5 Mitigation Strategy

44 U.S. CFR Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the process to develop the mitigation strategy and mitigation action plan for the City of Petaluma Local Hazard Mitigation Plan (LHMP) update. It describes how the City met the requirements for the Federal Emergency Management Agency (FEMA) 10-step planning process. This chapter specifically discusses:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the participation of the Hazard Mitigation Planning Committee (HMPC) led to the action plan documented in Section 5.3 Mitigation Action Plan. Taking all the above into consideration, the HMPC developed the following overall mitigation strategy:

- **Communicate** the hazard information collected and analyzed through this planning process so that the community better understands what can happen where and what they can do to be better prepared.
- **Implement** the action plan recommendations of this plan.
- **Use** existing rules, regulations, policies, and procedures already in existence.
  - Given the flood hazards in the Planning Area, an emphasis should be placed on continued compliance with the National Flood Insurance Program (NFIP) and participation in the Community Rating System (CRS).
- **Monitor** multi-objective management actions so that funding opportunities may be shared, projects may be packaged, and broader constituent support may be garnered among neighboring communities.

5.1 Goals and Objectives

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas

where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and the ultimate mitigation strategy for the City of Petaluma Planning Area.

5.1.1 Goals Development Process

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation cost, schedule, and means. Goals are defined before considering how to accomplish them so that they are not dependent on the means or cost of achievement. The goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

During the planning process, HMPC members were given a list of sample goals to consider from the California 2018 State Hazard Mitigation Plan (SHMP), the 2010 City of Petaluma LHMP Annex to the Association of Bay Area Government's (ABAG) *Taming Natural Disasters* regional multi-jurisdictional LHMP for the Bay Area, the City of Petaluma General Plan Health and Safety Element, the City Council's 2019-2020 Strategic Plan, and the 2016 Sonoma County Operational Area HMP. They were also provided a list of goal statements from neighboring city and county hazard mitigation plans (e.g. City of Santa Rosa LHMP). They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was each given three 3 by 5 inch sticky notes and asked to write a goal statement on each sticky note. Goal statements were collected and grouped into similar themes and pasted onto the wall of the meeting room. The goal statements from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use.

5.1.2 Objectives Development Process

Next, the HMPC was asked whether they wanted to develop objectives that summarized strategies to achieve each goal. The HMPC agreed they would consider the development of objective statements as part of the goal development process and refine the objectives at the next meeting. The HMPC also reviewed the City Council's 2019-2020 Strategic Plan to look for opportunities to align the Strategic Plan with the LHMP goals and objectives. The HMPC revisited the goal statements prepared and categorized during the next HMPC meeting (HMPC Meeting #3). During this meeting, the Wood team explained that Wood staff and the City Project Manager reviewed each goal, re-arranged them by theme and removed duplicate goal statements. The remaining draft goals focused on loss of life and property prevention, resilience of the natural and built environment, emergency response coordination, public education, and plan implementation.

Based on the risk assessment review and goal setting process, the HMPC identified the following five goals, which provide direction for reducing future hazard-related losses within the City of Petaluma Planning Area. Statements that were more specific and measurable, but not as detailed as mitigation actions were categorized as objectives.

Goal 1: Minimize loss of life and property damage and protect people and property from hazards.

- **Objective 1.1:** Ensure public infrastructure and critical facilities are earthquake and flood safe and can withstand natural hazards through the implementation of mitigation projects for the built environment.
- **Objective 1.2:** Review land use regulations, development standards, and growth management programs to ensure future development exposure to natural and human-caused hazards is minimized.

Goal 2: Preserve and protect Petaluma's natural environment as an efficient resource to build community resilience against natural hazards.

- **Objective 2.1:** Enhance the City's natural environment capacity through mitigation projects designed to withstand hazards.
- **Objective 2.2:** Restore Petaluma river to improve water quality, expand economic opportunities, increase recreation accessibility, and enhance flood protection.

Goal 3: Educate and build community awareness on natural hazard risks and the importance of resiliency and emergency preparedness.

- **Objective 3.1:** Improve emergency preparedness awareness with an emphasis on outreach in vulnerable and socially disadvantaged populations by increasing coordination with these communities to ensure hazard risks, preparedness, and evacuation information is available and well understood.
- **Objective 3.2:** Develop outreach programs for the general public to increase awareness of hazards and to share ideas on hazard mitigation.
- **Objective 3.3:** Create partnerships with Sonoma Water to build awareness on water supply, drought, and conservation measures.

Goal 4: Enhance City staff coordination, training, and response during disasters and ensure City facilities and infrastructure are operational and provide safe places for the community to shelter during hazard events.

- **Objective 4.1:** Coordinate and share resources and information technology with neighboring jurisdictions and other agencies during disaster response and recovery training exercises.
- **Objective 4.2:** Develop contingency plans for critical facilities and infrastructure to maintain adequate water and wastewater services during hazard events.
- **Objective 4.3:** Upgrade and improve redundancy at critical facilities to ensure there are safe places and designated shelters during disasters.

Goal 5: Implement the LHMP as an integrated planning mechanism to prepare the City for natural and human-caused hazards.

- **Objective 5.1:** Schedule annual reviews of mitigation actions and regular 5-year updates of the LHMP to optimize funding opportunities and to efficiently track implementation progress.
- **Objective 5.2:** Continue to assess the effects of climate change on natural hazards, specifically sea level rise through annual review of scientific data and modelling.

5.1.3 Incorporation into Existing Planning Mechanisms

The information contained within this plan, 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 City Public Works and Utilities Department may utilize the hazard information when implementing the City's Infrastructure Master Plans and the Planning, Building, Housing, Fire, and Police Departments may utilize the hazard information when reviewing a site plan or other types of residential and commercial development applications. The City may incorporate information in this LHMP into future updates to the City's General Plan 2025 Health and Safety Element, 2015 Floodplain Management Plan (FMP), and River Access and Enhancement Plan. Information may include hazard profile information on climate change impacts and the incorporation of climate change adaptation strategies into other local and regional plans and outreach programs. The City will also incorporate this LHMP into the Health and Safety Element of the General Plan 2025, in accordance with California's Assembly Bill (AB) 2140.

Lastly, the HMPC representatives report on efforts to integrate the LHMP into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

5.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 Identifying Hazards: Natural Hazards was evaluated, as well as human-caused hazards identified in Section 4.4 Human-caused Hazards. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

The priority natural hazards are:

- Dam Incidents
- Drought
- Earthquake
- Flood: 100/200/500-Year, Localized Flooding
- Sea Level Rise
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog
- Severe Weather: High Winds
- Wildfire

Hazardous materials incidents (releases from a fixed facility or transportation accidents) and cyber threats were also identified by the HMPC as priority hazards, as noted in Section 4.4 Human-caused Hazards. Climate change impacts are qualitatively discussed in each hazard profile section. Public Safety Power Shutoffs (PSPS), commonly associated with high wind and wildfire events, are addressed by the Severe Weather: High Wind actions.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the CRS:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built to reduce hazard losses. This includes planning and zoning,

floodplain regulations, capital improvement programs, open space preservation, and stormwater management regulations.

- **Property Protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area. This includes acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Structural**: Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. This includes dams, levees, floodwalls, retaining walls, and safe rooms.
- **Emergency Services**: Actions that protect people and property during and immediately after a disaster or hazard event. This includes warning systems, emergency response services, and the protection of essential facilities.
- **Public Information/Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. This includes outreach, real estate disclosure, hazard information kiosks, and education programs.

At the mitigation strategy meeting the HMPC was provided with a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Another reference document titled "Mitigation Ideas" developed by FEMA was distributed to the HMPC during the mitigation strategy meeting. This document lists the common alternatives for mitigation by hazard. The HMPC was instructed to consider both future and existing buildings in considering possible mitigation actions. The HMPC was also asked to consider possible climate adaptation strategies in order comply with California Government Code Section 65302 subsection (g)(4). This code section addresses Senate Bill 379 requirements related to the probable consequences of climate change and assessing how climate change may affect critical facilities, infrastructure, and land uses. The HMPC was provided the California Adaptation Planning Guide (APG), which is a set of four complementary documents that provide guidance to support communities in addressing the consequences of climate change. Specific climate adaptation strategies were discussed as they relate to the priority natural hazards. The HMPC also discussed which mitigation actions and strategies should be pursued first to address immediate community needs.

A facilitated discussion took place to examine and analyze the options. Appendix C provides the matrix of alternatives considered. Each proposed action was written on a large sticky note and posted on flip charts underneath the hazard it addressed.

5.2.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- **Social:** Does the measure treat people fairly? (e.g., social equity, different groups, different generations)
- **Technical:** Is the action technically feasible? Does it solve the problem?
- **Administrative:** Are there adequate staffing, funding, and other capabilities to implement the project?

- **Political:** Who are the stakeholders? Will there be political and public support for the project?
- **Legal:** Does the jurisdiction have the legal authority to implement the action? Is it legal?
- **Economic:** Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental:** Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

The HMPC also discussed prioritizing actions that focus on climate adaptation, social equity, and community resiliency. They reviewed planning materials and tools designed to assist local communities in the development of climate adaptation and social equity goals and strategies.

In accordance with the Disaster Mitigation Act requirements (44 CFR , Section 201.6(c)(3)), an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. As part of this evaluation, the benefits of proposed actions were weighed against estimated costs as part of the prioritization process. Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the action address priority hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?
- What will the action cost?
- What is the timing of available funding?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix C: Mitigation Categories, Alternatives, and Selection Criteria.

At the mitigation strategy meeting the HMPC used STAPLEE to determine which of the identified actions were most likely to be implemented and effective. With these criteria in mind, team members were given a set of five green sticky-dot stickers. The team was asked to use the dots to prioritize projects with the above criteria in mind, essentially voting on the projects. The projects with the most dots became the higher priority projects. This process provided both consensus and priority for the recommendations.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to collectively prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. Benefit-cost was considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.3. For example, parameters were established for assigning subjective ratings (high, medium, low) to the benefits and costs of each mitigation action. Specifically, each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of an overall high, medium, or low priority for each action.

Recognizing the limitations in prioritizing actions from multiple departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue mitigation action strategy development and implementation according to the nature and extent of damages, the level of protection and benefits each action provides, political support, project cost,

available funding, and jurisdiction and department priority. This process guided the development of a prioritized action plan for the City of Petaluma. Cost-effectiveness will be considered in greater detail through a formal benefit-cost analysis when seeking FEMA mitigation grant eligibility and funding (e.g. Hazard Mitigation Grant Program, Pre-Disaster Mitigation grant program) for eligible actions associated with this plan.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This action plan was developed to present the recommendations developed by the HMPC for how the City of Petaluma 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.

5.3.1 Progress on 2010 City of Petaluma LHMP Annex Mitigation Actions

The City of Petaluma has been implementing actions identified in the City of Petaluma LHMP Annex developed and last updated by the ABAG in 2010, and working steadily towards meeting the 2010 plan goals based on funding and staff availability. During the 2019 LHMP update process the City reported on the status of the 2010 actions. The City provided input on whether the action had been completed, was deferred (not yet implemented, but still relevant for the updated plan), was in progress, or should be deleted.

Given the City has historically been impacted primarily by flood hazards, all goals and objectives from the 2010 FMP were carried forward into the 2010 LHMP Annex, plus five new mitigation strategies. For this 2019 LHMP update, new flood hazard mitigation actions were developed, but only four of the five mitigation strategies from the 2010 LHMP Annex were carried forward into the 2019 LHMP. This includes Strategy #GOVT-b-14, Strategy #GOVT-b-15, Strategy #GOVT a-7, and Strategy #GOVT a-9. Strategy #GOVT-b-22 was completed. Other strategies listed in the 2010 LHMP Annex were not funded and are no longer relevant for the City of Petaluma. These four strategies were consolidated into three mitigation actions in the 2019 LHMP mitigation strategy.

Strategy #GOVT-b-14 included the installation of a warning system with outdoor sirens, and coordinating installation with neighboring jurisdictions. This mitigation strategy was deferred and carried forward into the 2019 LHMP. In the 2019 LHMP, this strategy is included as MH-1: Evacuation Alert and Warning System and Periodic Testing.

Strategy #GOVT-b-15 involved conducting periodic tests of the outdoor sirens once per month. This mitigation strategy was deferred and carried forward into the 2019 LHMP. In the 2019 LHMP, this strategy is also included as MH-1: Evacuation Alert and Warning System and Periodic Testing.

Strategy #GOVT a-7 included periodically assessing the need for new or relocated fire or police stations and other emergency facilities; changes in staffing levels; and additional or updated supplies, equipment, technologies, and in-service training classes. This mitigation strategy was not funded in the 2010 LHMP Annex, and therefore carried forward into the 2019 LHMP. In the 2019 LHMP, this strategy is included as MH-2: Periodically assess the need for new or relocated fire or police stations and other emergency

facilities; changes in staffing levels; and need for supplies, equipment, technologies, and in-service training classes.

Strategy #GOVT-a-9 involved developing and maintaining a system of interoperable communications for first responders from cities, counties, special districts, state and federal agencies. This mitigation strategy was not funded in the 2010 LHMP Annex, and therefore carried forward into the 2019 LHMP. In the 2019 LHMP, this strategy is included as MH-3: Develop and maintain a system of interoperable communications for first responders from local, state, and federal agencies.

The fifth mitigation strategy in the 2010 LHMP Annex, Strategy #GOVT-b-22, involved investigating the use of phone-based warning systems for selective geographic areas. Strategy #GOVT-b-22 was funded, implemented, and completed at the County level. Sonoma County has a system in effect that has been used to broadcast messages across the County during recent flood and wildfire emergencies. The system is coordinated throughout the Sonoma County Operation Area and at the County Emergency Operations Center (ABAG 2010).

The majority of the flood hazard goals, objectives, and actions listed in the 2010 LHMP Annex are in progress and integrated into the 2019 LHMP update. Details are highlighted in the new flood action descriptions. Details on the progress of these actions since the 2010 LHMP Annex planning process can be found in subsection 5.3.3 and Table 5-1 below.

5.3.2 Continued Compliance with National Flood Insurance Program

Recognizing the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by the City of Petaluma. As a NFIP participant, Petaluma will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain regulations. Other details related to NFIP participation are discussed in the flood vulnerability discussion in Chapter 4 and in the capability assessment in Chapter 2. Additional actions are related to participation with the CRS program. The City's participation in the CRS is further evidence of continued NFIP compliance.

5.3.3 Mitigation Action Plan

This action plan presents the recommendations developed by the HMPC outlining how the City of Petaluma can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The mitigation actions developed by the HMPC are summarized in Table 5.1 and listed in detail in the mitigation action worksheets that follow. Table 5.1 is a summary table for quick reference. It identifies the mitigation action title, lead agency/department, hazards mitigated, priority and if the action mitigates losses to existing or future development. The 'Related Goal' column notes which of the five goals in Section 5.2 that the action helps achieve. The action worksheets that follow provide more background information, ideas for implementation, lead agency, partners, potential funding sources, cost estimates, benefits, and timeline for each identified action.

The City of Petaluma has other existing, detailed action descriptions in planning documents, such as General Plan 2025 Health and Safety Element, 2015 FMP, Infrastructure Master Plans, Capital Improvement Program and Budgets, and other planning mechanisms. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The HMPC also realizes that new needs, priorities, and adaptation strategies may arise as a result of a disaster or other circumstances and reserves the right to support new actions and strategies, as necessary, as long as they conform to the overall goals of this plan.

The actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The City is not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the City and the community to mitigate the risks and vulnerabilities from identified hazards.

Many of the action items included in this plan are also a collaborative effort among City of Petaluma departments, Sonoma County, Sonoma Water, City of Sebastopol, Climate Action Commission, and other state, regional, and local agencies and stakeholders in the City of Petaluma Planning Area and greater Sonoma Valley.

Table 5- 1: Mitigation Action Summary Table

Action ID	Action Title	New Action/2010 Action	Hazard(s) Mitigated	Responsible Office / Agency	Address Existing or Future Development	Priority	Related Goal
Dam Incidents							
DI-1	Assess downstream impacts associated with dam incidents	New	Dam Incidents, Flood Hazards	Public Works and Utilities Department	Both	Low	1, 3, 4
Drought							
DR-1	Groundwater supply augmentation for drought resiliency	New	Drought	Public Works and Utilities Department	Both	Medium	1, 2, 3, 4
DR-2	Sustainable Groundwater Management Planning	New	Drought	Public Works and Utilities Department	Both	Low	1, 3, 4, 5
Cyber Threats							
CT-1	Develop a Water Infrastructure Vulnerability Risk and Resilience Plan and Emergency Response Plan that addresses cyber sufficiency	New	Cyber Threats, Drought	Public Works and Utilities Department	Both	Low	1, 2, 3, 4, 5
Earthquake							
E-1	Implement Seismic Retrofits at Petaluma Historic Library and Museum	New	Earthquake Hazards	Building Department, Public Works and Utilities Department	Existing	Medium	1, 2, 3, 4
E-2	Seismic Retrofit Analysis of City buildings	New	Earthquake Hazards	Building Department, Public Works and Utilities Department	Existing	High	1, 2, 3, 4
Flooding							
F-1	Enhance structural flood mitigation projects to reduce near annual floods on north end of City	New	Flood Hazards	Public Works and Utilities Department	Both	Medium	1, 2, 3, 4, 5
F-2	Floodplain property protection, acquisition, and relocation	New	Flood Hazards, Sea Level Rise	Public Works and Utilities Department	Existing	Low	1, 3, 4

Action ID	Action Title	New Action/2010 Action	Hazard(s) Mitigated	Responsible Office / Agency	Address Existing or Future Development	Priority	Related Goal
F-3	Continue annual stream and creek channel maintenance	New	Flood Hazards	Public Works and Utilities Department	Both	Low	1, 2, 3, 4
F-4	Higher Regulatory Standards for Flood Protection	New	Flood Hazards	Building Department, City Engineer	Both	Medium	1, 3, 4
F-5	Improve National Flood Insurance Program Community Rating System rating	New	Flood Hazards	Public Works and Utilities Department	Both	Medium	1, 3, 4
Hazardous Material Releases							
HM-1	Evacuation Planning	New	Hazardous Material Releases, Multiple Hazards	Fire Department, Industrial Company	Both	High	1, 3, 4, 5
Sea Level Rise							
SLR-1	Explore natural protection with wetland enhancement, marshland protection, and restoration project implementation in the Petaluma River and San Pablo Bay transition zone	New	Sea Level Rise, Flood Hazards	Public Works and Utilities Department	Both	Low	1, 2, 3, 4
SLR-2	Continue Petaluma River Dredging Program to enhance flood resilience	New	Sea Level Rise, Flood Hazards	Public Works and Utilities Department	Both	Medium	1, 2, 3, 4
SLR-3	Open space preservation in areas prone to sea level rise along the Petaluma River	New	Sea Level Rise, Flood Hazards	Parks and Recreation Department, City Engineer, Public Works and Utilities Department, Building Department	Existing	Medium	1, 2, 3, 4, 5

Action ID	Action Title	New Action/2010 Action	Hazard(s) Mitigated	Responsible Office / Agency	Address Existing or Future Development	Priority	Related Goal
SLR-4	Map and assess vulnerability to sea level rise and integrate the information with the City GIS mapping capabilities to educate the community and help them gain awareness of the potential impacts and actions the City is taking to plan and adapt	New	Sea Level Rise, Flood Hazards	Public Works and Utilities Department	Both	Medium	1, 3, 4
SLR-5	Assess sea level rise modelling for use in the LHMP and how those projections can be routinely re-evaluated in subsequent climate adaptation planning efforts	New	Sea Level Rise, Flood Hazards	Public Works and Utilities Department	Both	Low	1, 3, 4, 5
SLR-6	Update City Implementing Zoning Ordinance (IZO) to manage development in high risk areas	New	Sea Level Rise, Flood Hazards	Planning Department, City Engineer	Both	Low	1, 3, 4, 5
Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog							
SW-1	Replace aging generator and plan for severe weather by obtaining backup generators at City critical facilities, including the Communications Center	New	Severe Weather: Heavy Rains/Thunderstorms/ Hail/Lightning/Dense Fog; Earthquake; Extreme Heat; Wildfire; PSPS	Public Works and Utilities Department	Existing	Medium	1, 3, 4, 5
Severe Weather: Extreme Heat							
SW-2	Establish cooling centers at City Community Center to be used during severe weather events involving heat waves	New	Severe Weather: Extreme Heat	Parks and Recreation Department, Public Works and Utilities Department	Both	Low	1, 4, 5

Action ID	Action Title	New Action/2010 Action	Hazard(s) Mitigated	Responsible Office / Agency	Address Existing or Future Development	Priority	Related Goal
Severe Weather: High Wind							
SW-3	Enhance local building code to incorporate wind-resistant design features that address high wind hazards	New	Severe Weather: High Wind; PSPS	Building Department	Both	Low	1, 3, 4, 5
SW-4	Develop a PSPS toolkit for local businesses	New	Severe Weather: High Wind; PSPS	Public Works and Utilities Department, Economic Development Department	Both	Low	1, 3, 4, 5
Wildfire							
W-1	Defensible space funding program	New	Wildfire	Fire Department	Both	Medium	1, 3, 4, 5
W-2	Develop a City-wide Fire Suppression Master Plan	New	Wildfire	Fire Department, Fire Prevention Bureau, Public Works and Utilities Department	Both	Medium	1, 3, 4, 5
W-3	Evaluate the WUI Zone in the City Limits	New	Wildfire	Fire Department, Fire Prevention Bureau	Both	Medium	1, 3, 4, 5
W-4	Install Fire Protection System in all City facilities	New	Wildfire	Public Works and Utilities Department, Fire Prevention Bureau, Building Department	Existing	Medium	1, 3, 4, 5
W-5	Wildland Urban Interface Pre-Fire Plan	New	Wildfire	Fire Department	Both	Low	1, 3, 4, 5
Multi-Hazard Actions							
MH-1	Evacuation Alert and Warning System and Periodic Testing	2010 Action	Multi-Hazard, Dam Incidents, Earthquake, Floods, Hazardous Material Releases	Fire Department, Police Department	Both	Low	1, 3, 4, 5

Action ID	Action Title	New Action/2010 Action	Hazard(s) Mitigated	Responsible Office / Agency	Address Existing or Future Development	Priority	Related Goal
MH-2	Periodically assess the need for new or relocated fire or police stations and other emergency facilities, changes in staffing levels, and need for supplies, equipment, technologies, and in-service training classes	2010 Action	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	Police Department, Fire Department, Public Works and Utilities Department	Existing	Medium	1, 3, 4, 5
MH-3	Develop and maintain a system of interoperable communications for first responders from local, state, and federal agencies	2010 Action	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	Fire Department, Police Department	Both	High	1, 3, 4, 5
MH-4	Update the City Emergency Operations Plan	New	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	Fire Department	Both	High	1, 3, 4, 5
MH-5	Emergency Operations Center replacement and upgrades	New	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	Public Works and Utilities Department	Both	Low	1, 3, 4, 5
MH-6	Expand Community Emergency Pre Program	New	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	Fire Department	Both	Low	1, 3, 4, 5
MH-7	Community Emergency Preparedness Webpage	New	Multi-Hazard, Dam Incidents, Floods, Earthquake, Severe Weather, Wildfire	City Manager's Office	Both	Low	1, 3, 4, 5

The following mitigation actions provide project specific information and implementation details on each mitigation activity identified. They are grouped by the type of hazard(s) they address.

DI-1 Assess downstream impacts associated with dam incidents

Mitigation Project Title	Assess downstream impacts associated with upstream dam incidents
Hazard(s) Mitigated	Dam Incidents, Flood Hazards
Project Description, Issue/Background	The City of Petaluma will assess downstream impacts anticipated from the breach or failure of existing dams located upstream of the City of Petaluma. There is currently one dam, La Crema Winery dam, located east of the City of Petaluma. While the likelihood of dam failure or breach for this dam is low, there may be impacts to downstream properties and critical facilities. This dam lacks available Geographic Information System (GIS)-based inundation mapping and an Emergency Action Plan (EAP). By analyzing the risks in detail, the City, in collaboration with the dam owners and operators, can determine whether there is risk. If there is a risk for a dam incident the City can prioritize planning, warning, and evacuation procedures to raise awareness of the hazard in targeted areas. If necessary, evacuation procedures can be integrated into Mitigation Action MH-1: Evacuation Alert and Warning System and Periodic Testing.
Related planning mechanisms	General Plan 2025, Evacuation Planning, 2007 Emergency Operations Plan
Other Alternatives	Partner with other agencies, such as Sonoma County for infrastructure improvements assessments on dams and levees and public awareness of potential dam and levee failure impacts. Work with existing inundation mapping data based on water storage facility information.
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Dam Owners (e.g. La Crema Winery), Reclamation Districts, Sonoma County, California Department of Water Resources (DWR)
Priority (High, Medium, Low)	Low
Cost Estimate	Varies, if dam inundation modelling is not available, modeling and inundation mapping costs depend on the size of the dam; $25,000 - $50,000 given existing upstream water storage facilities are small.
Benefits (Avoided Losses)	The risk to the City is low due to the distance between the downstream properties and dam locations. However, the downstream impacts should be further evaluated to confirm no City-owned critical facilities would be impacted. Also, if needed, educating home buyers of the upstream dams and flood protections should be considered in order to avoid loss of life and injuries if an event where to occur. Understanding the risk that could occur can improve warning and evacuation procedures. Currently, there is

	mainly open space and rural agricultural land located downstream of the La Crema Winery dam.
Potential Funding	Homeowners should be encouraged to purchase flood insurance in areas near the dams. FEMA High Hazard Potential Dam Grants, Dam Owners could partially fund studies
Schedule	2020-2024

DR-1 Groundwater supply augmentation for drought resiliency

Mitigation Project Title	Groundwater supply augmentation for drought resiliency
Hazard(s) Mitigated	Drought
Project Description, Issue/Background	According to the City's 2015 Urban Water Management Plan (UWMP), the City does not rely on groundwater as a significant portion of supply due to yield and water quality limitations. Groundwater is only used for peak water demand needs or to minimize short-term supply cost impacts and only half of the City's existing wells are used due to low yields, poor water quality, and deteriorating well conditions. Instead, the City obtains the majority of its water supply from Russian River surface water deliveries from Sonoma Water. While the City currently relies on various groundwater management tools and studies are underway to better understand the groundwater basin, the City anticipates using more groundwater to meet demand during emergencies, when back-up supplies are necessary during drought conditions. As a result, the City of Petaluma has a 20 percent maximum daily demand (MDD) peak water usage goal. The City intends to achieve this 20 percent goal by relying on City groundwater supply through the rehabilitation and installation of additional groundwater wells and by expanding the existing recycled water system. Over the years, the increased reliance on City groundwater has been the result of rehabilitated well sites and studies to determine the actual production capabilities in the event of emergency use. The City is in the process of expanding the groundwater well system. The City recently expanded the recycled water distribution system in the urban area. Another phase is planned with the Maria Drive reconstruction within the next year. Future phases may be constructed through 2040.
Related planning mechanisms	City's Municipal Code, 2015 UWMP, City's Water Shortage Contingency Plan (WSCP) (Chapter 8 of UWMP), Water Shortage Contingency Resolution
Other Alternatives	Ongoing water conservation efforts to mitigate the impacts to water supply; water conservation education and outreach
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma Water, California DWR, North Bay Water Reuse Program (NBWRP)
Priority (High, Medium, Low)	Medium
Cost Estimate	$25,000 - $200,000 annually depending on well rehabilitation and installation costs and civil engineering associated with water recycling facility expansion.

Benefits (Avoided Losses)	The City of Petaluma has cycle periods of wet and drought years. The last drought in California was longer and more devastating than prior droughts, due to both increased temperatures, and higher demand on public services. Well rehabilitation, new well installation, and recycled water use are long-term solutions for mitigating the impacts of drought years. Long-term City investment in an expanded recycled water and distribution system will provide a sustainable water solution to the City that promotes drought resiliency.
Potential Funding	General Fund, California Proposition 1 Grants, California DWR Sustainable Groundwater Planning Grants Program, State's Water Recycling Funding Program (WRFP), Integrated Regional Water Management (IRWM) Grant Programs, and funding from other agencies (i.e., Sonoma Water)
Schedule	2020-2022

DR-2 Sustainable Groundwater Management Planning

Mitigation Project Title	Sustainable Groundwater Management Planning
Hazard(s) Mitigated	Drought
Project Description, Issue/Background	The 46,000-acre Petaluma Valley Groundwater Basin is located within the larger 93,440-acre Petaluma Valley watershed. The City of Petaluma relies on local groundwater to supplement imported Russian River surface water supplies from Sonoma Water. While studies are underway to evaluate groundwater conditions in Petaluma Valley Groundwater Basin, current conditions suggest that groundwater elevations are relatively stable in southern and central Petaluma Valley, but areas in the northwest have exhibited long-term declines. The Basin has historical occurrences of serious nitrate contamination in the western portion of the Basin and evidence of saltwater intrusion from the tidally influenced portion of the Petaluma River. Other degradation of water quality impacts and loss of storage capacity continue to be evaluated through the installation of new groundwater monitoring wells and technical guidance from the California DWR. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins. The City of Petaluma is a local agency (as defined by §10723 of the Water Code) which overlays the Petaluma Valley Groundwater Basin, and as such the City has become part of the local GSA. The Petaluma Valley GSA was required to develop and implement, no later than January 31, 2022, a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. The GSP is a 20-year plan to ensure that groundwater will be used sustainably in the groundwater basin. The Petaluma Valley GSA is a multi-agency GSP consisting of Sonoma Resource Conservation District, Sonoma Water, Sonoma County, North Bay Water District, and the City of Petaluma formed to develop the GSP and sustainably manage groundwater in Petaluma Valley. As of 2017, the City of Petaluma participates in the groundwater management planning process. The development of the Petaluma Valley GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies, coordinate with other water agencies and districts, while providing insurance and resilience against periods of long-term drought.
Related planning mechanisms	GSP, City's Municipal Code, 2015 UWMP, City's WSCP (Chapter 8 of UWMP),
Other Alternatives	None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma Water, Sonoma County, Sonoma Resource Conservation District, North Bay Water District
Priority (High, Medium, Low)	Low
Cost Estimate	Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge or monitoring projects.
Benefits (Avoided Losses)	Preparation and implementation of the GSP will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California DWR.
Potential Funding	Property owner assessments along with grant funding opportunities from the State.
Schedule	GSAs must complete and submit the required GSP to DWR by January 31, 2022, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2042.

CT-1 Develop a Water Infrastructure Vulnerability Risk and Resilience Plan and Emergency Response Plan that addresses cyber sufficiency

Mitigation Project Title	Develop a Water Infrastructure Vulnerability Risk and Resilience Plan and Emergency Response Plan that addresses cyber sufficiency
Hazard(s) Mitigated	Cyber Threats, Drought
Project Description, Issue/Background	Section 2013 of America's Water Infrastructure Act of 2018 (AWIA) requires community water systems serving more than 3,300 people to develop or update risk and resilience assessments and emergency response plans (ERPs). The risk and resilience assessments must be conducted and certification submitted to the U.S. EPA by March 31, 2020 if the utility serves more than 100,000 people; December 31, 2020 if the utility serves 50,000 to 99,999 people; and June 30, 2021 if the utility services 3,301 to 49,999 people. The City must also develop or update ERPs and complete certification submittals to the U.S. EPA no later than six months after the risk and resilience assessments are certified. These risk and resilience assessments evaluate vulnerabilities, threats, and consequences from potential natural hazards and malevolent acts. They also assess the resilience of water facility infrastructure (pipe, water sources of collection, treatment, storage, distribution and electronic and computer systems), monitoring practices, chemical storage and handling, and operation and maintenance activities. ERPs include strategies and resources to improve resilience, including physical security and cybersecurity. ERPs also cover plans and procedures for responding to natural hazards or malevolent acts that threaten safe drinking water. Implementation of this action would ensure that City water supply wells and pump status are secure and appropriate site and cyber security is in place, thereby also minimizing impacts related to drought hazards.
Related planning mechanisms	2007 Emergency Operations Plan, Draft Water Infrastructure Vulnerability Risk and Resilience Assessment, Facility Assessment
Other Alternatives	Existing Facility Vulnerability Assessments, LHMP Vulnerability Assessment (public water drinking water supply infrastructure assessment was included, but facilities were not mapped due to sensitivity of information)
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma Water
Priority (High, Medium, Low)	Low
Cost Estimate	$50,000 - $100,000

Benefits (Avoided Losses)	The implementation of a detailed vulnerability risk and resilience assessment of the City's drinking water supply infrastructure would better prepare the City for natural and human-caused hazards. The assessment would also allow the City to prepare hazard-specific contingency plans and identify additional hazard mitigation actions.
Potential Funding	U.S. EPA grant funding
Schedule	June 30, 2020 based on federal AWIA legislation and population served by City water and wastewater services

E-1 Implement seismic retrofits at Petaluma Historic Library and Museum

Mitigation Project Title	Implement seismic retrofits at Petaluma Historic Library and Museum
Hazard(s) Mitigated	Earthquake
Project Description, Issue/Background	In 1992 the City adopted a resolution establishing a list of unreinforced masonry buildings in the City for the purpose of setting a timeframe for strengthening the Unreinforced Masonry (URM) Building Ordinance. The resolution classified the buildings into four groups, with the first groups being potentially the highest risk and need for prioritized retrofitting. Higher occupancy buildings were also identified as higher risk structures that needed to be retrofitted, as well as other factors, such as the physical height of the building and the proximity to pedestrian activity. The classification included 98 buildings within the City that needed to be retrofitted within the next 20 years. As of early 2020, all of the classified buildings have been retrofitted with the exception of the Petaluma Historic Library and Museum located at 20 4th Street. This action involves seismically retrofitting the historic library and museum for earthquake, fire, and public safety hazards. Seismic modifications to the library and museum must also take into consideration the architectural integrity of the building to avoid compromising the building's historical features.
Related planning mechanisms	2016 California Building Code, URM Building Ordinance, 1992 URM Building Resolution
Other Alternatives	None
Responsible Office/ Agency	Building Department, Public Works and Utilities Department
Partners	Petaluma Museum Association
Priority (High, Medium, Low)	Medium
Cost Estimate	$1,000,000 - $5,000,000
Benefits (Avoided Losses)	Seismic retrofits of Petaluma's historic library and museum would better preserve the historic and architectural integrity of the building, while also addressing seismic, fire, and public safety hazards.
Potential Funding	General funds, grant fund opportunities
Schedule	2022-2025

E-2 Seismic Retrofit Analysis of City buildings

Mitigation Project Title	Seismic Retrofit Analysis of City buildings
Hazard(s) Mitigated	Earthquake
Project Description, Issue/Background	The City of Petaluma adopted the 2016 California Building Code (CBC), which governs the design, construction, and maintenance of buildings. In California, most cities adopt model building codes maintained by the International Building Code (IBC) and every few years the International Code Council (ICC) publishes new editions of the codes. The CBC requires specific tests for masonry to ensure that structures can adequately resist seismic forces during earthquakes. The City of Petaluma has already identified unreinforced masonry properties in their jurisdiction that are vulnerable to seismic risk and have removed or retrofitted most of the City-owned buildings and facilities, with the exception of the City's historic museum and library. While most City-owned facilities have been seismically retrofitted, there are key critical facilities in the City where seismic retrofit analyses need to be conducted to better understand detailed vulnerabilities during major earthquakes. These buildings include the City police and fire stations, City Emergency Operations Center (EOC), and City's Emergency Communication Center. This can include bracing of non-structural items to reduce damage potential to building contents and reduce risk of injury, ensuring continuity of operations during an incident. An earthquake retrofit analysis would include a structural and non-structural assessment of City buildings, as well as infrastructure, such as water tanks, sewer lines, bridges, and roads. Initial retrofitting analysis may involve a survey of the structural condition at critical facilities and prioritized surveys at buildings closer to major fault or liquefaction zones. Replacement and retrofits can then occur as funding becomes available. Various resources provided by FEMA and the American Society of Civil Engineers (ASCE) provide seismic retrofitting guidelines and techniques to strengthen the structural elements of buildings, and better protect non-structural components.
Related planning mechanisms	Survey, evaluate, and prioritize existing structures and prioritize worst-case buildings and properties and repair these as funding becomes available.
Other Alternatives	Completion of Unreinforced Masonry Retrofit Program (historic museum and library is only remaining City-owned facility that needs retrofitting) Update City's building code to exceed current state seismic and safety standards in order to minimize earthquake damage for new buildings and structures. Voluntary seismic retrofitting and encouraging property owners to exceed state seismic standards.

Responsible Office/ Agency	Building Department, Public Works and Utilities Department
Partners	None
Priority (High, Medium, Low)	High
Cost Estimate	$200,000 - $1,000,000 (varies depending on whether buildings have already been assessed and need retrofits)
Benefits (Avoided Losses)	Protection of life and property during an earthquake by removing the threat of loss, injury, and damage to people and property from building hazards.
Potential Funding	City General Fund, State funding
Schedule	2020-2024

F-1 Enhance structural flood mitigation projects to reduce near annual floods on north end of City

Mitigation Project Title	Enhance structural flood mitigation projects to reduce near annual floods on the north end of the City
Hazard(s) Mitigated	Flooding
Project Description, Issue/Background	For over the past 15 years, the City of Petaluma has been proactive to mitigate flood hazards within the Petaluma watershed. The City has worked on the Petaluma River Flood Control Project, as part of the joint effort with the U.S. Army Corps of Engineers, and has received state funding to implement four phases of the Petaluma River–Denman Reach flood mitigation project near the north end of the City along Industrial Avenue. Both projects help the City implement the 1996 Petaluma River Access and Enhancement Plan, General Plan 2025, and the 2015 FMP. These structural projects increase the capacity of the historic floodplain and alleviate flood impacts to neighboring residences and businesses. The Petaluma River Flood Control Project included channel widening, floodwalls along Washington Creek and the Petaluma River, a concrete transition weir, two new pump stations, replacement of the Payran Street Bridge and the Lakeville Street Bridge, and the creation of a U-shaped channel along one reach of the river. This project was completed in late 2015. The first three phases of the Petaluma River–Denman Reach project were completed from 2005 to 2018 with California DWR grant funds. The first phases involved acquiring vacant parcels, developing a permanent trail easement, opening the river channel and extending a flood terrace along the top of the bank, widening the eastern bank of the River within the lower portion of Denman Reach (between Petaluma Boulevard North and Corona Road), and creating wetlands and riparian habitat. The final phase is currently under construction and funded by a California DWR grant award through coordination with Sonoma Water. Phase 4 is expected to be completed in early 2020. The completed project will lower the flood elevation for the 100-year storm up to one foot in areas around Industrial Avenue and Corona Road.
Related planning mechanisms	1996 River Access and Enhancement Plan, General Plan 2025, 2015 FMP
Other Alternatives	Other Flood Mitigation Projects, Non-Structural Projects
Responsible Office/ Agency	Public Works and Utilities Department
Partners	U.S. Army Corps of Engineers, Sonoma Water, Conservation Corps of the North Bay
Priority (High, Medium, Low)	Medium

Cost Estimate	$1,000,000 - $2,000,000 for implementation of all phases of each project
Benefits (Avoided Losses)	Structural flood control projects will ensure the City continues to provide adequate flood protection, which will minimize flood related losses associated with property damage.
Potential Funding	DWR grant funding (Urban Streams Restoration grant funds, Proposition 1E funds)
Schedule	Ongoing; Construction anticipated to be complete for Denman Reach Phase 4 in 2020

F-2 Floodplain property protection, acquisition, and relocation

Mitigation Project Title	Floodplain property protection, acquisition, and relocation
Hazard(s) Mitigated	Flooding, Sea Level Rise
Project Description, Issue/Background	Consistent with the General Plan 2025 and the 2015 FMP goals and property protection activities, the City of Petaluma has successfully undertaken efforts to acquire and relocate 13 properties in the floodplain. The City will continue to explore opportunities for property protection, acquisition, and relocation consistent with the General Plan 2025 Policy 8-P-37 and the 2015 FMP property protection activities. The City would seek acquisition and relocation funding using pre-disaster mitigation and flood mitigation assistance (FMA) program funding, with a focus on acquiring properties in the repetitive loss areas of the floodplain. These property acquisitions would increase floodplain capacity and reduce flood hazards. This action supports the preservation of open space and natural areas according to General Plan 2025 Policies 4-P-1 through 4-P-4 and the establishment of a 200-foot setback on both sides of the Petaluma River based on General Plan 2025 Policy 8-9-30. The action also involves exploring property protection projects and acquisitions in other portions of the floodplain, and is further supports Mitigation Action SLR-2 focused on open space preservation.
Related planning mechanisms	General Plan 2025, 2015 FMP
Other Alternatives	Floodplain Regulation Enforcement, Enhancing Building Codes and Development Standards, Building Elevation Certification, CRS Program Participation
Responsible Office/ Agency	Public Works and Utilities Department
Partners	FEMA, Cal OES, California DWR
Priority (High, Medium, Low)	Low
Cost Estimate	Varies, depending on property relocation and acquisition effort
Benefits (Avoided Losses)	Relocation of buildings or structures in the floodplain or the acquisition of such properties would reduce repetitive losses related to flooding.
Potential Funding	Pre-Disaster Mitigation Grant Funds, FMA Funding
Schedule	Ongoing

F-3 Continue annual stream and creek channel maintenance

Mitigation Project Title	Continue annual stream and creek channel maintenance
Hazard(s) Mitigated	Flooding
Project Description, Issue/Background	The City has worked with Sonoma County and Sonoma Water since the December 11, 2014 flood event to clear channels and creeks of debris, sediment, and overgrown vegetation within the parameters of existing environmental permits. This action would support floodplain management goals to continue annual stream and creek channel maintenance in accordance with established City, County, and Sonoma Water requirements. Permitted creek and stream channel maintenance activities would occur throughout the City and include structural channel modification projects referenced in the 2015 FMP.
Related planning mechanisms	General Plan 2025 Surface Water Management Element, 2015 FMP, City's 5-year Capital Improvement Program (CIP), City-wide Expanded Channel and Creek Maintenance Program and Permit
Other Alternatives	Stormwater Management Program, Phase II Stormwater Management Plan, Storm Water Ordinance Petaluma River Watershed Drainage Master Plan
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma County, Sonoma Water
Priority (High, Medium, Low)	Low
Cost Estimate	$250,000 - $500,000
Benefits (Avoided Losses)	Routine stream and creek channel maintenance activities, such as debris clearing and vegetation management would provide adequate flood conveyance capacity, improve stream and habitat restoration, and provide improved flood protection for the residents and business in the City of Petaluma. The maintenance activities are also creditable under the CRS.
Potential Funding	Sonoma Water funding, Urban Streams Restoration Program Grant (USRP), Proposition 1 Funding
Schedule	2020-2025

F-4 Higher regulatory standards for flood protection

Mitigation Project Title	Higher regulatory standards for flood protection
Hazard(s) Mitigated	Flooding
Project Description, Issue/Background	Since the implementation of the 2010 LHMP Annex prepared by ABAG, the City of Petaluma has prioritized floodplain management activities in the General Plan 2025 and 2015 FMP. The City joined the NFIP in 1983 and adopted its first FMP in 1995, which was last updated in 2015. The City participates in the CRS program as one of its efforts to reduce potential losses due to flooding, and the NFIP has conducted annual audits of the City's floodplain management efforts for over two decades and awarded the City a Class Rating 6. As part of this action, the City of Petaluma will continue to implement preventative activities summarized in the 2015 FMP that involve enforcing standards that provide more flood protection than the NFIP's minimum requirements. These activities include: • Implement flood protection policies in the General Plan 2025; • Require two feet of freeboard for first floor elevations above the base flood elevation (General Plan 2025 Policy 8-P-37F); • Require foundation protection; • Require digital post-construction elevation certificates for new structures, additions and substantial improvements to structures in the floodplain to be organized into a GIS database; • Require zero net fill on all new developments in the floodplain; • Adhere to federal and state-mandated regulatory standards; and • Maintain adequate staffing in the City's Building Department to continue to enforce building codes for new construction and improvements in the floodplain through the City.
Related planning mechanisms	General Plan 2025, 2015 FMP, CRS Program participation
Other Alternatives	Site-Specific Development Review (case-by-case project site plan review); Building Code Enforcement
Responsible Office/ Agency	Building Department, City Engineer
Partners	None
Priority (High, Medium, Low)	Medium
Cost Estimate	$100,000 annually (staffing costs for enforcement and site plan review)
Benefits (Avoided Losses)	The enforcement of higher regulatory standards will ensure the City continues to provide adequate flood protection, which will minimize flood related losses associated with property damage. This action is integral in maintaining a CRS Class 6 rating, which helps flood insurance be more affordable for City residents. The requirement for organizing digital post-construction elevation certificates in GIS would increase staff

	production time versus referencing paper copies, and ensure accurate flood prediction and mapping data is easily accessible and tracked electronically.
Potential Funding	General Fund
Schedule	Ongoing

F-5 Improve National Flood Insurance Program Community Rating System rating

Mitigation Project Title	Improve National Flood Insurance Program Community Rating System rating
Hazard(s) Mitigated	Flooding
Project Description, Issue/Background	This action involves improving the NFIP CRS Rating for City. Subsequent steps will involve tracking credit opportunities associated with the LHMP and completing the Activity Floodplain Coordinator Manual 510 steps and worksheets. This plan update is already aligned with the CRS planning process to maximize CRS points. Other opportunities to improve credits according to the latest CRS Coordinator's manual will be evaluated.
Related planning mechanisms	General Plan 2025; 2015 FMP, NFIP Participation, CRS Participation
Other Alternatives	2015 FMP Implementation
Responsible Office/ Agency	Public Works and Utilities Department
Partners	None
Priority (High, Medium, Low)	Medium
Cost Estimate	$15,000 - $25,000 for consultant assistance with ISO Verification Process
Benefits (Avoided Losses)	Maximizing participation in the CRS program will reduce property losses and damage. If the City achieves a higher CRS rating, flood insurance policy holders will receive reduced premiums on their policies.
Potential Funding	General Fund
Schedule	Ongoing

HM-1 Evacuation Planning

Mitigation Project Title	Evacuation Planning
Hazard(s) Mitigated	Hazardous Material Releases, Multi-Hazard
Project Description, Issue/Background	The City currently has several industrial sites that during an accident or disaster could release hazardous material that would negatively impact the health of persons in the community. It is important for those potentially affected to know, understand, and practice the best course of action, whether that be to shelter-in-place or evacuation procedures. Once initial action is taken, the community needs to understand the next steps and plan appropriately. This action can be implemented on a neighborhood-by-neighborhood level, and it would take into consideration socially vulnerable and disadvantaged populations in the City.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	During an event, the City could continue a reactionary approach, which will not be as effective and require more effort from public safety officials to complete.
Responsible Office/ Agency	Fire Department, Industrial Company
Partners	Industrial Company
Priority (High, Medium, Low)	High
Cost Estimate	$20,000-$70,000
Benefits (Avoided Losses)	A plan with an informed community will lead to less confusion and more timely reaction to any accident that requires a response from the community.
Potential Funding	General Fund
Schedule	2020-2022

SLR-1 Explore natural protection with wetland enhancement, marshland protection, and restoration project implementation in the Petaluma River and San Pablo Bay transition zone

Mitigation Project Title	Explore natural protection with wetland enhancement, marshland protection, and restoration project implementation in the Petaluma River and San Pablo Bay transition zone
Hazard(s) Mitigated	Flooding, Sea Level Rise
Project Description, Issue/Background	The Petaluma River stretches for approximately 6.5 miles through the City from the upstream freshwater reaches to the downstream tidally-influenced portion of the river near San Pablo Bay, known as the "transition zone." Natural protection of wetlands and marsh in the southern portion of the City's Planning Area near the confluence of Petaluma River and San Pablo Bay can help the City adapt to rising sea levels and tidal fluctuations in the Bay. Wetland protection would preserve undeveloped shorelines within San Pablo Bay and support ecosystem adaptation in areas where sea level rise may cause migration of species and habitat changes. Protecting the undeveloped shorelines along the Petaluma and San Pablo Bay transition zone would also maintain ecological values, provide increased flood protection, and support habitat resiliency.
Related planning mechanisms	General Plan 2025, 2015 FMP, 1995 River Access and Enhancement Plan
Other Alternatives	Setback policies, Living Shoreline concept, Conservation programs, Improved Building Codes, Ecosystem preservation and restoration
Responsible Office/ Agency	Public Works and Utilities Department
Partners	General Fund, Army Corps of Engineers Funding, California DWR Grant Funding, Habitat Conservation Fund Grant, California Department of Fish and Wildlife (CDFW) Grants, National Fish and Wildlife Foundation Grants, In-Lieu Mitigation Fees, Local Non-Profits (Petaluma Water Ways, Petaluma River Access Partnerships – P-RAP)
Priority (High, Medium, Low)	Low
Cost Estimate	Varies by wetland restoration project planning, implementation and construction costs.
Benefits (Avoided Losses)	Reduced potential for repetitive flooding; preservation of marshland and habitat
Potential Funding	Local, regional, and state funding opportunities are available.
Schedule	2020-2030

SLR-2 Continue Petaluma River Dredging Program to enhance flood resilience

Mitigation Project Title	Continue Petaluma River Dredging Program to enhance flood resilience
Hazard(s) Mitigated	Flooding, Sea Level Rise
Project Description, Issue/Background	Watershed runoff deposits silt within the waterway. Regular dredging is required to restore the original riverway capacity of Petaluma River to enhance floodwater carrying capacity and maintain adequate depth for boating.
Related planning mechanisms	2015 FMP, 1995 River Access and Enhancement Plan
Other Alternatives	Additional excavation of the Petaluma riverbed may mitigate sea level rise volume. Dredge materials may be used to create earth berms to hold additional sea level volume.
Responsible Office/ Agency	Public Works and Utilities Department
Partners	U.S. Army Corps of Engineers Funding, California DWR Grant Funds
Priority (High, Medium, Low)	Medium
Cost Estimate	Varies phasing of dredging project, but costs could range from $500,000 - $1,000,000.
Benefits (Avoided Losses)	Reduced repetitive flooding; continued navigable access on Petaluma River between the City and San Pablo Bay.
Potential Funding	Local, regional, and state funding opportunities are available.
Schedule	Ongoing

SLR-3 Open space preservation in areas prone to sea level rise along the Petaluma River

Mitigation Project Title	Open space preservation in areas prone to sea level rise along the Petaluma River
Hazard(s) Mitigated	Flooding, Sea Level Rise
Project Description, Issue/Background	The City of Petaluma anticipates planning for and adapting to risk from increased flooding due to sea level rise and coastal storm events along the Petaluma River. A portion of the properties located to south of downtown Petaluma and near the tidally-influenced portions of the Petaluma River consist of open space and park lands that make up the City's greenbelt. Given the open space land use designation, development is not permitted within these low-elevation properties where tidal flooding is common. Although building codes are enforced on adjacent developed commercial properties and flood insurance is required, these developed properties are at risk to future flooding that could be exacerbated by sea level rise. Traditional land management controls, like land use zoning and open space preservation could be used to limit development. The City could also improve interagency cooperation related to ecological conservation efforts within the lands susceptible to flooding and sea level rise by focusing on property acquisition, protecting natural areas. and improving habitat resiliency. Interagency coordination would enhance the overall connectivity of different open space preservation and habitat restoration projects within the San Pablo Bay transition zone. The City plans to continue efforts to keep vacant and floodplain land designated as open space. The City also plans to pursue additional open space acquisition opportunities pursuant to General Plan 2025 goals and policies and the 2015 FMP open space preservation preventative activities. Given the recreational amenities present within these open space areas, this action may also involve ensuring trailheads, trails, and signage are maintained and upgraded to withstand future flooding and erosion that may be associated with sea level rise.
Related planning mechanisms	General Plan 2025, 2015 FMP, 1995 River Access and Enhancement Plan
Other Alternatives	In high hazard areas, building a sea wall at top of bank to protect existing structures. In high hazard areas, require raising first floor level elevation above predicted sea level rise.
Responsible Office/ Agency	Parks and Recreation Department, City Engineer, Public Works and Utilities Department, Building Department
Partners	California Coastal Conservancy, Sonoma County Agricultural Preservation and Open Space, U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board (RWQCB), San Francisco Bay Conservation and Development Commission

	(San Francisco BCDC), Sonoma Land Trust, State and federal conservancy agencies, Community-Based Organizations
Priority (High, Medium, Low)	Medium
Cost Estimate	Varies by planning efforts and property acquisitions
Benefits (Avoided Losses)	Land use zones, such as open space designation can be successfully used as a tool to limit development, and special flood hazard zones are now often added to comprehensive and general plan land use designations. These overlay designations, or "adaptation action areas" can be defined as areas below, at, or near the mean high water mark, or areas where there is a hydrological connection to coastal waters, such as Petaluma River. These open space overlay areas establish additional and stricter development standards or criteria for development. While an open space designation may limit development on properties prone to future flooding due to sea level rise, the City needs to carefully monitor the scientific data regarding sea level rise and understand the risk levels associated with projected inundation.
Potential Funding	General Fund, Sonoma County Ag and Open Space Matching Grant Program 2020, Habitat Conservation Fund Grant, CDFW Grants, DWR Grant Funding,
Schedule	2020-2024; Ongoing

SLR-4 Map and assess vulnerability to sea level rise and integrate the information with the City GIS mapping capabilities to educate the community and help them gain awareness of the potential impacts and actions the City is taking to plan and adapt

Mitigation Project Title	Map and assess vulnerability to sea level rise and integrate the information with the City GIS mapping capabilities to educate the community and help raise awareness of the potential impacts and actions the City is taking to plan and adapt
Hazard(s) Mitigated	Sea level rise, flooding
Project Description, Issue/Background	GIS is an effective tool that can identify where climate-change related effects are likely to occur now and in the future. Mapping and overlaying climate information, such as projected sea level rise projections with critical facilities, parcel, infrastructure, and building footprints can help communities understand the expected extent of sea level rise, and also where flooding, wildfires, and other natural hazards are more likely to occur based on climate change. As of early 2020 the City of Petaluma has not engaged the community on the topic of sea level rise, nor have possible sea level rise scenarios have not been widely distributed to the community. The 2019 LHMP included a preliminary sea level rise vulnerability assessment that analyzed three sea level rise scenarios: 25 centimeters (cm), 75 cm, and 200 cm sea level rise inundation datasets based on best available science from the CoSMos Version 2.1 Model applicable to the City of Petaluma (see Section 4.3.6 Sea Level Rise in Chapter 4). This dataset provided detailed projections of tidal inundation, also referred to the predicted average annual tidal inundation conditions. It also included detailed projections of coastal flood hazards, also referred to the 100-year coastal flood event that accounts for coastal wave and storm surge intervals,. The preliminary vulnerability assessment is consistent with the full spectrum of sea level rise (0 to 2 meters, 5 meters) and storms (daily to 100-year return) used on the outer Sonoma coast and storm events used inside the Bay were derived from the Global Climate Model (GCM). Given sea level rise projections linked to planning horizons can change with new scientific data, the preliminary sea level rise scenarios selected by the City are based on sea level rise elevation. The probabilistic projections based on the high emissions scenario (business as usual) for 2050 and 2070 translates to 1.1 foot by 2050 and 1.9 feet by 2070, both which have a 66 percent probability of occurrence. The conservative approach for 2050 and 2070 have a 0.5 percent probability of occurrence and translate to 1.9 feet by 2050 and 4.0 feet by 2070. The City HMPC also considered one conservative scenario to assess potential future

	impacts to critical infrastructure. These projection recommendations roughly convert to the 25 cm (1 foot or 0.25 meters), 75 cm (2.7 feet or 0.75 meters), and 200 cm (6.6 feet or 2 meters) sea level rise datasets. These three elevations could apply to a range of sea level rise projections and associated planning years. This action considers the findings from the preliminary sea level rise vulnerability assessment included in the 2019 LHMP and determines whether a more detailed vulnerability assessment and Climate Adaptation Plan (CAP) is warranted. As part of this action, the City would select a most likely sea level rise scenario to present to the Climate Action Commission and the community (or a range of scenarios), as part of climate change initiatives. While the City may choose to select all three scenarios considered in the 2019 LHMP vulnerability assessment, the City could also select one scenario with the highest probability of occurrence within the current planning period (by 2030) and proceed with beginning outreach with the community regarding sea level rise science, scenarios, and adaptation planning. Outreach may including GIS mapping and the production of easily understandable maps to distribute within the community, as well as initiating discussions with the community on how to plan for and adapt to sea level rise.
Related planning mechanisms	Select an independent resource to share with community members interested in understanding sea level rise information. Implement base elevation modifications for development based on sea level rise. Maps could be created showing past flooding events and further enhanced with estimated sea level rise projections to identify City-owned buildings and infrastructure would be impacted in future flooding events.
Other Alternatives	Reliance on vulnerability assessment in 2019 LHMP, CAP, Adaptive Management Plan
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma County
Priority (High, Medium, Low)	Medium
Cost Estimate	$50,000 - $75,000
Benefits (Avoided Losses)	Reduces repetitive flooding, preservation of the built environment, and helps the City develop long-term climate resilience
Potential Funding	General fund, Caltrans SB-1 Climate Adaptation Planning Grant, Sonoma County Transportation Authority (SCTA) Funding, ABAG Funding, California Ocean Protection Council Funding (from Prop 1 funds), California Resilience Challenge Grant Competition
Schedule	2020-2024, or within five years

SLR-5 Assess sea level rise modelling and how current and best available projections can be routinely re-evaluated in subsequent climate adaptation planning efforts

Mitigation Project Title	Assess sea level rise modelling used in the LHMP and how those projections can be routinely re-evaluated in subsequent climate adaptation planning efforts
Hazard(s) Mitigated	Sea level rise, flooding
Project Description, Issue/Background	Sea level rise science continues to evolve and the best available science on sea level rise projections will change. Given the uncertainty in the magnitude and timing of future sea level rise, the City should use scenario-based analysis to examine a range of possible shoreline changes and sea level risks. Selection of sea level rise scenario modelling (current best available data for the City of Petaluma Planning Area includes 25 cm, 75 cm, 200 or 300 cm scenarios with and without 100-year coastal flood event) or scenarios based on planning horizons will help guide the City in sea level rise planning efforts. This action could also use sea level rise projections during review of applications for new development to ensure new development proposals incorporate adequate protection (e.g. setbacks, armoring) in site plans.
Related planning mechanisms	General Plan 2025, 2015 FMP, Climate Action 2020 and Beyond: Regional Sonoma County CAP (not adopted)
Other Alternatives	City selects sea level rise scenario elevations and produces maps of impacted areas to share with the community.
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma County, SCTA
Priority (High, Medium, Low)	Low
Cost Estimate	$100,000
Benefits (Avoided Losses)	Avoiding damage and replacement needs of city buildings and infrastructure, as well as private property.
Potential Funding	General fund, Caltrans SB-1 Climate Adaptation Planning Grant
Schedule	2020-2024

SLR-6 Update City Implementing Zoning Ordinance (IZO) to manage development in high risk areas

Mitigation Project Title	Update City Implementing Zoning Ordinance (IZO) to manage development in high risk areas
Hazard(s) Mitigated	Sea level rise, flooding
Project Description, Issue/Background	The City of Petaluma sits mainly in the flattest portion of the watershed basin. The Petaluma River bisects the town and is the main waterway collecting all the runoff from the various streams in the watershed. The area around the river and larger streams are more prone to disaster from flooding. Sea level rise may increase the intensity and frequency of disaster from flooding. Updating zoning tools in these areas can minimize flooding related disasters. The City of Petaluma would also consider updating the IZO and Municipal Code for consistency with the LHMP and General Plan Health and Safety Element.
Related planning mechanisms	Update zoning tools, including the City of Petaluma IZO regardless of sea level rise impacts; General Plan 2025
Other Alternatives	Existing IZO Ordinance
Responsible Office/ Agency	Planning Department, City Engineer
Partners	None
Priority (High, Medium, Low)	Low
Cost Estimate	$100,000
Benefits (Avoided Losses)	Reduce Repetitive flooding in flood hazard zones that may be exacerbated by sea level rise.
Potential Funding	General Fund
Schedule	2020-2024

SW-1 Replace aging generator and plan for severe weather by obtaining backup generators at City critical facilities, including the Emergency Communications Center

Mitigation Project Title	Replace aging generator and plan for severe weather by obtaining backup generators at City critical facilities, including the Emergency Communications Center
Hazard(s) Mitigated	Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog; Severe Weather: High Wind; Severe Weather: Extreme Heat; Earthquake; Severe Weather: Extreme Heat; Wildfire
Project Description, Issue/Background	Generator replacement can minimize the effects of power outages during earthquake, extreme heat, severe storms, wildfire, and high wind hazard events in the City, as they will supply back-up power during a power outage. City facilities will also need backup power during "planned" PSPS. The City will need reliable emergency backup power when Pacific Gas & Electric (PG&E) power lines are affected by natural hazard events. This action would ensure the City obtains diesel powered generators in select locations at City critical facilities to ensure electrical power is provided for essential services, as well as the City's primary evacuation shelter, the Petaluma Community Center. It would also ensure the City replaces aging generators at key locations, such as the City Police Department and Emergency Communications Center.
Related planning mechanisms	Coordination with EOC staff, 2007 Emergency Operations Plan
Other Alternatives	None
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Police Department, Parks and Recreation Department, Fire Department, City Manager
Priority (High, Medium, Low)	Medium
Cost Estimate	$20,000-$50,000 per generator depending on power needs
Benefits (Avoided Losses)	Reliable and emergency backup power will reduce the risk of property damage and increased life safety.
Potential Funding	General Fund
Schedule	2022-2025

SW-2 Establish cooling centers at City Community Center to be used during severe weather events involving heat waves

Mitigation Project Title	Establish cooling centers at City Community Center to be used during severe weather events involving heat waves. Cooling centers should also accommodate sensitive receptors that may be susceptible to poor air quality
Hazard(s) Mitigated	Severe Weather: Extreme Heat
Project Description, Issue/Background	Climate change is expected to result in longer droughts and longer days of extreme heat. Extreme heat can also disproportionately affect the health of vulnerable populations in the City of Petaluma. This action involves establishing the City Community Center and Petaluma Senior Center located at Lucchesi Park to function as a cooling center, or "resiliency hub" during severe weather events, involving heat waves, poor air quality, and wildfires. A cooling center would accommodate sensitive receptors that may be susceptible to poor air quality and respiratory illness. A central and well-used existing community-serving facility location for a cooling center or resiliency hub, such as the City Community Center and Petaluma Senior Center would ensure residents in the community can easily access the facility by public transit and alternative modes of transportation. The cooling center or resiliency hub would also have other essential resources, such as food, water, ice, refrigeration, medical supplies, and charging stations. Currently, neither of these facilities have back-up power and could not function as cooling centers during power outages; PSPS or actual power outages. This action would therefore also entail obtaining sufficient back-up power at each facility. This action involves associated outreach to ensure the vulnerable segments of the local population (e.g. people with disabilities, elderly, low-income) and the local homeless population are aware of the cooling center and are able to access it during extreme heat events. Outreach would specifically focus on making sure the public knows where to go to find relief from extreme heat using social media, traditional media, and printed materials/handouts. This includes ensuring there is accessible transportation during extreme heat events, and an appropriate number of cooling centers. The action would also involve coordination with local homeless services to ensure that the homeless population is aware of the cooling center. The City could work with Sonoma County Department of Health Services Public Health Division and Petaluma Valley Hospital to build outreach capacity to better engage vulnerable segments of the City's population that may need to rely on cooling centers and other facilities during extreme heat events.

Related planning mechanisms	General Plan 2025
Other Alternatives	Expand availability of cooling centers to include space for pets
Responsible Office/ Agency	Parks and Recreation Department, Public Works and Utilities Department
Partners	Sonoma County Department of Health Services Public Health Division, Sonoma County Homeless Services, Petaluma Valley Hospital
Priority (High, Medium, Low)	Low
Cost Estimate	$50,000
Benefits (Avoided Losses)	Protecting life, particularly sensitive receptors and vulnerable populations, such as elderly and residents with respiratory illness in the City of Petaluma during heat events
Potential Funding	City, County, state, and federal funds, Transformative Climate Communities Grant, Emergency Solutions Grants (ESG) Program (funds homeless and improves quality of emergency shelters for homeless), possible PG&E grant funds
Schedule	Ongoing, 2020-2024

SW-3 Enhance local building code to incorporate wind-resistant design features that address wind hazards

Mitigation Project Title	Enhance local building code to incorporate wind-resistant design features that address wind hazards
Hazard(s) Mitigated	Severe Weather: High Wind; Public Safety Power Shutdown PSPS
Project Description, Issue/Background	Enhance local building codes and ordinances to ensure that new structures and remodels or improvements to buildings and structures incorporate wind-resistant design features to withstand high winds and tornadoes. This action would prevent wind damage through revisions to the existing building code and adopting standards for residential construction in high-wind regions. Construction techniques may include requiring structural bracing, straps and clips, anchor bolts, and impact-resistant glass, reinforced garage doors, window shutters, and interlocking roof shingles. Requiring tie-downs with anchors and ground anchors for manufactured homes may also be appropriate. There are also various site and building design standards that could be considered to minimize wind damage in new residential developments.
Related planning mechanisms	City Building Code, Municipal Code
Other Alternatives	None
Responsible Office/ Agency	Building Department
Partners	PG&E
Priority (High, Medium, Low)	Low
Cost Estimate	$50,000
Benefits (Avoided Losses)	Protecting life and property in the City of Petaluma
Potential Funding	City, County, state, and federal funds
Schedule	Ongoing, 2020-2024

SW-4 Develop a Public Safety Power Shutdown (PSPS) Toolkit for local businesses

Mitigation Project Title	Develop a Public Safety Power Shutdown (PSPS) toolkit for local businesses
Hazard(s) Mitigated	Severe Weather: High Wind; PSPS
Project Description, Issue/Background	PG&E is expected to conduct PSPS during high winds and dry conditions and generally a heightened fire risk forecast. The outages could last several days, and PG&E has suggested customers be prepared for outages that could last longer than 48 hours. A majority of Sonoma County could be affected by the power outages including almost the entirety of the City of Petaluma. The City of Petaluma has been proactive with sharing information on the City PSPS website providing tips for citizens to prepare and make plans for their families. The City has opened community shelters, and coordinated with the school districts on school closures and which areas of the City are impacted. This action will expand the existing public information to provide resources and tips for local businesses to be able to continue business operations during PSPS events.
Related planning mechanisms	Traditional outreach materials, including printed informational handouts and brochures that are available at the City offices.
Other Alternatives	Use City website
Responsible Office/ Agency	Public Works and Utilities Department, Economic Development
Partners	Chamber of Commerce, Petaluma Downtown Business Association
Priority (High, Medium, Low)	Low
Cost Estimate	$10,000
Benefits (Avoided Losses)	Avoid economic losses
Potential Funding	General Fund
Schedule	2020-2022

W-1 Establish a Defensible Space Funding Program

Mitigation Project Title	Establish a Defensible Space Funding Program
Hazard(s) Mitigated	Wildfire
Project Description, Issue/Background	California has a long history of wildfire, and the destruction and effects are growing more intense, frequent, and developing into a year-round problem. California law requires landowners in areas with flammable groundcover to maintain defensible space around buildings that can help slow or prevent the spread of wildfire. Petaluma has an area within the City limits that is a designated wildfire urban interface (WUI) and high fire hazard severity zone (FHSZ). The City is also surrounded on the west side by moderate FHSZ and hilly topography, which currently consists of rural residential development and open space. The State of California has implemented specific requirements for new buildings within these zones that mandates fire safe building practices, landscaping, and design. Some jurisdictions throughout the State are implementing stricter codes and requirements specific to their jurisdiction. The City of Petaluma has minimally expanded those requirements. There may be a benefit to expanding those requirements further. Additionally, the limited staff and resources currently deployed in the Fire Prevention Bureau do not have the capacity for education, enforcement or assistance for the community to improve their defensible space. This action will establish a funding program for the City and the community to implement defensible space in the WUI. The program will include the identification of defensible space funding and grant opportunities, incentives for private landowners to conduct brush clearing and home hardening, project implementation tools (e.g. vegetation clearing), and a long-term management program for WUI areas around the City. The program will prioritize defensible space projects that may include brush removal and prescribed burns, while also working with the community to reduce fuel loads on private property. The City would also work with local fire protection agencies to promote structure hardening and retrofitting , and other mitigation techniques summarized in Cal FIRE's Wildfire Mitigation Program.
Related planning mechanisms	2007 Emergency Operations Plan, Community Wildfire Protection Plan
Other Alternatives	Remain status quo in minimal education, engineering and enforcement policies/programs for the WUI area.
Responsible Office/ Agency	Fire Department
Partners	Sonoma County, Cal FIRE
Priority (High, Medium, Low)	Medium

Cost Estimate	Depends on program
Benefits (Avoided Losses)	Limited/lesser wildfire damage, community engagement.
Potential Funding	General Fund, Cal FIRE Fuel Reduction Project Grants, Cal FIRE Forest Health Grants, FEMA HMPG, Wildfire Mitigation Financial Assistance Program (Fire Hardened Homes Revolving Loan Fund)
Schedule	2020-2024; Implementation depends on prioritization and resources

W-2 Develop a City-wide Fire Suppression Master Plan

Mitigation Project Title	Develop a City-wide Fire Suppression Master Plan
Hazard(s) Mitigated	Wildfire
Project Description, Issue/Background	The City's fire suppression water system is an integral part of the Fire Department operations and Fire Prevention planning. There are several areas within the City's water system with low fire-flow. Currently, there is not a system, map, or other record retention system where the Fire Prevention Bureau or Fire Department staff can access fire flow data from each fire hydrant in the City. This action would involve the development of a comprehensive City-wide fire suppression water system Master Plan to assess fire flow water capacity and how to upgrade the water system to accommodate projected changes in water availability and provide adaptability. While the five-year updates to the UWMP address future conditions and community water demand, a City-wide Fire Suppression Master Plan would address water supply needs for fire suppression, assess water supply capacity for fire response within the City's Planning Area, and use the plan recommendations to upgrade the system to improve the City's water system's adaptability to urban fire and wildfire hazards. Appropriate retrofits to the City's water system, specific to fire suppression infrastructure can help the City and community be better prepared and ensure there is adequate water supply, suppression capabilities, and fewer disruptions to water services.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	2015 UWMP
Responsible Office/ Agency	Fire Department, Fire Prevention Bureau, Public Works and Utilities Department
Partners	Mutual Aid Providers, Sonoma County, California Department of Forestry and Fire (Cal FIRE)
Priority (High, Medium, Low)	Medium
Cost Estimate	$150,000
Benefits (Avoided Losses)	A system where each fire hydrant fire flow and pressure is identified would provide valuable information for pre-planning for emergency incidents. This would also increase the City's ISO rating.
Potential Funding	General Fund, Capital Improvement Funds, Water and Wastewater Infrastructure Improvement Grants, State Water Resources Control Board: Clean Water State Revolving Fund, Water Enterprise
Schedule	2020-2024

W-3 Evaluate Wildland Urban Interface Zone in the City Limits

Mitigation Project Title	Evaluate the WUI Zone in the City Limits
Hazard(s) Mitigated	Wildfire
Project Description, Issue/Background	California has a long history of wildfire, and the destruction and effects are growing more intense, frequent, and developing into a year-round problem. Within the Petaluma city limits there is a designated WUI and high FHSZ. The City is also surrounded on the west side by a moderate FHSZ and hilly topography that consists of rural residential development, undeveloped hillsides, and open space (see Figure 4-19 and 4-20 in Chapter 4). Wildland fires west of the City could be exacerbated by prevailing winds. California has implemented specific requirements for new buildings within the WUI and FHSZs and some jurisdictions throughout the State are implementing stricter codes and requirements specific to their jurisdiction. The City of Petaluma has minimally expanded those requirements, but there may be a benefit to substantially expanding those requirements further. Government Code Sections 65302 subdivision (g)(3) and 65302.5 subdivision (b) require the General Plan Safety Element to address the risk of fire for land classified as SRAs and land classified as very high FHSZ. Additionally, the limited staff and resources currently deployed in the Fire Prevention Bureau do not have the capacity for education, enforcement or assistance for the community to improve their defensible space. The Petaluma Fire Department wildland apparatus is limited to a Type VI pick-up mounted pumper. It may be beneficial to have more wildland specific equipment to avoid wildfire hazards within the WUI. As wildland fire characteristics continue to change, the capabilities, resources, policies and programs need to be re-evaluated to assure the community has the most appropriate protection. This action involves an evaluation of the WUI zone and high and very high FHSZs in the City limits and surrounding areas to develop a comprehensive plan to protect City buildings and infrastructure (building codes, Type 3 Fire engine, water supply, access roads). The evaluation of the extent of the WUI within the City limits and the surrounding unincorporated areas will allow the City to develop a comprehensive plan to protect people, property, and infrastructure. The evaluation would identify the potential for fires to occur within and surrounding new and existing development. The evaluation would address wildfire probability using metrics, such as fire history, fire threat, response time, proximity to the WUI, fuel reduction projects, and mutual aid coordination. The evaluation would also address building codes, the need for a Type 3 fire engine, water supplies, and road accessibility. This action acknowledges the pending Cal FIRE mapping of the SRA and land use distribution within very high FHSZs within the City limits. The

	action would also involve review of construction methods for new facilities in SRAs and very high FHSZs (if applicable), safe access for emergency response (street signs, water supply, and fire suppression), and identification of a minimum of two evacuation routes for neighborhoods in the City of Petaluma. Upon adoption of the LHMP, the City shall align the General Plan Health and Safety Element (Chapter 10 of General Plan) with the LHMP and Government Code Sections 65302 subdivisions (g)(3) and Section 65302.5 that address state legislation, such as SB 2911, SB 1241, and pending Cal FIRE FHSZ map updates. This state legislation requires additional fire safe building practices and fire safe design, and pending changes to the Cal FIRE FHSZ maps may impose additional requirements in areas prone to wildfire. The City Fire Department and Fire Prevention Bureau should review the updated maps and policies to ensure they align with the new legislation.
Related planning mechanisms	2007 Emergency Operations Plan, Community Wildfire Protection Plan
Other Alternatives	None
Responsible Office/ Agency	Fire Department, Fire Prevention Bureau
Partners	Mutual Aid Providers, Sonoma County, Cal FIRE
Priority (High, Medium, Low)	Medium
Cost Estimate	$25,000
Benefits (Avoided Losses)	Less wildfire damage, improved understanding of revised Cal FIRE mapping should enable the City to better prepare for wildland fires, and increase capabilities to respond to wildfire events. .
Potential Funding	FEMA Hazard Mitigation Grant Program
Schedule	2020-2024

W-4 Install Fire Protection System in all City facilities

Mitigation Project Title	Install Fire Protection System in all City facilities
Hazard(s) Mitigated	Urban Fires, Wildfire
Project Description, Issue/Background	The City needs to install an updated fire protection system in accordance with current fire code within all City facilities. This action would provide funding for the installation of the required systems in all City-owned facilities. Fire system upgrades would first occur in designated critical facilities.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	Build new facilities compliant with current fire code.
Responsible Office/ Agency	Public Works and Utilities Department, Fire Prevention Bureau, Building Department
Partners	None
Priority (High, Medium, Low)	Medium
Cost Estimate	Will depend on building being retrofitted
Benefits (Avoided Losses)	Prevention of injury or loss of life, prevention of facility and file destruction, and the prevention of delay in employee work status due to facility destruction.
Potential Funding	Homeland Security Grants
Schedule	Depends on facility replacement.

W-5 Wildland Urban Interface Pre-Fire Plan

Mitigation Project Title	Wildland Urban Interface Pre-Fire Plan
Hazard(s) Mitigated	Wildfire
Project Description, Issue/Background	As wildland fires spread more rapidly with a drier climate, increased heat days, drought and strong north winds, pre-planning hazard areas, access points, and locations to fight fire are important to ensure a more efficient response and deployment of resources. Cal FIRE has created "pre-fire plans" for other areas of Sonoma County which were used during 2017 and 2019 to better plan and organize responses and tactics. The development of a WUI Pre-Fire Plan will help the City better prepare for future wildfires.
Related planning mechanisms	2007 Emergency Operations Plan, Existing Pre-Fire Plans used in 2017 and 2019 during wildfires, Community Wildfire Protection Plan
Other Alternatives	Continue to use standard mapping and be more reactionary to wildland threats once the fire has started.
Responsible Office/ Agency	Fire Department
Partners	Cal FIRE
Priority (High, Medium, Low)	Low
Cost Estimate	General Fund, Staff time for Coordination time with Cal FIRE
Benefits (Avoided Losses)	This will increase effectiveness and coordination of response to wildland urban interface fires in or around the community.
Potential Funding	Cal FIRE funding, Proposition 84 Wildfire Resiliency and Recovery Planning Grants (administered through California's Strategic Growth Council, Office of Planning and Research, and Department of Conservation)
Schedule	By 2020, specifically next fire season

MH-1 Evacuation Alert and Warning System and Annual Testing

Mitigation Project Title	Evacuation Alert and Warning System and Annual Testing *(Strategy #GOVT-b-14 and Strategy #GOVT-b-15 from 2010 LHMP Annex)*
Hazard(s) Mitigated	Multi-Hazard, Earthquake, Flood, Hazardous Materials, Wildfire
Project Description, Issue/Background	The City currently has few routes leading out of downtown Petaluma. During an accident or disaster impacts on these transportation routes could negatively impact the health of persons in our community. It is important to be able to notify the public when they need to take action to protect themselves, whether sheltering-in-place, or evacuating. Emergency notification systems are a critical type of communication that let people know of potential and impending disaster events. The installation of an alert warning system with outdoor sirens and coordinating their use with neighboring jurisdictions was a mitigation action included in the 2005 and 2010 LHMP Annex. Previous studies showed that the City's warning systems are not an effective tool in Petaluma due to the nature of the natural disasters anticipated in the area. Sirens are a common warning device for coastal areas that have some, but little warning of a natural disaster, specifically with tsunamis. In Petaluma, the greatest major natural disaster threat: an earthquake has zero warning signs. Flood hazards usually have several days of warning notice. The City, however, has several other hazards that could result in regional disasters, as well as several industrial sites that during an accident or disaster could release hazardous material that would negatively impact the health of persons in the community and where an alert warning system would be beneficial. While the City currently notifies the public about how to best prepare for natural disasters before they occur through the radio, television, phone-based warning systems (i.e. Strategy #GOVT-b-22 in 2010 LHMP Annex), and other media outlets, it is important to be able to notify the public when they need to take action to protect themselves, whether sheltering-in-place or following evacuation procedures, and how they can make recovery easier. This action would consist of the installation of an evacuation alert and warning system that includes coordination with neighboring jurisdictions and effectively educating the community about the evacuation alert system. The evacuation and alert system would be designed and implemented so that it reaches the needs of segments of the community with functions needs, such as vision or hearing-related disabilities by ensuring there are alternative means for these people to receive information. Once installed, the alert and warning system would also involve conducting annual tests of the outdoor sirens (e.g. once per month). This periodic testing of the outdoor sirens was also part of a mitigation action included in the 2005 and 2010 LHMP Annex (Strategy #GOVT-b-15).

Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	Continued use of emergency alert phone calls, text messages, and social media to notify the community. Other alternatives include adding high-lo sirens to emergency vehicles.
Responsible Office/ Agency	Police Department, Fire Department
Partners	Sonoma County, Neighboring Jurisdictions, Community-Based Organizations
Priority (High, Medium, Low)	Low
Cost Estimate	$25,000 Annually
Benefits (Avoided Losses)	A sure-fire way to notify the public when they need to immediately take action will lead to many more persons notified, a more rapid reaction, and decrease the number of people exposed to potential hazard events.
Potential Funding	General Fund
Schedule	2020-2022

MH-2 Periodically assess the need for new or relocated fire or police stations and other emergency facilities, changes in staffing levels, and need for supplies, equipment, technologies, and in-service training classes

Mitigation Project Title	Periodically assess the need for new or relocated fire or police stations and other emergency facilities, changes in staffing levels, and need for supplies, equipment, technologies, and in-service training classes *(Strategy #GOVT-a-7 from 2010 LHMP Annex)*
Hazard(s) Mitigated	Multi-Hazard, Flood, Earthquake, Wildfire, Sea Level Rise
Project Description, Issue/Background	As one of the high priority mitigation strategies from the 2010 LHMP Annex, this action ensures the City periodically assess the need for new or relocated fire and police stations, as well as other emergency facilities. Any upgrades associated with this action, as they relate to the EOC are detailed in MH-4.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	Continued use of existing fire and police stations. Also assumed continued use of the existing EOC.
Responsible Office/ Agency	Police Department, Fire Department, Public Works and Utilities Department
Partners	Sonoma County
Priority (High, Medium, Low)	Medium
Cost Estimate	Based on need for new fire or police station, which can vary according to property values and construction costs.
Benefits (Avoided Losses)	New or relocated fire and police stations can ensure quick response times, which would reduce the loss of life and property associated with natural and human-caused hazards.
Potential Funding	General Fund
Schedule	2020-2024

MH-3 Develop and maintain a system of interoperable communications for first responders from local, state, and federal agencies

Mitigation Project Title	Develop and maintain a system of interoperable communications for first responders from local, state, and federal agencies *(Strategy GOVT-a-9 in 2010 LHMP Annex)*
Hazard(s) Mitigated	Multi-Hazard, Flood, Earthquake, Wildfire
Project Description, Issue/Background	As one of the high priority mitigation strategies from the 2010 LHMP Annex, this action involves developing and maintaining a system of interoperable communication for first responders to use to support disaster response and recovery efforts during disaster events. The communications system would be used by the EOC during disaster events and would be managed by the City's Fire Department.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	Mutual Aid Agreements
Responsible Office/ Agency	Fire Department, Police Department
Partners	Sonoma County, Neighboring Jurisdictions
Priority (High, Medium, Low)	High
Cost Estimate	$15,000
Benefits (Avoided Losses)	An effective and interoperable communication system would improve the execution of emergency procedures coordinated among federal, state, local agency and volunteer first responder staff.
Potential Funding	General Fund, staff time
Schedule	2020-2024

MH-4 Update the City Emergency Operations Plan

Mitigation Project Title	Update the City Emergency Operations Plan
Hazard(s) Mitigated	Multi-Hazard; Dam Incidents; Earthquake; Severe Weather: Extreme Heat; Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog; Severe Weather: High Winds; Wildfire; Hazardous Material Releases; Cyber Threat
Project Description, Issue/Background	The City's EOP was last updated in 2007. It includes a basic plan that addresses the City of Petaluma's responsibilities in emergencies associated with natural disaster, human-caused emergencies, and technological incidents. It provides a framework for coordination of response and recovery efforts within the City and in coordination with local, state, and federal agencies. The plan establishes emergency organization staff to direct and control operations during a period of emergency by assigning responsibilities to specific personnel. The scope of the plan addresses earthquakes, hazardous materials emergencies, flooding, and wildfires. The plan is now dated and does not address all potential hazards in today's world. A comprehensive update of the EOP would ensure it addresses all hazards covered in the General Plan 2025 Health and Safety Element and the 2019 LHMP and provides a more user-friendly plan document for the City.
Related planning mechanisms	General Plan 2025 Health and Safety Element, 2007 Emergency Operations Plan
Other Alternatives	2007 Emergency Operations Plan
Responsible Office/ Agency	Fire Department
Partners	Sonoma County Neighboring Jurisdictions, Mutual Aid Providers
Priority (High, Medium, Low)	High
Cost Estimate	$80,000
Benefits (Avoided Losses)	An updated plan that consists of training all EOC staff on the plan would help us better identify, prepare, and respond to incidents in a more efficient and productive manner. An updated EOP would also reduce the negative impacts on our community and more rapidly returning City services to normal.
Potential Funding	General Fund
Schedule	2020-2022

MH-5 Emergency Operations Center Replacement and Upgrades

Mitigation Project Title	Emergency Operations Center Replacement and Upgrades
Hazard(s) Mitigated	Multi-Hazard; Dam Incidents; Earthquake, Extreme Heat, Flood; Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog; Severe Weather: High Winds; Wildfire; Hazardous Material Releases; Cyber Threat
Project Description, Issue/Background	The City's EOC currently utilizes the police briefing room and surrounding normally occupied offices. Technology, including phones and computers need to be set-up, tables moved, supplies moved from a small towable trailer in the parking lot to inside, and normal police operations changed in order to utilize the EOC. The EOC needs to be in a more functional work-space that also has permanent phones, computers, and other technology.
Related planning mechanisms	2007 Emergency Operations Plan
Other Alternatives	Continued use of the current space in the police briefing room and operations as usual.
Responsible Office/ Agency	Public Works and Utilities Department
Partners	Sonoma County Neighboring Jurisdictions, Mutual Aid Providers
Priority (High, Medium, Low)	Low
Cost Estimate	$150,000
Benefits (Avoided Losses)	A more functional and permanent workplace would drastically speed up the time needed to make the EOC operational and would increase work efficiencies once in place. A new or upgraded EOC would also reduce the impacts on the police department personnel and operations.
Potential Funding	General Fund
Schedule	2020-2022

MH-6 Expand Community Emergency Prep Program

Mitigation Project Title	Expand Community Emergency Prep Program
Hazard(s) Mitigated	Multi-Hazard; Dam Incidents; Earthquake, Extreme Heat, Flood; Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog; Severe Weather: High Winds; Wildfire; Hazardous Material Releases; Cyber Threat
Project Description, Issue/Background	The City began expanding its community disaster preparation outreach following the 2017 fires to include four quarterly educational sessions per year. The program Citizens Organized to Prepare for Emergencies (COPE) is to encourage residents, families, and neighborhoods to become and remain better prepared to respond to and recover from emergency situations. It is a current program at the City and includes developing individual response plans, maintaining individual emergency supply kits, and ensuring neighbors get to know and plan with other neighbors in their community. The community would like more educational sessions and has expressed interest in a Community Emergency Response Team (CERT) type program. The City has held discussions with other emergency coordinators and Sonoma County about a county-wide program. The initial theory is to train persons that could later be used as volunteers, coordinated through the county volunteer center, to assist in non-operational responses during disaster such as shelter set-up/staffing.
Related planning mechanisms	Existing public outreach and awareness programs
Other Alternatives	Existing COPE Program; CERT program; Continue provide quarterly awareness trainings
Responsible Office/ Agency	Fire Department
Partners	Sonoma County Neighboring Jurisdictions, Mutual Aid Providers
Priority (High, Medium, Low)	Low
Cost Estimate	$25,000
Benefits (Avoided Losses)	An educated and prepared community will be less dependent on services when demand is high during disaster. By training and coordinating volunteers, staffing to provide essential services can be surged to meet the demand and improve support to community members.
Potential Funding	General Fund
Schedule	2020-2024

MH-7 Community Emergency Preparedness Webpage

Mitigation Project Title	Community Emergency Preparedness Webpage
Hazard(s) Mitigated	Multi-Hazard; Dam Incidents; Earthquake, Extreme Heat, Flood; Severe Weather: Heavy Rains/Thunderstorms/Hail/Lightning/Dense Fog; Severe Weather: High Winds; Wildfire; Hazardous Material Releases; Cyber Threat
Project Description, Issue/Background	Members of Petaluma rely on the City for information related to how they can be better prepared for disaster. The City has substantial information currently on its website. The content should be better consolidated and streamlined to make it easier to read and understand. Not all people or businesses that need this information have access to the internet, including segments of the population that are considered social disadvantaged (e.g. low income, language barriers, etc.). The City should convey emergency preparedness information to a wide audience, including the business community, which means developing communication tools in many different formats and languages, if needed. Printed and digital material regarding all types of emergencies and disaster placed at important targeted sites in the City would help educate the community. The City would develop emergency preparedness outreach materials that address differences in adaptive capacity, as some community members in Petaluma may need financial assistance, or help accessing both printed and digital information. This action would involve developing an advisory group of community members who can address social equity issues and provide regular outreach within the community. It would also involve collaboration with regional partners that support resiliency through preparedness education and training.
Related planning mechanisms	Traditional outreach materials, including printed informational handouts and brochures that are available at the City offices.
Other Alternatives	Continued referral to the City website
Responsible Office/ Agency	City Manager's Office
Partners	Sonoma County, Neighboring Jurisdictions, Mutual Aid Providers, Community-Based Organizations, Community Foundation Sonoma County
Priority (High, Medium, Low)	Low
Cost Estimate	$25,000
Benefits (Avoided Losses)	An educated and prepared community will be less dependent on services when demand is high during disaster. By training and coordinating volunteers, staffing to provide essential services can be coordinated to meet the demand and improve support to community members, particularly socially disadvantaged populations.
Potential Funding	General Fund
Schedule	2020-2024

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