildfire behavior appears to be becoming more severe with fires burning hotter, moving more quickly, and even creating their own weather which in turn can cause firestorms that are difficult to contain. While wildfires are a natural part of California's ecology, the fire season is getting longer every year. Warmer temperatures, variable snowpack, and earlier snowmelt caused by climate change make for longer and more intense dry seasons, leaving forests more susceptible to severe fire. Anticipated growth and development in the vicinity of the City can also be expected to amplify these effects. As seen with the 2017 - 2018 wildfires, more damage occurred in developed areas like the Thomas Fire in Ventura and Santa Barbara counties.

Large wildfires also have several indirect effects beyond those of a smaller, local fire. These may include mudflows and debris flows, air quality and health issues, road closures, business closures, and other forms of losses (see also, Section 5.3.2, *Mudflow & Debris Flow*).

5.3.11 Tsunami

Description of Hazard

A **tsunami** is a series of extremely long waves caused by a large and sudden displacement of the ocean, usually the result of an earthquake below or near the ocean floor. This force creates waves that radiate outward in all directions away from their source, sometimes crossing entire ocean basins. Unlike wind-driven waves, which only travel through the topmost layer of the ocean, tsunamis move through the entire water column, from the ocean floor to the ocean surface (NOAA 2018). Once a tsunami forms, its speed depends on the depth of the ocean. In the deep ocean, a tsunami can move as fast as a jet plane, over 500 mph, and its wavelength, the distance from crest to crest, could be hundreds of miles. Mariners at sea will not normally notice a tsunami as it passes beneath them; in deep water, the top of the wave rarely reaches more than three feet higher than the ocean swell. A tsunami only becomes hazardous when it approaches land. As a tsunami enters shallow water near coastal shorelines, it slows to 20 to 30 mph. The wavelength decreases, the height increases, and currents intensify (NOAA 2018).

Large tsunamis are significant threats to human health, property, infrastructure, resources, and economies. Rushing water from waves, floods, and rivers are incredibly powerful. Just six inches of fast-moving water can knock adults off their feet, and twelve inches can carry away a small car. Tsunamis can be particularly destructive because of their speed and volume. They are also dangerous as they return to the sea, carrying debris and people with them. Low-lying areas could experience severe inland inundation of water and deposition of debris. Effects can be long-lasting and felt far beyond the coastline. Tsunamis typically cause the most severe damage and casualties near their source, where there is little time for warning. But large tsunamis can also reach distant shorelines, causing widespread damage. The 2004 Indian Ocean tsunami, for example, impacted 17 countries in Southeastern and Southern Asia and Eastern and Southern Africa (NOAA 2018).

Location and Extent of Hazard in the City of Carpinteria

As shown in Figure 5-10, areas prone to tsunami hazards in the City are limited to coastal areas and offshore areas. The City is very susceptible to tsunami hazards, given that it is located on or near several offshore geological faults, the more prominent faults being the Mesa Fault, the Santa Ynez Fault in the mountains, and the Santa Rosa Fault (refer to Section 5.3.3, *Earthquake & Liquefaction*). Other unnamed faults in the offshore area of the Channel Islands may present tsunami hazards. These faults have been active in the past and can subject the City's coastal area to seismic action at any time.

History of Hazard in the City of Carpinteria

Earthquakes along the county's coast along submarine fault lines could generate large, destructive tsunamis. However, the relative threat for local tsunamis in the City can be considered low due to low recurrence frequencies. Major faults of the San Andreas zone, although capable of strong earthquakes, cannot generate any significant tsunamis. Only earthquakes in the Transverse Ranges, specifically the seaward extensions in the Santa Barbara Channel and offshore area from Point Arguello, can generate local tsunamis of any significance (Pararas-Carayannis 2007). The reason for this may be that earthquakes occurring in these regions result in a significant vertical displacement of the crust along these faults. Such tectonic displacements are necessary for tsunami

generation. Most of the tsunamis observed in California have been small, causing a slight rise in water levels in coastal areas and little damage. Large, locally generated tsunamis are estimated to occur once every 100 years (Pararas-Carayannis 2007).

There have been no recorded locally generated tsunamis since 1988. Additionally, previous tsunami events were poorly documented, and the precise extent of environmental and public impacts is uncertain. Two tsunami events have affected the City:

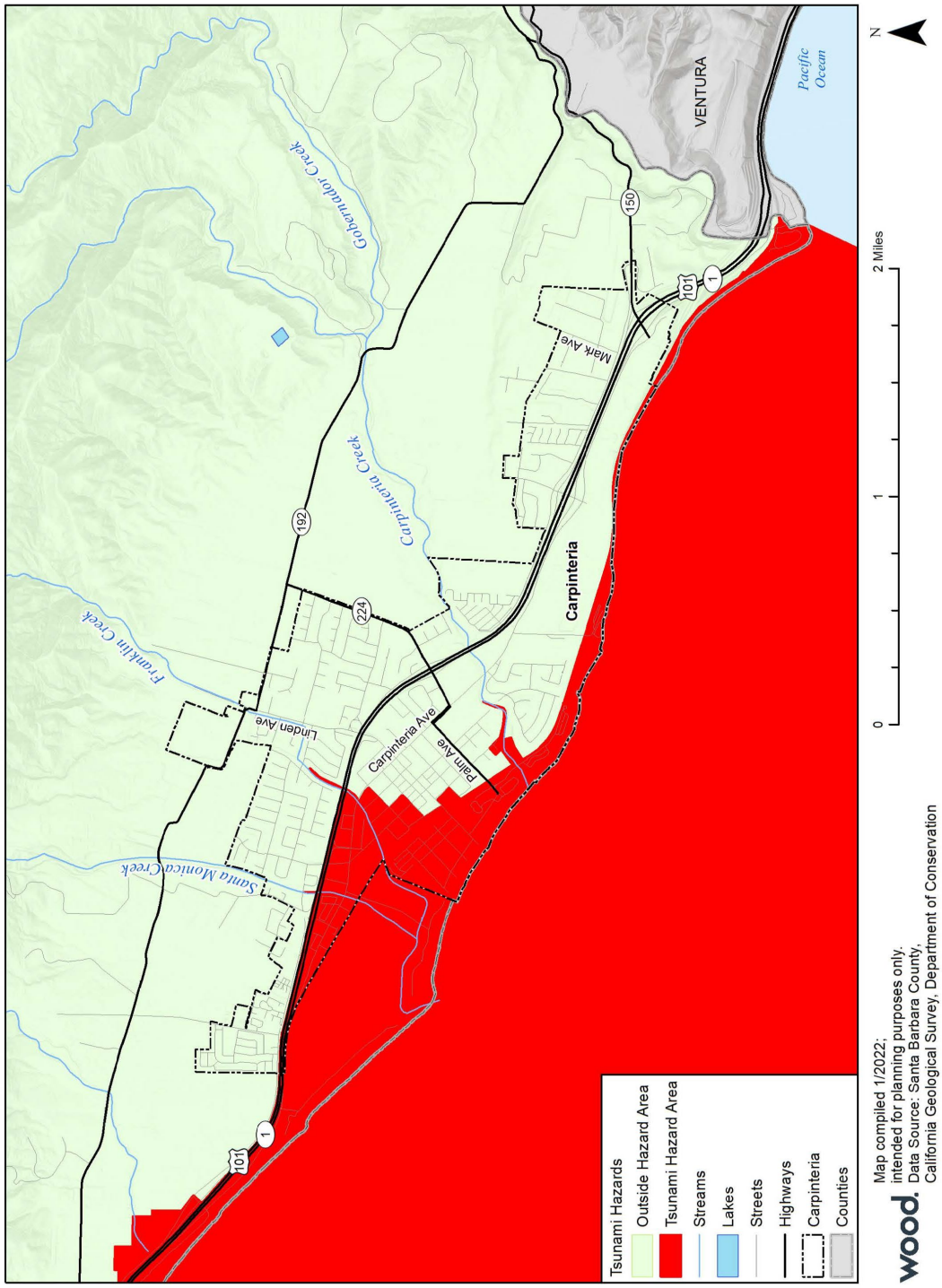
- **December 1812.** Historical records indicate one or two tsunamis were generated from major earthquakes in the Santa Barbara region in December of 1812. Researchers have theorized that a landslide triggered by an earthquake caused the tsunami (NBC Los Angeles 2018). The size and extent of these tsunamis are relatively uncertain due to the lack of historical records; however, unconfirmed estimates in various literature and based on anecdotal history reports that the Gaviota Coast was impacted by 15-foot waves, the City of Santa Barbara received 30- to 35-foot waves, and Ventura County received waves of approximately 15 feet or more (Pararas-Carayannis 2007). Additionally, the USGS, in cooperation with Moss Landing Marine Laboratory, mapped the slopes of the Santa Barbara Channel using sonar and was able to link a large earthquake in 1812 to a tsunami, which wiped out many coastal villages and destroyed ships in harbor (USGS 2003). Low lying areas of Santa Barbara and Ventura were flooded and damage was reported to nearby ships due to powerful waves (NBC Los Angeles 2018).
- **February 27, 2010**. A magnitude 8.8 earthquake occurred along the central coast of Chile and produced a tsunami. For the coast of Southern California, it was one of the largest tsunami episodes since 1964. At Santa Barbara Pier, significant beach erosion was reported along with displacement of buoys. The tsunami surge lasted more than 20 hours. The most significant damage occurred along the coasts of Ventura and the south coast of the county. Numerous reports of dock damage were reported along with beach erosion.

Probability of Occurrence

Unlikely – The University of Southern California Tsunami Research Group has modeled areas in the City that could potentially be inundated in the event of a tsunami. This model is based on potential earthquake sources and hypothetical extreme undersea, near-shore landslide sources. The data was mapped by the California Geological Survey and Cal OES for Tsunami Evacuation Planning. The maps and data are compiled with the best currently available scientific information and represent areas that could be exposed to tsunami hazards during a tsunami event. The tsunami inundation map helps to assist cities and counties in identifying their tsunami hazard areas. Figure 5-10 shows tsunami hazard areas of the City.

Based on the tsunami inundation map above, several areas along the coast of the City have the potential to be inundated by a tsunami. Given there is a medium probability of an earthquake, which would result in high impacts including potential tsunami events in the City, the City is at risk of future tsunami events. However, the only documented major tsunami event occurred in 1812 and the county continues to develop and maintain emergency plans for tsunamis.

Figure 5-10. City of Carpinteria Tsunami Hazard Area



Climate Change Consideration

As previously described, tsunamis are created by earthquakes or other earth movements. To date, no direct relationship has been made between climate change and the occurrences of earthquakes or other earth movements (refer to Section 5.3.3, *Earthquakes and Liquefaction*).

5.3.12 Cyber Threat

Description of Hazard

The 2018 California State Hazard Mitigation Plan defines cyber-attacks as "attempts by cyber criminals to attack a government, organization, or private party by damaging or disrupting a computer or computer network, or by or stealing data from a computer or computer network for malicious use." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks (refer to Section 5.5.2, *Cyber Threat* of the MJHMP for a discussion of the types of cyber attacks).

In a recent attempt to combat this threat, the State of California adopted SB 327 in September of 2018. This bill seeks to improve information privacy, specifically on connected devices. Existing laws in California require businesses to take all reasonable steps to dispose of customer records within their custody containing personal information and also require businesses that own, license, or maintain personal information about a California resident to implement and maintain reasonable security procedures. SB 327, which went into effect January 1, 2020, further requires the manufacturer of connected devices to equip the device with a reasonable security feature to protect user information.

Location and Extent of Hazard in the City of Carpinteria

Cyber-attacks can and have occurred in every location regardless of geography, demographics, and security posture. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within the county. The Santa Barbara County Grand Jury determined in 2020 that cyber-attacks and related threats are an ongoing security issue for all public entities within the county, which requires prompt and aggressive actions to prevent significant disruption (Santa Barbara County Grand Jury 2020). This hazard can occur anywhere within the City; however, cyber threats are generally targeted towards larger corporations or the government.

The City's Financial Services Director, Licette Maldonadoto, is responsible for the City's IT budget and oversees all City IT projects. The City's IT consultant, Policore, works closely with Licette to apply appropriate network and security solutions. Currently, Policore visits the City once per week to handle routine IT tasks which require on-site presence; although, the City is considering expanding the amount of time spent on-site. Policore also provides support to the network and its users remotely for urgent and off-hours maintenance. City staff holds periodic meetings with Policore to discuss

network status, outstanding issues, upcoming projects, and Policore's recommendations regarding new technology topics (Policore 2022).

Policore and the City work together to increase the City's security posture on an ongoing basis. For example, various network security upgrades have been implemented, such as advanced firewall systems, multi-layered security, operating system hardening, and developing a culture of security awareness amongst the City staff. Legacy systems are reviewed often for possible security upgrades, replacement and configuration for a more secure environment. Policore has additional recommendations for enhancing the City's security needs and expects to deliver them during security focused meetings (Policore 2022).

History of Hazard in the City of Carpinteria

Between 2012 and 2015, 50 million records of Californians were breached, and the majority of these breaches resulted from security failures, with malware and hacking; physical breaches constituted three-quarters of all events. As the use of digital information expands, Californians will increasingly become more vulnerable to the slow-moving, potential technological hazard of cyber damage (Cal OES 2018).

While the City experiences minor cyber threats (e.g., spam and phishing emails), none have reached a level of significance within the City. There have been no logged instances of network breaches or attempted breaches in the City's cyber security to date (Policore 2022).

Probability of Occurrence

Occasional – As described above, cyber threats are on the rise globally, nationally, and locally. The probability of occurrence of cyber threats is rapidly increasing, especially with increased reliance on the Internet and cloud-based computing. Small-scale cyber-attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services. Perhaps of greatest concern to the City are ransomware attacks, which are becoming increasingly common. It is difficult to predict the odds of the City being hit with a successful ransomware attack in any given year, but it is likely to be targeted in the coming years. The possibility of a larger disruption affecting systems within the City is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in the City cannot be ruled out.

Climate Change Consideration

While there is no evidence to link climate change to an increase in occurrences of cyber threats, the target could be related to issues with individuals or companies perceived to affect the climate (i.e., GHG producers).

5.3.13 Natural Gas Pipeline Rupture

Description of Hazard

The U.S. is heavily dependent on transmission pipelines to distribute energy and fuel sources. Virtually all-natural gas, which accounts for approximately a third of the energy consumed annually, is transported by transmission pipelines (California Public Utilities Commission [CPUC] 2021).

Generally speaking, transmission lines are large-diameter steel pipes carrying natural gas at high pressure and compressed to provide higher carrying capacity. Transmission lines are both interstate and intrastate, with the latter connecting to smaller distribution lines delivering gas directly to homes and businesses.

Significant failure, including pipe breaks and explosions, can result in loss of life, injury, property damage, and environmental impacts. Causes of and contributors to pipeline failures include construction errors, material defects, internal and external corrosion, operational errors, control system malfunctions, outside force damage, subsidence, and seismicity.

Location and Extent of Hazard in the City of Carpinteria

Natural gas is transported via the interstate pipelines, and some of the California-produced natural gas, is delivered into the Pacific Gas & Electric (PG&E) and SoCal Gas intrastate natural gas transmission pipeline systems (commonly referred to as California's "backbone" natural gas pipeline system) (CPUC 2021). Natural gas on the utilities' backbone pipeline systems is then delivered into the local transmission and distribution pipeline systems or to natural gas storage fields. PG&E and SoCal Gas own and operate several natural gas storage fields that are located in Northern and Southern California. Locally, SoCal Gas, which serves the City of Carpinteria, operates the La Goleta Storage Field, a natural gas storage field at More Ranch Road in the Eastern Goleta Valley. SoCal Gas purchases market-quality natural gas when prices are low and stores it in a depleted gas reservoir located at this field.

The Petroleum Unit of the County's Planning and Development Department, Energy Division regulates onshore oil and gas activities within the county by performing annual inspections of onshore wells, facilities, pipelines, and other pertinent equipment throughout oil production leases (Santa Barbara County Planning and Development Department, Energy Division 2018).

Natural Gas Odorant and Metering Facilities

Natural gas is a colorless and odorless gas and can be harmful if inhaled, can cause suffocation, fire, or explosion. As such, and as required by law, natural gas must be odorized before entering a pipeline distribution system. The odor also assists in the detection of gas leaks and the prevention of hazardous consequences. The odorant used by the Gas Company is tetrahydrothiophene and has the well-known "rotten egg" smell. The two natural gas odorant and metering facilities located in the City of Carpinteria, the Carpinteria Natural Gas Odorant and Metering Facility and the Pitas Point Facility, were recently shut down and are no longer operational (City of Carpinteria 2022). These facilities, both owned by SoCal Gas, were shut down in 2018 and will be fully decommissioned by SoCal Gas in 2023.

History of Hazard in the City of Carpinteria

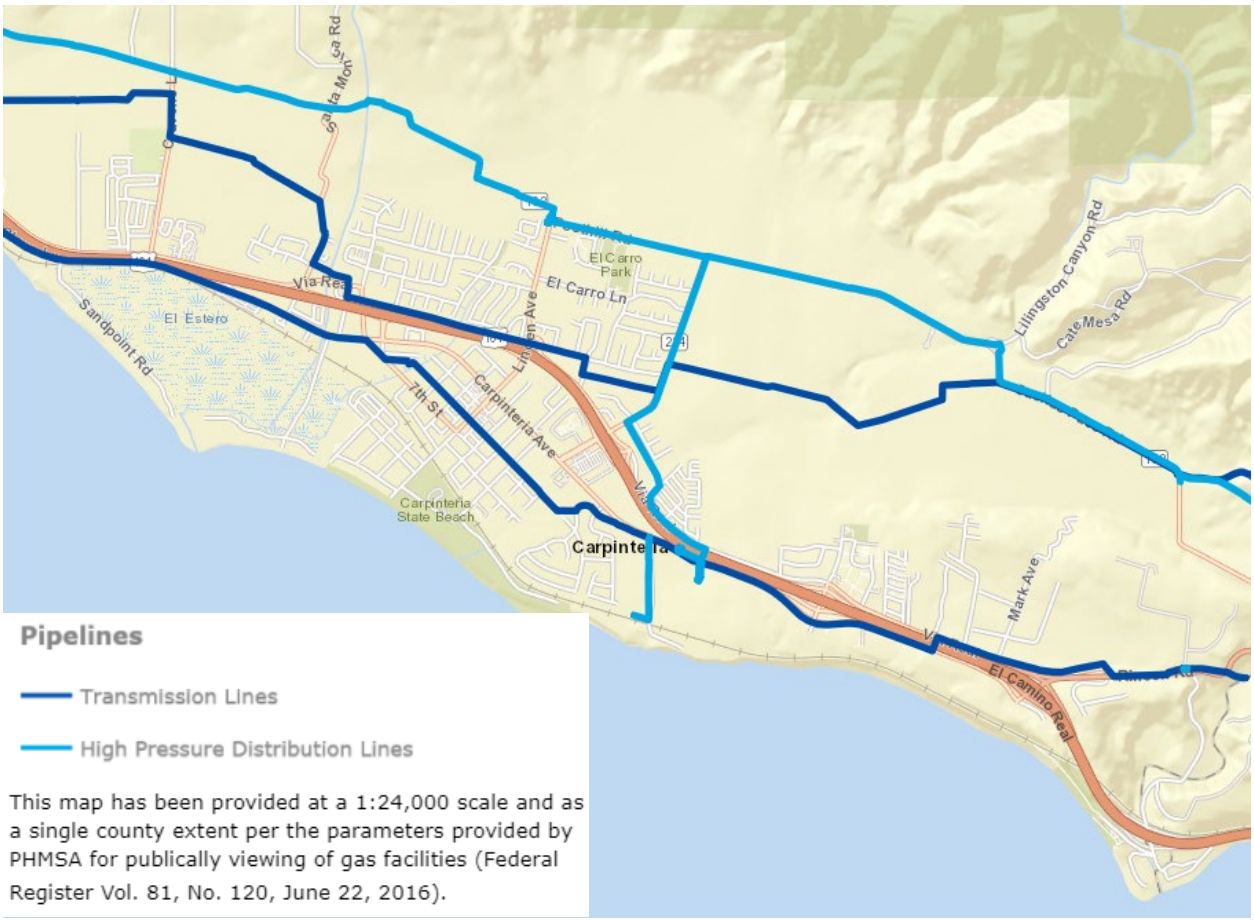
There have been no significant historical events to report to date in the City of Carpinteria or Santa Barbara County.

Probability of Occurrence

Occasional – Increased urbanization is resulting in more people living and working closer to existing gas transmission pipelines that were placed before government agencies adopted and implemented land use and other pipeline safety regulations. Compounding the potential risk is the

age and gradual deterioration of the gas transmission system due to natural causes. Growth in population, urbanization, and land development near transmission pipelines, together with the addition of new facilities to meet new demands, may increase the likelihood of pipeline damage due to human activity and the exposure of people and property to pipeline failures.

Figure 5-11. Natural Gas Pipeline in the City of Carpinteria



Climate Change Consideration

Climate change will not have a direct effect on natural gas pipelines; however, the 2016 California Legislation (SB 32) to reduce emissions to 40 percent below 1990 levels by 2030 could reduce demand and use of natural gas across California. Further, in a decision issued on November 1, 2019, CPUC now requires all energy utility companies, including PG&E and SoCal Gas to file vulnerability assessments, which includes consideration of climate change (CPUC 2019). This decrease in demand, as well as mandatory evaluation of the climate change vulnerabilities for local natural gas service providers and the identification of strategies for achieving climate resiliency, may reduce the number of pipeline ruptures and release events.

5.3.14 Oil Spill

Description of Hazard

An **oil spill** is a release of liquid petroleum hydrocarbon into the environment due to human activity or technological error that results in pollution of land, water, and air. Oil releases also occur naturally through oil seeps either on land or under water. Marine oil spills, whether accidental or intentional, can result from the release of crude oil from offshore oil platforms, drilling rigs, wells, underwater pipelines, tank trucks, and marine tank vessels (tankers) and even supply pipelines on land. Refined petroleum products such as gasoline, diesel, and heavier fuels such as bunker fuel used by cargo ships are also sources of potential oil spill releases (Cal OES 2018).

Oil spills have immediately visible consequences on animals and habitats. Depending on the origin, size, and duration of the release, an oil spill can have serious impacts on air and water quality, public health, plant and animal habitat, and biological resources. Oil in the water can be deadly for animals. Oil is toxic when ingested. When birds get oil on their feathers, it impairs the important waterproofing that is necessary to keep a bird warm. A bird may also lose its ability to float in the water or to fly if it is covered in oil. Oiled marine mammals may suffer from hypothermia. Oil may cause reproductive problems and genetic abnormalities in fish. Contaminants may enter the food chain and result in seafood that is unfit for people to eat (California Coastal Commission 2019). Clean-up and recovery are time and cost-consuming, and dependent on weather conditions such as wind and rain. Tidal and current conditions may also make the spill more dynamic, which causes further difficulties with clean-up activities.

Many state and federal agencies are involved in preventing and responding to oil spills. Platforms in federal waters are regulated by the U.S. Department of the Interior's Minerals Management Service. Facilities located in state waters less than 3 nautical miles from shore are regulated by the California State Lands Commission and California Geologic Energy Management Division, under the jurisdiction of the California Department of Conservation (Cal OES 2018). California enacted the Oil Spill Prevention and Response Act in 1990, which established the Office of Oil Spill Prevention and Response within the Department of Fish and Game, which is authorized to direct spill response, cleanup, and natural resource damage assessment activities, as well as regulate all private vessels over 300 gross tons (672,000 pounds) that enter California ports (California Coastal Commission 2019).

Location and Extent of Hazard in the City of Carpinteria

This hazard can occur in any part of Santa Barbara County where existing oil and gas operations are located, either onshore through supply pipelines and well facilities or offshore where there are several platforms and undersea pipelines. Currently, there are 19 offshore oil platforms off the coast of Santa Barbara County as well as two onshore refineries and six oil separation and treatment plants (refer to Figure 5-32 of the MJHMP; County Department of Planning and Development 2017). Since the 2015 spill described below, seven offshore oil platforms have been shut down (refer to Section 5.6.7, *Oil Spill* of the MJHMP).

The Carpinteria Oil and Gas Processing Facility (CPF) site, located at 5675 Carpinteria Avenue, was obtained by Chevron (formerly Standard Oil Company) in 1959 and was originally built to

receive oil and gas from Platforms Hilda, Hazel, Hope, and Heidi all of which were decommissioned in 1996. The CPF began receiving oil and gas production from Platforms Gail and Grace in 1988. In 1998, Venoco, Inc. (Venoco) acquired 100 percent ownership of Outer Continental Shelf Leases P-0204, P-0205, P-0208, P-0209, P-0215, and P-0217 from Chevron, and took over as operator of the existing offshore and onshore production. Chevron reacquired ownership of the CPF in an agreement between Chevron and Venoco in 2017. The plant facilities include a large bulk crude oil storage tank, pipeline shipping pumps and metering skids, a gas compression plant, a natural gas liquids recovery plant, field offices, tanks, maintenance shops, and other equipment and facilities (City of Carpinteria 2022). Historically, processing levels at the Chevron facility have been as high as 20,000 barrels per day of crude oil and 20 million standard cubic feet per day of natural gas. Although Platform Grace ceased production in 1998, the Plant and Tank 861 continued to receive oil and gas production from Platform Gail until approximately 2017 (Chevron West Coast Decommissioning Program 2021).

Incident Profile: 1969 Santa Barbara Oil Spill

In 1969, a blowout of a Union Oil drilling rig platform off the coast of Santa Barbara resulted in a spill of 4.2 million gallons of crude oil into the ocean and onto nearby shores. This disaster is considered to have been a catalyst for the modern environmental movement.

Photo: vcstar.com

Offshore pipelines that make landfall in the City include the Platform Gail to Platform Grace to the CPF oil (12- and 10-inch) and gas (10-inch) lines and the Platform Habitat to the Pitas Point Natural Gas Odorant and Metering Facility gas (12-inch) line. Onshore pipelines in the City include a common carrier crude (10-inch) pipeline from Carpinteria to the Rincon Common Carrier Crude pipeline system (10-inch mainline) (City of Carpinteria 2022).

Chevron is currently planning to decommission and remediate the CPF site and associated pipelines and filed a Coastal Development Permit with the City of Carpinteria in the Fall of 2021 in support of this activity. Decommission and remediation of the CPF site would include demolition of surface and subsurface facilities and remediation of any subsurface impacted soil and groundwater at the CPF. The decommission and remediation project also includes the removal of nearshore/offshore pipelines out to three miles (State Waters limit; Chevron West Coast Decommissioning Program 2021).

History of Hazard in the City of Carpinteria

Santa Barbara County has experienced several large oil spills (refer to Section 5.6.7 of the MJHMP). Two significant oil spills have affected the City:

- **1969:** The Santa Barbara oil spill occurred in January and February 1969 in the Santa Barbara Channel, near the city of Santa Barbara in Southern California. On January 28, 1969, pressure built up in a 3,500-foot-deep well on Platform A of a Union Oil drilling rig platform off the coast of Santa Barbara as a pipe was being extracted. A burst of natural gas blew out the drilling mud that was being pumped into the well, split the steel casing, and caused cracks to form in the seafloor surrounding the well. The large volume of oil and gas being released caused a "blowout" of the well, releasing approximately three million gallons of oil over 11 days. Workers pumped chemical mud down the 3,500-foot shaft at a rate of 1,500 barrels an hour. It was then topped by a cement plug. Although capped, gas continued to escape and another leak sprung up weeks later, releasing oil for several more months. Union Oil drilled a relief well and pumped cement into a leaking wellbore, thereby killing it. However, small amounts of oil continue to leak from fractures in the seafloor to this day. An estimated total of 100,000 barrels (4.2 million gallons) of crude oil was spilled into the ocean and onto nearby shores over several months, impacting over 40 miles of coastline Platform A of the Union Oil drilling rig is still in operation (Cal OES 2018; California Coastal Commission 2019; Santa Barbara Channelkeeper 2021).

  The cause of the blowout and spill was attributed to the inadequate protective casing allowed by the U.S. Geological Survey waiver. Investigators postulated that more steel pipe sheathing inside the drilling hole would have prevented the rupture (Cal OES 2018).

  It was the largest oil spill in U.S. waters by that time and now ranks third after the 2010 Deepwater Horizon and 1989 Exxon Valdez spills. The incident received international attention and was a major catalyst in the development of modern environmental law in the United States. The spill influenced the passage of major state and federal legislation, such as the National Environmental Policy Act, Clean Water Act, California Environmental Quality Act (CEQA), California Coastal Initiative in 1972 (Proposition 20), and California Coastal Act of 1976. According to these and other statutes, development permits for onshore or offshore oil and gas facilities cannot be issued without provisions to protect terrestrial, marine, visual, recreational, and air resources (Cal OES 2018). This disaster is considered to have been a catalyst for the modern environmental movement (California Coastal Commission 2019; Santa Barbara Channelkeeper 2021).

- **2015:** Another tragic oil spill blackened the shores of Santa Barbara County at Refugio on May 19, 2015, when a 24-inch subterranean pipeline (Line 901) owned and operated by Plains All America Pipeline ruptured on the Gaviota Coast, west of Refugio State Park. Much of the crude oil spilled ran down a storm drain and into a ravine under the freeway and entered the ocean. The size of the spill ranged from 100,000 to 140,000 gallons, covering the Santa Barbara County coastline and extending nearly 9 miles out into the ocean. Various agencies, including local, county, state, and federal partners, were involved in response and recovery efforts, with the participation of approximately 1,300 field personnel and 325 incident command post personnel. Notifications from the county to state and federal partners were aligned with the Santa Barbara Operational Area Oil Spill Contingency Plan and Los Angeles-Long Beach Area

Contingency Plan. The incident command post remained operational for the first 13 days of the incident.

Three bills were signed into law in response to the spill. Under a new law, the California Fire Marshal will be required to review the oil pipelines conditions every year, while federal regulations only mandate a review every five years. Another new law provides for making oil spill response times faster and more effective. The third will force intrastate pipelines to use the best-known technology such as automatic shut-off valves (Cal OES 2018).

Probability of Occurrence

Occasional – In any given year, the county and City of Carpinteria could be subject to oil spills onshore or offshore. Given that 2 spills affecting the City occurred between 1969 and 2020, there is an approximately 4 percent probability of an oil spill occurring in the City.

Climate Change Considerations

With increased changes in weather, climate, and economics, the demands for oil and gas production may shift. This shift in demand could increase production, distribution, and transportation of oil products; thus, increasing the potential for oil spill occurrences.

5.3.15 Train Accident

Description of Hazard

Train accidents are defined as any accidents involving public or private trains carrying passengers or cargo along the rail corridor. Train accidents, like other transportation accidents, are less likely to lead to a state or federal disaster declaration than other hazards described in this LHMP. Train accidents are generally localized, and the incidents result in limited impacts at the community level. However, if there are toxic, volatile, or flammable substances on the train and the train is in a highly populated or densely forested area, death, injuries, and damage to homes, infrastructure, and the environment, including forest fires, can occur (see Section 5.3.17, *Hazardous Materials Release* for a full discussion of hazards related to release of hazardous materials and substances).

Location and Extent of Hazard in the City of Carpinteria

The UPRR carries both freight and passengers through the coastal areas. The county is served by two Amtrak train routes for passenger-only services along the UPRR: the Pacific Surfliner and Coast Starlight (Santa Barbara 2021). The Pacific Surfliner runs adjacent to Highway 101 and the coastline with stops in San Diego, Orange, Los Angeles, and Ventura counties (Santa Barbara 2021). The Coast Starlight connections Seattle and Los Angeles traveling south from Seattle with stops in Portland, the San Francisco Bay Area, Sacramento, Paso Robles, San Luis Obispo, and Santa Barbara.

Within the City of Carpinteria, the UPRR runs northwest-southeast along the Pacific coastline, south of the Downtown District, and curving north around the El Estero salt marsh. The Carpinteria Station train station is located in the Downtown District at 475 Linden Avenue.

In addition to passenger-only rail services, the Carpinteria train station receives train movements from the shipment of commodities, such as hazardous materials, fuel (including oil), agriculture,

meats, and non-consumables. Train accidents are generally localized and the incidents result in limited impacts at the community level. However, if there are volatile or flammable substances on the train and the train is in a highly populated, death, injuries, and damage to homes, infrastructure, and the environment, including forest fires, can occur. Additionally, a hazardous materials incident on the rails or roadway has the potential to shut down both rail and highway transportation routes, such as Highway 101, where the two are within proximity to one another.

History of Hazard in the City of Carpinteria

No major train accidents have occurred in the City of Carpinteria or Santa Barbara County. However, in the last thirty years, numerous train accidents have occurred throughout the southern California region. For example, in 1991 the Seacliff Incident occurred in Ventura County when a train released 440 gallons of aqueous hydrazine (used to make agricultural, metal, and plastics processing chemicals) and naphthalene (industrial solvent) (Los Angeles Times 1991). The accident required the evacuation of the nearby Seacliff Community along with the shutting down of Highway 101 and took 5 days to cleanup.

Probability of Occurrence

Occasional – Given that no known train accidents have occurred in the City or county, the probability of occurrence is low. While neither of the train accidents described above occurred within the county, due to the scale and scope of train transportation for people and commodities, such events have the potential to occur.

Climate Change Consideration

There is no known linkage between climate change and train accidents; however, because of railroad track proximity to the Pacific Ocean within the county, sea level rise could impact service. Current estimates project the range of sea level in the county will be between 27.2 and 30 inches by 2060 (refer to Section 5.3.4, *Coastal Hazards*). The railroad alignment along the Carpinteria Bluffs is highly vulnerable to coastal erosion; with approximately 5 feet of sea level rise, up to 1.4 miles of the UPRR could be damaged. Coastal flooding could also impact the railroad in other parts of the City north of the Salt Marsh and in the Downtown core. Disruption of the railroad could have substantial economic impacts on the region (City of Carpinteria 2019).

5.3.16 Landslide

Description of Hazard

Landslide movements are interpreted from the geomorphic expression of the landslide deposit and source area, and are categorized as falls, topples, spreads, slides, or flows. Falls are masses of soil or rock that dislodge from steep slopes and free-fall, bounce, or roll downslope. Topples move by the forward pivoting of a mass around an axis below the displaced mass. Lateral spreads, commonly induced by liquefaction of material in an earthquake, move by horizontal extension and shear or tensile fractures. Slides displace masses of material along one or more discrete planes. In rotational sliding, the slide plane is curved and the mass rotates backward around an axis parallel to the slope; in translational sliding the failure surface is more or less planar and the mass moves parallel to the ground surface. Flows mobilize as a deforming, viscous mass without a discrete failure

plane (California Geological Survey 2019a). Debris flows are described in Section 5.3.2, *Mudflow & Debris Flow*.

For landslides to occur, the correct geological conditions, which include unstable or weak soil or rock, and topographical conditions, such as steep slopes, are necessary. Heavy rain often triggers these hazards, as the water adds extra weight that the soil cannot bear. Over irrigating has the same effect. Earthquakes can also affect soil stability, causing enough weakening to favor gravitational forces.

Location and Extent of Hazard in the City of Carpinteria

Landslides and landslide-prone sedimentary formations are present throughout the coastal plain of western Santa Barbara County. Generally, areas with soft soils are more prone to movement. Figure 5-18 of the MJHMP shows the location of soil types throughout the county. Many of these landslides are thought to have occurred under much wetter climatic conditions than at present. Reactivations of existing landslides can be triggered by disturbances such as heavy rainfall, seismic shaking, and/or grading. Many recent landslides are thought to be reactivations of ancient landslides.

Section 5.3.7 of the MJHMP lists the areas in Santa Barbara County where there are geologic formations that can lead to fairly severe landslides as identified by the Santa Barbara County Comprehensive Plan Seismic Safety and Safety Element (Santa Barbara County Planning and Development Department 2015). Some areas of the City are prone to more frequent rain-induced landslides, resulting in disruption to transportation and damage to roadways. The most common areas of recent historic landslides are Gobernador Canyon and all roads that are underlain by the Rincon Shale Formation.

The City of Carpinteria's General Plan identifies areas within the City that have a high landslide susceptibility. Areas of relatively high landslide and rock fall potential are primarily located in the northern portion of the planning area, outside areas of current or planned urban development. In general, the areas most susceptible to mudflows and debris flows correspond to the areas with a high potential for earthquake-induced landslides (refer to Section 5.3.2, Mudflow & Debris Flow; City of Carpinteria 2003).

History of Hazard in the City of Carpinteria

As previously mentioned, the northern portion of the City is prone to landslides; however, many previous landslide occurrences were smaller and are not well documented. Additionally, significant historic mudflows and debris flows are described in Section 5.3.2 above. Three of the more significant recent landslides in the vicinity of the City are discussed below:

- **1995** – In the spring of 1995, La Conchita, located at the western border of Ventura County and adjacent to Santa Barbara County, experienced a landslide that destroyed several houses in its path.
- **2005** – In January 2005, a powerful Pacific storm brought heavy rain, snow, flash flooding, high winds, and landslides to Central and Southern California. With such copious rainfall, flash flooding was a serious problem across Santa Barbara, Ventura, and Los Angeles counties. In Santa Barbara County, flash flooding and mudslides closed Gibraltar Road at Mt. Calvary Road, stranding several vehicles, while mudslides inundated 3 homes in Lake Casitas. Across

Ventura County, flash flooding and mudslides closed down Creek Road at Hermosa Road. In addition, the Ventura Beach RV Resort was flooded and Highways 1 and 126 were closed due to flooding. In La Conchita, a devastating mudslide killed 10 people, destroyed 15 homes, and damaged 12 other homes (NOAA 2005).

Probability of Occurrence

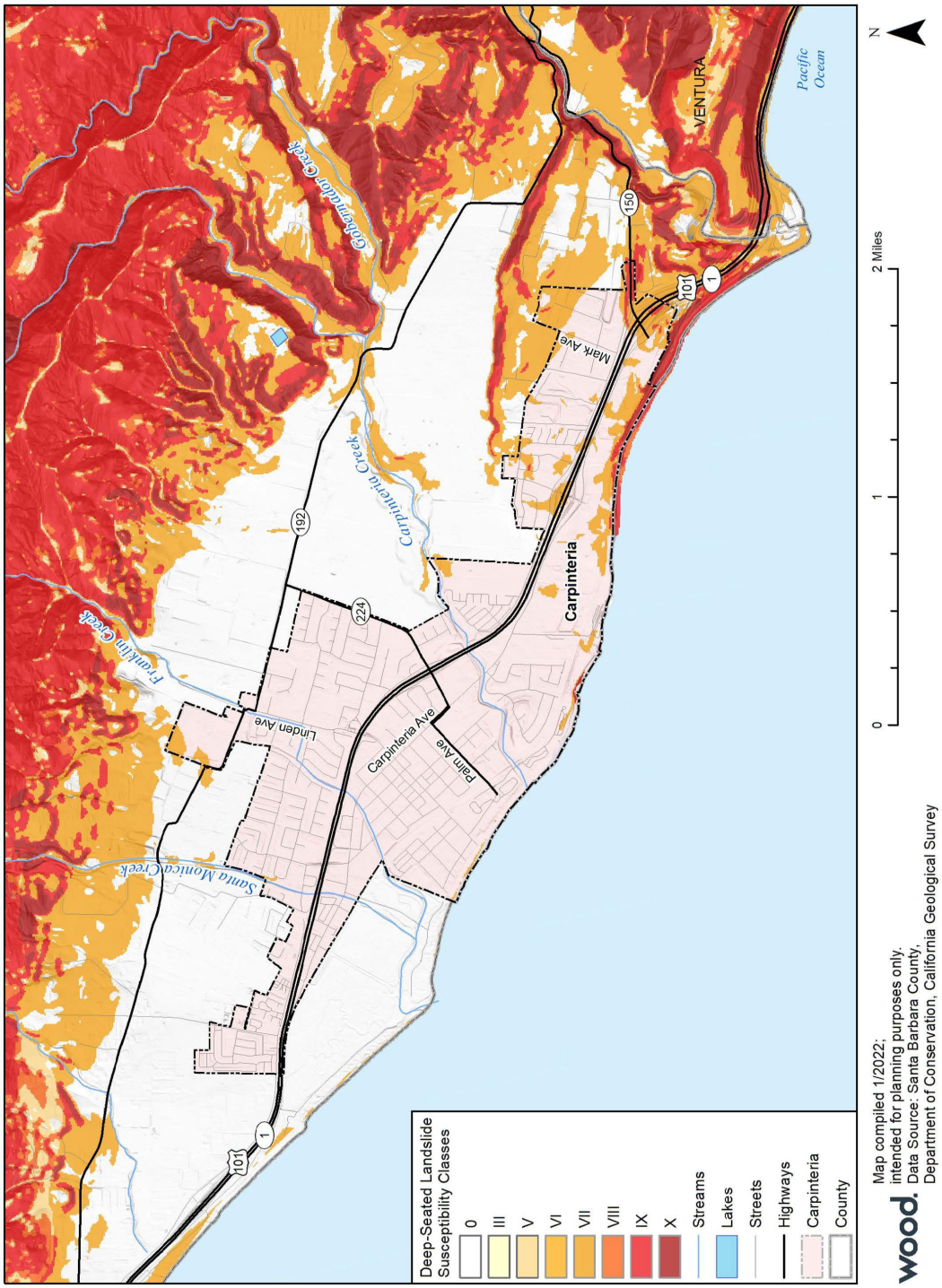
Occasional – Figure 5-12 shows the locations of deep-seated landslide susceptibility in the City as mapped by the California Geological Survey. This map shows the relative likelihood of deep landslide based on the three site factors that most determine susceptibility: prior failure (from a landslide inventory), regional estimates of rock or soil strength, and steepness of slopes. On the most basic level, weak rocks and steep slopes are more likely to generate landslides. The map uses detailed information on the location of past landslides, the location and relative strength of rock units, and the steepness of the slope in a methodology developed by Wilson and Keefer (1985). The result shows the distribution of one very important component of landslide hazard. It is intended to provide infrastructure owners, emergency planners, and the public with a general overview of where landslides are more likely. The map does not include information on landslide triggering events, such as rainstorms or earthquake shaking, nor does it address susceptibility to shallow landslides such as debris flows. Therefore, this map is not appropriate for the evaluation of landslide potential at any specific site (California Geological Survey 2019a). The areas shaded in darker red in Figure 5-12 are considered to have a higher probability of landslide occurrence than the low landslide risk areas in the City.

Climate Change Consideration

A 2021 study by the USGS finds that Southern California is likely to see increased post-wildfire landslides caused by climate change-induced shifts in the state's wet and dry seasons. Wildfires make the landscape more susceptible to landslides when rainstorms pass through as the water liquefies unstable, dry soil and burned vegetation. Wildfire frequency, higher temperatures, and increased droughts projected to occur under climate change can reduce soil absorption capacity and kill vegetation that holds soil in place, making it unable to absorb as much water, further destabilizing slopes. Slope failure is expected to become more frequent as more precipitation falls during fewer storm events (refer also to Section 5.3.1, *Flood*). Also, the increased heavy precipitation events may cause instability in areas where landslides were not as likely before. Therefore, resulting landslides may be larger or more widespread.

Major landslides capable of damaging 40 or more structures can be expected every 10 to 13 years – about as frequently as magnitude 6.7 earthquakes occur in California. Combined with recent research showing California's wildfire season is getting longer and the rainy season is getting shorter and more intense, the new findings suggest Californians face a higher risk of wildfires and post-wildfire landslides that can damage property and endanger people's lives (USGS 2021).

Figure 5-12. City of Carpinteria Deep-Seated Landslide Susceptibility



5.3.17 Hazardous Materials Release

Description of Hazard

Hazardous waste/materials are defined under the U.S. Congress' original statutory definition under the Resource Conservation and Recovery Act (RCRA) as substances with physical or chemical properties of flammability, corrosivity, reactivity, or toxicity, which because of quantity, concentration, or physical, chemical, or infection characteristics may cause or significantly contribute to increased mortality or serious illness (RCRA Section 1004(5)). Hazardous waste/ materials are widely used or created at facilities, such as hospitals, wastewater treatments plants, universities, and industrial/manufacturing warehouses.

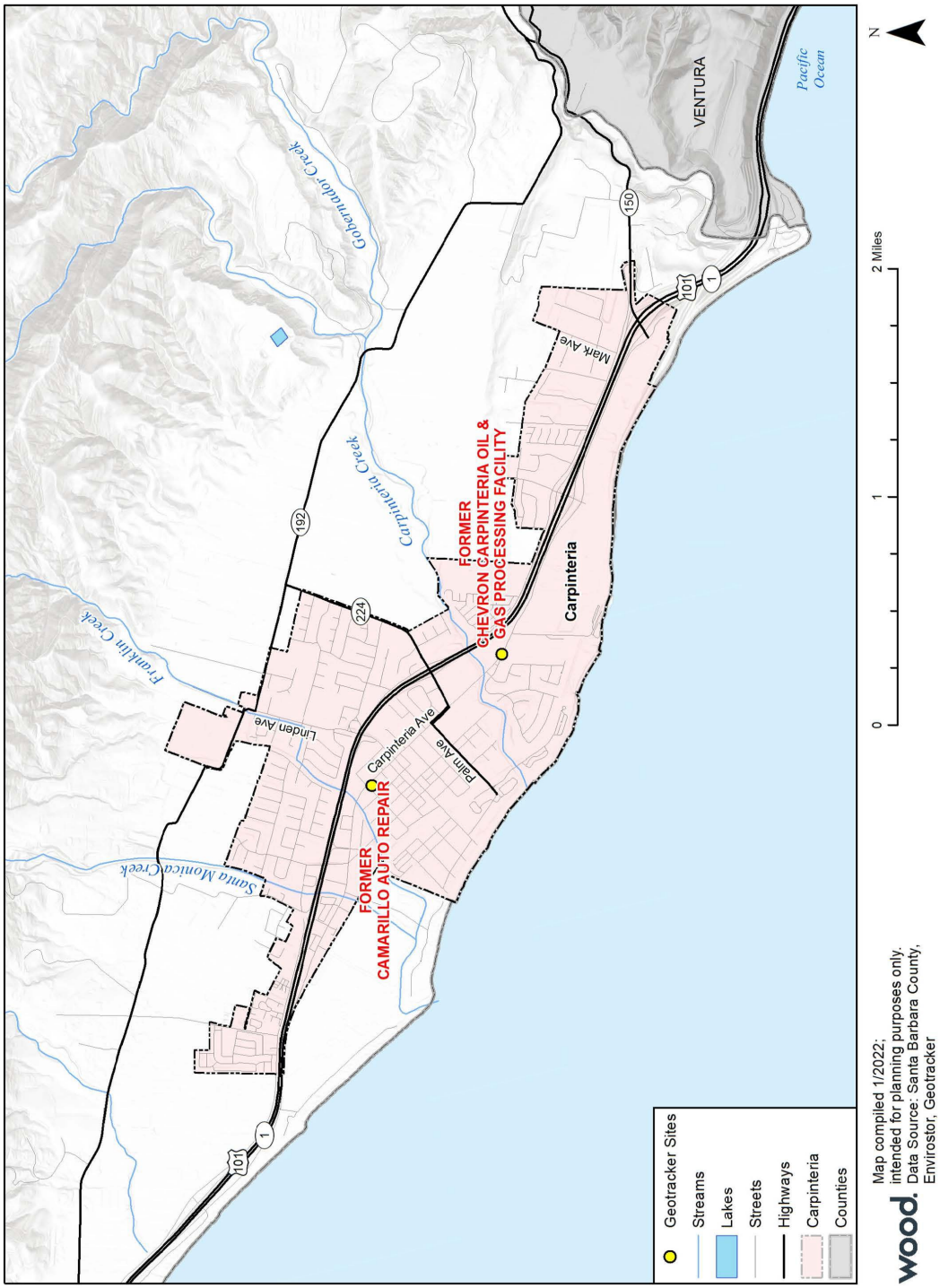
Both mobile and external hazardous materials releases can spread and affect a wide area, through the release of plumes of chemical, biological, or radiological elements or leaks or spills. Conversely, internal releases are more likely to be confined to the structure the material is stored in. It is also common to see hazardous materials releases as escalating incidents resulting from other hazards, such as floods, wildfires, and earthquakes. The release of hazardous materials and waste can greatly complicate or even escalate the response to a natural hazards disaster that caused the spill. Hazardous materials and waste may pose a substantial present or potential hazard to human health and/or the environment when improperly treated, transported, stored, disposed of, or otherwise managed. Chemicals may also be corrosive or otherwise damaging over time. A hazardous materials release could also result in fire or explosion. Contamination may be carried out of the immediate area of the incident by people, vehicles, wind, and water. Weather conditions can increase the size and intensity of the Hazardous Materials Release. Typography, such as hills and canyons, can increase the size of the release or make it more difficult to contain.

The EPA has developed a regulatory definition and process that identifies specific substances known to be hazardous and provides criteria for the regulation of hazardous waste. Several household products, such as cleaning supplies and paint are also considered hazardous materials. The County regulates approximately 350 substances subject to the California Code of Regulations, Title 19.

The U.S. Department of Transportation (DOT), EPA, and OSHA all have responsibilities relating to the transportation, storage, and use of hazardous materials and waste. The National Response Center is the designated federal point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment, anywhere in the U.S. and its territories. The National Response Center is a primary source of information on the use and storage of hazardous materials, as well as data regarding spills and releases.

The California Environmental Protection Agency and the Department of Toxic Substances Control (DTSC) are authorized by the EPA to enforce and implement federal hazardous materials laws and regulations within the state. EnviroStor is DTSC's online data management system for tracking their cleanup, permitting, enforcement, and investigation efforts at hazardous waste facilities and sites with known or suspected contamination issues. Additionally, the State Water Resources Control Board GeoTracker information system provides online access to environmental data from water quality regulatory programs, including oil and gas monitoring-related activities. EnviroStor and GeoTracker sites within the City are shown in Figure 5-13.

Figure 5-13. Hazardous Sites (Envirostor/Geotracker) within the City of Carpinteria



At the local level, the County's Environmental Health Services Department is the approved Certified Unified Program Agency (CUPA) responsible for the administration of permitting, inspections, and enforcement for hazardous waste and hazardous materials programs. The CUPA administers the Hazardous Material Business Plan, California Accidental Release Prevention program, and the Aboveground Storage Act, as well as permitting and inspection activities for hazardous waste generators, onsite hazardous waste treatment facilities, and underground storage tanks. The Seismic Safety and Safety Element of the Santa Barbara County Comprehensive Plan includes goals, policies, and implementation measures for hazardous materials.

Location and Extent of Hazard in the City of Carpinteria

The locations and identity of facilities that store hazardous materials are reported to local and federal governments. Many facilities have their own hazardous materials guides and response plans, including transportation companies that transport hazardous materials. Some of the most notable hazardous material sites that may affect the City include oil processing facilities along the South Coast. While these oil and gas facilities have been closed, they have not yet been decommissioned and remediated. Figure 5-13 shows the location of hazardous material sites in the City (i.e., former Camarillo Auto Repair and former CPF).

Hazardous materials may be found in the materials of older buildings, such as asbestos or lead-based paints or may have been used routinely for the operation of certain land uses, such as automotive repair shops, commercial agricultural fields, medical offices, dry cleaners, and photo processing centers. Potentially hazardous materials are commonly found in urban and agricultural areas, and generally include cleaning and metal solvents, pesticides/herbicides, paints, and oils and lubricants. Land uses that are particularly sensitive to the release of hazards or hazardous materials include residential, educational, assisted living, and daycare, which are located throughout the City.

Two large industrial facilities and two CVWD water treatment plants are located in the City. These include the former CPF site, the Carpinteria Sanitary District Wastewater Treatment Plant, and the water treatment sites located at 4810 Foothill Road and El Carro Lane and Namouna Street. The former CPF consists of natural gas dehydration and metering stations. These facilities may store and/or use flammable hazardous materials/waste, highly toxic and corrosive materials/waste, as well as acutely hazardous materials/waste.

Agricultural production activities, including both conventional and organic agriculture, occur in a limited capacity within the City and more widely in unincorporated areas surrounding the City. Agricultural activities involve the use of regulated hazardous materials, particularly commercial pesticides. Pesticide use is regulated by the County Agricultural Commissioner's Office, with permits required for pesticide application. Such pesticide use is carefully regulated under state law and consistent with guidelines issued by the California Department of Pesticide Regulation. Such regulations generally govern the type of pesticide applied, as well as the location, timing, and rules of applications. Special consideration is given to applications near schools.

Pesticides including rodenticides, insecticides, herbicides, fungicides, and other pest-controlling substances are applied in landscaped areas, nurseries, and agricultural lands in the City. Consequently, pesticides, fertilizers, and associated contaminants may be present in near-surface soils in residual concentrations at these locations. Many irrigated lands are currently required to

operate under the Irrigated Lands Regulatory Program to regulate runoff of pesticides, fertilizers, and sediments from irrigated lands through Waste Discharge Requirements issued by the State Water Resources Control Board.

Crude oil activities have historically occurred onshore and continue to exist offshore in the Carpinteria area. These facilities have the potential to result in the release of hazardous materials in the City, as further described in Section 5.3.14, *Oil Spill*.

Hazardous materials release is most likely to occur at facilities handling acutely hazardous materials or during transport of hazardous materials. Highway 101 is the major vehicular transportation corridor through the City in which hazardous materials release is likely to occur. The UPRR may also result in hazardous materials due to freighter rail cars that are known to carry hazardous materials through the City. Specifically, jet fuel is transported from Los Angeles northward through the City to Vandenberg Space Force Base (SFB) via UPRR. The City also contains other hazardous materials sites, including four sites designated by the EPA as "small quantity generators" of hazardous waste such as dry cleaners and gas stations.

History of Hazard in the City of Carpinteria

Several significant hazardous material incidents have occurred in the County in the past century, and include the oil spills which occurred in 1969, 1997, 2007, 2008, 2015, and 2020 (see Section 5.6.7, *Oil Spill* of the MJHMP for a detailed discussion of these incidents and risks associated with oil spill-related hazards). Eight hazardous materials incidents in the City were reported to the Cal OES Warning Center from 2006 through 2021 (Cal OES 2021). These incidents include both transportation and fixed-facility incidents. This list does not capture all hazardous material spills within the City, only those that were significant enough to be reported to Cal OES (refer to Table 5-18 of the MJHMP for a summary of hazardous materials incidents reported to Cal OES in Santa Barbara County by location and type). The data indicates that hazardous materials incidents can occur across the county with a greater frequency in the more developed areas.

Probability of Occurrence

Occasional – The City experiences hazardous materials incidents every year; however, the vast majority of the incidents are minor and have highly localized impacts. Incidences can occur during the production, storage, transportation, use, or disposal of hazardous materials. Communities can be at risk if a chemical is used unsafely or released in harmful amounts into the environment. Hazardous materials can cause death, serious injury, long-lasting health effects, and damage to buildings, the environment, homes, and other property. However as described above, a range of federal and state regulations exist to limit the risk of upset during the use, transport, handling, storage, and disposal of hazardous waste and materials including the EPA, DTSC, OSHA, and DOT. The State Water Resources Control Board is responsible for prevention and enforcement in California for hazardous materials associated with water quality. Additionally, OSHA regulates hazardous materials and potential exposure to workers to prevent impacts on human health, and DOT is responsible for the regulation of the transport of hazardous materials and waste to avoid accidental spills and exposure to the public through transport.

Climate Change Consideration

There are no known effects of climate change on human-caused hazards including hazardous material and waste incidents.

5.3.18 Geologic Hazards

Description of Hazard

Land subsidence is defined by the USGS as the lowering of the land-surface elevation from changes that take place underground. Common causes of land subsidence from human activity are pumping water, oil, and gas from underground reservoirs; drainage of organic soils; and initial wetting of dry soils (i.e., hydrocompaction). Overdraft of aquifers is the major cause of subsidence in the southwestern U.S., and as groundwater pumping increases (such as during periods of drought), land subsidence also will increase. In many aquifers, groundwater is pumped from pore spaces between grains of sand and gravel. If an aquifer has beds of clay or silt within or next to it, the lowered water pressure in the sand and gravel causes slow drainage of water from the clay and silt beds. The reduced water pressure is a loss of support for the clay and silt beds. Because these beds are compressible, they compact (become thinner), and the effects are seen as a lowering of the land surface. Weight, including surface developments such as roads, reservoirs, and buildings, and manmade vibrations from such activities as blasting and heavy truck or train traffic can accelerate the natural processes of subsidence, or induce subsidence over human-made voids (USGS 2016).

Land subsidence causes serious, localized problems including:

- changes in elevation and slope of streams, canals, and drains;
- damage to bridges, roads, railroads, underground utilities (e.g., storm drains, sanitary sewers, pipelines, etc.), streams, canals, and levees;
- damage to private and public buildings; and
- failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems.

In some coastal areas, subsidence has resulted in tides moving into low-lying areas that were previously above high-tide levels, increasing the effects of coastal hazards, such as coastal storm surge (USGS 2016).

Erosion is a geological process in which earthen materials (i.e., soil, rocks, sediments) are worn away and transported over time by natural forces (e.g., water, wind, ice), although sometimes this is sped up by poor management or other human impacts on land (e.g., farming, land clearing). Coastal erosion, which is caused by the ocean, is discussed under Section 5.3.4, *Coastal Hazards*. Soil erosion occurs primarily when the dirt is left exposed to strong winds, hard rains, flowing water, and ice. In some cases, human activities leave soil vulnerable to erosion. For example, when farmers till (plow) the soil before or after growing a season of crops, they may leave it exposed to the elements for weeks or months. The overgrazing of farm animals like cattle and sheep can also leave large areas of land devoid of ground-covering plants that would otherwise hold the soil in place (Natural Resources Defense Council 2021).

Soil erosion reduces the quantity and the quality of soil ecosystems and arable land (i.e., land that can be used to grow crops). Severe soil erosion can result in the loss of food crops, negatively impact community resiliency and livelihoods, and even alter ecosystems by reducing biodiversity above, within, and below the topsoil. Approximately 60 percent of soil that is washed away ends up in rivers, streams, and lakes, along with whatever has been applied to that soil, including agrochemicals and other pollutants that can contribute to harmful algal blooms and polluted waterways. Dirt that enters water bodies can also clog their natural flow and increase flooding along the waterways (Natural Resources Defense Council 2021).

Expansive soils are soils that can undergo a significant increase in volume with an increase in water content and a significant decrease in volume with a decrease in water content. Changes in the water content of an expansive soil can result in severe distress to structures constructed upon the soil. Expansive soils tend to swell with seasonal increases in soil moisture in the winter months and shrink as soils become drier in the summer months. Repeated shrinking and swelling of the soil can lead to stress and damage of structures, foundations, fill slopes, retaining walls, and other associated facilities.

Location and Extent of Hazard in the City of Carpinteria

Subsidence

Land subsidence is common in several areas of California, usually as a result of groundwater pumping, peat loss, or oil and gas extraction. DWR's Draft California Groundwater Update 2020 is the state's most up-to-date compendium of statewide data and information on the occurrence, nature, use, and conditions of California's groundwater resources and their management. DWR provides an interactive map with information about land subsidence in California (2009-2018) that is presented in California's Groundwater Update 2020. The point data in the map displays land elevation changes over varying periods as recorded by a collection of continuous global positioning system stations and is presented for groundwater basins within Santa Barbara County in Table 5-13 of the MJHMP. As shown therein, no vertical displacement (subsidence) has been measured for the Carpinteria Groundwater Basin, which underlies the City of Carpinteria.

As described in the City's General Plan Safety Element, no recognized subsidence has occurred in the City or immediate vicinity due to either groundwater or oil extraction. Accordingly, the potential for subsidence is considered to be minimal. However, the General Plan identifies the potential for soil settlement within the eastern portion of the City and to the north of the City boundaries (City of Carpinteria 2003).

Erosion

Erosion can vary greatly in short distances, and thus, erosion has not been mapped or rated at the county level (Santa Barbara County Planning and Development Department 2015). However, there are a few areas that are particularly susceptible to erosion given their basic granular characteristics. The Santa Barbara formation and old dunes are subject to erosion. The Santa Barbara formation occurs in patches on the coastal hills and the lower foothills from Carpinteria to Goleta. Because it is so soft and weakly cemented, the Santa Barbara Formation is rapidly gullied and washed away when vegetation is removed making it hazardous, especially on steep slopes.

When short grass and other annuals are not present, the soft and uncemented sand is subject to wind erosion and gullying (Santa Barbara County Planning and Development Department 2015).

The Santa Barbara County coastline is mainly subject to marine erosion. The western coastline is comprised of dunes and sea cliffs. The majority of exposed rocks in the sea cliffs are readily eroded by marine and non-marine processes (Santa Barbara County Planning and Development Department 2015). The exposed seacliffs in the City of Carpinteria are composed of the Monterey (Modelo) Formation, which is a thinly bedded, hard, siliceous shale. The Monterey Formation readily yields to erosion, slumping, landslides, and other erosional processes (refer to Section 5.3.4, *Coastal Hazards*; City of Carpinteria 2003).

Expansive Soils

Expansive soils can cause problems because they contain clay minerals that swell when the moisture content increases and shrink when the moisture decreases. Such soils are usually described as "adobe," and form ground cracks when they are allowed to dry out. The volume changes resulting from variable moisture conditions can cause movement and cracking of structures built on expansive soils. Soils beneath concrete floor slabs tend to increase in moisture content, thus causing heave. Soils under raised floors tend to dry out and shrink, causing settlement of the structure. The most hazardous areas occur in a belt along the south coastal foothills, where geological formations are either highly expansive themselves or generate highly expansive topsoil (Santa Barbara County Planning and Development Department 2015).

The City's General Plan states that expansive soils with shrink-swell potential are present in the City and primarily overlap with outcrops of claystone, siltstone, and shale and areas that are susceptible to soil compaction. The areas of potentially highly expansive soil are limited to the western portion of the City and the El Estero salt marsh to the south (City of Carpinteria 2003).

History of Hazard in the City of Carpinteria

Land subsidence, erosion, and expansive soils have been identified as issues in the City as described above. There is no history of acute, specific events associated with these hazards in the City.

Probability of Occurrence

Occasional – The frequency of future land subsidence incidents in the City will largely be dependent on the mitigation actions and pumping regulations initiated by the state, the county, and local regulations. As described in Section 5.3.7, *Drought & Water Shortage*, groundwater basins that are designated as a high or medium priority by the DWR must form a Groundwater Sustainability Agency, which is responsible for the development, implementation, and oversight of a GSP. GSP objectives require that future groundwater use does not cause undesirable results, including land subsidence (Santa Barbara County Public Works 2020).

Climate Change Consideration

The most likely impact that climate change will have on land subsidence risk is the potential for extended and severe drought, which could likely result in more groundwater pumping and human-induced subsidence. In areas where climate change results in less annual precipitation and reduced surface-water supplies, communities will pump more groundwater. During periods of drought, water levels may be drawn too low. Also, an increasing population in California will increase demands on

groundwater supplies. The water cannot recharge the layers, causing irreversible compaction of aquitards and diminishment of groundwater storage capacity. In the future, an increasing population may result in subsidence problems in metropolitan areas where subsidence could severely damage infrastructure (USGS 2016).

Climate is also a major driver of erosion. Changes in rainfall and water levels can shift soil, extreme fluctuations in temperature can make topsoil more vulnerable to erosion, and prolonged droughts can prevent plants from growing, leaving soil further exposed (Natural Resources Defense Council 2021).

There is also evidence that climate change may affect the impacts of expansive soils. Climate change effects on expansive soil movements are quantified using the Thornthwaite Moisture Index. The Thornthwaite Moisture Index is calculated from the moisture deficiency and surplus, both related to rainfall, and the potential evapotranspiration which is derived from temperature. Established relationships between the Thornthwaite Moisture Index and the depth and magnitude of soil suction changes for sites with and without the presence of trees, and the relationships between soil movement and soil suction changes, are used to predict the increase in soil movement for a site. It is shown that a significant increase in predicted soil movement is expected with climate change (Mitchell 2014).

5.3.19 Windstorm

Description of Hazard

Santa Barbara County is known to experience a unique, damaging wind known as a **sundowner**, which is a kind of offshore wind that occurs in the late afternoon or early evening along the southern slopes of the Santa Ynez mountains from Gaviota to Carpinteria. Sundowners occur when a north-south oriented high-pressure gradient develops directly north of the area and perpendicular to the Santa Ynez Mountains. They bring gusty, low humidity winds which can reach up to 80 mph and blow over the Santa Ynez Mountain range and descend towards the Pacific Ocean. Sundowner events are most prevalent in the spring and summer months but can strike at any time of the year. Sundowners are particularly dangerous during the wildfire season because the hot, dry air can fuel raging wildfires on the south coast. As the winds come up and over the mountain, they warm and dry the air (which is typically cool and moist along the coast) and gain speed coming down through the passes and coastal canyons causing a high wind speed. These winds often precede Santa Ana winds which are warm, dry, and can exceed 40 mph (Live Science 2012). Santa Ana winds are most prevalent in the autumn and winter months. These winds originate from cool, dry high-pressure air masses in the Great Basin. They come up, over, and are pulled southward down the eastern side of the Sierra Nevada Mountains and into the Southern California region (National Weather Service 2021).

Location and Extent of Hazard in the City of Carpinteria

All of the City is susceptible to Santa Ana winds. The City, like the rest of the south county, is also susceptible to sundowner winds due to the unique east-west orientation of the Santa Ynez Mountains and the Pacific Coast which generates the required high-pressure gradient necessary for these winds to occur.

History of Hazard in the City of Carpinteria

Sundowner winds have caused extreme heat bringing record-breaking temperatures to the area (such as the Simoon event in Goleta in 1859), as well as exacerbating fire weather and expanding already burning brush fires (such as the Painted Cave Fire in 1990, Gap and Tea Fire in 2008, Jesusita Fire in 2009, and Sherpa Fire in 2016). Santa Ana winds were unusually strong and persistent during the Thomas Fire in 2017, causing a wind event on and off for a little over two weeks. Beyond extreme heat and dangerous fire weather conditions, winds can cause damage to critical infrastructure, crops/agriculture, and personal property.

Probability of Occurrence

Occasional – The City is at risk of windstorms at any given time during the calendar year.

Climate Change Considerations

Climate change effects, although still being studied, will affect sundowner and Santa Ana windstorms in the future. Severe weather events, including strong winds and sundowners, are expected to become more frequent with climate change; however, recent studies suggest that climate change and global warming may decrease the frequency of Santa Ana wind events in the early and late season – fall and spring – but the peak season and intensity of these wind events likely to remain unchanged (Guzman-Morales and Gershunov 2019). Another 2019 study pointed to natural climate cycles and changing temperatures for the wind changes, suggesting that wind speeds declined by an estimated 8 percent between 1980 and 2010, but have significantly increased in the past decade, and are likely to continue to increase in the future (Zeng et al. 2019). Contradicting research suggests that in some areas wind speeds will increase while others decrease, possibly due to temperature changes caused by climate change.

5.3.20 Civil Disturbance

Description of Hazards

The term **civil disorder** is defined by 18 U.S. Code Section 232 as any public disturbance involving acts of violence by assemblages of three or more persons, that causes an immediate danger of or results in damage or injury to the property or person of any other individual. Civil disturbance can range from unlawful forms of protest against socio-political problems to riots.

Civil disorders occur in California sporadically and last from a few days to months. Loss of life and loss of property have occurred in the last 25 years. There are various causes for civil disturbance, all human-caused. All begin as local events. (Cal OES 2018).

As described in the State Hazard Mitigation Plan and MJHMP, the majority of significant civil disorder events in California started in response to violence against people of color, as well as the acquittal of police officers and other persons on trial for committing violence against people of color. Refer to Section 5.5.4 of the MJHMP for a description of historical examples.

In the summer of 2020, a string of peaceful protests as well as violent riots took place across the country in response to graphic images of the killing of George Floyd under a police officer's knee. The anti-racism and anti-police brutality protests resulted in hundreds of reports of police brutality and excessive force used during the protests.

Incident Profile: George Floyd Protests

Nationwide protests surged following the murder of George Floyd, an unarmed black man, by a Minneapolis police officer. Among them, students from Carpinteria High School organized a peaceful "Carp for Black Lives Matter" protest on June 6, 2020, on all corners of Linden and Carpinteria Avenues.

Photo: Edhat

More than a dozen after-action evaluations have been completed, looking at how police departments responded to the demonstrations that broke out in hundreds of cities between late May and the end of August. Across U.S. cities, the reports reveal the extensiveness of police forces that were poorly trained, heavily militarized, and stunningly unprepared for the possibility that large numbers of people would surge into the streets in response to the killing of George Floyd (New York Times 2021). Departments were criticized for not planning for protests, despite evidence that they would be large. Almost uniformly, the reports said departments need more training in how to handle large protests (New York Times 2021).

Demonstrations were large, constant, and unpredictable, often springing up organically in several neighborhoods at once. While most protests were peaceful, in cities like New York, Philadelphia, Minneapolis, and Portland, buildings were looted and fires were set, and demonstrators hurled firecrackers and Molotov cocktails at law enforcement officers. At least six people were killed; hundreds were injured; thousands were arrested (New York Times 2021).

News reports and social media repeatedly blamed police departments for escalating violence instead of taming it. Responding officers often treated all protesters the same, instead of differentiating between peaceful protesters and violent rioters or looters. In part, reports acknowledged, that was because of the chaos. But it was also because the protests pitted demonstrators against officers, who became defensive and emotional in the face of criticism, some reports said (New York Times 2021).

Location and Extent of Hazard in the City of Carpinteria

Civil disturbance can occur in any part of the City; however, this hazard generally occurs within more populated areas, such as the Downtown District.

History of Hazard in the City of Carpinteria

Santa Barbara County's urban communities have on occasion experienced civil unrest, with the college town of Isla Vista perhaps having the most notable disturbances.

In 2020, footage of the murder of George Floyd incited civil disturbances nationwide, including peaceful protests in the county. The peaceful protests, as well as sporadic post-demonstration vandalism (e.g., spray-painting buildings) and disturbances that occurred in the City of Santa Barbara and the City of Santa Maria, are described further in Section 5.5.4 of the MJHMP. In the City of Carpinteria, students from Carpinteria High School organized a peaceful "Carp for Black

Lives Matter" protest on June 6, 2020. The event took place on all corners of Linden and Carpinteria Avenues. Protesters marched between Casitas Pass and Elm with local police and Santa Barbara County Sheriff's Deputies assisting with traffic control (Edhat 2020).

On October 18, 2021, more than three dozen Carpinteria parents stood outside of the CUSD administrative office for a few hours in protest over Governor Gavin Newsom's COVID-19 vaccine mandate for California schools. Under the current plan – unlike other vaccine requirements – the mandate allows for an exemption to the COVID-19 vaccine requirement based on personal beliefs, such as religious or ideological reasons. According to the CUSD, approximately 90 percent of school district employees are vaccinated. However, in the first six weeks of school, the School District reported seven COVID-19 cases among its students and three among its vaccinated staff (Edhat 2021).

Probability of Occurrence

Likely – There are no studies that predict the probability of civil disturbance occurrences. However, major national events such as the Vietnam War and anti-racism protests are associated with spillover disturbances into urban areas. As a result, local law enforcement adopts robust responses to such large community events with hundreds of law enforcement personnel typically deployed to maintain order.

Climate Change Consideration

Climate change results in stresses and long-term reduction in a range of natural resources, such as potable water, food, and arable land. United Nations has declared stresses on natural resources increase the likelihood of conflict (United Nations Education, Scientific, and Cultural Organization 2021). Potential for climate change-induced migration is now recognized internationally as people flee their home countries due to drought, floods, and other factors with the U.S. southern border being impacted more frequently by new climate refuges from Central America. While such migrants are typically nonviolent and seeking relief from the dire circumstances in their homeland and improved lives for their families, the movements of large numbers of often desperate people can create the potential for civil unrest. The County continues to evaluate and model future climate risk and vulnerability of the environment and community to reduce the likelihood of future impacts, including civil disturbance.

5.3.21 Terrorism

Description of Hazard

Terrorism refers to intentional, criminal malicious acts. There is no single, universally accepted definition of terrorism, and the term can be interpreted in many ways. The federal definition for terrorism found in the Code of Federal Regulations (28 Code of Federal Regulations [CFR], Section 0.85) is "*...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.*" The 2018 California State Hazard Mitigation Plan defines refers to terrorism as the use of weapons of mass destruction, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous

materials releases; and cyber terrorism (refer to Section 5.3.12, *Cyber Threat* for a detailed discussion of cyber-attacks; Cal OES 2018).

Terrorist threats are difficult to predict. Many different groups use terrorist attacks for various reasons. Two things are clear from the perspective of hazard mitigation: the most often used weapons of terrorists in California are incendiary bombs, and the greatest potential for loss is from active shooters or weapons of mass destruction. Additional concerns include the use of chemical and biological weapons (Cal OES 2018).

Location and Extent of Hazard in the City of Carpinteria

Terrorism can occur throughout the City but due to its intended purpose would most likely happen in more populous urban areas where more devastation and panic would ensue, such as the Downtown District, or in the City of Santa Barbara or Isla Vista.

History of Hazard in the City of Carpinteria

The county has seen several recent events of mass casualties brought on by disgruntled or distraught individuals; however, none of them can be categorized as terrorism. No terrorist events have been documented in the City.

Probability of Occurrence

Unlikely – The County has never experienced a terrorist attack. Given the small population and low density of the City of Carpinteria relative to other cities in the county (e.g., Santa Barbara, Santa Maria, etc.), the probability of a terrorist act occurring in the City of Carpinteria is low; however, terrorist acts in other more populous areas of the county would likely affect the City (see Section 6.3.21, *Terrorism*).

Climate Change Consideration

Climate change is and will continue to cause increased resource scarcity including, energy, water, and arable land globally, which is likely to result in increased global terrorism (United Nations 2019). While resource scarcity is not an immediate challenge for the City, sea level rise predictions, growing wildfire threat, and drought will result in mid-term climate change impacts, as previously described.

5.3.22 Invasive Species

Description of Hazard

Non-indigenous species are transported to new environments, both intentionally and unintentionally, through human activities (Cal OES 2018). The introduction of non-indigenous species into California and Santa Barbara County has fundamentally altered many of the City's environments and ecosystems ranging from the City's upland habitats (e.g., nonnative grasslands) to coastal marine and estuarine waters. A non-indigenous species is considered an invasive species when it becomes established in a new geographic location, causing impacts (Cal OES 2018). Invasive species can cause significant and enduring economic, human health, and environmental impacts.

Terrestrial Invasive Species

Plant invasive species can threaten vegetation native to the City. When exotic plants begin to colonize natural landscapes, each ecosystem is subject to changes that threaten the integrity and longevity of that system. As a result, the native flora and fauna are often displaced with less desirable species (Santa Barbara Botanic Garden 2021). Ecosystem damage caused by invasive plant species can include competition with native species, changes in hydrology and soil chemistry, hazards for natives due to loss of food supply, protective cover, physical harm, and potentially devastating new diseases or insect pests.

Aquatic Invasive Species

In coastal environments, commercial shipping is the most significant vector for species introductions. Ships transfer organisms to California waters from throughout the world. Once introduced, invasive species could become a permanent part of an ecosystem and may flourish, creating environmental imbalances, presenting risks to human health, and causing significant economic problems. The introduction of nonindigenous species into California's marine, estuarine, and freshwater environments can cause significant economic, human health, and ecological impacts (Cal OES 2018). Biofouling organisms are aquatic species attached to or associated with submerged or wetted hard surfaces, such as pipes or piers. Ships transfer organisms to California waters from throughout the world.

The quagga mussel and closely related zebra mussel are two of the most devastating aquatic pests in the U.S. The small freshwater mussels grow on hard surfaces such as water pipes and can cause major problems for water infrastructure. They can also negatively impact ecosystems and fisheries by feeding on microscopic plants and animals that support the food web. First appearing in North America in the 1980s, they appeared in California in 2007. The cost of managing these mussels is estimated at billions of dollars since their introduction into the U.S. (UC Santa Barbara [UCSB] 2019).

Location and Extent of Hazard in the City of Carpinteria

Terrestrial Invasive Species

All of the City, including wildlands, are subject to invasive plant species. Non-indigenous species occur throughout the City and are often very prevalent within grassland and riparian woodland habitats. Several of these riparian invasive species in the riparian habitat within and surrounding Carpinteria Creek and Lagunitas Creek are documented in the City of Carpinteria's 2005 Creeks Preservation Program report, as described further below (City of Carpinteria 2005).

Carpinteria Creek

Non-native understory vegetation in Carpinteria Creek includes giant reed (*Arundo donax*), which is highly invasive and forms dense, monotypic stands along the creek banks in several areas. Prominent non-native vines including German ivy (*Senecio mikanoides*), English ivy (*Hedera helix*), and greater periwinkle (*Vinca major*) dominate the ground layer in areas. These highly invasive vines have extended into the canopy and killed several riparian trees. Other non-native plants in the riparian corridor of Carpinteria Creek include blue gum (*Eucalyptus globulus*), Durango root (*Datisca glomerata*), sweet fennel (*Foeniculum vulgare*), castor bean (*Ricinus communis*), black

mustard (*Brassica nigra*), iceplant (*Carpobrotus edulis*), ripgut brome (*Bromus diandrus*), wild radish (*Raphanus sativus*), common sow thistle (*Sonchus oleraceus*), smilo grass (*Piptherum millaceum*), annual beard grass (*Polypogon monspeliensis*), bent grass (*Agrostis viridis*), rescue grass (*Bromus catharticus*), Japanese honeysuckle (*Lonicera japonica*), garden nasturtium (*Tropaeolum majus*), myoporum (*Myoporum laetum*), and poison hemlock (*Conium maculatum*) (City of Carpinteria 2005).

Lagunitas Creek

Non-native vegetation found in the riparian forest along Lagunitas Creek includes Monterey cypress (*Cupressus macrocarpa*), nasturtium, common sow thistle, filaree (*Erodium cicutarium*), sweet fennel, black mustard, poison hemlock, wild radish, scarlet pimpernel (*Anagallis arvensis*), prickly ox tongue (*Picris echioides*), Harding grass (*Phalaris aquatica*), and petty spurge (*Euphorbia peplus*) (City of Carpinteria 2005).

Carpinteria Salt Marsh Mosquitos

According to the UC Natural Reserve System, 10 species of mosquitos are known to breed in Carpinteria Salt Marsh, including species that prefer fresh, brackish, or salt water. The Carpinteria Valley Mosquito Abatement District monitors the estuary during the rainy season and treats various sites, especially those with ponded water, to reduce or eliminate mosquitoes. These insects are native to the ecosystem but can be a nuisance to residents if they occur in large numbers. Some of the native mosquito species also can carry malaria (e.g., *Anopheles sp.*), or encephalitis (e.g., *Culex sp.*) (refer to Section 5.3.5, *Pandemic/Public Health Emergency*). The most common practice of control is the application of "Golden Bear" oil in ponded areas to suffocate mosquitoes and other larvae that breathe at the surface of the water. Another abatement activity is the occasional draining of ponded water. Historically, various portions of the estuarine wetlands were "ditched" to drain ponded areas. This technique had little impact on mosquitos in the wetlands (UC Natural Reserve System 2022).

Aquatic Invasive Species

According to a 2019 scientific article published by UCSB, Santa Barbara County's waters have so far been clear of the invasive quagga and zebra mussels, thanks to aggressive measures to prevent contamination (UCSB 2019).

The majority of the estuarine wetland habitats at the Carpinteria Salt Marsh Reserve are dominated exclusively by native plants. This is in contrast to the artificial berms and other adjacent upland habitats that can be dominated exclusively by exotic species, including plants from Eurasia, Africa, Australasia, South America, and elsewhere in North America such as Mexico. Natural habitat restoration and enhancement with native species require the eradication or control of invasive exotic plant species that dominate the vegetation. On-going management goals include the eradication or control of many aggressive species that dominate some portions of the reserve such as the upland habitats and palustrine wetland habitats of the delta of Santa Monica Creek. Management techniques include manual and mechanical removal or trimming and occasional treatment with environmentally sensitive herbicides (UC Natural Reserve System 2022). Selected target invasive exotic species are listed in Table 5-8.

Table 5-8. Common Invasive Plant Species in Santa Barbara County

Common Name	Scientific Name	Common Name	Scientific Name
Giant Reed	*Arundo donax*	Iceplant	*Malephora crocea Croceum*
Black Mustard	*Brassica nigra*	Sea Lavender	*Limonium ramosissimum*
Italian Thistle	*Carduus pycnocephalus*	Myporum	*Myoporum laetum*
Hottentot Fig	*Carpobrotus edulis*	Kikuyu Grass	*Pennisetum clandestinum*
Poison Hemlock	*Conium maculatum*	Caster Bean	*Ricinus communis*
Pampas Grass	*Cortaderia jubata*	Russian Thistle	*Salsola tragus*
Sweet Fennel	*Foeniculum vulgare*		

Source: UC Natural Reserve System 2022.

The UC Natural Reserve System lists several other species, which are potentially problematic or not widespread enough at this time to warrant specific actions. Table 5-9 lists some of these less problematic species.

Table 5-9. Common Invasive Plant Species in Santa Barbara County

Common Name	Scientific Name	Common Name	Scientific Name
Australian Salt Bush	*Atriplex semibaccata*	Slender Crystalline Iceplant	*Mesembryanthemum nodiflorum*
Five-hook	*Bassia hyssopifolia*	Indian-Fig	*Opuntia ficus-indica*
Tecolote, Napa Thistle	*Centaurea melitensis*	Feathertop	*Pennisetum villosum*
Bermuda Grass	*Cynodon dactylon*	Victorian Box	*Pittosporum undulatum*
Italian Ryegrass	*Lolium multiflorum*	Wild Radish	*Raphanus sativus*
Tree Tobacco	*Nicotiana glauca*	New Zealand Spinach	*Tetragonia tetragonioides*

Source: UC Natural Reserve System 2022.

A species of Limonium (Sea Lavender, *Plum-baginaceae*) has invaded portions of the upper marsh near the mouth of the estuary. As with many introduced species along berms and on bars, this species probably was ocean-transported from a local source and subsequently deposited as a fragment in the rack that accumulates at the high tide line. The species has successfully reproduced and now covers many square meters of wetland habitat, including the only site on the UC Natural Reserve System property where Salt Marsh Bird's-beak, a Federal-listed endangered species, occurs. Funding from the U.S. Fish and Wildlife Service (USFWS) initiated an eradication and research program to learn more about this species including its identity and potential methods of control or eradication. As with other invasive exotics at the Carpinteria Salt Marsh Reserve, this species has been located in several gardens near the estuary. It and other species of Limonium are sold in the local horticultural trade and may present a serious future problem because many of these species occur naturally in salt marshes in Europe and elsewhere and may colonize coastal wetlands in California relatively easily (UC Natural Reserve System 2022).

History of Hazard in the City of Carpinteria

As described above, as part of the Creeks Preservation Program, the City of Carpinteria monitors and manages invasive plant species along the riparian corridors of creeks within the City. The UC Natural Reserve System, in coordination with other agencies, such as the USFWS and Carpinteria

Valley Mosquito Abatement District, monitors and manages invasive and other exotic species in the Carpinteria Salt Marsh Reserve.

Probability of Occurrence

Occasional – While the probability of future occurrence is usually calculated based on experience, different invasive species have different recidivism rates across the county. Based on past occurrences, invasive species will continue to present a constant threat to the county and City.

Climate Change Consideration

According to the International Union for Conservation of Nature (IUCN), globalization over the recent decades has increased the movement of people and goods around the world, leading to a rise in the number of species introduced to areas outside their natural ranges. A 2017 study found that over one-third of all introductions in the past 200 years occurred after 1970 and the rate of introductions is showing no sign of slowing down. A 2020 study predicts that the number of established alien species will increase by 36 percent between 2005 and 2050 (IUCN 2021).

The impacts from invasive species can be compounded by climate change. Extreme climatic events resulting from climate change, such as hurricanes, floods, and droughts can transport invasive species to new areas and decrease the resistance of habitats to invasions. Climate change is also opening up new pathways of the introduction of invasive species. For example, emerging Arctic shipping passages due to melting ice caps will greatly reduce the time taken for ships to travel from Asia to Europe. This will increase the risk of invasive species surviving the journey (IUCN 2021).

Many invasive species can expand rapidly to higher latitudes and altitudes as the climate warms, out-pacing native species. Invasive species that are regularly introduced by humans but have so far failed to establish may succeed in doing so thanks to climate change, creating new sets of invaders.

Some habitats, such as temperate forests and freshwater systems that currently have thermal barriers limiting the establishment of invasive species will become more suitable for alien species as the climate changes (IUCN 2021).

5.3.23 Agricultural Pests

Description of Hazard

Agricultural pests and disease infestation occur when an undesirable organism inhabits an area in a manner that causes serious harm to agriculture crops, livestock or poultry, and wild land vegetation or animals. Countless insects and diseases live on, in, and around plants and animals in all environments. Most are harmless, while some can cause significant damage and loss. Under some conditions, insects and diseases that have been relatively harmless can become hazardous. For example, severe drought conditions can weaken trees and make them more susceptible to destruction from insect attacks than they would be under normal conditions.

Different pests can impact different crops in different ways; while there is no scale to define the extent of an infestation, a pest could have a major economic impact on the value of infested crops. Another large factor that may influence crop yield is the spread of invasive plants, which may compete with crops for resources and in some cases also introduce pests.

Agricultural pests and pathogens (e.g., insects, fungi, bacteria, viruses, and invasive plants) cause injury or severe destruction to crops or livestock. These pests pose significant threats to crops, farm workers, the economy, food supply, and native habitat. Agricultural pests and diseases also weaken crops, vineyards, and livestock, which makes them more susceptible to harm from extreme heat, wildfire, and drought. They can also result in increases in food prices for consumers. The number of invasive pests and pathogens newly detected in California and the rest of the U.S. has increased at alarming rates in recent years, and that trend is projected to continue. Insect pests and diseases, such as bark beetles and Sudden Oak Death in trees, can also destroy forests and oak woodland habitat in the City, which can, in turn, increase the fuel load and lead to greater fire risk.

Location and Extent of Hazard in the City of Carpinteria

Figure 5-23 of the MJHMP shows agricultural, farm, and grazing lands in the county, which are susceptible to agricultural pests and diseases. Agriculture occurs in the Carpinteria Valley. As shown in Figure 4-1, there are only two small agricultural lands in the City, which are susceptible to agricultural pests and diseases.

In 2020, 217 pests were intercepted through the County of Santa Barbara's Pest Exclusion Program, the most commonly intercepted species being the Lesser Snow Scale (*Pinnaspis strachani*) (Santa Barbara County Agricultural Commissioner's Office 2020). These pests and diseases, such as the light brown apple moth, white peach scale, Asian citrus psyllid, Pacific mealybug, and avian influenza, can retard the growth of plants and animals, damage them so that their products are less appealing and harder to sell, or even kill them (Santa Barbara County Planning and Development Department 2021). By July 2020, the California Department of Food and Agriculture confirmed the presence of Asian citrus psyllids (*Diaphorina citri*), Kuwayama, in Santa Barbara County, indicating that a breeding population exists in the area. Asian citrus psyllids are a harmful exotic insect pest and a vector of Huanglongbing disease, one of the most devastating citrus diseases. In response to this infestation, the County ordered insecticide treatments within a 400-meter radius around the Asian citrus psyllids detection site (California Department of Food and Agriculture 2020). Though there are treatment options for many agricultural pests and diseases, some have no cure (Santa Barbara County Planning and Development Department 2021).

History of Hazard in the City of Carpinteria

Santa Barbara County is susceptible to infestation or infection by the light brown apple moth, white peach scale, Asian citrus psyllid, Pacific mealybug, and avian influenza. Infestations of Mediterranean Fruit Fly, Oriental Fruit Fly, Gypsy Moth, Glassy-winged Sharpshooter, Asian Citrus Psyllid, and Light-Brown Apple Moth have all occurred in the last 30 years. Diseases such as Chrysanthemum White Rust and Pierce's Disease of Grapes have caused significant losses to local growers. Between November 15, 2019, to July 7, 2020, the California Department of Food and Agriculture (CDFA) confirmed the presence of Asian Citrus Psyllid in the county (CDFA 2020). Additionally, UC Riverside and the UC Cooperative Extension recently sent out notification warnings of the invasive black fig fly, which has spread to Santa Barbara County (UC Riverside and the UC Cooperative Extension 2021). These pests could affect crops and other vegetation within the City.

Probability of Occurrence

Occasional – Due to its interaction with the global economy, its mild Mediterranean climate, and its diversified agricultural and native landscape, the City currently experiences and will continue to experience periodic losses due to agricultural pests and diseases. Many pests and organisms that carry diseases are most active during warmer months, so the threat of infection or infestation is higher during that time of year (Santa Barbara County Planning and Development Department 2021).

Climate Change Consideration

Continued climate change is likely to alter the abundance and types of many pests, lengthen pests' breeding season, and increase pathogen growth rates. For example, the pink bollworm, a common pest of cotton crops, is currently a problem only in southern desert valleys because it cannot survive winter frosts elsewhere in the state. However, if winter temperatures rise, the pink bollworm's range would likely expand northward, which could lead to substantial economic and ecological consequences for the state (Allen-Diaz 2009). Projection trends show temperatures getting warmer earlier in the year and remaining warmer until later in the year due to increases in air temperature, which creates a wider activity window for pests and diseases (Santa Barbara County Planning and Development Department 2021).

California's Fourth Climate Change Assessment (2018) notes that "climate change impacts terrestrial ecosystems and wildlife in multiple ways, including invasion by exotic species, the prevalence of wildlife disease, and loss of native habitats." Changing climate conditions can impact viable living areas of species and cause migration; shift the spread of pests and disease northward by changing habitat temperatures and making previously undesirable habitats welcoming for new species and lengthen habitable seasons (California Natural Resources Agency 2018). Longer growing seasons may also allow agricultural pests to persist longer, which can increase the severity of infestations on agricultural operations. Further, weather events have become more numerous and more severe. Changes in weather patterns can also have dramatic impacts on the ecosystem, including agriculture systems, and more severe impacts can be expected into the future.

6.0 VULNERABILITIES ASSESSMENT

6.1 PURPOSE & METHODOLOGY

The purpose of this section is to estimate the potential vulnerability (impacts) of hazards within the City on the built environment (residential, non-residential, critical facilities, etc.) and population. This assessment informs the development of mitigation strategies to avoid or lessen potential impacts through the 2022 Local Hazard Mitigation Plan (LHMP) update. To accomplish this, three different approaches are used:

1. Application of scientific loss estimation models (i.e., Hazus);
2. Analysis of exposure of critical facilities to hazards; and
3. A qualitative estimate of the impacts to hazards.

This section summarizes the methodologies and approaches employed in the assessment of vulnerabilities contained in Sections 6.2 and 6.3. A detailed discussion of the methodologies and approaches employed in the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) and this 2022 LHMP update is provided in Section 6.1 of the MJHMP.

6.1.1 Approach to Earthquake Vulnerability Assessment

Earthquake loss estimation for the 2022 LHMP update utilizes the Federal Emergency Management Agency's (FEMA's) Hazus-MH 5.0 natural hazard loss estimation software. Hazus-MH uses state-of-the-art Geographic Information Systems (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of earthquakes and floods on populations.

Hazus also uses U.S. Census data to estimate loss using 2010 Census tracts and for estimating population by multiplying the number of Residential and Multi-Use parcels by average household size by jurisdiction. As with any model, there are uncertainties, and the results should be considered approximate for broad hazard mitigation planning purposes.

To evaluate potential losses associated with earthquake activity in the City, two Hazus scenarios were run, including a Hazus 2,500-year probabilistic scenario and a Magnitude 7.4 – Red Mountain Fault ShakeMap Scenario.

The earthquake loss estimation analysis in Section 6.2.1 is broken into two subsections:

4. **Hazus 2,500-year probabilistic scenario**: this assesses the City-wide vulnerabilities to ground shaking based on overall seismic probabilities (7.0 magnitude) in the county; and
5. **Magnitude 7.4 – Red Mountain Fault ShakeMap Scenario**: this assesses the unique vulnerabilities that may exist in the City if the epicenter for an earthquake (7.4 magnitude) was located along the Red Mountain Fault south of the Santa Ynez Mountains.

See Section 6.2.1, *Earthquake (Ground shaking)* for a discussion of the City's vulnerabilities to ground shaking hazards.

6.1.2 Approach to Flood Vulnerability Assessment

To assess flood vulnerability and loss estimations, a flood vulnerability assessment was performed for the City using the following GIS methodology. Santa Barbara County's effective Digital Flood Insurance Rate Maps (DFIRM) was used as the hazard layer. A DFIRM is FEMA's flood risk data that depicts the 1-percent annual chance (100-year) and the 0.2-percent annual chance (500-year) flood events. Table 6-1 summarizes the flood zones included on these maps.

Table 6-2. City of Carpinteria Community Information System Policies in Force by Flood Zone

Flood Zone	City of Carpinteria
A01-30 & AE Zones	126
A Zones	76
B, C & X Zone	
Standard	93
Preferred	128
Total	**423**

The DFIRM flood zones were overlaid in GIS on the County's parcel layer to identify properties and structures that would likely be inundated during a coastal 1-percent annual chance (e.g., storm/ high tide inundation), riverine 1-percent annual chance, and riverine 0.2-percent annual chance flood event. The extent of the FEMA floodplain in the City is shown in Figure 5-1 and Figure 6-4. Building and contents values were totaled to estimate exposure. The result is an inventory of the number and types of improved parcels subject to flooding in the City. It is important to note that there could be more than one structure or building on an improved parcel (e.g., a condo complex occupies one parcel but might have several structures). This flood loss analysis does not account for business disruption, emergency services, environmental damages, or displacement costs, thus actual losses associated with flooding would likely exceed the estimate shown. Conversely, this analysis does not differentiate parcels that may have been developed since when the City adopted floodplain regulations, which would be mitigated to the 1-percent annual chance of flood if developed per local floodplain regulations.

Similar to the 2022 MJHMP update, Hazus modeling for this LHMP was completed for earthquake hazards only and was not used to develop approximate flood hazard areas given that Hazus flood modeling results are typically not as accurate and do not always coincide with the regulatory FEMA FIRM or local flood mapping. Therefore, proven GIS methods were used to estimate flood risk to structures where GIS is used to overlay the FEMA flood mapping on parcel-based inventory data, as described further below. This approach yields a more accurate count and types of structures at risk.

See Section 6.3.1, *Flood* for a discussion of the City's vulnerabilities to flood hazards.

6.1.3 Approach to Analysis of Exposure of Critical Facilities to Hazards

Critical facilities are key support facilities and structures most necessary to withstand the impacts of and respond to natural hazards (e.g., utilities, transportation infrastructure, and emergency response and services facilities). The Carpinteria Local Planning Team (LPT) reviewed and updated its list of critical facilities and generated a summary of the facilities by major categories: Law Enforcement, Fire, Public Works (including transportation and flood control facilities), Health and Human Services, Administrative, Communications, and Other.

Using a GIS and the mapped extents of the hazards affecting the City, it was determined which critical facilities are exposed to which hazards depending on whether they fall within the mapped hazard area. This approach was taken for Wildfire, Earthquake-Induced Liquefaction, Flood, Dam Failure, Landslide, Coastal Hazards, Tsunami.

Table 6-2 below presents the 57 mapped critical facilities within the City. These facilities primarily included utilities, government, medical, and educational structures as well as bridges. Of the available data, it was shown that these buildings are worth approximately $130,249,918 in total building value (i.e., structural and content value) (Table 6-2). No values were able to be obtained for many major facilities, so the actual value may be substantially higher.

It should be noted that operations at the Carpinteria Oil and Gas Plant and the Natural Gas Odorant Facility, both located at 5675 Carpinteria Avenue, have ceased, as described in Section 5.13 and Section 5.14. However, given that these facilities have not yet been removed or remediated, they remain included as critical facilities. Additional public facilities, such as Viola Fields, the Cavalli Property (Friends of the Library building), and Monte Vista Park, are considered in Sections 6.3.1 through 6.3.23. However, these facilities are not considered FEMA Lifelines as defined above and therefore, are not included in the analysis of critical facilities in the City.

Table 6-2. City of Carpinteria Critical Facilities List

Type	Facility	Address	Total Value
Communications	Critical Facility	10151 Oceanview Rd	$98,226
Communications	Rincon Peak Relay Station	5115 Ogan Rd	-
Energy: Industrial	Verizon	5675 Carpinteria Ave	-
Energy: Substation	Natural Gas Odorant Carpinteria Oil and Gas	4918 Foothill Rd	-
Utilities	SCE - Substation	1488 Linden Ave	$5,000,000
Utilities	Sewage Pump Station 7	546 Palm Ave	$2,000,000
Utilities	Sewage Pump Station 1	1301 Santa Ynez Ave	$2,266,000
Utilities	Water District Maintenance Building	4527 Carpinteria Ave	$1,500,000
Utilities	Sewage Pump Station 2	1301 Santa Ynez Ave	$1,500,000
Utilities	Headquarters Well	4859 Foothill Rd	$1,500,000
Utilities	High School Well	5315 Foothill Rd	$1,500,000
Utilities	El Carro Well	5315 Foothill Rd	$1,500,000
Utilities	El Carro Well Filtration Plant	1301 Santa Ynez Ave	$1,400,000
Utilities	Water District Main Office	3950 Via Real	$1,000,000
Utilities	Sewage Pump Station 4	4859 Foothill Rd	$800,000
Utilities	High School Well Treatment Plant	1301 Santa Ynez Ave	$700,000
Utilities	Headquarters Well Control Building	1301 Santa Ynez Ave	$90,000
Wastewater Treatment Plant	Headquarters Well Enclosure	5300 Sixth St	$60,000,000
Hazardous Material	Wastewater Treatment Plant	5675 Carpinteria Ave	-
Health and Medical Clinic	Carpinteria Oil and Gas Plant	4806 Carpinteria Ave	-
Health and Medical Clinic	Sansum Clinic-Carpinteria	931 Walnut Ave	-
EMS Station	PHD Carpinteria Clinic	911 Walnut Ave	-
EMS Station	Carpinteria - Summerland Fire Protection District Station 1	4235 Carpinteria Ave	-

Type	Facility	Address	Total Value
Nursing Home	American Medical Response Station 1	5464 Carpinteria Ave	-
Veteran Services	Granvida Senior Living and Memory Care	941 Walnut Ave	-
Veteran Services	Carpinteria Veterans Memorial Building	941 Walnut Ave	-
Colleges / Universities	Veteran's Memorial Building	1015 Mark Ave	-
Education	International Sports Sciences Association	4810 Foothill Rd	$28,535,898
Education	Carpinteria High School	5351 Carpinteria Ave	$14,366,233
Education	Carpinteria Middle School	1480 Linden Ave	$10,583,606
Education	Canalino Elementary	4545 Carpinteria Ave	$6,457,908
Education	Aliso Elementary	5201 Eighth St	$4,360,870
Education	Carpinteria Children's Project at Main	4698 Foothill Rd	$210,720
Education	Rincon/Foothill High School	1400 Linden Ave	-
Education	Carpinteria Unified School District (CUSD) District Office	1480 Linden Ave	-
Education	Carpinteria Family	1480 Linden Ave	-
Education	Canalino Elementary	5315 Foothill Rd	-
Fire Station	The Howard School	911 Walnut Ave	$7,150,000
Government	Carpinteria Fire Station 1	5775 Carpinteria Ave	$4,436,787
Government	City Hall, Sheriff's Substation, Maintenance	1140 Eugenia Pl	$60,000
Library	Carpinteria Summerland HQ	5141 Carpinteria Ave	-
Museum	Carpinteria Public Library	956 Maple Ave	-
Sheriff	Carpinteria Valley Museum of History	5775 Carpinteria Ave	$111,767
Transportation	Carpinteria Sheriff's Station	HWY 101 SB / Franklin Creek	-
Transportation	Bridge	HWY 101 NB / Franklin Creek	-
Transportation	Bridge	7th St / HWY 101	-
Transportation	Bridge	SR-150 (Rincon Rd) / HWY 101	-
Transportation	Bridge	7th St / Franklin Creek	-
Transportation	Bridge	Carpinteria Ave / Franklin Creek	-
Transportation	Bridge	Carpinteria Rd / Carpinteria Creek	-
Transportation	Bridge	Via Real / Santa Monica Creek	-
Transportation	Bridge	4th St / Carpinteria Creek	-
Transportation	Bridge	HWY 101 SB / Santa Monica Creek	-
Transportation	Bridge	HWY 101 NB / Santa Monica Creek	-

Type	Facility	Address	Total Value
Transportation	Bridge	Carpinteria Avenue / Santa Monica Creek	-
Transportation	Bridge	Bailard Avenue / HWY 101	-
Transportation	Bridge	Malibu Dr / Franklin Creek	-

The results of the exposure analysis are included in this section. A further description of the threats and methodologies used in this analysis is provided in Chapter 6.0, *Vulnerability Assessment* of the 2022 MJHMP. As the City continues to assess its vulnerability, the collection of better and more complete data will help to improve the risk assessment process to direct planning and mitigation decisions.

Table 6-3. Summary of Potential Impacts to Critical Facilities

Hazard Type	Specific Risk	Count	% of Critical Facilities Impacted	Exposure ($)
Wildfire	Low to Extreme Wildfire Threat	0	0%	$0
Liquefaction (Earthquake)	High Liquefaction Potential	49	86%	$154,237,262
Flood	FEMA 1% Annual Chance Flood Zone	14	25%	$37,504,526
	FEMA 0.2% Annual Chance Flood Zone	4	7%	$63,500,000
Coastal Hazards	Sea Level Rise (2060)	1	2%	-
Dam Failure	Santa Monica Debris Basin Failure	9	16%	$12,513,908
Landslide	Class 7	2	4%	$210,720
Tsunami		10	18%	$9,957,908

6.1.4 Approach to Qualitative Estimate of Impacts

The approach used to complete this effort involves utilizing readily available data (i.e., U.S. Census) to extrapolate and estimate potential vulnerability. In some cases, the estimation would build upon historic events but it may also include projecting worst-case potentials. The Carpinteria LPT summarized the remaining hazards to which the City is vulnerable and assessed the amount and type of damage that could be expected. This approach of qualitative assessment was done for the following hazard types in Section 6.3.5 through Section 6.3.23 below:

- Drought & Water Shortage
- Pandemic/Public Health Emergency
- Extreme Heat/Freeze
- Energy Shortage & Resiliency
- Mudflow and Debris Flow
- Windstorm
- Hazardous Materials Release
- Cyber Threat
- Invasive Species
- Civil Disturbance
- Natural Gas Pipeline Rupture
- Agricultural Pests
- Train Accident
- Terrorism
- Oil Spills
- Geologic Hazard

6.2 SCIENTIFIC LOSS ESTIMATION (HAZUS) ANALYSIS

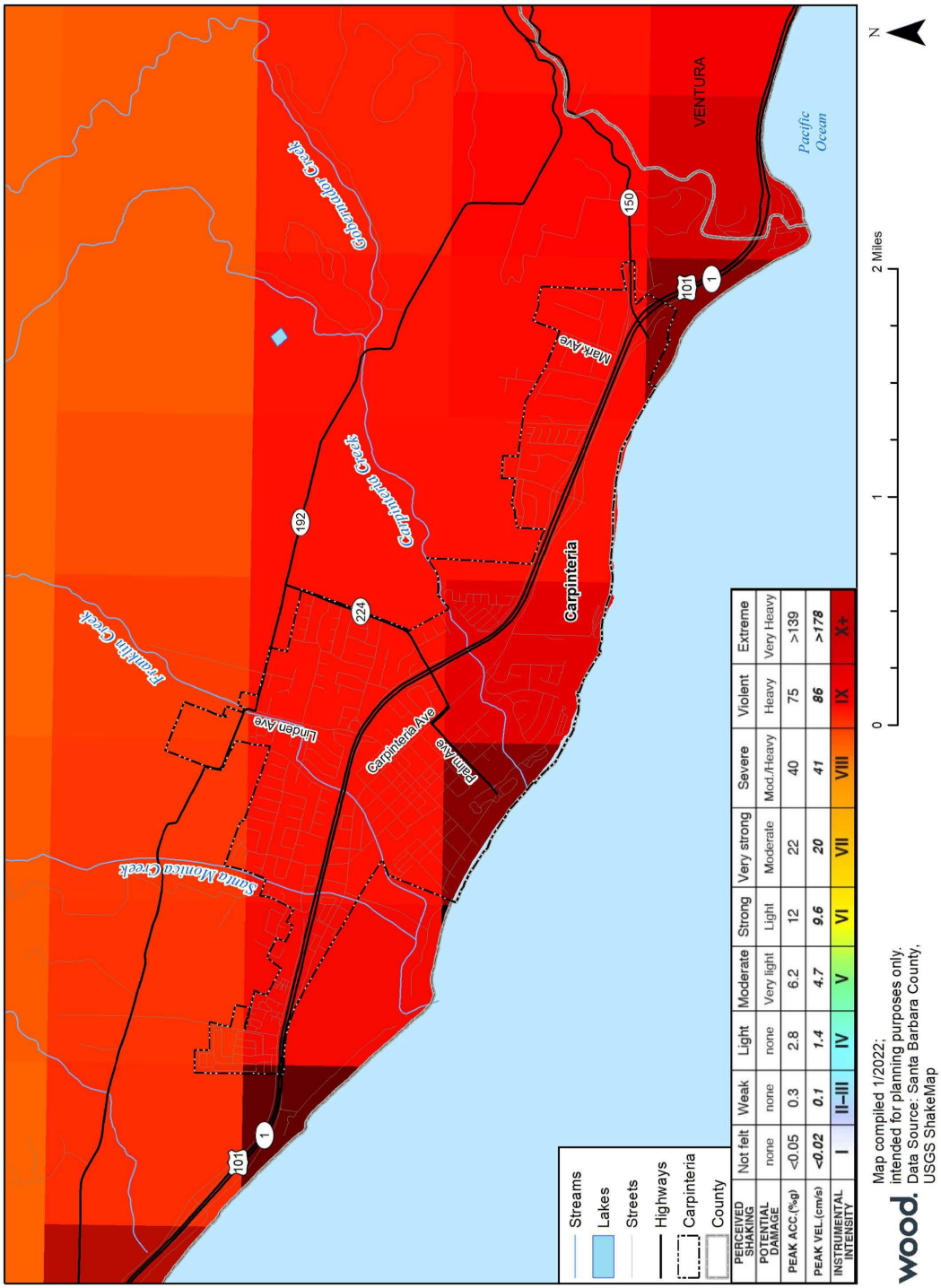
6.2.1 Earthquake (Ground shaking)

The 2,500-year scenario considers multiple faults in the region. The methodology utilizes probabilistic seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2018 update of the National Seismic Hazard Maps that are included with Hazus-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 seconds and 1.0 seconds, respectively. The 2,500-year return period analyzes ground shaking estimates from the various seismic sources in the area with a two percent probability of being exceeded in 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas.

The Magnitude 7.4 – Red Mountain Fault ShakeMap Scenario is a deterministic scenario that predicts the outcome of a specific earthquake event. This deterministic scenario used USGS provided ShakeMap datasets to model what a Magnitude 7.4 earthquake of the Red Mountain Fault would generate in terms of damages and losses for the chosen area of interest (City of Carpinteria). The datasets used to import into Hazus 5.0 for these scenarios included four USGS-provided key data layers in a geospatial format: peak ground velocity, peak ground acceleration, peak spectral acceleration for 0.3 seconds (0.3 percent gravitational velocity [g]), and peak ground acceleration for 1.0 seconds (1.0 percent g).

Figure 6-1 is the ShakeMap produced for the Magnitude 7.4 – Red Mountain Fault ShakeMap Scenario. As shown in the figure, in the Red Mountain Fault ShakeMap Scenario, the entire City would perceive severe to extreme shaking and would likely receive moderate/heavy to very heavy damage.

Figure 6-1. City of Carpinteria Red Mountain Fault 7.4 Magnitude ShakeMap



Property

Hazus estimates the number of buildings that would be damaged during a modeled earthquake, and these estimates are provided in the tables below. The 2,500-year probabilistic scenario is expected to produce more severe building damage than the Red Mountain Fault ShakeMap Scenario. For example, an earthquake from the 2,500-year probabilistic scenario could demolish (i.e., "Complete" building damage) 177 homes compared to 28 homes from the Red Mountain Fault Shakemap Scenario (Tables 6-4 and 6-5). Hazus estimates that under the 2,500-year probabilistic scenario, about 3,148 buildings will be at least moderately damaged (i.e., Moderate, Extensive, Complete building damage), which is over 74 percent of the buildings in the region. On the other hand, under the Red Mountain Fault Shakemap Scenario, 1,918 buildings will be at least moderately damaged, which is over 45 percent of the buildings in the region.

Table 6-4. Expected Building Damage by Occupancy – 2,500-year Probabilistic Scenario

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	County	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0.94	0.55	4.73	0.52	11.08	0.69	8.89	1.20	10.35	1.28
Commercial	4.34	2.54	21.60	2.36	72.61	4.55	93.50	12.64	118.95	14.66
Education	0.32	0.19	1.43	0.16	3.30	0.21	2.62	0.35	2.33	0.29
Government	0.05	0.03	0.25	0.03	0.90	0.06	1.22	0.16	1.59	0.20
Industrial	0.81	0.47	4.43	0.48	17.11	1.07	24.42	3.30	33.23	4.10
Other Residential	13.81	8.08	72.88	7.98	155.84	9.75	182.56	24.69	462.92	57.05
Religion	0.36	0.21	1.72	0.19	4.39	0.27	4.32	0.58	5.21	0.64
Single Family	150.31	87.93	806.71	88.29	1332.29	83.40	421.92	57.06	176.77	21.79
Total	171		914		1,598		739		811	

Source: Hazus-MH 5.0

Table 6-5. Expected Building Damage by Occupancy – Red Mountain Fault ShakeMap Scenario

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	County	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5.53	0.66	9.26	0.62	10.68	0.94	6.19	1.33	4.35	1.39
Commercial	32.77	3.93	55.92	3.77	98.63	8.64	76.27	16.42	47.41	15.16
Education	1.81	0.22	2.69	0.18	2.98	0.26	1.64	0.35	0.88	0.28
Government	0.36	0.04	0.62	0.04	1.16	0.10	1.06	0.23	0.80	0.26
Industrial	7.02	0.84	13.00	0.88	25.50	2.23	20.69	4.45	13.78	4.41
Other Residential	70.88	8.51	136.25	9.20	208.69	18.28	256.84	55.29	215.35	68.84
Religion	2.16	0.26	3.51	0.24	4.62	0.40	3.41	0.73	2.30	0.73
Single Family	712.23	85.53	1260.34	85.07	789.09	69.14	98.41	21.19	27.93	8.93
Total	833		1,482		1,141		465		313	

Source: Hazus-MH 5.0

Figure 6-2. City of Carpinteria 2,500-year Probabilistic Scenario Total Building Loss

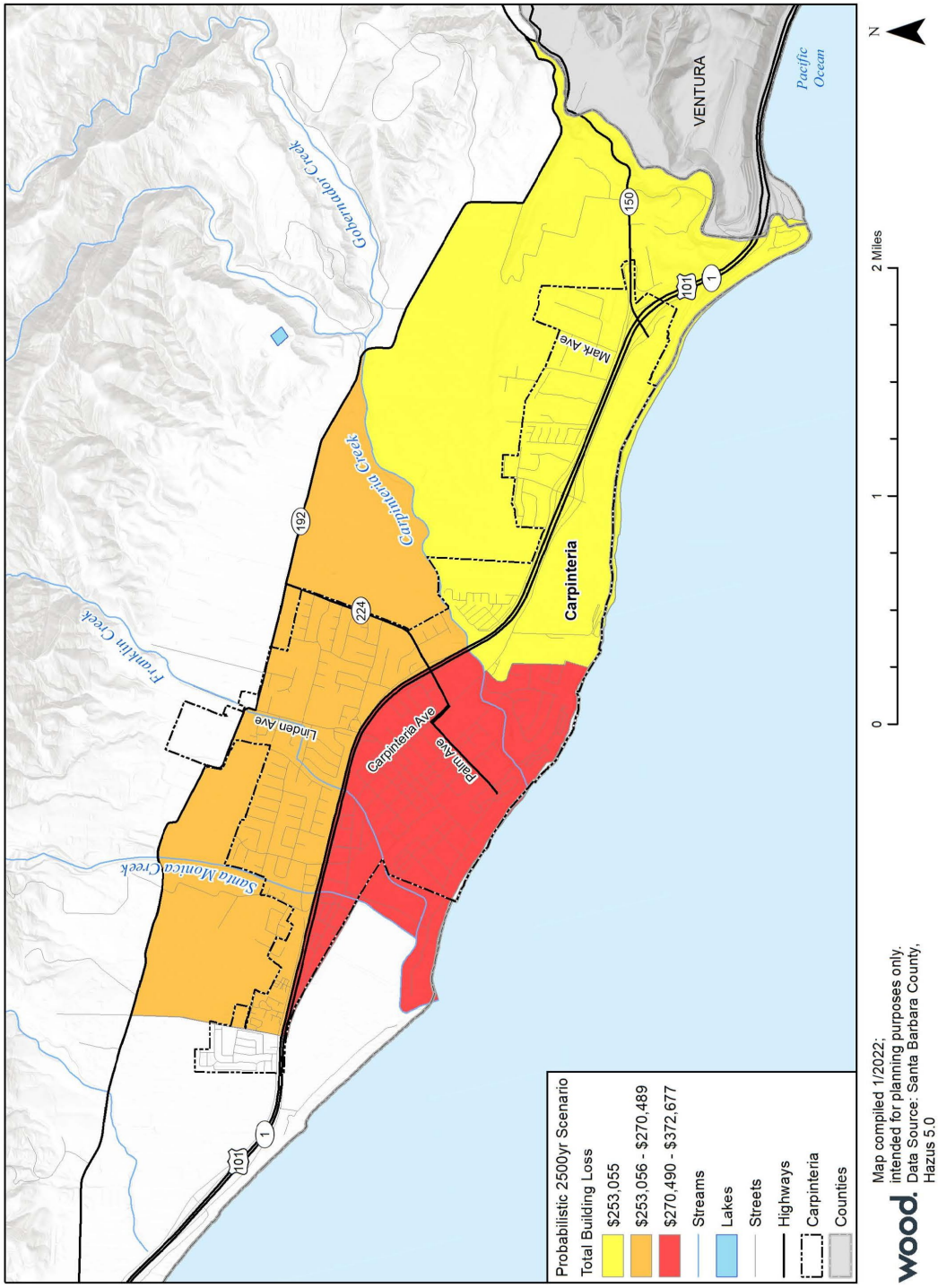
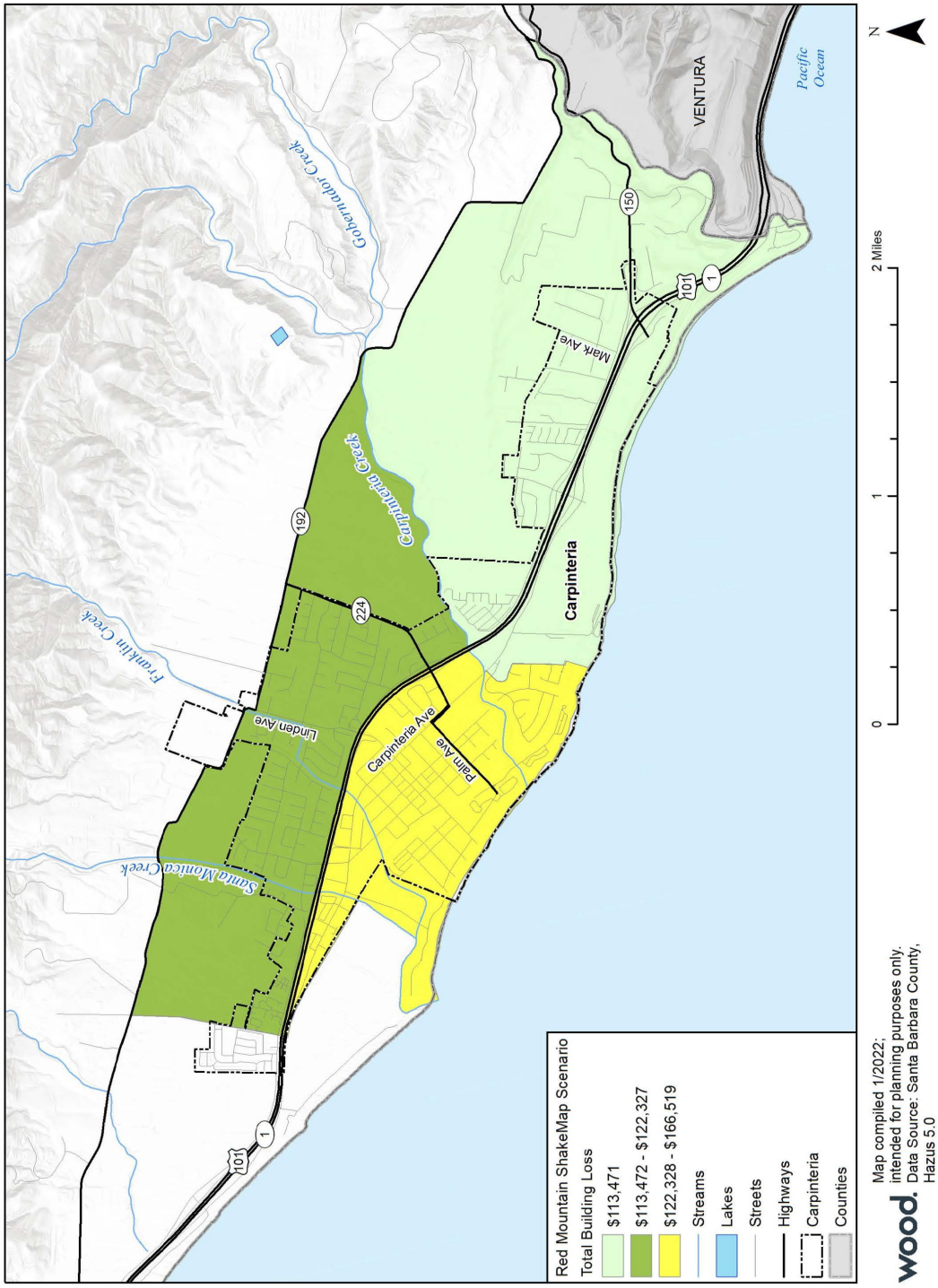


Figure 6-3. City of Carpinteria Red Mountain Fault ShakeMap Scenario Total Building Loss



The total citywide building loss for these two scenarios is shown in Figures 6-2 and Figure 6-3. Potential building losses would likely be clustered within built communities and downtown areas where structures are older and denser. As shown in Figure 6-2 and Figure 6-3, for both scenarios, the western and southwestern portions of the City would have the highest total building loss. However, the absolute dollar amount of total citywide building loss under the 2,500-year Probabilistic Scenario is higher than the Red Mountain Fault ShakeMap Scenario.

People

Utility Services: Loss of utility services would have a major impact on the people of the City. The following tables indicate the number of projected households that would experience potable water and electric power loss, and the number of days the loss would last. For example, this analysis shows that more than 2,700 households would remain without electricity 7 days after an earthquake under the 2,500-year Probabilistic Scenario. The 2,500-year Probabilistic Scenario is expected to cause a long delay in the recovery of potable water and electric power systems as well as cause more people to be without potable water or electric power compared to the Red Mountain Fault ShakeMap Scenario (Tables 6-6 and 6-7).

Table 6-6. Expected Potable Water and Electric Power System Performance – 2,500-year Probabilistic Scenario

	Total Number of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,695	4,571	4,125	0	0	0
Electric Power		4,395	3,841	2,725	963	5

Table 6-7. Expected Potable Water and Electric Power System Performance – Red Mountain Fault ShakeMap Scenario

	Total Number of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,695	3,819	0	0	0	0
Electric Power		3,373	2,057	821	153	5

Source: Hazus-MH 5.0

Sheltering: Sheltering is another concern during an earthquake – people may be displaced from their homes due to the earthquake, and those displaced people may need accommodations in temporary public shelters. Table 6-8 shows the projected total displacement and projected shelter needs for each scenario. The total number of residents seeking shelter could range from 185 under the Red Mountain Fault ShakeMap Scenario to 534 under the 2,500-year Probabilistic Scenario. The 2,500-year Probabilistic Scenario is expected to result in more displaced households and also people seeking shelter than the Red Mountain Fault ShakeMap Scenario. Displaced households that do not seek shelter may require other evacuation services as well.

Table 6-8. Shelter Requirements

2,500-year Probabilistic Scenario		Red Mountain Fault ShakeMap Scenario	
Total Population	13,025	Total Population	13,025
Total Displaced Households	813	Total Displaced Households	283
Total Seeking Shelter	534	Total Seeking Shelter	185

Source: Hazus-MH 5.0

Casualties: Hazus estimates the number of people that would be injured or killed by the earthquake, based on magnitude and time of occurrence for the earthquake. The casualties are broken down into four severity levels that describe the extent of the injuries.

- **Level 1:** Injuries would require medical attention but hospitalization is not needed
- **Level 2:** Injuries would require hospitalization but are not considered life-threatening
- **Level 3:** Injuries would require hospitalization and can become life-threatening if not promptly treated
- **Level 4:** Victims are killed by the earthquake

The casualty estimates are provided for three times of day: 2:00 AM, 2:00 PM, and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial, and industrial sector loads are maximum, and 5:00 PM represents peak commute time. The worst-case outcome is projected for a 2:00 PM earthquake under the 2,500-year Probabilistic Scenario with total casualties of 543 individuals, including 38 deaths. These estimates of casualties are broken down in Table 6-9 for the 2,500-year Probabilistic Scenario and Table 6-10 for the Red Mountain Fault ShakeMap Scenario. In both scenarios, an earthquake at 2:00 PM would cause the most casualties and deaths. The 2,500-year Probabilistic Scenario is expected to result in more casualties and also more severe casualties than the Red Mountain Fault ShakeMap Scenario.

Table 6-9. Casualty Estimates – 2,500-year Probabilistic Scenario

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	4.39	1.41	0.24	0.48
	Commuting	0.03	0.04	0.07	0.01
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	4.57	1.45	0.24	0.48
	Other- Residential	97.46	25.87	2.65	4.86
	Single Family	55.54	11.07	0.69	1.17
	Total	**162**	**40**	**4**	**7**
2 PM	Commercial	244.67	78.24	13.39	26.35
	Commuting	0.27	0.40	0.63	0.12
	Educational	65.05	20.76	3.60	7.05
	Hotels	0.00	0.00	0.00	0.00

		Level 1	Level 2	Level 3	Level 4
	Industrial	33.73	10.67	1.78	3.49
	Other- Residential	15.89	4.22	0.45	0.80
	Single Family	9.54	1.90	0.14	0.20
	Total	**369**	**116**	**20**	**38**
5 PM	Commercial	176.09	56.02	9.62	18.67
	Commuting	5.40	7.81	12.45	2.45
	Educational	8.38	2.68	0.46	0.91
	Hotels	0.00	0.00	0.00	0.00
	Industrial	21.08	6.67	1.12	2.18
	Other- Residential	36.21	9.61	1.02	1.82
	Single Family	22.07	4.39	0.32	0.46
	Total	**269**	**87**	**25**	**26**

Source: Hazus-MH 5.0

Table 6-10. Casualty Estimates – Red Mountain Fault ShakeMap Scenario

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	2.07	0.62	0.10	0.20
	Commuting	0.01	0.02	0.03	0.01
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2.16	0.63	0.10	0.19
	Other- Residential	47.12	11.54	1.11	2.04
	Single Family	16.09	2.54	0.15	0.26
	Total	**67**	**15**	**1**	**3**
2 PM	Commercial	115.43	34.28	5.63	11.07
	Commuting	0.13	0.20	0.30	0.06
	Educational	30.66	9.13	1.54	3.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	15.89	4.61	0.73	1.41
	Other- Residential	7.58	1.86	0.19	0.34
	Single Family	2.70	0.43	0.03	0.04
	Total	**172**	**51**	**8**	**16**
5 PM	Commercial	83.07	24.58	4.05	7.86
	Commuting	2.47	3.75	5.78	1.15
	Educational	4.07	1.22	0.21	0.40
	Hotels	0.00	0.00	0.00	0.00
	Industrial	9.93	2.88	0.45	0.88
	Other- Residential	17.31	4.26	0.42	0.77
	Single Family	6.26	0.99	0.07	0.10
	Total	**123**	**38**	**11**	**11**

Source: Hazus-MH 5.0

Economy

Depending on its location and magnitude, an earthquake could have a devastating impact on the City's economy. In general, impacts would be related to debris cleanup and management, building and infrastructure damage, and losses related to business and infrastructure interruption.

Hazus estimates economic impacts including building-related losses, and transportation and utility lifeline losses over 15 years after the incident. Building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. Business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

Table 6-11. Economic Losses (Millions of Dollars)

Category	Single Family	Other Residential	Commercial	Industrial	Others	Total
2,500-year Probabilistic Scenario						
Income Losses	26.45	19.53	77.4	3.15	4.82	131.36
Capital Stock Losses	280.64	154.57	206.17	65.41	58.07	764.86
Total	**307.09**	**174.10**	**283.58**	**68.56**	**62.89**	**896.22**
Red Mountain Fault ShakeMap Scenario						
Income Losses	9.59	10.19	45.45	1.95	2.73	69.91
Capital Stock Losses	103.61	70.71	100.29	30.17	27.62	332.41
Total	**113.20**	**80.90**	**145.75**	**32.12**	**30.35**	**402.32**

Source: Hazus-MH 5.0

The 2,500-year Probabilistic Scenario is expected to result in more economic losses than the Red Mountain Fault ShakeMap Scenario (Table 6-11).

- **2,500-year Probabilistic Scenario:** The total building-related losses were over $896 million. Fifteen percent of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 54 percent of the total loss.
- **Red Mountain Fault ShakeMap Scenario**: The total building-related losses were over $402 million. Seventeen percent of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 48 percent of the total loss.

Critical Facilities and Infrastructure

The 2,500-year Probabilistic Scenario (Table 6-12) is also expected to result in more lifeline system (e.g., transportation, utility, communication) losses than the Red Mountain Fault ShakeMap Scenario (Table 6-13).

Table 6-12. 2,500-year Probabilistic Scenario Lifeline System Losses – Transportation and Utility (Millions of Dollars)

System	Inventory Value	Economic Loss
Highway	248.65	12.38
Railways	40.93	6.73
Light Rail	0	0
Bus	1.83	1.43
Ferry	0	0
Port	3.62	2.83
Airport	0	0
Potable Water	4.02	2.33
Wastewater	329.63	236.39
Natural Gas	17.69	1.84
Oil Systems	0	0
Electrical Power	0	0
Communication	0	0

Table 6-13. Red Mountain Fault ShakeMap Scenario Lifeline System Losses – Transportation and Utility (Millions of Dollars)

System	Inventory Value	Economic Loss
Highway	248.65	5.52
Railways	40.93	3.73
Light Rail	0	0
Bus	1.83	0.76
Ferry	0	0
Port	3.62	1.51
Airport	0	0
Potable Water	4.02	1.22
Wastewater	329.63	103.85
Natural Gas	17.69	0.84
Oil Systems	0	0
Electrical Power	0	0
Communication	0	0

Source: Hazus-MH 5.0

An earthquake could have a major impact on critical infrastructure, including hospitals, schools, EOCs, police stations, and fire stations. All of these facilities would sustain at least moderate

damage under the 2,500-year Probabilistic Scenario while 75 percent would sustain at least moderate damage under the Red Mountain Fault ShakeMap Scenario.

Table 6-14. Expected Damage to Critical Facilities – 2,500-year Probabilistic Scenario

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on Day 1
Hospitals	0	0	0	0
Schools	6	6	0	0
EOCs	0	0	0	0
Police Stations	1	1	0	0
Fire Stations	1	1	0	0
Total	**8**	**8**	**0**	**0**

Table 6-15. Expected Damage to Critical Facilities – Red Mountain Fault ShakeMap Scenario

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on Day 1
Hospitals	0	0	0	0
Schools	6	5	0	0
EOCs	0	0	0	0
Police Stations	1	0	0	0
Fire Stations	1	1	0	0
Total	**8**	**6**	**0**	**0**

Source: Hazus-MH 5.0

The 2,500-year Probabilistic Scenario is expected to cause more damage and also more severe damage to critical facilities, as well as result in delays for the critical facilities to recover than the Red Mountain Fault ShakeMap Scenario. The more extreme damage to critical facilities would require additional time to repair and ensure safe operation post-earthquake.

Other Earthquake Vulnerabilities

Social Vulnerability. The entire City's population is exposed in some way to earthquake hazards. Populations most vulnerable to earthquake hazards would be those that rely on specific services or electrical power, which may not be available during or after a quake, such as health care patients and the elderly. Residents would have a difficult time receiving emergency notifications or evacuating due to age or disability, houselessness, or language barriers. Such socially vulnerable and sometimes financially disadvantaged households may not have the financial resiliency to cope with both short-term post-earthquake issues such as paying for lodging and clean up as well as potentially lacking resources to address longer-term issues such as major structural repairs or replacement.

Eastern Carpinteria has an above-average social vulnerability based on statewide ranking as identified by the Center for Disease Control's (CDC's) social vulnerability index (SoVI) (refer to

Figure 4-3 of the MJHMP). Therefore, this portion of the City may be more vulnerable to natural hazards such as earthquakes.

Historic, Cultural, and Natural Resources. Earthquake effects on the environment, natural resources, and historic and cultural assets could be very destructive depending on the type of seismic activity experienced and secondary/cascading effects from an event (e.g., wildfire). The biggest impact would likely be on older properties such as wooden or masonry buildings, though reinforced masonry structures would be much more resilient during earthquakes. However, an earthquake-triggered event such as a rockslide could impact natural foothill or mountain habitats.

Future Development. Future development in the City is not anticipated to significantly affect vulnerability to earthquakes when designed according to modern building codes. However future development would result in a slight increase in exposure of the population, building stock, and related infrastructure to earthquakes.

6.3 VULNERABILITIES

6.3.1 Flood

The geographical location, climate, and topography of Carpinteria make some areas of the City prone to flooding. While there are some benefits associated with flooding, such as maintaining natural riparian processes along creeks, replenishment of beach sand and nutrients to agricultural lands, it presents a hazard to development in floodplains. In addition to the damage to properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Emergency responses can be interrupted by damaged roads and infrastructure. Fire can break out as a result of dysfunctional electrical equipment. Hazardous materials can also get into floodways, causing health concerns and polluted water supplies. During a flood, the drinking water supply can be contaminated. Climate change is expected to increase the frequency and intensity of heavy rainstorms that cause riverine flooding.

Based on the GIS analysis, the City has 551 improved parcels valued at over $300 million in the 1-percent annual chance floodplain. Based on this analysis, which accounts for residents only and not workers, 9,190 residents are living in the 1-percent annual chance floodplain throughout the City.

An additional 419 improved parcels and $160.7 million in value fall within the 0.2-percent annual chance floodplain. Areas of the City vulnerable to the 0.2-percent annual chance riverine flood are home to 23,681 residents. Development in the 0.2-percent annual chance floodplain is typically not regulated, thus a large flood event could be extremely damaging in the City. This information is summarized in Table 6-16 below. Additionally, a GIS vulnerability assessment was conducted delineating the areas exposed to the coastal 1-percent annual chance flood hazard in the City. Utilizing this data for an exposure analysis, the City has 37 improved parcels valued at over $18 million located within the 1-percent annual chance coastal floodplain.

Table 6-16. City of Carpinteria FEMA Floodplain Exposure and Loss

Property Type	Improved Parcel Count	Total Value	Estimated Loss	Population
Riverine 1% Annual Chance Floodplain Exposure and Loss				
Commercial	13	$28,348,074	$7,087,019	
Exempt	4	$308,904	$77,226	
Industrial	5	$18,497,223	$4,624,306	
Mixed Use	3	$4,332,258	$1,083,065	
Residential	526	$250,693,286	$62,673,321	
Total	**551**	**$302,179,744**	**$75,544,936**	9,190
Riverine 0.2% Annual Chance Floodplain Exposure and Loss				
Commercial	8	$2,262,698	$565,675	
Exempt	1	$0	$0	
Residential	410	$158,401,811	$39,600,453	
Total	**419**	**$160,664,509**	**$40,166,127**	23,681
Coastal 1% Annual Chance Floodplain Exposure and Loss				
Residential	37	$18,184,314	$4,546,079	340

As listed in Table 6-17, 16 critical facilities in the City would be vulnerable to damage or destruction from 1-percent or 0.2-percent annual chance flood (Figure 6-4; see also, Section 6.3.3, *Flood* of the 2022 MJHMP). The majority of transportation critical facilities located within a flood zone are bridges, but other vulnerable facilities include the well and water treatment plants, schools (i.e., Carpinteria High, Aliso Elementary, and Rincon/Foothill High), the Granvida Senior Living and Memory Care, Sansum Clinic, and two sewage pump stations. Hazardous material facilities include the Wastewater Treatment Plant and sewage pump stations.

Table 6-17. City of Carpinteria Critical Facilities at Risk to Flood Hazard

Type	Critical Facility	Flood Hazard	Total Value
Utilities	High School Well Treatment Plant	1% Annual Chance	$1,500,000
Wastewater Treatment Plant	Wastewater Treatment Plant	1% Annual Chance	$800,000
Nursing Home	Granvida Senior Living and Memory Care	1% Annual Chance	-
Education	Carpinteria High School	1% Annual Chance	$28,535,898
Education	Aliso Elementary	1% Annual Chance	$6,457,908
Education	Rincon/Foothill High School	1% Annual Chance	$210,720
Bridge	8 Bridges	1% Annual Chance	-
Utilities	Sewage Pump Station 1	0.2% Annual Chance	$2,000,000
Utilities	Sewage Pump Station 2	0.2% Annual Chance	$1,500,000
Wastewater Treatment Plant	Wastewater Treatment Plant	0.2% Annual Chance	$60,000,000
Clinic	Sansum Clinic-Carpinteria	0.2% Annual Chance	-

Based on this analysis, in the event of a major flood, damage to the Water Treatment Plant or sewage pump stations can cause the systems to backup and leak effluent into the surrounding soil and water. Transportation facilities, such as bridges along State Route (SR-) 192 and Highway 101, may be damaged or destroyed in a flood, compromising evacuation routes and delaying emergency response services. Residents, clientele of the Granvida Senior Living and Memory Care and Sansum Clinic, and students of Carpinteria High School, Aliso Elementary School, and Rincon/Foothill High School may need to be relocated or evacuated during a flood event; however, difficulties may arise due to flood damage to transportation facilities and mobility constraints of affected residents. It should be noted that the CUSD is considering adaptation strategies, including both on- and offsite measures and regional approaches, to protect Aliso Elementary School from flooding, as identified in the City's 2019 Sea Level Rise Vulnerability Assessment and Adaptation Plan (SLRVAAP). The locations of critical facilities within the City relative to the FEMA 1-percent annual chance (100-year) flood are shown in Figure 6-4.

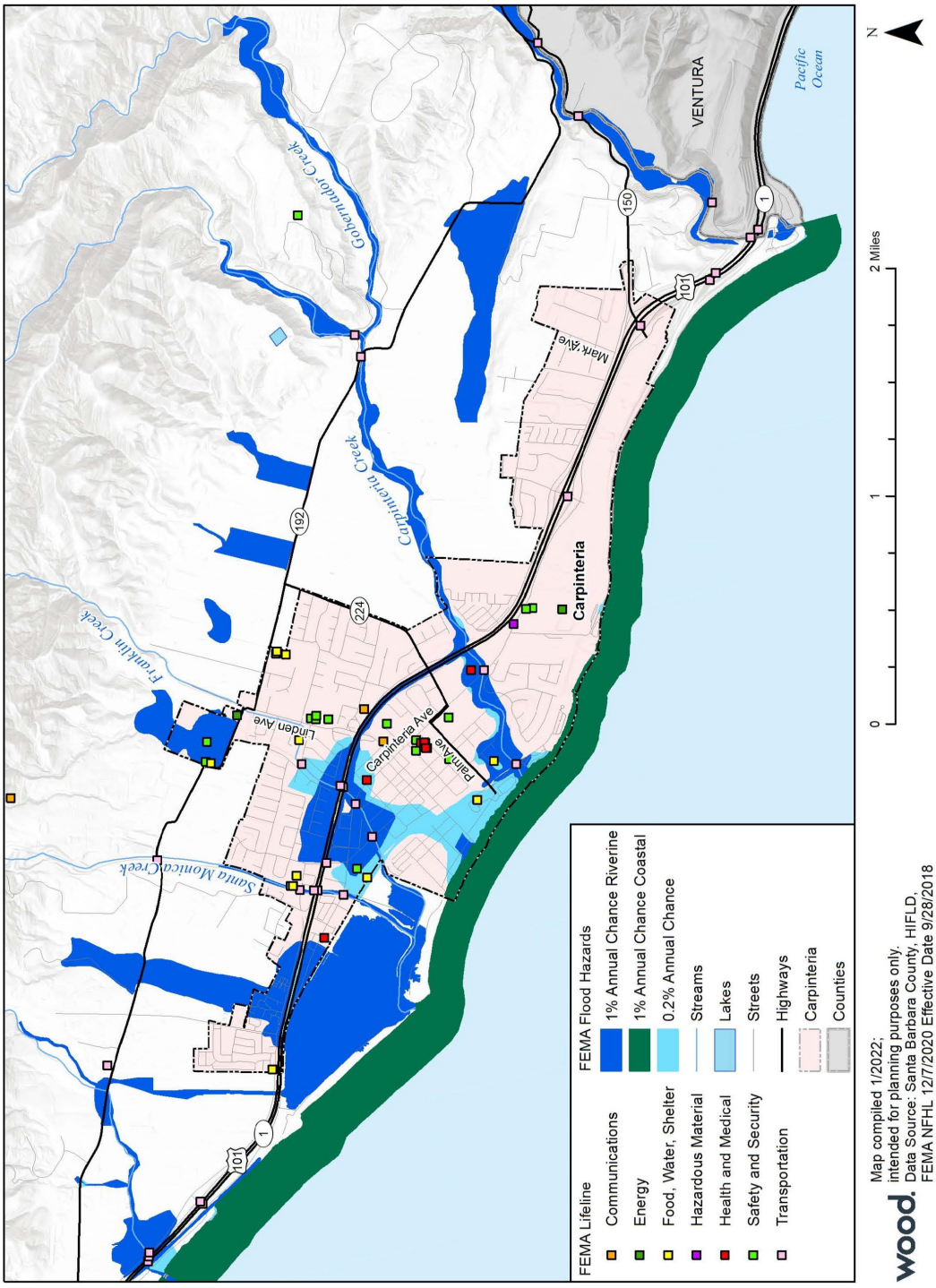
Repetitive Loss (RL) Properties

An RL property is defined by FEMA as "a property for which two or more National Flood Insurance Program (NFIP) losses of at least $1,000 each have been paid within any 10 years since 1978". An RL property may or may not be currently insured by the NFIP.

As described in Section 4.9.7, *National Flood Insurance Program*, FEMA's RL data shows that there have been 18 properties in Carpinteria with multiple claims against the NFIP. Four of these properties have had more than three insurance claims, and one of them has had a total of six claims (City of Carpinteria 2019). According to the City's 2019 SLRVAAP, 79 residential structures are vulnerable to damage and flooding from coastal hazards; an additional 164 residential structures become vulnerable with approximately 1 foot of sea level rise, 234 additional residential structures become vulnerable with approximately 2 feet of sea level rise, and 264 additional residential structures become vulnerable with approximately 5 feet of sea level rise, for a total of 769 structures. It is anticipated that over time, sea level rise would result in repetitive loss to at least a portion of these structures (see Section 6.3.4, *Coastal Hazards*; City of Carpinteria 2019).

The City identified a need for an RL program in the 2019 SLRVAAP to reduce damage to private property, injury or loss of life, demand on emergency services, and disruption to public services caused by frequent flooding and associated damages for the RL properties in the City (see mitigation action 2022-26). Under an RL program, a property that repeatedly experiences substantial damages from storms and coastal flooding within a given period may not be permitted to redevelop. It is important to note, however, the City intends to combine this adaptation strategy with other protection strategies, such as a living shoreline and beach nourishment, which could provide an additional buffer for private development from coastal hazards in the near-term (see Section 7.4, *Mitigation Implementation Plan*). Nonetheless, in the mid- to long-term and with higher elevations of sea level rise, protection strategies may be less effective and could result in loss or damage to private property.

Figure 6-4. City of Carpinteria Critical Facilities in FEMA Flood Hazard Zones



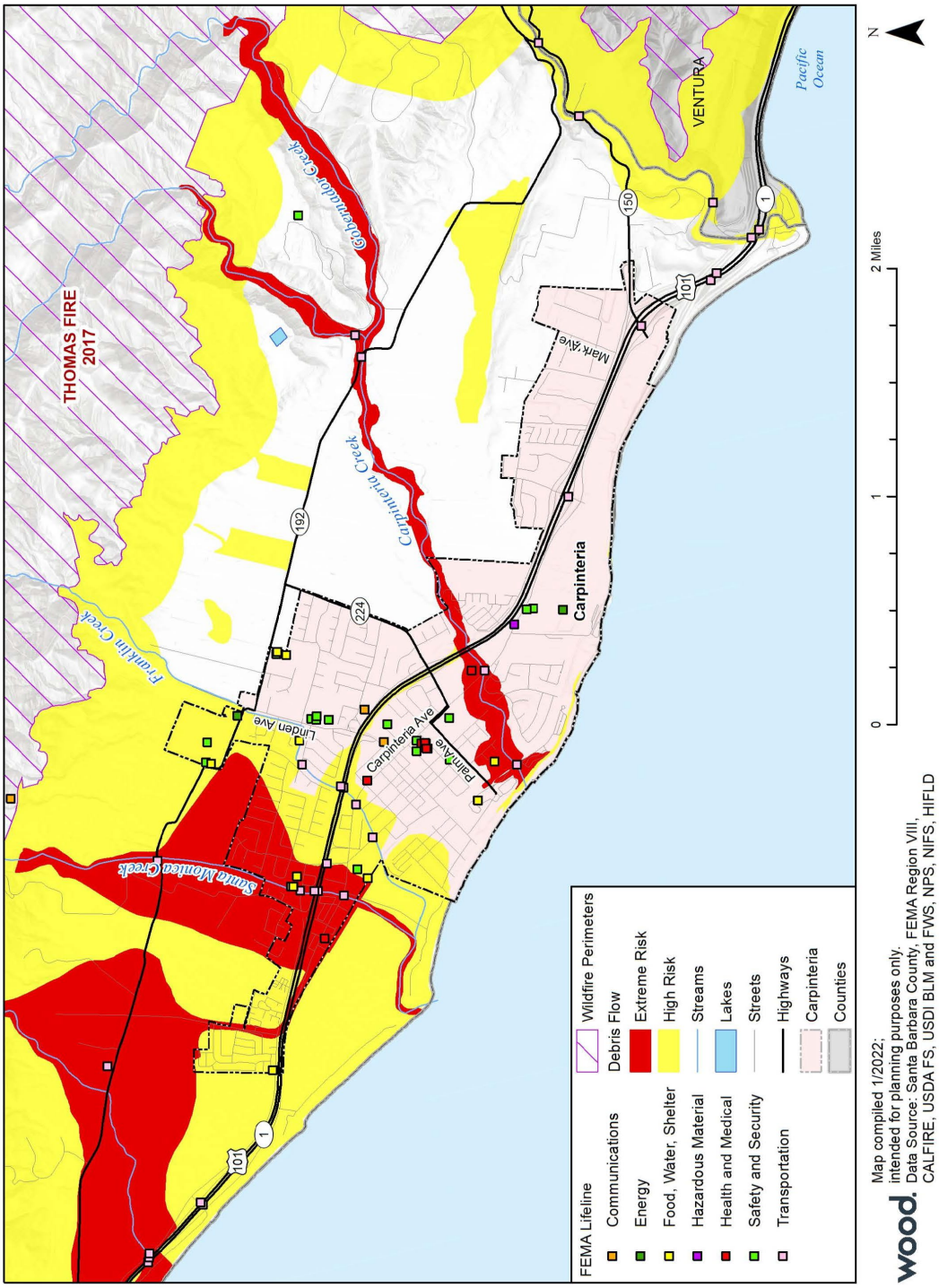
6.3.2 Mudflow & Debris Flow

As described in Section 5.3.2, *Mudflow & Debris Flow*, hillsides and communities at the base of the Santa Ynez mountains are especially at risk of debris flows and mudflows following wildfires. Three acres (0.16 percent) of the City are within Extreme risk and 309 acres (18.8 percent) of the City is within High risk for debris flows. As shown in Figure 6-5, critical facilities located along the creeks that extend from the foothills towards the coast (i.e., Santa Monica, Carpinteria, and Gobernador, creeks) have been most recently at risk for debris or mudflow. However, debris flow hazard mapping is not well developed in the City or surrounding County of Santa Barbara with formal mapping confined to these creeks due to the recent 2018 debris flows. In addition, properties located along the base of the Santa Ynez Mountains could also be vulnerable.

Transportation infrastructure is vulnerable to debris flow hazards, where bridges, culverts, and roadways may be washed out or blocked by debris and mud. Highway 101 and SR-192 extend east to west and pass-through areas susceptible to debris flow due to intersecting with multiple drainages from the Santa Ynez Mountains, with this vulnerability demonstrated by severe damage sustained during the January 2018 debris flows following the Thomas Fire. Following the debris flows, a 30-mile section of Highway 101 was closed for 13 days (Robert D Niehaus, Inc 2018). Multiple bridges along SR-192 and Highway 101 were damaged. As such, in the event of mudslide or debris flow, these highways can be vulnerable to damage or destruction.

As discussed in Section 6.3.10, *Wildfire*, in the event of an emergency the county would utilize existing alert systems and the county's website to distribute alerts and emergency updates. However, these channels require prior planning for recipients to already be signed up to receive emergency notifications from the county and have access to a reliable internet connection and/or service provider, leaving populations with limited resources, existing social or economic disparities, language and communication barriers, and distrust of government programs, staff, and officials vulnerable to natural hazards such as mudflows and debris flows. Emergency notification and evacuation efforts may be hindered in Carpinteria where the potential for debris flow within developed communities is greatest.

Figure 6-5. Debris Flow Storm Impact Consideration and Critical Facilities



6.3.3 Liquefaction (Earthquake)

Earthquake-related vulnerabilities within the City were quantified using Hazus and analyzed in Section 6.2.1, *Earthquake (Ground shaking)* above. Vulnerabilities within the City associated with liquefaction, which is often caused by earthquake ground shaking, are discussed below.

As described in Section 5.3.3, *Earthquake and Liquefaction*, the rating of high, moderate, and low hazard is based on the probable depth to groundwater with consideration given to probable soil characteristics. As shown in Figure 6-6, the majority of areas within the City of Carpinteria have a high liquefaction severity class. In particular, low-lying areas of the Cities of Carpinteria that were constructed over historic salt marsh and wetland areas are vulnerable, such as the Beach Neighborhood. High liquefaction vulnerable areas of the City are home to 7,760 residents and are valued at $1,519,375,447. Regional earthquakes could cause liquefaction in the City, which could damage buildings and utilities when soils become unstable.

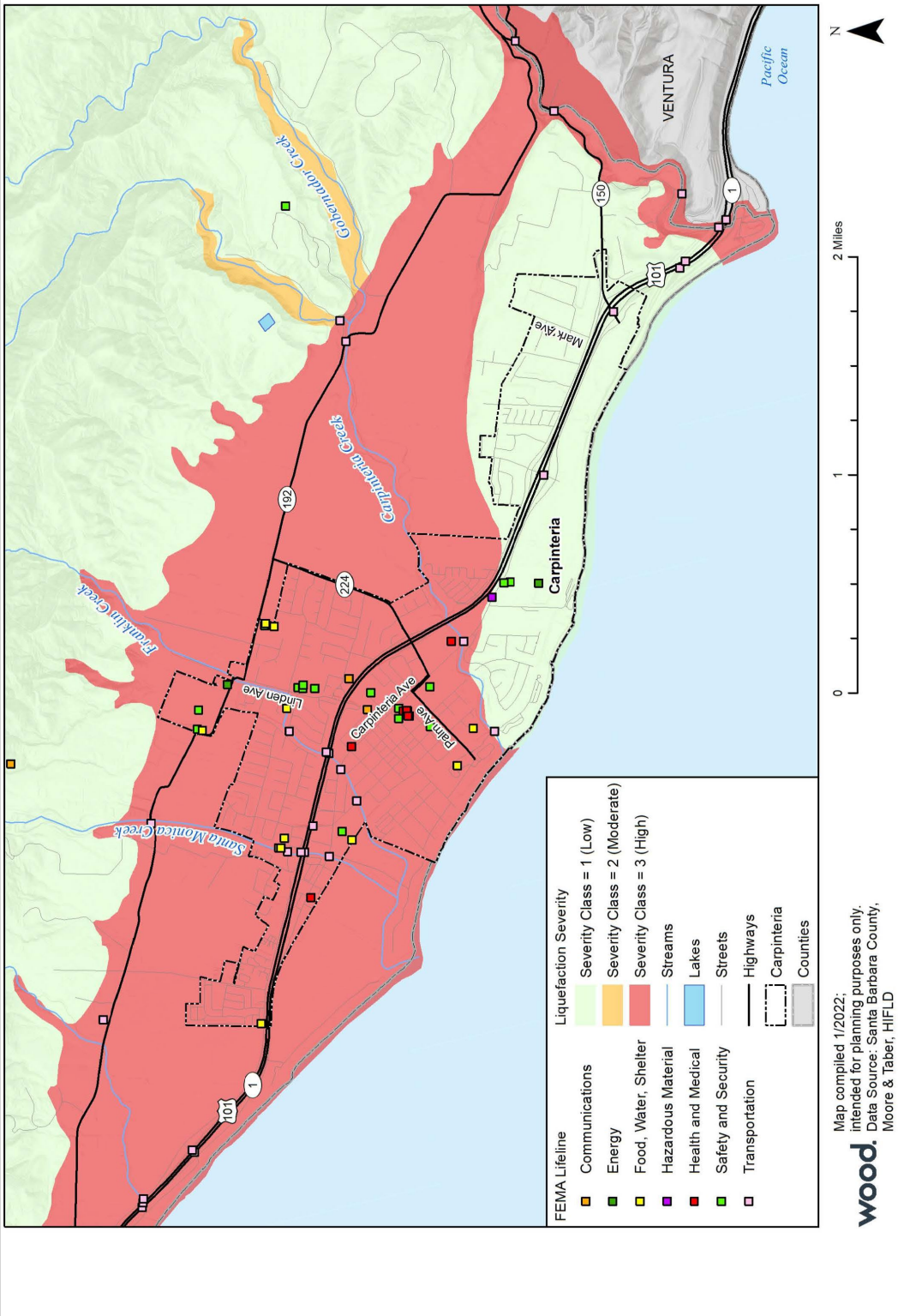
As listed in Table 6-18, 49 critical facilities in the City would be vulnerable to damage or destruction from liquefaction during a significant regional earthquake (i.e., high liquefaction potential). These critical facilities at risk include facilities related to utilities, wastewater treatment, clinics, emergency response stations, veteran services, education, transportation, and nursing homes. Of those critical facilities, those with the highest building value include a wastewater treatment plant, schools, and a fire station. No critical facilities are located in areas with moderate liquefaction potential and 8 critical facilities are located in areas of the City with low liquefaction potential (see also, Section 6.3.3, *Liquefaction (Earthquake)* of the 2022 MJHMP).

Table 6-18. City of Carpinteria Critical Facilities in High Liquefaction Zones

Type	Critical Facility	Liquefaction Potential	Total Value
Relay Station	Rincon Peak Relay Station	High	$98,226
Utilities	Verizon	High	-
Sub Station	Southern CA Edison - Substation	High	-
Utilities	Sewage Pump Station 7	High	$5,000,000
Utilities	Sewage Pump Station 1	High	$2,000,000
Utilities	Water District Maintenance Building	High	$2,266,000
Utilities	Sewage Pump Station 2	High	$1,500,000
Utilities	Headquarters Well	High	$1,500,000
Utilities	High School Well	High	$1,500,000
Utilities	El Carro Well	High	$1,500,000
Utilities	El Carro Well Filtration Plant	High	$1,500,000
Utilities	Water District Main Office	High	$1,400,000
Utilities	Sewage Pump Station 4	High	$1,000,000
Utilities	High School Well Treatment Plant	High	$800,000
Utilities	Headquarters Well Control Building	High	$700,000
Utilities	Headquarters Well Enclosure	High	$90,000
Wastewater Treatment Plant	Wastewater Treatment Plant	High	$60,000,000

Type	Critical Facility	Liquefaction Potential	Total Value
Clinic	Sansum Clinic-Carpinteria	High	-
Clinic	PHD Carpinteria Clinic	High	-
EMS Station	Carpinteria Summerland – Fire Protection District Station 1	High	-
EMS Station	American Medical Response Station 1	High	-
Nursing Home	Granvida Senior Living and Memory Care	High	-
Veteran Services	Carpinteria Veterans" Memorial Building	High	$1,657,801
Veteran Services	Veterans' Memorial Building	High	-
Education	Carpinteria High School	High	$28,535,898
Education	Carpinteria Middle School	High	$14,366,233
Education	Canalino Elementary	High	$10,583,606
Education	Aliso Elementary	High	$6,457,908
Education	Carpinteria Children's Project at Main	High	$4,360,870
Education	Rincon/Foothill High School	High	$210,720
Education	CUSD District Office	High	-
Education	Carpinteria Family	High	-
Education	Canalino Elementary	High	-
Education	The Howard School	High	-
Fire Station	Carpinteria Fire Station 1	High	$7,150,000
Government	Carpinteria Summerland HQ	High	$60,000
Library	Carpinteria Public Library	High	-
Museum	Carpinteria Valley Museum of History	High	-
Bridge	11 Bridges	High	-
Industrial	Natural Gas Odorant Carpinteria Oil and Gas	Low	-
RMP Facilities	Carpinteria Oil and Gas Plant	Low	-
Colleges / Universities	International Sports Sciences Association	Low	-
Government	City Hall, Sheriff's Substation, Maintenance	Low	$4,436,787
Sheriff	Carpinteria Sheriff's Station	Low	$111,767
Bridge	3 Bridges	Low	-

Figure 6-6. City of Carpinteria Critical Facilities within Liquefaction Severity Zones



6.3.4 Coastal Hazards

As described in Section 5.3.4, *Coastal Hazards*, under current sea levels, shoreline areas of the City are vulnerable to bluff and beach erosion, wave impacts, and flooding of low-lying areas (City of Carpinteria 2019). Beaches buffer the shoreline from erosion, wave attack, and flooding, with beach widths governed primarily by sediment input from coastal streams and storm wave erosion, with beach width varying significantly over time based on these factors. However, outside of areas with historic wetland and dune complexes, such as Carpinteria Beach, South Coast beaches generally consist of a thin layer of sand overlying rocky marine terraces.[1]

Rising sea levels would amplify the damaging effects of coastal hazards. As sea level continues to rise, areas that would have previously only been temporarily flooded or submerged during very high tides or strong storm conditions would begin to be more consistently submerged or inundated by routine high tide inundation.

For example, with approximately 2 feet of sea level rise, more extensive coastal flooding and coastal beach erosion during storms could affect properties, land uses, and infrastructure between both Ash and Linden Avenues north of the Union Pacific Railroad (UPRR), as well as in the Carpinteria State Beach campgrounds. Coastal cliff erosion could continue to impact the UPRR, recreational trails, and habitats along the Carpinteria Bluffs, but not any structures. Coastal flooding may also begin encroaching through the Carpinteria Salt Marsh into the Beach Neighborhood. Routine high tides would largely be confined to existing creek channels and the Carpinteria Salt Marsh; however, during rain events, the increased tide elevations would likely back up stormwater drains and could cause extensive stormwater flooding in low-lying neighborhoods (City of Carpinteria 2019).

With approximately 5 feet of sea level rise, coastal beach erosion could extend through the first row of properties inland of Sandyland Road and begin to affect dwellings and infrastructure in the Concha Loma neighborhood. Coastal flooding during a large storm wave event could expand in depths and extend inland into the Downtown Core along Linden Avenue, affecting portions of the Old Town District inland of the UPRR, Carpinteria Salt Marsh, and areas along Franklin Creek. Coastal cliff erosion could continue to impact the UPRR, recreational trails, and habitats along the Carpinteria Bluffs and potentially impact one commercial structure. Routine monthly high tides could inundate much of the Downtown Beach Neighborhood and Carpinteria State Beach inland to the Tomol Interpretative Park, even in areas not directly connected due to daylighting, or the surfacing, of groundwater due to tidal inundations (City of Carpinteria 2019).

The rate of sea level rise is expected to increase over time due to the effects of climate change and global warming, resulting in increased flooding and erosion hazards along the City's coastal shoreline. The County of Santa Barbara and the City of Carpinteria have both completed sea level rise studies with varying approaches to modeling and associated assumptions. While each of these models is useful for general initial hazard planning purposes and represents the best available tools, all have limitations. As discussed further below, while the best available tools, these limitations

[1] Wildfires and floods can have significant benefits to beach width due potential large volumes of sand from areas creeks reaching the shoreline. For example, historically wide beaches experienced during over a decade the late 1970s and early 1980s along much of the South Coast are thought to have originated from the 1955 Refugio Fire and subsequent heavy rains which left beaches such as Goleta Beach over 400 feet in width (Noble Engineers, 2018). These wide beaches were heavily eroded during the historically severe 1983 El Niño.

may cause the models in some instances potentially to overstate the degree of sea level rise hazard. According to the City's SLRVAAP, 43 acres of land within the City are currently vulnerable to coastal erosion and flooding, and 170 acres are projected to be affected by approximately 5 feet of sea level rise (City of Carpinteria 2019). According to Coastal Storm Modeling System (CoSMoS), a regional model employed in the County's 2017 sea level rise study, by 2030, a 10.2-inch sea level rise and 100-year flood (refer to Section 6.3.1, *Flood*) is projected to inundate 86 acres (5.26 percent) of Carpinteria, particularly within the City's Beach Neighborhood, accounting for 5.26 percent of the City. By 2060, sea level rise is projected to increase to 27.2 inches, inundating 136 acres (8.3 percent) of Carpinteria.

Approximately 131 improved parcels valued at over $79,731,008 and a population of approximately 359 may be at risk to the projected 2030 sea level rise. Under projected 2060 sea level rise conditions, 342 improved parcels valued at $151,092,437 and a population of 918 may also be at risk to coastal hazards from sea level rise (Table 6-19). Damages could be particularly severe within the Beach Neighborhood. Key coastal campgrounds at Carpinteria State Beaches may also all be vulnerable to increased damage.

Table 6-19. City of Carpinteria at Risk to the 2030 and 2060 Sea Level Rise Hazard

Year	Acres	Improved Parcel Count	Total Value	Population
2030	86	131	$79,731,008	359
2060	136	342	$151,092,437	918

The City's SLRVAAP identifies 79 residential structures as vulnerable to damage and flooding from coastal hazards; an additional 164 residential structures become vulnerable with approximately 1 foot of sea level rise, 234 additional residential structures become vulnerable with approximately 2 feet of sea level rise, and 264 additional residential structures become vulnerable with approximately 5 feet of sea level rise, for a total of 769 residential structures (Table 6-20; City of Carpinteria 2019). As described in Section 6.3.1, *Flood*, sea level rise is anticipated to result in repetitive loss to at least a portion of these structures.

Table 6-20. City of Carpinteria Parcels at Risk to Sea Level Rise Hazard in SLRVAAP by Land Use

Sea Level Rise	Residential	Commercial and Mixed Use	Industrial	Open Space & Recreational	Public Facilities
Existing	79	1	1	42	3
~1 foot	164	1	3	4	1
~2 feet	234	3	2	5	3
~5 feet	292	16	4	8	2
Total	**579**	**20**	**10**	**59**	**9**

Source: City of Carpinteria 2019.

Figure 6-7. City of Carpinteria Critical Facilities and Sea Level Rise Projections Tidal Inundations: No Flood Event

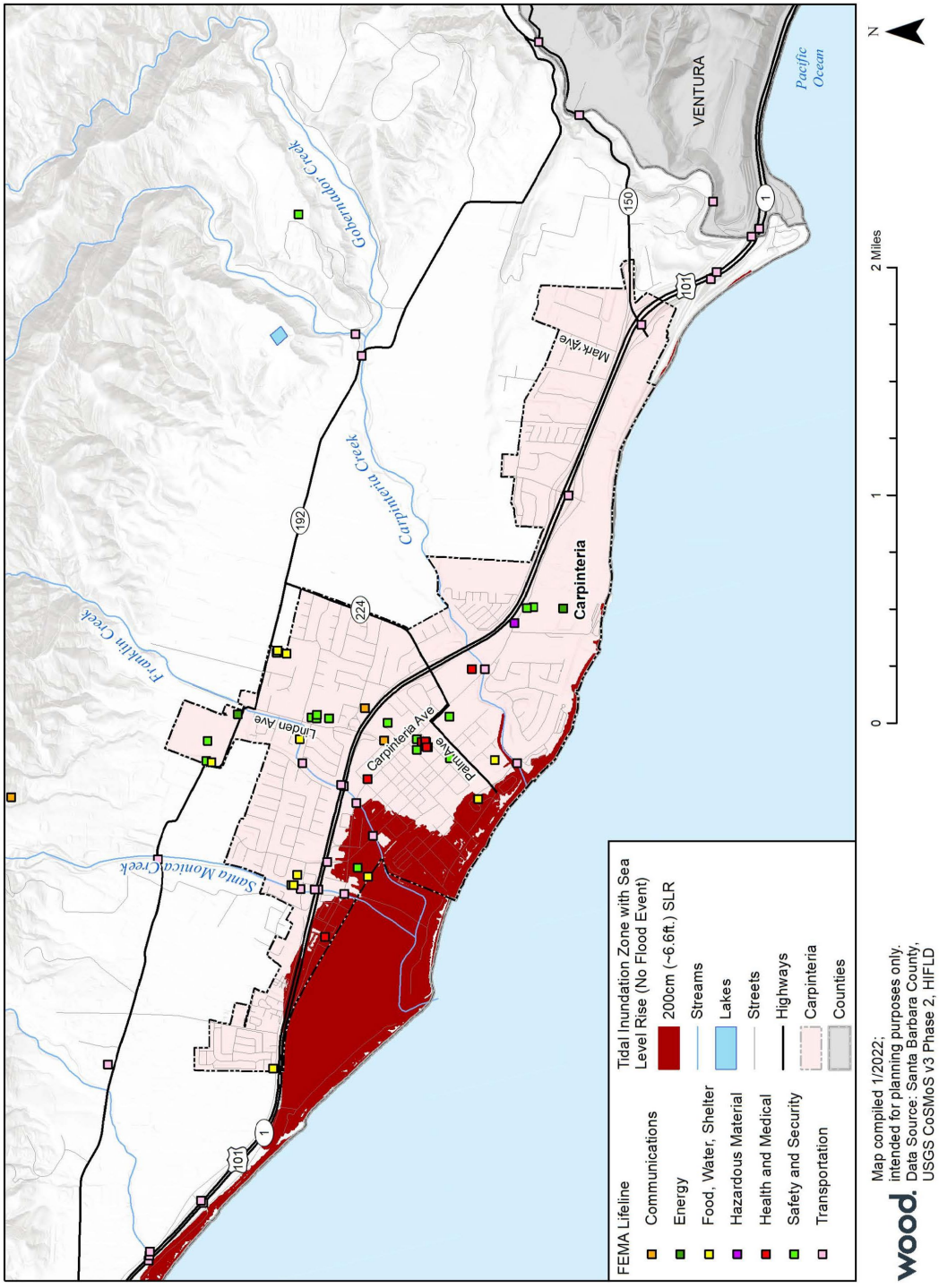
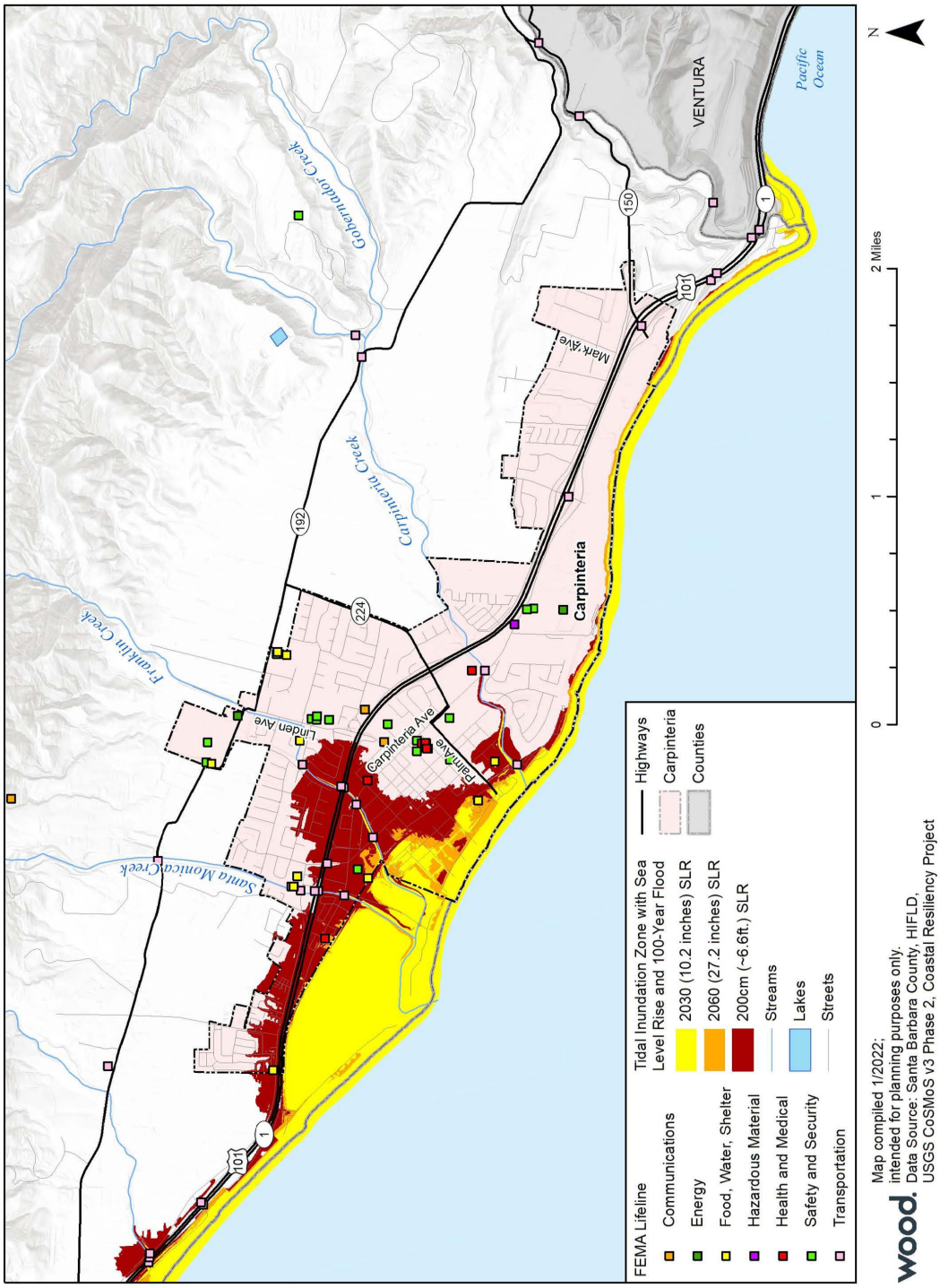


Figure 6-8. City of Carpinteria Critical Facilities and Sea Level Rise Projections Tidal Inundations: 100-Year Flood Event



However, this vulnerability assessment is based on long-term regional models that cannot reflect the mitigating effects of local conditions such as revetments, sand elevations, beach profiles, the distance of structures from the shoreline, and the construction of structures that may be able to better withstand coastal hazards. Damage from sea level rise can be substantially affected by location and elevation, the presence of hard structures or revetments, and intervening structures between the facility and the shoreline. For example, while the City of Carpinteria's 2019 SLRVAAP projects substantial flooding inland through the Carpinteria Salt Marsh, the model employed could not account for the presence of 16-foot-high rock revetments fronting most of the Marsh which constrict tidal influx and projected inland tidal flooding passage to the 100-foot-wide Santa Monica Creek ocean outlet. Similar modeling limitations may apply to the projected extent and depth of flooding of Carpinteria's Beach Neighborhood (City of Carpinteria 2019).

A sand retention wall originally constructed in 1977 fronts the Carpinteria Shores apartments, and small portions of revetment are located at the base of Casitas Pier and under the Carpinteria Bluffs. Tar Pits Park, Carpinteria State Beach, and a portion of San Miguel Campground also have a small amount of shoreline protection. The protective features at San Miguel Campground consist of materials used as part of the former burn dump site and were installed in fall 2013 under a Development Plan and Coastal Development Permits issued by the City. The City was also recently awarded grant funding to create the Dune and Shoreline Management Plan, which includes developing several options for a living shoreline. The purpose of this project is to plan for a living shoreline dune system that will protect the shoreline and landward infrastructure against coastal hazards and future sea level rise.

While there are currently minimal shoreline revetments within the City, the City experiences some impacts to Carpinteria City Beach at Ash Avenue as a result of the Sandyland Revetment. In particular, an erosion hotspot has been identified at Ash Avenue located at the end of the Sandyland Revetment within the City jurisdiction. Presently, approximately 10 to 15 feet (>1 percent) of the approximately 2,800-foot-long rock revetment is placed on the City Beach within City jurisdiction. This small segment interacts with waves during most high tides in the winter. This wave and revetment interaction causes accelerating erosion and is increasing the alongshore current velocities and scour potential along the revetment on Carpinteria City Beach (City of Carpinteria 2019).

The County's model shows that while none of the City's critical facilities are at risk of becoming periodically or more frequently inundated and exposed to repeated damage by sea level rise by 2030, one facility (the American Medical Response Station 1) is at risk of damage by sea level rise by 2060 (Table 6-21) (see also, Section 6.3.6, *Coastal Hazards* of the 2022 MJHMP).

Table 6-21. City of Carpinteria Critical Facilities at Risk to Sea Level Rise

Year	FEMA Lifeline	Type	Critical Facility	Address	Total Value
2030	-	-	-	-	-
2060	Health and Medial	EMS Station	American Medical Response Station 1	4235 Carpinteria Ave	-

One of the City's most important infrastructure challenges associated with sea level rise is the need for efficient rapid drainage of storm water; however, the City's existing storm drain system lacks the elevation requirements necessary for a gravity-flow system to accommodate current and projected storm events. Within the Beach Neighborhood, some storm drains are located down-gradient from outfall locations, at a lower elevation than necessary for gravity flow, which is a problem that becomes exacerbated during high tide storm events when outfalls can be inundated. Presently, the existing infrastructure is not always able to accommodate all storm water flow, which can flood portions of the Beach Neighborhood and Downtown. As sea levels rise, greater portions of the system may not drain during high tides and during more of the tide cycle, which in turn may increase storm water flood depths and frequency. Culverts and pipes may also create back flows of ocean water into the neighborhoods. Ash Avenue and Linden Field experience tidal inundation with areas of ponded flood waters from rainfall event storm water runoff. For the City, the storm water infrastructure that is vulnerable to coastal hazards includes approximately 6 outlets, 3 outfalls, and 1 mile of storm drains, which would likely require a moderately sized storm water infrastructure installation. Additionally, storm water is not diverted to the Carpinteria Wastewater Treatment Plant for treatment and no pumps exist to convey storm water (City of Carpinteria 2019).

6.3.5 Pandemic/Public Health Emergency

The City of Carpinteria, as well as the state, nation, and the entire world, is vulnerable to outbreaks, epidemics, and pandemics caused by either newly emerging or existing diseases spread person to person, through a vector such as a mosquito, or both. A significant public health emergency can have a considerable impact on the population, the economy, and essential public services (e.g., fire and police protection, medical services, etc.).

Populations identified by the county as especially vulnerable to human health hazards include undocumented persons, senior citizens, senior citizens living alone, persons with existing chronic health conditions, persons experiencing homelessness, overcrowded households and neighborhoods, low-resourced ethnic minorities people of color, households in poverty, communities with a high-pollution burden (Santa Barbara County Planning and Development Department 2021). Undocumented or non-English speaking individuals may be less able to understand such pandemic-related instructions or receptive to responding to government outreach, while lower-income households may lack the means to comply with the direction. Trends of the COVID-19 pandemic further revealed vulnerable groups within Santa Barbara County population and how such public health emergencies have the potential to affect the local economy. For example, COVID-19 disproportionately impacted the county's Hispanic/Latino population. While Hispanics/Latinos accounted for 48 percent of Santa Barbara County's population they represented 59 percent of COVID-19 cases and 63 percent of hospitalizations (Santa Barbara County Public Health Department 2022). In contrast, Whites represented 17 percent of cases while accounting for 43 percent of the population (Santa Barbara County Public Health Department 2022). While Whites made up 43 percent of deaths, many of these deaths occurred at skilled nursing homes and other congregate care settings, which have been highly impacted by the pandemic. As described in Section 5.3.5, *Pandemic/Public Health Emergency*, the County Public Health Department tracks the number of cases in the City along with the South County unincorporated areas of Montecito and Summerland. This region has reported a total of 3,207 confirmed COVID-19 cases and 28 deaths (Santa Barbara County Public Health Department 2022).

The data found that working-age adults (18 to 49 years) had the highest proportion of cases, with 20 year-olds being the 10-year age group with the most common cases (Santa Barbara County Public Health Department 2022). Many of these younger adults likely make up a large proportion of students and workers in frontline occupations and highly exposed industries, putting them at greater risk of contracting the virus. The COVID-19 pandemic also presented a major strain on the Santa Barbara County healthcare system due to hospitalizations of primarily the 50-69 and 70+ year-olds age groups (33 percent and 30 percent, respectively, of hospitalizations countywide) (refer to Section 6.5.1 of the MJHMP).

The arrival of the COVID-19 pandemic led to unprecedented nationwide economic restrictions and shutdowns. According to the 2021 Carpinteria Valley Economic Profile, over 700 jobs were lost in the Carpinteria Valley labor market in 2020 due to the COVID-19 pandemic. By mid-2021, most of these jobs had been restored, and full reinstatement of the workforce is expected to be complete by mid-2022 (City of Carpinteria 2021a). During 2020, the most prominent job losses were observed in two industries – Information Services and Accommodation and Food Services (i.e., hotels, restaurants, caterers, and bars). The largest pandemic-related impact on employment in the Carpinteria Valley occurred in the hotels and restaurants. Job counts in Accommodation and Food Services declined sharply in 2020 as restaurants were forced to suspend in-person dining, bars were ordered to cease operations completely, hotels were subjected to a huge decline in demand, and caterers were impacted by the cancelation of live events. However, very few restaurants closed during the pandemic, and the Accommodation and Food Services sector began rapid recovery since the state opened up entirely in June 2021 (City of Carpinteria 2021a).

Additionally, as described in Section 5.3.22, the Carpinteria Valley Mosquito Abatement District monitors the estuary for mosquitoes during the rainy season and treats various sites to reduce or eliminate the native mosquito species, which can carry malaria (e.g., *Anopheles sp.*), or encephalitis (e.g., *Culex sp.*).

6.3.6 Energy Shortage & Resiliency

Energy disruptions are considered a form of lifeline system failure. Electricity service is also highly vulnerable because it is highly dependent on electrical transmission lines and substations functioning properly. Much of the City's electrical lines are located in areas at risk for hazards (e.g., in high fire risk and flood hazard areas). For example, most of the electrical transmission lines that serve the City run through the Santa Ynez Mountains, making them susceptible to service disruption in the event of a wildfire or landslide (Santa Barbara County Planning and Development Department 2021).

As described in Section 5.3.6, *Energy Shortage & Resiliency*, since the entire City is served by SCE, a major interruption of service in the South Coast planning region could result in all service within the City likely being denied. If this existing transmission network were to be disrupted, metered customers would face extended blackouts, preventing the use of critical services such as electric medical devices, traffic lights, retail businesses, grocery stores, gas stations, ATMs, and banks. Power outages and communication system failures can directly harm the economy, government operations, public safety, and hinder recovery efforts. Transportation may also be disrupted during a power outage for Amtrak as well as populations that use electric vehicles and therefore rely on electric vehicle charging stations.

Additionally, the City is vulnerable to power outages during PSPS, which would occur when Southern California Edison (SCE) shuts off the electric power to protect public safety during extreme weather conditions (refer to Section 6.3.8, *Extreme Heat/Freeze* and Section 6.3.19, *Windstorm*). In extreme heat conditions, increases in air conditioning use can stress and overload the grid, causing power outages and potential damage to electricity transmission lines and substations. During severe wind events, electricity transmission lines can be damaged or turned off by SCE, causing widespread power outages and hardships for City residents. During a PSPS, all customers serviced by an affected power line would have their power shut off, and such power outages could last multiple days depending on the severity of the weather and other factors (e.g., wildfire risk).

As climate change increases the frequency and intensity of related wildfire and weather hazards, energy disruptions are likely to occur more frequently and last longer. Predicted increases in heatwaves, as well as increasingly severe winter storms, would put greater strain on SCE energy facilities throughout the City.

6.3.7 Drought & Water Shortage

Prolonged droughts can deplete regional surface water storage and decrease groundwater recharge, affecting two primary water sources for the Carpinteria Valley Water District (CVWD), the potable water purveyor for the Carpinteria community. Locally, drought can impact water reservoirs included in the Cachuma Project, particularly Lake Cachuma, from which CVWD receives the majority of its surface water supplies. As of November 9, 2021, Cachuma Reservoir, a key water supply for the entire South Coast, was reported to be at 48.1 percent capacity (refer to Table 5-6 of the MJHMP) (County Flood Control 2021).

Droughts can impact the level of water supplies that the City has for drinking water, fire-fighting purposes, and the agriculture industry. Income-constrained communities within the City may struggle to pay for increased water utility bills that may occur during drought or a continuing climate crisis (Santa Barbara County Planning and Development Department 2021).

Drought can also have many secondary impacts. For example, drought is a major contributor to increased wildfire hazards, in that it creates a greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes. See Section 6.3.10, *Wildfire* for greater detail on vulnerability to wildfire risk. During droughts, overdraft (when groundwater recharge cannot keep up with groundwater extraction) of the Carpinteria Groundwater Basin can occur. While sustained groundwater overdraft is related to long-term trends in the balance between groundwater withdrawals and recharge, droughts increase demand on groundwater basins while decreasing or even eliminating recharges and replenishment, sometimes for multiple years. Such droughts can delay the recovery of groundwater basins even during wet years and cause problems such as declines in water quality, drying of surface creeks and wetlands, etc. As described in Section 5.3.7, *Drought & Water Shortage*, the Carpinteria Groundwater Basin is identified as High or Medium priority basins subject to critical conditions of overdraft (refer to Figure 5-6 of the MJHMP; California Department of Water Resources [DWR] 2021a). Groundwater overdraft often leads to subsidence, the lowering of the land-surface elevation (see Section 6.3.18, *Geologic Hazards*). Drought can also prevent dams and wastewater infrastructure from functioning properly. Without rainfall and river flow during periods of drought, beach sediments are not replenished, making beaches smaller and more

vulnerable to coastal hazards related to sea level rise (refer to Section 6.3.4, *Coastal Hazards*) (USGS 2017).

Climate change has the potential to make drought events more common in the City of Carpinteria (DWR 2021c). Extreme heat creates conditions more conducive for the evaporation of moisture from the ground, increasing the possibility of drought and affecting both CVWD's local surface water supplies and groundwater recharge. As described in Section 5.3.7, *Drought & Water Shortages*, changing precipitation patterns are anticipated to increase the severity of episodic severe storms; however, droughts would likely last longer and happen more frequently because of more variability in precipitation extremes (Santa Barbara County Planning and Development Department 2021).

As described in Section 5.3.7, *Drought & Water Shortage*, CVWD uses a six-stage rationing plan during declared water supply shortages that include voluntary and mandatory rationing, depending on the causes, severity, and anticipated duration of the shortage (refer to Table 5-5). To address potential water shortages in the future, CVWD is planning for future additional water supplies such as potable reuse via the Carpinteria Advanced Purification Project (CAPP). The CAPP will produce advanced treated recycled water that will be injected into the Carpinteria Groundwater Basin to be stored and later extracted to meet potable demands. The CAPP is expected to begin delivering water in 2026, and produce approximately 1,000 acre-feet per year (AFY) of reliable, drought-proof local supply.

6.3.8 Extreme Heat/Freeze

As described in Section 5.3.8, *Extreme Heat/Freeze*, coastal communities, such as the City, have lower temperatures on average compared to communities in the inland areas of the county and could be less at risk to extreme temperatures. Although temperatures are lower in coastal areas, it is still dangerous when temperatures are higher than usual because people are potentially less acclimatized to high temperatures if they occur and may not have the resources to cope with extreme temperatures (Santa Barbara County Planning and Development Department 2021). For example, people may be less aware of the behaviors that can reduce exposure (e.g., reduce activity level or go to an air-conditioned location) or reduce physiologic stress (e.g., appropriate hydration), and the built environment may not be designed for extreme heat or freeze conditions (e.g., homes, workplaces, and institutions are less often equipped with air conditioning or it is inadequate for extreme or prolonged heat events). Even in areas equipped with air conditioning, the increased use of air conditioners during heat waves (or heaters during extreme cold events) may overload demands for electricity and lead to power outages, which presents health concerns to individuals outside in the temperatures. Electrical power outages may impact response capabilities or care capabilities for hospitals and clinics in the City. Critical infrastructure such as water pumping stations that rely on public utility systems could also be overloaded and may result in impacts during extreme heat events.

While extreme heat rarely damages buildings, both extreme heat and freeze can cause damage to utility and transportation infrastructure. Water infrastructure is at risk from freezing during extreme cold events, including line breaks and frozen valve gates affecting the water distribution system. The City wraps pipes before freezing temperature events to help prevent damage. Both

extreme heat and freeze can also impact transportation conditions through increased wear and stress on asphalt roads and bridges. Exposed populations may be at risk while waiting for public transportation, particularly when combined with wind-chill, and some vehicles may not start, which impacts the commute of the workforce and, in worst-case scenarios, the movement of emergency services personnel.

The elderly, children, people in poor physical health, and the homeless are also vulnerable to exposure. However, any populations working or recreating outdoors during periods of extreme cold or heat are exposed, including otherwise young and healthy adults and homeless populations. Extreme heat poses the greatest danger for Carpinteria Valley's outdoor laborers who support the City's agriculture economy. Exertional heat illness also occurs in the following industries and occupations: construction, firefighting, warehousing, delivery, and service work.

Although infrequent in the City, prolonged freezing temperatures can damage or destroy crops, affecting the economy and agricultural jobs in Carpinteria Valley. Freezing temperatures occurring during winter and spring growing seasons can cause extensive crop damage, impacting farmers and potentially causing significant increases in food prices to the consumer due to shortages. Freezing spells are likely to become less frequent as climate temperatures increase.

6.3.9 Dam Failure

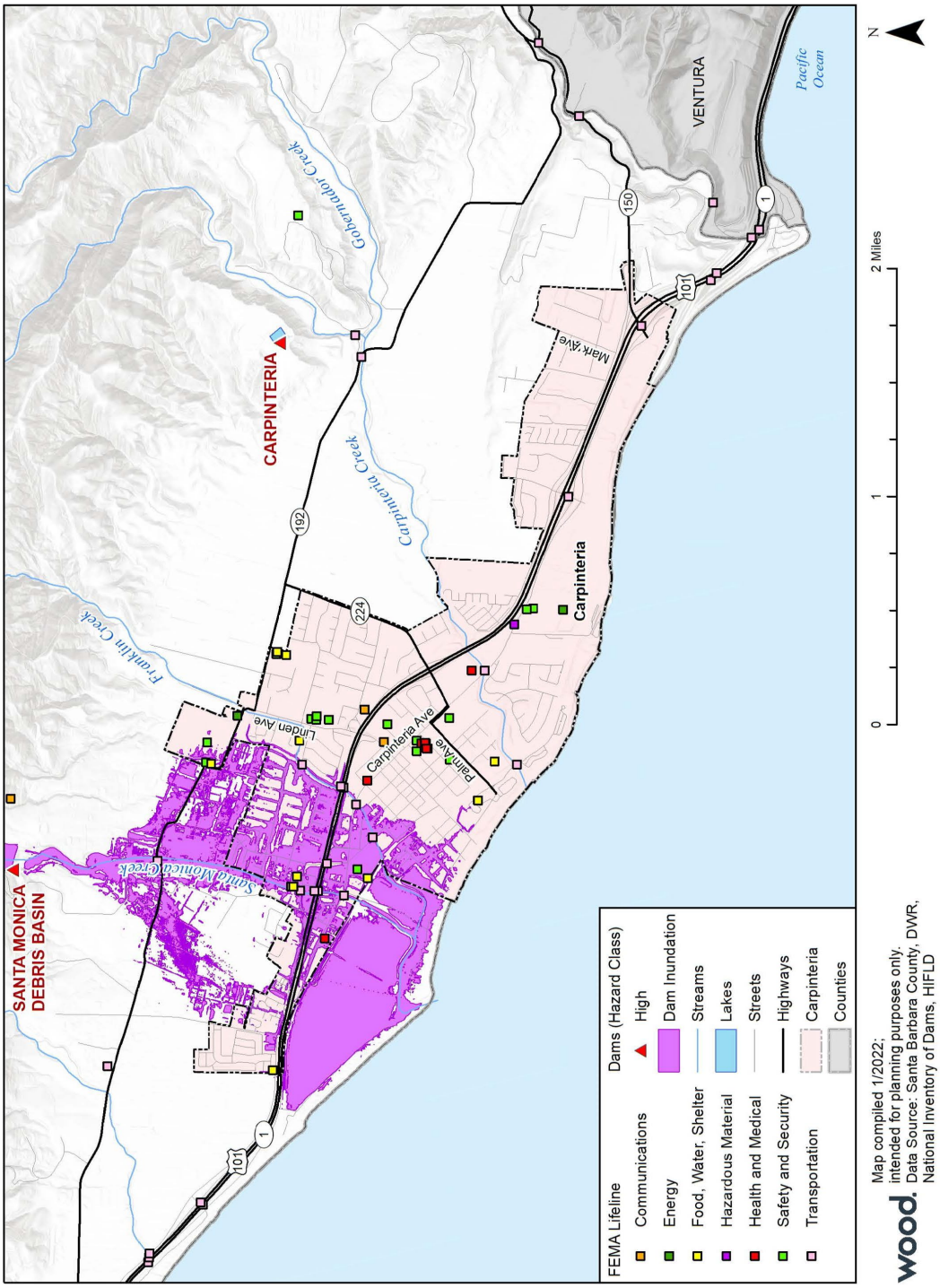
Vulnerability to dam failures is confined to the areas and populations subject to inundation downstream of the facility. As described in Section 5.3.9, *Dam Failure*, there are two dams in the City of Carpinteria: Santa Monica Debris Basin and Carpinteria Dam. Based on dam inundation data from the County, DWR, and National Inventory of Dams, failure of Santa Monica Debris Basin would inundate portions of the City, as well as Highway 101 and SR-192, with little evacuation time (Figure 6-9).

The City could be affected by dam failure from the Santa Monica Debris Basin/Dam, located on Santa Monica Creek, 2.3 miles north of the ocean. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Of particular risk would be roads and bridges that could be vulnerable to washouts, further complicating response and recovery opportunities by cutting off impacted areas. The City of Carpinteria area has 358 parcels, which are home to 3 residents and are valued at $156,637,957 within the dam inundation zone for the Santa Monica Debris Basin (Table 6-22).

Table 6-22. City of Carpinteria at Risk to Dam Inundation Hazard

Improved Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
358	$103,183,093	$53,454,864	$156,637,957	3

Figure 6-9. City of Carpinteria Critical Facilities and Dam Failure Inundation Areas



As listed in Table 6-23, there are nine critical facilities within the dam inundation zones. These facilities include the CVWD Maintenance Building and Headquarters Well, a sewage pump station, a medical station, Aliso Elementary School, and two bridges (Figure 6-9; see also, Section 6.6.3, *Dam Failure* of the 2022 MJHMP). All of these facilities would be affected by a failure of the Santa Monica Debris Basin.

Table 6-23. City of Carpinteria Critical Facilities at Risk to Dam Inundation Hazard

Type	Critical Facility	Dam Name	Total Value
Utilities	Water District Maintenance Building	Santa Monica Debris Basin	$1,500,000
Utilities	Sewage Pump Station 2	Santa Monica Debris Basin	$6,457,908
Utilities	Headquarters Well	Santa Monica Debris Basin	-
Utilities	Headquarters Well Control Building	Santa Monica Debris Basin	-
Utilities	Headquarters Well Enclosure	Santa Monica Debris Basin	-
EMS Station	American Medical Response Station 1	Santa Monica Debris Basin	-
Education	Aliso Elementary	Santa Monica Debris Basin	-
Bridge	2 Bridges	Santa Monica Debris Basin	-

The Santa Monica Debris Basin has a history of becoming plugged with debris. While debris is cleaned out regularly, it could pose a problem if storms arrive in rapid succession without time for the required maintenance. An Emergency Action Plan for the Santa Monica Debris Basin is maintained by Santa Barbara County Flood Control (City of Carpinteria 2014).

6.3.10 Wildfire

The county has extensive areas within mapped Fire Hazard Severity Zones and Wildland-Urban Interface (WUI) areas. These hazard areas generate vulnerability for life and structures, particularly within rural foothills areas where dry vegetation, steep slopes, and difficult access combine to create a high probability of wildfire. Based on these maps, the City has 1 acre (0.07 percent) within Very High Wildfire Threat areas, 35 acres (2.12 percent) within High Wildfire Threat areas, 148 acres (9.04 percent) within Moderate Wildfire Threat areas, and 8 acres (0.49 percent) within Low Wildfire Threat areas (Table 6-24).

Table 6-24. City of Carpinteria Fire Threat

Threat Level	Fire Threat Acres	Total Acres	Percent
Extreme Wildfire Threat	None	None	0%
Very High Wildfire Threat	1	1,643	0.07%
High Wildfire Threat	35	1,643	2.12%
Moderate Wildfire Threat	148	1,643	9.04%
Low Wildfire Threat	8	1,643	0.49%

Most of these areas are residential with limited vulnerabilities in commercial and agricultural areas. There are 47 residential properties and one industrial property located in High fire threat zones in the City of Carpinteria. Additionally, 80 residential, two agricultural, and one commercial properties in the City of Carpinteria are located in Moderate fire threat zones. These vulnerable areas are home to 425 residents and are valued at $88,753,343. None of the City's critical facilities fall within wildfire threat areas (see also, Section 6.3.1, *Wildfire* of the 2022 MJHMP).

Figure 6-10 depicts the location of the City's critical facilities relative to Fire Hazard Severity Zones. Figure 6-11 depicts critical facilities and WUI Zones within the City. Figure 6-12 depicts critical facilities and Fire Threat within the City.

Further, as indicated by Figure 4-1 of the MJHMP, emergency access and evacuation can be constrained in hillside neighborhoods and rural communities where limited ingress and egress can slow and prevent the efficient movement of people and vehicles. This is particularly true in denser communities with larger populations served by narrow local roads. During an evacuation, additional residents would depend on the existing roadway network to flee and emergency responders would have additional residents to protect and serve. Highway 101 is the only freeway evacuation route in the City of Carpinteria. Casitas Pass and Santa Monica Road lead north to Foothill Road, which serves as an alternate evacuation highway if Highway 101 closes from mudslide or fire disasters.

In the event of a wildfire, real-time emergency and disaster information for large-scale incidents is provided on the County's Ready Santa Barbara County website (see also, Chapter 4, C*ommunity Profile and Capability Assessment* of the MJHMP). However, access to this information requires an accessible and reliable internet connection and/or service provider. Further, during immediately threatening events, the Carpinteria-Summerland Fire Protection District (CSFPD) and Santa Barbara County Sheriff's Office may send emergency alerts and press release information through its Nixle alert system. Such systems are only effective if City residents are already signed up to receive alerts. This leaves populations with limited resources, existing social or economic disparities, language and communication barriers, and distrust of government programs, staff, and officials vulnerable.

Figure 6-10. Critical Facilities in Fire Hazard Severity Zones

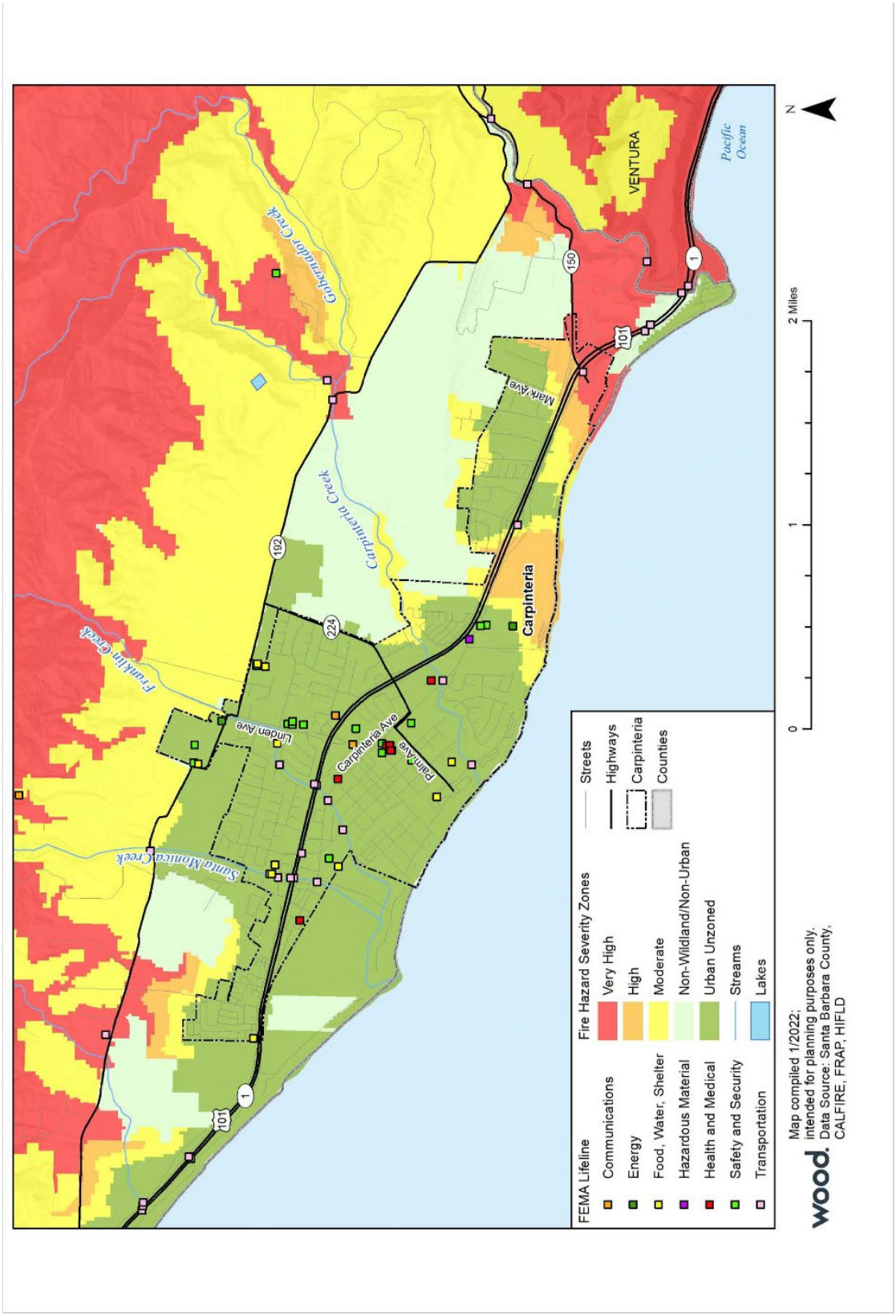


Figure 6-11. Critical Facilities in Wildland Urban Interface (WUI)

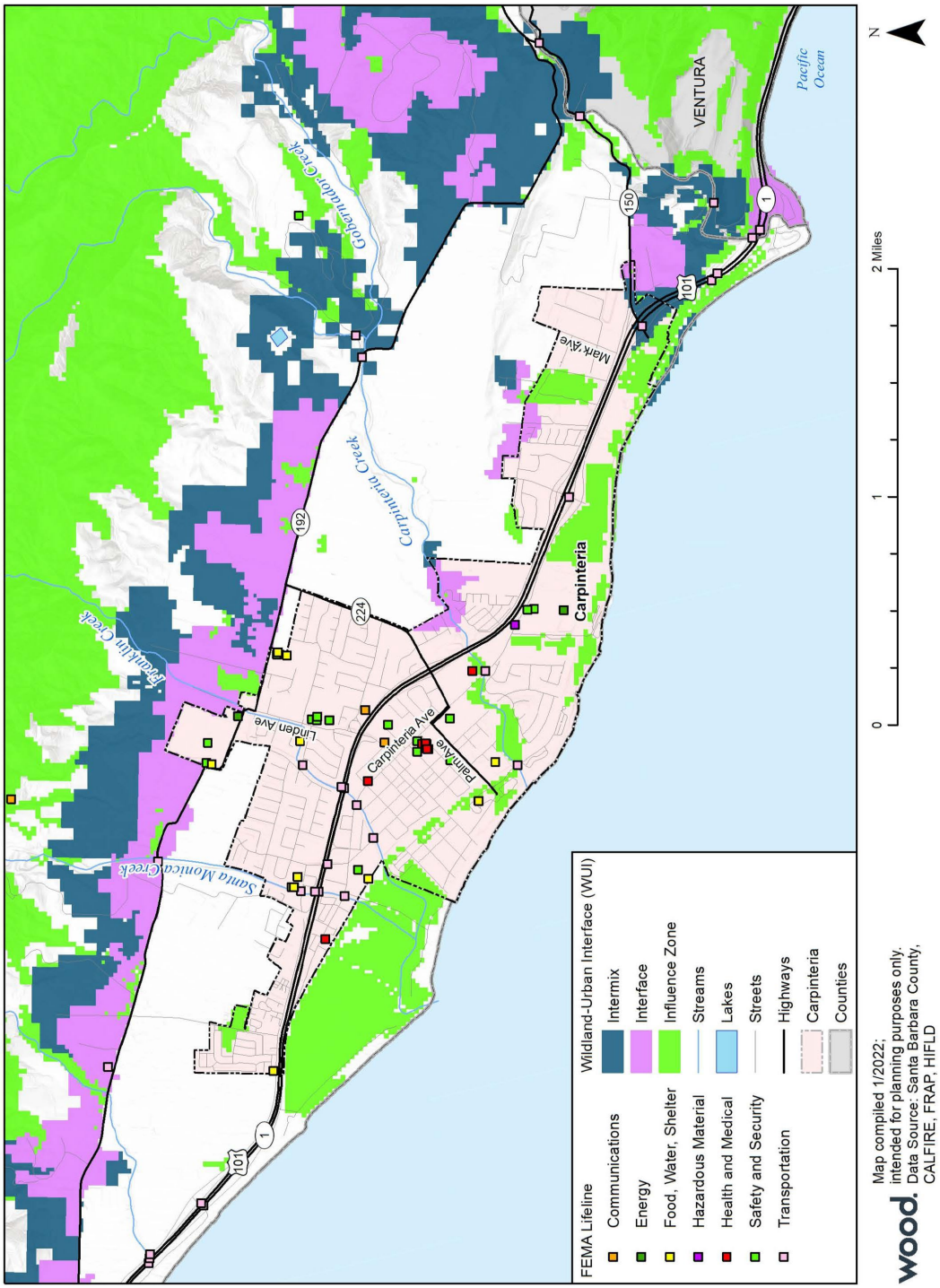
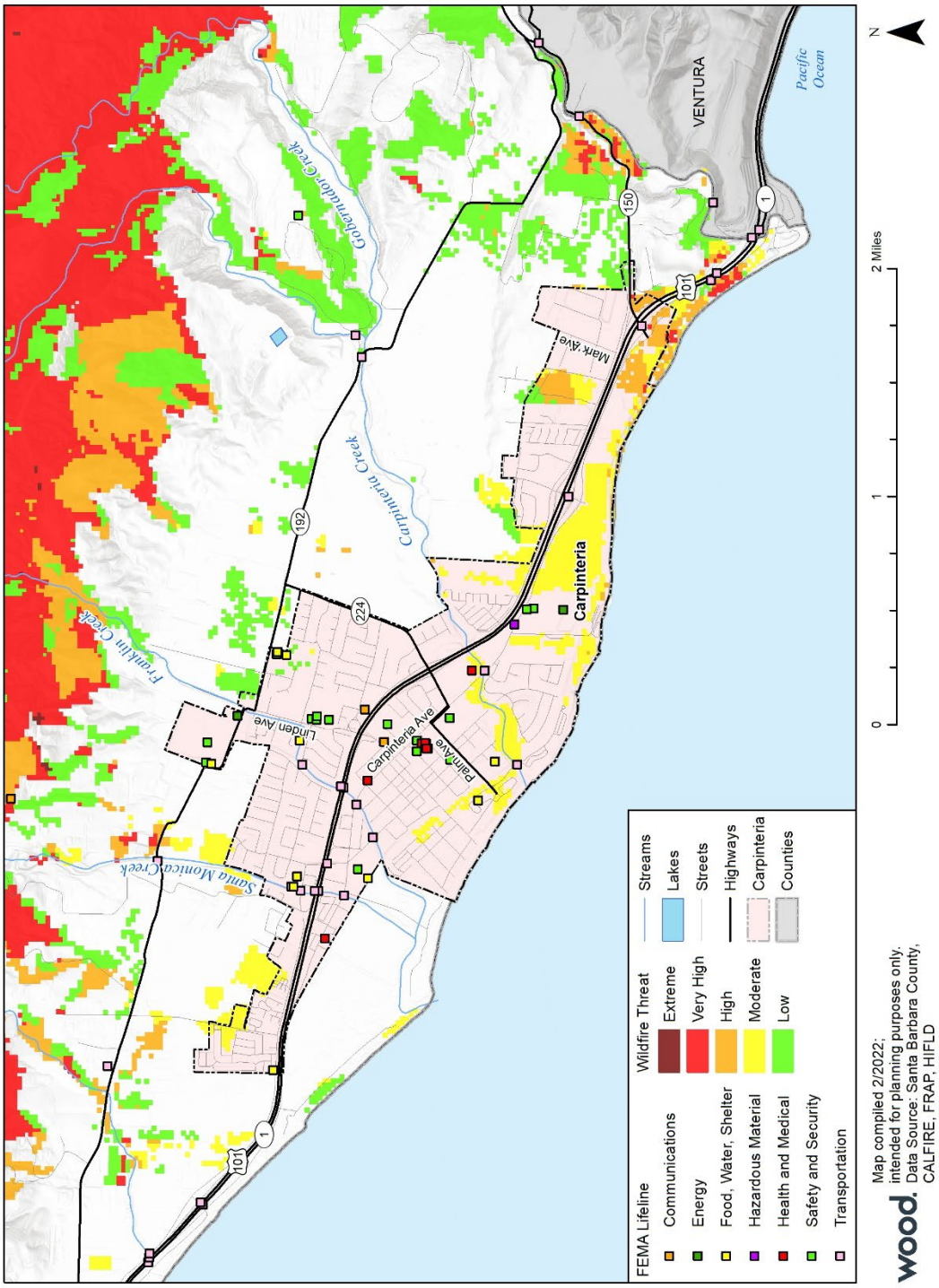


Figure 6-12. Critical Facilities in Fire Threat Zones



6.3.11 Tsunami

The University of Southern California Tsunami Research Group has modeled areas in Santa Barbara County that could potentially be inundated in the event of a tsunami. This model is based on potential earthquake sources and hypothetical extreme undersea, near-shore landslide sources were mapped and used to profile maximum potential exposure. The data was mapped by the California Geological Survey and California Office of Emergency Services (Cal OES) for Tsunami Evacuation Planning (Figure 6-13). As shown in this figure, much of the City's coastline and beaches are considered within tsunami hazard areas and threaten critical facilities and infrastructure within the City.

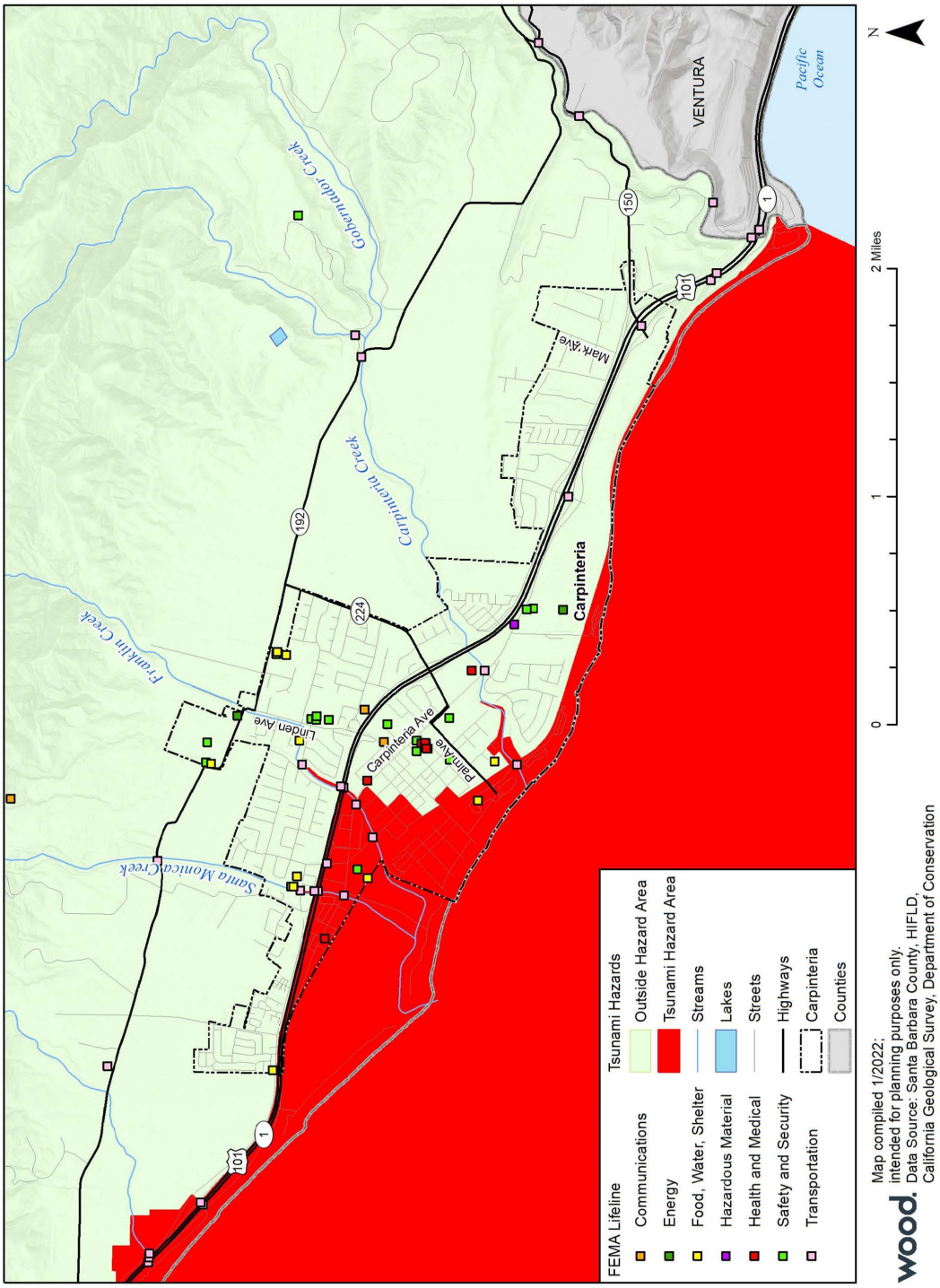
Areas of the City vulnerable to tsunami inundation are home to 2,332 residents and are valued at $405,364,480. These properties are primarily residential, with limited commercial and industrial uses.

Critical facilities were compared against the extreme tsunami inundation zone overlay to see whether they fall within the geographic extent of the hazard. Based on the GIS mapping, 10 Carpinteria critical facilities fall within the tsunami risk area, of which six facilities are bridges (Table 6-25). Other facilities within the tsunami hazard zone include critical infrastructures, specifically, two sewage pump stations. A medical station and Aliso Elementary School are also at risk for tsunami inundation. Together, these 10 facilities have an estimated structure value of over $9.9 million (Figure 6-13; see also, Section 6.3.9, *Tsunami* of the 2022 MJHMP).

Table 6-25. City of Carpinteria Critical Facilities in Tsunami Inundation Zone

Type	Name	Total Value
Utilities	Sewage Pump Station 2	$1,500,000
EMS Station	American Medical Response Station 1	$6,457,908
Education	Aliso Elementary	-
Bridge	6 Bridges	-

Figure 6-13. City of Carpinteria Critical Facilities and Tsunami Inundation Areas



6.3.12 Cyber Threat

In the event of a significant cyber-attack event, there could be a considerable impact on the population, built environment, lifeline infrastructure, environment, and the economy. A cyber threat can infiltrate many institutions including banking, medical, education, government, military, and communication and infrastructure systems. Cyber-attacks generated toward large corporations can negatively affect the economy. Attacks geared toward critical infrastructure and hospitals can result in the loss of life and the loss of basic needs, such as power and water, to the general public. Cyber-attacks can also lead to the loss of operational capacity.

The county provides the public with online guidance to avoid cyber risks and cyber-attacks on personal information, such as keeping software applications and operating systems up to date and limiting the personal information you share online (Ready 2021). Humans are the weakest link in a chain of cyber security; it remains difficult to continuously monitor and manage human/operator vulnerability. However, to address this weakness it is suggested that the City continues or develops a security training program which all employees are required to complete or renew annually.

6.3.13 Natural Gas Pipeline Rupture

No history of major natural gas pipeline or storage facility incidents have occurred in the City; although a minor rupture has occurred along the 20-inch high-pressure gas transmission line (600 pounds per square inch [psi]). It can be assumed that any facility near a natural gas transmission pipeline is at risk. This risk is heightened if the facility is also located in an area of high seismicity, where multiple gas line failures and resulting fires can be expected (Cal OES 2018).

Compounding the potential risk is the age and gradual deterioration of the gas transmission system due to natural causes. Significant failure, including pipe breaks and explosions, can result in loss of life, injury, property damage, and environmental impacts. Causes of and contributors to pipeline failures include construction errors, material defects, internal and external corrosion, operational errors, control system malfunctions, outside force damage, subsidence, and seismicity. Growth in population, urbanization, and land development near transmission pipelines, together with the addition of new facilities to meet new demands, may increase the likelihood of pipeline damage due to human activity and the exposure of people and property to pipeline failures (Cal OES 2018).

As described in Section 5.3.13, gas odorization facilities in the City, including the Carpinteria Natural Gas Odorant and Metering Facility and Pitas Point Facility, are no longer operating and are planned for decommissioning and removal by the Southern California Gas Company (SoCal Gas) in in the next 10 years.

6.3.14 Oil Spill

As described in Section 5.3.14, oil spills can be caused by people making mistakes or being careless, by equipment breaking down, by natural disasters, and by deliberate acts of terrorism, vandals, or illegal dumpers. Depending on the origin, size, and duration of the release, an oil spill can have serious impacts on air and water quality, public health, plant and animal habitat, and biological resources. Spill clean-up and remediation activities may cost millions of dollars and impacts can last for years (Cal OES 2018).

Since the close of operations at the Carpinteria Oil and Gas Processing Facility in 2017, the risk of onshore oil spill in the City has been significantly reduced. However, oil spills originating from offshore oil platforms can create devastating and significant impacts on the economy and natural environment of the City. During an oil spill, the oil floats on saltwater and often floats on freshwater. Depending on the type of oil, oil can sink in freshwater but usually, oil spreads out across a large area. Onshore oil spills result in similar impacts to surface waters, habitats, and wildlife. The environmental impacts from oil spills contribute to short- and long-term impacts on economic activities in areas affected by oil spills. Tourism may decline in the City, resulting in economic hardship on individuals that are dependent on those industries for their livelihood and on the economic health of the community. Oil spills may also impact recreational uses such as camping, non-commercial fishing, and beach visits (Cal OES 2018).

Wetlands, marshes, and other sensitive habitats, such as the Carpinteria Salt Marsh and the Carpinteria Seal Sanctuary, are especially at risk for long-term significant impacts of oil spills. Marshes and wetlands provide critical habitat to a diverse range of species, including migratory birds and endangered plants and animals. Once oil enters a marsh below sediment levels it becomes near impossible to remove and has longstanding impacts on wildlife and ecosystems.

The California Department of Fish and Wildlife (CDFW) Office of Spill Prevention and Response (Oiled Wildlife Division) treats countless thousands of oiled birds and other wildlife annually (Cal OES 2018).

6.3.15 Train Accident

As described in Section 5.3.15, trains running through the City, and near Highway 101 in some areas, carry commuters as well as commodities, such as hazardous materials and fuel (including oil). Train accidents are generally localized, and the incidents result in limited impacts at the community level. However, a hazardous material incident on rails or roadways in the City has the potential to damage and destroy habitat and built structures, harm people and wildlife, and shut down both rail and highway transportation routes where the rail line and Highway 101 are nearby. Secondary impacts related to train accidents may include the shutdown of rail transportation and associated effects on commuting, transportation of goods, and the regional economy.

The risk of train accidents in the City is limited to areas immediately surrounding Amtrak's Pacific Surfliner and Coast Starlight routes. Within the City, both of these routes hug the Pacific Coastline. The routes also run proximate to Highway 101 at the northwest and southeast corners of the City. As described in Section 6.3.4, *Coastal Hazards*, the railroad alignment along the Carpinteria Bluffs is highly vulnerable to coastal erosion. For example, with approximately 5 feet of sea level rise,

up to 1.4 miles of the UPRR could be damaged. This vulnerability may lead to pressure to repair existing seawalls or armor a significant portion of the City's shoreline, which could further impact coastal access, beach habitats, and sand supply. Coastal flooding could also impact the railroad in other parts of the City north of the Carpinteria Salt Marsh and in the City's Downtown core. Disruption of the railroad could have substantial economic impacts on the region (City of Carpinteria 2019).

6.3.16 Landslide

As described in Section 5.3.16, *Landslides*, landslides are most common on steep slopes made of loose soil and other material such as those found in North County and the South Coast, but they can also happen on shallower slopes. Landside susceptibility areas and the location of critical facilities are depicted in Figure 6-14.

Table 6-26 below summarizes the total exposure of properties in areas of the City at risk for landslide hazards. As shown therein, the City has 132 improved parcels valued at $128,827,530 and a population of approximately 318 at risk of landslide hazards. The majority of these properties are located at the base of the foothills just south of the Santa Ynez Mountains.

Table 6-26. City of Carpinteria at Risk to Landslide Hazard

Total Improved Parcel Count	Total Value	Population
132	$128,827,530	318

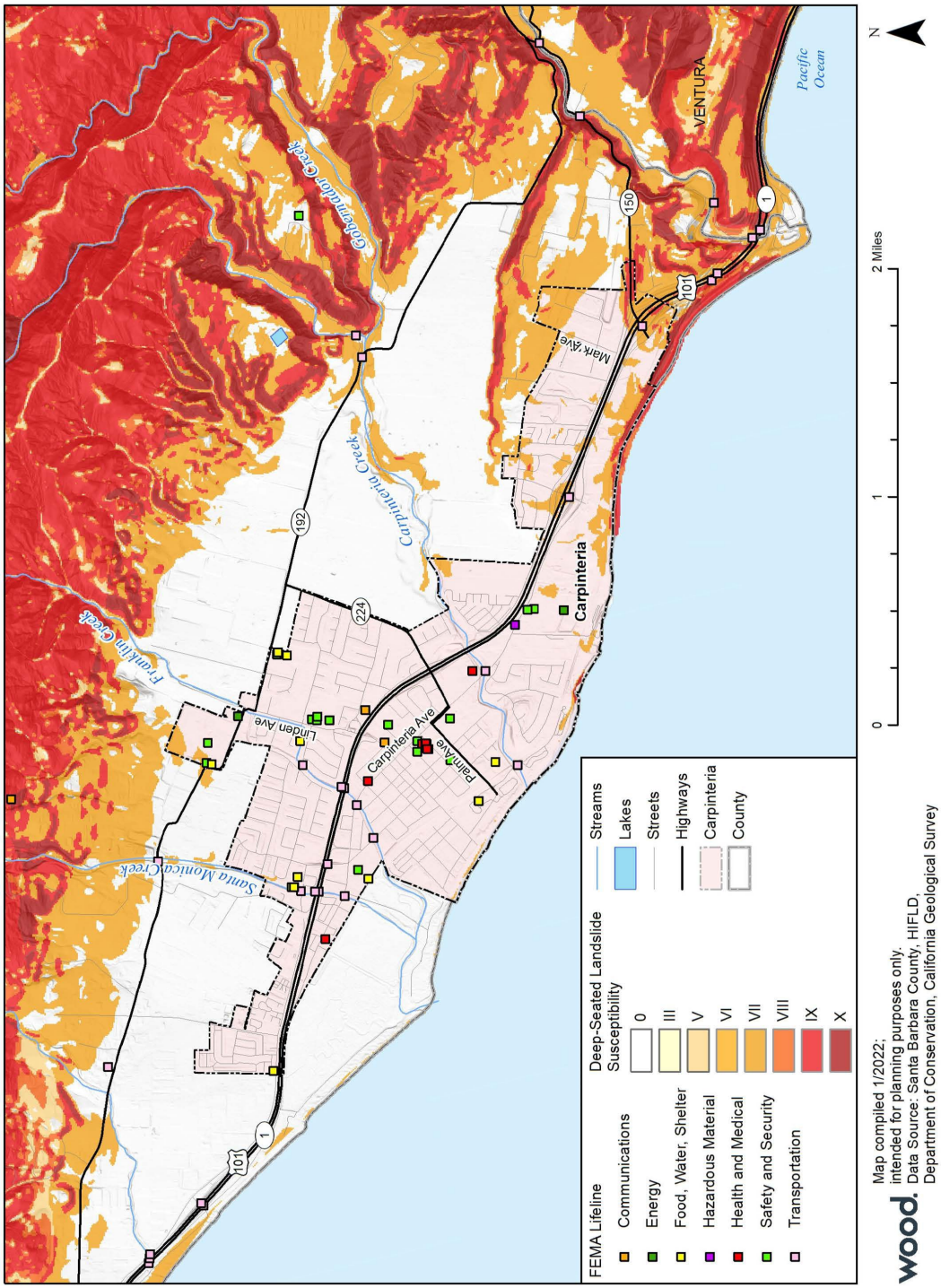
As listed in Table 6-27, two critical facilities in the City would be vulnerable to damage or destruction from landslides, including Rincon/Foothill High School and a bridge (Figure 6-14; see also, Section 6.3.7, *Landslide* of the 2022 MJHMP). Both of these critical facilities are located in the northern portion of the City at the base of the foothills just south of the Santa Ynez Mountains. All facilities not shown fall into the low-risk category.

Table 6-27. City of Carpinteria Critical Facilities in Landslide Zones

Type	Critical Facility	Landslide Severity Class	Total Value
Education	Rincon/Foothill High School	7	$210,720
Bridge	Bridge	7	-

If the Rincon/Foothill High School was damaged by landslides the facility would be unable to serve as a temporary community shelter to support emergency response and, if damaged while occupied by faculty, staff, or students, human life could be endangered. If the bridge is damaged by landslides, fire and emergency medical response or evacuation efforts in the area may be delayed.

Figure 6-14. City of Carpinteria Critical Facilities and Landslide Incidence



6.3.17 Hazardous Materials Release

As described in Section 5.3.17, *Hazardous Materials Release*, the release of hazardous materials into the environment can cause a multitude of problems for the population, built environment, lifeline infrastructure, environment, and the economy. The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e., liquid spill) may also be limited to the extent of the spill and remediated if needed.

While hazardous material incidents could take place anywhere across the City and could be unpredictable, higher risk areas include transportation-related infrastructure, such as roadways and railways, as well as areas within a half-mile in either direction of designated hazardous materials routes or hazardous waste treatment, storage, and disposal facilities. The locations and identity of facilities that store hazardous materials are reported to local and federal governments. Many facilities have their own hazardous materials guides and response plans, including transportation companies that transport hazardous materials. As shown in Figure 5-13, hazardous material sites in the City include the former Camarillo Auto Repair and former Carpinteria Oil and Gas Facility. However, because both these facilities are no longer operating, the risk of a hazardous material incident that could result in the release of hazardous materials affecting surrounding communities is low.

Hazardous material incidents can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These incidents would be more severe if they result in traffic delays on road closures on any of the designated truck routes or hazardous materials routes in the City, such as Highway 101. The primary economic impact of hazardous material incidents results in lost business, delayed deliveries, property damage, and potential contamination. Large and publicized hazardous material-related events can deter tourists and recreationists too. In addition, agricultural farm workers are most vulnerable to pesticide exposure and other hazardous material incidents associated with the agricultural operation.

Communities can be at risk if a chemical is used unsafely or released in harmful amounts into the environment. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life.

6.3.18 Geologic Hazards

As described in Section 5.3.18, *Geologic Hazards*, geologic hazards in the City include land subsidence, inland erosion, and expansive soils. However, instances of erosion within the City are primarily limited to coastal erosion along the exposed sea cliffs of the City. Vulnerabilities to coastal erosion are described in Section 6.3.4, *Coastal Hazards*. Earthquake-induced liquefaction vulnerabilities are discussed in Section 6.3.3, *Liquefaction (Earthquake)*. Therefore, the discussion below is limited to vulnerabilities from expansive soils and land subsidence. While these hazards often result in severe property damage, they typically do not present risks to human life.

While expansive soils are present in the City and areas of potentially highly expansive soil are limited to the western portion of the City and the El Estero salt marsh to the south, expansive soils are not identified as a major hazard. Policies outlined in the General Plan describe development

on areas identified as having a high potential for expansive soils require recommendations by a qualified geotechnical engineer to be integrated into project design (City of Carpinteria 2003).

As described in Section 5.3.18, *Geologic Hazards*, no vertical displacement (subsidence) has been measured for the Carpinteria Groundwater Basin, which underlies the City of Carpinteria. The lack of detailed data on land subsidence in the City makes it difficult to quantify potential losses. Most subsidence instances result in relatively minor damage and settling of buildings. Linear infrastructure (e.g., roads and bridges, water and sewer lines, pipelines) tends to have the most risk to land subsidence.

Typically, there is little impact on the natural environment from land subsidence. However, subsidence events can disrupt and alter the flow of surface or underground water, an impact that may not be noticed until long after the fact. However, the City's General Plan and Local Coastal Plan identify the potential for subsidence in the City is considered minimal, as no recognized subsidence has occurred within the City due to either groundwater or soil extraction (City of Carpinteria 2003).

Severe land subsidence can also reduce the future capacity of aquifers. For example, land subsidence is caused by loss of support underground, which can result from an overdraft of groundwater supplies (National Oceanic and Atmospheric Administration [NOAA] 2021b). Furthermore, soil compaction resulting from subsidence can permanently reduce aquafer capacity, impacting water supplies long into the future. Therefore, increased water pumping resulting from new development or increased agricultural production has the potential to increase the frequency and severity of subsidence. Increased efforts to monitor and manage groundwater pumping, increased accuracy of mapping, and emphasis on appropriate grading and ground compaction during development would help alleviate vulnerability for future development in unknown areas of risk. Further discussion of water storage loss can be found in Section 6.3.7, *Drought & Water Shortage*.

6.3.19 Windstorm

Severe winds, especially sundowner winds, can directly impact the City by damaging or destroying buildings, knocking over trees, and damaging power lines and electrical equipment (Santa Barbara County Planning and Development Department 2021). Secondary impacts of damage caused by wind events often result from damage to communication, transportation, or medical infrastructure. During severe wind events in and near the City, electricity transmission lines can be damaged or turned off by SCE, causing widespread power outages and hardships for City residents. Severe winds, particularly on steep slopes, can also damage communication facilities (Santa Barbara County Planning and Development Department 2021). Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies.

High winds can also cause severe indirect impacts by sparking wildfires and spreading them quickly over the terrain (Santa Barbara County Planning and Development Department 2021). The effects of wildfire on population, built environment, lifeline infrastructure, and the economy in the City of Carpinteria are further discussed in Section 6.3.10, *Wildfire*. Windstorms can also damage or destroy crops, affecting the economy and agricultural jobs in the Carpinteria Valley.

Vulnerable groups of the community are especially exposed to the indirect impacts of high winds, particularly the loss of electrical power. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity. Nursing homes, community-based residential facilities, and other special needs housing facilities are also vulnerable if electrical outages are prolonged since backup power generally operates only minimal functions for a short period.

6.3.20 Civil Disturbance

As described in Section 5.3.20, *Civil Disturbance*, the county has been historically vulnerable to some degree of civil disturbance unrest, particularly within the densely populated college community of Isla Vista and within larger cities surrounding the City of Carpinteria. However, there is no history of significant civil disturbance incidents in the City. Recently, the City has seen a rise in protests and demonstrations for social change (e.g., anti-racism, anti-vaccines for children), indicating that this type of civil disturbance may occur in the future. While these protests themselves are peaceful, they can be followed by sporadic post-demonstration vandalism (e.g., spray-painting buildings) (The Independent 2020).

Serious civil disturbances can be triggered by national or international events, or potentially local events that cause high levels of community concern. Based on historical occurrences, the City of Carpinteria's vulnerability to the potential for such civil disturbances is low.

Climate change may also result in increased civil disturbance over competition for natural resources. In this county, climate change-induced water shortages may increase competition for water between urban and agricultural users or between farming and natural resources preservation interests, although civil disturbances for such competition have not historically occurred.

6.3.21 Terrorism

In the unlikelihood of a significant terrorism event, there could be a considerable impact on the population, built environment, lifeline infrastructure, environment, and the economy. Terrorism can occur throughout the entire county but due to its intended purpose would most likely happen in more populous urban areas where more devastation and panic would ensue, such as the City of Santa Barbara, Isla Vista, or the City of Santa Maria. Military operations at Vandenberg Space Force Base (SFB) could be a target for terrorism, though unlikely given the location of the SFB in a remote coastal location over 100 miles north of the Los Angeles metropolitan area. Therefore, the City has a low likelihood of being targeted for terrorism.

6.3.22 Invasive Species

All of the City of Carpinteria, including wildlands, are vulnerable to invasive plant species. The City supports dozens of non-native species, with different potential to increase the vulnerability of native ecosystems, farmland, and even urban environments. Invasive plant species can increase maintenance costs for agriculture, homes, and roads. The City's natural environment is vulnerable to the uncontrolled spread of invasive plant species, which could reduce biodiversity, increase fire risk, and result in crop loss. For example, eucalyptus trees are non-native to California yet occur along the Carpinteria Creek riparian corridor and throughout the county. However, these trees are highly

flammable and can worsen the spread and severity of wildfire events. As described in Section 5.3.22, *Invasive Species*, the City of Carpinteria monitors and manages invasive plant species along the riparian corridors of creeks within the City as part of the Creeks Preservation Program.

Although not currently an issue, the City's marine environments may become vulnerable to, invasive species due to commercial shipping causing the introduction of non-indigenous species to the Santa Barbara Channel. Biofouling (i.e., the colonization of submerged surfaces by microorganisms) can affect submerged or wetted hard surfaces in the City, such as the Casitas Pier. Rapid reproduction can negatively disrupt an ecosystem in a short amount of time. Once these mussels are introduced into a waterway, there is no way to fully eradicate the species. To date, there are no indications that the City's waters, including Carpinteria, Santa Monica, and Franklin creeks, have been exposed to quagga or zebra mussels, and early detection monitoring has detected no mussels. Close monitoring of marine and lake vessels is performed in the county to prevent the colonization of marine invasive species in the county's water bodies.

6.3.23 Agricultural Pests

Agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, floods, freeze. The State of California Multi-Hazard Mitigation Plan attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations. Other agricultural hazards include fires, crop and livestock disease, noxious weeds, and contamination of animal food and water supplies.

A widespread infestation of crops could severely impact the economic base of the City and its communities employed by the agriculture industry. While agricultural production in the county can enhance the economy and improve human health and ensure stable food prices, certain habitats established for irrigation and agricultural output can also threaten human health by increasing the risk of vector-borne diseases (e.g., mosquitos, etc.). Jobs could be negatively impacted during an agriculture emergency. Critical facilities in the City would not be directly impacted by agricultural pests or diseases; however, the City's farms and the associated food processing facilities would be directly impacted economically by long-term disruptions in the food supply associated with crop losses due to agricultural pests and disease.

As further described in Section 6.5.5 of the MJHMP, rising temperatures and drought conditions due to climate change could also lead to increases in the occurrence and transport of pathogens in agricultural environments, which would increase the risk of food contamination and direct human exposure to pathogens and toxins (U.S. Global Change Research Program 2016).

The County of Santa Barbara's Pest Exclusion Program acts as the first line of defense to prevent pests and diseases that are potentially devastating to crops and livestock from becoming established. Incoming plant material is inspected at mail carriers, nurseries, retailers, and homes for pests (County of Santa Barbara Agricultural Commissioner's Office 2020). Pesticides, herbicides, and antibiotics can also help crops resist pests and diseases and new cultivars of crops that are heat and drought-resistant can be planted. However, this may be expensive for farm owners and there may be hesitancy from the community.

7.0 MITIGATION PLAN

7.1 MITIGATION GOALS AND OBJECTIVES

As a key part of the 2022 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Update, Mitigation Advisory Committee (MAC) members reviewed the goals and objectives from the 2017 plan and made the following adjustments to better reflect current conditions, community inputs, and agency concerns. The City of Carpinteria adopted the same mitigation goals for the Local Hazard Mitigation Plan (LHMP) as updated for the 2022 MJHMP update. The updated goals and objectives of this plan are:

Goal 1: Ensure future development is resilient to known hazards.

Objective 1.A: Ensure development in known hazardous areas is limited or incorporates hazard-resistant design based on applicable plans, development standards, regulations, and programs.

Objective 1.B: Educate developers and decision-makers on design and construction techniques to minimize damage from hazards.

Goal 2: Protect people and community assets from hazards, including critical facilities, infrastructure, water, and public facilities.

Objective 2.A: Enhance the ability of community assets, particularly critical facilities, to withstand hazards.

Objective 2.B: Use best available science and technology to better protect life and property.

Objective 2.C: Upgrade and replace aging critical facilities and infrastructure.

Objective 2.D: Ensure mitigation actions encompass vulnerable and disadvantaged communities to promote social equity.

Goal 3: Actively promote understanding, support, and funding for hazard mitigation by participating agencies and the public.

Objective 3.A: Engage, inform, and educate the public on tools and resources to improve community resilience to hazards, reduce vulnerability, and increase awareness and support of hazard mitigation activities.

Objective 3.B: Ensure effective outreach and communications to vulnerable and disadvantaged communities.

Objective 3.C: Increase awareness and encourage incorporation of hazard mitigation principles and practice among public, private, and nonprofit sectors, including all participating agencies.

Objective 3.D: Ensure interagency coordination and joint partnerships with the County, cities, state, tribal, and federal governments.

Objective 3.E: Continuously improve the County's capability and efficiency at administering pre- and post-disaster mitigation programs, including providing technical support to cities and special districts and providing support for implementing local mitigation plans.

Objective 3.F: Monitor and publicize the effectiveness of mitigation actions implemented countywide.

Objective 3.G: Position the County and participating agencies to apply for and receive grant funding from FEMA and other sources.

Goal 4: Minimize the risks to life and property associated with urban and human-caused hazards.

Objective 4.A: Minimize risks from biological hazards, including disease, invasive species, and agricultural pests.

Objective 4.B: Be prepared and respond to urban hazards, including terrorism, cyber threats, and civil disturbance.

Objective 4.C: Minimize risks from energy production, including hazardous oil and gas activities.

Goal 5: Prepare for, adapt to, and recover from, the impacts of climate change and ensure regional resiliency.

Objective 5.A: Use the best available climate science to implement hazard mitigation strategies in response to climate change.

Objective 5.B: Identify, assess, and prepare for impacts of climate change.

Objective 5.C: Coordinate with the public, private, and nonprofit sectors to implement strategies to address regional hazards exacerbated by climate change.

Objective 5.D: Ensure climate change hazard mitigation addresses vulnerable and disadvantaged communities.

7.2 STATUS OF PREVIOUS MITIGATION ACTIONS

Since 2017, the City has incorporated the LHMP goals, objectives, and mitigation actions into its local plans and processes, including the General Plan Safety Element by reference, specific hazard planning efforts (e.g., Sea Level Rise Vulnerability Assessment and Adaptation Plan, General Plan/CLUP update), the City's grant pursuits, and capital improvement planning. Ongoing monitoring and evaluation of the LHMP by the City ensured mitigations are implemented and tracked. Key mitigation actions completed since 2017 include updating the Master Drainage Plan and Floodplain Management Ordinance and completing the Sea Level Rise Vulnerability Assessment and Adaptation Plan. The City is also underway with a comprehensive update of the General Plan/Coastal Land Use Plan, including the Safety Element.

During the planning process for the LHMP update, the City's Local Planning Team (LPT) reviewed the mitigation actions identified in the 2017 LHMP, which include several strategies brought forward from the 2011 LHMP, to determine the status of each mitigation action. These actions from the 2017 LHMP were revisited, re-evaluated, and in some cases re-prioritized for inclusion in the 2022 LHMP. All incomplete projects were reassessed by the LPT and, if deemed necessary, are included in the Mitigation Implementation Plan (Section 7.4). Table 7-1 provides a summary report for each mitigation action included in the former 2017 LHMP, including the current status (e.g., completed,

ongoing, not started, under construction) and whether the action has been included in the 2022 implementation plan provided in Section 7.4.

Table 7-1. Status of Previous Mitigation Actions

Project Number	Project Description	Comments	Status	In 2022 Plan?
EQ-1	Work with Venoco, Inc. to research Earthquake Related Risks at the Venoco Oil and Gas Processing Facility	Chevron is now in control of the property and the facility is shut down. Application to decommission the site has been submitted and is under review.	Cancelled	
EQ-2	Work with the Southern California Gas Company (SoCal Gas) and the California Public Utilities Commission (CPUC) to review gas pipeline safety documents and to conduct public outreach related to gas pipeline safety	While the Carpinteria Gas Odorant and Metering Facility was shut down in 2018, the City continues to coordinate with SoCal Gas and the CPUC to ensure gas pipeline safety until full decommissioning of the facility in 2023.	Ongoing	X
FLD-1	Update Master Drainage Plan	Completed in 2015.	Completed	
FLD-2	Update Floodplain Management Ordinance	Completed in 2015.	Completed	
FLD-3	Expand participation in the National Flood Insurance Program (NFIP) Community Rating System (CRS)	The City continues to work actively to expand its participation in the NFIP.	Ongoing	X
FLD-4	Carpinteria Avenue Bridge Replacement	Construction of this project has not begun; however, it is planned to be completed in 2026.	Not Started	X
FLD-5	Linden/Casitas Interchanges	Though the public infrastructure is deemed for public beneficial use as of September 2020, the City does not consider the project "complete" because the California Department of Transportation (Caltrans) has not yet fulfilled its conditions of approval for the Condition Use Permit/Coastal Development Permit.	In Progress	X
FLD-6	General Plan/Coastal Land Use Plan Update	Grant-funded program to include analysis of climate change impacts and development of policies addressing sea level rise, drought habitat changes, and increased weather-related hazards.	In Progress	X
GEN-1	Community Emergency Response Team (CERT) Training	While this program is ongoing, all CERT training has been halted due to the Covid-19 pandemic.	Ongoing	X
GEN-2	Create a disaster response supplies warehouse for emergency supplies at City Hall	The City will secure the location and update supplies and materials - budgetary restrictions may apply.	In Progress	X
GEN-3	Provide information to residents to increase community awareness of early warning systems	The City will provide information to residents on the County's "Aware & Prepare" alert system that was implemented in 2016.	Ongoing	X

Project Number	Project Description	Comments	Status	In 2022 Plan?
GEN-4	Conduct Critical Facility Audit	The updated list was completed in 2021. The City will continue to update as needed.	Ongoing	X
GEN-5	Update Comprehensive Emergency Response Plan	The City's updated Emergency Operations Plan was completed in 2014.	Ongoing	X
GEN-6	Conduct community disaster education programming related to general disaster preparedness	The City will conduct public outreach related to general disaster preparedness on an ongoing basis.	Ongoing	X
GEN-7	Host Annual Oil & Gas System Safety Review Group Meeting	These meetings between the City and Venoco personnel as well as other regulators such as APCD occurred between 2009 to 2017 and facilitated discussion of regulatory compliance matters associated with the operation of the Carpinteria Oil & Gas Processing Facility (CPF). Venoco's bankruptcy occurred as part of a broader reduction of oil and gas production in the region and the Interagency Decommissioning Working Group (IDWG), led by Bureau of Safety and Environmental Enforcement and Bureau of Ocean Energy Management, was formed in response to this reduction of assets on federal leases in the Santa Barbara Channel. The IDWG facilitates interagency coordination concerning decommissioning of offshore oil platforms and pipelines in the Santa Barbara Channel. Chevron took over the CPF for the purpose of decommissioning because, as the legacy operator, Chevron retains environmental liability. Once decommissioning is complete, these meetings may wind down and/or shift emphasis to other coordination issues.	In Progress	X
GEN-8	Participate in County Drought Task Force	Multi-jurisdictional drought task force to assess vulnerabilities and monitor drought conditions, water supply.	Ongoing	X
WDF-3	Perform a Comprehensive Evaluation of all Wildfire Hazard Reduction Programs	Programs are driven by federal grant money and are ongoing in various phases based on funding.	Ongoing	X
WDF-4	Firewise Community Planning and Prevention Techniques	Completed in 2012.	Completed	

7.3 PRIORITIZATION PROCESS

Per the Disaster Mitigation Act (DMA) of 2000 requirements, the LHMP update used a cost-benefit methodology in determining action priority; however, this was not quantitative analysis. Once the available mitigation actions were identified by City staff, stakeholders, and the public, each action was evaluated for cost-benefit considerations to assist in prioritizing each measure. The priority for implementing mitigation recommendations depends upon the overall cost-effectiveness of the recommendation when considering monetary and non-monetary costs and benefits associated with

each action. Additionally, the following questions would be considered when developing the Cost-Benefit Review:

- How many people will benefit from the action?
- How large an area is impacted?
- How critical are the facilities that benefit from the action?
- Environmentally, does it make sense to do this project for the overall community?

The cost-benefit considerations are included in the Mitigation Priority and Performance summary tables below each mitigation action presented in Section 7.4, *Mitigation Implementation Plan*. Based on these cost-benefit considerations determined by the LPT, the relative priority rank (High, Medium, and Low) is also included in the Mitigation Priority and Performance summary tables below. The general category guidelines are listed below:

- **High** – Benefits are perceived to exceed costs without further study or evaluation
- **Medium** – Benefits are perceived to exceed costs but may require further study or evaluation before implementation
- **Low** – Benefits and costs evaluation requires additional evaluation before implementation

7.4 MITIGATION IMPLEMENTATION PLAN

This Mitigation Implementation Plan was developed to present the recommendations developed by the LPT for how the City can reduce the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

The Mitigation Implementation Plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also considers the benefit-cost of the action to meet the regulatory requirements of the DMA. The Mitigation Implementation Plan identifies the updated mitigation actions for the City of Carpinteria. Actions specific to the County and other participating agencies are detailed in the 2022 MJHMP Update and other jurisdictional annexes, respectively.

It is important to note that the City has numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as general plan elements, community wildfire protection plans, and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their source document (see also, Chapter 4.0, *Capability Assessment*). The City also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

2022-1. Review and Conduct Public Outreach Related to Gas Pipeline Safety

The City shall continue to work with the Southern California Gas Company (SoCal Gas) and the California Public Utilities Commission (CPUC) to review high-pressure gas pipeline safety documents

and to conduct public outreach related to gas pipeline safety. The City shall focus on key areas of public concern.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Earthquake, Energy Shortage & Resiliency, Natural Gas Pipeline Rupture
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$1,000 annually/General fund for staff salaries, CPUC grants
Responsible Agency/Department	Public Works Department
Cost-Benefit Consideration	While it would require time and planning with SoCal Gas and the CPUC to review high-pressure gas pipelines and conduct associated public outreach, this action would ensure gas pipeline safety to avoid potential pipeline rupture or leaks.
Comments	This mitigation action is adapted from EQ-2 included as part of the 2017 LHMP.

2022-2. Expand Participation in the National Flood Insurance Program (NFIP) Community Rating System (CRS)

The City shall continue to work actively to expand its participation in the NFIP CRS. The CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. In CRS communities, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts that address the three goals of the program:

1. Reduce and avoid flood damage to insurable property
2. Strengthen and support the insurance aspects of the National Flood Insurance Program
3. Foster comprehensive floodplain management

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise)
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$5,000/General fund for staff salaries
Responsible Agency/Department	Public Works Department
Cost-Benefit Consideration	While this action does not directly mitigate existing flood hazards in the City, it is an ongoing action that supports community-wide floodplain management practices and reduces flood insurance premium rates in the City.
Comments	This mitigation action is adapted from FLD-3 included as part of the 2017 LHMP.

2022-3. Carpinteria Avenue Bridge Replacement

The existing bridge deck at Carpinteria Avenue is severely deteriorated and has inadequate hydraulic capacity under the bridge for flood flows. The purpose of the project is to remove the

structurally deficient bridge and replace it with a bridge designed to meet current structural, geometric and hydraulic standards.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Earthquake, Flood, Coastal Hazards
Estimated Timeline	2026
Estimated Cost/Funding Source	$14 million/Federal Highway Bridge Program, Local highway, interchanges, and bridges development impact fees
Responsible Agency/Department	Public Works Department
Cost-Benefit Consideration	While construction of the bridge would cost money, it is required to ensure the bridge meets all safety requirements during heavy rain.
Comments	This mitigation action is adapted from FLD-4 included as part of the 2017 LHMP.

2022-4. Linden/Casitas Interchanges

The Highway 101: Linden and Casitas Pass Project is a combination of local circulation improvements and key bridge replacements that prepare for future Highway 101 widening. The roadway extensions, bike lanes, and sidewalk improvements make it easier for residents to use local streets for in-town trips. The longer overcrossings, new bridges, and safer on and off-ramp connections all prepare for the future addition of a carpool lane on Highway 101. Though the public infrastructure is deemed for public beneficial use as of September 2020, the City does not consider the project "complete" because the California Department of Transportation (Caltrans) has not yet fulfilled its conditions of approval for the Condition Use Permit/Coastal Development Permit. The City shall continue to coordinate with Caltrans to fulfill its conditions of approval.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Earthquake, Flood, Coastal Hazards
Estimated Timeline	2022
Estimated Cost/Funding Source	$60 million/Federal Highway Bridge Program, Local highway, interchanges, and bridges development impact fees
Responsible Agency/Department	Public Works Department, Caltrans, Santa Barbara County Association of Governments (SBCAG)
Cost-Benefit Consideration	This action will make local travel easier in Carpinteria.
Comments	This mitigation action is adapted from FLD-5 included as part of the 2017 LHMP.

2022-5. General Plan/Coastal Land Use Plan (GP/CLUP) Update

The City shall continue to work on this grant-funded program to update the 2003 combined GP/CLUP document. There will be two new elements of the General Plan: 1) the Climate Change and Resiliency Element, which will be based on the City's Sea Level Rise Vulnerability Assessment and Adaptation Plan (SLRVAAP), and 2) the Healthy Community Element, a multi-disciplinary element that focuses on public health.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	All Hazards
Estimated Timeline	2023
Estimated Cost/Funding Source	$1 million/California Coastal Commission grant, General fund for staff salaries
Responsible Agency/Department	Community Development Department (CDD)
Cost-Benefit Consideration	While the mandatory GP/CLUP Update would cost money, this action is partially grant-funded and would provide the City with a long-term guidance document to plan for future development, policies, and programs.
Comments	This planning process was halted due to the COVID-19 pandemic. This mitigation action is adapted from FLD-6 included as part of the 2017 LHMP.

2022-6. Community Emergency Response Team (CERT) Training

The Carpinteria-Summerland Fire Protection District (CSFPD) supports and assists the City of Carpinteria and the County of Santa Barbara with CERT Training.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	All Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$2,500/ General fund for time and materials, FEMA Building Resilient Infrastructure and Communities Grant
Responsible Agency/Department	CSFPD
Cost-Benefit Consideration	CERT provides City residents with emergency preparedness training to prevent property damage, injuries, and fatalities during hazardous events.
Comments	While this program is ongoing, all CERT training has been halted due to the Covid-19 pandemic. This mitigation action is adapted from GEN-1 included as part of the 2017 LHMP. Training is expected to resume in 2022

2022-7. Listos Training

Listos is a grass-roots disaster preparedness program that partners with community leaders, jurisdictions, non-profits, faith-based organizations, schools, and other community institutions to provide disaster preparedness information to the Spanish-speaking community. With a basic understanding of Incident Command Structure, Listos can instruct the participants in the command structure of First Responders, ensuring communication between Listos graduates and firefighters and police in the event of an emergency. The California Office of Emergency Services (Cal OES) recently announced that funding is available for peer-to-peer education and outreach activities designed to build readiness and protect lives in communities too often overlooked by traditional emergency management programs, such as Listos. The City shall obtain Cal OES grant funding provide local Listos Training to support emergency preparedness within the Spanish-speaking community.

Mitigation Priority and Performance	
Priority	High

Mitigation Priority and Performance	
Hazards Mitigated	All Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$25,000/Cal OES Listos Grant
Responsible Agency/Department	Public Works Department, County Flood Control District
Cost-Benefit Consideration	While Listos training would cost money, this training would be covered by the Cal OES Listos Grant and would provide emergency preparedness education to the Spanish-speaking community of Carpinteria, which are often overlooked and not able to participate in CERT training.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-8. Emergency Response Supplies Warehouse at City Hall

The City's emergency supplies have been stored in the dedicated CERT trailer and a separate closet in City Hall since the recent renovation of City Hall. The City shall secure the location of a supply warehouse within City Hall. The City shall consolidate and organize existing supplies in this new warehouse location and then update with new supplies and materials, as needed.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	All Hazards
Estimated Timeline	2023
Estimated Cost/Funding Source	$15,000/General fund for staff salaries
Responsible Agency/Department	Emergency Services Division
Cost-Benefit Consideration	Creation of an emergency response supplies warehouse would require time and planning by City staff; however, it would benefit the City to have all emergency supplies organized in one designated location.
Comments	This mitigation action is adapted from GEN-2 included as part of the 2017 LHMP. Budgetary restrictions may apply.

2022-9. Increase Community Awareness of Early Warning Systems

The City shall increase community awareness of early warning systems by providing residents information on County alert systems. The City has provided early warning systems information in the Emergency Operations Plan and at community disaster education presentations through *Don't Panic! Prepare!* since 2008. The City shall continue to utilize every opportunity to register residents at ReadySBC.org, the County's existing alert system. Additionally, the City is developing a social media campaign on an ongoing basis to include educational information about emergency warnings and orders.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	All Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$5,000/General fund for staff salaries
Responsible Agency/Department	Emergency Services Division

Mitigation Priority and Performance	
Cost-Benefit Consideration	Early warning systems are the best way to alert residents of hazardous events and the best response when they occur. Encouraging residents to register for the County's alert system requires little cost and planning.
Comments	This mitigation action is adapted from GEN-3 included as part of the 2017 LHMP.

2022-10. Conduct Critical Facility Audit

The City's Critical Facilities list was updated in preparation for this LHMP in 2021. The City shall collect and maintain accurate and detailed critical facility information to ensure the next LHMP update can include a more accurate risk assessment. Data that should be collected for critical facilities should include structural system, the number of stories, year of construction, seismic code used for design, building square footage, construction materials, building replacement value, and content replacement value. This should also be done for schools. A review of each participating agency's critical facilities list shall occur annually and be confirmed by emergency management staff.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	All Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$2,000 annually/General fund for staff salaries
Responsible Agency/Department	Emergency Services Division
Cost-Benefit Consideration	This action will require time and planning by City staff; however, an updated critical facilities list would ensure the next LHMP update can include a more accurate risk assessment.
Comments	This mitigation action is adapted from GEN-4 included as part of the 2017 LHMP.

2022-11. Update Comprehensive Emergency Operations Plan

The City's most recent Emergency Operations Plan was updated in 2015. The City shall update the Emergency Operations Plan based on the capabilities, hazards, and vulnerabilities identified in this LHMP.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	All Hazards
Estimated Timeline	2023
Estimated Cost/Funding Source	$50,000/General fund for staff salaries
Responsible Agency/Department	Emergency Services Division
Cost-Benefit Consideration	While the Emergency Operations Plan update would require time and planning, the plan would benefit the City by outlining the planned courses of action for each City department should a hazardous event occur.

Mitigation Priority and Performance	
Comments	This mitigation action is adapted from GEN-5 included as part of the 2017 LHMP.

2022-12. Community Disaster Education Programming

Don't Panic! Prepare! is a public education and awareness program run by the City's Emergency Services Division, which is designed to increase emergency preparedness at home, work, and school for City residents. The program features free customizable emergency preparedness training for residents in coordination with community partners. The City shall continue to conduct public outreach related to general disaster preparedness on an ongoing basis.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	All Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$7,000/General fund for staff salaries
Responsible Agency/Department	Emergency Services Division
Cost-Benefit Consideration	This public education and awareness program is an ongoing program that requires little maintenance costs and provides helpful emergency preparedness information to City residents.
Comments	This mitigation action is adapted from GEN-6 included as part of the 2017 LHMP.

2022-13. Participate in County Drought Task Force

The County's Drought Task Force has been established "to seek countywide solutions to the current drought situation, and to provide the best advice possible to local decision-makers." The County identifies mitigation action 2022-91 in the MJHMP to maintain the Drought Task Force to 1) Assess vulnerability to drought risk; 2) Monitor drought conditions; 3) Monitor water supply; 4) Plan for drought; 5) Develop related mitigation projects and programs. The City shall continue to participate in the multi-jurisdictional drought task force to assess vulnerabilities and monitor drought conditions and water supply.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Drought & Water Shortage, Agricultural Pests
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$1,000 - $10,000 annually/FEMA Building Resilient Infrastructure and Communities Grant, FEMA Emergency Management Program Grant, General Fund
Responsible Agency/Department	County Executive Office (CEO) / Environmental Program Manager
Cost-Benefit Consideration	Participation in the County's Drought Task Force requires time and planning; however, this would allow the City to stay informed on regional drought conditions and water supply.
Comments	This mitigation action is adapted from GEN-8 included as part of the 2017 LHMP.

2022-14. Comprehensive Evaluation of all Wildfire Hazard Reduction Programs

The Community Wildfire Protection Plan is a community-based plan that assesses the community's exposure and vulnerabilities to wildfire threats, serves to guide the community in an effort to reduce the wildfire threat. The plan also provides an opportunity for federal funding to help fund implementation of the plan. This Community Wildfire Protection Plan was developed through a collaborative process involving the CSFPD, surrounding fire agencies, County officials, County, state, and federal land management agencies, and community members. It meets the Community Wildfire Protection Plan requirements set forth in the federal Healthy Forests Restoration Act.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Wildfire
Estimated Timeline	Ongoing/Every 10 years
Estimated Cost/Funding Source	$150,000/Federal vegetation management funds/grants
Responsible Agency/Department	CSFPD
Cost-Benefit Consideration	This Community Wildfire Protection Plan provides a science and engineering-based assessment of the wildfire threat in the wildland-urban interface (WUI) of the CSFPD.
Comments	This mitigation action is adapted from WDF-3 included as part of the 2017 LHMP. The City of Carpinteria (Dave Durflinger) signed off on the Community Wildfire Protection Plan Update in August 2021.

2022-15. Create Solar and Storage Permitting Procedures

The City shall update residential and small commercial ordinances for combined solar and storage systems to go beyond Assembly Bill (AB) 2188 and AB 546 regulations. To do this, the City must:

1. Implement electronic submission for energy storage permitting; and
2. Update Carpinteria Municipal Code Section 15.29 – Solar Energy Permitting to streamline permitting for larger sized systems, up to anywhere between large residential (<20 kilowatts [kW]) to small commercial systems (<100 kW), with a checklist of planning and zoning requirements that must be, and typically are, met to make projects eligible for the streamlining.

Other potential methods to streamline permitting beyond current requirements are listed below:

1. Enable online permit submissions and over-the-counter permits for larger systems;
2. Pilot solar design software for solar developers that only creates designs that are already permit approved; and
3. Enable virtual safety inspections for solar installations.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Energy Shortage & Resiliency
Estimated Timeline	2024

Mitigation Priority and Performance	
Estimated Cost/Funding Source	$30,000 annually/General fund for staff salaries, FEMA Hazard Mitigation Grant, FEMA Building Resilient Infrastructure and Communities Grant, PG&E Better Together Resilient Communities Grant Program
Responsible Agency/Department	CDD, Public Works Department
Cost-Benefit Consideration	This action would require time and planning but would help the City become a desirable area for solar installers to operate.
Comments	This mitigation action is adapted from Strategy 5.1.1 included as part of the 2019 Strategic Energy Plan (SEP).

2022-16. Commercial Building Energy Benchmarks

While state-wide building codes are aimed at making new construction more energy-efficient, energy benchmarking is aimed at reducing the energy use of already constructed buildings. Energy benchmarking involves a comparison of how much energy buildings use, normally specified per square foot so that it applies to buildings of different sizes. Depending on the implementation, it can be either voluntary or mandatory. The City shall institute energy benchmarks for large commercial buildings to encourage commercial building owners to undertake energy projects.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Energy Shortage & Resiliency
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$45,000 - $65,000 annually/General fund for staff salaries
Responsible Agency/Department	CDD, Public Works Department
Cost-Benefit Consideration	This action would require time and administrative work; however, energy benchmarking would reduce the energy use of existing large commercial buildings that comprise a large amount of the City's energy use.
Comments	This mitigation action is adapted from Strategy 5.1.2 included as part of the 2019 SEP.

2022-17. Backup Inverter Program

This program aims to promote backup inverters to bridge the gap between the low up-front costs and high emissions of a backup generator and the high up-front costs and lack of emissions from battery storage. The City would need to avoid pushing a specific vendor or solution, but if the City releases a Request for Offers for vendors to provide solutions, they may receive more applicants.

The City shall conduct research on possible solutions and vendors for backup power supplies to create a draft Request for Offers with a request for solar and backup inverter standard offers, with specifications including the amount of backup power and cost.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Energy Shortage & Resiliency
Estimated Timeline	2025-2027

Mitigation Priority and Performance	
Estimated Cost/Funding Source	$25,000 annually/General fund for staff salaries, FEMA Building Resilient Infrastructure and Communities Grant, PG&E Better Together Resilient Communities Grant Program
Responsible Agency/Department	Public Works Department
Cost-Benefit Consideration	Implementation of a backup inverter program would require research and planning. Backup inverters provide a small amount of power from solar panels while they are active, but as with solar panels without batteries, do not provide power during the night.
Comments	This mitigation action is adapted from Strategy 5.2.1 included as part of the 2019 SEP.

2022-18. Diversify Funding Streams

The City shall diversify its funding streams using one or more of the following proposed methods:

1. Aggressively pursue new federal, state, and private foundation funding sources;
2. Continue to work closely with the CPUC and Southern California Edison (SCE) to maximize the City's share of existing renewable program funding; and
3. Partner with other nearby regional governments to create energy programs.

The City shall continue to work with the CPUC and SCE both to maximize its intake from a utility funding stream that may decrease and to receive CPUC funding that would otherwise go to utilities to administer local programs.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Energy Shortage & Resiliency
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$10,000 - $15,000 annually/General fund for staff salaries, CPUC funding
Responsible Agency/Department	Public Works Department, CPUC, SCE
Cost-Benefit Consideration	While diversifying funding streams would require planning and coordination with other agencies, this action would ensure the City has a stable funding stream that is not dependent on any one source.
Comments	This mitigation action is adapted from Strategy 5.3.3 included as part of the 2019 SEP.

2022-19. Energy Assurance Plan

The City shall create and implement an energy assurance plan to ensure electrical reliability at critical facilities. Energy assurance planning is an important step in improving the robustness, security, and reliability of energy infrastructure by creating plans to protect key sites so that they continue to operate in the event of any disaster or electricity outage. This will increase the reliability of critical services such as water distribution. Energy Assurance Plans are therefore a key step in building a resilient, local electricity grid. The City has already taken several key steps towards assurance planning by conducting an Emergency Action Plan and this LHMP.

To develop a strong Energy Assurance Plan, the City shall:

1. Use results from Emergency Action Plan to identify the City-owned buildings and facilities that are most critical from a resiliency perspective, such as sites used as Emergency Operations Centers (EOCs) or community gathering spots;
2. Evaluate each critical site, including its current level of emergency preparation from an energy perspective and the renewable energy potential present; and
3. Evaluate opportunities to supplement diesel generators with battery storage.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Energy Shortage & Resiliency
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$106,000/General fund for staff salaries
Responsible Agency/Department	Public Works Department
Cost-Benefit Consideration	While energy assurance planning would require time, planning, and labor costs for the City, it would allow key sites (e.g., medical, fire departments, water distribution, etc.) to continue to operate in the event of any disaster or electricity outage.
Comments	This mitigation action is adapted from Strategy 5.4.1 included as part of the 2019 SEP.

2022-20. Winter Storm Berm Program

The winter storm berm is a protection device that buffers landward assets from coastal storm damage during the winter storm season. Since 1983, the City has implemented an annual Winter Storm Berm Program to protect beachfront properties along the Carpinteria City Beach from wave action and related flooding during the winter storm season. A sand berm is erected annually and is in place for approximately three months out of the year during the winter storm season, (typically late November until early March the following year), based on storm predictions and beach conditions. This ongoing measure reduces the probability of damage to development and infrastructure.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Flood, Coastal Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$35,500 annually/General fund and assessment district comprising beachfront property owners
Responsible Agency/Department	California Coastal Commission, ACOE, Central Coast Regional Water Quality Control Board, Parks & Recreation Department, Public Works Department
Cost-Benefit Consideration	The California Coastal Commission is the primary responsible agency for this action. This program benefits the City by protecting beachfront properties along the Carpinteria City Beach from wave action and coastal flooding during the winter storm season, a high priority hazard for the City.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-21. Storm Damage and Shoreline Protection Feasibility Study

An independent study is currently being prepared by Army Corps of Engineers (ACOE) that could result in a funding opportunity for an adaptation project. As a result of long-term erosion of City beaches, ACOE is working with the City to prepare a Storm Damage and Shoreline Protection Feasibility Study that will identify a range of possible measures to address coastal erosion. Analyzing an approximate 0.25-mile section of shoreline between Ash Avenue and Linden Avenue, this Feasibility Study investigates vulnerabilities to structures that may be directly affected by existing shoreline erosion and wave attack during severe storms. Additionally, the Feasibility Study aims to preserve and enhance the biological environment by restoring nesting, feeding, and resting areas for species dependent on sandy beaches.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Coastal Hazards
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$2,700,000/General fund for staff salaries, ACOE funding, Federal grants
Responsible Agency/Department	ACOE, USFWS, California Coastal Commission, California State Lands Commission, CDFW, Central Coast Regional Water Quality Control Board, County of Santa Barbara, Public Works Department
Cost-Benefit Consideration	The majority of this action would be funded by federal grant funds. This study would also benefit the City by investigating the City's vulnerabilities to existing shoreline erosion and wave attack during severe storms, a high priority hazard for the City.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-22. Living Shoreline

Historically, the City's western one mile of shoreline supported a large dune field that buffered low-lying areas from wave attack and flooding. The former dune system has been eroded over the last 90 years, largely due to human impacts (or influences), and the dune system has not recovered. Improving shoreline resiliency to reduce hazards from coastal flooding and erosion from large storm events may include the development of a stabilized (e.g., cobble-based) dune complex that would function as a "living shoreline." The City initiated the living shoreline planning process in the fall of 2020 and prepared the Dune and Shoreline Management Plan as of February 2022. The City shall pursue funding and partnerships, including with the County, State Parks, and Beach Erosion Authority for Clean Oceans and Nourishment (BEACON).

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Coastal Hazards
Estimated Timeline	2023
Estimated Cost/Funding Source	$9 million - $12 million, $100,000 annually for maintenance/ACOE Project Partnership Agreement, 2019-2020 Caltrans Adaptation Planning grant, other state grants
Responsible Agency/Department	ACOE, USFWS, California Coastal Commission, California State Lands Commission, CDFW, Central Coast Regional Water Quality Control Board, California State Parks, Caltrans, Public Works Department

Mitigation Priority and Performance	
Cost-Benefit Consideration	While the Living Shoreline and associated studies/analyses would require planning and cost money, this action would buffer low-lying areas of the City from wave attack and flooding, which would protect infrastructure and prevent future costs associated with infrastructure and building repair.
Comments	This mitigation action is sourced from the 2019 SLRVAAP. This action was presented to City Council in February 2022, and the Council continued the item with a request for additional information. The additional information for this project will be presented to City Council in April 2022. A detailed cost-benefit analysis is the next recommended step for this project.

2022-23. Coastal Regional Sediment Management Plan Update and Sediment Management Program

The maintenance of a wide and sandy beach provides widespread economic and recreational benefits for nearby communities. Fifty years after the debris basin installations, the loss of natural beach cobble quantities is visible on Carpinteria City Beach. The City should revise the Coastal Regional Sediment Management Plan in order to consider exporting sediment onto Carpinteria City Beach for re-nourishment and coastal resiliency. This effort should be in coordination with BEACON, the Santa Barbara County Flood Control & Water Conservation District, and UCSB Natural Reserve System. The Coastal Regional Sediment Management Plan, as adopted by BEACON in 2009, includes information about sand supplied to the Santa Barbara Littoral Cell between Point Conception and Point Mugu as well as an understanding of erosion hot spots and shoreline protection. The revised Coastal Regional Sediment Management Plan should consider adaptation strategies that export sediment from the watershed to sandy beaches in order to mimic historical natural processes and improve coastline resiliency within existing funding levels. Adaptation strategies should include changing the approach of local debris basin cleanout activities and the deposition of these materials within the watershed as well as the transport to Carpinteria City Beach or other adjacent coastlines depending on the extent of sediment transport, sediment quality and quantity, and potential regional benefits. Consideration of mud placements in Carpinteria Salt Marsh should also be investigated in order to increase sediment discharge from the marsh which would ultimately elevate the marsh to keep pace with sea level rise and result in increased sediment transport along the coastline. BEACON is currently working to develop a regional opportunistic sediment placement program for the Coastal Regional Sediment Management Plan. The sediment placement program would focus on ensuring sediment reaches local beaches through the natural sediment transport process. The sediment placement would also establish a program of pre-permitted coastal locations (i.e., receiver sites) within the BEACON region where materials from sediment basins could be opportunistically deposited to augment existing sand supplies. That program would address sediment transportation and deposition approaches including trucking routes, deposition locations, dredging techniques, and transportation management in order to minimize adverse effects to the Carpinteria community including the City's infrastructure. The City emphasizes the use of hydraulic dredging rather than desilting, dewatering, and trucking because of its reduced impact to the City's infrastructure as well as to beach access. The City should coordinate with BEACON and the Santa Barbara County Flood Control & Water Conservation District in order to facilitate the implementation of the sediment management program and establish sediment removal permits and protocols.

The City shall conduct the following tasks to implement a successful shoreline sediment management program:

- Coordinate with BEACON in order to develop a flexible regional opportunistic sediment placement program that identifies specific placement or receiver locations in and upcoast of the City for appropriate sediment sizes.
- Address appropriate methods for sediment disposal.
- Incorporate recommendations from the City's Sea Level Rise Vulnerability Assessment and Adaptation Plan and the Dune and Shoreline Management Plan.
- Streamline regulatory approvals with extended permit duration (e.g., 20 years).
- Prioritize retention of sediment for local use and beach nourishment and avoid exporting debris basin sediments out of the watershed.
- Create sustainable local, state, and federal funding programs.

Mitigation Priority and Performance	
Priority	High
Hazards Mitigated	Flood, Mudflow & Debris Flow, Coastal Hazards, Dam Failure
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$743,000 - $6 million annually/FEMA Hazard/Pre-Disaster Mitigation Grant, FEMA Building Resilient Infrastructure and Communities Grant, Department of Water Resources Grants, Department of Boating and Waterways Grants
Responsible Agency/Department	BEACON member agencies, ACOE, USFWS, California Coastal Commission, California State Lands Commission, CDFW, Central Coast Regional Water Quality Control Board, California State Parks, Caltrans, County of Santa Barbara, Parks & Recreation Department, Public Works Department
Cost-Benefit Consideration	This action would ensure efficient management and use of sediment resources within the City and County to improve coastline resiliency within existing funding levels.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-24. Storm Drain Master Plan and Improvements

To address the stormwater infrastructure deficiencies during high tide, the City shall update the Storm Drain Master Plan as needed. As part of the Storm Drain Master Plan, the City shall investigate the use of stormwater pumps and/or lift stations (pumps) to move water out of the Beach Neighborhood. The range of options for consideration should also include potential tide gates, mud flaps, and creek alterations that could be utilized as preventative measures before stormwater or tidal effects can reach the storm drain systems (e.g., inlets, outfalls). The investigation should be focused along inland portions of Ash Avenue and Linden Field, which experience tidal inundation with areas of ponded floodwaters from rainfall event stormwater runoff. As tidal inundation increases with sea level rise, even without heavy rainfall or runoff events, the use of pumps to move water out of the lower-elevation areas could be investigated. The use of pumps is moderately adaptable, as the pumping capacity could be increased or improved over time when the pumps need to be replaced. As the necessary volume of water to be pumped increases, operational and maintenance costs would likely escalate over time. Additional challenges for the operation of

stormwater pump systems can include accommodating the large amounts of fibrous material and solids that often accompany stormwater.

Accommodation for storm drain improvements shall be integrated into the City's Capital Improvements Program. The action item would have the intent of improving stormwater runoff, reducing tidal inundation, and accommodating larger volumes of storm or tidal water that have the potential to inundate vulnerable areas of the City. Examination of precedent stormwater infrastructure projects that have included the installation or replacement of stormwater pumps, lift stations, and associated maintenance results in a variety of associated costs.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise)
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$4 million/Pre-Disaster Mitigation Grant, FEMA Flood Mitigation Assistance Grant, CalOES 404 Grant
Responsible Agency/Department	California Coastal Commission, California State Lands Commission, Caltrans, County Flood Control District, Public Works Department
Cost-Benefit Consideration	While a Storm Drain Master Plan Update could cost money for planning, it would help identify stormwater management and storm drain improvements for the Beach Neighborhood, protecting this neighborhood from flooding and sea level rise.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-25. Coastal Adaptation Overlay

The City shall implement a Coastal Adaptation Overlay to address land use and infrastructure vulnerabilities that could become at risk from coastal hazards affected by projected sea level rise. Overlay zoning is a regulatory tool that places a special zone district over an existing base zone with additional regulations and incentives. The overlay zone identifies special provisions in addition to or instead of the base zone given special circumstances to promote planning for orderly development and to provide protection of the public's health, safety, and general welfare.

Implementation of a Coastal Adaptation Overlay Zone could address potential risks to private property, reduce liability for the City, and accomplish multiple adaptation objectives. For example, an overlay zone would define the nature, intensity, scale, uses, and location of suitable development within projected hazard areas. Based on the projected time of exposure, siting and construction standards may be applied including, but not limited to, increased setbacks, relaxed building heights, limitations on habitable first floors, and use of flexible construction methods (e.g., movable foundations) based upon site-specific technical studies. An important aspect of this overlay is that it may be able to provide more flexibility in design and/or use than is currently permitted by the base zone regulations. Standards for increased heights or mixed uses could also be incorporated into the overlay zone to respond to changing sea level rise conditions. As determined necessary and appropriate, the Coastal Adaptation Overlay Zone could also provide a framework to transition at-risk development away from coastal hazards and/or could implement the concepts of managed retreat over time, by including standards for gradual relocation of development away from the increasingly hazardous surf and coastal flooding areas.

The boundaries of a Coastal Adaptation Overlay Zone shall correspond to the best available science of projections of hazards and shall be reviewed periodically (e.g., every 5 to 10 years) to incorporate the emerging scientific understanding of sea level rise and coastal hazards, as well as regional approaches to adaptation planning.

The Coastal Adaptation Overlay Zone shall define policy considerations and establish required processes triggered by actions. Such requirements may include:

- Provision of a Notice to Property Owner at the time of transfer of real property to future buyers within the Coastal Adaptation Overlay Zone of coastal hazard-related development requirements. Such requirements could include, but are not limited to, building coverage, height, raised floors, or other adopted strategies. This disclosure would also inform interested buyers of potential hazards (e.g., erosion, flooding, inundation, possible intrusion onto public trust lands, etc.) as a result of climate-induced impacts, such as sea level rise.
- Submittal of site-specific Coastal Hazard and Sea Level Rise reports as part of a Coastal Development Permit application. The reports would evaluate specific risks for proposed structural development or exterior expansions of habitable space in an existing development, identify design requirements to ensure compliance with health and safety codes, and estimate the life expectancy of the development. Authority to implement necessary development requirements (e.g., increased base floor elevations, building heights, development setbacks, use of perimeter foundations, etc.) within the Coastal Overlay Zone would be based on findings of the Coastal Hazard and Sea Level Rise reports and/or compliance with planning and building codes for new structural development, including additions to habitable space.
- An indemnification agreement between the City and prospective applicants acknowledging coastal hazard risks and owner-assumption of damages resulting from development proposed in the Coastal Adaptation Overlay Zone.
- The City's Capital Improvement Program could include a provision to investigate and identify eligible roads within the Coastal Adaptation Overlay Zone that could be elevated or relocated. This study would also identify priority road segments, schedules, and methods (e.g., additional pavement improvements during established road resurfacing activities).
- The City and residents could consider the creation or modification of an assessment district to address costs of special public services or improvements. Consistent with Coastal Commission guidance, the Coastal Adaptation Overlay may establish a prohibition of seawalls and hard armoring on the City and State Beaches.
- The planned/expected life of development and redevelopment could be standardized. The following table is provided as a recommended life of development based on state guidance and other jurisdictional policy approaches. Coastal Development Permits may be required to include analysis of the effects of sea level rise and coastal hazards, identify and incorporate adaptation strategies into the project, and discuss the adaptive capacity of the development as part of the application process.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Coastal Hazards
Estimated Timeline	2023-2024
Estimated Cost/Funding Source	$1 million/Grant funds and/or general fund for staff salaries
Responsible Agency/Department	CDD, California Coastal Commission, California State Parks, Carpinteria Unified School District (CUSD)
Cost-Benefit Consideration	The overlay would provide the City with a planning tool to analyze the effects of sea level rise, guide future development planning, and address vulnerabilities.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-26. FEMA's Repetitive Loss Program

Before implementation of a repetitive loss program, the City shall continue to monitor triggers such as storm frequency and sea level rise and evaluate the effectiveness of this measure with consideration to social, economic, and environmental effects. If coastal hazards continue to increase, the City shall consider a repetitive loss program that allows properties subject to repetitive loss to be downsized, moved away from the shoreline, or in extreme cases with frequent and severe damages, may even grant the City, State, or other public agency the right of first refusal to purchase the property and restrict for open space uses. Any such program shall be designed to be consistent with FEMA's repetitive loss program. Per the California Coastal Commission Draft Residential Adaptation Guidelines (2018), the City could choose to adopt a policy within the GP/CLUP Update that provides a mechanism for such a program to be developed when necessary and appropriate based on the increase of coastal hazards.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Flood, Coastal Hazards
Estimated Timeline	2025
Estimated Cost/Funding Source	$1 million/FEMA Hazard/Pre-Disaster Mitigation Grant
Responsible Agency/Department	Environment and Sustainability Division, Emergency Services Division, FEMA, Cal OES, California Coastal Commission
Cost-Benefit Consideration	The RL program would benefit repetitive property damage and risks to residents at the 18 properties in Carpinteria with multiple claims against the NFIP (refer to Section 6.3.1, *Flood*).
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-27. Protection of Union Pacific Railroad (UPRR) Corridor

The UPRR railroad corridor runs south of Highway 101 and through the City. At its closest, the corridor is approximately 290 feet landward of the mean high water tideline along the Carpinteria Bluffs. UPRR intends to construct an additional railroad track at the Carpinteria Station by 2023. A 0.4-mile segment of the track will be elevated on a platform, and a pedestrian underpass will be constructed. Efforts to expand and raise the track are intended to increase pedestrian safety and

expand train service in the region. Despite the inclusion of an underpass, this track elevation provides an opportunity to address storm-based flooding vulnerabilities.

The City would pursue opportunities to coordinate with the Los Angeles – San Diego – San Luis Obispo (LOSSAN) Rail Corridor Agency and other regional jurisdictions to maintain and improve this important transportation corridor. By establishing effective partnerships with these agencies, the City could ensure that a well-designed adaptation approach for the railroad synergistically protects important infrastructure such as recreational trails, downtown development, and residential neighborhoods.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise), Train Accident
Estimated Timeline	2023 and ongoing
Estimated Cost/Funding Source	$1 million/LOSSAN Rail Corridor Agency
Responsible Agency/Department	UPRR, Public Works Department
Cost-Benefit Consideration	This action would protect the UPRR, an important means of transportation and evacuation in the City, from coastal flooding; however, this action is a low priority since LOSSAN Rail Corridor Agency is the primary responsible agency for this action and sea level rise/coastal flooding on the LOSSAN rail corridor is not an immediate concern.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-28. Protection of Highway 101

Since Highway 101 is subject to flooding with approximately 5 feet of sea level rise, significant coordination and collaboration between Caltrans and the City would be required to ensure protection from coastal hazards, particularly flooding. The City has been awarded funding from Caltrans under the 2017-2018 Adaptation Planning Grant Program for additional analysis of sea level rise impacts to transportation infrastructure with the City, impacts to vulnerable populations within the City, and the identification of adaptation strategies to build resiliency within the transportation network. In the long term, this may include capital improvements to improve drainage and conveyance beneath the Highway 101 corridor, elevating the segment of Highway 101 that is vulnerable to flooding impacts, or identifying alternative routes in case of closures. The City shall continue to coordinate with Caltrans to efficiently facilitate such adaptation measures.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise)
Estimated Timeline	2023 and ongoing
Estimated Cost/Funding Source	$100,000/ Caltrans Adaptation Planning Grant Program, general fund for staff salaries
Responsible Agency/Department	Caltrans, CDD, Public Works Department
Cost-Benefit Consideration	This action would protect Highway 101, the primary evacuation route in the City, from coastal flooding; however, this action is a low priority since Caltrans is the primary responsible agency for this action and sea level rise and coastal flooding on Highway 101 is not an immediate concern.

Mitigation Priority and Performance	
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-29. Carpinteria Sanitary District Wastewater Treatment Plant

To protect the Wastewater Treatment Plant from coastal flooding and inundation with sea level rise, the City shall continue to coordinate with the Carpinteria Sanitary District to identify and develop mid- to long-term improvements to reduce coastal hazard risks, including installation of a fortified flood control wall along Carpinteria Creek, additional elevation and setbacks of any new facilities, and installation of backflow protection devices. The City shall continue to coordinate with the Carpinteria Sanitary District regarding findings of the SLRVAAP to consider future sea level rise hazards.

Mitigation Priority and Performance	
Priority	Medium
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise)
Estimated Timeline	Ongoing
Estimated Cost/Funding Source	$100,000/FEMA Hazard/Pre-Disaster Mitigation Grant
Responsible Agency/Department	Public Works Department, CDD, Emergency Services Division, Carpinteria Sanitary District
Cost-Benefit Consideration	The Wastewater Treatment Plant would be vulnerable to coastal flooding and inundation with approximately 5 feet of sea level rise. Coordination with the Carpinteria Sanitary District would help identify potential capital improvements that will build resiliency.
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

2022-30. Sandyland Revetment

Alteration, relocation, or removal of the Sandyland Revetment could reduce the erosion hotspot that primarily affects a small portion of the City Beach and Beach Neighborhood. As Sandyland Cove is largely within Santa Barbara County, any alterations to the revetment would need to be processed by the County in coordination with the City, in addition to the California Coastal Commission and Sandyland Cove Homeowners Association. However, alteration of the revetment may result in significant changes and may expose homes to wave attack or damage or potentially increase flooding in areas adjacent to the Carpinteria Salt Marsh. Therefore, the City shall coordinate with the County Public Works Department to prepare a study of the potential effects of alteration, relocation, or removal of the Sandyland Revetment.

Mitigation Priority and Performance	
Priority	Low
Hazards Mitigated	Flood, Coastal Hazards (Sea Level Rise)
Estimated Timeline	2025
Estimated Cost/Funding Source	$100,000/County funds
Responsible Agency/Department	CDD, Public Works Department, County Flood Control District
Cost-Benefit Consideration	An impact study for alteration, relocation, or removal of the Sandyland Revetment would by costly and require time and planning.

Mitigation Priority and Performance	
Comments	This mitigation action is sourced from the 2019 SLRVAAP.

8.0 PLAN MAINTENANCE

The City of Carpinteria (City) and its departments have been continually implementing mitigation actions and monitoring their effectiveness since the last update of the Local Hazard Mitigation Plan (LHMP) in 2017. Since the last LHMP in 2017, the LPT has monitored, evaluated, and updated the plan on a continuing and as-needed basis. The City was very successful in implementing the 2017 mitigation actions as noted in Table 7-1. The remaining mitigation actions outlined in the 2017 LHMP are ongoing at the time of this 2022 update.Some deferred projects from 2011 were completed successfully, while others are ongoing or still pending. This section sets forth the intended process for monitoring and maintaining the 2022 LHMP.

8.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The City of Carpinteria will be responsible for ensuring that this LHMP is monitored on an ongoing basis. The City will convene Carpinteria's Local Planning Team (LPT) representatives on an annual basis to review progress on the LHMP. As noted in Chapter 7.0, *Mitigation Plan*, the City's LPT representatives will report on efforts to integrate the hazard mitigation plan into local plans, programs, and policies at the annual LPT plan review meeting. Additionally, actions identified in the LHMP will be tracked and discussed during other regular City department meetings.

The City will also ensure that as new hazard information is discovered or produced, the LPT will review and determine the appropriateness of incorporation. As part of this effort, as major disasters and other significant events affect the City of Carpinteria, the LPT will be convened to review and assess the LHMP. Additionally, LPT members will be ensuring that lessons learned from the LHMP planning process are incorporated and/or leveraged in other plans and planning efforts.

The City will continue to participate in the countywide Mitigation Advisory Committee (MAC) and attend the annual meeting organized by the County Office of Emergency Management (OEM) to discuss items to be updated/added in future revisions of this plan. The City will follow the procedures to monitor, review, and update this LHMP per Santa Barbara County as outlined in Chapter 8 of the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The City acknowledges it is important to review the plan regularly and update it every five years per the Disaster Mitigation Act Requirements as well as other State of California requirements.

8.2 IMPLEMENTATION THROUGH EXISTING PLANS AND PROGRAMS

The City implements the LHMP through existing plans, programs, and procedures, as detailed in Section 4.0, *Capability Assessment*. This LHMP provides a baseline of information on the hazards impacting the City and the existing institutions, plans, policies and ordinances that help to implement the LHMP (e.g., General Plan, building codes, floodplain management ordinance). The General Plan and the LHMP annex are complementary documents that work together to achieve the goal of reducing risk exposure to the City's citizens. An update to a general plan may trigger an update to the hazard mitigation plan. Implementation responsibilities of mitigation actions is integrated into

the operational functions of the responsibility parties identified, including responsibility for seeking funding needed for implementation.

The City incorporates the LHMP by reference into its General Plan Safety Element. Under AB 2140, the City may adopt its current, FEMA-approved LHMP into the Safety Element of the General Plan. This adoption makes the City eligible to be considered for part or all of its local-share costs on eligible Public Assistance funding to be provided by the state through the California Disaster Assistance Act (CDAA) (see Section 2.0, *Plan Purpose and Authority* for the adopting resolutions). The LHMP has also been prepared to support the City's Sea Level Rise Vulnerability Assessment and Adaption Plan to address changing coastal hazards over time, including coastal sediment management and shoreline protection. The Floodplain Management Ordinance applies in concert with the City's zoning ordinance and building codes to reduce flooding hazards from land use. The LHMP includes several mitigations addressing critical infrastructure to support the City's efforts to reduce improve resilience to natural hazards, including wildfire and coastal flooding.

The information contained within this LHMP, including results from the Vulnerability Assessment and the Mitigation Strategy, will be used by the City to help inform updates and the development of local plans, programs, and policies. The Engineering Division may utilize the hazard information when implementing the City's Community Investment Program and the Planning and Building Divisions may utilize the hazard information when reviewing a site plan or other type of development applications. The City may utilize the hazard information when developing and implementing the City's capital improvement programs and the Planning and Building Divisions may utilize the hazard information when reviewing a site plan or other type of development applications. The City's budget process and CIP are updated to include hazard mitigation actions.

8.3 ONGOING PUBLIC OUTREACH AND ENGAGEMENT

The public will continue to be involved whenever the plan is updated and as appropriate during the monitoring and evaluation process. Before the adoption of updates, the City will provide the opportunity for the public to comment on the updates. A public notice will be published before the meeting to announce the comment period and meeting logistics. Moreover, the City will engage stakeholders in community emergency planning. As described in Section 3.4, *Public Outreach and Engagement*, the public outreach strategy used during development of the current update will provide a framework for public engagement through the plan maintenance process. It can be adapted for ongoing public outreach as determined to be feasible by the MAC and the LPT.

8.4 POINT OF CONTACT

Comments or suggestions regarding this plan may be submitted at any time to Olivia Uribe-Mutal, Emergency Services Program Manager using the following information:
Olivia Uribe-Mutal, Emergency Services Program Manager
City of Carpinteria
5775 Carpinteria Avenue
Carpinteria, CA 93013
805-*755*-4401
oliviau@carpinteriaca.gov

9.0 LIST OF ACRONYMS

°F	Fahrenheit
AB	Assembly Bill
ACOE	U.S. Army Corps of Engineers
AF	acre-feet
AFY	acre-feet per year
BEACON	Beach Erosion Authority for Clean Oceans and Nourishment
BFE	Base Flood Elevations
BMPs	best management practices
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
Caltrans	California Department of Transportation
CAPP	Carpinteria Advanced Purification Project
CCCE	Central Coast Community Energy
CDC	Center for Disease Control
CDD	Carpinteria Community Development Department
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
City	City of Carpinteria
CLUP	Coastal Land Use Plan
County	Santa Barbara County
County Flood Control	Santa Barbara County Flood Control and Water Conservation District
COVID-19	Coronavirus
CPF	Carpinteria Oil and Gas Processing Facility
CPUC	California Public Utilities Commission
CSFPD	Carpinteria-Summerland Fire Protection District
CUPA	Certified Unified Program Agency
CUSD	Carpinteria Unified School District
CVWD	Carpinteria Valley Water District
DFIRM	Digital Flood Insurance Rate Map
DMA	Disaster Mitigation Act of 2000
DOT	U.S. Department of Transportation
DSOD	Division of Safety of Dams
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
FBI	Federal Bureau of Investigation

FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FRAP	Fire and Resource Assessment Program
FY	Fiscal Year
GHG	greenhouse gas
GIS	Geographic Information Systems
GP/CLUP	General Plan/Coastal Land Use Plan
GSP	Groundwater Sustainability Plan
HMGP	Hazard Mitigation Grant Program
IUCN	International Union for Conservation of Nature
kV	kilovolt
kWh	kilowatt-hours
LHMP	Local Hazard Mitigation Plan
LOSSAN	Los Angeles-San Diego-San Luis Obispo
LPT	Local Planning Team
MAC	Mitigation Advisory Committee
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NIH	National Institute of Environmental Health Services
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollution Discharge Elimination System
OEM	County Office of Emergency Management
OES	Carpinteria Office of Emergency Services
OPC	Ocean Protection Council
OSHA	Occupational Safety and Health Administration
PDM	Pre-Disaster Mitigation
PG&E	Pacific Gas & Electric
POP	Public Outreach Plan
PRD	Parks and Recreation Department
psi	Pounds per square inch
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
RL	Repetitive Loss
SARS	Severe Acute Respiratory Syndrome
SARS-CoV	SARS-associated coronavirus
SB	Senate Bill
SBCAG	Santa Barbara County Association of Governments
SBMTD	Santa Barbra Metropolitan Transit District
SCE	Southern California Edison
SEP	Strategic Energy Plan
SFHA	Special Flood Hazard Areas

SLRVAAP	Sea Level Rise Vulnerability Assessment and Adaptation Plan
SoCal Gas	Southern California Gas Company
SoVI	social vulnerability index
SR-	State Route
SWP	State Water Project
UC	University of California
UCSB	University of California, Santa Barbara
U.S.	United States
UPRR	Union Pacific Railroad
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Vandenberg SFB	Vandenberg Space Force Base
VCTC	Ventura County Transportation Commission
WHO	World Health Organization
WUI	Wildland-Urban Interface

10.0 REFERENCES

Allen-Diaz, Barbara. 2009. Climate Change Affects Us All. California Agriculture, 63/2: 51–3. University of California, Agriculture and Natural Resources.

California Coastal Commission. 2019. Oil Spills. Accessed: 26 October 2021. Retrieved from: https://www.coastal.ca.gov/publiced/oilspills.html

California Department of Food and Agriculture. 2020. Official Notice - Amendment Notice of Treatment for the Asian Citrus Psyllid.

California Department of Public Health. 2021. Vector-Borne Disease Section. Retrieved from: https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/VBDS.aspx

California Department of Water Resources (DWR). 2021a. California's Groundwater Online. Accessed: 3 November 2021. Retrieved from: https://storymaps.arcgis.com/stories/2a301109fd984ab98b0217c7c6a6e754

———. 2021b. Drought. Accessed: 27 October 2021. Retrieved from: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Publications-And-Reports/DroughtBrochure2021update_ay11.pdf

———. 2021c. Drought in California. Accessed: 27 October 2021. Retrieved from: https://water.ca.gov/Programs/All-Programs/Drought

California Geological Survey. 2019a. Landslides. Accessed: 1 November 2021. Retrieved from: https://www.conservation.ca.gov/cgs/landslides#debrisflows

——. 2019b. Post-Fire Debris Flow Facts. Accessed: 1 November 2021. Retrieved from: https://www.conservation.ca.gov/index/Pages/Fact-sheets/Post-Fire-Debris-Flow-Facts.aspx

California Natural Resources Agency. 2018. California's Fourth Climate Change Assessment. Accessed: 26 October 2021. Retrieved from: https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf

California Office of Emergency Services (Cal OES). 2018. California State Hazard Mitigation Plan. Accessed: 26 October 2021. Retrieved from: https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/state-hazard-mitigation-plan

——. 2021. Hazardous Materials Spill Reports – Santa Barbara County, Reporting Period 2006 to 2021. Accessed: 5 November 2021. Retrieved from: https://w3.calema.ca.gov/operational/malhaz.nsf/f1841a103c102734882563e20076 0c4a?SearchView.

California Public Utilities Commission (CPUC). 2019. Decision 19-10-054. Accessed: 5 November 2021. Retrieved from: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M319/K075/319075453.PDF .

——. 2021. Natural Gas and California. Accessed: 5 November 2021. Retrieved from: https://www.cpuc.ca.gov/natural_gas/.

California Water Environment Association. 2022. "Emergency Recovery: 'After the Fires Come the Floods'." January 26, 2022. https://www.cwea.org/news/emergency-recovery-after-the-fires-come-the-floods/.

Carpinteria Valley Water District (CVWD). 1986. "Carpinteria Groundwater Basin - Final Hydrogeologic Update." Prepared by Geotechnical Consultants, Inc.

_____. 2021a. "Final 2020 Urban Water Management Plan." January 18, 2022. https://cvwd.net/doc/4371/.

_____. 2021b. "Ordinance No. 21-1 An Ordinance of The Board of Directors of The Carpinteria Valley Water District Declaring a Stage Two Drought Condition And Implement Water Use Restrictions To Be Effective During a Stage Two Drought Condition." January 18, 2022. https://cvwd.net/doc/4295/.

Cayan, D. R., Bromirski, P., Hayhoe, K., Tyree, M., Dettinger, M., & Flick, R. 2006. 'Abstract: Projecting Future Sea Level' (Other Report). Projecting future sea level, p. 64. California Climate Change Center. Accessed: 5 October 2021. Retrieved from: http://pubs.er.usgs.gov/publication/70157139

Center for Disease Control and Prevention (CDC). 2012. Lesson 1: Introduction to Epidemiology. Retrieved from: https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html

——. 2016. SARS (10 Years After). Retrieved from: https://www.cdc.gov/dotw/sars/index.html

——. 2021. Symptoms of COVID-19. Retrieved from: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

Central Coast Community Energy (CCCE). 2022. "Energy Resiliency." January 31, 2022. https://3cenergy.org/resiliency-programs/.

Chevron West Coast Decommissioning Program. 2021. "Decommissioning and Remediation of The Carpinteria Oil and Gas Processing Facilities - Project Description." January 20, 2022. https://carpinteriaca.gov/wp-content/uploads/2021/11/Project-Description.pdf.

City of Carpinteria. 2003. General Plan/Local Coastal Land Use Plan & Environmental Impact Report. March 10, 2022. https://carpinteriaca.gov/wp-content/uploads/2020/03/cd_General-Plan.pdf.

_____. 2005. "City of Carpinteria Creeks Preservation Program Final Document Volume One". January 26, 2022. https://carpinteriaca.gov/wp-content/uploads/2020/03/cd_creeks-report.pdf.

_____. 2014. Emergency Operations Plan. https://carpinteriaca.gov/wp-content/uploads/2020/03/emergency-prep_EOP.pdf

_____. 2019. "City of Carpinteria Sea Level Rise Vulnerability Assessment and Adaptation Project." January 18, 2022. https://carpinteriaca.gov/city-hall/community-development/planning/general-plan-local-coastal-plan-update/.

_____. 2021a. "2021 Carpinteria Valley Economic Profile." January 16, 2022. https://carpinteriaca.gov/wp-content/uploads/2021/12/2021-Carpinteria-Profile-Final.pdf.

_____. 2021b. "City of Carpinteria Adopted Budget Fiscal Year 2021/22." January 17, 2022. https://carpinteriaca.gov/wp-content/uploads/2021/02/Adopted-FY22-Budget-1.pdf.

_____. 2022. "Carpinteria Operations." January 20, 2022. https://carpinteriaca.gov/city-hall/community-development/oil-gas-information/carpinteria-operations/.

Climate Central. 2019. AMERICAN WARMING: The Fastest-Warming Cities and States in the U.S. Accessed: 4 November 2021. Retrieved from: https://www.climatecentral.org/news/report-american-warming-us-heats-up-earth-day

Coast View News. 2021. "Carpinteria parents protest California Covid-19 vaccine mandate for schools." January 19, 2022. https://www.coastalview.com/news/carpinteria-parents-protest-california-covid-19-vaccine-mandate-for-schools/article_a5227c16-31f9-11ec-a1c9-872518d09ff0.html.

Colorado Geological Survey. 2021. Debris and Mud Flows. Accessed: 1 November 2021. Retrieved from: https://coloradogeologicalsurvey.org/hazards/debris-flows/

Community Environmental Council. 2020. Raise the Red Flag on the Causes of Wildfire. Accessed: 26 October 2021. Retrieved from: https://resource.cecsb.org/raise-the-red-flag-on-causes-of-wildfire/

DWR Division of Safety of Dams (DSOD). 2021a. Division of Safety of Dams. Accessed: 5 November 2021. Retrieved from: https://water.ca.gov/programs/all-programs/division-of-safety-of-dams.

———. 2021b. Dams within Jurisdiction of the State of California Listed Alphabetically by County. Accessed: 5 November 2021. Retrieved from: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/Dams-Within-Jurisdiction-of-the-State-of-California-Listed-Alphabetically-by-County-September-2021.pdf.

Edhat. 2020. "Black Lives Matter Protest in Carpinteria." January 19, 2022. https://www.edhat.com/news/black-lives-matter-protest-in-carpinteria.

———. 2021. Carpinteria parents protest California Covid-19 vaccine mandate for schools. January 19, 2022. https://www.coastalview.com/news/carpinteria-parents-protest-california-covid-19-vaccine-mandate-for-schools/article_a5227c16-31f9-11ec-a1c9-872518d09ff0.html.

———. 2022. Highway 101 Closes Off and On For Storm Drain Fire Near Carpinteria. Accessed: March 1, 2022. Retrieved from: https://www.edhat.com/news/highway-101-closes-off-and-on-for-storm-drain-fire-near-carpinteria.

Environmental Protection Agency (EPA). 2021. Climate Adaptation and Saltwater Intrusion. Accessed: 27 October 2021. Retrieved from: https://www.epa.gov/arc-x/climate-adaptation-and-saltwater-intrusion.

Federal Emergency Management Agency (FEMA). 2020. Flood Zones. Accessed: 29 October 2021. Retrieved from: https://www.fema.gov/glossary/flood-zones

———. 2021a. Coastal Hazards & Flood Mapping, A Visual Guide. Accessed: 29 October 2021. Retrieved from: https://www.fema.gov/sites/default/files/documents/fema_coastal-glossary.pdf

———. 2021b. Protective Actions Research: Extreme Heat. Accessed: 3 November 2021. Retrieved from: https://community.fema.gov/ProtectiveActions/s/article/Extreme-Heat.

Fitzgerald, Maureen. Personal Communication with Maureen Fitzgerald. 2022. January 27, 2022.

FloodList. 2021. USA – Deadly Flooding and Mudslides in California (Updated). Accessed: 29 October 2021. Retrieved from: https://floodlist.com/america/usa/flood-mudslide-california-january-2018

Guinness World Records. 2021. Highest recorded temperature on Earth. Accessed: 4 November 2021. Retrieved from: https://www.guinnessworldrecords.com/world-records/highest-recorded-temperature/.

Guzman-Morales, J. and Gershunov, A. 2019. "Climate change suppresses Santa Ana winds of Southern California and sharpens their seasonality." Geophysical Research Letters 46, no. 5 (2019): 2772-2780. Retrieved from: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018GL080261.

Ilsain, John. Personal Communication with John Ilsain, Public Works Director. 2022. January 27, 2022.

International Union for Conservation of Nature (IUCN). 2021. Invasive alien species and climate change. Retrieved from: https://www.iucn.org/resources/issues-briefs/invasive-alien-species-and-climate-change

Jervis, L. 2020. "Laurie Jervis: Late Season Extreme Heat Leads to Accelerated Grape Harvest". Noozhawk, November 2, 2020. Accessed: 5 November 2021. Retrieved from: https://www.noozhawk.com/article/laurie_jervis_late_season_extreme_heat_leads_to_accelerated_grape_harvest.

Live Science. 2012. Dangerous Sundowner Winds Explained. Accessed: 4 November 2021. Retrieved from: https://www.livescience.com/18508-dangerous-sundowner-winds-explained.html.

Lompoc Record. 2021. "Judith Dale: Wildfires in Santa Barbara County, 1985 to 2007." February 11, 2022. https://lompocrecord.com/lifestyles/columnist/judith-dale-wildfires-in-santa-barbara-county-1985-to-2007/article_539b9eb5-7c34-5171-b7f7-d2ee952cedc4.html

Los Angeles Times. 1991. Most of Toxic Chemical Taken from Crash Site: Derailment. Retrieved from: https://www.latimes.com/archives/la-xpm-1991-08-02-mn-226-story.html

——. 2021. "Magnitude 3.4 earthquake strikes near Carpinteria." February 11, 2022. https://www.latimes.com/california/story/2021-12-08/earthquake-3-4-quake-strikes-near-carpinteria-calif.

Marks, Robert. 2015. Personal communication with Robert Marks, Pueblo Water Resources.

Mitchell, P.W. 2014. Climate Change Effects on Expansive Soil Movements. Accessed: 5 October 2021. Retrieved from: https://www.cfms-sols.org/sites/default/files/Actes/1159-1162.pdf

National Interagency Fire Center. 2021. Wildland Fire Open Data. Accessed: 26 October 2021. Retrieved from: https://data-nifc.opendata.arcgis.com/

National Research Council. 2012. Sea Level Rise for the Coasts of California, Oregon, and Washington. Accessed: 1 November 2021. Retrieved from: https://www.adaptationclearinghouse.org/resources/sea-level-rise-for-the-coasts-of-california-oregon-and-washington-past-present-and-future.html

National Watershed Coalition. 2018. "Santa Monica Debris Basin Prevented Major Damages from Occurring After Heavy Rains in Wildfire Burned Areas in California." January 28, 2022. https://watershedcoalition.org/wp-content/uploads/2021/11/Santa-Monica-Debris-Basin-6-2018.pdf

National Weather Service. 2021. Mountain and Valley Winds. Accessed: 4 November 2021: Retrieved from: https://www.weather.gov/safety/wind-mountain-valley.

National Institute for Occupational Safety and Health (NIOSH). 2021. OSHA-NIOSH Heat Safety Tool App. Accessed: Retrieved from: https://www.cdc.gov/niosh/topics/heatstress/heatapp.html

National Institute of Environmental Health Services (NIH). 2018. Vectorborne and Zoonotic Diseases. Retrieved from: https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/vectorborne/index.cfm

National Oceanic and Atmospheric Administration (NOAA). 2005. Storm Data and Unusual Phenomena with Late Reports and Corrections. Accessed: 29 October 2021. Retrieved from: https://books.google.com/books?id=PoaQUEKivqkC&pg=RA1-PA120&lpg=RA1-PA120&dq=Santa+Barbara+County,+flash+flooding+and+mudslides+closed+down+Highway+101+at+Bates+Road+2005&source=bl&ots=ZDdp2KHs2m&sig=ACfU3U03BeQPsHNV8rIaMA4QgbcFjD5zMw&hl=en&sa=X&ved=2ahUKEwjnvNSswvfzAhWEaDABHfAMAugQ6AF6BAgREAM#v=onepage&q=Santa%20Barbara%20County%2C%20flash%20flooding%20and%20mudslides%20closed%20down%20Highway%20101%20at%20Bates%20Road%202005&f=false

———. 2021a. Storm Events Database – Santa Barbara County – January 1, 1990, to August 31, 2021. Accessed: 4 November 2021. Retrieved from: https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Frost%2FFreeze&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1990&endDate_mm=07&endDate_dd=31&endDate_yyyy=2021&county=SANTA%2BBARBARA%3A83&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA.

———. 2021b. "What Is Subsidence?" April 15, 2021. Available at: https://oceanservice.noaa.gov/facts/subsidence.html.

NBC Los Angeles. 2018. List: Historic Tsunamis on California's Coast. Retrieved from: https://www.nbclosangeles.com/news/earthquakes/earthquake-tsunami-california-waves-history-damage/178803/

New York Times. 2021. In City After City, Police Mishandled Black Lives Matter Protests. Retrieved from: https://www.nytimes.com/2021/03/20/us/protests-policing-george-floyd.html

Noozhawk. 2020. Neal Graffy: Santa Barbara's Hottest Day, and a Record High of 133 Degrees. Retrieved from: https://www.noozhawk.com/article/santa_barbaras_hottest_day_and_a_record_high_of_133_degrees_20200617

Occupational Safety and Health Administration (OSHA). 2021. Heat Illness Prevention Campaign: Heat Safety Tool. Accessed: 3 November 2021. Retrieved from: https://www.osha.gov/heat/heat-app.

Ocean Protection Council (OPC). 2017. Rising Seas in California: An Update on Sea-Level Rise Science. Accessed: 1 November 2021. Retrieved from: https://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf.

———. 2018. State of California Sea-level Rise Guidance – 2018 Update. Accessed: 4 November 2021. Retrieved from:

https://opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf.

Office of Governor. 2019. Wildfires and Climate Change: California's Energy Future, A Report from Governor Newsom's Strike Force. Accessed: 26 October 2021. Retrieved from: https://www.gov.ca.gov/wp-content/uploads/2019/04/Wildfires-and-Climate-Change-California%E2%80%99s-Energy-Future.pdf

Pararas-Carayannis, George. 2007. The Santa Barbara, California, Earthquakes and Tsunami(s) of December 1812. Retrieved from: http://www.drgeorgepc.com/Tsunami1812SantaBarbara.html

Policore. 2022. Personal Communication with Foster Cannon and Calvin Wong.

Ready. 2021. Cybersecurity. Available at: https://www.ready.gov/cybersecurity

Revell, D.L., P. Barnard, and N. Mustain. 2008. "Influence of Harbor Construction on Downcoast Morphological Evolution: Santa Barbara, California." January 31, 2022.

Robert D Niehaus, Inc. 2018. The Economic Impacts of the Montecito Mudslides A Preliminary Assessment.

Santa Barbara Channelkeeper. 2021. Oil & Gas. Accessed: 26 October 2021. Retrieved from: https://www.sbck.org/our-work/advocacy/oil-gas/

Santa Barbara County. 2017. County of Santa Barbara Coastal Resiliency Project: Sea Level Rise and Coastal Hazards Vulnerability Assessment. Accessed: 28 October 2021. Retrieved from: https://cosantabarbara.app.box.com/s/uon3kzbfsviq8xoevcxeeke64c2tk87f

———. 2018. Petroleum Unit. Accessed: 5 November 2021. Retrieved from: https://www.countyofsb.org/plndev/energy/onshore.sbc.

Santa Barbara County Agricultural Commissioner's Office. 2020. Agricultural Production Report. https://www.countyofsb.org/uploadedFiles/agcomm/Content/Other/crops/2020.pdf

Santa Barbara County Association of Governments (SBCAG). 2021. "Connected 2050 Regional Transportation Plan Sustainable Communities Strategy." http://www.sbcag.org/uploads/2/4/5/4/24540302/connected_2050_final.pdf.

Santa Barbara County Integrated Regional Water Management (IRWM) Cooperating Partners. 2019. Santa Barbara County Integrated Regional Water Management Plan. Accessed: 26 October 2021. Retrieved from: https://www.countyofsb.org/uploadedFiles/pwd/Content/Water/IRWMP/IRWM-PLAN-UPDATE-Final_MASTER.pdf

Santa Barbara County Flood Control and Water Conservation District (County Flood Control). 1995. 1995 Floods. Accessed: 29 October 2021. Retrieved from: https://www.countyofsb.org/uploadedFiles/pwd/Content/Water/1995FloodsRpt.pdf

———. 1998. 1998 Flood Report. Accessed: 29 October 2021. Retrieved from: https://www.countyofsb.org/uploadedFiles/pwd/Content/Water/1998FloodRpt.pdf

——. 2011. Santa Barbara County Hydrology Report: Precipitation, Rivers/Streams, & Reservoirs, 2010-2011. Accessed: 29 October 2021. Retrieved from: https://www.countyofsb.org/uploadedFiles/pwd/Content/Water/2011%20Hydrology%20Report%20-%20Final-WPost(1).pdf

——. 2021. Rainfall and Reservoir Summary. Accessed: 9 November 2021. Retrieved from: http://www.countyofsb.org/pwd/water/downloads/hydro/rainfallreports/rainfallreport.pdf

Santa Barbara County Grand Jury. 2020. Juveniles in Gangs in Santa Barbara County has Accountability Been Forgotten? Accessed: 3 October 2021. Retrieved from: http://sbcgj.org/2020/JuvenileGangs.pdf

Santa Barbara County Planning and Development Department. 2015. Seismic Safety and Safety Element - Santa Barbara County Comprehensive Plan. Accessed: 21 July 2017. Retrieved from: http://longrange.sbcountyplanning.org/programs/genplanreformat/PDFdocs/Seismic.pdf

——. 2021. Draft Climate Change Vulnerability Assessment. Accessed: 26 October 2021. Retrieved from: https://s3-us-west-2.amazonaws.com/mysocialpinpoint/uploads/redactor_assets/documents/8c4aa5d7d81a96f8896bce055b229c2e7ec3c010a9866b35a18b7ae86aef7067/44589/SantaBarbaraCounty_CCVA_Report_PublicDraft_withExecSummary__09-21-21_reduced.pdf

Santa Barbara County Planning and Development Department, Energy Division. 2018. Venoco. Accessed: 28 October 2021. Retrieved from: http://www.sbcountyplanning.org/energy/projects/venoco.asp

Santa Barbara County Public Health Department. 2022. Santa Barbara County Community Data Dashboard. Accessed: Retrieved from: https://experience.arcgis.com/experience/030e625c69a04378b2756de161f82ef6

Santa Barbara County Public Works. 2020. 'County of Santa Barbara 2020 Groundwater Basins Summary Report'. Accessed: Retrieved from: https://www.countyofsb.org/uploadedFiles/pwd/Content/Water/WaterAgency/GW%20Data%20Report%202020.pdf

Santa Barbara Independent. 2021. "County Board of Supervisors Proclaims Local Emergency Caused by Drought Conditions." January 31, 2022. https://www.independent.com/2021/07/14/county-board-of-supervisors-proclaims-local-emergency-caused-by-drought-conditions/.

——. 2022. Carpinteria Man Arrested for Allegedly Starting Fire That Shut Down Highway 101. March 1, 2022. https://www.independent.com/2022/02/22/carpinteria-man-arrested-for-allegedly-starting-fire-that-shut-down-highway-101/.

Santa Maria Times. 2021. Judith Dale: Wildfires in Santa Barbara County, 2016 to 2019. Accessed: 26 October 2021. Retrieved from: https://santamariatimes.com/lifestyles/judith-dale-wildfires-in-santa-barbara-county-2016-to-2019/article_ba567bff-ad16-5a6e-9d85-226bcb76cce9.html.

Southern California Edison (SCE). 2017. News Release: Thomas Fire Leads to Santa Barbara Area Outage. Accessed: 5 November 2021. Retrieved from: https://newsroom.edison.com/releases/releases-20171210.

———. 2021. Wildfire Safety: Customer Resources & Support. Accessed: 5 November 2021. Retrieved from: https://www.sce.com/wildfire/customer-resources-and-support.

The Independent. 2020. Thousands at Santa Barbara Courthouse Protest the Murder of George Floyd. Retrieved from: https://www.independent.com/2020/06/01/thousands-at-santa-barbara-courthouse-protest-the-murder-of-george-floyd/

U.S. Bureau of Reclamation (USBR) 2021. Reclamation / Projects & Facilities / Dams. Accessed: 5 November 2021. Retrieved from: https://www.usbr.gov/projects/facilities.php?type=Dam#C.

———. 2022. "Carpinteria Dam." January 28, 2022. https://www.usbr.gov/projects/index.php?id=9#:~:text=The%20dam%20is%20an%20earthfill,capacity%20of%2040%20acre%2Dfeet.

U.S. Department of Agriculture (USDA) and U.S. Geological Survey (USGS). 2018. The Increasing Wildfire and Post-Fire Debris-Flow Threat in Western USA, and Implications for Consequences of Climate Change. Accessed: 2 November 2021. Retrieved from: https://link.springer.com/chapter/10.1007%2F978-3-540-69970-5_9

U.S. Department of Health and Human Services. 2005. HHS Pandemic Influenza Plan. Retrieved from: https://www.cdc.gov/flu/pdf/professionals/hhspandemicinfluenzaplan.pdf.

USGS. 2003. Tsunami Hazards in the Santa Barbara Channel. Accessed: 29 October 2021. Retrieved from: https://www.usgs.gov/centers/pcmsc/science/tsunami-hazards-santa-barbara-channel?qt-science_center_objects=0#qt-science_center_objects

———. 2016. Land Subsidence from Ground-Water Pumping. Accessed: 27 October 2021. Retrieved from: https://geochange.er.usgs.gov/sw/changes/anthropogenic/subside/

———. 2021b. Post-wildfire Landslides Becoming More Frequent in Southern California. Accessed: 2 November 2021. Retrieved from: https://www.usgs.gov/news/post-wildfire-landslides-becoming-more-frequent-southern-california

U.S. Global Change Research Program. 2016. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. https://health2016.globalchange.gov/.

University of California (UC) Natural Reserve System. 2022. "Part II: Carpinteria Salt Marsh: The Management Plan." January 26, 2022. https://carpinteria.ucnrs.org/interagency.html.

UC Santa Barbara (UCSB). 2019. Integrated approach for managing aquatic invasive species in California. Retrieved from: https://www.sciencedaily.com/releases/2019/12/191202190410.htm

Ventura County Fire Department. 2019. VCFD Determines Cause of the Thomas Fire. Accessed: 26 October 2021. Retrieved from: https://vcfd.org/news/vcfd-determines-cause-of-the-thomas-fire/.

Western Regional Climate Center. 2021. Cooperative Climatological Data Summaries – Southern California – Santa Barbara FAA COOP. Accessed 4 November 2021. Retrieved from: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7905.

Zeng, Zhenzhong, Alan D. Ziegler, Timothy Searchinger, Long Yang, Anping Chen, Kunlu Ju, Shilong Piao et al. "A reversal in global terrestrial stilling and its implications for wind energy production." Nature Climate Change, Nature Publishing Group, 2019, 9 (12), pp.979-985. ff10.1038/s41558-019-0622-6ff. ffhal-02440789. Accessed 4 November 2021. Retrieved from: https://hal.archives-ouvertes.fr/hal-02440789/document.