2023 KINGS COUNTY

Multi-Jurisdictional Hazard Mitigation Plan

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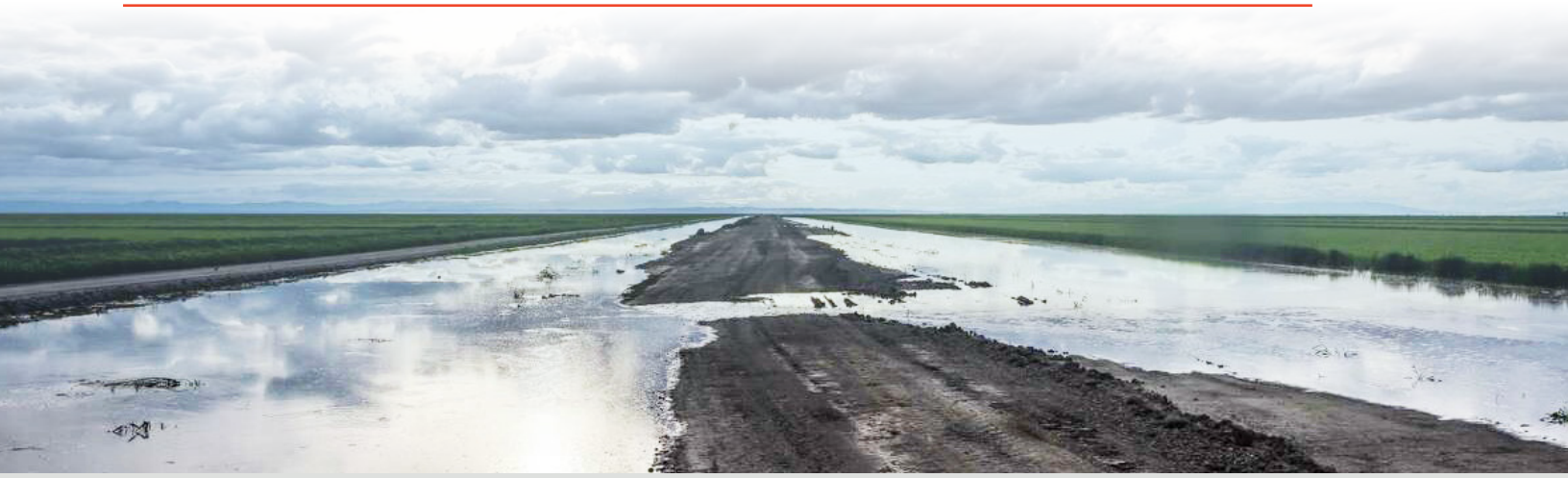

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. The County of Kings (County) developed this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) update to make the County, its four participating jurisdictions, and its residents less vulnerable and more resilient to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that Kings County would be eligible for the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation and Hazard Mitigation Grant programs.

The County followed a planning process prescribed by FEMA, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key County representatives, four participating jurisdictions from the cities of Avenal, Corcoran, Hanford and Lemoore, and other regional stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to Kings County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The County is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Drought; extreme temperatures: extreme heat and freeze; flood; land subsidence; and severe weather hazards: fog, heavy rain, thunderstorms, hail, and lightning; are among the hazards that can have a significant impact on the County.

Based on the risk assessment review and goal-setting process, the HMPC adoptedthe following four goals, modified from their previous HMP, which provide the direction for reducing future hazard-related losses within the County's Planning Area:

- **Goal 1:** Reduce impacts of natural hazards to life, property, and the environment
- **Goal 2:** Minimize impacts of natural disasters to agriculture and the economies of communities
- **Goal 3:** Implement identified mitigation activities
- **Goal 4:** Plan for and adapt to the effects of climate change

To meet these goals, the plan recommends a total of 77 mitigation actions, which are summarized by jurisdiction and the hazard they mitigate in the table that follows. Together, the 77 mitigation actions address more than one hazard relevant to each jurisdiction given the mitigation strategy consists of several multi-hazard actions. Of the 77 mitigation actions in the updated plan, 29 were carried forward from the prevoius plan, including two actions that were revised, and 48 are new mitigation actions developed as part of the 2022-2023 planning process. This includes 13 Kings County actions and 35 jurisdiction-specific actions. Once formally approved by the California Office of Emergency Services (Cal OES) and FEMA Region IX and adopted by the County and their participating jurisdictions, this MJHMP will be updated every five years.

Table ES-1 Kings County Mitigation Actions

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
KC-1	Goal 1, Goal 2, Goal 3	Drought, Subsidence	Water Recharge Basin Partnership Program Partner with the State and contiguous counties to improve coordination, planning, and investment in long-term water supplies by developing a comprehensive water recharge basin project to meet demands of ongoing growth and development.	Kings County	State DWR led joint powers authority should be developed to manage this multi-jurisdictional project. California Department of Water Resources (DWR), Kings County water and irrigation districts, Kings County OES, Community Development,	High	Possible grant and bond funds through recent State Propositions, DWR Grants, HMGP	Food, Hydration, Shelter	Medium	Ongoing	Funding not secured but has been applied for with Hazard Mitigation Grant Program
KC-2	Goal 1, Goal 2, Goal 3	Multi-Hazard	Community Alert and Warning System Purchase, install, test and utilize a community wide alert and early warning system that alerts residents by phone, email, cell phone and other electronic communication devices.	Kings County	Kings County OES, Sheriff and City Law Enforcement, Kings County Operational Area partners, county communications and Cal OES, State Department of Corrections, State High Speed Rail Authority.	High	HMGP, Emergency Management Performance Grant (EMPG), Homeland Security Grant Program (HSGP) and potentially the EOC Grant Program	Safety and Security; Communications	High	Ongoing	In progress -Funding has been secured through EMPG grant
KC-3	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	New County EOC Assessment Develop a standing EOC group to review and discuss specifications, supervise the creation of construction plans, identify funding mechanism and requirements, and identify the site for the new Kings County EOC.	Kings County	Kings County OES, County Departments, Kings County Fire Department, Kings County Environmental Health, Kings County Information Technology Department, and Kings County Public Works Department .	High	General Fund, HMP Grants, EOC Grant Program, Partnership with State, County and Transportation Agencies, EMPG, Homeland Security Grant Program	Safety and Security; Communications	High	Short-term	Funding not secured yet
KC-4	Goal 1, Goal 2, Goal 3	Multi-Hazard	Inter-jurisdictional GIS Program Improve coordination, planning, and investment in long-term water supplies to meet demands of ongoing growth and development	Kings County	Kings County Community Development, OES, City GIS, IT, Cities of Avenal, Corcoran, Lemoore, and Hanford; special districts; water and irrigation districts; Local Agency Formation Commission of Kings County; and Kings	Moderate	Local government funds and possible grant funds through recent State Propositions.	Safety and Security; Communications; Transportation	Medium	Short-term	In progress. The County has been completely mapped; Hanford and Avenal have joined in on the project contracting with County GIS to meet their mapping needs. The project is planned to expand to include all the incorporated Cities and continue to create an integrated countywide

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					County Association of Governments.						GIS system and database.
KC-5	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Kings County Area Disaster Council - Review and update items related to the Kings County Area Disaster Council in the Kings County Emergency Services Ordinance to improve countywide coordination and the monitoring and implementation of the mitigation plan	Kings County	Kings County OES, County Admin Office, Board of Supervisors	Low	Kings County General Fund, EMPG	Safety and Security	High	Short-term	(2012 Status Update: Organizational work to establish the council was accomplished but formal meetings have not yet commenced.)
KC-6	Goal 1, Goal 2, Goal 3	Agriculture and Pest Disease, Public Health, Extreme Temperatures: Freeze and Heat	Livestock Disposal Plan - Establish a livestock disposal plan and compost team to address livestock fatality during extreme heat events.	Kings County	Kings County Agricultural Commissioner, Kings County Agricultural Advisory Committee, University of California at Davis Extension, Environmental Health Services, Natural Resources Conservation Service, Kings County Community Development Agency, Kings County Environmental Health, County OES, PHEP	Moderate	Hospital Preparedness Grant, the actual costs to bury the carcasses would be the responsibility of the animal facility owner/operator.	Safety and Security	High	Short-term	(2012 Status Update: This project has been partially completed. A detailed Bovine disposal SOP has been developed. The committee recognized that a poultry, sheep and goat protocols need to be developed.) Funding not yet secured
KC-7	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Disaster Evacuation Routes - Ensure the maintenance and enhancement of established disaster evacuation routes	Kings County	Kings County Public Works Department, Kings County Sheriff / City Police, County OES, Human Services Agency (HAS), Kings Rural Area Transit, Public Health Emergency Preparedness, Kings County Planning Agency; Cities of Avenal, Corcoran, Lemoore, and Hanford; California Department of Transportation	Moderate	Gas tax, federal/state transportation funding, Kings County General Fund for staff time, Community Power Resiliency Allocation Program, EMPG, HMGP	Transportation	High	Short-term	In progress - funding has not been secured, may do this internally

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KC-8	Goal 1, Goal 2, Goal 3	Fog	Traffic Safety Fog Events - Improve lighting and traffic controls at critical intersections and roadways to improve safety during fog events.	Kings County	Kings County Public Works, Kings OES, County and City Law Enforcement, CHP, Caltrans	Moderate	Cal Trans Grants, EMPG, HSGP	Transportation	Medium	Short-term	Funding not secured yet
KC-9	Goal 1	Multi Hazard	Automated Transportation App - Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events	Kings County	Kings County Public Works, Kings County Administration, City GIS and Emergency Management Department	Moderate	Community Power Resiliency Allocation Program, EMPG, HMGP	Transportation, Communications	Low	Short-term	New in 2023
KC-10*	Goal 2, Goal 3, Goal 4	Drought	Water Conservation Campaign - Create a water conservation campaign, utilizing social media, signage, and grass roots outreach	Kings County	Kings County Administration, Water Manager, Utility Districts	Low	DWR, FEMA HMA HMGP Funds	Food, Water, Shelter	High	Short-term	New in 2023
KC-11	Goal 2, Goal 4	Drought	Floodwater Recharge Project - Create a flood water recharge project utilizing a feasibility study, pumps, and land for recharge.	Kings County	Kings County Administration, Water Manager, Utility Districts, City and County Engineering Departments	Very High	FEMA HMA HMGP Funds, DWR	Food, Water, Shelter	High	Medium-term	New in 2023
KC-12*	Goal 1, Goal 2, Goal 3, Goal 4	Drought, Subsidence	Land Subsidence Study - Conduct updated land subsidence study to understand elevation, shifts, and vulnerability.	Kings County	Kings County Administration, Water Manager, City and County Engineering Departments	Moderate	DWR, USACE, Cal OES	Safety and Security; Food, Water, Shelter; Transportation	Medium	Short-term	New in 2023
KC-13*	Goal 1, Goal 2	Flooding, Fire	Debris Management Plan - Create a flood channel debris management plan to allow the flow of water, increase capacity, and remove fire hazards.	Kings County	Kings County Public Works, Water and Irrigation Districts, City Public Works	High	Proposition 68, Federal and State Resources	Safety and Security	High	Short-term	New in 2023
KC-14	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Severe Weather, Drought, Subsidence	Develop a series of flood control basins on the Kings River that either recharge or store water during flood flows.	Kings County	Kings County Conservation District (KRCD), Local GSAs	Very High	DWR Grants	Safety and Security, and Food, Water, Shelter	High	Long-term	New in 2023
KC-15	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Subsidence, Severe Weather	Sediment Removal - Remove sediment from the Kings to River to avoid future capacity issues.	Kings County	KRCD	Very High	HMPG Funds, Prop 68	Safety and Security	High	Medium-term	New in 2023
KC-16	Goal 1, Goal 4	Drought	Establish a Drought Task Force – Kings County will establish and convene a task force that develops water shortage preparedness planning efforts for domestic wells, privately	Kings County Department of Public Health	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems	High	General Fund	Water Systems, Safety and Security	High	Short-term	New in 2023

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			supplied homes, and small state water systems.								
KC-17	Goal 1, Goal 2, Goal 4	Drought	Regularly review and incorporate information from the Water Storage Vulnerability Tool to update information about drought and water shortage vulnerabilities in the County's MJHMP, WSCPs, and Drought Resiliency Plan	Kings County Department of Public Health	Kings County Office of Emergency Services, Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems	Little to No Cost	General Fund	Water Systems	High	Short-term	New in 2023.
KC-18	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Water Shortage Contingency Plans (WSCPs) - The County will work with small water providers to develop a WSCP and update the plans every 5 years.	Kings County Department of Public Health	Kings River Hardwick School, Hanford Christian School, Island Union School, Pioneer Union Elementary School, Lakeside Union School, Kings Ranch Ministries, Villa Terrace Apartments, Rollerland Company, Westlake Farms Headquarters, Couture Farms, State Water Resources Control Board (SWRCB)	Moderate	FEMA HMA, CA DWR	Water Systems	Medium	Short-term	New in 2023.
KC-19	Goal 1, Goal 2, Goal 3, Goal 4	Drought	County Drought Resiliency Plan – The County will develop a Drought Resiliency Plan that includes water districts, small water suppliers, and Non-Transient Non-Community Water Systems	Kings County	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems	Moderate	FEMA HMA HMGP, DWR	Water Systems	Medium	Short-term	New in 2023.
KC-20	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Perform a countywide service area assessment to address the needs of maintaining an adequate level of service for all small public water systems.	Kings County Department of Public Health	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems	Moderate	FEMA HMA HMGP	Water Systems	Medium	Short-term	New in 2023.
A-1	Goals 1, 3-4;	Earthquake, Land Subsidence, Landslide	Housing Rehabilitation Program.	Avenal	City of Avenal Community Development Director	High	General Fund, Housing and Urban Development (HUD) Community Development Block Grant (CDBG) Funds, HOME, Cal Home Program	Food, Hydration, Shelter	Medium	Medium-term	Annual implementation.
A-2	Goals 1-4;	Flood, Drought, Earthquake,	Vulnerability of Water Distribution Systems.	Avenal	City of Avenal Public Works Department	High	FEMA HMA HMPG, BRIC	Food, Hydration, Shelter	Medium	Long-term	In progress,.

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		Land Subsidence									
A-3	Goals 1, 3-4;	Earthquake, Subsidence, Landslide	Loss Reduction Program for unreinforced masonry (URM) Buildings.	Avenal	City of Avenal City Manager's Office, California Seismic Safety Commission, City of Avenal Public Works Department	Very High	FEMA HMA HMGP, BRIC, General Fund, Staff Time	Food, Hydration, Shelter	Medium	Long-term	In progress.
A-4	Goals 2-4;	Earthquake	Replace Existing Valves at Tank Sites with Earthquake Valves to Protect Water Supply	Avenal	City of Avenal Public Works	Moderate	General Fund	Safety and Security	Medium	Medium Term	New in 2023
A-5	Goals 2-4;	Drought	Water Supply Rehabilitation.	Avenal	DWR, City of Avenal, Westlands Water District	Very High	FEMA HMA HMGP, BRIC, USDA DWSRF, DWR Urban Community Drought Relief Grant Program	Food, Hydration, Shelter	Low	Medium Term	New in 2023
A-6	Goals 1-4;	Flood	Improve Flow Design for Arroyo Esquinado Channel	Avenal	City of Avenal Public Works Department	Moderate	FEMA HMA HMGP, BRIC	Water Systems	Medium	Medium Term	New in 2023
A-7	Goals 1-4;	Flood	Stormwater Drainage Master Plan	Avenal	City of Avenal Public Works Department	Moderate	General Fund	Water Systems	Medium	Medium Term	New in 2023
A-8	Goals 1-4;	Flood	Investigate Capacity for Floodwater Conveyance Facilities (Drainage Ditches and Culverts) along Arroyo del Camino	Avenal	City of Avenal Public Works Department	Moderate	FEMA HMA HMGP, BRIC, General Fund	Water Systems	Low	Medium Term	New in 2023
A-9*	Goals 1-4:	Land Subsidence	Conduct updated Land Subsidence Study to understand Elevation, Shifts, and Vulnerability.	Avenal	Kings County Administration, Water Management Agencies, City of Avenal Public Works Department	Moderate	DWR, FEMA HMA HMGP, USACE	Safety and Security, Food and Water, Shelter, Transportation	Medium	Long Term	New in 2023
A-10	Goals 1-4;	Wildfire	Undergrounding of Utilities along City's Main Corridors	Avenal	Kings County Fire Department	High	FEMA HMA HMGP	Energy	Medium	Medium Term	New in 2023
C-1	Goal 1, Goal 2, Goal 3,	Extreme Temperatures: Freeze and Heat	Equip and maintain the Recreational Association of Corcoran (RAC) Gymnasium Building, and Corcoran Transit Station with climate control features and designate each site as an Emergency Warming and Cooling Center for Sensitive Populations	Corcoran	City of Corcoran Public Works Department,	High	FEMA HMA HMGP, Other State Grants	Safety and Security	High	Long Term	Annual implementation.
C-2	Goal 1, Goal 3,	Extreme Temperatures: Extreme Heat	Emergency Power System for the Corcoran Depot Apartment complex operated by the Kings County Housing Authority.	Corcoran	City of Corcoran Public Works, Kings County Office of Emergency Services	High,	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program	Energy	High	Short Term	Not started.

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C-3	Goal 1, Goal 2, Goal 3, Goal 4,	Multi-Hazard, Earthquake, Flood, Land Subsidence	Assess the Vulnerability of Critical Facilities	Corcoran	City of Corcoran Public Works, Police Department	High	General Fund	Water Systems	High	Ongoing	Annual implementation.
C-4	Goal 1, Goal 2, Goal 3, Goal 4,	Drought	Assess Community Lifelines related to Water Distribution Systems	Corcoran	City of Corcoran Public Works Department	High	Department of Water Resources (DWR) and Regional Water Quality Control Board (RWQCB)	Safety and Security, Water Systems	High	Ongoing	Annual implementation.
C-5	Goal 1, Goal 4,	Multi-Hazard, Earthquake, Extreme Temperatures: Extreme Heat and Freeze, Flood, Severe Weather	Develop a Program to Support Vulnerable Populations during Emergency Events	Corcoran	City of Corcoran Police Department	Moderate	General Fund	Safety and Security	High	Ongoing	Annual implementation.
C-6	Goal 1, Goal 2, Goal 3, Goal 4,	Multi-Hazard	Update the City's General Plan Safety Element and Integrate the next MJHMP Update and City of Corcoran Annex	Corcoran	City of Corcoran Community Development Department	High	General Fund	Safety and Security	High	Ongoing	Annual implementation.
C-7	Goal 1, Goal 2, Goal 3, Goal 4,	Multi-Hazard, Severe Weather: High Wind and Tornadoes	Natural Hazards Review Criteria	Corcoran	Kings County Community Development Department	High	General Fund	Safety and Security	High	Ongoing	Annual implementation..
C-8	Goal 3,	Cyber Threat	Use antivirus solutions, malware, and firewalls to block threats	Corcoran	City of Corcoran, Public Works Department	Moderate	General Fund	Safety and Security; Communications	Medium	Ongoing	New in 2021
C-9	Goal 1, Goal 2, Goal 3,	Multi-Hazard, Dam Incidents	Community Alert and Warning System	Corcoran	City of Corcoran, Corcoran Police Department, and Kings County OES	Moderate	Emergency Management Performance Grant (EMPG), Homeland Security Grant Program (HSGP), High Hazard Potential Dam (HHPD)	Safety and Security, Water Systems	High	Ongoing	New in 2021
C-10	Goal 1, Goal 2, Goal 3,	Drought	Public Education Program for Water Conservation	Corcoran	City of Corcoran, City Public Works Department	Low	General Fund, City Water Enterprise Fund, and Department of Water Resources funding.	Water Systems	High	Ongoing	New in 2021
C-11	Goal 1, Goal 2, Goal 3, Goal 4,	Flooding, Drought, Subsidence	Corcoran Flood Protection – Multi-Agency Strategic Plan for Upstream Floodwater Diversion to Reduce Tulare Lake Flooding	Corcoran	City of Corcoran, Cross Creek Flood Control District, other Water & Irrigation Districts representing the Tulare Lake Basin, and DWR	Very High	FEMA HMA HMGP, DWR Riverine Stewardship Program and Urban Stream Restoration Program, Prop 68 Funds (Floodplain	Water Systems	High	Long Term	New in 2021

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							Management, Protection, and Risk Awareness Grant Program)				
C-12	Goal 1, Goal 3, Goal 4,	Flooding	Enhanced Erosion Control and Protection of the Flood Control Levee	Corcoran	City of Corcoran, Cross Creek Flood Control District	High	FEMA HMA HMGP, DWR Urban Community Drought Relief Program	Safety and Security	Medium	Long Term	New in 2021
C-13	Goal 2, Goal 3, Goal 4,	Flooding, Drought, Subsidence	Increase Reservoir Storage for Control of Floodwater	Corcoran	Cross Creek Flood Control District, City of Corcoran, USACE, Kings County, Other Water Districts	Very High	FEMA HMA HMGP, DWR Grants	Water Systems	High	Long Term	New in 2021
C-14	Goal 3,	Public Health Hazards	Utilize trainings and exercises, epidemiology, and surveillance to control and combat public health risks	Corcoran	Kings County, City of Corcoran	Moderate	General Fund	Health and Medical	Medium	Short Term	New in 2021.
C-15	Goal 1, Goal 2, Goal 3,	Flooding	Update the City's Storm Drain Master Plan every Few Years to included Planned Growth Areas	Corcoran	City of Corcoran	Low	General Fund	Water Systems	Low	Short Term	New in 2021
C-16	Goal I, Goal 2, Goal 3,	Flooding	Continue to Participate with the Cross Creek Flood Control District to Ensure Levees Protecting Corcoran from Tulare Lake Flooding are Adequately Monitored	Corcoran	City of Corcoran, Cross Creek Flood Control District	Low	General Fund	Water Systems, Safety and Security	High	Short Term	New in 2021
H-1	Goal 1, Goal 2, Goal 3;	Multi-hazard	Public Education Program for All Hazards	Hanford	County and City Public Works, Kings County Health Dept., Kings County OES	Low	General Fund	Safety and Security	High	Ongoing	In Progress..
H-2	Goal 1, Goal 3;	Drought	Retrofits to Water Storage Tanks.	Hanford	City of Hanford Public Works Department	Moderate	DWR Grants, HMGP	Food, Water Shelter	High	Ongoing	In progress.
H-3	Goal 1, Goal 2, Goal 3;	Earthquake	GIS Database of Unreinforced Masonry (URM) Buildings	Hanford	City of Hanford Fire Department, Kings County Community Development, OES, City GIS, IT	Moderate	General Fund	Safety and Security; Communication; Transportation	Medium	Short Term	Not started,
H-4	Goal 1, Goal 3, Goal 4; Food, Hydration, Shelter	Earthquake	Retrofit 58 URM Buildings in Downtown Hanford	Hanford	City of Hanford City Manager's Office	Very High	FEMA HMA HMGP	Food, Hydration, Shelter	Medium	Long Term	In progress,

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H-5	Goal 1, Goal 2, Goal 3;	Multi-Hazard	Assessment of Critical Facilities	Hanford	City of Hanford Fire Department	Moderate	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	In progress.
H-6	Goal 1, Goal 2;	Multi-Hazard	Disaster Evacuation Routes.	Hanford	City of Hanford City Manager's Office, City of Hanford Public Works Department, Kings County OES	Moderate	General Fund	Transportation	Medium	Medium Term	Not started.
H-7	Goal 1;	Multi-Hazard	Develop a transportation routing app.	Hanford	Kings County Public Works, Kings County Administration	Moderate	Community Power Resiliency Allocation Program, Emergency Management Performance Grant (EMPG), HMGP	Transportation, Communication	Low	Short Term	New in 2023
H-8	Goal 1, Goal 2;	Flooding, Wildfire	Create a flood channel debris management plan.	Hanford	Kings County Public Works, Water and Irrigation Districts, City Public Works	High	Proposition 68, Federal and State Resources	Safety and Security	High	Short Term	New in 2023
H-9	Goal 1, Goal 2, Goal 3, Goal 4;	Multi-Hazard	Develop a series of flood control basins on the Kings River that either recharge or store water during flood flows.	Hanford	Kings County Conservation District (KRCD), Local GSAs	Very High	DWR Grants, FEMA HMA HMGP, BRIC	Safety and Security, and Food, Water, Shelter	High	Long Term	New in 2023
H-10	Goal 1, Goal 2, Goal 3, Goal 4;	Multi-Hazard	Evaluate federal levees to determine height and make-up of levees to protect during 100-year storm events.	Hanford	United States Army Corps of Engineers (USACE), KRCD	Very High	USACE Grants	Safety and Security	High	Long Term	New in 2023
H-11	Goal 1, Goal 2, Goal 3, Goal 4;	Multi-Hazard	Remove sediment from Kings River to avoid future capacity issues.	Hanford	KRCD	Very High	HMPG Funds. Prop 68	Safety and Security	High	Medium Term	New in 2023
H-12*	Goal 1, Goal 2, Goal 3, Goal 4;	Drought, Subsidence	Conduct updated land subsidence study to understand elevations, shifts, and vulnerability.	Hanford	Kings County Administration, Water Management Agencies	Moderate	DWR, USACE, Cal OES	Safety and Security, Food, water, Shelter, Transportation	Medium	Short Term	New in 2023
H-13	Goal 3;	Cyber-attack	Use antivirus solutions, malware, and firewalls to block threats	Hanford	Kings County, Avenal, Corcoran, Hanford, Lemoore	Moderate	General fund	Safety and Security, Communications	Medium	Ongoing	New in 2023
H-14	Goal 3;	Public Health Hazards	Utilize trainings and exercises, epidemiology and surveillance to control and combat public health risks	Hanford	County and City Public Health Departments	Moderate	General Fund	Health and Medical	Medium	Ongoing	New in 2023

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H-15	Goal 1, Goal 3;	Earthquake, Drought	Safety Building & Community Center.	Hanford	Hanford Police and Fire Departments	Moderate	General Fund	Safety and Security	Medium	Medium Term	New in 2023
H-16	Goal 1, Goal 3, Goal 4;	Extreme Temperatures	Extreme Weather Shelter..	Hanford	Hanford Community Development Agency, Police and Fire Department	Moderate	General Fund, APGP	Food, Hydration, Shelter	High	Medium Term	New in 2023
H-17	Goal 1, Goal 3, Goal 4;	Multi-Hazard	Grangeville Overpass.	Hanford	Hanford Public Works, Community Development, and Administration	Very High	General Fund	Transportation	High	Long Term	New in 2023
H-18	Goal 1, Goal 3, Goal 4;	Multi-Hazard	Assess the Capacity and Viability of Designate Evacuation Routes and Develop Evacuation Plan for All Hazard Scenarios	Hanford	Hanford Public Works, Community Development, and Administration	Very High	General Fund	Transportation	High	Long Term	New in 2023
L-1	Goal 1, Goal 2, Goal 3	Earthquake, Flood, Wildfire	Municipal GIS Program - Assist in establishing a centralized, inter-jurisdictional GIS program in partnership with the County of Kings to improve all phases of emergency management.	Lemoore	Planning Department, Kings County Planning Department, Cities of Hanford, Corcoran, Avenal, and Tachi Tribal Council	Moderate	Grant money from FEMA/Department of Homeland Security, ESRI	Safety and Security; Communications; Transportation	Medium	Short-term	
L-2	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Water Conservation - Public Education for water supply and conservation efforts	Lemoore	City of Lemoore Administration, Finance, and Public Works	High	FEMA HMA HMGP, DWR	Water Systems	Medium	Short-term	New in 2023
L-3	Goal 1, Goal 2, Goal 3, Goal 4	Flooding	Well Protection - Work to Protect wells from floodwaters during future flooding events,	Lemoore	City of Lemoore Public Works	High	FEMA HMA HMGP, DWR	Water Systems	Medium	Medium-term	New in 2023

Acronyms and abbreviations are defined below:

- HMA – Hazard Mitigation Assistant Program
- HMGP – Hazard Mitigation Grant Program
- HSGP – Homeland Security Grant Program
- EMPG – Emergency Management Performance Grant
- Community Power Resiliency Allocation Grant Program – formerly the Public Safety Power Shutoff (PSPS) Program Funds
- DWR – Department of Water Resources Grant Funds
- Proposition 68 – water bond funds allocated to recreation, ecosystem protection, habitat conservation, and climate resilience projects
- KRCD – Kings River Conservation District Funds (funding from the California Department of Conservation [DOC])
- USACE – U.S. Army Corps of Engineers Funds
- APGP – Adaptation Planning Grant Program

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1 INTRODUCTION

1.1 PURPOSE OF PLAN

Kings County including the participating jurisdictions have prepared this multi-jurisdictional hazard mitigation plan (MJHMP) to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. The purpose of this MJHMP is to identify policies, actions, and strategies that will help to reduce risk and prevent future losses. Hazard mitigation is best realized when community leaders, businesses, citizens, and other stakeholders join together to undertake a process of learning about hazards that can affect their area and use this knowledge to prioritize needs and develop a strategy for reducing damage. Hazard mitigation is most effective when it is based on a comprehensive long-term plan that is developed prior to a disaster occurring.

This plan demonstrates the Kings County communitites' commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources. This plan was also developed to make Kings County and the participating jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) and Building Resilient Infrastructure and Communities (BRIC) program, as well as to make the County and jurisdictions more disaster resistant. This plan demonstrates the County's commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources.

1.2 HAZARD MITIGATION PLANNING

FEMA has determined that there is a critical link between hazard mitigation planning and sustainability. This means if Kings County has the foresight to plan ahead to reduce the impacts of hazards, the County will be better able to prevent injury, loss of life and damage to our homes, businesses, and neighborhoods. The County can use the threat of disaster as a catalyst to act and develop a plan so we can recover more quickly following a disaster.

Kings County and the four participating jurisdictions have committed to reducing long-term risk to their citizens and damage to property from the effects of natural hazards. By planning, preparing, and adopting a MJHMP, the County and each jurisdiction are taking a proactive approach to reduce or eliminate the impacts of hazards before they occur.

FEMA defines "hazard mitigation" as any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The County's plan will serve as a tool for learning from disasters that have already occurred, so they can deal with them more effectively and efficiently with less expenditure than in the past.

Direct benefits include:

- Reduced loss of life;
- Reduced loss of property and essential services;
- Reduced economic hardship;
- Reduced reconstruction costs;
- Increased cooperation and communication within the community through the planning process; and
- Expedited post-disaster funding.

Indirect benefits include:

- Disaster resilience;
- Environmental quality;
- Economic vitality; and
- Improved quality of life.

1.3 FEDERAL REGULATORY FRAMEWORK

Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act ("the Stafford Act"), enacted by Section 104 of the Disaster Mitigation Act of 2000 ("DMA 2000"), provides revitalized approaches to mitigation planning. Section 322 continues the requirement for a State Hazard Mitigation Plan (SHMP) as a condition of disaster assistance and establishes a new requirement for Local Hazard Mitigation Plans (LHMP). In order to apply for federal aid for technical assistance and post-disaster funding, local jurisdictions must comply with DMA 2000 and its implementing regulations (44 Code of Federal Regulations [CFR] Part 201.6).

Under the 2008 44 CFR update, requirements have changed governing mitigation planning provisions for LHMPs published under 44 CFR §201.6. LHMPs qualify communities for federal mitigation grant programs including:

- HMA Grants
- HMGP
- BRIC
- FMA
- High Hazard Potential Dam (HHPD)
- Severe Repetitive Loss (SRL)
- Repetitive Flood Claim (RFC)

1.4 STATE AND LOCAL REGULATORY FRAMEWORK

The MJHMP was prepared consistent with the Health and Safety Element (Safety Element) of the Kings County General Plan, as the planning effort covers common overlapping natural hazard issues and mutually-reinforcing policies and implementation programs. The MJHMP and Safety Element are considered complimentary documents that address natural hazards, and both planning documents contain goals, policies, and project actions or implementation programs to enhance the County's mitigation efforts related to public safety.

California Government Code Section 65302.10, also referred to as Assembly Bill (AB) 2140 encourages California counties and cities to adopt their current, FEMA-approved LHMPs into the Safety Element of their General Plan. This adoption by reference or incorporation of the MJHMP into the Safety Element of the General Plan follows plan approval and makes Kings County and each participating jurisdiction eligible to be considered for part or all of its local-share costs on eligible public assistance funding to be provided by the State through the California Disaster Assistance Act (CDAA). The CDAA allows the State to pay up to 18.75% of the non-federal share that would otherwise fall upon a county or city to pay for public assistance projects. The legislature passed AB 2140 to provide additional funding after a disaster occurs. The local share is 25% of the total project cost; therefore, the legislation allows city and counties that comply to be eligible for only the remaining local share (6.25%).

AB 2140 is an optional state incentive to help counties and cities become more resilient to natural hazards. Compliance with AB 2140 also expires when the MJHMP expires, and the County must re-adopt the plan into the Safety Element during update cycles to ensure continued compliance and funding eligibility. Additionally, each participating jurisdiction in Kings County must adopt their annex into their own General Plan Safety Element, as the annex jurisdictions are not covered under the County's General Plan Safety Element adoption.

1.5 BACKGROUND AND SCOPE

In the State of California and around the world, natural disasters occur frequently. Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. The time and money needed to recover from these events can strain or deplete local resources. These monies only partially reflect the true cost of disasters because additional expenses to insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries (Natural Hazard Mitigation Saves: 2017 Interim Report).

Hazard mitigation planning is the process through which hazards that threaten communities are identified; likely impacts are determined, prioritized, and implemented. This MJHMP update continues the hazard mitigation planning process for Kings County, the unincorporated county; the participating cities of Avenal, Corcoran, Hanford, and Leemore. The plan identifies natural and human-caused hazards and risks within Kings County and identifies the hazard mitigation strategy to reduce vulnerability and make the communities of Kings County more disaster-resistant and sustainable. Information in this plan can be used to help guide and coordinate mitigation activities and local land use decisions. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Kings County planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

1.6 PLAN UPDATE

This plan underwent a comprehensive update in 2022-2023 in fulfillment of the five-year update requirement. Several factors underscore the need for this planning effort:

- Kings County is exposed to hazards that have caused past damage.
- Limited local resources make it difficult to be pre-emptive in reducing risk. Eligibility for federal financial assistance is paramount to promote successful hazard mitigation in the area.
- Kings County and its partners recognize the probability of certain future hazards is increasing, and want to identify and implement mitigation actions that will address the needs of populations most vulnerable to these hazards impacts.
- Kings County and its partners participating in this plan want to be proactive in preparing for the probable impacts of natural hazards.

The Kings County's 2012 MJHMP was already developed pursuant to the regulations of DMA 2000, and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR Section 201.6). While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that LHMPs must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the Kings County planning and response area is subject to many kinds of hazards, access to these programs is vital. As a result, the County and its participating jurisdictions must complete a comprehensive plan update every five years. For the current plan update, Kings County completed the update as part of a multi-jurisdictional planning process in 2022-2023 to bring the MJHMP into compliance with recent legislation related to climate change probability, underserved and socially vulnerable populations, increased stakeholder engagement, and to address emerging concerns. The Kings County 2012 MJHMP was adopted by Kings County and the participating jurisdictions on January 13, 2015. The Kings County 2012 MJHMP was approved by FEMA on June 4, 2015.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Kings County planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

This MJHMP identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens. One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. FEMA encourages multi-jurisdictional

planning under its guidance for the DMA. This plan will help guide and coordinate mitigation activities throughout the planning area. The plan was developed to meet the following objectives:

- Meet or exceed the requirements of the DMA.
- Enable all planning partners to use federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on Kings County hazards of concern.
- Update the risk assessment with a consequence analysis that assesses the risk and vulnerability of people, property, critical facilities and infrastructure, natural and cultural resources, future development from these hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the County and puts all partners on the same planning cycle for future updates.
- Meet the planning requirements of FEMA's Community Rating System (CRS), allowing planning partners that may choose to participate in the CRS program to enhance their CRS classifications.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented.

1.7 MULTI-JURISDICTIONAL PLANNING

All citizens and businesses of Kings County are the ultimate beneficiaries of this MJHMP. The plan reduces the risk for those who live in, work in, and visit the County. It also provides a viable planning framework for all foreseeable natural hazards that may impact the County. Participation in the development of the plan by key stakeholders in the County helps ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable countywide, and the plan's goals and recommendations can lay the groundwork for the development and implementation of local mitigation activities and partnerships.

The Kings County 2022-2023 MJHMP is a multi-jurisdictional plan that geographically covers people, property, and critical assets within Kings County's jurisdictional boundaries (hereinafter referred to as the planning area). Unincorporated Kings County and the following jurisdictions participated in the 2022-2023 update planning process:

- Kings County
- City of Avenal
- City of Corcoran
- City of Hanford
- City of Lemoore

The four cities were all participants of the 2012 Kings County MJHMP. In addition to these four cities, Santa Rose Rancheria/Tachi Yokut Tribe and the Kings County Office of Education representing various school districts were also all participants of the 2012 Kings County MJHMP, however, they opted not to participate in the 2022-2023 plan update due to limited staff capacity and resources. This 2022-2023 MJHMP update process covers four of the participating jurisdictions and includes four annexes.

1.8 PLAN ORGANIZATION

The sections that comprise the County's MJHMP include:

Executive Summary and Prerequisite – This section includes the executive summary of the MJHMP and addresses the formal adoption of the plan by each governing body to demonstrate the commitment of the community and elected officials to the County's goal of becoming disaster-resistant.

Section 1: Introduction – This section describes the purpose of the MJHMP update, the benefits of hazard mitigation planning, the federal and state regulatory requirements, and the background of the County's hazard mitigation planning process.

Section 2: Community Profile and Capability Assessment – This section provides the history and background of the County, including population trends and the demographic and economic conditions that have shaped the area. This section also includes the County's capability assessment.

Section 3: Planning Process – This section identifies the planning process, the HMPC members, the meetings held as part of the planning process, documents the outreach efforts, and the review and incorporation of existing plans, reports, and other appropriate information.

Section 4: Hazard Identification, Risk Assessment (HIRA), and Consequence Analysis –This section describes the process through which the HMPC and our local partners identified, screened, and selected the hazards to be profiled. The hazard analysis includes the description, location, extent, and probability of future events for each hazard. This section also includes a Vulnerability Assessment. The Vulnerability Assessment covers all hazards and considers the impact on the following assets: property; people; critical facilities and infrastructure; natural and cultural resources; economic condition of the jurisdiction; and future development trends.

Section 5: Mitigation Strategy – The mitigation strategy section provides a plan for reducing the potential losses identified in the vulnerability analysis. Mitigation goals and potential actions to minimize the risks and losses associated with each hazard will be described along with a strategy for implementation.

Section 6: Implementation and Maintenance – This section describes the method and schedule for monitoring, evaluating, and updating the plan to ensure it remains an active and applicable document.

Section 7: Plan Adoption – This section includes the plan adoption documentation and process for integrating the plan by reference into the County's General Plan Safety Element.

Section 8: References – This section lists the sources cited in the plan.

Appendices

- Appendix A: Hazard Mitigation Planning Committee
- Appendix B: Planning Process Documentation
- Appendix C: Approval and Adoption Documentation
- Appendix D: Mitigation Categories and Alternatives
- Appendix E: Annual Progress Meeting Agenda and Report Template
- Appendix F: Outreach Strategy

Annexes

- Annex A: City of Avenal
- Annex B: City of Corcoran
- Annex C: City of Hanford
- Annex D: City of Lemoore

2 COMMUNITY PROFILE AND CAPABILITY ASSESSMENT

2.1 HISTORY

As noted in the Kings County 2035 General Plan, Kings County was established in 1893 through a separation of territory from Tulare County. Additional territory was added from Fresno County in 1909 to make up what is known today as Kings County. Before the formation of the County, there were a number of historical events that led up to its establishment. Early inhabitants of this region were the Tache tribe of the Yokut Indians which existed throughout the San Joaquin Valley from the Delta to Tejon Pass. The first European contact occurred in 1805 when Lieutenent Gabriel Moraga led a company of Spanish soldiers and Franciscan clergymen through the eastern edge of the San Joaquin Valley while in search of possible mission sites. On January 6, 1805, they encountered a thriving Yokut Indian culture along the banks of a large river draining into the Laguna de Tache, (Tulare Lake). The river was named El Rio de los Santos Reyes, the "River of the Holy Kings," later shortened to "Kings River." This is where the County derived its namesake.

Prior to the development of any towns, Kings County was home to a handful of adventurous pioneers who settled primarily in the barren valley floor along the Kings River. Kingston, the first of several settlements located in Kings County was founded in 1856 and situated along the south bank of the Kings River. The town grew up around a ferry crossing that transported travelers across the Kings River who were traveling along the Spanish road called El Camino Viejo á Los Angeles (the old road to Los Angeles). Kingston was the only stopping point along the Overland Mail Company stage route between Stockton and Visalia.

Following Kingston, other communities sprang up in Kings County, primarily along existing or proposed railroad easements. The first incorporated community in Kings County was Lemoore. The success of the community was assured with the arrival of the Southern Pacific Railroad in 1877, the same year the community of Hanford was founded. Hanford later became incorporated in 1891, and later was selected as the County seat when in 1893, local voters approved the formation of a new county when a portion of western Tulare County was divided to form Kings County. In 1909, Kings County increased its boundary by 118 square miles when a triangular area of land was transferred from Fresno County's jurisdiction to Kings County.

Settlement in Kings County remained modest throughout much of the County's first century. The third incorporated community, Corcoran, was established on the San Francisco and San Joaquin Railroad in 1905 following a visit from Hobart Johnstone Whitley, a prominent land developer from southern California. The fourth incorporated town, Avenal, was established along the west side of the Kettleman Hills in an area historically called "Avena" by Spanish soldiers and explorers.

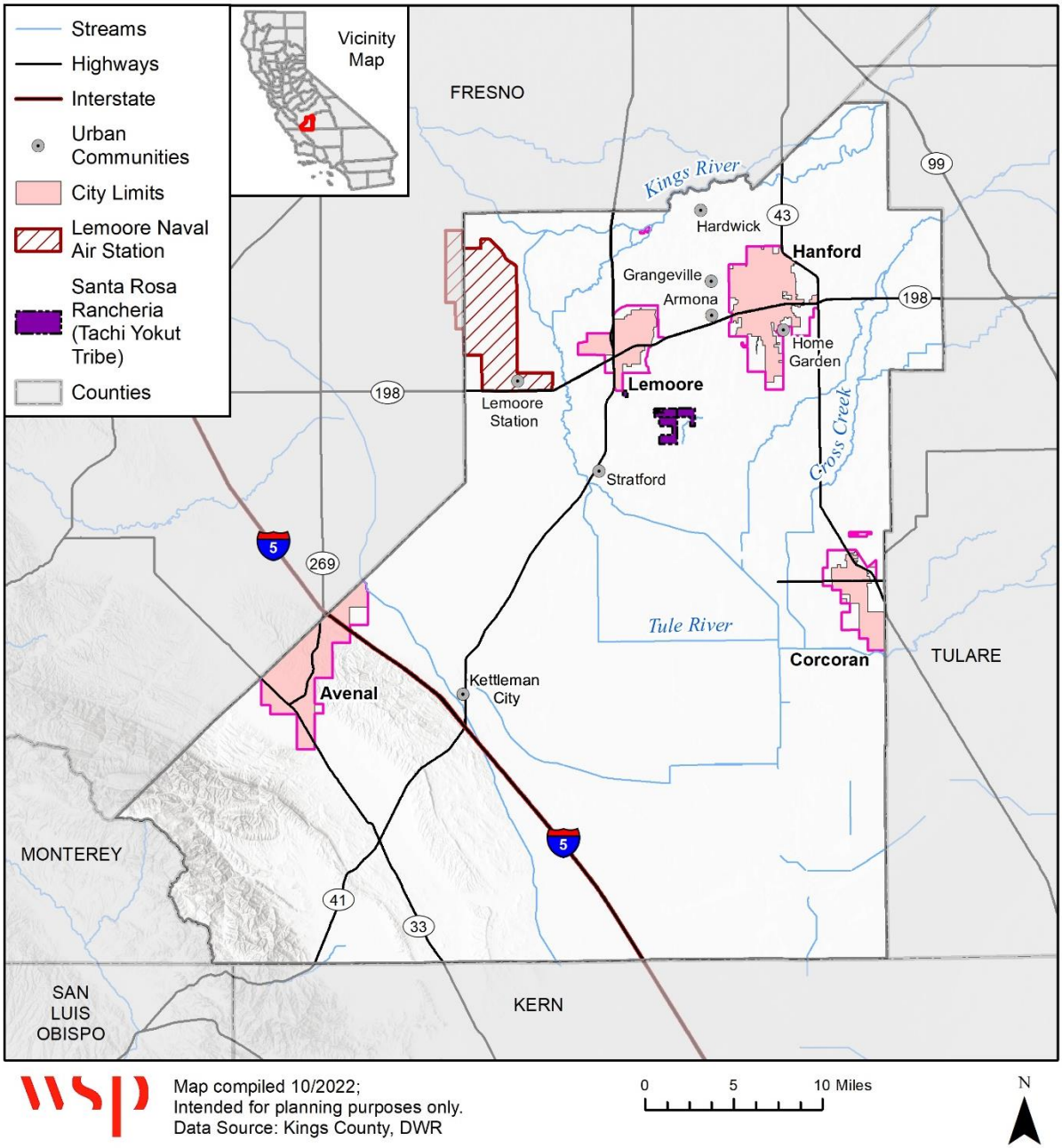
A number of unincorporated communities also grew from the early pioneering years. The Southern Pacific Railroad, which was the cause of many valley communities, was the primary driving force that led to the creation of Armona's town layout in 1875 by John Yoakum for the Pacific Improvement Company. The railroad line followed in 1877, and Armona quickly became recognized as a main railroad shipping point for the rich Grangeville farming and fruit growing region. Farming and ranching supported the early economy of Kings County.

The community of Stratford has its origins dating back to 1899 when settlers of the Tulare Lake Basin dug three miles of canal to irrigate the farms of Blakeley, Clawson, Lovelace and others who had settled on the margins of what was once water filled Tulare Lake. Stratford technically came into being in 1905 when the Empire Investment Company purchased 19,000 acres from the Bates, Davis and Miller Company. The town officially was organized by the sale of town lots from the ranch. However, due to a name conflict with another depot, the community name was changed to what it is recognized today "Stratford". Manford Brown, a real estate developer founded the town of Kettleman City in 1929, following his donation of land to construct a school site and a community church. The community of Home Garden was established later during the 1940s and was initially home to many local farmers and farm industry workers. The City of Hanford has grown around the community on three sides, and Home Garden has evolved into a bedroom community for Hanford.

The Naval Air Station Lemoore (NASL) has been a strong economic force in the County since its development in 1961 when it was commissioned and constructed to be the largest and newest Master Jet Base in the Navy. Currently, the NASL hosts the Navy's largest west coast fighter/attack capability and houses approximately 175 Hornets and SuperHornets organized into 16 squadrons which comprise the Pacific Strike Fighter Wing.

Figure 2-1 shows the County's planning area.

Figure 2-1 County of Kings Planning Area



2.2 GEOGRAPHY AND CLIMATE

According to the U.S. Census Bureau, Kings County has a total area of 1,392 square miles, of which 1,389 square miles is land and 2.1 square miles (0.2%) is water. Kings County is bordered on the north and northwest by Fresno County, on the east by Tulare County, on the south by Kern County and a small part of San Luis Obispo County, and on the west by Monterey County. Most of the historic Tulare Lake was within Kings County. Kings County is governed by a five-member Board of Supervisors.

Kings County has a climate that can be described as warm and sunny for much of the year. Summers are dry and hot while winters are mild. The County averages approximately 7.43 inches of rainfall each year. Temperatures range from an average minimum temperature of 36.2 degrees Fahrenheit in the winter, and to an average high in the 90s during the summer months. The County has an annual average maximum temperature of 76 degrees Fahrenheit and an average minimum temperature of 62.3 degrees Fahrenheit. Table 2-1 lists the average maximum and minimum temperatures by month and associated average rainfall.

Table 2-1 Average Maximum & Minimum Temperatures by Month and Associated Average Rainfall

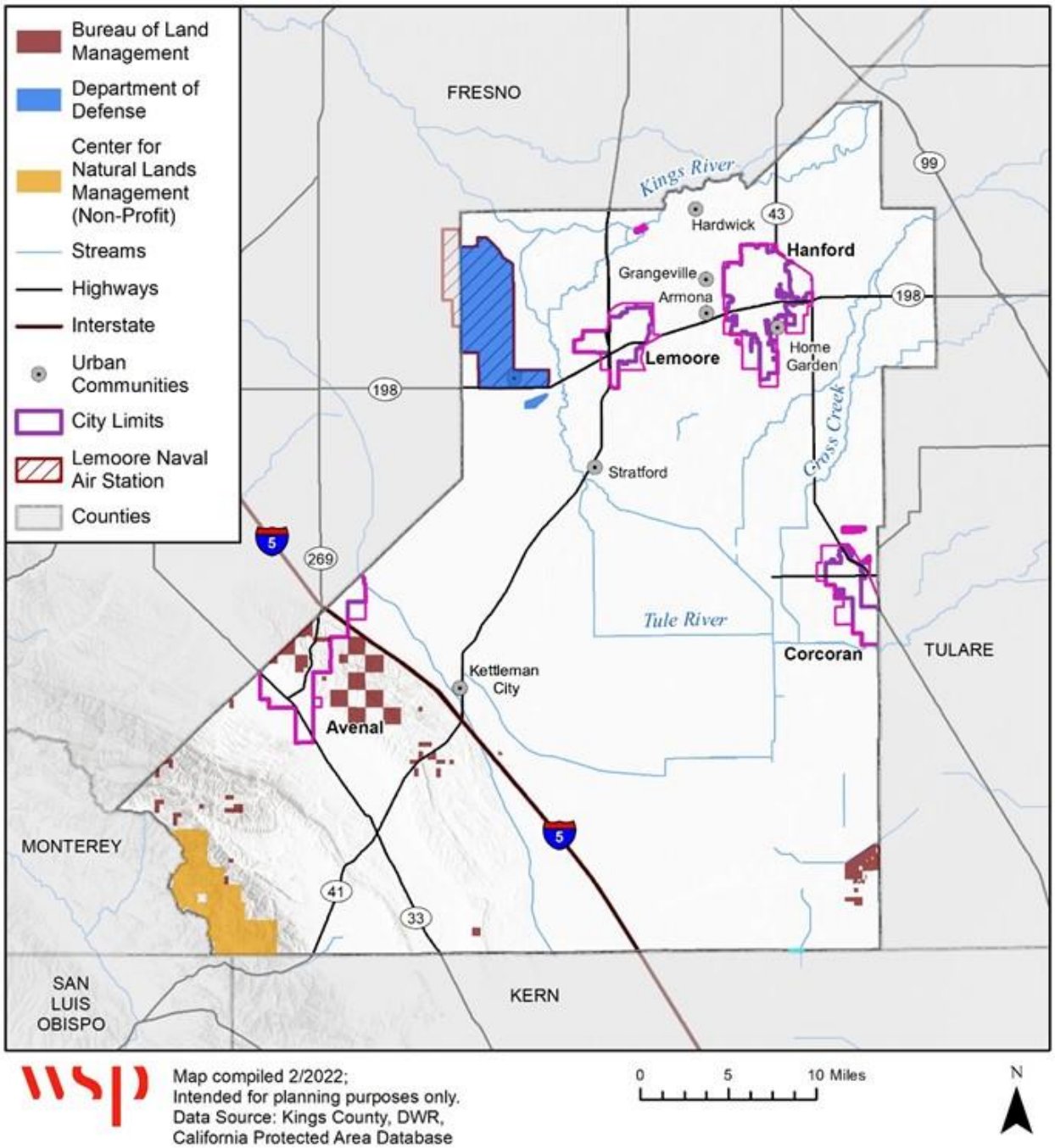
Average Maximum/Minimum Temperature	Average Rainfall
January 54.3˚/36.2˚F	January 1.55 inches
August 95.7˚/63.7˚F	August .01 inches
Annual 76˚/62.3˚ F	Annual 7.43 inches

Note: The time frame for both temperature and precipitation is from 1950 to 2023.
Sources: Climate at a Glance County Time Series, NOAA

2.3 LAND OWNERSHIP

Large expanses of the County are public land. The entities and agencies that own non-public land within the County include the Bureau of Land Management (BLM), the Department of Defense (who owns the Lemoore Naval Air Station), and the Center for Natural Lands Management (which is a non-profit land trust). Figure 2-2 shows the overall land ownership in the County.

Figure 2-2 Kings County Land Ownership



2.4 TRANSPORTATION SYSTEM

Kings Area Rural Transit (KART) is Kings County's public transportation provider. KART provides transportation services to the cities and unincorporated communities of Armona, Avenal, Corcoran, Grangeville, Hardwick, Hanford, Kettleman City, Laton, Lemoore, and Stratford. KART also provides regular transportation services to Fresno and Visalia. Two railway stations are located within the County, Corcoran station and Hanford station. Both stations are Amtrak train stations.

The major highways in the County include Interstate 5 (I-5), State Route (SR) 41, Highway 198 and Highway 43. I-5 is a major north–south route of the Interstate Highway System in the United States, stretching from the Mexican border at the San Ysidro crossing to the Canadian border near Blaine, Washington. I-5 links the major California cities of San Diego, Santa Ana, Los Angeles, Stockton, Sacramento, and Redding. I-5 runs through the City of Avenal. SR 41 is a state highway in California, connecting the Central Coast with the San Joaquin Valley and the Sierra Nevada. SR 41 runs through the City of Lemoore and Kettleman City. SR 198 is an east–west state highway that connects the California Central Coast to the mid-Central Valley through Hanford and Visalia. It intersects I-5 and SR 41. SR 43 is a north–south state highway, which runs roughly parallel to SR 99, connecting the towns of Shafter, Wasco, Corcoran, and Selma, and the City of Hanford. All these highways are shown in Figure 2-1.

2.5 ECONOMY

Kings County is located in the heart of California's rapidly growing San Joaquin Valley, the richest agricultural area in the world. With that distinction also come the challenges of an economy which has historically been dependent on seasonal agriculture and low wages. Select 2017-2021 economic characteristics estimated for Kings County by the U.S. Census Bureau American Community Survey (ACS) are shown in Table 2-2.

Table 2-2 Kings County Economic Characteristics

CHARACTERISTIC	KINGS COUNTY
Families below Poverty Level (%)	13.8%
All People below Poverty Level (%)	12.6%
Median Family Income	$85,806
Median Household Income	$69,717
Per Capita Income	$38,332
Population in Labor Force	63.0%
Population Employed*	58.6%
Unemployment Rate**	6.3%

Source: U.S. Census Bureau ACS 2017-2021 5-Year Data Profile

Kings County provides a broad range of services to its residents, businesses, and visitors, and manages and operates its facilities to meet community needs. Agriculture is the dominant land use in the County, accounting for 90.2% of total land use (2023 General Plan 2010). Furthermore, as shown in Table 2-3, based on U.S. Census Bureau ACS, the most common industries within Kings County are educational services and health care and social assistance (a combined average of 20.3% of workers). Agriculture, forestry, fishing and hunting, and mining as well as Public administration are the other two major industries.

The tables below show the labor force breakdown by industry and occupation and are based on estimates from the 2017-2021 five-year ACS.

Table 2-3 Kings County Employment by Industry Sector, 2017-2021

INDUSTRY SECTOR	PERCENT OF WORKFORCE
Educational services, and health care and social assistance	20.3%
Agriculture, forestry, fishing and hunting, and mining	16.2%
Public administration	13.3%
Retail trade	10.0%
Arts, entertainment, and recreation, and accommodation and food services	8.3%
Manufacturing	7.6%
Professional, scientific, and management, and administrative and waste management services	6.0%

INDUSTRY SECTOR	PERCENT OF WORKFORCE
Transportation and warehousing, and utilities	5.0%
Construction	3.3%
Other services, except public administration	3.3%
Wholesale trade	2.9%
Finance and insurance, and real estate and rental and leasing	2.7%
Information	1.0%

Source: U.S. Census Bureau ACS 2017-2021 5-Year Data Profile

Table 2-4 Kings County Employment by Occupation, 2017-2021

OCCUPATION	# EMPLOYED	% EMPLOYED
Management, business, science, and arts occupations	13,224	25%
Service occupations	10,863	21%
Sales and office occupations	9,236	18%
Natural resources, construction, and maintenance occupations	11,125	21%
Production, transportation, and material moving occupations	8,029	15%
Total	13,224	25%

Source: U.S. Census Bureau American Community Survey 2017-2021 5-Year Estimates, www.census.gov/
*Excludes armed forces

2.6 POPULATION & HOUSING CHARACTERISTICS

The total estimated population of Kings County in 2021 was 151,887, up from 151,122 people in 2010. This constitutes less than a 1% increase in population. Select demographic and social characteristics for Kings County from the 2017-2021 ACS and the California Department of Finance (DOF) are shown in Table 2-5. Increases in population growth also increase exposure to severe weather-related hazards, pandemics/epidemics as well as earthquakes. This increase in growth also puts more demand on water resources and can increase vulnerability to drought.

Table 2-5 Kings County Demographic and Social Characteristics, 2017-2021

CHARACTERISTIC	KINGS COUNTY
Gender/Age	
Male	55.2%
Female	44.8%
Median age (years)	32.1
Under 5 years	7.5%
Under 18 years	27.2%
65 years and over	10.3%
Race/Ethnicity	
White	30.9%
Asian	3.7%
Black or African American	6.0%
American Indian/Alaska Native	0.8%
Hispanic or Latino (of any race)	55.5%

CHARACTERISTIC	KINGS COUNTY
Native Hawaiian and Other Pacific Islander	0.2%
Some other race	0.2%
Two or more races	2.7%
Education*	
% High school graduate or higher	89.4%
% with Bachelor's Degree or Higher	35.0%
Social Vulnerability	
% with Disability	13.0%
% Language other than English spoken at home	21.6%
% Speak English less than "Very Well"	8.3%
% of households with a computer	95.0%
% of households with an Internet subscription	90.1%
% of households with no vehicle available	5.3%

Source: CA Department of Finance U.S. Census Bureau ACS 2015-2019 5-Year Estimates, www.census.gov/
* Population 25 years and over

The following table summarizes information from the ACS 5-year estimates (2017-2021) related to housing occupancy in Kings County. More than half of the County residents own the home they live in.

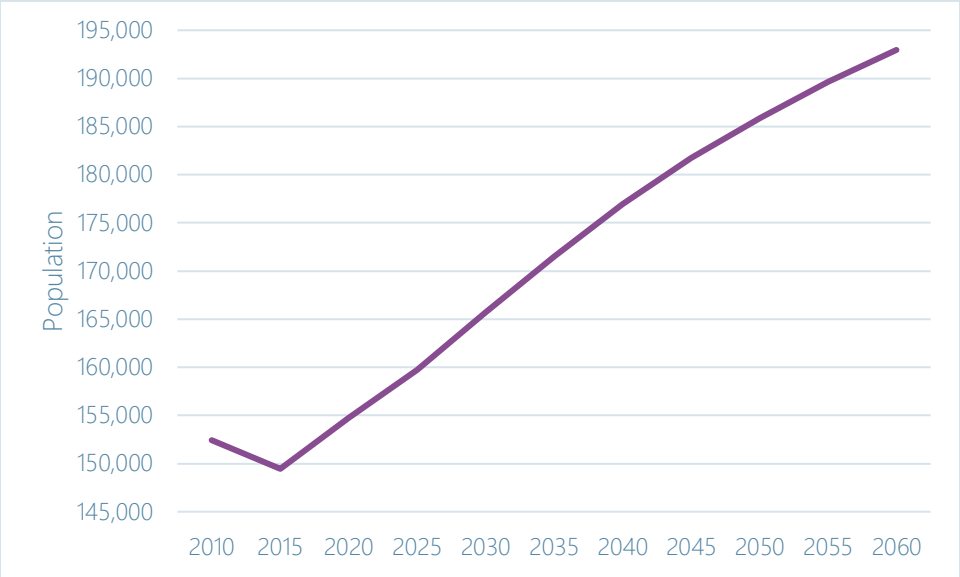
Table 2-6 Kings County Housing Occupancy and Units, 2017-2021

Housing Characteristic	Estimate	Percentage
Housing Occupancy		
Total Housing Units	46,145	100%
Units Occupied	43,286	93.8%
Vacant	2,859	6.2%
Housing Units		
1-unit detached	33,140	71.8%
1-unit attached	2,082	4.5%
2 units	1,337	2.9%
3 or 4 units	2,546	5.5%
5-9 units	1,655	3.6%
10-19 units	906	2.0%
20 or more units	2,403	5.2%
Mobile Home	2,017	4.4%
Boat, RV, van etc.	59	0.1%
Housing Tenure		
Owner Occupied	23,610	54.5%
Renter Occupied	19,676	45.5%

Source: U.S. Census Bureau ACS 2017-2021 5-Year Estimates, www.census.gov/

According to the DOF, the 2020 population of Kings County was 154,745 (DOF 2021). The DOF projects the total population will increase by 7% to 165,752 by 2030 (DOF 2021). These projections are shown in Figure 2-3. While total households in the County are also projected to increase from 44,561 in 2020 to 50,068 in 2030, people per household is projected to slightly decrease from 3.16 in 2020 to 3.06 persons per household in 2030 (DOF 2021).

Figure 2-3 Kings County Observed and Projected Population (2010 – 2060)



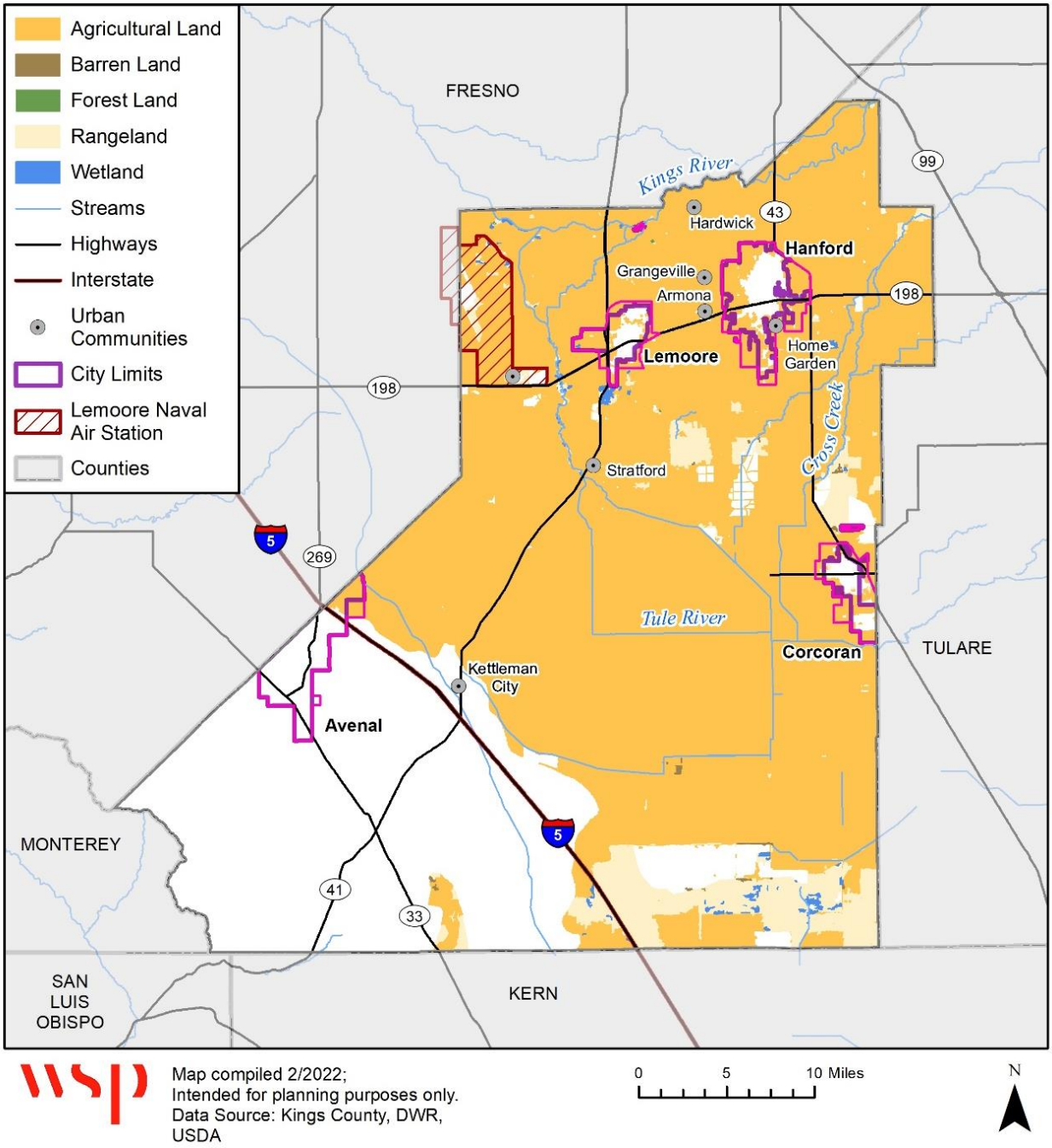
Source: DOF 2021

2.7 NATURAL AND RECREATION RESOURCES

As shown in Figure 2-4, the majority of the County's land cover is agricultural land. Like other counties in the Central Valley, the agriculture industry is one of the pillar industries. Rangelands are also scattered over the County. The majority of the southwestern County is made up of rangeland.

Further details on the County's natural resources can be found in Section 4.4.1.4 Cultural, Historical and Natural Resources.

Figure 2-4 Kings County Land Cover



2.8 COUNTY'S MITIGATION CAPABILITIES

The following section assesses the County's and each participating jurisdiction's existing capabilities to pursue hazard mitigation. The capability assessment analyzes Kings County's capabilities that can be leveraged to mitigate hazards. Combining the risk assessment with the mitigation capability assessment results in the County's "net vulnerability" to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County and jurisdictions. First, an inventory of common mitigation activities was made using a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This assessment is divided into four sections: regulatory mitigation capabilities; administrative and technical mitigation capabilities; fiscal mitigation capabilities; and mitigation outreach and partnerships. Additional information on jurisdiction capabilities can also be found in the participating jurisdictions' annexes.

2.8.1 Regulatory Mitigation Capabilities

The regulatory and planning capabilities listed in Table 2-7 outline planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicate those that are in place in Kings County.

Table 2-7 Regulatory Mitigation Capabilities

REGULATORY TOOL (ORDINANCES, CODES, PLANS)	KINGS COUNTY	AVENAL	CORCORAN	HANFORD	LEMOORE
General plan	Yes	Yes	Yes	Yes	Yes
Zoning ordinance	Yes	Yes	Yes	Yes	Yes
Subdivision ordinance	Yes	No	Yes	Yes	Yes
Growth management ordinance	No	No	No	No	No
Floodplain ordinance	Yes	Yes	Yes	Yes	Yes
Other special purpose ordinance (storm water, steep slope, wildfire)	No	No	Yes	No	No
Building code	Yes	No	Yes	Yes	Yes
Fire department ISO rating	N/A	N/A	N/A	N/A	N/A
Erosion or sediment control	Yes	No	No	No	No
Storm water management program	Yes	No	No	Yes	Yes
Site plan review requirements	Yes	No	No	Yes	No
Capital improvements plan	Yes	No	No	Yes	Yes
Economic development plan	No	No	No	No	No
Local EOP	Yes	No	No	No	No
Other special plans	N/A	N/A	N/A	N/A	No
Flood insurance study or other engineering study for streams	Yes	Yes	Yes	Yes	Yes
Elevation certificates	Yes	Yes	No	No	Yes

Source: Hazard Mitigation Planning Committee

2.8.2 Related Plans and Regulations

2035 Kings County General Plan, 2035

The 2035 Kings County General Plan defines goals, objectives and policies that will guide the physical growth, use and development of land under the jurisdictional authority of the County through the year

2035. The County's overarching priorities are to protect prime agricultural land, direct urban growth to existing cities and community districts, and increase economic and community sustainability. General Plan land use designations and policies are designed to encourage compact and community-centered development patterns that lower public service costs, make more efficient use of land, and discourage premature conversion of farmland to other uses. Policies embodied in this General Plan are designed to balance the protection of individual property owners' rights and property value with the efficient provision of public services to the community at large and long-term preservation of natural resources. The General Plan also contains specific community plans that elaborate on the development planning for the County's several urban communities.

The County's General Plan includes the six mandatory elements: the Land Use Element, Circulation Element, Open Space Element, Noise Element, Health and Safety Element, and 2016-2024 Housing Element. The General Plan also has a Dairy Element and an Air Quality Element. The Health and Safety Element contains goals and policies that address natural and human-caused hazards in the County.

Health and Safety Element

The purpose of the Health and Safety Element is to reduce or eliminate long-term risks to people and property from natural or man-made hazards. This element includes policies for community health and safety-related issues associated with the built environment that affect the health and safety of residents living within the County. This element concentrates on those hazards and community factors that are within the responsibility of the County to mitigate. These include land use decisions and patterns of development that directly and indirectly affect the health, well-being, and personal/property protection of county residents, and the mitigation of potential natural hazards. The Health and Safety Element also describes the location and extent of known hazards and provides maps of hazardous land uses and evacuation routes.

The Health and Safety Element is the primary vehicle for relating County land use policies to local safety planning, and is comprised of three major components that include "Natural Hazards," "Community Health," and "Community Safety." While the Land Use Element identifies areas where hazardous land uses may be located, the Health and Safety Element contains policies for determining acceptable levels of public risk imposed by these land uses, as well as policies for mitigating the effects of natural or manmade catastrophes. The natural hazards discussed in the Health and Safety Element include:

- Geologic Hazards: including earthquake, subsidence and liquefaction, landslide, expansive soil;
- Flood Hazards: flood, dam inundation;
- Temperature Hazards: extreme heat, drought, freeze, fog;
- Fire Hazards; and
- Wind Hazards.

Moreover, the Health & Safety Element includes various Community Health and Safety components, which cover community health topics such as Built Environment Health and Medical Services, as well as community safety topics, including Safe Routes, Built Environment Safety, Law Enforcement, Fire Protection, Emergency Operations, Evacuation Routes, and Airport Safety.

The Safety Element fully incorporates the County's 2007 MJHMP by reference to meet the requirements under California Government Code Section 65302(g)(4). During the 2022-2023 MJHMP update process, the County OES and Planning and Community Development Department collaborated so that the forthcoming Health and Safety Element update would complement and be consistent with the efforts already underway associated with the MJHMP update, such as the climate-related hazards profiled and the other climate change considerations addressed in the risk and vulnerability assessment. The MJHMP update also now addresses socially vulnerable and underserved communities.

Kings County Emergency Operations Plan

The purpose of the County of Kings Emergency Operations Plan (EOP) and its Functional Annexes is to provide the basis for a coordinated response before, during and after a disaster incident. This plan is the principal guide for the County's response to, and management of real or potential emergencies and disasters occurring within its designated geographic boundaries. Specifically, this plan is intended to:

- Facilitate multi-jurisdictional and interagency coordination in emergency operations, particularly between local government, private sector, operational area (geographic county boundary), state response levels, and appropriate federal agencies;

- Serve as a county plan, a reference document, and when possible, may be used for pre-emergency planning in addition to emergency operations.
- To be utilized in coordination with applicable local, state and federal contingency plans.
- Identify the components of an Emergency Management Organization (EMO), and establish associated protocols required to effectively respond to, manage and recover from major emergencies and/or disasters.
- Establish the operational concepts and procedures associated with field response to emergencies, and Emergency Operations Center (EOC) activities.
- Establish the organizational framework of the California Standardized Emergency Management System (SEMS), and the National Incident Management System (NIMS).

Emergency Services Ordinance, (County Code Chapter 6)

The declared purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within this County in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of this county with the cities in this County and with all other public agencies, corporations, organizations, and affected private persons. This ordinance also discusses the Kings Area Disaster Council, its powers and duties, the designation of director and assistant director of emergency services, etc.

Building Code (County Code Section)

Several specific building codes are adopted for Kings County. These codes include the 2013 edition of the California Building Standards Code, the California Fire Code (which is adopted separately), the Uniform Housing Code, and the Uniform Code for the Abatement of Dangerous Buildings. By adopting these codes, they become a part of the rules that apply to construction in the unincorporated area of Kings County. The codes are considered as if they are fully written in this statement, and they must be followed when constructing buildings in the county. However, if a newer edition of the California Building Standards Code is published within 180 days after this statement, that newer edition will replace the 2013 edition as the adopted building code for Kings County. So, in that case, the newer edition will be the set of rules that should be followed for construction purposes.

Flood Damage Prevention Ordinance (County Code Chapter 5A)

The purpose of this Ordinance is to promote public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas. The County's flood damage prevention ordinance provisions are designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blight areas;
- Assist potential buyers in identifying properties which are in areas of special flood hazard; and
- Promote those who occupy the areas of special flood hazard assuming responsibility for their actions.

Moreover, base flood data in the County must also meet the following requirements:

- Single parcels are required to elevate the lowest floor of any residential structure to no less than two feet above natural grade when base flood data does not exist. Nonresidential structures may elevate or floodproof to meet this standard.
- Multiple parcels (five or more) are required to have all proposals establish the 100-year base flood elevation before consideration of the preliminary plan for development. The floodplain administrator may, at his/her discretion, require higher standards.
- All new subdivision proposals and other proposed development, including proposals for manufactured home parks and subdivisions, greater than 50 lots or five acres, whichever is the lesser, shall:
- Identify the Special Flood Hazard Areas (SFHA) and Base Flood Elevations (BFE);
- Identify the elevations of the lowest floors of all proposed structures and pads on the final plans; and

- If the site is filled above the base flood elevation, the following as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a Letter of Map Revision based on Fill (LOMR-F) to the floodplain administrator:
  - Lowest floor elevation;
  - Pad elevation; and
  - Lowest adjacent grade.

Kings County has numerous other plans, programs, and procedures in place that support hazard mitigation, public health and safety, hazardous materials management, and emergency operations. Related partner agency plans were also reviewed to inform the MJHMP to update risk assessment and mitigation strategies based on public availability, as they relate to flooding, drought and water supply events, as well as agricultural pests and disease. These plans are listed below.

- 2017 U.S. Census of Agriculture. United States Department of Agriculture
- Agriculture Response Plans
- American Red Cross Emergency Plan
- California 2018 State Hazard Mitigation Plan (SHMP) (2023 Draft SHMP is in development)
- California's Fourth Climate Change Assessment
- City of Lemoore Urban Water Management Plan 2015
- Continuity of Operations/Continuity of Government Plans (COOP/COG)
- Department of Water Resources Directory of Flood Officials
- Economic analysis of the 2014 drought for California agriculture. University of California, Davis, CA: Center for Watershed Sciences
- Kings River Handbook
- Kings County 2012 MJHMP
- Kings County Association of Governments Regional Climate Action Plan
- Kings County Department of Agriculture 2021 Crop Report
- Reclamation Emergency Action Plan (EAP)
- Safeguarding California Plan: California Climate Adaptation Strategy
- The Privacy Rights Clearinghouse. Data Breach Notification in the United States 2022 Report. 2023.
- Westlands Water District Water Management Handbook
- Westlands Water District Water Management Plan

2.8.3 Administrative and Technical Mitigation Capabilities

Table 2-8 below identifies the County personnel responsible for activities related to mitigation and loss prevention in Kings County and the unincorporated areas. Many positions are full-time and/or filled by the same person. A summary of technical resources follows.

Table 2-8 Kings County Administrative and Technical Mitigation Capabilities

PERSONNEL RESOURCES	YES/NO	DEPARTMENT/POSITION
Planner/engineer with knowledge of land development/land management practices	Yes	Community Development Agency
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Public Works Department, Community Development Agency
Planner/engineer/scientist with an understanding of natural hazards	Yes	Public Works Department, Community Development Agency
Personnel skilled in Geographic Information System (GIS)	Yes	Community Development Agency, County Assessor
Full time building official	Yes	Community Development Agency
Floodplain manager/Floodplain Administrator	Yes	Building Official/Community Development Agency
Emergency manager	Yes	Office of Emergency Services
Grant writer	Yes	
Other personnel	N/A	
GIS Data Resources	Yes	Kings County Geographic Information System

PERSONNEL RESOURCES	YES/NO	DEPARTMENT/POSITION
(Hazard areas, critical facilities, land use, building footprints, etc.)		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	Office of Emergency Services
Other	N/A	

Source: HMPC 2022

Office of Emergency Services

The County's Office of Emergency Services (OES) is the County's emergency management agency, responsible for coordinating multi-agency responses to complex, large-scale emergencies and disasters within Kings County. It is the responsibility of the County OES to develop and maintain the EOP, which serves as a guideline for who will do what, as well as when, with what resources, and by what authority--before, during, and immediately after an emergency. The County OES provides dedicated staff responsible for managing the County Emergency Operations Center (EOC) and developing and implementing training and exercise programs designed to coincide with the processes and procedures within the EOP.

The OES is the conduit for information and resource coordination between the State of California and the local governments of Kings County (the Kings Operational Area), as defined in California's Standardized Emergency Management System (SEMS). The Kings Operational Area includes all the political subdivisions of the County.

Kings County Fire Prevention Bureau

Kings County Fire Department protects approximately 153,000 residents. The Fire Department responds to an approximate 1,392 square-mile region through a combination of 10 stations and one headquarters office with 88 full-time employees. The Department's goal is to serve communities with the best in fire protection and offer a professional and dedicated response when citizens of Kings County call for help. Kings County Fire Department primarily serves the rural areas of the County and provides contractual services to the cities of Avenal and Corcoran. Kings County Fire Department responds to over 5,100 calls annually, averaging nearly 14 calls daily. Calls include structure, vehicle, wildland and grass fires, medical aids, traffic accidents, hazardous materials incidents and various public assistance calls.

Hanford Fire Department

The Hanford Fire Department consists of three stations staffed with paid professional firefighters. Each station is staffed with a Captain, who runs the station for their assigned shift; an Engineer, who is responsible for the safe operations and maintaining all apparatus; and a Firefighter, who operates and maintains the equipment. Together they make up the station crew that routinely responds to mitigate emergencies and events.

Kings County Public Works Department – Engineering

The County Engineer processes community development projects including land divisions, records of survey, County Right-of-Way (ROW) encroachment permits, and provides recommendations on zoning permits. The County Surveyor reviews land division proposals and community development applications. The division assists the public and county offices including the Clerk/Recorder's Office. In addition, the County Engineer provides support for traffic engineering, roadway and bridge design, project management, and contract preparation/administration for various road and building projects. The County Engineer also provides engineering support for the Waste Management Authority and administers the Solid Waste Ordinance. The County Engineer maintains engineering records on assessment districts, right-of-way, and County owned property.

Kings County Community Development Agency

The County's Planning Division keeps the County's General Plan on file. The Planning Division contains various commissions and committees, including Agricultural Advisory Committee, Local Assessment Committee, Planning Commission/Advisory Agency and Water Commission. The Planning Division also is responsible for the GIS/Mapping system. The Building Division implements the County's building ordinance, well ordinance, and flood damage prevention ordinance.

KC Alert

By opting into the Kings County emergency mass notification system, citizens will be informed before, during, and after incidents that could impact their safety. During hazard events, Kings County OES will launch a mass notification system that notifies registered users of important emergency information pertaining to severe weather, police and fire emergencies, and public health crises.

2.8.4 Fiscal Mitigation Capabilities

Table 2-9 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 2-9 Kings County Financial Capabilities

FINANCIAL RESOURCES	ACCESSIBLE/ ELIGIBLE TO USE	COMMENTS/HAS THIS BEEN USED FOR MITIGATION IN THE PAST?
Authority to levy taxes for specific purposes	Yes	Has not been used. Must be approved by voters.
California Disaster Assistance Act	Yes	The County was awarded $95 million in May 2023 to assist undocumented residents suffering from hardships and damages from the 2023 floods.
California Rapid Response Fund	Yes	The County was allotted funds from the Rapid Response Fund to provide disaster recovery services to mixed-status and undocumented families that were not eligible for FEMA individual assistance after the 2023 flooding events.
Capital improvements project funding	Yes	No.
Community Development Block Grants	Yes	Each year Kings County may apply under both the General Allocation and Economic Development components of the CDBG program. Potential projects under General Allocation include housing acquisition, housing rehabilitation, new construction, public works and community facilities. Potential projects under Economic Development include business loans, infrastructure grants, micro enterprise assistance, and other types of loans and grants for businesses. Projects funded with CDBG allocations must carry out at least one of three National Objectives as follows: benefit to low to moderate income persons, elimination of slums and blight, or meeting urgent community development needs. The Planning and Community Development Department also administers the Kings Urban County CDBG and Emergency Solutions Grant (ESG) funds.
Federal Grant Programs (HMGP)	Yes	HMPG funding has been used to update the County Hazard Mitigation Plan. Various departments in Kings County are eligible and will remain eligible for HMA BRIC funding that focuses on risk reduction and funding of public infrastructure projects that increase the County's resilience to disasters. The County is eligible for HMA FMA funding that funds projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the NFIP. The County is also eligible for Homeland Security Preparedness Technical Assistance Program funding. This funding source builds preparedness technical assistance activities in support of the four homeland security mission areas related to prevention, protection, response, and recovery.

FINANCIAL RESOURCES	ACCESSIBLE/ ELIGIBLE TO USE	COMMENTS/HAS THIS BEEN USED FOR MITIGATION IN THE PAST?
Fees for water, sewer, gas, or electric services, new development	Yes	Has not been used. Services provided through cities or districts and levied through property assessments.
FEMA's Public Assistance Program	Yes	The County received post-flood funding from the Public Assistance Program in 2011 to repair roads, bridges, and public buildings, as well as for debris removal and protective measures. In 2020, the County received several rounds of funding from the Section 406 Public Assistance (PA) Program for protective measures resulting from the COVID-19 pandemic. In 2023, the County received additional funding from the PA Program for post-flood assistance.
Incur debt through general obligation bonds	Yes	No.
Incur debt through private activities	Yes	Has not been used. Do not have any in place.
Incur debt through special tax bonds	Yes	Has not been used. Must be approved by two-thirds voters.

Source: HMPC 2022-2023

2.8.5 Other Mitigation Programs and Partnerships

Table 2-10 below summarizes some of the mitigation partnerships and education or outreach capabilities available to Kings County.

Table 2-10 Kings County Education and Outreach Capabilities

EDUCATION & OUTREACH	YES/NO	COMMENTS
Local Citizen Groups That Communicate Hazard Risks	Yes	See below.
Firewise USA	No	There are currently no Firewise USA communities in the County.
StormReady	No	The County and all the participating are not StormReady communities.
Other		

Source: HMPC 2023

American Red Cross: The American Red Cross identified several capability enhancements through collaboration with the County, cities, and fire departments of Kings County. Programs such as outreach campaigns for preparedness education, continuing shelter inspections, and updating existing points of contact for shelter sites. These efforts will improve the American Red Cross' ability to conduct mitigation, preparedness, and response efforts in Kings County.

Dam Owners and Operators Coordination: Kings County coordinates with numerous dam owners and operators, including owners upstream of the County. Coordination involves partnerships with federal, state, and local officials, agency engineers, emergency managers, emergency preparedness coordinators, dam owners and operators, and property owners near areas that can be potentially affected by dam incidents. Key agencies within the County's partnership include the FEMA's National Dam Safety Program (NDSP), US Army Corps of Engineers (USACE), Bureau of Reclamation, California Division of Safety of Dams (DSOD), and other companies who own low-hazard dams in the County.

Given there is a range of mitigation actions that can be taken to reduce the risk of dam incidents and the effects of dam failure, the County has an ongoing partnership with key dam owners and operators to ensure each agency is aware of each other's actions and to coordinate them effectively, recognizing that

working together maximizes risk reduction. As a result, many of these dam owners and operators were invited as stakeholders to inform and support the update of the County's MJHMP. Information on these dam owners and operators is shown in the table below.

Table 2-11 Kings County Dams of Concern Owner/Operator & Emergency Information

COUNTY	DAM NAME	DAM OWNER/OPERATOR	WHETHER OR NOT AN OFFICE, DEPARTMENT, OR AGENCY SUPPORTS DAM MITIGATION ACTIONS
Kings	Crescent Weir	Crescent Canal Company	Yes
	Empire Weir No.1	Empire Westside Irrigation District	Yes
	Empire Weir No.2	Tulare Lake Basin Water Storage District	Yes
	Island Weir	Laguna Irrigation District	Yes
	Last Chance Weir	Last Chance Water Ditch Company	Yes
	Lemoore Diversion Weir	Lemoore Canal and Irrigation Company	Yes
	Peoples Weir	Peoples Ditch Company	Yes
Tulare	Terminus	USACE – Sacramento District	Yes
	Schafer (Success Dam)	USACE – Sacramento District	Yes
Fresno	Pine Flat	USACE – Sacramento District	Yes

2.8.6 Opportunities for Enhancement

The 2022-2023 MJHMP update process provided the County and the participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. This also provided an opportunity to identify where capabilities could be improved or enhanced. Specific opportunities could include:

Safety Plan Update: Kings County has identified several plans which could be updated, specifically the County's General Plan Safety Element last updated in 2010. During the MJHMP update process, the County also indicated they will soon begin a formal update of the General Plan, including the Health and Safety Element. The County's Safety Element was last updated in 2010 to incorporate by reference the 2007 MJHMP.

The County will incorporate by reference the 2023 MJHMP into the County Safety Element to become eligible again for CDAA funding in the event of a disaster; this process also ensures further consistency of each plan and provides an opportunity to reference the MJHMP and enhance the capabilities for implementation of goals and objectives of each plan. The Safety Element currently covers several hazards that align with the MJHMP; it is only missing severe weather hazard: heavy rain, thunderstorm, hail, and lightning, the Safety Element does not discuss how these hazards disproportionately impact socially vulnerable populations and underserved communities. A comprehensive update of the Safety Element to include hazards and mitigation strategies addressed in the 2023 MJHMP update will ensure plan alignment and help the County integrate the related goals, policies, and mitigation actions into each plan.

Training: Provide training opportunities to help inform County staff on how best to integrate hazard information and mitigation projects into their departments. Kings County has identified a multi-year training and exercise plan which would cover all county departments. There are also several financial resources that the County could leverage in the future for funding mitigation efforts. In particular, the 2022-2023 MJHMP provides eligibility for FEMA HMA grants. County OES staff can attend workshops and training regarding the grant application process and how to develop successful grant applications under

the HMGP. Cal OES periodically hosts related training and webinars. Understanding the types of projects that can be funded, and the components of a successful application will enhance the chances of a successful grant award.

Hazard Mitigation Specialist: The County could appoint or assign someone in OES to oversee hazard mitigation grant opportunities. This could be a follow-up goal to the Cal OES grant training. This specialist can notify the County departments/agencies of upcoming grant cycles, and support tracking and completing the Notice of Intent (NOI) applications, grant applications, and final grant management reporting requirements. Related financial opportunities for enhancement should include applying for HMA grants, such as BRIC and HMGP funding as it becomes available. The Hazard Mitigation Specialist should also focus on funding mitigation actions that mitigate critical infrastructure, provide protection for those most vulnerable in the community, address climate change, public health hazards, extreme heat, flooding, other climate-related hazards and needed and related climate adaptation strategies.

HMGP Technical Assistance: HMGP funding opportunity provides support for communities to implement mitigation activities to reduce risk to life and property from natural hazards. In California, natural hazards include wildfire, earthquake, drought, extreme weather, flooding, and other impacts of climate change. Cal OES technical subject-matter experts are available to discuss project eligibility, benefit cost analysis, technical feasibility, and Environmental and Historic Preservation (EHP) requirements.

Firewise: Firewise USA® is a voluntary program that provides a framework to help neighbors get organized, find direction, and take action to increase the ignition resistance of their homes and community. The program is co-sponsored by the US Department of Agriculture (USDA) Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters. As of June 2023, neither Kings County nor any of the incorporated jurisdictions in the County currently participate in the program. In order to become a Firewise USA site, a neighborhood, community, city, or county must form a board or committee comprised of residents and stakeholders, obtain a written wildfire risk assessment, develop and maintain an action plan, and contact the applicable state liaison to the program.

Storm Ready: Neither Kings County nor any of the incorporated jurisdictions in the County are certified as Storm Ready communities. The National Weather Service's (NWS) Storm Ready program helps local governments handle extreme weather and improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially Storm Ready, a community must:

- Establish a 24-hour warning point and EOC
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars, and
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Community Rating System (CRS): An additional indicator of floodplain management capability is the active participation of local jurisdictions in the National Flood Insurance Program's (NFIP) Community Rating System (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP, adding extra local measures to protect from flooding. All 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class. Class ratings, which run from 10 to 1, are tied to flood insurance premium reductions. As class ratings improve (decrease), the percent reduction in flood insurance premiums for NFIP policyholders in that community increases. These potential discounts in flood insurance premiums through CRS are summarized in Table 2-12 below.

As of June 2023, neither Kings County nor any of the other incorporated jurisdictions in the County participate in the CRS. Should the other jurisdictions and Kings County decide to join the CRS, it would be an opportunity for the enhancement of existing mitigation capabilities and help make flood insurance more affordable in the future.

Table 2-12 CRS Premium Discounts

CLASS	DISCOUNT	CLASS	DISCOUNT	
1	45%	6	20%	SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class. SHFA (Zones A99, AR/A, AR/AE. AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9. Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1-6; 5% discount for Classes 7-9. In determining CRS premium discount, all AR and A99 Zones are treated as non-SFHAs.
2	40%	7	15%	
3	35%	8	10%	
4	30%	9	5%	
5	25%	10	--	

Source: FEMA CRS Coordinators Manual

3 PLANNING PROCESS

Requirement §201.6(b) and §201.6(c)(1):

An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 BACKGROUND ON MITIGATION PLANNING IN KINGS COUNTY

The primary purpose of the Kings County MJHMP update is to reduce or eliminate long-term risk to people and property from natural hazards and their effects on the Kings County planning area. Kings County recognized the need and importance of a MJHMP and initiated its development in 2012 after receiving a grant award from FEMA. The County also qualified for Prepare CA, a program that covers the HMGP State match.

The plan underwent a comprehensive update in 2022-2023. The planning process followed during the update was similar to what was used in the original plan development, except that the 2022-2023 planning process did not have participation from the Santa Rose Rancheria/Tachi Yokut Tribe, who opted not to participate in the plan update. The 2022-2023 planning process also involved a multi-jurisdictional HMPC. WSP USA Environment & Infrastructure Solutions, Inc. (WSP) was procured to assist with the update in 2022 to 2023. The process is described further in this section and documented in Appendix B.

3.2 WHAT'S NEW IN THE PLAN UPDATE

DMA Requirement §201.6(d)(3):

A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The updated MJHMP complies with the latest FEMA guidance and California OES guidelines for LHMPs, specifically FEMA's 2022 Local Mitigation Planning Policy Guide. The update followed the requirements noted in the DMA of 2000 and FEMA's 2023 Local Hazard Mitigation Planning Handbook.

This MJHMP update involved a comprehensive review and update of each section of the 2012 MJHMP, the integration of a detailed risk assessment, and an assessment of the progress in evaluating, monitoring, and implementing the mitigation strategy outlined in the initial plan. The planning process provided an opportunity to review jurisdictional priorities related to hazard significance and mitigation actions, and revisions were made where applicable to the base plan. Another change was the development of specific annexes for the municipalities of Avenal, Corcoran, Hanford, and Lemoore; jurisdictional information was integrated throughout the 2012 MJHMP.

While each jurisdiction participated in the previous MJHMP updates, representatives from multiple departments representing a Local Planning Team (LPT) for each of the participating jurisdictions were engaged and involved in the development of the 2023 MJHMP through multiple planning workshops and numerous one-on-one work sessions. Only the information and data still valid from the 2012 plan were carried forward as applicable to this MJHMP update. Also, given the four municipalities' participation, significant new hazard information was integrated into the base plan and into each annex. The 2012 MJHMP assessed nine hazards, including drought, earthquake, extreme heat, flood, fog, freeze, landslide, tornado and wildfire. The 2023 MJHMP update assessed 15 natural, human-caused, and human-health hazards, including agricultural pests and disease; cyber attack; dam incidents; drought; earthquake; extreme temperatures: freeze and heat, flooding; land subdidence; landslide; public health

hazards: epidemic/pandemic; severe weather: dense fog; severe weather: heavy rain, thunderstorms, hail, and lightning; severe weather: high wind/tornado; and wildfire. As a result, there are 10 new countywide mitigation actions, plus nine jurisdiction-specific mitigation actions that were developed for the four annexes for a total of 19 new mitigation actions.

3.2.1 Plan Section Review and Analysis – 2022-2023 Update

During the 2022-2023 MJHMP update process, the HMPC updated each of the sections of the previously approved plan to include new information. WSP developed a summary of each section in the plan and guided the HMPC through the elements that needed updating during the kick-off webinar in October 2022. This included analyzing each section using FEMA's Local Mitigation Planning Handbook (2023) and the Local Mitigation Planning Policy Guide (2022; Effective April 19, 2023) to ensure that the plan met the latest requirements. In addition, for this plan update, the FEMA Local Mitigation Plan Review Tool was not provided with the approval of the 2012 version of this plan; therefore, it was not referenced. Therefore, previous 2012 FEMA comments on opportunities for improvement were not considered and addressed in the 2022-2023 update. Instead, the County focused the update on meeting the new requirements outlined in the Local Mitigation Planning Policy Guide.

The HMPC and WSP determined that nearly every section of the plan would need revision to align the plan with the latest FEMA planning guidance and requirements and recent California legislation. A detailed summary of the changes in this plan update is highlighted in the table below.

Table 3-1 Kings County Hazard Mitigation Plan Update Highlights

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
1. Introduction	• Revised to reflect updated plan and 2022-2023 planning process
2. County Profile and Capability Assessment	• Updated with recent census data and current economy description • Updated land use and development trends
3. Planning Process	• Described and documented the planning process for the 2022-2023 update, including coordination among agencies • Described how the 2012 plan was integrated with/into other planning efforts, like the County Safety Element and EOP • Removed 2012 planning process information • Described changes to jurisdictional participation • Described 2022-2023 update public participation process • Summarized the results of the Public Survey • Described the HMPC • Described the 10-step process followed for the update
4. Hazard Identification and Risk Assessment and Consequence Analysis	• Climate change information has been added to each hazard profile • Updated list of disaster declarations to include recent data • Updated tables to include recent National Center for Environmental Information data • Updated past occurrences for each hazard to include recent data • 2012 Plan Vulnerability Assessment is now included with the Risk Assessment and an integrated Vulnerability Assessment section organized by hazard • The Vulnerability Assessment considers the impacts on the following assets: (1) people; (2) property; (3) critical facilities and lifelines; (4) economy; (5) cultural, historic and natural resources; (6) development trends. • The Vulnerability Assessment includes a discussion on impacts on population assets, including socially vulnerable populations and underserved communities. • Updated critical facilities identified from the 2012 plan; the critical facilities database now includes 646 facilities organized by Community Lifeline • Updated growth and development trends to include recent Census and local data sources from the County's Public Works Department and Community Development Agency, as well as the general plans and most up-to-date housing elements of the participating jurisdictions • Updated historic and cultural resources using local/state/national sources • Updated property values for vulnerability and exposure analysis, using updated building information based on assessor's data; in order to estimate the participating

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
	juridisctions' future development and growth areas' vulnerability against hazards, the exposure analysis also includes properties that are located in Sphere of Influences (SOIs) in order to assess risk in future development areas; SOI exposure analysis was not carried out in the 2012 plan • Updated estimate flood losses using the latest Digital Flood Insurance Rate Map (DFIRM) and assessor's data • Updated National Flood Insurance Program (NFIP) data and Repetitive Loss structure data from the previous plan • Incorporated new hazard loss estimates since 2012, as applicable • Used updated GIS inventory data to assess wildfire threat to the County • Updated HAZUS-MH Level I earthquake vulnerability analysis data with two scenarios performed (one probabilistic scenario and one ShakeMap scenario) • Seven additional hazards that were not included in the 2012 plan are added and profiled, which include: Agricultural Pests and Disease, Cyber Attack, Dam Incidents, Land Subsidence, Public Health Hazards: Epidemic/Pandemic, Severe Weather: Heavy Rain, Thunderstorms, Hail, and Lightning, Severe Weather: High Wind • Updated information regarding specific vulnerabilities to hazards, including maps and tables of specific assets at risk, specific critical facilities at risk, and specific populations at risk • Revisited and updated hazard significance/priority levels • Updated maps in the plan where appropriate
5. Mitigation Strategy	• Indicated what actions have been implemented that may reduce previously identified vulnerabilities • Updated mitigation strategy based on the results of the updated risk assessment, consequence analysis, completed mitigation actions, and implementation obstacles and opportunities since the completion of the 2012 plan • Reviewed and updated goals and objectives based on HMPC input • Included updated information on how actions are prioritized, or how priorities changed • Reviewed mitigation actions from the 2012 plan and developed a status report for each • Identified if actions have been completed, deleted, or deferred/carried forward • Updated priorities on actions • Summarized successful implementation to highlight the implementation of actions identified in the 2012 plan • Identified new mitigation actions proposed by the HMPC with more detail on implementation than the previous plan • Nine new countywide mitigation actions were added to address existing hazards and new hazards • Eight new jurisdiction-specific mitigation actions were included in the annexes • Developed a summary table of mitigation actions for all participating jurisdictions
6. Plan Review, Evaluation, and Implementation	• Reviewed and updated procedures for monitoring, evaluating, and updating the plan • Revised to reflect current methods • Updated the system for monitoring the progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance • Added a process for incorporation of the MJHMP update into existing mechanisms • Clarified future public involvement activities and tied them to the Outreach Strategy in Appendix F
7. Plan Adoption	• Updated to reflect the 2022-2023 adoption process
Jurisdictional Annexes	• Updated previous participants' annexes with recent Census data • Updated past event history and hazard loss estimates • Added new maps and updated old maps as needed • Updated mitigation actions from 2012 and added new mitigation actions • Integrated the following annexes: A City of Avenal B City of Corcoran C City of Hanford D City of Lemoore
Appendices	• Appendix A: Planning Committee • Appendix B: Planning Process Documentation

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
	• Appendix C: Approval and Adoption • Appendix D: Mitigation Categories and Alternatives • Appendix E: Annual Progress Meeting Agenda and Report Template • Appendix F: Outreach Strategy

3.3 MULTI-JURISDICTIONAL PARTICIPATION

In the 2022-2023 MJHMP update, the following jurisdictions participated in the planning process and will be adopting the updated plan following FEMA approval. All incorporated cities in the County participated in this planning process.

Lead Jurisdiction:

- Kings County

Municipalities:

- City of Avenal
- City of Corcoran
- City of Hanford
- City of Lemoore

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC
- Detail areas within the planning area where the risk differs from that facing the entire area
- Identify potential mitigation actions
- Formally adopt the plan

For the Kings County planning area's HMPC, "participation" meant the following:

- Providing facilities for meetings
- Attending and participating in the HMPC meetings
- Completing and returning WSP Plan Update Guide worksheets
- Collecting and providing other requested data (as available)
- Identifying mitigation actions for the plan
- Reviewing and providing comments on plan drafts and jurisdictional annexes
- Informing the public, local officials, and other interested parties about the planning process and providing the opportunity for them to comment on the plan
- Coordinating, and participating in the public input process
- Coordinating the formal adoption of the plan by the governing boards

The County and all jurisdictions with annexes to this plan and seeking FEMA approval met all these participation requirements. In most cases, one or more representatives for each jurisdiction attended the multi-jurisdictional webinars/meetings and workshops described in Table 3-4 and brought together the HMPC to help collect data, identify mitigation actions and implementation strategies, and review and provide data on annex drafts. In some cases, the jurisdictions had limited capacity to attend or had conflicts with HMPC meetings; in these cases, alternative forms of communication were used to provide input into the process, and in some instances, a representative from a different jurisdiction's department attended the HMPC meeting on behalf of the main representative. County OES and WSP staff also met via virtual meetings with individual jurisdictions, such as the cities of Avenal, Corcoran, Hanford, and Leemore to gather additional input on the planning process, existing capabilities, and new mitigation actions. Appendix B provides additional information and documentation of the planning process.

3.4 PLANNING PROCESS

WSP established the planning process for the Kings County MJHMP using the DMA planning requirements and FEMA's associated guidance. The original FEMA planning guidance is structured around a four-phase process:

1. Organize Resources

2. Assess Risks
3. Develop the Mitigation Plan
4. Implement the Plan and Monitor the Progress

Into this process, WSP integrated a more detailed 10-step planning process used for FEMA's CRS and FMA programs. Thus, the modified 10-step process used for this plan meets the requirements of major grant programs including FEMA's HMGP, BRIC program, FMA Program, and flood control projects authorized by the U.S. Army Corps of Engineers.

In May 2023, FEMA released the Local Mitigation Planning Handbook that has become the official guide for local governments, including special districts, to develop, update and implement local mitigation plans. While the requirements under Section 201.6 have not changed, the Handbook guides local governments on developing or updating hazard mitigation plans to meet the requirements under the CFR Title 44 – Emergency Management and Assistance Section 201.6, Local Mitigation Plans for FEMA approval and eligibility to apply for FEMA HMA grant programs. It also offers practical approaches, tools, worksheets, and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook complements and liberally references the Local Mitigation Plan Review Guide (October 1, 2011), which is the official guidance for federal and state officials responsible for reviewing local mitigation plans in a fair and consistent manner.

Table 3-2 shows how the modified 10-step process fits into FEMA's four-phase process, and how these elements correspond to the tasks in the FEMA Mitigation Planning Handbook.

Table 3-2 Kings County Hazard Mitigation Planning Process

FEMA'S 4-PHASE DMA PROCESS	MODIFIED 10-STEP CRS PROCESS	FEMA LOCAL MITIGATION PLANNING HANDBOOK TASKS
1) Organize Resources		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1)
		4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)
2) Assess Risks		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii)&(iii)
201.6(c)(2)(ii)	5) Assess the Risks	
3) Develop the Mitigation Plan		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
4) Implement the Plan and Monitor Progress		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current
		9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

3.4.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

The 2022-2023 planning process and update of the 2012 MJHMP had its roots in the development of a HMGP application. The County OES wrote the grant and in the process solicited commitments from local government jurisdictions that were interested in participating. With an understanding of the number of

jurisdictions and their commitment to participate, the HMGP application was approved and awarded to the County in 2021.

WSP worked with the County to get organized for the plan update. Organizational efforts were initiated with the County and participating jurisdictions in September 2022 to inform and educate the plan participants of the purpose and need for updating the countywide hazard mitigation plan. An initial meeting between WSP and County OES was held to discuss the organizational aspects of this plan update process. Invitations to the kick-off meeting for this plan update were extended to key County departments, the four incorporated communities, and representatives from special districts for the County and municipalities, as well as to other federal, state, and local stakeholders that might have an interest in participating in the planning process. Representatives from participating jurisdictions and HMPC members of the 2012 plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in Appendix A.

Representatives from the following County and municipal departments participated in the HMPC and the development of the plan update; these representatives are listed in Table 3-3. A list of specific HMPC representatives is included in Appendix A. Other local, state, federal, and agencies and stakeholders invited to participate in the HMPC are discussed under Planning Step 3.

Table 3-3 List of HMPC Participants for 2021-2022 MJHMP Update

ROLE	NAME	DEPARTMENT
Emergency Services Manager	Abraham Valencia	Kings County Office of Emergency Services
Deputy Director	Alex Hernandez	Kings County Community Development Agency
Director	Chuck Kinney	Kings County Community Development Agency
Public Health Emergency Planner	Alexander Mena	Kings County
Director of Emergency Services	Joe Neves	Kings County
Deputy Agricultural Commissioner	Mario Gutierrez	Kings County
Fire Chief	Bill Lynch	Kings County Fire Department
Police Chief	Robert Nevarez	Avenal Police Department
Deputy Chief	Gary Cramer	Corcoran Police Department
Chief of Police	Reuben Shortnacy	Corcoran Police Department
City Manager	Greg Gatzka	City of Corcoran
Chief of Police	Parker Sever	Hanford Police Department
Fire Chief	Steve Pendergrass	City of Hanford, Fire Department
Chief of Police	Mike Kendall	Lemoore Police Department

Source: HMPC 2022-2023

Planning Meetings

The planning process officially began with a kick-off meeting on September 16, 2022, which involved County OES staff and the WSP team. On October 31, 2022, the HMPC convened for the first time. The first HMPC meeting covered the scope of work and an introduction to the DMA requirements. Participants were provided with a Plan Update Guide, which included electronic worksheets to facilitate the collection of information necessary to support the update of the plan. Using FEMA guidance, WSP designed these worksheets to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. A copy of WSP's Plan Update Guide for this project is included in Appendix B. The County and each jurisdiction seeking FEMA approval of their plan completed and returned the worksheets in either the Plan Update Guide or shared their most recent local hazard mitigation plan for incorporation into the plan document.

During the planning process, the HMPC communicated through in-person meetings, virtual meetings, email, telephone conversations. The first three HMPC meetings were held virtually while the last HMPC meeting was held in person. Draft documents were emailed so that the HMPC members could easily access and review them. The County's OES staff and HMPC formally met four times during the planning period (September 16, 2022 – June 8, 2023). The purposes of these meetings are described in Table 3-4. The planning consultant sent meeting handouts ahead of time to the participating jurisdictions to review

and provide feedback before or at the meeting. In addition to these meetings, some jurisdictions held meetings with subcommittees to discuss the needed input for the plan update. The Emergency Services Coordinator of the County's OES and WSP worked with the jurisdictions individually to obtain necessary information and input into the planning process. This was done through direct emails from the planning consultant and follow-up phone conversations with the consultant and County OES where necessary.

Table 3-4 Summary of Planning Meetings

MEETING NUMBER	MEETING TOPIC	DATE	LOCATION
1	Kick-off/HMPC Roles and Expectations (Kings County OES staff only)	September 16, 2022	Virtual/Webinar – Microsoft Teams
2	Overview of DMA 2000 & Hazard Mitigation Planning Process / Review 2012 MJHMP	October 31, 2022	Virtual/Webinar – Microsoft Teams
3	Hazard Identification and Risk Assessment	March 9, 2023	Virtual/Webinar – Microsoft Teams
4	Mitigation Strategy and Goals Update / New Mitigation Actions Brainstorm	January 13, 2023	In-Person Workshop

Source: WSP 2023

Internal Kick-off Meeting – On September 16, 2022, Kings County's OES staff and the WSP's team convened and discussed the project background and the overall MJHMP update process, as well as the scope of work and project goals. County OES staff and WSP's team also discussed the hazards that need to be profiled in this MJHMP update based on initial conversations with the County during an internal kick-off meeting. In addition, County OES staff and WSP's team reviewed potential additional HMPC members, partners, and stakeholders. Moreover, the outreach plan needed for the MJHMP update and GIS data needs were also discussed during the kick-off meeting.

HMPC Meeting #1 – Overview of DMA 2000 & Hazard Mitigation Planning Process

On October 31, 2022, the HMPC convened to discuss the process for completing the update of this plan. This first HMPC meeting was attended by twenty-one (21) representatives. The HMPC consisted of a mix of county departments, local governments, special districts, and stakeholders. A complete list of those in attendance at the first HMPC meeting can be found in the meeting minutes in Appendix B.

Following introductions, WSP reviewed the DMA requirements and the suggested planning process to follow to meet the requirements as well as the expected schedule of the process for the MJHMP update. The roles of the HMPC and stakeholders were discussed including the participation requirements for the different roles.

During the first HMPC meeting, the HMPC validated the identified hazards within the 2012 plan, together with additional hazards that are added and profiled in this 2023 MJHMP update. The HMPC collaboratively prioritized the hazards to identify which are of most concern to the County. More details are included in Section 4: Hazard Identification and Risk Assessment.

The group also discussed other agencies that should be part of this planning process, as well as related planning efforts to be coordinated with and recent studies to be incorporated. Part of this discussion was also related to creating an outreach strategy to involve the public throughout the planning process. This outreach strategy is included in Appendix F. The first HMPC meeting ended with WSP sharing handouts to assist in the planning process. These handouts included the Plan Update Guide, which outlined data collection needs for each participating jurisdiction.

HMPC Meeting #2 –Risk Assessment and Mitigation Goal Refinement

On March 9, 2023, the HMPC convened virtually to discuss the results of the risk and vulnerability assessment. Fourteen (14) members of the HMPC were present for the discussion. WSP began the meeting with a presentation on the results of the risk assessment findings for natural hazards and public health hazards. The group went through each hazard together and discussed the results as well as shared any local insight to inform the HIRA update. Refer to the meeting summary in Appendix B for notes related to each hazard discussed.

Following the discussion on the results of the risk assessment findings, WSP explained this update process provides an opportunity to review the previous plan's goals to determine if they are still valid, and comprehensive, and reflect current priorities, and updated risk assessment. Inputs on mitigation goals and objectives were solicited via virtual polls. The group was also encouraged to share insights on the development of mitigation goals, objectives, and specific actions and projects.

WSP shared with HMPC that the online public survey had been opened. A link was shared with the HMPC to easily distribute by email and for posting on each of the participating jurisdiction's websites and MJHMP webpages. This was encouraged to promote engagement and input from the public and participating jurisdiction communities. The meeting ended with a review of the next steps and the planning process schedule.

HMPC Meeting #3 –Mitigation Strategy

The HMPC convened for an in-person workshop on June 8, 2022, with 27 people participating to update the plan's mitigation strategy. The group finalized the plan's goals and objectives (Step 6) and reviewed the progress made on the previous mitigation actions from the 2012 LHMP. The group then discussed the criteria for mitigation action selection and prioritization using a worksheet provided by WSP. The group reviewed each possible new mitigation action. Additional details were provided by the Planning Committee (Step 7). This was followed by agroup activity to elicit the development of new mitigation actions followed by another group activity to prioritize (rank) the top mitigation actions. WSP then briefly explained the plan implementation and maintenance process. The meeting ended with a review of the next steps and planning process schedule.

Planning Step 2: Involve the Public

Involving the public assures support from the community at large and is a required part of the planning process per the DMA 2000. Early discussions with Kings County and input received in the first HMPC meeting established the initial plan for public involvement in the plan update. Public outreach began with the development of an online public survey that was shared with each participating jurisdiction to post on their websites and disseminate via email to local stakeholders. The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this plan.

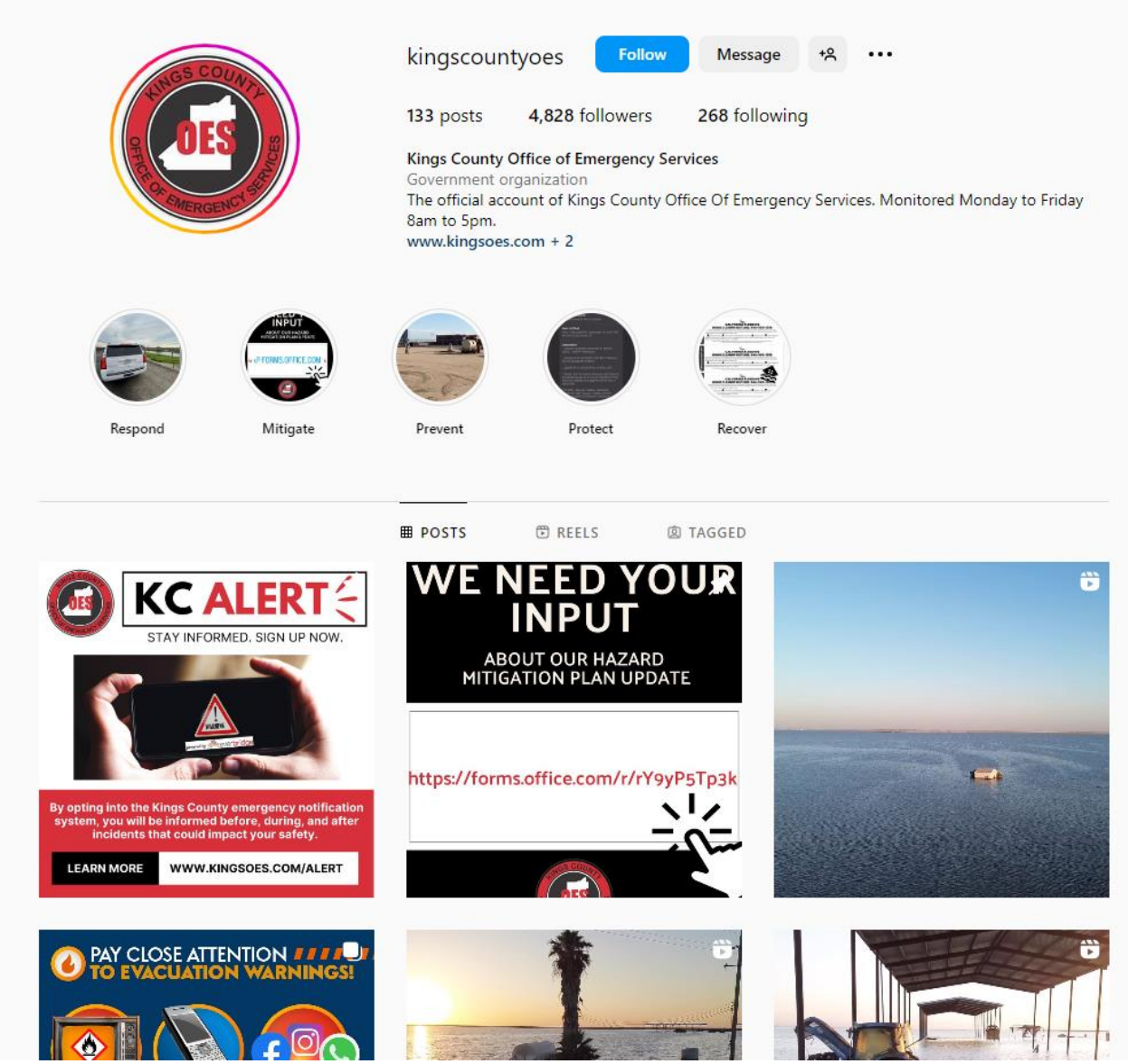
During the planning process, three public workshops were held to inform the public of the purpose of the DMA and the hazard mitigation planning process for the Kings County planning area. At each workshop, the public in attendance was provided links to electronic comment forms to leave any comments related to the County's MJHMP as well as provide their contact information if they would like to receive ongoing updates and information related to the planning process.

At the first HMPC meeting, the HMPC discussed additional options for public involvement and agreed to an approach using established public information mechanisms and resources within the community. These additional options are outlined in the Outreach Strategy. Additional public involvement activities included press releases, website postings, flyer development and distribution, three public workshops (two were held during the plan development and one was held during public review), and the collection of public comments on the draft plan. Details on the outreach methods and approach are also summarized in the Outreach Strategy included in Appendix F.

Plan Facts

The WSP team provided the County with a Webpage Backgrounder document that included MJHMP update information for the MJHMP Webpage. Some of this information was incorporated on the County's OES Instagram page. Figure 3-1 includes a screenshot of the County's OES Instagram page. As shown in the screenshot, the second post is the County's OES seeking participation in the MJHMP online public survey. Most of the information regarding the 2022-2023 MJHMP update is provided on the County's OES Instagram page.

Figure 3-1 Kings County's Instagram Page



Source: Kings County 2023

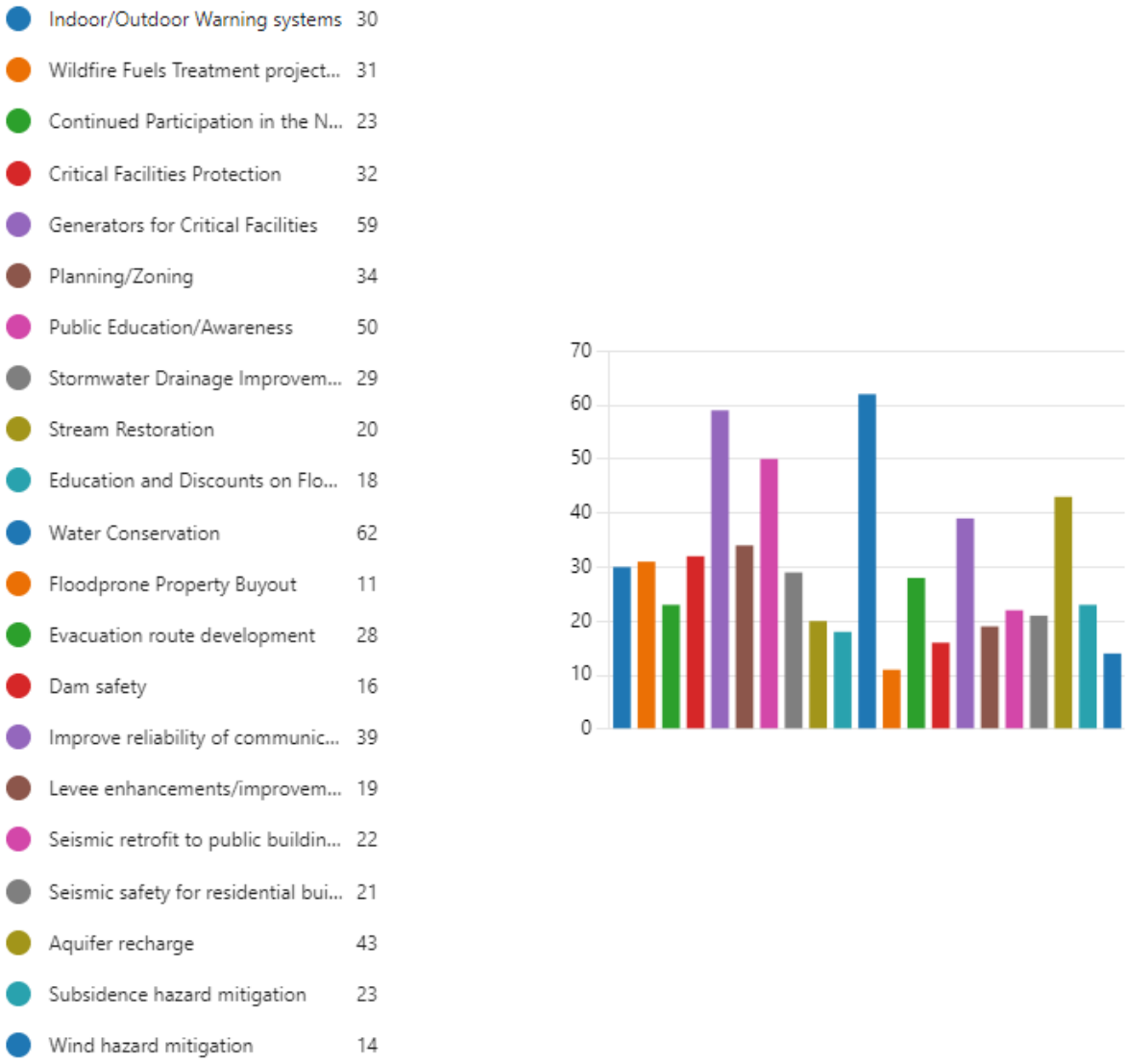
Online Public Survey

During the plan update's initial drafting stage, an online and bi-lingual public survey was used to gather public input for the HMPC. The survey provided an opportunity for public input during the planning process before the finalization of the plan update. The survey gathered public feedback on concerns about hazards and input on mitigation strategies to reduce their impacts. The survey was released on December 21, 2022, and closed on June 30, 2023 (6-month period). The usual input period for the public survey is one month, but the public survey was left open for an extended period to allow the County and participating jurisdictions to circulate additional advertisements during public meetings and outreach events to seek more input from the public. The HMPC provided links to the public survey by distributing it using social media, email, and posting the link on websites. Screenshots from the County's OES Webpage and social media channels can be found in Appendix B.

A total of 92 people filled out the survey online. Results showed that the public perceives the most significant hazards to be drought, dense fog, extreme temperatures, agricultural pests and disease, and power outages. Figure 3-2 shows the results of a question from the survey, which asked the public's opinion on what mitigation actions should have the highest priority in the updated MJHMP. Water

conservation, generators for critical facilities, public education/awareness, aquifer recharge, and improve reliability of communication systems were cited as the most popular mitigation actions. This information was shared with the HMPC during the update of the mitigation strategy to consider when evaluating hazard rankings and as a source of potential mitigation ideas. A summary of the survey data and documentation of the public feedback can be found in Appendix B.

Figure 3-2 Example of Results from the Online Public Survey



Source: WSP 2022

Online Public Workshops

Three public workshops were held during the planning process to inform the public, receive input to integrate into the plan update and keep the public updated on the progress being made in the planning process. Two workshops were held virtually as webinars followed by question and answer sessions (Q&A) and one workshop was held in person during the plan development.

The first workshop took place on February 9, 2023 through Microsoft Teams. The workshop introduced the public to the hazard mitigation planning process for the County's Plan Update and County and WSP staff answered any questions and gather public input to be integrated into the plan update. In addition, it was an opportunity to help staff identify risks, hazards, and vulnerabilities from the public's perspective.

The second workshop took place on February 16, 2023, at the Multi-Purpose Room in the County Administrative Building. Members of the public were able to submit comments and ask questions verbally or via the chat function. The HMPC also received various questions and comments from the workshop on the public's priority hazards in their community and possible mitigation ideas to reduce hazard risk. Figure 3-3 is copy of the first and second public workshop press release.

Figure 3-3 Press Release for the First and SecondPublic Workshops

KINGS COUNTY
OFFICE OF EMERGENCY SERVICES
280 North Campus Drive • Hanford, California 93230
Phone: 559-852-2883 • Fax: 559-582-8261

FOR IMMEDIATE RELEASE

Contact: KingsCounty.OES@co.kings.ca.us
Phone: (559) 852-2883
Date of Release: February 3, 2023

KINGS COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN PUBLIC WORKSHOP

HANFORD - Kings County in collaboration with the cities of Avenal, Corcoran, Hanford, and Lemoore is updating the 2012 Local Hazard Mitigation Plan (LHMP). This planning process involves the development of hazard mitigation strategies designed to reduce risks and vulnerabilities posed by natural, man-made, and human health hazards. The plan must be updated and approved by the Federal Emergency Management Agency (FEMA) every five years to keep it current and to maintain eligibility for federal and state mitigation grant assistance. The plan is currently being updated as a Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) in coordination with the four participating jurisdictions and under the guidance of a Hazard Mitigation Planning Committee (HMPC).

The people who live and work in Kings County are vulnerable to a range of natural hazards, including drought, climate change, earthquakes, extreme heat, flooding, severe weather, and wildfires. The MJHMP will provide the County with valuable tools to identify risks and mitigate hazards through future project-specific actions. Hazard mitigation is an investment in the County's future safety, sustainability, and resiliency and results in less vulnerable conditions through pre- and post-disaster actions, projects, and adaptation strategies. The implementation of hazard mitigation actions means building stronger, safer, and smarter communities that will be able to withstand future impacts and damages.

Residents, organizations, businesses, and interested stakeholders are encouraged to contribute to the planning process. Broad public participation is an essential strategy for developing an updated and multi-jurisdictional plan that will be effective, supported by County residents, and ultimately implemented. The Public Workshops will be an opportunity to get involved and learn more about the planning process and the hazards the County, participating jurisdictions, and HMPC plan to assess in the MJHMP. Information on how to participate is provided below:

- Virtual Public Workshop – Thursday February, 9, 2023, 6:30 – 8:00 PM
  - The meeting can be accessed virtually here: https://bit.ly/3I6McXJ
  - Click here to join the meeting, (866) 670-1764,,625914223#, Password: 625 914 223#
- In-Person Public Workshop – Thursday February 16, 2023, 6:30 – 8:00 PM
  - Emergency Operations Center, 330 Campus Dr. Hanford, CA 93230,
- A Public Survey is available in English and Spanish: https://forms.office.com/r/rY9yP5Tp3k.

Questions may be directed to Abraham Valencia, Kings County OES Manager by calling (559) 852-2883.

Visit us online at **www.KingsOES.com**

Geographic Information System (GIS) Data Collection

During the 2022-2023 plan update, the WSP team prepared a GIS data list to request the GIS data needed for the plan update. The County's GIS staff was then able to compile and provide the WSP team with access to the County's GIS data.

During the project kick-off meeting the County and WSP team discussed the MJHMP update process and schedule, plan review, data, and GIS hazard mapping for the Plan update. In attendance were representatives from the County's Community Development Agency, which is in charge of managing the County's GIS data, Public Works, and the Assessor's Office. The County's GIS Manager reviewed a GIS Data Needs List provided by WSP. The GIS team proceeded to discuss the details of the GIS mapping requirements, such as including inventory and valuation information for public infrastructure for each of the five identified hazards: earthquake, landslide, dam failure, flood, and wildfire. The team also discussed GIS data sources for potential new hazards. Other related comprehensive inventory information that was discussed included: roads, traffic signals, drainage facilities, lighting facilities, bridges, and airports.

Most of the inventory and risk data can be layered to provide aggregation of asset values within specifically identified risk areas. Additional hazard-specific data and layers were acquired and analyzed to quantify the geographic extent as well as the magnitude and severity of hazards for each of the five identified hazards that are assessed quantitatively: earthquake, landslide, dam failure, flood, and wildfire. Data sources include USACE, Department of Water Resources (DWR), Homeland Infrastructure Foundation-Level Data (HIFLD), National Inventory of Dams (NID), FEMA, California Department of Forestry and Fire Protection (CALFIRE), Fire and Resource Assessment Program (FRAP), Department of Conservation (DOC), and California Geological Survey (CGS). Additional GIS spatial data was integrated to assess agricultural pests and diseases (important farmland data from DOC) and severe weather data from NWS and NOAA.

During the HIRA process, to assess hazards' potential impacts on the County's critical facilities, a critical facilities GIS database was needed and then established. While building the critical facilities GIS database, each participating jurisdiction's assistance was requested to validate the critical facilities GIS data. There were two primary aspects of this: data completeness/correctness and alignment/classification with FEMA Lifelines framework. The County and four participating jurisdictions each reviewed the critical facility database and were encouraged to edit descriptive attributes and add new point data for critical facilities. This process further engaged participating jurisdictions that saw the value of the MJHMP and long-term use and maintenance of the critical facility data moving forward. The result was an updated comprehensive critical facilities database with 646 facilities.

Risk Assessment and GIS Methodology

The GIS methodology for the risk assessment is summarized below.

- Identify Structures—buildings, infrastructure, critical facilities, structures that house elderly or disabled and transportation systems—both for present assets and those planned—categorized by FEMA Lifelines.
- Address Repetitive Loss Properties for flood hazard.
- Estimate Potential Property Losses. The development of the MJHMP includes an inventory of assets from each publicly governed jurisdiction, coordinated by Kings County, and an assessment of all the hazard risks: agricultural pest and disease, cyber threats, dam incidents, drought, earthquakes, extreme temperatures, flood, land subsidence, landslide, public health hazards, severe weather hazards and wildfires.
- The asset inventory provided by the County Assessor's Office database includes individual parcels, address points, various lands use codes, and various taxing agencies or districts.
- County property (building asset) inventory and valuation—for both present assets and those planned (within jurisdictions' SOI).
- Each property within this County property inventory has its Assessor's Parcel Number (APN), assessor's use code, government jurisdiction, and valuation data. Property value includes both improved value and estimated content value.
- County property type includes agricultural, commercial, exempt, industrial, multi-family residential, multi-use, and residential.
- From Census data, the number of people that would be affected by each natural hazard is calculated, which is the product of the number of properties that would be affected and the average household size.
- During an update to the risk assessment, local jurisdictions must consider current and expected future vulnerability to all hazards and integrate new hazard data such as flood studies. Local

jurisdictions were asked to incorporate replacement costs for vulnerable buildings and impacts of population growth or loss in vulnerable areas. WSP staff integrated this information, if available from each jurisdiction after the critical facilities assessment was complete. This process helped the jurisdictions understand what facilities were vulnerable to hazards and gather replacement value for these facilities.

- For hazards that are not assessed quantitatively, the vulnerability assessment includes qualitative analysis that addresses the hazard's impact on property, people, critical facilities and infrastructure, economy, natural and cultural resources, and future development.

Public Review Period

The County OES department circulated the Public Review Draft MJHMP for a 20-day period from October 19, 2023 through November 7, 2023. The Public Review Draft was released for comment and made available for download via the County OES website. The Public Review Draft MJHMP was advertised through social media, mass emailing, and an advertisement through the media mechanisms noted previously. An electronic comment form through Microsoft Forms was provided with the draft plan. X comments were received on the Public Review Draft MJHMP. The comments received were shared with the HMPC and incorporated into the plan. The comment and response are briefly summarized in Table 3-5.

Table 3-5 Summary of Comments Received during Public Review

COMMENT	RESPONSE
Electronic Written Comment #1	
• Insert Comment.	• Insert Comment Response

3.4.2 Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, state and local agencies and organizations were invited to participate as stakeholders in the process through email. Stakeholders include local and regional agencies involved in hazard mitigation activities or those beyond the County and local government that have the authority to regulate development. Kings County worked with the WSP team to come up with a list of potential HMPC participants and stakeholders. Stakeholders could participate in various ways, either by contributing input at HMPC meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan. Based on their involvement in other hazard mitigation planning efforts, and status in the County, representatives from the following agencies and organizations were invited to participate as stakeholders in the process by email; an asterisk indicates they participated in HMPC meetings. More specifics on stakeholder agency representatives can be found in Appendix A and documentation in Appendix B.

Federal, State, and Local Agencies

- California Department of Fire Protection and Forestry
- California Department of Parks and Recreation
- California DSOD
- California DWR*
- California Natural Resource Agency
- California OES*
- City of Hanford Fire Department*
- County Agricultural Commissioner*
- FEMA Region IX
- Kings County Board of Supervisors*
- Kings County Community Development Agency*
- Kings County Department of Agriculture*
- Kings County Fire Department*
- Kings County OES*
- Kings County Public Health Department*
- Kings County Public Works*
- Lemoore Police Department*
- National Oceanic Atmospheric Administration (NOAA)/National Weather ServiceNWS
- NWS Hanford*

- Office of Senator Hurtado SD 16*
- USACE

Businesses, Academia, Utility Providers, Dam Owners and Operators and Non-Profits

- Cross Creek Flood Control District*
- Kings County Farm Bureau*
- Kings County Office of Education
- Kings County Water District*
- Kings Partnership
- Kings River Conservation District*
- Kings Tulare Homeless Alliance
- Mid-Kings River Groundwater Sustainability Agency*
- PG&E
- Sequoia Riverlands Trust
- Southern California Edison
- Westland Water District*

Incorporation or Existing Plans and Other Information

The coordination and synchronization with other community planning mechanisms and efforts are vital to the success of this plan. To have a thorough evaluation of hazard mitigation practices already in place, appropriate planning procedures should also involve identifying and reviewing existing plans, policies, regulations, codes, tools, and other actions designed to reduce a community's risk and vulnerability from natural hazards. Kings County uses a variety of mechanisms to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible, comprehensive document that weaves the common threads of a community's values together. The development and update of this plan involved a comprehensive review of existing plans, studies, reports, and initiatives from Kings County and each participating municipality that relate to hazards or hazard mitigation. A high-level summary of the key plans, studies and reports is summarized in the table below. Information on how they informed the update is noted and incorporated where applicable.

Table 3-6 Summary of Review of Key Plans, Studies and Reports

PLAN, STUDY, REPORT NAME	HOW PLAN INFORMED LHMP
Kings County General Plan	The Kings County General Plan was adopted by the Board of Supervisors on January 26, 2010. The County proactively addresses hazards through the General Plan Health and Safety Element and references the MJHMP that was prepared in 2012. One representative from the HMPC is also working on initiating the County's General Plan update, which would help ensure that both plans are integrated and contain mutually-reinforcing policies (please note this formal update process will not start before the finalization of the MJHMP). The General Plan and the 2023 MJHMP Update contain complementary actions to achieve the goal of hazard risk reduction. Future updates of the General Plan, including incorporation by reference of the 2023 MJHMP into the Health and Safety Element will continue to ensure consistency between both plans. The General Plan also includes the Housing Element chapter. The 2016-2024 Housing Element is incorporated into the 2023 MJHMP Update to identify development trends.
Kings County Emergency Operations Plan	The purpose of the County of Kings Emergency Operations Plan (EOP) and its Functional Annexes is to provide the basis for a coordinated response before, during and after a disaster incident. This plan is the principal guide for the County's response to, and management of real or potential emergencies and disasters occurring within its designated geographic boundaries. The 2015 Kings County Emergency Operations Plan (EOP) incorporates the FEMA Comprehensive Preparedness Guide (CPG) 101 v. 2.0 and the State of California Emergency Plan best practices. The plan is designed to be read, understood and exercised prior to an emergency and establishes the framework for implementation of the California Standardized Emergency Management System (SEMS) and the NIMS for the County. The County of Kings

PLAN, STUDY, REPORT NAME	HOW PLAN INFORMED LHMP
	EOP is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between the County of Kings and its jurisdictions, as well as special districts, utilities, major businesses, the American Red Cross (ARC), community groups, state agencies, and the federal government. The County is in the process of initiating a formal update to the EOP in late 2023.
Kings County Code, Chapter 5 – Buildings and Structures	The Kings County Code, Chapter 5, provides minimum standards to safeguard life, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within the unincorporated areas of the County. This chapter of the County code includes building code, relocation permits, electrical code, and plumbing code.
Kings County Code, Chapter 16.50, Floodplain Management	The purpose of this Chapter is to promote public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas through specific provisions. This ordinance was used as a reference to assess County's mitigation capabilities and design mitigation actions and projects.
Kings County Code, Chapter 16.55, Fire Code	This chapter is enacted for the public need in the extinguishment of fires, and the preventing, eliminating, or minimizing fire hazards for the safety of life and property in the county.
Kings County 2012 MJHMP	The plan was reviewed to provide a basis for the current update.
Assessor for parcel data including Use Codes; assessed categories; and values; address points	Used for quantitative vulnerability assessment for hazards. Parcel information was integrated into each hazard's "Property" section in the vulnerability assessment.
Public Works for current infrastructure list (Bridges, Drainage, Street Lights, and Traffic Lights) and their geographic placement	Used to establish critical facilities GIS database.
GIS for numerous base map shapefiles such as cities, counties, parcels, rivers, and roads	Used as base maps and for establishing critical facilities GIS database.
FEMA Flood Insurance Rate Map	1% and 0.2% annual chance floodplain data was acquired to profile flood hazard and carry out the related vulnerability assessment.
USACE Comprehensive Study; DWR Awareness Floodplain Mapping project	USACE 100-year flood event layer and DWR best available maps in 200-year flood event layer were acquired to profile flood hazard and carry out the related vulnerability assessment.
FEMA Technical Bulletin 11-01 Crawlspace Construction for Buildings located in Special Flood Hazard Areas NFIP Interim Guidance	Provides guidance on crawlspace construction; used as a reference to design mitigation actions and projects.
NFIP	This program aims to reduce the impact of flooding on private and public structures by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. NFIP data was incorporated into the vulnerability assessment for flood hazard.
NIMS	This system directs the creation of a comprehensive, national approach to incident management by federal, state, territorial, Tribal, and local responders and across all functional disciplines.
Federal Energy Regulatory Commission (FERC)	FERC is an independent agency that regulates interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied

PLAN, STUDY, REPORT NAME	HOW PLAN INFORMED LHMP
	national gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects and providing regulations for dams.
California Geological Survey, USGS	Data was acquired to profile and carry out vulnerability assessment for earthquake, land subsidence, and landslide hazards.
California Code of Regulations, Title 24, Part 9 (California Building Standards Code) (Fire Code)	CCR Title 24 governs the design and construction of all building occupancies and associated facilities and equipment throughout California and is also known as building standards. It contains requirements for the structural, mechanical, electrical, and plumbing systems, and requires measures for energy conservation, green design, construction and maintenance, fire and life safety, and accessibility. The code is used as a reference to design mitigation actions and projects.
Alquist-Priolo Earthquake Fault Zoning Act	The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Relevant data was acquired to profile earthquake hazard.
California Environmental Quality Act (CEQA)	CEQA is a California statute passed in 1970 (shortly after the United States Federal Government passed the National Environmental Policy Act (NEPA)), to institute statewide policy of environmental protection. The County will complete supporting CEQA documentation prior to board approval and adoption.
California Public Resources Code (PRC) Section 4291 – Structures in Fire Hazard Areas	This code provides direction for persons owning, leasing, controlling, operating, or maintaining any building or structure in, upon, or adjoining any mountainous area of forest-covered lands, brush-covered lands, or grass-covered lands, or any lands which are covered with flammable material. The code is used as a reference to design mitigation actions and projects.
Municipal General Plans (including Safety Elements, Land Use Elements, and Housing Elements)	Informed the municipal annexes and in some cases the community service district annexes on past hazard events, mitigation policies, combining designations and existing and projected development.
Kings County Flood Insurance Study	Reviewed for information on past floods and flood problems to inform risk assessment and consequence analysis (Section 4). Utilized digital flood insurance rate maps effective
2018 State of California Multi-Hazard Mitigation Plan	Reviewed information on climate change and hazard assessment data to ensure consistency with this plan update. Reviewed list of hazards to inform risk assessment and consequence analysis (Section 4). Reviewed goals for consistency
CALFIRE and FRAP	Data was acquired to profile and carry out vulnerability assessment for wildfire hazard.
NOAA National Centers for Environmental Information-State Climate Summaries	Reviewed information on climate change to inform risk assessment and consequence analysis. Data was acquired to profile and carry out vulnerability assessment for severe weather hazard.
California DOF/U.S. Census Bureau, ACS, 2015-2019	Informed the background of the community including demographic trends and the calculation of population at risk.
USDA Risk Management Agency Crop Indemnity Reports, 2007-2020	Informed the adverse weather section vulnerability assessment on how crops have been impacted by weather events in the past. Also informed the Drought, Severe Weather and Agricultural Pests and Disease sections of the HIRA.
California Climate Adaptation Strategy, 2018 and California OES Contingency Plan for Excessive Heat Emergencies (2014)	Informed the Extreme Heat profile and climate change considerations in the risk assessment and consequence analysis.

PLAN, STUDY, REPORT NAME	HOW PLAN INFORMED LHMP
All relevant plans, codes, and ordinances currently in place such as building codes, zoning ordinances, subdivision ordinances, special purpose ordinances, site plan review requirements, growth management ordinances, economic development plans, and emergency response plans were reviewed	Reviewed and used to profile and carry out vulnerability assessment for hazards. Used as references to design mitigation actions and projects.

In the process of preparing this 2023 MJHMP Update, many other existing plans, studies, reports, and technical information were evaluated or used as guidance. The HMPC for the development of the MJHMP Update included representatives who are charged with developing the Kings County General Plan and the Kings County EOP. The Planning Committee members work to ensure that local plans are integrated with the MJHMP and provide expertise for the integration of other local, state, and federal plans, codes, and regulations.

Other technical data, reports and studies were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include hazard identification, vulnerability assessment, and capability assessment. Information from the following agencies and groups was reviewed in the development and update of this plan. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

- CAL FIRE
- California Department of Parks and Recreation Office of Historic Preservation
- California Department of Transportation
- California Department of Public Health
- California Natural Resources Agency
- California DSOD
- California DWR
- California Geological Survey
- Kings County Agricultural Department
- Kings OES
- California Water Foundation
- FEMA
- NOAA National Climatic Data Center
- National Register of Historic Places
- Natural Resource Conservation Service
- NWS
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- Western Regional Climate Center
- Center for Western Weather and Water Extremes

Integration of 2012 Plan into Other Plans and Planning Mechanisms

The 2012 MJHMP was referenced in the County's 2015 EOP. However, the 2012 MJHMP was not specifically incorporated or referenced in any other county or municipal plans and planning mechanisms. A process to do so with the 2023 MJHMP is outlined in Subsection 6.3.3. For example, the County's 2010 General Plan Health and Safety Element extensively referenced the County's 2007 MJHMP. The 2023 MJHMP update can be incorporated into the Health and Safety Element when the County updates the element. There is a process noted in both Subsection 6.3.3 and corresponding mitigation actions in Subsection 5.3 that outline how the County and municipalities can sustain compliance under AB 2140, which recommends adoption by reference or incorporation of the MJHMP into the Safety Element of the General Plan. The County can also use the Health and Safety Element update process to address compliance with AB 747 and Senate Bill 99 related to evacuation route capacity and the identification of residential neighborhoods that do not have at least two ingress/egress routes.

3.4.3 Phase 2: Assess Risks

Planning Step 4: Identify the Hazards

WSP led the HMPC to review the list of hazards identified in the 2012 plan and document all the hazards that have, or could, impact the Kings County planning area, including documenting recent drought, flood, land subsidence, wildfire and severe storm events that were not included in the 2012 MJHMP. The Plan Update Guide worksheets were used to aid in determining hazards and vulnerabilities and where risk varies across the planning area. The profile of each of these hazards was then updated during the 2022-2023 process with information from the HMPC and additional sources. Web resources, existing reports and plans, and existing GIS layers were used to compile information about past hazard events and determine the location, previous occurrences, probability of future occurrences, and magnitude/severity of each hazard. GIS was used to display, analyze, and quantify hazards and vulnerabilities where data was permitted. The potential for climate change to affect the frequency and intensity of the hazards was summarized based on the latest available science, where applicable. A more detailed description of the HIRA process and the results are included in Section 4: Hazard Identification and Risk Assessment.

Planning Step 5: Assess the Risks

After updating the profiles of the hazards that could affect the County, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions. This step included two parts: a vulnerability assessment and a capability assessment.

Vulnerability Assessment – Participating jurisdictions updated their assets at risk to natural hazards—overall and in identified hazard areas. These assets included the total number and value of structures; critical facilities and infrastructure; natural, historic, and cultural assets; and economic assets. The HMPC also analyzed development trends in hazard areas. Population at risk, specifically socially vulnerable populations and underserved communities werealso assessed and calculated for dam incidents, earthquake, flood, landslide, and wildfire hazards. The latest DFIRM was used to refine the estimated flood losses during the update, where available for the NFIP participating communities.

Capability Assessment – The HMPC conducted a capability assessment update to review and document the planning area's current capabilities to mitigate risk and vulnerability from hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. This information for the County is included in Section 6 and the respective jurisdictional annexes. This addressed FEMA planning task 4: Review community capabilities - 44 CFR 201.6 (b)(2) & (3).

Results of the risk assessment were presented, and comments were discussed at the second HMPC meeting in March 2023. A more detailed description of the risk assessment process and the results are included in Section 4: Hazard Identification and Risk Assessment.

3.4.4 Phase 3: Develop the Mitigation Plan

Planning Step 6: Set Goals

WSP facilitated a discussion session with the HMPC to review the 2012 MJHMP's goals and objectives. The HMPC discussed definitions and examples of goals, objectives, and actions and considered the goals of the 2023 Draft California SHMP and other relevant local plans when reviewing and revising the goals and objectives. The resulting updated goals and objectives are presented in Section 5: Mitigation Strategy. For the 2023 MJHMP, several goals were modified; no objectives specific were added.

Planning Step 7: Review Possible Activities

WSP facilitated a discussion at an HMPC meeting to review the alternatives for mitigating hazards. This included a group activity with the HMPC to identify a comprehensive range of mitigation actions for each identified hazard, and a group activity to select and rank mitigation actions using selection criteria. More specifics on the process and the results of this collaborative process are captured in Section 5: Mitigation Strategy.

As part of the review of mitigation options long-term climate change adaptation strategies were also discussed. HMPC members were encouraged to incorporate climate change adaptation measures into

the mitigation strategy of their respective jurisdictions by utilizing resources and guidance available on the Cal-Adapt website and the California Adaptation Planning Guide (APG).

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, WSP produced a complete first draft of the plan. This complete Administrative Draft MJHMP was shared electronically with the HMPC for review and comment. Other agencies were invited to comment on this draft, specifically surrounding counties. HMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Neighboring county emergency managers and interested stakeholders identified under Step 3 were also solicited to provide comments on the draft plan during the public review period; no comments were received. WSP integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the California OES and FEMA Region IX to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.4.5 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction on the dates included in the adoption resolutions in Appendix C. The final plan will be incorporated by reference in the Safety Element of the County General Plan and result in the County's eligibility for Assembly Bill (AB) 2140. This adoption makes the jurisdiction eligible for consideration for part or all its local costs on eligible public assistance to be provided by State share funding through the CDDA.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the plan update process, all the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and updating and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as hazard(s) addressed, lead manager and priority, to help initiate implementation. An overall implementation strategy is described in Section 6: Plan Adoption, Implementation, and Maintenance.

Finally, there are numerous organizations within the Kings County planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in Kings County and is addressed further in Section 6. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Section 6.

Implementation and Maintenance Process: 2012 MJHMP

The 2012 MJHMP included a process for implementation and maintenance which was generally followed, with some variation. Implementation of the plan including the status of mitigation actions is captured in Section 5 and the jurisdictional annexes. In general, the County and participating jurisdictions have made progress in the implementation of the plan. Successes of note are detailed in the mitigation strategy in Section 5. An updated implementation and maintenance section can be referenced in Section 6.

4 HAZARD IDENTIFICATION AND RISK ASSESSMENT

Requirement §201.6(c)(2)(i):

[The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement §201.6(c)(2)(ii):

[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

- *§201.6(c)(2)(ii)(A): The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*
- *§201.6(c)(2)(ii)(B): An estimate of the potential dollar losses to vulnerable structures identified in ... this section and a description of the methodology used to prepare the estimate.*
- *§201.6(c)(2)(ii)(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Risk to natural hazards is a combination of hazard, vulnerability and capability. This section of the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) will look at both hazards and vulnerability. The risk assessment process identifies and profiles relevant hazards and assesses the exposure to lives, property and infrastructure to these hazards. The goal of the risk assessment table is to estimate the potential losses in Kings County (County) from a hazard event. This process also allows communities in the County to better understand their potential risk to natural hazards and provides a foundation for developing and prioritizing mitigation actions to reduce the risks from future hazard events in Kings County. These mitigation actions can then be designed to reduce damage from natural disasters through increased preparedness and focus resources towards assets that have the greatest vulnerability.

In the early meetings, the County and the Hazard Mitigation Planning Committee (HMPC) reviewed data from the following sources on hazards affecting the County, those sources were: the federal and state disaster declaration history, the State of California Hazard Mitigation Plan (SHMP) (2018) and the Draft SHMP Update (2023), the previous Kings County MJHMP (2012), the Health Safety Element of the Kings County 2035 General Plan (2010), and interviews of staff that live and work in the County.

During the 1st HMPC Meeting (October 31, 2022), the HMPC reviewed the broad set of hazards evaluated in the relevant local and regional hazard planning documents, including the SHMP. Based on this crosswalk process with the other relevant planning documents, the HMPC agreed on the significant natural, human-caused, and human-health hazards in the County that should be evaluated in the risk assessment. The HMPC agreed to address technological or human-caused hazards but not transportation accidents and hazardous material incidents, which are addressed in emergency operations plans for the county and participating jurisdictions. This crosswalk process provided the basis for prioritizing the hazards profiled and evaluated in the risk assessment. The hazards contained in this planning effort are in alphabetical order and listed below. Hazards noted in italics (and with an asterisk) are hazards not previously profiled in the 2012 Kings Count MJHMP; five additional hazards were addressed in the MJHMP update, including two natural hazards, two human-caused hazards, and one public health hazard.

- Agricultural Pests and Disease*
- Cyber-Attack*
- Dam Incidents
- Drought
- Earthquake
- Extreme Temperatures: Freeze and Extreme Heat
- Flood
- Land Subsidence*
- Landslide
- Public Health Hazards: Pandemics/Epidemics*
- Severe Weather: General

- Severe Weather: Dense Fog
- Severe Weather: Heavy Rain, Thunderstorms, Hail, and Lightning*
- Severe Weather: High Wind/Tornado
- Wildfire

4.1 NON-PROFILED HAZARDS

The HMPC reviewed data and discussed several other hazards, which were eliminated from further discussion because they rarely occur and/or their impacts are not significant. The list below details these hazards and provides a brief explanation for their omission from further profiling.

- Avalanche - Snowfall is extremely rare to nonexistent across the County planning area.
- Coastal Erosion/Storm - Coastal hazards do not occur due to distance from coasts and ocean.
- Hurricane - Hazard does not occur due to distance from ocean.
- Terrorism/Civil Unrest/Human-Caused Threats – While terrorism and civil unrest are threats to the County, this risk is best addressed in other plans.
- Tornado – Impacts to the County due to tornados are unlikely.
- Tsunami - Hazard does not occur due to distance from ocean.
- Severe Winter Storm - Very little to no snowfall recorded throughout the County; temperatures fall below 32 degrees Fahrenheit only a few days of the year.
- Volcano - The U.S. Geological Survey does not include the County in their map of areas identified as subject to hazards from potential eruptions in California. The volcanoes in California are not close to the County and have a limited chance of eruption

The remainder of this section begins with an overview of the history of declared disasters in the County followed by the profiles of identified hazards.

4.2 DISASTER DECLARATION HISTORY

One method to identify hazards is to look at the events that have triggered federal and/or state disaster declarations that included the County. The County received 20 federal and state disaster declarations since 1950, the majority of which consisted of flood and severe storm events. Table 4-1 lists the disaster declarations where the County was designated federal and/or state disaster declarations from 1950 to the present. There have been 21 State declarations and 15 federal declarations.

Table 4-1 Kings County Disaster Declaration History 1950-present

HAZARD TYPE	DISASTER NAME	DISASTER NUMBER	STATE DECLARATION	FEDERAL DECLARATION
Flood	1969 Storms	OEP DR-253	01/29/69	01/26/69
Flood	Heavy Snow Runoff	OEP DR-2270	01/28/69	08/15/69
Severe Storm, Freeze	Freeze / Severe Weather	OEP DR-3086	04/17/72	Not declared
Drought	1976 Drought	EM-3023-CA	02/13/76	01/20/77
Severe Storms	Winter '78 Storms	DR-547	02/27/78	02/15/78
Flood	Winter Storms	DR-682	03/03/83	02/09/83
Severe Storm	Severe Winter Storms	DR-1044	01/17/95	01/13/95
Severe Storm, Flood	Late Winter Storms	DR-1046	01/05/95	01/10/95
Flood	January 1997 Floods	W-145-97	01/31/97	Not declared
Flood	El Nino	W-169-98	02/13/98	Not declared
Freeze	Freeze	DR-1267	02/09/99	02/09/99
Freeze	Severe Freeze	DR-1689	3/13/2007	3/13/07
Severe Storm	08 January Storms	OES 2008-01	1/2008	Not declared

HAZARD TYPE	DISASTER NAME	DISASTER NUMBER	STATE DECLARATION	FEDERAL DECLARATION
Drought	Central Valley Drought	OES 2008-03	06/12/08	Not declared
Flood	December 2010 Statewide Storms	DR-1952 OES 2010-17	12/21/10	01/26/11
Flood	Severe Winter Storms	DR-4308-CA	04/01/2017	04/01/17
Biological	Statewide Covid-19	EM-3428-CA	03/13/2020	03/13/2020
Biological	Covid-19 Pandemic	DR-4482-CA	03/20/2020	03/22/20
Biological	Statewide Monkeypox	NR22-119	09/04/2022	Not declared
Flood	Severe Winter Storms	EM-3591-CA	01/24/2023	01/09/23
Flood	Severe Winter Storms	EM-3592-CA	03/10/23	03/09/23

Source: Kings OEM, Cal EMA and FEMA

The majority of declarations and all but two federal disaster declarations were declared for severe storms and flooding. These occurred twice in 1969, once each in 1978 and 1983, and twice in 1995 and again in 2010-2011. A federal disaster declaration for freeze in February was declared in 1999 and in 2007. The remaining declarations were for a state declaration for drought in 1976 and another in 2008.

The federal government may also issue a disaster declaration through the U.S. Department of Agriculture (USDA) and/or the Small Business Administration (SBA), as well as through the Federal Emergency Management Agency (FEMA). The quantity and types of damage are the determining factors. A USDA declaration makes all qualified farm operators in the designated areas eligible for low-interest emergency loans from the USDA's Farm Service Agency. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffered economic losses in declared and contiguous counties. The USDA declarations are listed in Table 4-2 since the last plan update in 2012.

Table 4-2 USDA Agricultural Declarations Since 2012 Plan Update

USDA DECLARATION	APPROVAL DATE	DESIGNATION NUMBER
Drought	2/27/2013	S3491
Drought	3/13/2013	S3497
Drought	4/10/2013	S3504
Drought	1/15/2014	S3626
Drought	9/17/2014	S3743
Drought	2/17/2016	S3952
Rain and wind	7/27/2016	S4003
Excessive rainfall and high winds	3/31/2017	S4164
Excessive rain, high winds, cold temperatures, and hail	4/28/2017	S4170
Drought	2/23/2017	S4144
Freeze	7/18/2018	S4350
Drought	3/22/2019	S4467
Excessive rain	3/11/2020	S4656
Excessive rain and hail	3/11/2020	S4657
Drought	3/5/2021	S4916
Drought	5/10/2021	S4969

Source: USDA Disaster Designations, 2012 – 2021

Hazard events that occur outside the County planning area can also directly and indirectly impact the County. These hazard events are commonly associated with dam incidents that result in inundation flooding within the larger watershed and wildfires that affect air quality and downstream post-wildfire erosion. Power outages can also occur due to high wind events and wildfires and because of outages that occur outside the County.

4.3 METHODOLOGY

The HMPC prioritized hazards based on a process that combines criteria on the hazard problem, where the hazard occurs in the planning area, past occurrences, the Likelihood of Future Occurrence, and the magnitude of the hazard if it were to cause damage. Each hazard profile includes the following subsections:

HAZARD DESCRIPTION – This section gives a description of the hazard problem and associated issues followed by details on the hazard specific to the County planning area.

GEOGRAPHIC AREA – This section provides a spatial description of the potential location or areas of the County where the hazard is expected to impact.

- **Limited**: Less than 10% of planning area
- **Significant**: 10-50% of planning area
- **Extensive**: 50-100% of planning area

PAST OCCURRENCES – This section contains information on historical incidents, including impacts where known events occurred. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.

LIKELIHOOD OF FUTURE OCCURRENCE – The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance (probability) of an event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:

- **Highly Likely**: Near 100 percent chance of occurrence in next year or happens every year.
- **Likely**: Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
- **Occasional**: Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
- **Unlikely**: Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

CLIMATE CHANGE CONSIDERATIONS – This describes the potential for climate change to affect the frequency and intensity of the hazard in the future. The HIRA describes two GHG emissions scenarios that reflect different projections for how global emissions and atmospheric GHG concentrations may change over time but selects a high emissions scenario (Representative Concentration Pathway [RCP] 8.5) for each natural hazard affected by climate change. The Governor's Office of Planning and Research (OPR) recommends that agencies use RCP 8.5 for analyses considering impacts through 2050 because there are minimal differences between emissions scenarios during the first half of the century. The HIRA also uses Cal-Adapt's default settings that provides outputs for subsets of 10 and 4 global climate models (GCMs) and integrates projections for mid-century (2040-2060) and through the end-of-century (2070-2090); however mapped climate projects using GIS data were only included for the mid-century.

MAGNITUDE AND SEVERITY – This section describes the potential strength or magnitude of the hazard as it pertains to the County. It describes how much damage could occur as a result of a hazard event.

- **Catastrophic**: More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
- **Critical**: 25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
- **Limited**: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability

- **Negligible**: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

VULNERABILITY ASSESSMENT – Following the hazard profiles is a vulnerability assessment for each identified hazard. The assessment was conducted through the study of potential impacts on the following specific sectors:

- People
- Property
- Critical Facilities and Lifelines
- Economy
- Cultural, Historic and Natural Resources
- Development Trends

The vulnerabilities are summarized for all natural hazards, including the human-caused and human-health hazards. For example, the vulnerability assessment addresses who or what is vulnerable to natural hazards or climate stressors that influence the hazard, where someone or a critical facility is susceptible to related health impacts or direct damage, and when and why these assets may be vulnerable. The vulnerability assessment is used to inform strategic decision-making by identifying the assets or portions of the planning areas most vulnerable to natural hazards.

RISK SUMMARY – Overall hazard significance is based on a combination of geographic area, probability of future occurrence and magnitude/severity. Each risk summary includes key issues and problems based on threat, vulnerability and impacts to the County planning area and jurisdictions from the specific hazard**.** Significance rankings are defined by the following:

- **Low**: minimal potential impact
- **Medium**: moderate potential impact
- **High**: widespread potential impact
-

Data used to support this assessment included the following information sources:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide and nationwide GIS datasets to support mitigation planning;
- California 2018 SHMP and 2013 Draft SHMP;
- Kings County 2012 MJHMP;
- Neighboring Jurisdictional HMPs;
- California Department of Forestry and Fire Protection (CAL FIRE) datasets;
- California's Fourth Climate Change Assessment;
- Written descriptions of inventory and risks provided by the jurisdictions;
- Online data sources (cited where applicable);
- Data and information from existing plans and studies; and
- Input from the HMPC members and staff from the County and local, state, and federal agencies

4.3.1 Hazard Ranking Summary by Jurisdiction

Overall hazard significance is based on a combination of information on how much of the hazard covers the planning areas, historical data, disaster potential and relevance to each jurisdiction, magnitude and severity, and the probability of future occurrences. Each metric was used to identify and prioritize the list of hazards most relevant to Kings County and the individual rankings are based on or interpolated from the analysis of the hazards in the risk assessment. This process helps the County and jurisdictions compare and rank hazards that pose the greatest risk.

Participating agencies were also asked to complete Plan Update Guide worksheets to initiate the process of screening and ranking hazards within the County. The Plan Update Guides require ranking of the

hazards based on geographic extent, magnitude/severity of the hazard, past occurrences, the frequency/probability of future occurrences, and overall significance, as shown in Table 4-3. The results of the Plan Update Guides were collected to determine the rankings, and these rankings were reviewed again with the HMPC for further input. Public input was also integrated based on feedback from the bi-lingual survey and two public workshops.

Table 4-3 Kings County Hazard Significance Summary

Hazard	Geographic Extent	Magnitude/Severity (Extent)	Probability of Future Occurrence	Overall Significance
Agricultural Pests and Disease	Extensive	Critical	Likely	Medium
Cyber-Attack	Significant	Critical	Occasional	Medium
Dam Incidents	Significant	Critical	Unlikely	Medium
Drought	Extensive	Critical	Likely	High
Earthquake	Limited	Catastrophic	Occasional	Medium
Extreme Temperatures	Extensive	Limited	Highly Likely	High
Flood	Extensive	Limited	Highly Likely	Medium
Land Subsidence	Extensive	Limited	Likely	Medium
Landslide	Significant	Negligible	Occasional	Low
Public Health Hazards	Extensive	Critical	Highly Likely	Medium
Dense Fog	Extensive	Critical	Highly Likely	Medium
Severe Storms	Extensive	Critical	Highly Likely	Medium
High Wind and Tornado	Extensive	Critical	Highly Likely	Medium
Wildfire	Significant	Negligible	Likely	Medium

Spatial Extent
Extensive: 50-100% of planning area
Significant: 10-50% of planning area
Limited: Less than 10% of planning area

Potential Severity
Catastrophic: Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged
Critical: Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged
Moderate: Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged
Negligible: Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.

Probability of Future Occurrence
Highly Likely: Near 100% probability each year.
Likely: Between 10 and 100% probability per year or at least one chance in ten years.
Occasional: Between 1 and 10% probability per year or at least one chance in next 100 years.
Unlikely: Less than 1% probability in next 100 years.

Significance
High: widespread potential impact
Medium: moderate potential impact
Low: minimal potential impact

Table 4-4 summarizes how these hazard rankings vary across jurisdiction, which allows the jurisdictions to compare multiple hazards and priorities, and with a focus on the natural hazards.

Table 4-4 Hazard Ranking Summary in Kings County by Jurisdiction

HAZARD	KINGS COUNTY	AVENAL	CORCORAN	HANFORD	LEMOORE
Agricultural Pest & Disease	Medium	Medium	Medium	Medium	Medium
Cyber-Attack	Medium	Medium	Medium	Medium	Medium
Dam Incidents	Medium	Low	Low	Medium	Medium
Drought	High	High	High	High	High
Earthquake	Medium	High	Medium	Medium	Medium
Extreme Temperatures	Medium	Medium	Medium	Medium	Medium
Flood	High	High	High	High	High
Land Subsidence	Medium	Medium	Medium	Medium	Medium
Landslide	High	Medium	High	Medium	Medium
Public Health	Medium	Medium	Medium	Medium	Medium
Fog	Medium	Medium	Medium	Medium	Medium
Severe Storm	Medium	Medium	Medium	Medium	Medium
Wind &Tornado	Medium	Medium	Medium	Medium	Medium
Wildfire	Medium	Medium	Low	Low	Low

Source: Kings County HMPC

4.4 ASSET SUMMARY

4.4.1 Assets Exposure

As a starting point for analyzing the planning area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster was to occur in the planning area, this section describes significant assets exposed or at risk in the planning area. Data used in this baseline assessment included:

- Total assets at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Population growth and land use and development trends.

4.4.1.1 Total Assets at Risk

Building value assessments in this plan are based on data from the County's Assessor's Office. This data provided the baseline for an inventory of the total exposure of developed properties within the County and helps to ensure that the updated MJHMP reflects changes in development. It is important to note that depending on the nature and type of hazard events or disasters, it is generally the value of the

infrastructure or improvements to the parcels that are of concern or at risk. Generally, the land itself is not a total loss, but may see a reduction in value. Thus, the parcel analysis excludes land value.

4.4.1.2 Parcel & Structure Exposure and Preparations for Analysis

The most up-to-date County Assessor data (2023) and address point data (2022) were used to inventory the total number and types of parcels with improvements, defined as parcels with an improvement value greater than zero in the County, as well as the total number and types of structures on these parcels. Building content values were estimated based on the following formulas derived from FEMA/Hazus methods: a) Residential and Multi-Family Residential properties received content values worth 50% of the improved values; b) Agricultural, Commercial, Exempt, and Multi-Use related properties received content values worth 100% of the improved values; and c) Industrial properties received content values worth 150% of the improved values. Adding up these content and original improved values yields the Total Value of Improved Parcels, which is an estimation of the total property exposure within the County. Table 4-5 summarizes the property inventory for the County and each participating jurisdiction with detail by property type. Table 4-6 shows the total property inventory from the Assessor's Office.

Table 4-5 Total Exposure Summary by Jurisdiction

JURISDICTION	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE
Avenal	1,897	2,514	$212,728,605	$118,884,090	$331,612,695
Corcoran	3,330	3,706	$411,183,649	$250,888,988	$662,072,637
Hanford	17,122	20,749	$3,636,911,685	$2,294,089,679	$5,931,001,364
Lemoore	7,109	10,012	$1,541,853,696	$955,326,836	$2,497,180,532
Unincorporated	10,227	13,561	$1,913,346,387	$1,681,807,156	$3,595,153,543
Total	39,685	50,542	$7,716,024,022	$5,300,996,749	$13,017,020,771

Source: Kings County Assessor's Office, WSP Analysis

Table 4-6 Total Exposure by Jurisdiction and Property Type

JURISDICTION	PROPERTY TYPE	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE
Avenal	Agricultural	6	6	$964,105	$964,105	$1,928,210
	Commercial	112	134	$18,337,766	$18,337,766	$36,675,532
	Exempt	27	33	$3,072,688	$3,072,688	$6,145,376
	Industrial	9	10	$849,591	$1,274,387	$2,123,978
	Multi-Family Residential	51	564	$42,930,514	$21,465,257	$64,395,771
	Multi-Use	9	12	$965,833	$965,833	$1,931,666
	Residential	1,683	1,755	$145,608,108	$72,804,054	$218,412,162
	Total	1,897	2,514	$212,728,605	$118,884,090	$331,612,695
Corcoran	Agricultural	6	6	$104,009	$104,009	$208,018
	Commercial	155	273	$39,701,556	$39,701,556	$79,403,112
	Exempt	35	41	$1,388,873	$1,388,873	$2,777,746
	Industrial	31	37	$24,083,922	$36,125,883	$60,209,805
	Multi-Family Residential	92	266	$46,250,891	$23,125,446	$69,376,337
	Multi-Use	10	16	$1,232,045	$1,232,045	$2,464,090
	Residential	3,001	3,067	$298,422,353	$149,211,177	$447,633,530
	Total	3,330	3,706	$411,183,649	$250,888,988	$662,072,637
Hanford	Agricultural	28	34	$2,925,519	$2,925,519	$5,851,038
	Commercial	794	1,534	$714,496,080	$714,496,080	$1,428,992,160
	Exempt	96	155	$26,175,037	$26,175,037	$52,350,074
	Industrial	97	130	$100,067,929	$150,101,894	$250,169,823
	Multi-Family Residential	489	3,008	$239,982,926	$119,991,463	$359,974,389

JURISDICTION	PROPERTY TYPE	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE
	Multi-Use	49	61	$7,535,179	$7,535,179	$15,070,358
	Residential	15,569	15,827	$2,545,729,015	$1,272,864,508	$3,818,593,523
	Total	17,122	20,749	$3,636,911,685	$2,294,089,679	$5,931,001,364
Lemoore	Agricultural	6	6	$360,817	$360,817	$721,634
	Commercial	228	704	$132,810,700	$132,810,700	$265,621,400
	Exempt	26	30	$6,332,106	$6,332,106	$12,664,212
	Industrial	24	32	$109,777,286	$164,665,929	$274,443,215
	Multi-Family Residential	166	2,445	$152,673,286	$76,336,643	$229,009,929
	Multi-Use	21	30	$9,741,781	$9,741,781	$19,483,562
	Residential	6,638	6,765	$1,130,157,720	$565,078,860	$1,695,236,580
	Total	7,109	10,012	$1,541,853,696	$955,326,836	$2,497,180,532
Unincorporated	Agricultural	768	803	$69,307,835	$69,307,835	$138,615,670
	Commercial	261	646	$80,078,804	$80,078,804	$160,157,608
	Exempt	3,874	6,233	$957,516,751	$957,516,751	$1,915,033,502
	Industrial	53	67	$117,039,604	$175,559,406	$292,599,010
	Multi-Family Residential	35	125	$6,238,179	$3,119,090	$9,357,269
	Multi-Use	489	653	$109,285,327	$109,285,327	$218,570,654
	Residential	4,747	5,034	$573,879,887	$286,939,944	$860,819,831
	Total	10,227	13,561	$1,913,346,387	$1,681,807,156	$3,595,153,543
	Grand Total	39,685	50,542	$7,716,024,022	$5,300,996,749	$13,017,020,771

Source: Kings County Assessor's Office, WSP Analysis

4.4.1.3 *Critical Facility/Lifeline Inventory*

A significant aspect of the 2023 Hazard Identification and Risk Assessment (HIRA) update was the update of critical facilities and an alignment/classification with the FEMA Community Lifelines framework. The critical facilities/lifelines GIS database was based on a combination of County-provided data, Homeland Infrastructure Foundation-Level Data (HIFLD), and local and jurisdiction-specific input. Jurisdictions were able to review critical facility data, edit descriptive attributes and address information, and add new critical facilities. The results are summarized here and provided the basis for GIS-based vulnerability analyses, where data permitted.

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA sorts critical facilities into seven lifeline categories as shown in Figure 4-1.

Figure 4-1 Lifeline Categories

Source: FEMA 2020.

These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans, easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

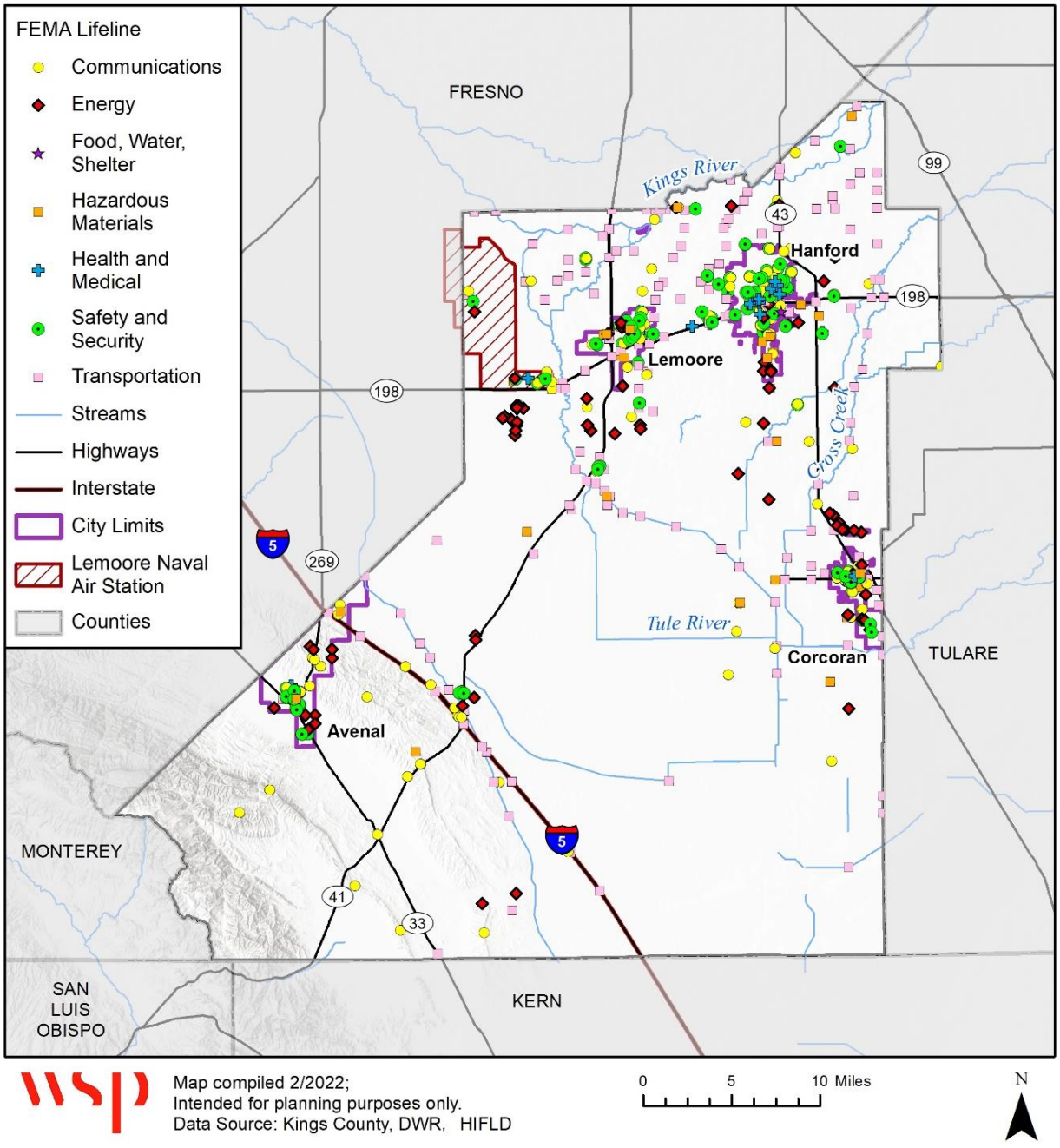
Table 4-7 shows a summary of the 646 critical facilities inventory grouped by lifeline. Figure 4-2 illustrates the location of critical facilities in the County. The critical facility database includes water infrastructure facilities, such as levees.

Table 4-7 Summary of Critical Facilities by Jurisdiction and Lifeline

JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
Avenal	16	5		2	1	17	2	**43**
Corcoran	12	5		3	2	17	3	**42**
Hanford	32	7	6	10	14	54	9	**132**
Lemoore	11	6		6	1	23	10	**57**
Unincorporated	94	57		15	5	41	160	**372**
Grand Total	165	80	6	36	23	152	184	**646**

Sources: HIFLD, National Inventory of Dams (NID), National Bridge Inventory, Kings County

Figure 4-2 Kings County Critical Facilities



Moreover, during the 2022-2023 planning process, the HMPC mentioned the Corcoran Levee as a critical facility, which is maintained by the Cross Creek Flood Control District and is a protective barrier for the City of Corcoran. The Corcoran Levee is a protective levee system in the southeast portion of the County that protects two State Prisons. The GIS info for Corcoran Levee is added to the critical facilities inventory. The levee is further discussed in Section 4.5.7 Flood.

One other critical facility unique to the County is the California Aqueduct. However, this facility is better addressed in the EOPs for the County and federal emergency plans. The California Aqueduct, part of the California State Water Project, runs through the western part of the County. The State Water Project is a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping plants. Its main purpose is to store water and distribute it to 29 urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. Seventy percent of the contracted water supply goes to urban users and thirty percent goes to agricultural users. The State Water Project makes deliveries to two-thirds of California's population. Earthquakes, landslides, flooding, or other hazard events that disrupt the aqueduct's ability to deliver water could have serious impacts to agriculture in the County and water users in many areas of California.

4.4.1.4 Cultural, Historical and Natural Resources

Assessing the County's vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical, and cultural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Historic and Cultural Resources

Historical resources are buildings, structures, objects, places, and areas that are eligible for listing in the National Register of Historic Places (NRHP), the California Register of Historic Resources (CRHR), or the County's List of Historic Resources; or that have an association with important persons, events in history, or cultural heritage; or that have distinctive design or construction method.

For purpose of federal actions, a qualified historic resource is defined as a property listed in or formally determined eligible for listing in the NRHP before a disaster occurs. The NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the U.S. Department of the Interior National Park Service. Local and state agencies may consider a broader definition of qualified historic properties in the review, evaluation, and treatment of properties damaged during a disaster.

The State of California Office of Historic Preservation can provide technical rehabilitation and preservation services for historic properties affected by a natural disaster. Depending on the hazard, protection could range from emergency preparedness, developing a fire safe zone around sites susceptible to wildfires, or seismically strengthening or structurally reinforcing structures.

State and local registers of historic resources provide designated Historical Landmarks, Points of Historical Interest, and Historic Buildings. These resources include, but are not limited to:

- The California Register of Historical Resources
- The California Historical Landmarks
- The California Inventory of Historical Resources
- The California Points of Historical Interest

Historical Resources designated on a federal, state or local level are listed in Table 4-8.

Table 4-8 Kings County Historical Resources

PROPERTY NAME	REGISTER	JURISDICTION	DATE LISTED
El Adobe De Los Robles Rancho (206)	California State Historical Landmark	Lemoore	6/20/1935
Hanford Carnegie Library (N977)	National Register	Hanford	12/17/1981
Kings County Courthouse (N674)	National Register	Hanford	9/21/1978
Kingston (270)	California State Historical Landmark	Laton	9/3/1937
Location Of The Famous Mussel Slough Tragedy (245)	California State Historical Landmark	Hardwick	9/28/1936
Taoist Temple (N173)	National Register	Hanford	6/13/1972
Witt Site (N77)	National Register	Kettleman City	5/6/1971

Source: California Office of Historic Preservation

Other historic sites of local importance also exist. These include the Kings County Museum, the Bastille building in Civic Park, and the Tulare Lake Basin which holds cultural and historical significance for the Yokut Tachi Tribe.

Lists of designated historical resources change periodically, and they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Cultural resources defined in California Environmental Quality Act (CEQA) Section 15064.5 include prehistoric and historic archeological resources; historic-period resources (buildings, structures, area, place, or objects). Archeological resources reflect past human activity extending from Native American prehistoric cultures throughout the early 20th century. The artifacts left by previous occupants may be encountered in small to large residential sites, or special use areas.

Many cultural and historical resources in the County are vulnerable to several hazards due to location and the nature of their construction. Some of these risks include earthquakes, wildfires, or adverse weather.

Natural Resources

Natural resources are important to include in benefit/cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Inventory and awareness of natural resource assets is vital to meeting conservation objectives. For example, protecting wetland areas provides sensitive habitat protection as well as floodwater conveyance and storage, which further enhances public safety.

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (endangered and threatened species) in the planning area. The U.S. Fish and Wildlife Service (USFW) maintains a list of federally listed threatened and endangered species for the country, which can be queried at the state or even county levels through the Information for Planning and Consultation (IPaC) database. The California Department of Fish and Wildlife (CDFW) also maintains species lists and accounts for threatened and endangered species. State and federal laws protect the habitat of these species through the environmental review process. Species of special concern may additionally include species that meet the State definition of threatened or endangered but that have not been formally

listed, species that are experiencing serious population or habitat decline, or a species which has a naturally small population that is exhibiting high susceptibility to population decline (CDFW n.d.).

Table 4-9 summarizes Kings County's special status animal species as indicated in the IPaC database, within the Environmental Conservation Online System.

Table 4-9 Threatened and Endangered Species in Kings County

GROUP	COMMON NAME	SCIENTIFIC NAME	STATUS
Amphibians	California Red-legged Frog	*Rana draytonii*	Threatened
	California Tiger Salamander	*Ambystoma californiense*	Threatened
Birds	California Clapper Rail	*Rallus longirostris obsoletus*	Endangered
	California Condor	*Gymnogyps californianus*	Endangered
	Western Snowy Plover	*Charadrius nivosus nivosus*	Threatened
Crustaceans	Conservancy Fairy Shrimp	*Branchinecta conservatio*	Endangered
	Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	Threatened
	Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	Endangered
Flowering Plants	California Jewelflower	*Caulanthus californicus*	Endangered
	San Joaquin Wooly-threads	*Monolopia (=Lembertia) congdonii*	Endangered
Insects	Monarch Butterfly	*Danaus plexippus*	Candidate
Mammals	Buena Vista Lake Ornate Shrew	*Sorex ornatus relictus*	Endangered
	Fresno Kangaroo Rat	*Dipodomys nitratoides exilis*	Endangered
	Giant Kangaroo Rat	*Dipodomys ingens*	Endangered
	San Joaquin Kit Fox	*Vulpes macrotis mutica*	Endangered
	Tipton Kangaroo Rat	*Dipodomys nitratoides nitratoides*	Endangered
Reptiles	Blunt-nosed Leopard Lizard	*Gambelia silus*	Endangered
	Green Sea Turtle	*Chelonia mydas*	Threatened

Source: US Fish and Wildlife Service – Environmental Conservation Online System

4.4.1.5 Growth and Development Trends

Population and Projected Growth

According to the Department of Finance (DOF) the 2023 population of the County was 157,316. The DOF projects the total population will increase by 7.6% to 169,215 by 2030. While total households in the County are also projected to increase from 44,561 in 2020 to 50,068 in 2030, people per household is projected to slightly decrease from 3.16 in 2020 to 3.06 persons per household in 2030. The cities of Avenal and Corcoran both experienced an increase in population between 2021 and 2022 (3.4% for Avenal and 6% for Corcoran), however, the rest of the cities experienced a slight decrease in population between 2021 and 2022.

Social Vulnerability

Social vulnerability considerations were included in the update of this 2023 MJHMP update to identify areas across the County that might be more vulnerable to hazard impacts based on many factors. In California, socially vulnerable populations, also referred to as disadvantaged communities (DACs) are mapped through Federal-developed and State mapping tools, including but not limited to the FEMA's National Risk Index (NRI) for Natural Hazards, the California Office of Environmental Health Hazard Assessment's (OEHHA) CalEnviroScreen, Department of Water Resources (DWR) Mapping Tools (DAC and Economically Distressed Areas [EDAs]), and, Center for Disease Control and Prevention (CDC) Agency for

Toxic Substances and Disease Registry (ATSDR)'s Social Vulnerability Index (SVI). FEMA's NRI and OEHHA's CalEnviroScreen are used to identify and assess socially vulnerable populations in the County's MJHMP update.

The OEHHA CalEnviroScreen tool applies a formula to generate a combined ranking score that considers 21 indicators for each census tract that cover pollution indicators, such as diesel emissions and concentrations of toxic clean-up sites and population indicators, such as poverty and unemployment rates. Census tracts with CalEnviroScreen rankings between 75 and 100 percent (i.e., a combined score in the top 25 percent of all census tracts in the State) are considered to be DACs.

One of the population indicators for the CalEnviroScreen is the Housing Burden Indicator, which identifies housing-burdened communities. Housing-burdened low-income households are households that are both low-income and highly burdened by housing costs. The housing burden indicator measures the percentage of households in a census tract that are both low-income (making less than 80% of its County's median family income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs). California has very high housing costs relative to the rest of the country, which can make it hard for households to afford housing (OEHHA 2022). Households with lower incomes may spend a larger proportion of their income on housing and may suffer from housing-induced poverty (OEHHA 2022). Housing affordability is an important determinant of health and well-being. Low-income households with high housing costs may suffer adverse health impacts. These households are also more likely to be adversely affected during a hazard event and less likely to recover as quickly as other population groups.

Figure 4-3 below shows the overall housing burden indicator for Kings County from the census tract level. As shown in Figure 4-3, there are a few communities within the County with a higher housing burden; these communities are concentrated in the cities of Hanford, Lemoore, Corcoran, and Avenal, as well as the unincorporated area surrounding the City of Avenal. Twenty-three percent of the people in the dark purple census tract near the City of Hanford are housing-burdened low-income households. This percent housing burdened is higher than 75% of the rest of California. In addition, 28% of the people in the dark purple census tract near the City of Corcoran are housing-burdened low-income households. This percent housing burdened is higher than 87% of the rest of California.

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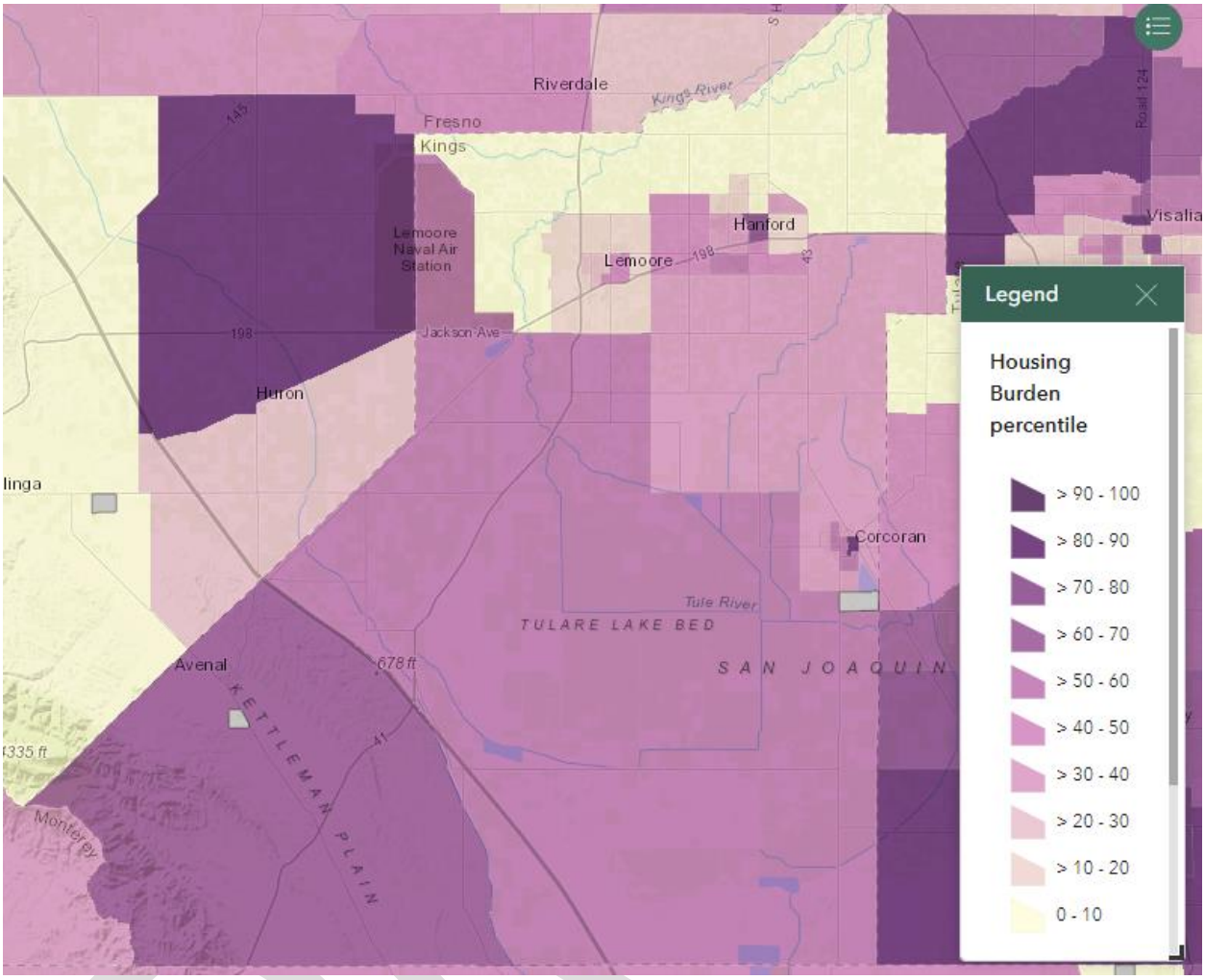
Figure 4-3 CalEnviroScreen Housing Burden Indicator – Kings County

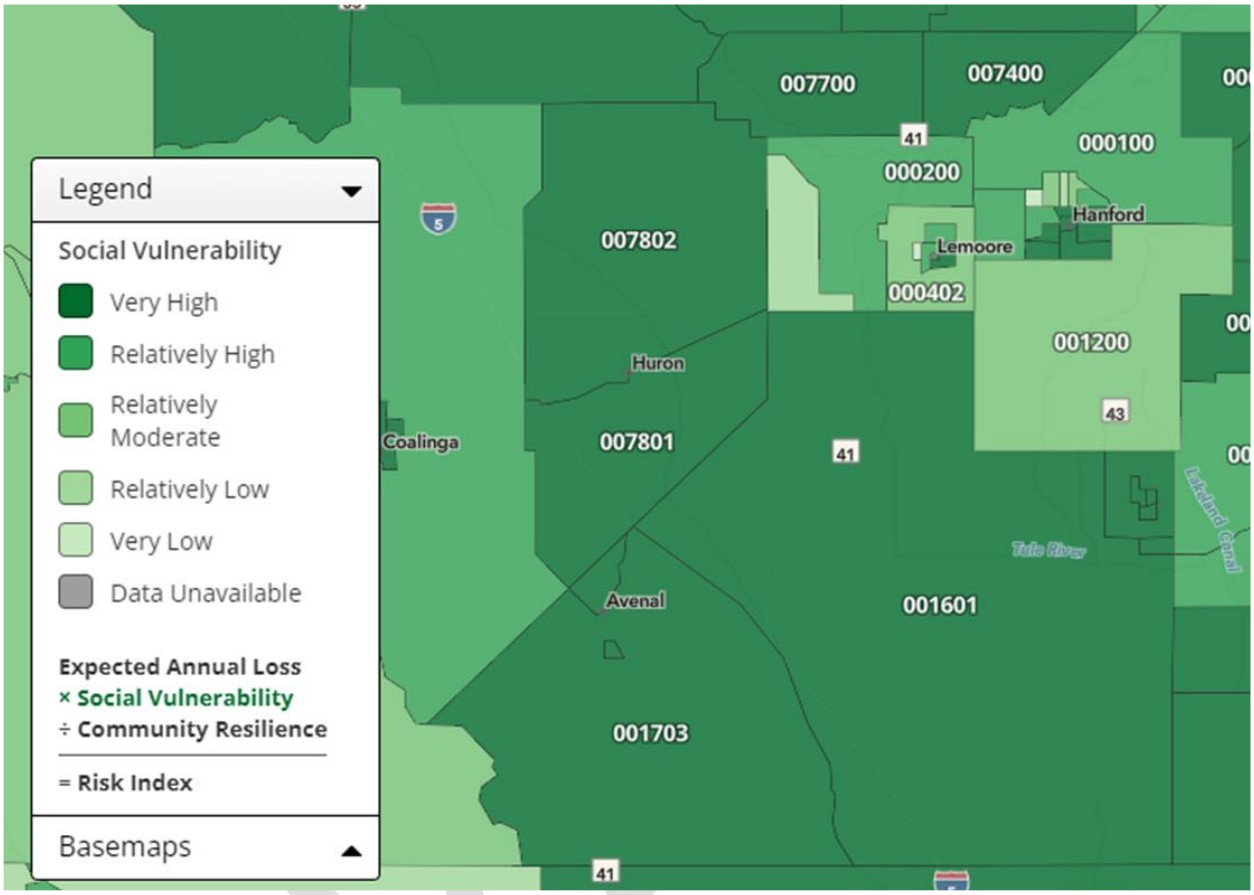


Source: OEHHA 2023

Social vulnerability is also one of the main three components of calculating FEMA's NRI level. As documented in the March 2023 NRI Technical Documentation, among various social vulnerability indices, the CDC/ATSDR's Social Vulnerability Index (SVI) was selected to be used in the NRI calculation. SVI is a location-specific assessment of social vulnerability that utilizes 16 socioeconomic variables deemed to contribute to a community's reduced ability to prepare for, respond to, and recover from hazards. Examples of these variables include racial & ethnic minority status, no high school diploma, and no health insurance.

Figure 4-4 below shows the overall social vulnerability of the County according to FEMA NRI and CDC/ATSDR's SVI. The darker the color, the higher social vulnerability the census tract possesses. Many census tracts within the County have very high social vulnerability. The entire southwestern and central portions of the County have very high social vulnerability. Quite a few census tracts near and within the City of Hanford also have very high social vulnerability.

Figure 4-4 FEMA NRI Social Vulnerability – Kings County



Source: FEMA 2023

The County can use the above information about these disadvantaged communities (DACs) to conduct targeted outreach and engage community members to consider what other hazards and mitigation strategies or programs should be considered to meet community needs. The County can also engage these communities to proactively prioritize hazard mitigation projects that benefit them. Additional information on specific DACs is summarized in the specific jurisdictional Annexes.

Development Trends

The areas located in the Sphere of Influence (SOI) for each incorporated jurisdiction are areas each city plans to grow into and potentially slated for Development Trends. Understanding the potential hazard exposure in each area can help to mitigate the impacts of events before development occurs in those areas. Development trends since the previous 2012 MJHMP update are also addressed. These growth and development trends are assessed in the Development Trends subsection of the vulnerability assessment, each annex, and broadly summarized below. In general, most residential development has occurred or is proposed within the city limits of each jurisdiction.

During this plan update process, an improved parcel & address point analysis was also conducted using the SOI areas for each incorporated jurisdiction and overlaid with available hazard risk layers to determine where Development Trends may be at risk of natural hazard events. The results of the spatial analysis have been integrated into the applicable hazard sections: flood, landslide, and wildfire. Table 4-10 is the summary of the SOI total exposure by jurisdiction.

Table 4-10 Total Exposure Summary by Jurisdiction Sphere of Influence Areas

JURISDICTION	IMPROVED PARCEL COUNT	Building COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE
Avenal	2	2	$340,269	$340,269	$680,538
Corcoran	192	203	$82,400,798	$88,858,817	$171,259,615
Hanford	768	970	$144,542,108	$143,772,786	$288,314,894
Lemoore	191	291	$30,525,548	$19,548,785	$50,074,333
Grand Total	**1,153**	**1,466**	**$257,808,723**	**$252,520,657**	**$510,329,380**

Source: WSP Analysis 2023

City of Avenal

According to the City's 2035 General Plan Land Use Element that was adopted in 2018, the City aims to preserve and enhance its unique and small-town character. The City aims to minimize urban sprawl and leap-frog development. The development of vacant, underdeveloped, and/or re-developable land within the boundaries of the existing developed area and where urban services are or can be made available should be prioritized. It is also noted that the City will preserve and protect agricultural use on lands for open space purposes and for the managed production of resources. Open space in the Avenal area should be created and preserved to meet the needs of the community. Additionally, according to the 2016 – 2024 Kings County Housing Element, the Regional Housing Needs Allocation (RHNA) for the City of Avenal is 639 housing units in total, including 73 for extremely low income, 72 for very low income, 108 for low income, 115 for moderate income, and 271 for above moderate income.

City of Corcoran

According to the City's 2008 General Plan Land Use Element, the City aims to preserve and enhance its unique character and achieve an optimal balance of residential, commercial, industrial, and open space land uses. Meanwhile, the City aims to further develop existing gateways and at some future time develop scenic entryways (gateways) and roadway corridors into the City through special setback and landscape standards, entry signage, open space and park development, and/or land use designations. Future gateways include development along State Route (SR) 43, SR 137 and Whitley Avenue/7th avenue. Regarding the City's growth management, the City will minimize urban sprawl and leap-frog development and provide for an orderly and efficient transition from rural to urban land uses. The City will also designate growth areas that can be served by logical infrastructure extensions. On the other hand, according to the 2016 – 2024 Kings County Housing Element, the RHNA for the City of Corcoran is 946 housing units in total, including 108 for extremely low income, 107 for very low income, 161 for low income, 169 for moderate income, and 401 for above moderate income.

As noted by the HMPC during the plan update process, the City experienced minor population growth over the past decade. One major factor contributing to the City not experiencing any significant population growth is the lack of available housing. The City is poised for additional residential and commercial growth. Currently, a 50-unit residential subdivision is in development with three additional subdivisions representing about 200 housing units potentially being approved over the next two years. Commercial infill development is currently taking place within the City's downtown and industrial areas. All this new potential growth is within the already established General Plan development area that historically maintains a compact urban area that avoids the most prominent hazard – flood hazard. New growth within the City's existing urban area will have similar risk and exposure to drought, earthquake, extreme heat, fog, and freeze. Since the designated FEMA 1% annual chance flood zones are located west and southwest of the City, the added growth of the city avoids this hazard. There is no significant change in development that increases the risk or severity of the hazards identified above, nor does the growth pattern compromise the needs of any underserved community.

City of Hanford

According to the City's 2035 General Plan Land Use Element, the City's growth management goals include a well-planned community that grows in an organized fashion, development preference of vacant and underutilized properties and limitation of urban sprawl-style development patterns in new growth areas. The land use element also mentions supporting the continuance of the Home Garden Community Services District (CSD) as an independent special district serving the existing Home Garden Community. The City will also keep supporting, encouraging, and incentivizing, to the extent possible,

infill development projects that can effectively utilize existing transportation and utility infrastructure. On the other hand, according to the 2016 – 2024 Kings County Housing Element, the RHNA for the City of Hanford is 4,832 housing units in total, including 549 for extremely low income, 548 for very low income, 821 for low income, 865 for moderate income, and 2,049 for above moderate income. In addition, as noted by the HMPC during the Plan Update, the 2023-2032 Regional Housing Needs Assessment projects the City will add approximately 5,547 residential units over the next decade. Although there are not any specific hazard-related concerns associated with this growth, the City will have to expand services as growth continues.

City of Lemoore

According to the City's 2030 General Plan Land Use Element, the City aims to preserve its small-town character. Actions are taken to revitalize downtown, prevent sprawl, keep neighborhoods within walking distance of amenities and schools, and provide open space and parks to maintain Lemoore's quality of life. The City intends to maintain a well-defined compact urban form, with a defined urban growth boundary, and development intensities on land designated for urban uses. The Element is explicit in noting that development west of the 21st Avenue alignment should be prevented to protect the Navy from encroachment. Contiguous development within SOI is also required. On the other hand, according to the 2016 – 2024 Kings County Housing Element, the RHNA for the City of Lemoore is 2,985 housing unit in total, including 339 for extremely low income, 338 for very low income, 507 for low income, 534 for moderate income, and 1,267 for above moderate income.

In addition, as noted by the HMPC during the plan update, growth in the City of Lemoore is continuing to the West side of Lemoore as well as the North side in the coming years. This growth has no impact on hazard-related concerns in the area.

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4.5 HAZARD ANALYSIS AND RISK SUMMARY

Requirement §201.6(c)(2)(i):

[The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.]

4.5.1 AGRICULTURAL PESTS AND DISEASE

4.5.1.1 Hazard Description

Agriculture is the dominant land use in the County, accounting for 90.2% of total land use (2023 General Plan 2010). The County was the 8th top-producing agricultural county in California by gross value in 2020, grossing more than $2.1 billion in 2020 (CFDA 2021). Top commodities in 2021 included milk, pistachios, almonds, and cotton (see Table 4-11 below).

Table 4-11 Top 10 Commodities in Kings County in 2021

RANK	CROP	DOLLAR VALUE
1	Milk, Total	$722,744,000
2	Pistachios	$267,900,000
3	Almonds, Total	$190,674,000
4	Cotton, Total	$190,079,000
5	Cattle & Calves	$172,131,000
6	Tomatoes, Processed	$128,712,000
7	Corn, Silage	$79,294,000
8	Walnuts	$61,883,000
9	Livestock, Poultry	$61,423,000
10	Alfalfa, Hay	$45,995,000

Source: Kings County Department of Agriculture 2021 Crop Report

Agricultural pests and pathogens (insects, fungi, bacteria, viruses and invasive plants) can cause injury or severe destruction to crops or livestock. From exotic fruit flies to noxious weeds, California's agriculture can be impacted by a wide variety of invasive pests and pathogens. These pests pose significant threats to the state's agricultural crops, farm workers, economy, food supply and native habitat. They can also result in increases in food prices for consumers. The number of invasive pests and pathogens newly detected in California and the rest of the United States has increased at alarming rates in recent years, and that trend is projected to continue into the future (Morales-RodrÍguez et al., 2019).

Insect pests and diseases, such as bark beetles and sudden oak death disease (SOD), can destroy forests and oak woodland habitat located along the north-east and south west tips of Kings County, which can in turn increase the fuel load and lead to greater fire risk. Agricultural disasters could also occur due to severe weather events, such as extreme heat, freeze cycles, and heavy rainfall, hazards that are covered under Sections 4.5.6 through 4.5.15. Drought events are covered under Section 4.5.4.

Agricultural pest and disease management programs are administered at the state level in California, which provides important existing capacity related to minimizing and managing agricultural pests and diseases. The California Food and Agricultural Code mandates pest prevention programs to prevent the introduction and spread of pests in the state, fund such programs, and direct administration of the programs to the local municipalities. These include the Pest Exclusion Program, Pest Detection Program, Pierce's Disease Control Program, and Federal Phytosanitary Certificate Program. Target pests addressed by each program are listed in Table 4-12, and also include dairy, livestock, and poultry pests and diseases, such as Mycobacterium bovis and pathogenic avian influenzas.

Table 4-12 Target Pests Kings County

PEST	TYPE OF TRAP	NUMBER OF TRAPS	NUMBER OF SERVICINGS
All Purpose Fruit Fly	Champ	116	1,030

PEST	TYPE OF TRAP	NUMBER OF TRAPS	NUMBER OF SERVICINGS
Asian Citrus Psyllid	Yellow Panel	272	4,007
European Corn Borer	Pherocon II	13	130
European Grape Vine Moth	Delta	501	4,374
European Pine Shoot Moth	Pherocon II	5	12
Glassy-Winged Sharpshooter	Yellow Panel	173	863
Spongy Moth	Delta	76	561
Japanese Beetle	Japanese Beetle	76	561
Light Brown Apple Moth	Jackson	152	810
Mediterranean Fruit Fly	Jackson	152	20,93
Melon Fly	Jackson	152	656
Mexican Fruit Fly	McPhail	98	2,351
Oriental Fruit Fly	Jackson	152	1,983
Total		**1,952**	**24,250**

Source: Kings County Department of Agriculture 2021 Crop Report

4.5.1.2 Geographic Area

Extensive – According to the 2017 Census of Agriculture, the County contains 615,958 acres of land in farms. There are approximately 963 farms (as of 2017) in the County. Most of these important farmlands are located within the County's unincorporated area and are currently zoned for agricultural use. Figure 4-5 illustrates the geographic extent of the important farmlands across the County.

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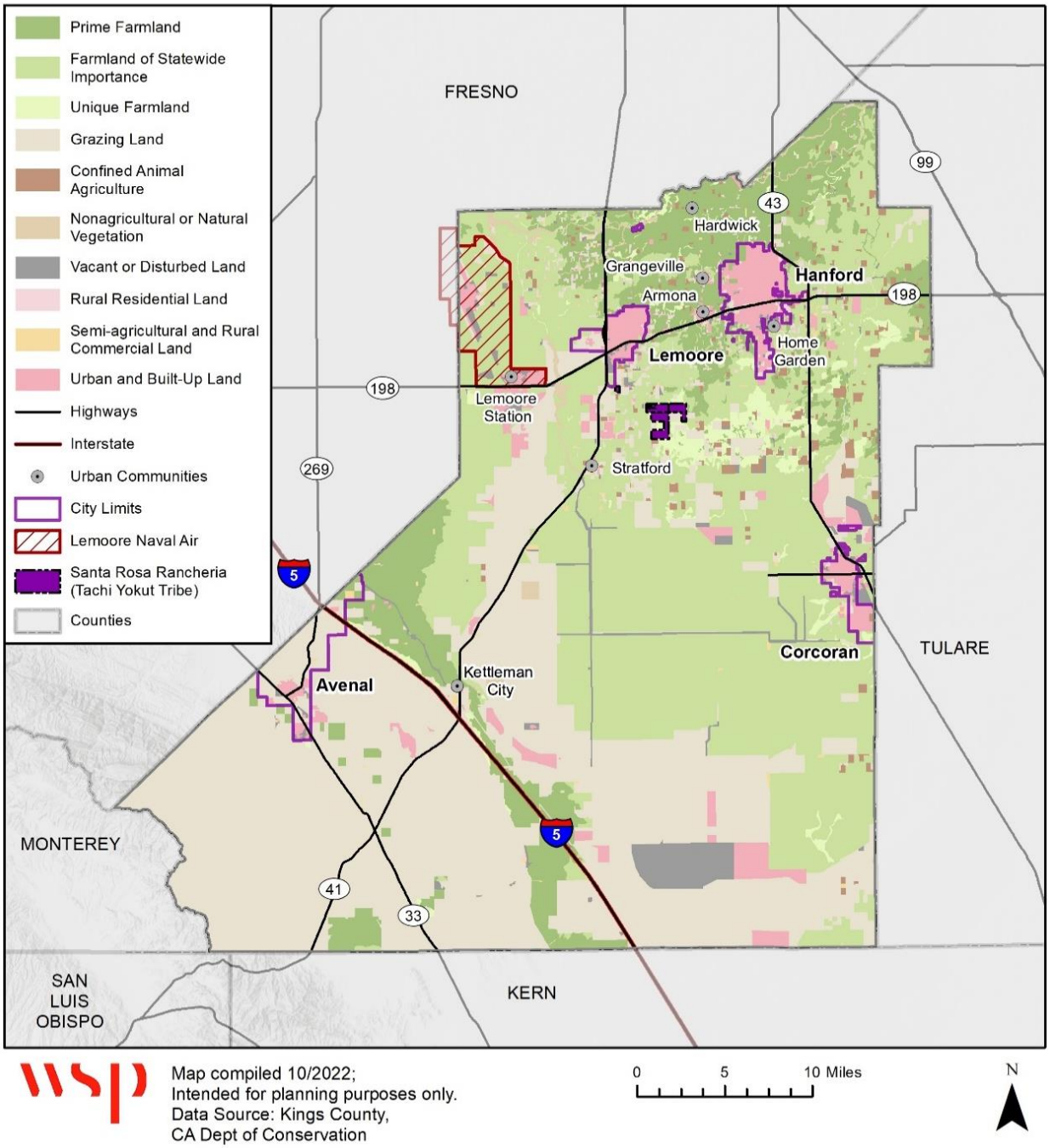
Figure 4-5 Kings County Important Farmland



4.5.1.3 *Past Occurrences*

The USDA Risk Management Agency (RMA) tracks insurance payments, or indemnities, made to farmers as a safety net against natural hazards, such as drought and agricultural disease. Between the years of 2007 and 2021, 8,444 acres of USDA insured crops were lost in Kings County due to agricultural pest and disease, resulting in over $3 million in indemnity payments. Of these payments, $1.1 million and 3,478 acres were due to insect damage, $1.9 million and 3,734 acres were due to plant disease, and $1,231 and 1,232 acres were due to wildlife damage. Table 4-13 summarizes these agricultural losses.

Table 4-13 Crop Losses due to Agricultural Pests and Disease, 2007-2021

COMMODITY YEAR	COMMODITY NAME	DAMAGE CAUSE DESCRIPTION	DETERMINED ACRES	INDEMNITY AMOUNT
2007	Wheat	Wildlife	1,231.9	$47,681
2007	Tomatoes	Insects	30.4	$1,997
2007	Plums	Insects	13.0	$5,718
2008	Cotton	Insects	99.8	$29,179
2010	Cotton	Insects	73.1	$29,845
2010	Cotton	Plant Disease	21.0	$3,522
2013	Tomatoes	Insects	867.3	$332,940
2013	Tomatoes	Plant Disease	1,221.7	$488,223
2013	Tomatoes	Plant Disease	1,534.2	$568,903
2014	Corn	Insects	240.0	$83,952
2015	Tomatoes	Insects	526.2	$77,887
2015	Tomatoes	Plant Disease	77.2	$178,326
2015	Tomatoes	Plant Disease	227.8	$182,791
2015	Alfalfa Seeds	Insects	160.0	$50,652
2017	Cotton	Insects	1,075.9	$357,251
2018	Tomatoes	Plant Disease	146.9	$36,124
2019	Wheat	Plant Disease	126.4	$8,342
2020	Onions	Plant Disease	229.3	$386,723
2020	Tomatoes	Plant Disease	149.3	$91,078
2021	Cotton	Insects	302.5	$113,301
2021	Cotton	Insects	90.2	$7,200
Total			8,443.9	$3,081,635

Source: USDA RMA Crop Indemnity Reports, 2007-2021

4.5.1.4 Likelihood of Future Occurrence

Likely – Based on past occurrences of economic impacts and implementation of control measures, and the likely increase in pest activity outlined in the Climate Change Considerations section below, pests, disease, and invasive species will continue to present a constant threat to the County and its jurisdictions. These events are anticipated to be influenced by a changing climate and therefore expected to occur on an annual basis or have a 100% chance of occurring each year.

4.5.1.5 Climate Change Considerations

California's Fourth Climate Change Assessment (2018) notes that "climate change impacts terrestrial ecosystems and wildlife in multiple ways, including invasion by exotic species, prevalence of wildlife disease, and loss of native habitats." Changing climate conditions can impact viable living areas of species and cause migration, shifting the spread of pests and disease northward by changing habitat temperatures and making previously undesirable habitats welcoming for new species, while also lengthening habitable seasons (Bedsworth et al, 2018). Longer growing seasons may also allow agricultural pests to persist longer, which can increase the severity of infestations on agricultural operations.

4.5.1.6 Magnitude and Severity

Critical – Pests can impact a multitude of crops in different ways. While there is no scale to define the extent of an infestation, a pest could have a major economic impact on the value of infested crops.

Another large factor that may influence crop yield is the spread of invasive plants, which may compete with crops for resources and, in some cases, also introduce pests. According to the California Invasive Plant Council (Cal-IPC), invasive plants cost California $82 million every year in control, monitoring, and outreach (Cal-IPC, n.d.). Based on the USDA's RMA Crop Indemnity Reports, in the County between 2007 and 2021, there were 8,443 acres lost due to agricultural pests and disease and $3.1 million in indemnity payments made. This results in an annualized loss of 603 acres and $220,116 due to agricultural pests and disease.

4.5.1.7 Vulnerability Assessment

Agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, floods, hail, freeze, and drought. The California SHMP attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations (Cal OES 2018). Other agricultural hazards include fires, crop and livestock disease, noxious weeds, and contamination of animal food and water supplies.

People

A widespread infestation of livestock and crops could result in severe consequences to the economic base of the County and its communities employed by the agriculture industry. According to the USDA 2017 Census of Agriculture, the County has 963 farms, which is a -9% change from the previous census in 2012 (USDA 2017). While agricultural production in the County can enhance the economy, improve human health, and ensure stable food prices in California and the U.S., certain habitats established for irrigation and agricultural output can also threaten human health by increasing the risk of vector-borne diseases (e.g. mosquitos, etc.). Agricultural pests and disease, or significant crop losses, can also impact communities if they result in limited food supplies and rises in food prices. Widespread crop losses due to contamination issues (foreign agents, biological disease) could also decrease the public's confidence in food safety. Rural communities residing closest to these agricultural operations may be most vulnerable to these diseases.

Agricultural jobs could be negatively impacted during an agriculture emergency, including jobs tangentially tied to the agriculture industry. According to *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*, rising temperatures and drought conditions could lead to increases in the occurrence and transport of pathogens in agricultural environments, which will increase the risk of food contamination and direct human exposure to pathogens and toxins (USGCRP 2016). In turn, this will increase health risks and require greater vigilance in food safety practices and regulation.

Property

An infestation of agriculture pests or disease can lead to a range of negative consequences on property, including decreased crop yields and the potential destruction of entire fields along with farmland property. However, the impact of damaged crops and plants goes beyond these direct effects and may exacerbate the impacts of other hazards, such as severe weather. For instance, dead branches resulting from pest or disease damage can easily be broken by high winds during a storm, posing a risk of property damage and harm to people.

Critical Facilities and Lifelines

Critical facilities assessed in this plan would not be directly impacted by agricultural pests or diseases; however, the food and agriculture industry is considered critical infrastructure in the County and California. Impacts to this infrastructure, such as farms, dairy operations, and processing facilities would have debilitating effects on food security, the economy, and public health and safety. The County farms and dairies, and the associated food processing facilities, would be directly impacted economically by long-term disruptions in the food supply associated with crop losses due to agricultural pests and disease.

Economy

Economic impacts include both prevention, response and recovery costs. Given the contribution of agriculture to the local economy, pest impacts could be significant. The value of agricultural commodities noted at the beginning of this hazard profile is $2,424,497,000 ($2 billion). Based on a hypothetical loss of 5% due to agricultural pest or disease, Kings County could equate to approximately $121 million in total economic losses to agricultural pests and disease.

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Cultural, Historic and Natural Resources

Invasive species typically harm native species through predation, habitat degradation and competition for shared resources. They can outcompete native species and are a leading cause of population decline and extinction in animals. Tree mortality raises the wildfire threat in healthy forests, increasing the vulnerability, strength, speed and destruction of fires in the area. Significant crop failures can also result in impacts on the environment if they result in contamination or the need for groundwater or surface water monitoring.

Development Trends

While the USDA RMA has made several indemnity payments for damaged crops in the County, there have been no USDA disaster declarations due to agricultural pests or disease. Good development practices and the ongoing implementation of policies included in the County's Resource Conservation Element and Open Space Element have had a positive impact on the County's vulnerability to agricultural pests, plant diseases, and tree mortality.

4.5.1.8 Risk Summary

- Kings County's farming and agricultural industry is ranked as one of the top agriculture-producing counties in California and the country.
- Agriculture is the dominant land use in Kings County, accounting for 90.2% of all land.
- Invasive plants cost California $82 million every year in control, monitoring and outreach.
- Over 14 years, there were 8,443 acres lost due to agricultural pests and disease and $3.1 million in indemnity payments made in Kings County.
- Changes in weather patterns can have dramatic impacts on the ecosystem, including agriculture systems, and more severe impacts associated with agricultural pests and disease can be expected in the future.
- Changing climate conditions can shift the spread of pests and disease northward by changing habitat temperatures and making previously undesirable habitats welcome new species through longer growing seasons. This may increase the severity of pest infestations on agricultural operations.
- Related hazards – Drought, Severe Weather

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Likely	Critical	Medium	No
City of Avenal	Extensive	Likely	Critical	Medium	No
City of Corcoran	Extensive	Likely	Critical	Medium	No
City of Hanford	Extensive	Likely	Critical	Medium	No
City of Lemoore	Extensive	Likely	Critical	Medium	No

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4.5.2 CYBER-ATTACK

4.5.2.1 Hazard Description

The 2018 California SHMP defines cyber attacks as "attempts by cyber criminals to attack a government, organization, or private party by damaging or disrupting a computer or computer network, or by or stealing data from a computer or computer network for malicious use." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attack is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks. Cyber threats can take many forms, including:

- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. They typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit individuals into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks**: Malware is malicious code that may infect a computer system. It typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.
- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Distributed Denial of Service (DDoS) attack:** Perhaps the most common type of cyber attack, a DDoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DDoS typically uses other infected systems and internet-connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.
- **Data breach:** Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.
- **Critical Infrastructure/SCADA System attack**: There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

Cyber-attacks are rapidly increasing in the United States. The FBI Internet Crime Complaint Center (IC3) was developed to provide the public with a direct way to report cyber crimes to the FBI. In 2021, the FBI IC3 reported a record number of cyber-attacks, with a 7% increase from 2020 (FBI, 2022). The events reported to the FBI are used to track the trends and threats from cyber criminals to combat cyber threats and protect U.S. citizens, businesses, and government from future attacks.

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

4.5.2.2 Geographic Area

Significant – Cyber-attacks can and have occurred in every location regardless of geography, demographics, and security posture. Anyone with information online is vulnerable to a cyber-attack. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within the County. All servers in the County are potentially vulnerable to cyber-attacks. Businesses, industries, and even individuals are susceptible to cyber-attacks. Therefore, the geographic extent of cyber-attack is significant.

4.5.2.3 Past Occurrences

According to the FBI's *2021 Internet Crime Report*, the FBI received 2.76 million complaints with $18.7 billion in losses over the last five years due to cyber-attacks (FBI 2022). The *Crime Report* also noted a trend of increasing cybercrime complaints and losses each year. Nationwide losses in 2021 alone exceeded $6.9 billion, a 393% increase since 2017. According to the 2021 Report, California ranked the top among all US territories in both the total number of victims (67,095 victims) and total victim losses ($1,227,989,139) in total losses (FBI 2022).

Data on past cyber-attacks impacting California was gathered from The Privacy Rights Clearinghouse. The Privacy Rights Clearinghouse, a non-profit organization based in San Diego, maintains a timeline of 9,741 data breaches resulting from computer hacking incidents in the United States from 2005-2021. The database lists 1,338 data breaches against systems located in California totaling almost 10.4 billion impacted records; it is difficult to know how many of those affected residents in the County. According to

Privacy Rights Clearinghouse, there is one specific incident that happened to the Yanez Dental Corporation located in the City of Hanford on September 19, 2011: an office burglary resulted in the loss of three computers with patient information such as patient names, social security numbers, dates of birth, addresses, telephone numbers, and other personal information being exposed.

Moreover, attacks happening outside of the County and California can also impact local businesses, personal identifiable information, and credit card information. Figure 4-6 shows several of the most significant cyber-attacks in California in recent years. All top five cyber attack events are businesses hacked by an outside party or infected by malware. The data aims to provide a general understanding of the impacts of cyber-attacks by compiling an up-to-date list of incidents but is limited by the availability of data: "This is an incomplete look at the true scope of the problem due in part to varying state laws", as noted by The Privacy Rights Clearinghouse.

Table 4-14 Major Cyber Attacks Impacting California (10,000,000,000+ Records), 2005-2021

DATE REPORTED	TARGET	CITY	ORG.TYPE	TOTAL RECORDS	TYPE OF ATTACK
12/14/2016	Yahoo	Sunnyvale	Business	3 billion	Hacked by an Outside Party or Infected by Malware
9/22/2016	Yahoo	Sunnyvale	Business	500 million	Hacked by an Outside Party or Infected by Malware
11/16/2016	FriendFinder	Sunnyvale	Business	412 million	Hacked by an Outside Party or Infected by Malware
5/31/2016	MySpace	Santa Monica	Business	360 million	Hacked by an Outside Party or Infected by Malware
6/6/2012	LinkedIn	Mountain View	Business	167 million	Hacked by an Outside Party or Infected by Malware

Source: The Privacy Rights Clearinghouse

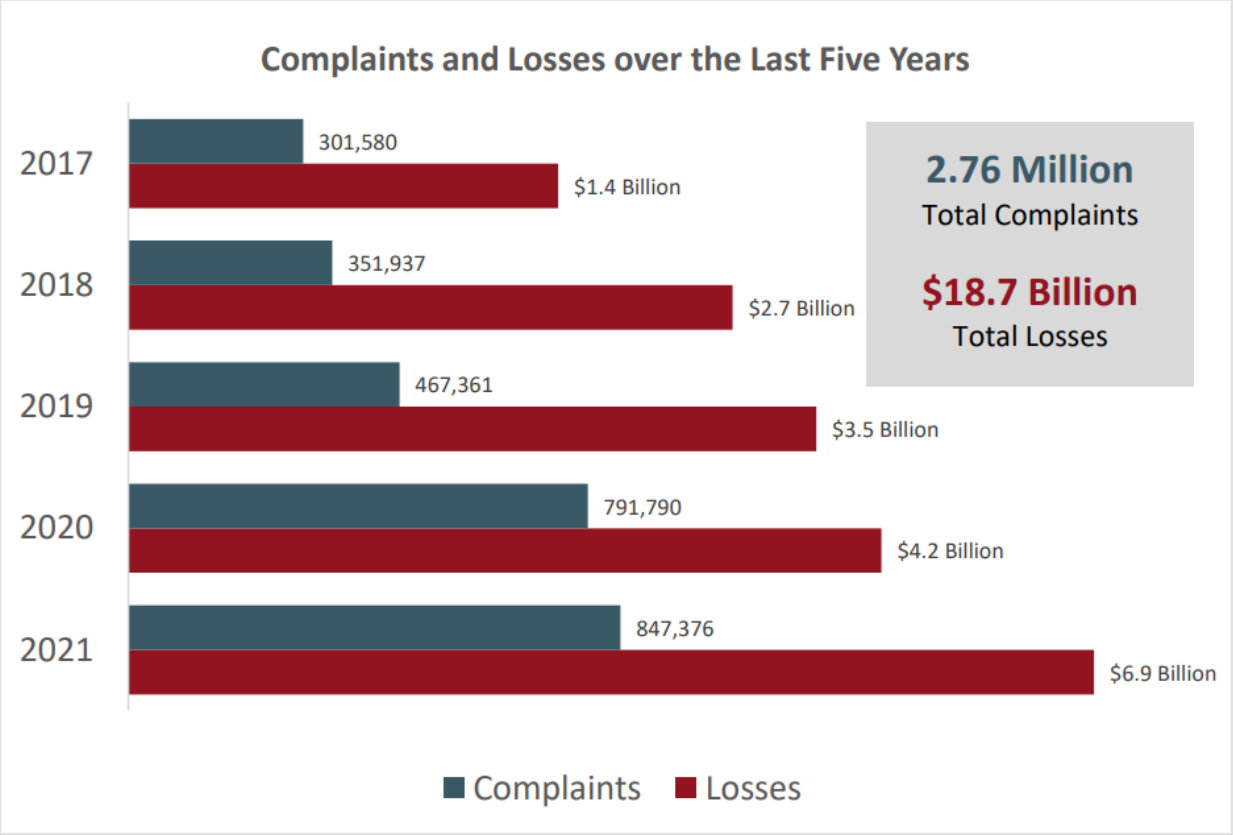
In addition to the incident with the City of Hanford, a data breach incident happened with Kings County's Public Health Department regarding COVID-19 data and individuals' information. The County determined via investigation that the breach was due to an error made by an external contractor. The error existed on the County's public web server from February 15, 2021, until it was fully corrected on December 2021. The Department did not exclude the possibility that some individuals' data also ended up online as a result of the breach. That data could include names, dates of birth, addresses, and COVID-19 related information (Zhadan, 2022).

Moreover, recent years have seen an increase in ransomware attacks, particularly against local government systems. The City of Atlanta was hit by a major ransomware attack in 2018, recovery from which ended up costing a reported $2.6 million, significantly more than the $52,000 ransom demand. A similar attack against the City of Baltimore in 2019 affected the city government's email, voicemail, property tax portal, water bill, and parking ticket payment systems, and delayed more than 1,000 pending home sales. In March 2019, Orange County, North Carolina was attacked with a ransomware virus, causing slowdowns and service problems at key public offices such as the Register of Deeds, the Sheriff's Office, and County libraries. The attack impacted a variety of county services, including disrupting the County's capability to process real estate closings, issue marriage licenses, process fees or permits, process housing vouchers, and verify tax bills. These past events are examples of the range of risks posed to county and municipal governments by various cyber attacks.

4.5.2.4 Likelihood of Future Occurrence

Occasional – Small-scale cyber-attacks such as DDoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services. Additionally, the FBI *Internet Crime Report 2021* found that there is a trend of increasing cyber-attacks over the past 5 years. These trends are shown in Figure 4-6.

Figure 4-6 Trends of the Frequency of Cyber-attacks, 2017-2021



Source: The FBI Internet Crime Report 2021

Perhaps of greatest concern to the County are ransomware attacks, which are becoming increasingly common. It is difficult to calculate the odds of the County or one of its jurisdictions being hit with a successful ransomware attack in any given year, but it is likely to be attacked in the coming years. The possibility of a larger disruption affecting systems within the County and even California is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in Kings County cannot be ruled out. Therefore, the probability of future cyber-attack is Occasional.

4.5.2.5 Climate Change Considerations

There are no known effects of climate-induced impacts on cyber attacks.

4.5.2.6 Magnitude and Severity

Critical – There is no universally accepted scale to explain the severity of cyber-attacks. The strength of a DDoS attack is often explained in terms of a data transmission rate. One of the largest DDoS disruptions ever, known as the Dyn Attack which occurred on October 21, 2016, peaked at 1.2 terabytes per second and impacted some of the internet's most popular sites, including Amazon, Netflix, PayPal, Twitter, and several news organizations.

Data breaches are often described in terms of the number of records or identities exposed. The largest data breach ever reported occurred in August 2013, when hackers gained access to all three billion Yahoo accounts. The hacking incidents associated with California in the Privacy Rights Clearinghouse database mentioned above are also showing big-scale incidents, where billions of records have been stolen.

Ransomware attacks are typically described in terms of the amount of ransom requested, or the amount of time and money spent to recover from the attack. One report from cybersecurity firm Emsisoft estimates the average successful ransomware attack costs $8.1 million and can take 287 days to recover from (Emsisoft, 2022). Therefore, the Magnitude and Severity of cyber-attack is Critical.

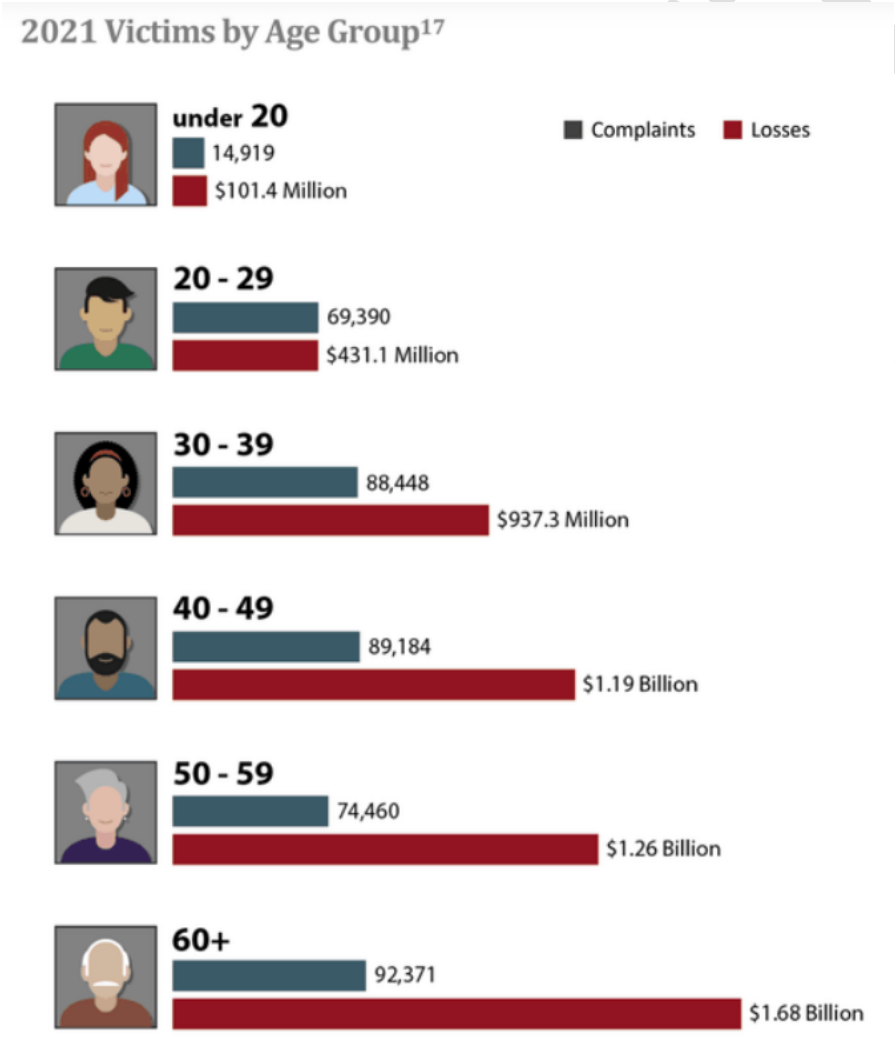
4.5.2.7 Vulnerability Assessment

People

Injuries or fatalities from cyber-attacks would generally only be possible from a major cyber-terrorist attack against critical infrastructure. More likely impacts on the public are financial losses and an inability to access systems such as public websites and permitting sites. Indirect impacts could include interruptions to traffic control systems or other infrastructure.

The FBI IC3 reports on the victims of cyber-attack by age group. While the number of cyber-attack complaints is comparable across age groups, the losses increase significantly as age group increases, with individuals 60 years and older experiencing the greatest losses. This is likely due to seniors being less aware of cyber threats, lacking the tools to identify cyber threats, and "Grandparent Scams", which is a cyberattacks where criminals impersonate a loved one in need, such as a grandchild, and ask for money. In the County, 15.4% of the population was reported to be 60+ in 2021 according to the U.S. Census. Figure 4-7 displays the breakdown of victims by age group in 2021.

Figure 4-7 Victims by Age Group in 2021



Source: The FBI Internet Crime Report 2021

Property

Most cyber-attacks affect only data and computer systems and have minimal impact on general property. However, sophisticated attacks have occurred against the SCADA systems of critical

infrastructure, which could potentially result in system failures on a scale equal to natural disasters. Facilities and infrastructure such as the electrical grid could become unusable. A ransomware attack on the Colonial Pipeline in 2021 caused temporary gas shortages on the East Coast (Colonial Pipeline Company 2021). A cyber-attack took down the power grid in Ukraine in 2015, leaving over 230,000 people without power (Zetter 2016). The 2003 Northeast Blackout, while not the result of a cyber-attack, caused 11 deaths and an estimated $6 billion in economic loss (Owens 2020).

Critical Facilities and Lifelines

A Government Technology article posted on July 31, 2022, highlights the increasing global cyber battles, despite the lack of major cyber attacks against U.S. critical infrastructure in 2022 (Lohrmann 2022). This is a growing concern as cyber actions worldwide become less covert. IBM's 2022 *Cost of a Data Breach* reveals that almost 80 percent of critical infrastructure organizations studied do not adopt zero-trust strategies, resulting in an average breach cost of $5.4 million, a $1.17 million increase compared to those that do. Additionally, 28 percent of breaches amongst these organizations were ransomware or destructive attacks (IBM 2022).

The impact of cyber-attacks on critical infrastructure can be devastating. For example, emergency response communications, access to mobile data terminals, and access to critical pre-plans and response documents can be disrupted. According to the Cyber & Infrastructure Security Agency (CISA), cyber risks to 911 systems can have severe impacts, including loss of life or property, job disruption for affected network users, and financial costs for the misuse of data and subsequent resolution. CISA has compiled a recent list of attacks on 911 systems, including a DDoS attack in Arizona, unauthorized access with stolen credentials in Canada, a network outage in New York, and a ransomware attack in Baltimore (CISA 2019).

Governments rely heavily on the electronic delivery of services, which can be significantly impacted by cyber-attacks. Most agencies rely on server backups, electronic backups, and remote options for Continuity of Operations and the Continuity of Government. Access to documents on the network, OneDrive access, and other operations that require collaboration across the County could be significantly impacted.

Furthermore, if systems such as permitting, Department of Motor Vehicles (DMV), voting, or public websites are down for a prolonged amount of time, public confidence in the government will likely suffer. An attack could raise questions regarding the security of using electronic systems for government services. Therefore, it is crucial to prioritize cyber security measures and adopt a zero-trust strategy to ensure the protection of critical infrastructure and electronic government services.

Economy

Data breaches and subsequent identity thefts can have huge impacts on the public. The FBI *Internet Crime Report 2021* reported losses in California due to cyber-attacks totaled over $1.2 billion in 2021 alone (FBI 2021).

Economic impacts from a cyber-attack can be debilitating. The cyber-attack in 2018 that took down the City of Atlanta cost at least $2.5 million in contractor costs and an estimated $9.5 million in additional funds to bring everything back online. The attack in Atlanta took more than a third of the 424 software programs offline and recovery lasted more than 6 months (Newman 2018). The 2018 cyber-attack on the Colorado Department of Transportation cost an estimated $1.5 million (Chuang 2018). None of these statistics consider the economic losses to businesses and ongoing IT configuration to mitigate a future cyber-attack.

Additionally, a 2016 study by Kaspersky Lab found that roughly one in five ransomware victims who pay their attackers never recover their data. A 2017 study found ransomware payments over a two-year period totaled more than $16 million (Huang et al. 2017). Even if a victim is perfectly prepared with full offline data backups, recovery from a sophisticated ransomware attack typically costs far more than the demanded ransom.

Cultural, Historic and Natural Resources

Most cyber incidents have little to no impact on historic, cultural, or natural resources. A major cyber terrorism attack could potentially impact the environment by triggering a release of hazardous materials, or by causing an accident involving hazardous materials by disrupting traffic control devices.

Most cyber-attacks would have a limited impact on natural resources. There are cases, such as a cyber-attack on a hydroelectric dam, that could result in catastrophic consequences to natural and human-built environments in the case of a flood. If a cyber-attack occurred on several upstream dams and released significant amounts of water downstream, the additional pressure put on downstream dams could fail, resulting in massive flood events. This would not only jeopardize the energy system that relies on these dams but also cause significant damage to the natural environment.

Development Trends

Changes in development have no impact on the threat, vulnerability, and consequences of a cyber-attack. Cyber-attacks can and have targeted small and large jurisdictions, multi-billion-dollar companies, small mom-and-pop shops, and individual citizens. The decentralized nature of the internet and data centers means that the cyber threat is shared by all, regardless of new construction and changes in development.

4.5.2.8 Risk Summary

- The overall significance of cyber attacks in Kings County is **Medium**. These incidents occur frequently, with California being the State with by far the most reported incidents. The possibility of an attack of any scale impacting the County is almost certain.
- There have been 9,741 data breaches statewide over a 17-year period, averaging approximately 573 incidents per year, or up to 48 incidents each month.
- Nationwide the increase in cyber attacks has been dramatic year over year. As this trend continues it is safe to assume there is a threat to Kings County.
- People ages 60+ are the most likely age group to experience the greatest monetary losses, although anyone of any age can be a victim of a cyber-attack
- The vast majority of attacks do not affect properties or cause casualties.
- Economic impacts from a cyberattack can be debilitating, sometimes costing local governments millions of dollars.
- The vast majority of attacks target only computer systems, however sophisticated attacks against utilities and infrastructure, such as electrical grids, have occurred.
- Related hazards: None
-

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Significant	Occasional	Critical	Medium	Yes
City of Avenal	Significant	Occasional	Critical	Medium	Yes
City of Corcoran	Significant	Occasional	Critical	Medium	Yes
City of Hanford	Significant	Occasional	Critical	Medium	Yes
City of Lemoore	Significant	Occasional	Critical	Medium	Yes

4.5.3 DAM INCIDENTS

4.5.3.1 Hazard Description

Dam failure is the breakdown, collapse or other failure of a dam structure characterized by the uncontrolled release of impounded water that results in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage to development downstream. An uncontrolled breach is the unintentional discharge from the impounded water body and is considered a failure. Dam failure can result from natural events or human-induced events. Dams have received more attention recently in the emergency management community as a potential target for terrorist acts.

Dams are built for a variety of uses, including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States (Jamal 2017). Dam failures can also result from any one or a combination of the following causes:

- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts on life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects on roads, bridges, and homes. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure. The best way to mitigate dam failure is through the proper construction, inspection, maintenance, and operation of the dam.

Spillways are designed to relieve pressure on dams and prevent dam failures. Flooding downstream often results when spillways flow, though the potential for flooding as a result of discharge from dam outlet structures can also result from excessive rain events. However, controlled releases of water from dams is a measure that can prevent or minimize spillway flooding or structure failure, by regulating capacity in a managed way. Even controlled releases can lead to unwanted or unpredicted flooding, depending on environmental and weather conditions, or even human error.

In general, there are three types of dams: concrete arch or hydraulic fill, earth-rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously: the flood wave builds up rapidly to a peak and then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach: the downstream flood wave will build gradually to a peak and then decline until the reservoir is empty. And a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

4.5.3.2 Geographic Area

Significant – According to the California Department of Water Resources' (DWR) Jurisdictional Dams and the National Inventory of Dams (NID) databases, as well as the 2035 Kings County General Plan Safety Element and input received from the HMPC, there are 10 dams of concern to the County; seven of which are in the County and three are upstream of the County.

As shown in Figure 4-8, Pine Flat, Terminus and Schafer dams are high hazard dams; however, these three dams are not located within Kings County. The rest of the dams are low hazard dams. Figure 4-8 shows the location of these dams, except Terminus, Schafer, Pine Flat dams due to data confidentiality and the fact that they are located within Tulare and Fresno County. The potential inundation areas for all dams are not available, as the data is either not available in GIS or not allowed for release in a public document.

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Figure 4-9 is extracted from the 2035 Kings County General Plan Safety Element given information on Pine Flat Dam in no longer publicly available. As mentioned in the Safety Element, if Pine Flat Dam failed while at full capacity, its floodwaters would arrive in the County within approximately five hours. If Terminus Dam failed while at full capacity, its floodwaters would arrive in Kings County within approximately twelve hours. However, the chances of any of these dams failing while at full capacity are considered remote. As shown in Figure 4-8 Pine Flat Dam could inundate the majority of the County's northeastern portion, including the cities of Hanford and Lemoore, as well as urban communities including Hardwick, Grangeville, Armona, Home Garden and Stratford. Terminus Dam's inundation area is relatively smaller – a small portion to the northeast of the County would be inundated. In addition, according to the HMPC's input during the 2022 Plan Update, the City of Corcoran mentioned that the Schafer dam on Lake Success in Tulare County has the potential to cause dam inundation flooding in the City of Corcoran. However, the dam inundation data is not available for Schafer dam to be shown on a map or used for vulnerability assessment.

Table 4-15 lists other dams of concern within or upstream of Kings County.

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Figure 4-8 Dams within Kings County

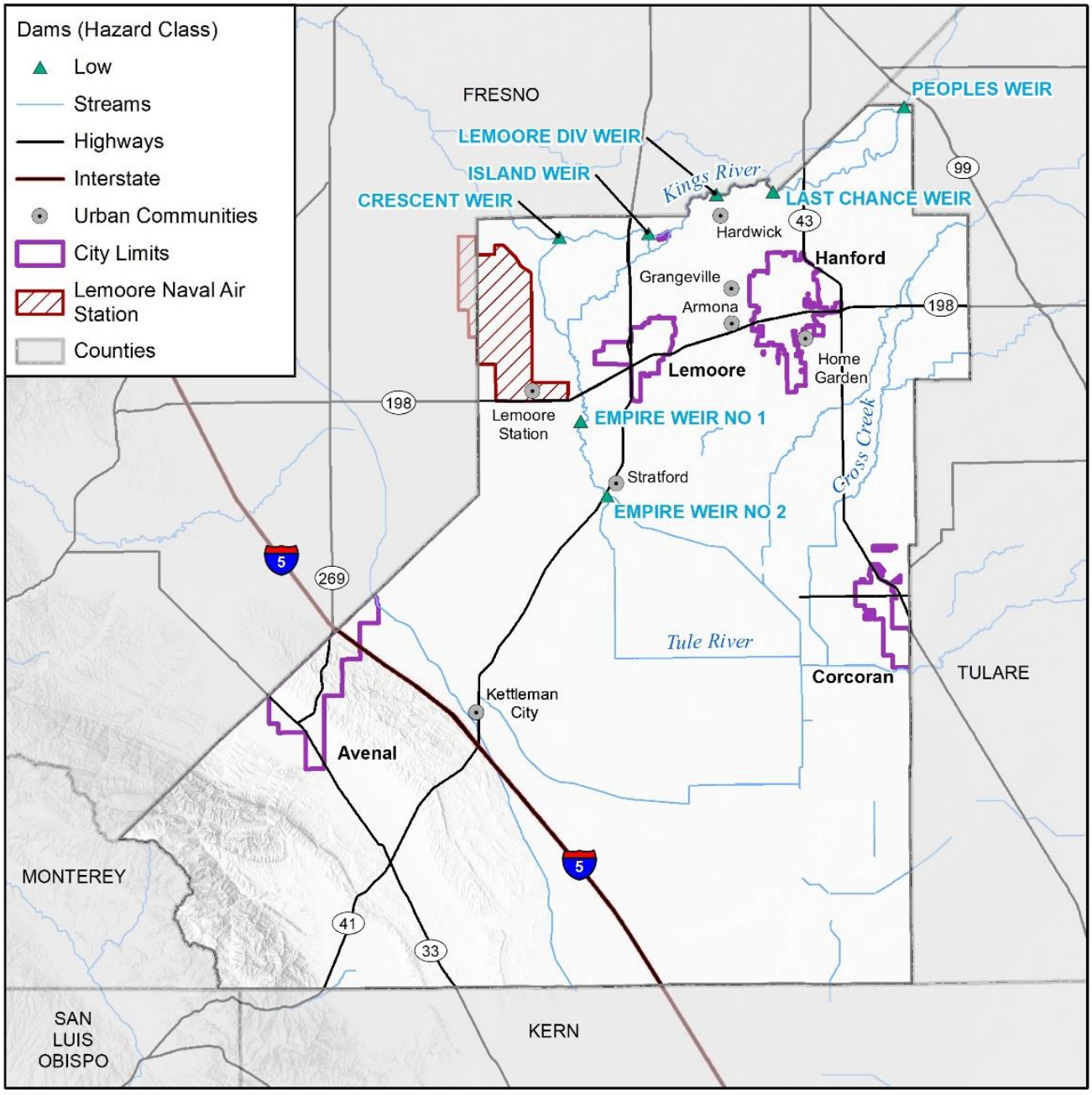
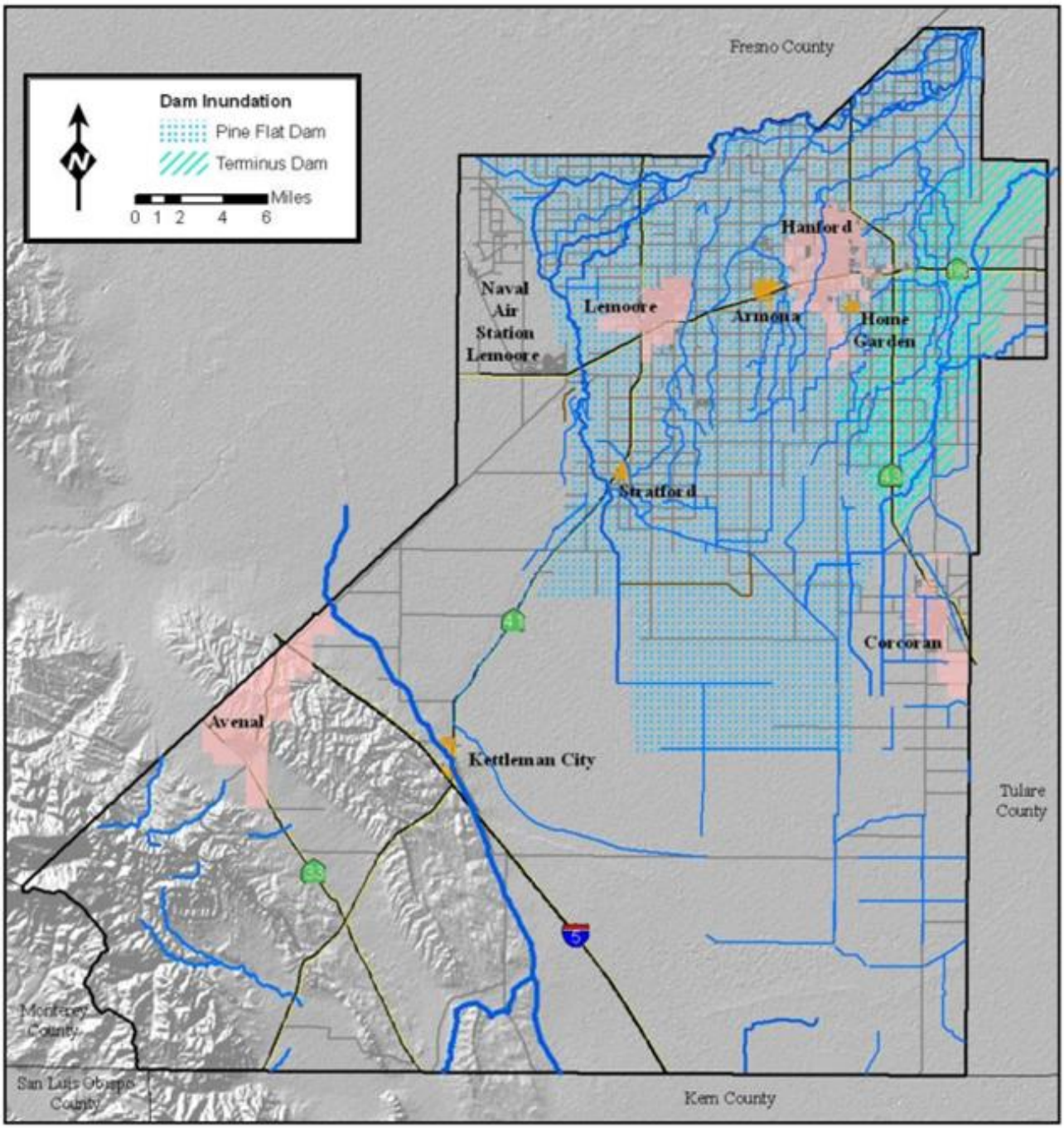


Figure 4-9 Pine Flat Dam and Terminus Dam Inundation Areas within Kings County



Source: Kings County 2010

Table 4-15 Dams of Concern Within and Upstream of Kings County

COUNTY	DAM NAME	DAM OWNER/OPERATOR	RIVER	DOWNSTREAM CITY	NORMAL STORAGE CAPACITY (ACRE-FEET)	EMERGENCY ACTION PLAN (EAP)?	NID HAZARD RATING	CA DSOD HAZARD RATING
Kings	Crescent Weir	Crescent Canal Company	-	-	50	Not Required	Low	Low
	Empire Weir No.1	Empire Westside Irrigation District	-	-	50	Not Required	Low	Low
	Empire Weir No.2	Tulare Lake Basin Water Storage District	-	-	480	Not Required	Low	Low
	Island Weir	Laguna Irrigation District	-	-	230	Not Required	Low	Low
	Last Chance Weir	Last Chance Water Ditch Company	-	-	50	Not Required	Low	Low
	Lemoore Diversion Weir	Lemoore Canal and Irrigation Company	-	-	50	Not Required	Low	Low
	Peoples Weir	Peoples Ditch Company	-	-	120	Not Required	Low	Low
Tulare	Terminus (in GP)	USACE – Sacramento District	-	-	235,205	Yes	High	N/A
	Schafer (Success Dam)	USACE – Sacramento District	Tule River	Porterville	65,473	Yes	High	N/A
Fresno	Pine Flat (in GP)	USACE – Sacramento District	Kings River	Hanford and Lemoore	1,000,000	Yes	High	N/A

Sources: California DSOD and the NID

As mentioned above, due to data limitations, analysis using inundation data and mapping associated with all dams was not possible for the plan, per communication with the Kings County Office of Emergency Services (OES) and the dam owners. As a result, the dam risk assessment does not quantify the entire risk to the County and the four participating jurisdictions in the event of a dam incident. However, these deficiencies have been noted and a qualitative summary of risk is provided instead.

4.5.3.3 Past Occurrences

There is no history of dam failure affecting the County. However, according to the HMPC's input during the 2023 MJHMP update, the City of Corcoran stated that Kings County has been a party of interest in Schafer dam and this dam has undergone retrofit and reinforcement for public safety. The March 2023 atmospheric river (AR) flash flooding demonstrated that flooding from Schafer dam can and did directly impact the City of Corcoran along the southeast portion of the City, including the directly adjacent two State Prison facilities that were protected by a portion of the Corcoran Levee along 4th Avenue between Quebec and Santa Fe Avenues.

4.5.3.4 Likelihood of Future Occurrence

Unlikely – The County remains at risk of dam failures from numerous dams under a variety of ownership and control and of varying ages and conditions. However, based on historical experience, dam failure is unlikely in the area based on the frequency of past dam incidents. Dams are regulated and inspected by either the State of California's DSOD or the Federal Energy Regulatory Commission (FERC) or both with follow-up written inspection reports. All the dams within the County have received satisfactory condition assessments. There have been no findings that would raise concern for a potential dam failure. Nevertheless, given the number of dams of concern in the County, the potential exists for future dam failures in the County, but the likelihood of this is low. Uncontrolled or controlled release flooding as well as spillway flooding below dams due to excessive rain or runoff are more likely to occur than failures. For example, the March 2023 atmospheric river (AR) flash flooding resulted in flooding from Schafer dam over the southeast portion of the City of Corcoran.

In addition, the potential for climate change to affect the likelihood of dam failure is not fully understood. However, climate change will impact the traditional operation measures and flow regimes used for dams because river conditions and water levels will be fluctuating due to climate change.

4.5.3.5 Climate Change Considerations

As noted in an academic journal Combined Effects of Reservoir Operations and Climate Warming on the Flow Regime of Hydropower Bypass Reaches of California's Sierra Nevada, which was published on March 24, 2014, climate warming will measurably alter some aspects of the flow regime (Rheinheimer and Viers, 2015). An article published at the Yale School of the Environment also notes that more evidence shows that climate change undermines the case for hydroelectric dams. Drought has caused reservoirs on five continents to drop below the levels needed to maintain hydroelectric production. Moreover, the article points out that climate change has caused vast uncertainty in flow assumptions, which resonates with the conclusions drawn by the 2014 journal article (Leslie 2021). Climate change may worsen drought conditions, which lessen the water available while climate change can also produce intense sudden storms that cause water levels to suddenly increase. Therefore, reservoir operators may need to change operations to mitigate climate change's impact on rivers and overall water levels.

However, the universal consensus is that the potential for climate change to affect the likelihood of dam failure is not fully understood. With a potential for more extreme precipitation events as a result of climate change, this could lead to large inflows into reservoirs. However, this could be offset by generally lowering reservoir levels if storage water resources become more limited or stretched in the future due to climate change, drought and/or population growth.

4.5.3.6 Magnitude and Severity

Critical – Standard practice among federal and state dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or mis-operation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental and lifeline facilities. The U.S. Army Corps of Engineers uses three categories to classify a dam's potential hazard to life and property:

- High hazard indicates that a failure would most probably result in the loss of life.
- Significant hazard indicates that a failure could result in appreciable property damage.

- Low hazard indicates that failure would result in only minimal property damage and loss of life is unlikely.
- Undetermined hazard dams have not been rated or their hazard rating is not known.

In addition to these, high, significant, and low hazard classifications the California Division of Safety of Dams (DSOD) adds the fourth category of "*Extremely High*". The DSOD defines this fourth category as "expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more" (DSOD 2020). As shown in Table 4-15 none of the dams are classified as "Extremely High". However, it is important to note that there is no DSOD rating available for Terminus and Pine Flat dams.

Although most of the dams are rated low significance and can only result in minimal property damage and loss of life, Pine Flat dam can inundate a significant portion of the County. The extent of the impact depends on the nature of the failure. The largest populations potentially at risk would be in the cities of Hanford and Lemoore, as well as urban communities including Hardwick, Grangeville, Armore, Home Garden and Stratford.

A severe storm, earthquake or erosion of the embankment and foundation leakage may cause the collapse and structural failure of dams in the County or other nearby counties. Seismic activity may also cause inundation by the action of a seismically induced wave that overtops the dam without causing failure of the dam, but significant flooding downstream. Landslides flowing into lakes and reservoirs may also cause dams to fail or overtop.

4.5.3.7 Vulnerability Assessment

A dam incident can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas and populations subject to inundation downstream of the facility. Secondary losses would include the loss of the multi-use functions of the dam itself and the associated revenues that accompany those functions.

Property

In the unlikely event of a complete dam failure, the majority of the populated areas within the northeastern portion of Kings County would be impacted. Inundation due to dam failure within the San Joaquin Valley is a low-probability but high-risk hazard. The potential risk for the inundation of property is present in nearly all of the developed areas in the County's northeastern portion. However, this potential risk is limited to only Pine Flat dam. The other low-significance dams may cause localized flooding events if they were to breach.

In general, communities located below a high or significant hazard dam and along a waterway are potentially exposed to the impacts of a dam failure. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are typically produced for all high significant dams and included in the Emergency Action Plan (EAP) required for each dam. The FERC also requires annual training and exercises for each individual EAP. This would apply to both Terminus and Pine Flat dams.

Given that a GIS layer containing inundation maps for the dams of concern to Kings County is not available, a quantitative dam inundation exposure analysis was not performed. However, based on properties located within the cities of Hanford and Lemoore, urban communities including Hardwick, Grangeville, Armore, Home Garden and Stratford, as well as the overall northeastern portion of the unincorporated County would be inundated if Pine Flat dam were to breach.

People

Persons located underneath or downstream of a dam are at risk of a dam failure, though the level of risk can be tempered by topography (specifically where populations are located within the inundation path of a dam), amount of water in the reservoir and time of day of the breach. Injuries and fatalities can occur from debris, bodily injury, and drowning. Once a dam has breached, standing water presents all the same hazards to people as floodwater from other sources. People in the inundation area may need to be evacuated, cared for, and possibly permanently relocated. Impacts could include thousands of evacuations and likely hundreds of casualties, depending on the dam involved.

The populations most vulnerable are those that have the least time to evacuate and need assistance. Populations that may need assistance to evacuate include the elderly, disabled and young. The vulnerable population also includes those who may not have adequate warning about evacuation from

emergency notification systems. The loss of life is impacted by the amount of early warning time first responders and the public have prior to the incident.

Given that Pine Flat dam could inundate the cities of Hanford and Lemoore, urban communities including Hardwick, Grangeville, Armore, Home Garden and Stratford, as well as the overall northeastern portion of the unincorporated County, people that live in these areas are then at risk of potential breaching events. Many of these communities were also identified as socially vulnerable due to income levels and higher housing burdens.

The central and southern portions of the County have the highest level of social vulnerability, while the central and southeastern portions of the County are located within Pine Flat and Terminus dams' inundation areas (FEMA 2023). There are also socially vulnerable census tracts located within the cities of Hanford and Lemoore, which are located within Pine Flat dam's inundation area. Therefore, socially vulnerable populations who live in these areas are exposed to a higher risk of dam inundation incidents.

Critical Facilities and Infrastructure

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical infrastructure. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Of particular risk would be roads and bridges that could be vulnerable to washouts, further complicating response and recovery by cutting off impacted areas. Impacts on cities would affect key infrastructure including hospitals, fire stations, clinics, and businesses.

Given that Pine Flat dam could inundate the cities of Hanford and Lemoore, urban communities including Hardwick, Grangeville, Armore, Home Garden and Stratford, as well as the overall northeastern portion of the unincorporated County, critical facilities located within these areas are then exposed to potential dam inundation events. In addition, as discussed above and mentioned by the HMPC, the two State Prison facilities located in the City of Corcoran and were protected by a portion of the Corcoran Levee along 4th Avenue between Quebec and Santa Fe Avenues, could be impacted if Schafer dam were to breach. The HMPC also expressed concern over the City of Corcoran's water treatment and wastewater treatment facilities that are not protected along the east from potential flooding events, which can result from Schafer Dam's potential overflow.

Economy

Extensive and long-lasting economic impacts could result from a major dam failure including the long-term loss of water in a reservoir after a failure event. As mentioned in the previous Agricultural Pests and Disease section, agriculture is the dominant land use in Kings County, accounting for 90.2% of total land use in the County. A major dam incident and loss of water from the associated reservoir could include direct business impacts on the agricultural industry, resulting in damages and indirect disruption of the local economy. Economic impacts related to agriculture in the unincorporated areas of the County would be the most severe. According to the *Kings County Agriculture Report* (2021), the value of agricultural commodities produced in Kings County was over $2.3 billion (Kings County 2021).

Cultural, Historic and Natural Resources

Dam failure effects on the environment would be similar to those caused by flooding from other causes. Water could erode stream channels and topsoil and cover the environment with debris. For the most part, the environment is resilient and would be able to rebound from whatever damages occurred, though this process could take years. However, historic and cultural resources could be affected just as housing or critical infrastructures would, were a dam to fail and cause downstream inundation that could further erode surfaces or cause scouring of structural foundations.

Development Trends

The areas located in the SOI for each incorporated jurisdiction are areas each city plans to grow into and are potentially slated for Development Trends. These areas should take into consideration potential impacts from dam failure risk upstream and should attempt to overlay the existing dam inundation maps with proposed Development Trends.

In the case of a dam failure, inundation would likely follow some existing FEMA-mapped floodplains, which contain development restrictions for areas in the 1% annual chance floodplain, but it could exceed those floodplains and affect areas that are not regulated for flood hazards. Also, of note is that development below a low or undetermined hazard dam could increase its hazard rating, while there are quite a few low hazard dams in the County. Finally, added development could compromise dams and

reservoir resources if populations depend on them for critical needs such as potable water during or after a dam failure event.

The County Board of Supervisors has maintained support for the preservation of agricultural resources through the adoption of the Open Space Element and Resource Conservation Element of the County's General Plan (2010). The County has implemented a "Right to Farm Ordinance" to recognize the right of farming operations to conduct necessary farming practices and activities throughout the County (Hanford Municipal Code 2001). The County General Plan also continues to maintain a priority for directing urban growth to the existing cities and community districts where urban-type development is better suited and can receive municipal services. This directive helps to promote coordinated orderly urban growth within the County and reduces the potential for premature conversion of agricultural land to other uses.

There has been no significant change in development in the unincorporated areas impacted by dam failure within the County since the last MJHMP update. According to the existing SOI data, the Development Trends areas of the cities of Lemoore and Hanford, as well as urban communities including Stratford, Armona and Home Garden are exposed to potential inundation events if Pine Flat and Terminus Dams were to breach. The Development Trends areas of the City of Corcoran are also exposed to potential inundation events if Schafer dam were to breach.

4.5.3.8 Risk Summary

- There are 10 dams of concern for the County. Seven are within the County (all are low significant) and three dams are upstream of the County (all are high hazard).
- Pine Flat, Terminus and Schafer Dams, which are located in Fresno and Tulare Counties, are rated high hazard potential and can inundate Kings County if they were to breach.
- Pine Flat Dam would inundate the cities of Hanford and Lemoore, urban communities including Hardwick, Grangeville, Armore, Home Garden and Stratford, as well as the overall northeastern portion of the unincorporated County if it were to breach. Properties and critical facilities that are located within these areas, as well as populations that reside in these areas, are exposed to the potential breaching event. Schafer dam could potentially inundate the eastern portion of the City of Corcoran.
- **Related Hazards** – Drought, Flood, Earthquake, Landslide, and Severe Weather.

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Significant	Unlikely	Critical	Medium	Yes
City of Avenal	Limited	Unlikely	Negligible	Low	No
City of Corcoran	Extensive	Unlikely	Critical	Medium	Yes
City of Hanford	Extensive	Unlikely	Critical	Medium	Yes
City of Lemoore	Extensive	Unlikely	Critical	Medium	Yes

4.5.4 DROUGHT

4.5.4.1 Hazard Description

A drought is a prolonged period of abnormally low rainfall or precipitation that causes a shortage of water, leading to a deficiency in water supply for plants, animals, and human activities in a particular region. It can also be defined as a condition of water scarcity that results from a lack of precipitation, high evaporation rates, and increased water usage, leading to a depletion of water resources in an area. Droughts can vary in severity and duration, and can have significant impacts on agriculture, ecosystems, and human communities.

According to the California DWR, a single year of dry weather typically does not qualify as a drought in California due to the state's comprehensive water supply infrastructure, which includes reservoirs, groundwater basins, and inter-regional conveyance facilities (DWR 2015). These systems help alleviate the effects of short-term dry periods for most users of water.

Identifying the onset of a drought is determined by how it impacts water users. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, many times over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. What qualifies as a drought for some water users in a particular area may not be considered a drought for others in different regions or with alternative water sources. Water suppliers may determine their water supply conditions using criteria such as rainfall and runoff, the amount of water in storage, or anticipated supply from a water wholesaler.

Drought can often be defined regionally based on its causes or effects:

- **Meteorological drought** is defined as a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.
- **Agricultural drought** occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought and can affect livestock and other dry-land agricultural operations.
- **Hydrological drought** refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snowpack, and lake, reservoir, and groundwater levels. There is usually a delay between a lack of rain or snow and noticeable water shortages in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag other drought indicators.
- **Socioeconomic drought** occurs when physical water shortages start to affect the health, well-being, and quality of life of people, or when the drought starts to affect the supply and demand of an economic product.

Drought can have secondary impacts. For example, drought is a major determinant of wildfire hazard, in that it creates a greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes. Drought is also an economic hazard. Significant economic impacts on California's agriculture industry can occur as a result of short- and long-term drought conditions; these include hardships to farmers, farm workers, packers, and shippers of agricultural products. The loss of hydroelectrical power generation may also occur during drought events due to the loss of hydroelectrical supply associated with lower reservoir levels and fewer water releases. In some cases, droughts can also cause significant increases in food prices for consumers due to shortages

Sustainable Groundwater Management Act (SGMA) of 2014

In January 2014, Governor Brown declared an emergency proclamation due to multiple years of drought. The proclamation called on citizens to reduce water use by 20 percent, with a subsequent Executive Order in April 2015 that directed urban water agencies to reduce water use by 25 percent. In September 2014, the Governor signed a three-bill package (California SBs 1168 and 1319, and Assembly Bill [AB] 1739), known as the Sustainable Groundwater Management Act of 2014 (SGMA). SGMA provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainably within the groundwater subbasins defined by the California DWR. Within the County, there are portions of four groundwater subbasins, Tulare Lake, Kaweah, Kings, and Westside Subasins, that are required

under SGMA to conduct sustainable groundwater management. Each of the four subbasins is required to develop and implement a Groundwater Sustainable Plan (GSP) by 2020 or 2022. Table 4-16 lists the GSAs in the County as well as their associated subbasins.

Table 4-16 Groundwater Sustainability Agencies in Kings County

SUBBASIN	GROUNDWATER SUSTAINABILITY AGENCY
Tulare Lake Subbasin	Southwest Kings GSA
	Tri-County Water Authority GSA
	El Rico GSA
	South Fork Kings GSA
	Mid-Kings River GSA
Kaweah Subbasin	Greater Kaweah GSA
Kings Subbasin	North Fork Kings GSA
Westside Subbasin	Westlands Water District GSA

Source: County of Kings Division of Water and Natural Resources

Drought Planning for Small Water Suppliers and Rural Communities

In September 2021, Governor Gavin Newsom signed Senate Bill 552, Drought Planning for Small Water Suppliers and Rural Communities (SB 552), into law. Under the bill, the State, its counties, and small water suppliers must meet requirements to ensure shared responsibility in preparing and acting in case of a drought event. The requirements of the law are as follows:

- Small water providers (those with fewer than 3,000 connections and serving fewer than 3,000-acre feet) are required to:
    - Have an abridged water shortage contingency plan by July 1, 2023,
    - Submit an annual report detailing their water supply conditions and usage by month, and
    - Upgrade their infrastructure to drought-resilient standards if necessary.
- DWR and the State Water Board have developed templates for abridged contingency plans for small suppliers on DWR's website: Drought Planning for Small Water Suppliers and Rural Communities (SB 552) (ca.gov)
- Counties are required to have a standing Drought Task Force that facilitates drought and water shortage preparedness for domestic wells, privately supplied homes within the county's jurisdiction(s), and small state water systems.[1] Additionally, the county is required to develop a plan that demonstrates potential drought and water shortage risks along with proposed short- and long-term solutions for small state and domestic wells within the county. Both of these requirements may be implemented as part of other existing committees and/or planning processes.
- The State is required to maintain and update the Water Shortage Vulnerability Tool to assist small water providers and counties in accessing information about drought, water shortage vulnerabilities, and risks. Additionally, DWR will coordinate with other state agencies to establish a standing drought and water shortage task force for California.

Urban Water Suppliers

Water suppliers who provide potable water for municipal purposes to more than 3,000 customers, or who supply more than 3,000 acre-feet of water annually, are defined as "urban water suppliers." Urban water suppliers in Kings County, summarized in Table 4-17, are subject to the Urban Water Management Planning Act and other requirements but are not subject to SB 552.

[1] Section 116275 (n) of the Health and Safety Code (Water Code §10609.51 subd. (m)): A state small water system is a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year. Kings County does not currently have any state small water systems.

Table 4-17 Urban Water Suppliers in Kings County

WATER SUPPLIER	SOURCE	# OF CONNECTONS	ACRE-FEET ANNUALLY	POPULATION SERVED
City of Hanford	Groundwater	18,438	11,714	62,127
City of Lemoore	Groundwater	7,305	7,413	27,038
City of Corcoran	Groundwater	3,548	5,708	21,835
City of Avenal	Surface water from the California aqueduct	2,080	3,500	13,819
Lemoore Naval Air Station	Surface water from the CA aqueduct and groundwater	1,396	3,055*	14,000

- Sources: https://sdwis.waterboards.ca.gov/, City of Hanford 2020 UWMP, City of Lemoore 2020 UWMP, City of Corcoran 2020 UWMP, City of Avenal 2016 USBR Water Management Plan
  * 2004 data, from https://energy.wsu.edu/Documents/LemooreREMCaseStudy.pdf

Small Water Suppliers

SB 552 defines a small water supplier as a community water system[2] that serves 15 to 2,999 service connections and provides less than 3,000 acre-feet of water per year. It considers several categories of small water suppliers: Suppliers with 15 to 999 Connections, Suppliers with 1,000 to 2,999 Connections and NTNC Systems That Are Schools. SB 552 does not explicitly apply to transient, noncommunity water systems or NTNC water systems that are not schools.

Under SB 552, all small water suppliers are required to have:

- Drought resiliency measures,
- Annual reporting of water supply condition information to the State Water Board, and
- Annual water demand reporting to the State Water Board.

Suppliers with 15 to 999 Connections

Health and Safety Code §116460 requires all community water systems to have an Emergency Notification Plan (ENP) or Emergency Response Plan (ERP) approved by the State Water Board that describes process and methods for meeting the public notification requirements when any primary drinking water standard is not complied with, when a monitoring requirement is not performed, or when the conditions of any variance or exemption are not complied with.

Under SB 552, suppliers with 15 to 999 connections must incorporate drought planning elements (including, but not limited to, drought-planning contacts and standard water shortage levels) into their ENP or ERP. The ENP or ERP is to be submitted to the State Water Board and updated every five years or when significant changes occur. Subject to funding availability, the State Water Board will offer technical assistance to support water suppliers with less than 1,000 connections in implementing this requirement.

Table 4-18 lists the small water suppliers in Kings County with 15 to 999 connections.

Table 4-18 Small Water Suppliers in Kings County with 15 to 999 Connections

NAME	SOURCE	CONNECTIONS	ACRE-FEET SUPPLIED	POPULATION SERVED	DROUGHT ELEMENT ADDED TO ENP OR ERP
Home Garden CSD	Groundwater	467	389	1,750	Yes

[2] Section 116275 of the Health and Safety Code (Water Code §10609.51 subd. (a)) defines a community water system as a public water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents of the area served by the system.

NAME	SOURCE	CONNECTIONS	ACRE-FEET SUPPLIED	POPULATION SERVED	DROUGHT ELEMENT ADDED TO ENP OR ERP
Stratford PUD	Groundwater	364	301*	1,277	Yes
Kettleman City CSD	Groundwater	348	263	1,136	Yes
Sunset Vista Estates MHP	Groundwater	109	Unknown	400	Unknown, likely yes
Hardwick Water Company	Groundwater	40	Unknown	69	Unknown, likely yes
Azcal Management Co	Surface water from CA aqueduct	21	Unknown	73	Unknown, likely yes

Sources: https://sdwis.waterboards.ca.gov/, https://www.waterboards.ca.gov/conservation/docs/2016_small_supplier_dataset.xlsx, Data from 2015 to 2016 self-reporting,
* Data from 2013 self-reporting

Suppliers with 1,000 to 2,999 Connections and NTNC Systems That Are Schools

Small water sources in Kings County include non-transient non-community water systems (NTNCWS). NTNCWS are public water systems that regularly supply water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems. NTNCWS that are not schools are not explicitly subject to SB 552.

All small water suppliers and non-transient non-community (NTNC) water systems that are schools must implement the following drought resilience measures, subject to funding availability:

- **No later than January 1, 2023**, implement monitoring systems sufficient to detect production well groundwater levels.
- **Beginning no later than January 1, 2023**, maintain membership in the California Water/Wastewater Agency Response Network (CalWARN) or similar mutual aid organization.
- **No later than January 1, 2024,** to ensure continuous operations during power failures, provide adequate backup electrical supply.
- **No later than January 1, 2027,** have at least one backup source of water supply, or a water system intertie, that meets current water quality requirements and is sufficient to meet average daily demand.
- **No later than January 1, 2032,** meter each service connection and monitor for water loss due to leakages.
- **No later than January 1, 2032,** have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet fire flow requirements.

Abridged Water Shortage Contingency Plans

Suppliers in this category, listed in Table 4-19, must develop, adopt, and maintain on-site an abridged water shortage contingency plan (WSCP) that covers a subset of drought-planning elements included in the plans that urban water suppliers submit as part of their Urban Water Management Plan. The first plan must be developed by July 1, 2023, and posted on the supplier's website, if any, or made available upon request. This abridged WSCP must be updated at least every 5 years. The required elements must include:

- Drought-planning contacts, including all the following:
    - At least one contact at the Water System for water shortage planning and response and the development of the plan.

- Contacts for local public safety partners and potential vendors that can provide repairs or alternative water sources, including but not limited to, local CBOs that work with the population in and around areas served by the water system, contractors for drilling wells, vended water suppliers, and emergency shower vendors.
- State and local agency contacts who should be informed when a drought or water shortage emergency is emerging or has occurred.
- Regional water planning groups or mutual aid networks, to the extent they exist.

- Triggering mechanisms and levels for action, including both of the following
  - Standard water shortage levels corresponding to progressive ranges based on the water supply conditions. Water shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, a fire, and other potential emergency events.
  - Water shortage mitigation, response, customer communications, enforcement, and relief actions that align with the water shortage levels.

As part of the technical assistance, DWR and the State Water Board have created a template for this abridged WSCP for small water suppliers serving 1,000 to 2,999 service connections and NTNC systems that are schools, located on DWR's website. In addition, subject to funding availability, the State Water Board will offer technical assistance to support NTNC systems that are schools in implementing this new requirement for improving drought and water shortage resiliency.

Table 4-19 Small Water Suppliers with 1,000 to 2,999 Connections and NTNC School Systems in Kings County

NAME	SOURCE	CONNECTIONS	POPULATION SERVED	ABRIDGED WATER SHORTAGE CONTINGENCY PLAN	DROUGHT ELEMENT ADDED TO ENP OR ERP
Armona Community Services District	Groundwater	1,297	4,143	Yes	Yes
Island Union School	Groundwater	17	416	Yes	No
Hanford Christian School	Groundwater	14	175	Yes	No
Kings River Hardwick School	Groundwater	7	908	Yes	No
Pioneer Elementary School	Groundwater	6	750	Yes	No
Lakeside Elementary School	Groundwater	5	388	Yes	No

Source: https://sdwis.waterboards.ca.gov/

In addition, America's Water Infrastructure Act of 2018 requires community water systems serving populations greater than 3,300 to develop or update an ERP that incorporates findings of their risk assessment. This requirement is not based on number of connections, although the number of connections, therefore, there may be a small number of small water suppliers with less than 1,000

connections who are required to develop and maintain an ERP. While the Armona CSD as a small water supplier with 1,000 to 2,999 connections is not required to have a drought element added to their ENP or ERP, they are required to as a community water system that serves greater than 3,300 customers.

A summary of the requirements for small water suppliers is provided in Table 4-20.

Table 4-20 Summary of Small Water Supplier Requirements for Implementation of Senate Bill 552

SUMMARY OF REQUIREMENT	COMMUNITY WATER SYSTEM 1,000-2,999 CONNECTIONS	COMMUNITY WATER SYSTEM 15-999 CONNECTIONS	NTNC WATER SYSTEMS THAT ARE SCHOOLS
Drought Resiliency Measures	Yes	Yes	Yes
Abridged Water Shortage Contingency Plan	Yes	No	No
Drought Element added to Emergency Notification or Response Plan	No	Yes	No
Annual reporting of water supply condition information to the State Water Board	Yes	Yes	Yes
Annual water demand reporting to the State Water Board	Yes	Yes	Yes

Source: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/SB-552/Primer-of-SB-552-052522_final.pdf

County Requirements

SB 552 places the drought and water shortage planning responsibility on counties for state small water systems and domestic well communities within the county's jurisdiction. SB 552's language allows for flexibility in how the County implements new requirements. Plans and response arrangements could be developed by GSAs that cover the County, in which case the County would need to formally recognize its agreement and adoption or deference to these plans as part of its compliance with SB 552.

County Drought and Water Shortage Task Force

By January 1, 2022, each county must establish a standing County Drought and Water Shortage Task Force to facilitate drought and water shortage preparedness for state smalls and domestic wells within the county's jurisdiction. Counties must solicit task-force membership from representatives of State and other local governments, including GSAs, community-based organizations (CBOs), local water suppliers, and residents.

As an alternative, the County may implement a different process that facilitates drought and water shortage preparedness for state smalls and domestic wells within the county's jurisdiction. The alternative process will provide opportunities for coordinating and communicating with the state and other local governments, CBOs, local water suppliers, and residents on a regular basis and during drought or water shortage emergencies.

County Drought and Water Shortage Risk Mitigation Plan

The County will develop a plan that includes potential drought and water shortage risks and proposed interim and long-term solutions for state smalls and domestic wells within the County's jurisdiction. The plan may be a stand-alone document or may be included as an element in an existing county plan, such as a LHMP, EOP, climate action plan or CAP, or general plan. The plan must include:

- Potential drought and water shortage risk
- Proposed interim and long-term solutions for state smalls and domestic wells in the County.

The plan must also consider the following, at a minimum:

- Consolidations for existing water systems and domestic wells.

- Domestic well drinking water mitigation programs.
- Provision of emergency and interim drinking water solutions.
- An analysis of the steps necessary to implement the plan.
- An analysis of local, state, and federal funding sources available to implement the plan.

As outlined in Table 4-21, there are ten small water suppliers, supplementing the previously identified ten water districts. Within this subset, five meet the criteria for NTNCWS. All ten of these smaller suppliers, as depicted below, meet the requirements under the SB 552 legislation. These entities are mandated to draft WSCPs, with Kings County providing dedicated support for their development.

Table 4-21 Small Water Suppliers in Kings County

WATER UTLILITIES	SYSTEM TYPE	ADDRESS	JURISDICTION
Kings River Hardwick School	Non-Transient Non-Community Water System	10300 Excelsior Ave	Hanford
Hanford Christian School	Non-Transient Non-Community Water System	11948 Flint Ave	Hanford
Island Union School	Non-Transient Non-Community Water System	7799 21st Ave	Lemoore
Pioneer Union Elem School	Non-Transient Non-Community Water System	8810 14th Ave	Hanford
Lakeside Union School	Non-Transient Non-Community Water System	9100 Jersey Ave	Hanford
Kings Ranch Ministries	State Small	13787 Kansas Ave	Hanford
Villa Terrace Apartments	State Small	13940 Hackett St	Hanford
Rollerland Co	State Small	18167 Medford Ave	Stratford
Westlake Farms Hqts/Cotton Gin	State Small	23311 Newton Ave	Stratford
Couture Farms	State Small	30650 Quebec Ave	Kettleman City

Source: Kings County Department of Public Health, Division of Environmental Health Services 2023

As part of compliance with the SB 552 requirements, the County will develop a drought resiliency plan, either as a stand-alone plan or as part of another plan, like the MJHMP that includes a risk assessment and action plan for all of the water districts and small water suppliers in the County. A drought resiliency plan is a structured strategy developed by governments, communities, and organizations to proactively address drought impacts. Its primary goal is to build long-term capacity for effective drought management. The plan includes a risk assessment, water conservation actions, diversifying water sources, early warnings, legal frameworks, community engagement, ecological considerations, emergency response, research, and adaptive management components. These plans are crucial, especially in drought-prone regions or areas facing water scarcity due to factors like climate change and population growth. They aim to balance stakeholder needs with sustainable water resource management in the face of drought challenges.

4.5.4.2 Geographic area

Extensive – Drought is a regional hazard, and at its worst can affect the entire State of California with varying levels of dryness and drought activity. It is safe to assume that unless the drought event is at its very beginning or very end, if any area of the County is affected by any level of drought, other areas of the County are experiencing varying effects as well.

The U.S. Drought Monitor is a widely used site for obtaining and summarizing drought information, as it integrates data from several other sources including the Palmer Drought Index, Soil Moisture Models, U.S.

Geological Survey Weekly Stream Flows, Standardized Precipitation Index, and the Satellite Vegetation Health Index. It includes drought intensity categories for measuring dry conditions across counties, states, and regions of the U.S., so that drought can be quantified. These categories range from “abnormally dry” to “exceptional drought.” Figure 4-10 provides “snapshots in time” of the drought conditions in California. The snapshots selected are instrumental in depicting both the historic and potential change in drought’s geographic range and severity in the County (circled).

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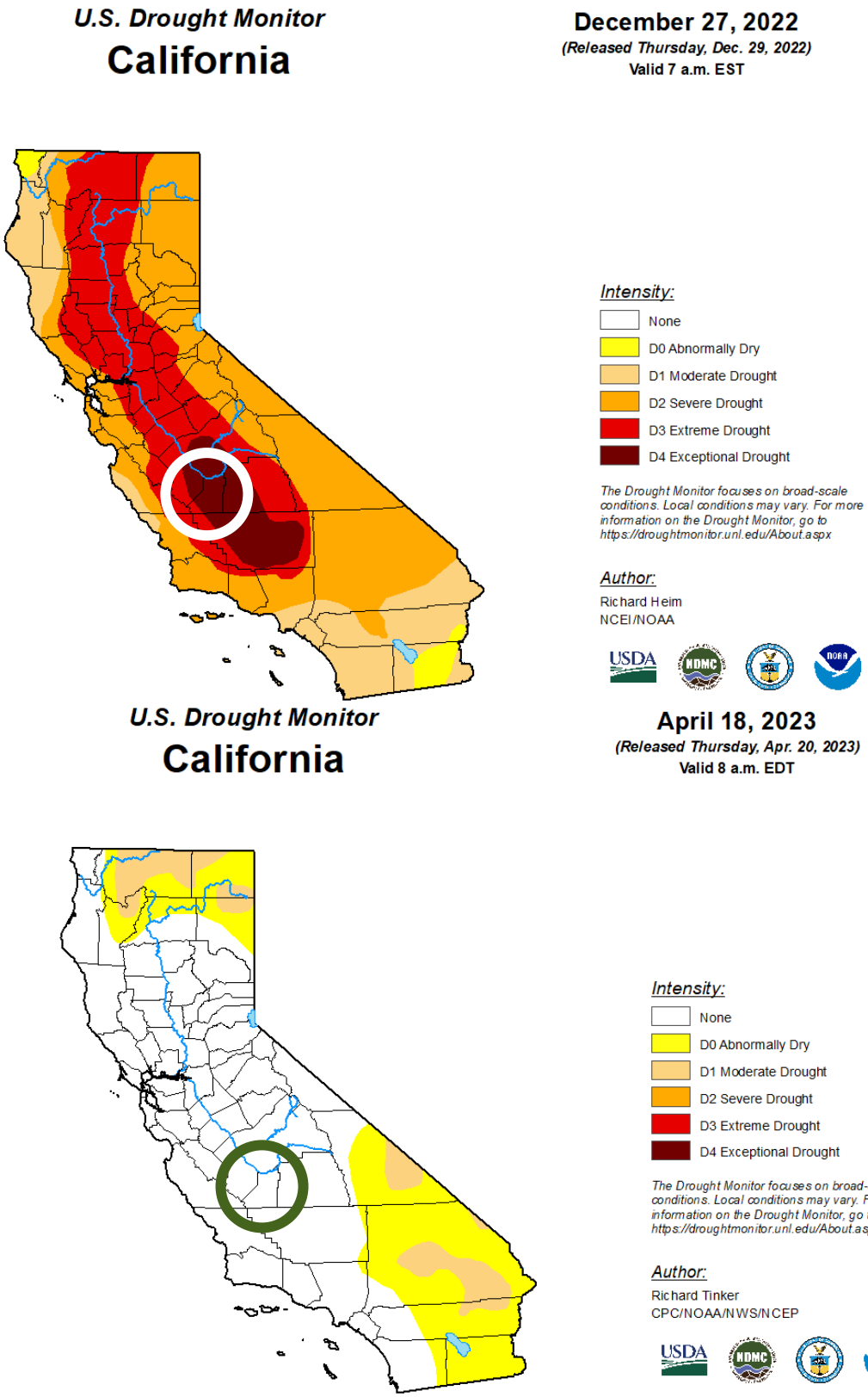
Figure 4-10 U.S. Drought Monitor for California: December 27, 2022 and April 20, 2023



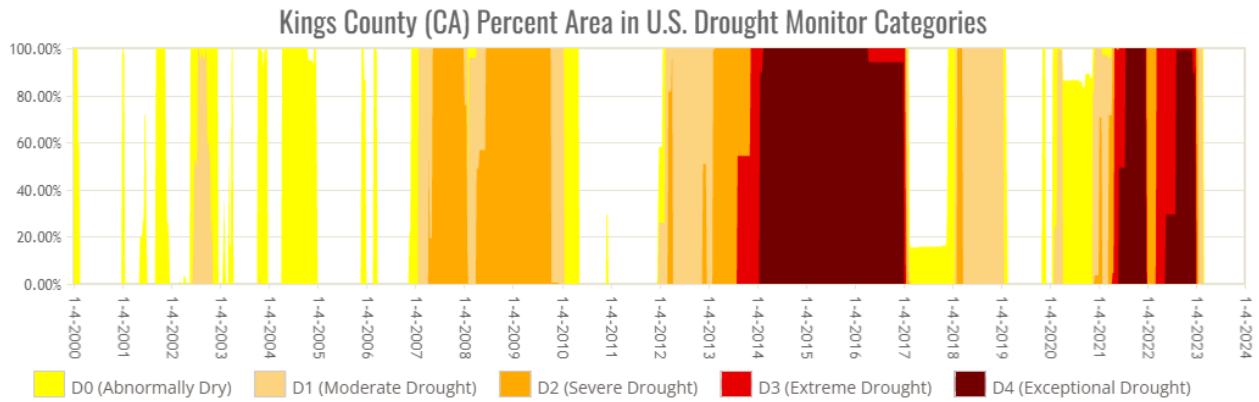
Source: Drought Monitor 2023

4.5.4.3 Past Occurrences

Historically, California has experienced severe drought conditions. The state's available record for determining hydrologic risks is short, only going back about 100 years. Recent droughts affecting Kings County are summarized below.

- 1928-1937—This drought affected the entire state and is the longest, most severe drought on record with a recurrence interval of greater than 80 years (Paulson et al, 1991).
- 1947-1950—Drought affected the entire state but was most extreme in Southern California. The drought in the winter of 1950 affected the area from the Kern River basin north to the American River basin. The drought caused two deaths and $33 million in damages (Paulson et al, 1991).
- 1976-1977—This drought was most severe in Northern and Central California, but the impact was experienced statewide because of the dependence of southern California on water transfers from the north. FEMA declared an emergency declaration for the County due to the effects of the drought. The water year 1977 was the driest year of record at almost all gauging stations in the affected area in California, and the water year 1976 was among the five driest in the central and northern Sierra Nevada. The two-year deficiency in runoff accumulated during the drought is unequaled at gauging stations in the affected area, and this deficiency has a recurrence interval that exceeds 80 years. Crop damages statewide were $2.67 billion (Paulson et al 1991).
- 1987-1992—During this multiyear, multi-county drought, the runoff from the San Joaquin Valley was 47 percent of the average. In 1991, the U.S. Department of Agriculture Economic Research Report Agricultural Outlook reported that the Kings River flow would be inadequate to provide sufficient water for agricultural uses for the fifth consecutive year. A USDA drought disaster declaration was declared (Economic Research Service 1992).
- 2004-2005—On January 26, 2005, the USDA designated the County a primary disaster area due to drought that had occurred since January 1, 2004 (USDA 2005).
- 2008-2009—On June 12, 2008, The Governor proclaimed the County as a state disaster area due to the Central Valley Drought (Schwarzenegger 2008).
- 2012-2017 – The County was designated a disaster area in 2012 due to drought, prompting a state of emergency proclamation by the Governor in 2014 (Brown 2014). Severe impacts were felt, including widespread crop damage, dry wells, and land subsidence. The drought cost the agriculture industry $1 billion in lost revenue and caused $2.2 billion in statewide economic damage, with a one-third reduction in water for agriculture (NCICS 2019). The groundwater situation in California is described as a "slow-moving train wreck" (NCICS 2019). The state expended $6.6 billion in response and mitigation efforts by 2017, according to the 2018 California SHMP.
- The USDA drought monitor compiles time series to communicate the extent and severity of drought over time. Figure 4-11 shows this data for Kings County.

Figure 4-11 USDA Drought Monitor Timeseries



Source: Drought Monitor 2023

Kings County has experienced 15 USDA disaster declarations due to drought between 2012 and 2021 as detailed in Table 4-22 below.

Table 4-22 USDA Drought Declarations by Year in Kings County, 2012 – 2021

DECLARATION TYPE	YEAR	NUMBER OF DECLARATIONS
Drought	2012	2
	2014	1
	2015	1
Drought-FAST TRACK	2012	1
	2013	3
	2014	1
	2015	1
	2016	1
	2017	1
	2019	1
	2021	2
	Grand Total	**15**

Source: USDA

4.5.4.4 *Likelihood of Future Occurrence*

Likely – Historical drought data for the County indicates there have been seven significant multi-year droughts, equating to roughly 30 years in drought conditions, in the last 100 years. This equates to a roughly 30% chance of a major drought in any given year. Given the historical occurrence of severe drought impacts throughout the County and across the State, drought is likely to continue to pose a high degree of risk to the entire planning area, potentially impacting crops, livestock, water resources, the natural environment, buildings and infrastructure (from subsidence and compound hazards), and local economies. Drought will also intensify based on climate change trends associated with precipitation variability and increased temperatures.

4.5.4.5 *Climate Change Considerations*

Water resources in California are already experiencing stresses related to population growth, increased water demand, poor water quality, groundwater overdraft, and aging infrastructure. As temperatures warm, heat waves become more frequent, and precipitation becomes increasingly variable, drought conditions in California are likely to become more frequent and persistent. Recent drought conditions have underscored the need to examine water supply and distribution management, conservation, and use policies.

According to *California's Climate Adaptation Strategy*, climate change is likely to significantly diminish California's future water supply. In an average year, approximately 40 percent of the State's total water supply comes from groundwater, and during a dry year, this increases to more than half of the State's water supply, with groundwater acting as a critical buffer against the impacts of drought and climate change.

Table 4-23 details how climate change induced drought will impact multiple sectors.

Table 4-23 Climate Change, Droughts, and Impacts

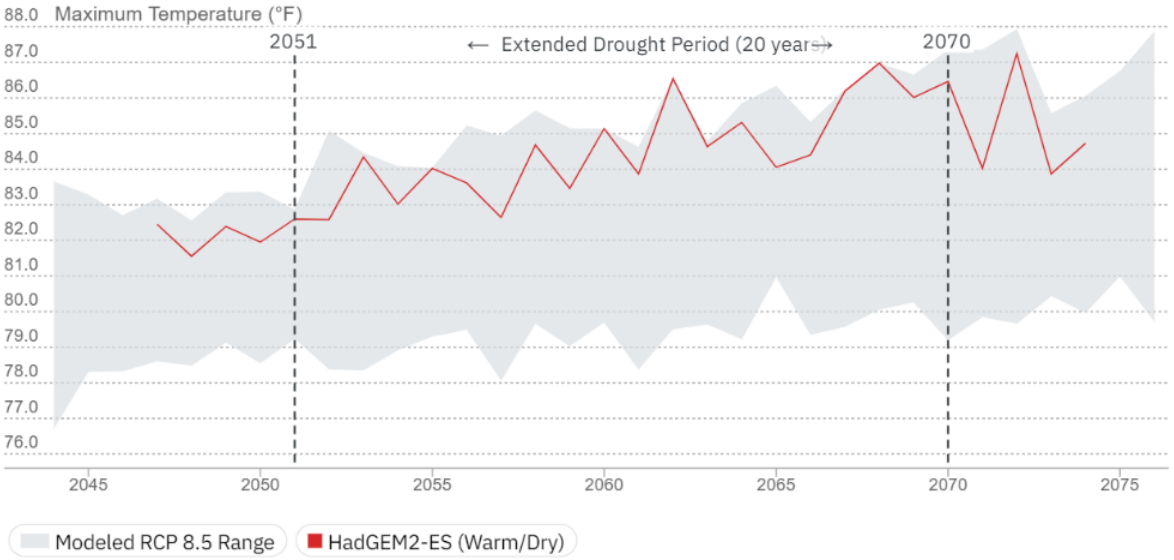
CHALLENGE	OBSERVED AND OR PROJECTED CHANGE
Agriculture and outdoor watering	Increasing temperatures raise evapotranspiration by plants, lower soil moisture, alter growing seasons, and thus increase water demand.
Water supply infrastructure	Changes in snowpack, streamflow timing, and hydrograph evolution may affect reservoir operations including flood control and storage. Changes in the timing

CHALLENGE	OBSERVED AND OR PROJECTED CHANGE
	and magnitude of runoff may affect the functioning of diversion, storage, and conveyance structures.
Legal water systems	Earlier runoff may complicate prior appropriation systems and interstate water compacts, affecting which rights holders receive water and operations plans for reservoirs.
Water quality	Although other factors have a large impact, "water quality is sensitive both to increased water temperatures and changes in patterns of precipitation" (US Climate Change Science Program Synthesis and Assessment Products 4.3, p. 149). For example, changes in the timing and hydrograph may affect sediment load and pollution, impacting human health.
Energy demand and Operating Costs	Warmer air temperatures may place higher demands on hydropower reservoirs for peaking power. Warmer lake and stream temperatures may affect water use by cooling power plants and other industries.
Interplay among forests, hydrology, wildland fires, and pests	Changes in air, water, and soil temperatures may affect the relationships between forests, surface and groundwater, wildland fire, and insect pests. Water-stressed trees, for example, may be more vulnerable to pests.
Soil moisture	Increasing temperatures lead to increased evaporation of water from soil. Parched soil dries out and becomes hardened, increasing flood risk when precipitation does occur, decreasing the likelihood of groundwater recharge.
Stream conditions	Decreases in snowpack that melt earlier in the season will result in less stream water throughout the year, decreasing a critical water source for forests, agriculture, and the economy.
Groundwater resources	Changes in long-term precipitation and soil moisture can affect groundwater recharge rates; coupled with demand issues, this may mean greater pressure on groundwater resources.

Source: Ray et al., 2008

California has a highly variable climate and projections from Cal-Adapt suggest that extended drought occurrence could become more pervasive in future decades (Cal-Adapt 2023). Cal-Adapt provides data for two 20-year drought scenarios derived from the downscaled simulations. Under a maximum temperature by water year under a drought from 2051-2070 (scenario that represents a late century dry spell from 2051-2070 identified from the RCP 8.5 simulation based on the average annual precipitation over 20 years), average temperatures will increase from 76.5 ˚F to 84.5˚F. Figure 4-12 shows the projected extended drought from 2051 to 2070 based on maximum temperatures by water year.

Figure 4-12 Projected Changes in Maximum Temperature by Water Year under 2051-2070 Drought



Source: Cal-Adapt 2023

4.5.4.6 *Magnitude and Severity*

Critical – Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the planning area are those related to water-intensive activities such as agriculture and wildlife preservation. During a drought, water allocations may go down, resulting in reduced water availability. Voluntary water conservation measures may also be implemented during extended droughts.

A reduction in electric power generation and water quality deterioration are also potential problems that can occur as a result of drought conditions. The reduced demand for electrical power generation is commonly linked to higher electricity costs due to the loss of hydropower supplies. Water quality deterioration is due to lower levels of precipitation which allow pollutants to concentrate and limit water storage supply. Table 4-24 summarizes the historically observed impacts by category. Figure 4-13 provides the drought statistics for the County.

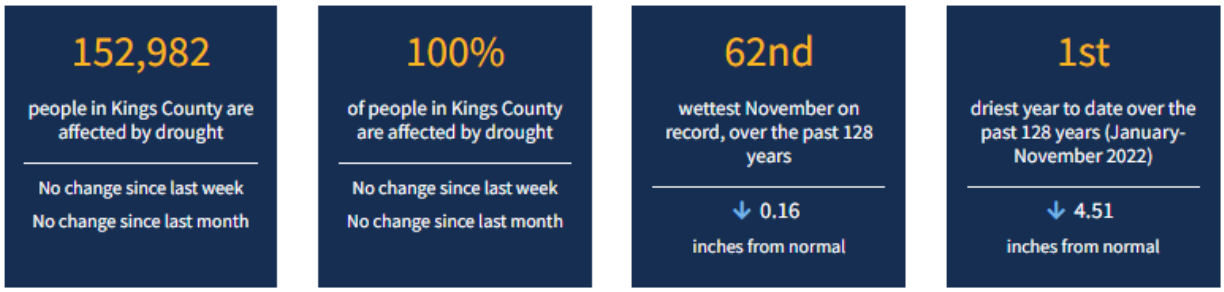
Table 4-24 Historically Observed Impacts by Drought Monitor Category in California

CATEGORY	HISTORICALLY OBSERVED IMPACTS
D0 – Abnormally Dry	• Soil is dry; irrigation delivery begins early • Dryland crop germination is stunted • Active fire season begins
D1 – Moderate Drought	• Dryland pasture growth is stunted; producers give supplemental feed to cattle • Landscaping and gardens need irrigation earlier; wildlife patterns begin to change • Stock ponds and creeks are lower than usual
D2 – Severe Drought	• Grazing land is inadequate • Fire season is longer, with high burn intensity, dry fuels, and large fire spatial extent

CATEGORY	HISTORICALLY OBSERVED IMPACTS
	• Trees are stressed; plants increase reproductive mechanisms; wildlife diseases increase
D3 – Extreme Drought	• Livestock need expensive supplemental feed; cattle and horses are sold; little pasture remains; fruit trees bud early; producers begin irrigating in the winter • Fire season lasts year-round; fires occur in typically wet parts of the State; burn bans are implemented • Water is inadequate for agriculture, wildlife, and urban needs; reservoirs are extremely low; hydropower is restricted
D4 – Exceptional Drought	• Fields are left fallow; orchards are removed; vegetable yields are low; honey harvest is small • Fire season is very costly; number of fires and area burned are extensive • Fish rescue and relocation begins; pine beetle infestation occurs; forest mortality is high; wetlands dry up; survival of native plants and animals is low; fewer wildflowers bloom; wildlife death is widespread; algae blooms appear

Source: U.S. Drought Monitor

Figure 4-13 Drought Statistics in Kings County: January 11, 2023



Source: U.S. Drought Monitor, NOAA National Center for Environmental Information, U.S. Geological Survey; drought.gov

4.5.4.7 Vulnerability Assessment

Impacts include water restrictions associated with domestic supplies, agricultural and livestock losses and economic impacts, hydroelectric power reductions, and increased costs for water. Secondary effects include susceptibility to wildfires and increased groundwater pumping that can contribute to land subsidence and degraded water quality.

People

Drought is one of the few hazards with the potential to impact all the citizens of the County through water restrictions, economic losses, and increased energy costs. The historical and potential impacts of drought on populations include agricultural sector job loss, secondary economic losses to local businesses and public recreational resources, increased cost to the local and state government for large-scale water acquisition and delivery, water rationing, and water wells running dry for individuals and families.

Droughts are often accompanied by high temperatures, which can cause heat stress and dehydration, especially in vulnerable populations such as the elderly, children, and those with pre-existing medical conditions. Additionally, droughts can increase the risk of wildfires, which can release large amounts of smoke and pollutants into the air, leading to respiratory problems such as asthma, bronchitis, and

pneumonia. Droughts can also lead to crop failures, food shortages, and rising food prices, resulting in malnutrition and undernutrition, especially in low-income populations. Finally, droughts can cause significant stress and anxiety, especially for those who rely on agriculture for their livelihoods, and drought-related economic losses can also lead to social and psychological stress.

Property

Between the years of 2007 and 2021, over 785,000 acres of USDA-insured crops were lost in the County due to drought, resulting in over $5 million in indemnity payments. Table 4-25 summarizes the total agricultural losses.

Table 4-25 Crop Loss Due to Drought, 2007 – 2021

YEAR	CROP	NET ACRES	IDEMNITY AMOUNT
2007	Barley	1,082.68	$ 9,774.00
	Wheat	15,351.79	$334,260.00
2008	Barley	2,248.90	$44,655.00
	Wheat	4,546.66	$128,883.00
2009	Barley	1,912.74	$30,184.00
	Wheat	5,200.18	$387,907.00
2010	Wheat	2,065.18	$98,314.00
2012	Barley	4,527.36	$336,738.00
	Wheat	16,769.36	$1,416,535.00
2013	Barley	1,470.36	$68,899.00
	Wheat	5,700.98	$560,696.00
2014	Barley	5,011.43	$293,190.10
	Wheat	9,279.79	$869,086.53
2016	Cotton	182.50	$189,546.00
2021	Wheat	3,228.04	$416,938.80
Total		785,77.948	$5,185,606.43

Source: USDA RMA Crop Indemnity Reports, 2007-2021

Critical Facilities and Infrastructure

Severe to exceptional droughts can have significant consequences for water supply, water quality, firefighting, navigation, recreation, and other critical facilities. In some cases, when groundwater levels substantially decline, groundwater wells may need to be deepened in response. Subsidence related to groundwater withdrawal can impact linear infrastructure such as pipelines, roads, and levees. Additionally, a higher demand on the water system infrastructure can lead to disruption of service due to line breakage. Possible losses to infrastructure include the loss of potable water.

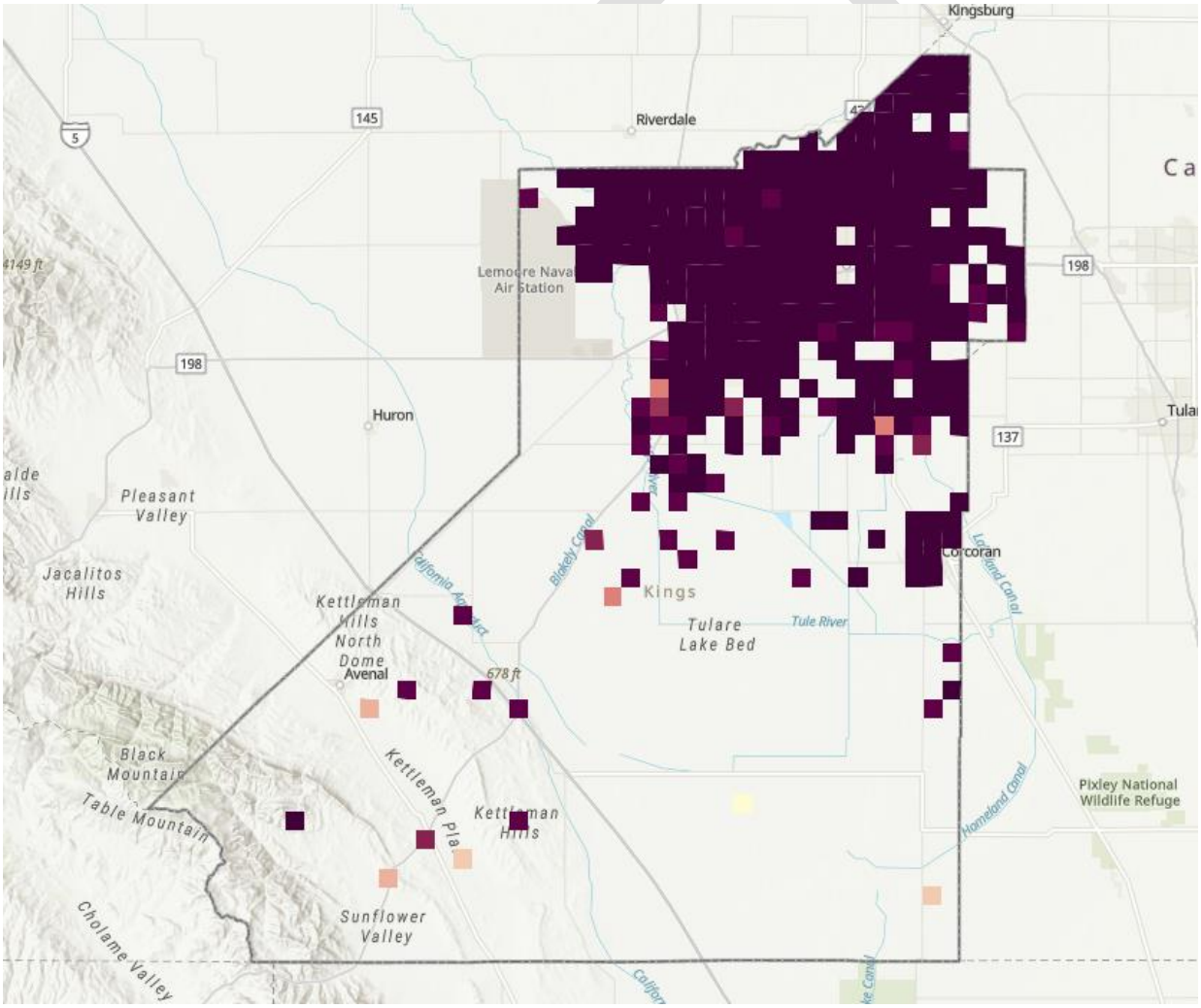
Small water suppliers and rural communities were the hardest hit during the five-year drought that ended in 2016. In some of the rural communities, wells went dry and State and county authorities provided bottled water and installed large water storage tanks for homes that went dry. Smaller water systems can therefore be more vulnerable to higher costs and water quality issues during prolonged dry periods. Unlike the larger water districts in Kings County, small water systems do not need to maintain drought contingency plans, and the lack of these plans have left small and rural water systems, rural water systems, and their stakeholders unaware of how to seek assistance. DWR publishes an online tool called the Drought and Water Shortage Risk Explorer Tool for small water suppliers and rural communities to use to identify and understand drought vulnerabilities.

According to the Drought and Water Shortage Vulnerability Explorer Tool for Small Water Suppliers, there are 11 water systems vulnerable to drought, which closely aligns with the 10 water systems identified by Kings County's Public Health Department:

- Stratford Public Utility District
- Home Garden Community Service District
- Armona Community Service District
- Hardwick Water Company
- Island Union School
- Champions – Samuel House
- Kettleman City Community Service District
- City of Avenal
- Azcal Management Company
- Sunset Vista Estates
- Lemoore Naval Air Station

Based on the vulnerability profiles for these small water systems, many had high vulnerability scores (scores greater than 40 depicted by a dark purple color). The physical vulnerabilities are associated with dry years, groundwater overdraft, lack of emergency interties, and the fact that these small water systems rely on single and small water sources for supply. Similarly, based on the water shortage vulnerability scores, the water suppliers located in the northeast portion of Kings County had the highest physical vulnerability scores above 40, and Kings County had an average physical vulnerability score of 57.71. The physical vulnerability scores for Kings County's state small and domestic wells are shown in Figure 4-14.

Figure 4-14 Kings County State Small and Domestic Wells Water Shortage Physical Vulnerability Scores



Source: DWR Water Shortage Vulnerability Explorer 2023

The Water Shortage Vulnerability Explorer tools are designed to support small water suppliers and rural communities identify and understand their risk. This vulnerabilities are also intended to support drought

task force discussions around water shortage preparedness for domestic wells and privately supplied homes and small state water systems. The information is also intended to support risk assessments as Kings County and the small water suppliers develop their Water Shortage Contingency Plans and the County Drought Resilience Plan that meet the requirements of SB 552.

Economy

Drought impacts on the local or regional economy can be difficult to quantify due to the extent to which most industries rely upon water. Many of the major industries in the County, such as grain and dairy farming, rely heavily on water and can be affected due to a lack of, or reduced quality of, water resources.

When water resources are limited, effects are more severe for industries that rely on large amounts of water, and prolonged droughts intensify these impacts. Agriculture often suffers the most financial losses from drought. Researchers at the University of California at Merced estimate that the 2020-2021 drought cost farms $1.2 billion in losses, with an additional $845 million loss incurred by the State's food processing and manufacturing industries (UC Merced date). An estimated 12,000 agricultural jobs were also lost due to the drought (Medellín-Azuara et al. 2022). Based on USDA indemnity payments, the County loses are just over $343,000 in annualized average loss.

Cultural, Historic and Natural Resources

In addition to groundwater, the County receives water from the Kings River. Sustained drought reduces waterflow in the river, depriving the region of valuable agricultural and recreational resources. Water-dependent habitats such as freshwater marshes and vernal pools native to the area suffer losses from droughts.

The Tulare Lake region contains numerous archeological artifacts important to the Yokut Tachi Tribe (Kings County MJHMP, 2012). It is unknown how drought will affect these resources.

In general, environmental impacts from drought are more likely at the interface of the human and natural world. The loss of crops or livestock due to drought can have far-reaching economic effects on communities. Wind and water erosion can alter the visual landscape, and dust can damage property. Water-based recreational resources are also heavily affected by drought conditions.

Development Trends

Because Development Trends encompasses all forms of industry, infrastructure, critical facilities and all related populations and their functions, drought impacts on Development Trends will align with the historical and potential impacts on populations, property, natural environment, and critical facilities discussed above. With the County's population projected to continue to steadily increase while climate change projections are showing an increase in the duration and intensity of drought events, it will be important for each new development application to be reviewed with existing and future water supplies in mind.

4.5.4.8 Risk Summary

- Due to widespread impacts in the area, drought is considered a high-significance hazard.
- There have been seven significant multi-year droughts, equating to roughly 30 years in drought conditions, in the last 100 years. This equates to a roughly 30% chance of a major drought in any given year.
- 15 USDA Disaster Designations due to drought have been declared between 2012 and 2021.
- Between the years of 2007 and 2021, over 785,000 acres of USDA-insured crops were lost in Kings County due to drought, resulting in over $5 million in indemnity payments.
- Climate change projections show that extreme prolonged drought is likely to continue and will exacerbate existing water supply challenges. Under a maximum temperature scenario that represents a late century dry spell from 2051-2070, average temperatures will increase from 76.5 ˚F to 84.5˚F.
- **Related Hazards** – Extreme Heat, Land Subsidence, Wildfire, Agricultural Pest Infestation and Disease

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JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Likely	Critical	High	Yes
City of Avenal	Extensive	Likely	Critical	High	Yes
City of Corcoran	Extensive	Likely	Critical	High	Yes
City of Hanford	Extensive	Likely	Critical	High	Yes
City of Lemoore	Extensive	Likely	Critical	High	Yes

4.5.5 EARTHQUAKE

4.5.5.1 Hazard Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. The magnitude of earthquakes is usually measured using the Richter Scale, a logarithmic scale calculated from the amplitude of the largest seismic wave recorded for the earthquake.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of damage to structures during earthquakes. Seismologists have developed the Mercalli scale to quantify the shaking intensity of an earthquake's effects, which is measured by how an earthquake is felt by humans and the damage to buildings.

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks such as water, power, gas, communication, and transportation lines. Other damage-causing effects of earthquakes are surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, seiches, liquefaction, and dam failure. Liquefaction occurs when ground shaking causes the mechanical properties of some fine-grained, saturated soils to liquefy and act as a fluid. It is the result of a sudden loss of soil strength due to a rapid increase in soil pore water pressures caused by ground shaking, in areas of shallow groundwater (within 10' of the surface or less). Liquefaction that produces surface effects generally occurs in the upper 40 to 50 feet of the soil column, although the phenomenon can occur deeper than 100 feet. The duration of ground shaking is also an important factor in causing liquefaction to occur. The larger the earthquake magnitude, and the longer the duration of strong ground shaking, the greater the potential for liquefaction to occur.

In populated areas, the greatest potential for loss of life and property damage can come as a result of ground shaking from a nearby earthquake. The degree of damage depends on many interrelated factors. Among these are the moment magnitude, focal depth, distance from the causative fault, duration of shaking, type of surface deposits or bedrock, presence of high ground water, topography, and finally, the design, type, and quality of building construction.

4.5.5.2 Geographic Area

Limited – As mentioned in the County's 2012 MJHMP, no major fault systems are known to exist in the County. Therefore, the potential for extensive surface rupture within the County is minimal. However, minor surface ruptures could occur in areas of minor faulting, which occur primarily in the southwestern part of the County along the Kettleman Hills. Ground shaking is the most likely damaging effect of an earthquake. During the preparation of the County's 2012 MJHMP, the HMPC reported that shaking was felt during the Coalinga earthquake of magnitude 6.4 in 1983. The epicenter of the Coalinga earthquake was located approximately 20 miles from the County's western border.

As shown in Figure 4-15, the San Andreas Fault is located less than four miles west of the Kings County line. The San Andreas occurs where the North American and Pacific plates come together and grind in a side - by - side motion relative to each other. The San Andreas Fault also falls within a Alquist-Priolo Earthquake Fault Zone. As defined by California Department of Conservation, Alquist-Priolo earthquake fault zones are regulatory zones surrounding the surface traces of active faults in California (CGS, n.d.). Wherever an active fault exists, if it has the potential for surface rupture, a structure for human occupancy

cannot be placed over the fault and must be a minimum distance from the fault (generally fifty feet). Moreover, the Pond Poso fault is to the southeast of the County – about 8 miles from the Countyline.

Figure 4-15 shows the known faults and potential for ground shaking resulting from earthquakes in and near Kings County based on USGS probabilistic ground shaking with a 2% in 50-year occurrence, which is also known as 2500-year probabilistic ground shaking. In addition, as documented in the County's 2012 MJHMP, another large known fault, the White Wolf fault, is located to the south near Arvin and Bakersfield and produced a severe M 7.7 earthquake in 1952. This fault is not shown in Figure 4-15 due to the extent of the map.

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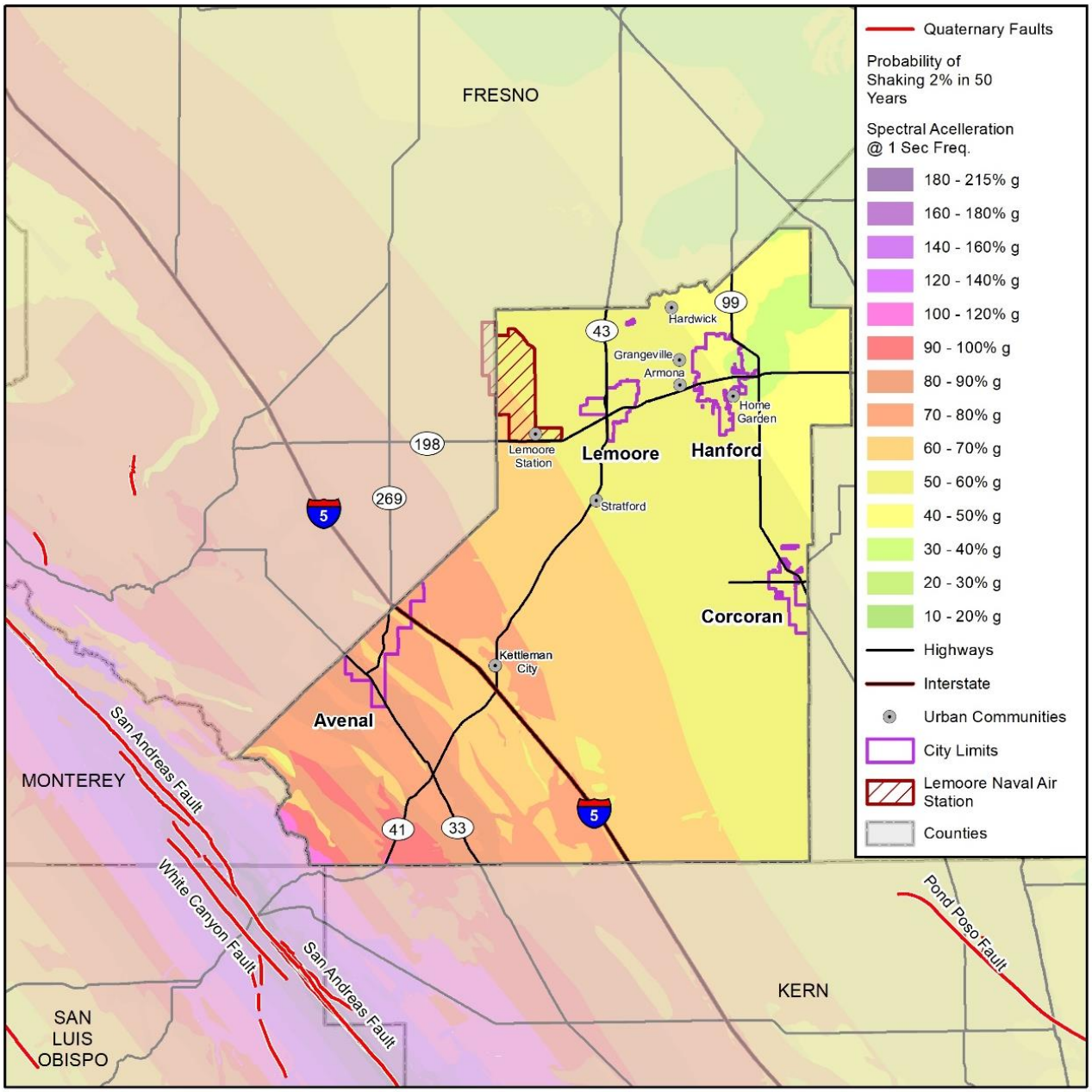
Figure 4-15 Kings County Earthquake Ground Shaking Potential and Nearby Faults



The potential for ground shaking is discussed in terms of the 2% percent probability of exceeding peak ground acceleration (% g) in the next 50 years. It varies from 30-70% g in the northeastern and central portions of the County, including the cities of Hanford, Lemoore, Corcoran, and the central primary agricultural part of the County. Earthquake hazard is more severe in the southwest of the County and the City of Avenal. The potential for ground shaking in this area ranges from 60-100% g. The potential for ground shaking is particularly high at the southwestern County line, reaching 100% g and above.

Earthquakes can occur at any time of the day or night and any time of the year. Earthquakes are particularly dangerous due to their rapid onset, generally without warning. Aftershocks can occur for

days, weeks, and even months following a major earthquake. This additional damage to structures already weakened by the main earthquake increases the danger to rescue and recovery personnel.

Earthquakes can result in many secondary effects, including fires and landslides, which are covered in separate sections of this plan. Ground settlement and soil compaction also may occur as a result of seismic ground shaking. When unconsolidated valley sediments are saturated with water, water from voids is forced to the ground surface, where it emerges in the form of mud spouts or sand boils. If soil liquefies in this manner (liquefaction), it loses its supporting capacity, which can result in the minor displacement to the total collapse of structures. These types of unconsolidated sediments represent the poorest kind of soil condition for resisting seismic shock waves. However, according to California Department of Conservation's most recent liquefaction data, there is no liquefaction zone located within or near Kings County.

4.5.5.3 Past Occurrences

Figure 4-16 depicts the epicenters of the historic earthquakes that occurred in Kings County from 1855 through 2021. As shown in the figure, most of the epicenters have occurred along the San Andreas fault, which falls within the Alquist-Priolo Fault Hazard Zone and is to the west of the County.

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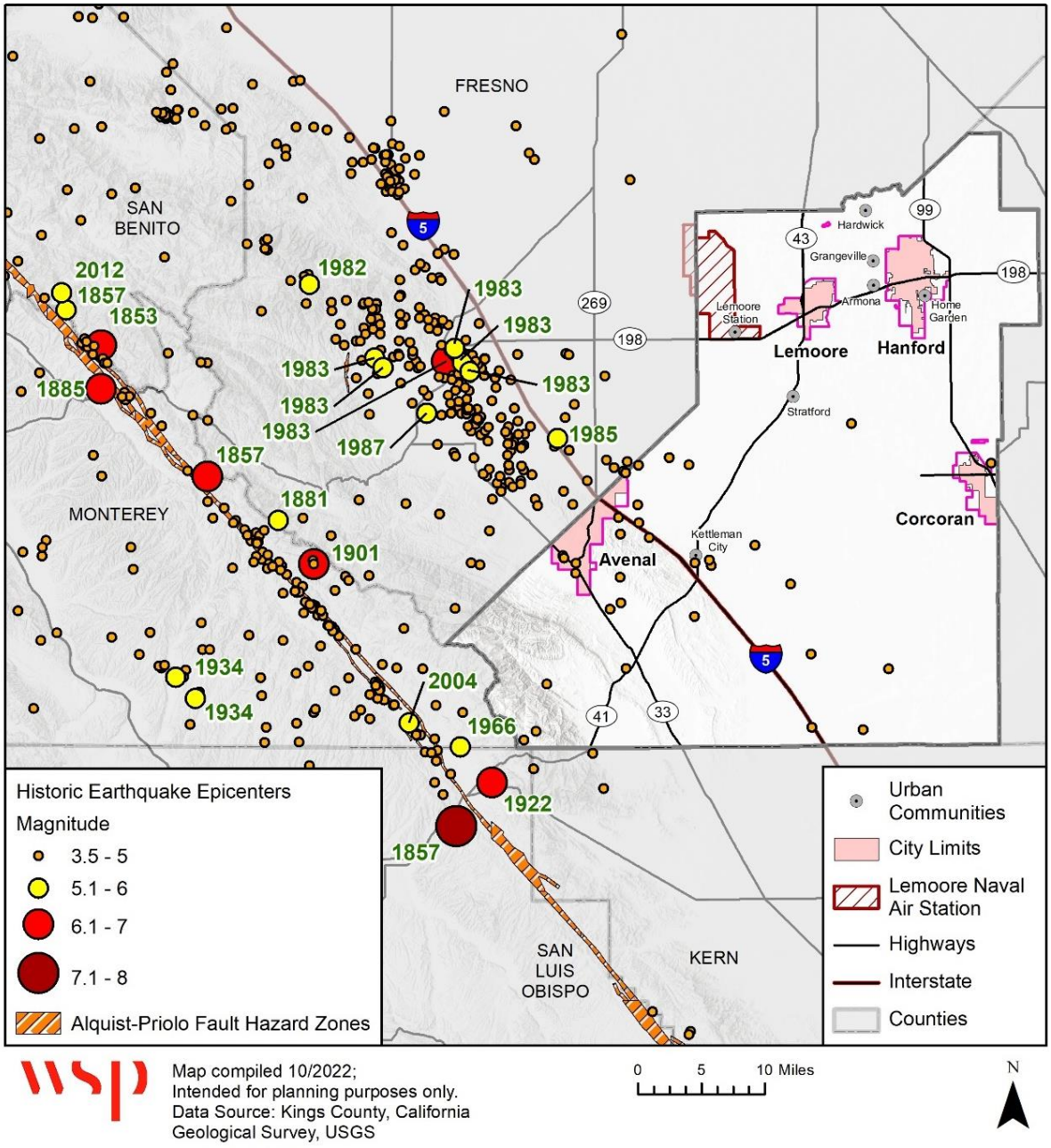
Figure 4-16 Kings County Historic Earthquake Epicenters: 1855 – 2021



As noted in the County's 2012 MJHMP, there have not been any damaging earthquakes greater than M 6.0 recorded in Kings County in over 200 years, though several have been close. The most recent large earthquake near Kings County was the Kettleman Hills earthquake of magnitude 5.6 on August 4, 1985, whose epicenter was located four miles from the Kings County border just north of Avenal. This earthquake was the third in a sequence of moderate earthquakes that occurred along a shallowly dipping thrust fault on the eastern border of the San Joaquin Basin. It was preceded by two earthquakes located approximately 20 miles from Kings County, the 1982 New Idria earthquake (M 5.4) and the 1983 Coalinga (M 5.2). The Kettleman Hills earthquake did not result in any surface rupture. There was a low level of ground shaking and low local magnitude reported, according to the 2012 Kings County MJHMP.

Major earthquakes have occurred near Kings County and resulted in ground shaking felt in the county. The Fort Tejon earthquake in 1857 of M 7.9 was one of the greatest earthquakes ever recorded in the United States and the largest in California. It left an amazing surface rupture scar over 215 miles in length

along the San Andreas Fault. The epicenter is now thought to have been located near Cholame, approximately 34 miles northwest of the Kings County border near Avenal. During the Fort Tejon earthquake, strong shaking lasted from one to three minutes. As a result of the shaking, the current of the Kern River was turned upstream, and water ran four feet deep over its banks (SCEDC, 2012). The waters of Tulare Lake were thrown upon its shores, stranding fish miles from the original lakebed. Property loss was heavy at Fort Tejon, one of the only settlements at the time, an Army post in south-central Kern County about four miles from the San Andreas fault. In 1857, two buildings were declared unsafe, three others were damaged extensively but were habitable, and still, others sustained moderate damage. One person was killed in the collapse of an adobe house at Gorman.

Figure 4-17 below is from the 2018 California State Hazard Mitigation Plan, which displays the common areas damaged by earthquakes based on historic evidence dating back to the year 1800. The occurrences are color-coded by damaging shaking intensity across California, and Kings County is enclosed within a red circle. The figure shows that per the MMI scale noting occurrences equal to or greater than an Intensity of VII, the County has experienced 1 to 2 earthquake events of this kind, mostly affecting the southwestern portion of the County, particularly the area encompassing the City of Avenal.

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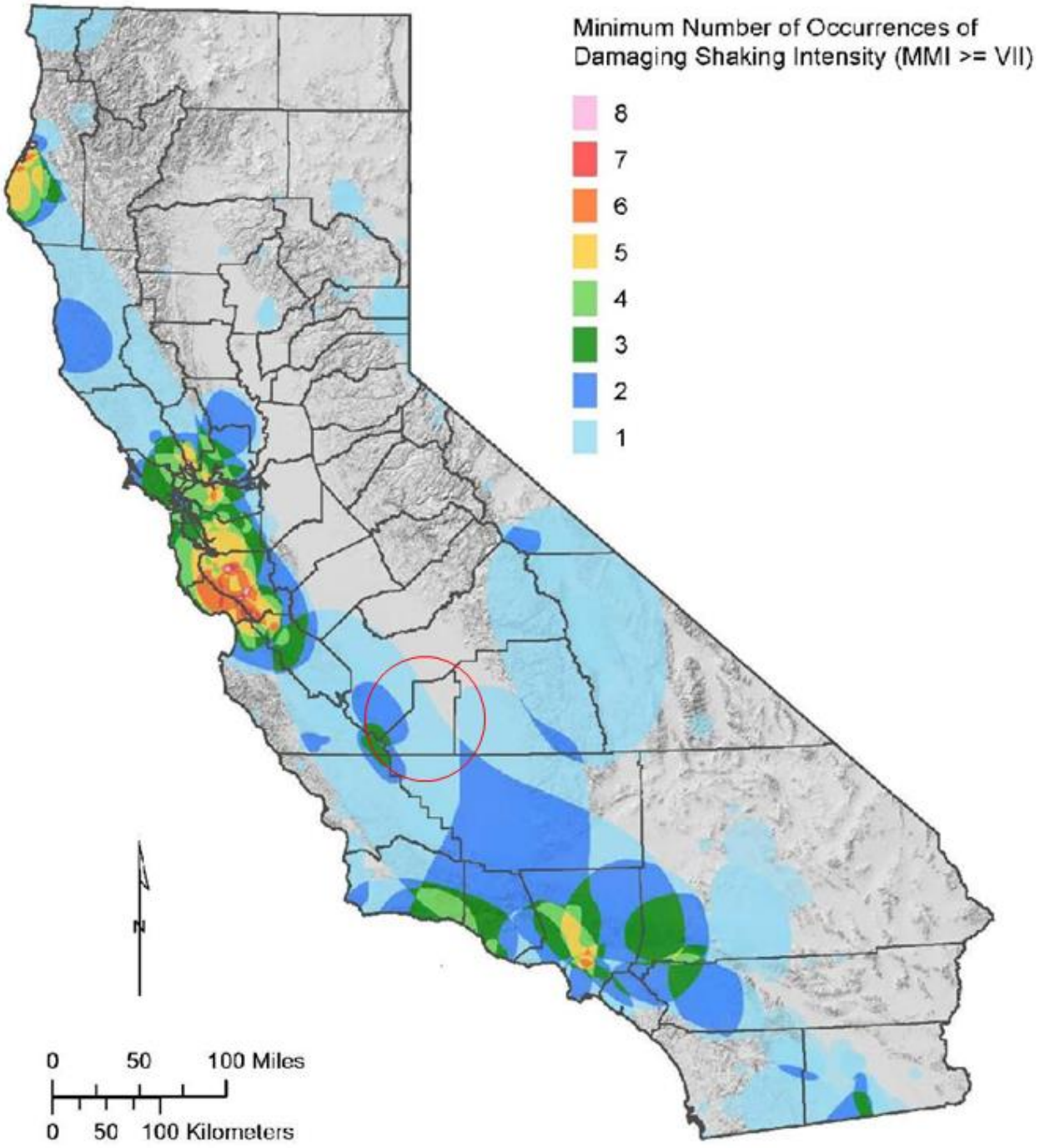
Figure 4-17 Areas Damaged by Earthquakes from 1800 to 2017



Source: California SHMP, 2018

4.5.5.4 Likelihood of Future Occurrence

Occasional – The National Earthquake Information Center (U.S.) reports 12,000-14,000 earthquakes a year around the world, or 35 a day. Throughout the world, there are one "great" (magnitude 8.0 or more), 18 "major" (7.0-7.9), 120 "large" (6.0-6.9) and 1,000 "moderate" (5.0-5.9) earthquakes in an average year (CA Department of Conservation, n.d.). Each year, California generally gets two or three earthquakes large enough to cause moderate damage to structures (magnitude 5.5 and higher). Moreover, earthquakes can occur at any time of the year. A strong earthquake can cause major damage depending on the

epicenter's location with regards to populated areas, and can lead to billions of dollars in disasters, deaths, injuries, and disruptions in services and communities' way of life.

Along the San Andreas Fault, segments exist where no large earthquakes have occurred for long intervals of time. These areas accumulate potential energy and provide clues as to where the next earthquake may occur and when. Scientists term these segments "seismic gaps" and, in general, have been successful in forecasting the time when some of the seismic gaps will produce large earthquakes. As noted by USGS, geologic studies show that over the past 1,400 to 1,500 years, large earthquakes have occurred at about 150-year intervals on the southern San Andreas Fault. Based on the earthquake shaking potential mapped for Kings County, the proximity to the San Andreas Fault and the history of shaking but no surface rupture, the probability of damaging seismic ground shaking in Kings County is occasional.

4.5.5.5 Climate Change Considerations

Climate change is not expected to directly affect earthquake frequency or intensity, nor the Likelihood of Future Occurrence of seismic activity.

4.5.5.6 Magnitude and Severity

Catastrophic – For extent, the severity of an earthquake, or the amount of energy released during an earthquake is usually expressed in terms of intensity or magnitude as described further below.

Magnitude – Magnitude represents the amount of seismic energy released at the hypocenter of an earthquake. It is based on the amplitude of the earthquake waves recorded. Seismologists have developed several magnitude scales; one of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Scale is numeric and has a logarithmic relationship between scale factors so that a difference of one scale number represents a tenfold increase in measured amplitude, which in turn corresponds to an approximate 31x energy release difference when compared to the next whole number value. The Moment Magnitude scale (M_w or M) is a measurement of energy released by the movement of a fault and is the modern method used by seismologists to measure earthquakes. Overall, as the amount of energy released by an earthquake increases, the potential for ground-shaking impacts also increases.

Intensity – Intensity represents the observed effects of ground shaking at any specified location and earthquake shaking decreases with distance from the earthquake epicenter. Intensity is an expression of the amount of shaking at any given location on the ground surface based on felt or observed effects. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Intensity is measured with the Modified Mercalli Intensity (MMI) scale. The intensity of ground shaking at a particular site or structure is a function of many factors including 1) earthquake magnitude, 2) distance from the epicenter, 3) duration of strong ground motion, 4) local geologic conditions (soil type and topography), and 5) the fundamental period of the structure. A brief description of those factors is presented below. The MMI scale is summarized in Table 4-26, along with the effects associated with the MMI scale. Damage typically occurs in MMI of scale VII or above. The associated magnitude scales are also shown in Table 4-26.

Table 4-26 Earthquake Magnitude and Intensity Measurements and Intensity Characteristics

MAGNITUDE	MERCALLI INTENSITY	EFFECTS	FREQUENCY
Less than 2.0	I	Microearthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year

MAGNITUDE	MERCALLI INTENSITY	EFFECTS	FREQUENCY
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicentral area.	100 to 150 per year
7.0-7.9	VIII<	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII<	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII<	At or near total destruction – severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Source: USGS Volcanic Hazards Program

Distance from Epicenter – Earthquake energy generally dissipates (or attenuates) with distance from a fault. Over long distances, this loss of energy can be significant, resulting in a significant decrease in ground shaking with increased distance from the epicenter.

Duration of Strong Shaking – The duration of strong ground shaking constitutes a major role in determining the amount of structural damage and the potential for ground failure that can result from an earthquake. Larger magnitude earthquakes have longer durations than smaller earthquakes.

Local Geologic Conditions – The geologic and soil conditions at a particular site have the potential to substantially increase the effects of ground shaking. The thickness, density, and consistency of the soil, as well as shallow groundwater levels, have the potential to amplify the effects of ground shaking depending on the characteristics of the earthquake. In general, the presence of unconsolidated soils above the bedrock surface can amplify the ground shaking caused by an earthquake.

Fundamental Periods – Every structure has its fundamental period or natural vibration. If the vibration of ground shaking coincides with the natural vibration period of a structure, damage to the structure can be greatly increased. The extent of damage suffered during an earthquake can also depend on non-geologic factors. The type of building and its structural integrity will influence the severity of the damage suffered. Generally, small, well-constructed, one- and two-story wood and steel frame buildings have performed well in earthquakes because of their light weight and flexibility. Reinforced concrete structures will also usually perform well. Buildings constructed from non-flexible materials, such as unreinforced brick and concrete, hollow concrete block, clay tile, or adobe, are more vulnerable to earthquake damage.

Effects of Ground Shaking – The primary effect of ground shaking is the damage or destruction of buildings, infrastructure, and possible injury or loss of life. Building damage can range from minor cracking of plaster to total collapse. Disruption of infrastructure facilities can include damage to utilities, pipelines, roads, and bridges. Ruptured gas and water lines can result in fire and produce scour/inundation damage to structures, as can fire from other causes, such as electrical damages. Secondary effects can include geologic impacts such as co-seismic fault movement along nearby faults, seismically induced slope instability, liquefaction, lateral spreading, and other forms of ground failure and seismic response. These secondary effects were demonstrated in Oceano by the San Simeon 2003 earthquake (Hardebeck et al, 2004).

4.5.5.7 Vulnerability Assessment

Earthquake loss estimation for the 2023 MJHMP update utilized FEMA's Hazus-MH 6.0 natural hazard loss estimation software. Hazus is a GIS-based, standardized, nationally applicable multi-hazard loss estimation methodology and software. Local, state, and federal government officials use Hazus for preparedness, emergency response, and mitigation planning. A Level 1 Hazus analysis was performed, which estimates damage based on an inventory database compiled at a national level aggregated to 2020 Census Tracts. As with any model, there are uncertainties and the results should be considered approximate for planning purposes.

To evaluate potential losses associated with earthquake activity in the County's planning area, two Hazus scenarios were run for the County, including a Hazus 2,500-year probabilistic scenario and the ShakeMap Magnitude 7.2 – Great Valley 14 (Kettleman Hills) Scenario. The 2,500-year scenario considers multiple faults in the region. The methodology utilizes probabilistic seismic hazard contour maps developed by the USGS for the 2018 update of the National Seismic Hazard Maps that are included with Hazus-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500-year return period analyzes ground shaking estimates from the various seismic sources in the area with a 2 percent probability of being exceeded in 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas.

The Magnitude 7.2 – Great Valley 14 (Kettleman Hills) is a deterministic earthquake analysis that was modeled using Hazus for the County. A deterministic scenario predicts the outcome of a specific earthquake event. This deterministic scenario used USGS-provided ShakeMap datasets to model what a Magnitude 7.2 earthquake of the Great Valley Fault Thrust System would generate in terms of damages and losses for the chosen area of interest (i.e. Kings County). The datasets used to import into Hazus 6.0 for the scenario included four USGS-provided data layers in geospatial format: peak ground velocity, peak ground acceleration, peak spectral acceleration for 0.3 seconds (0.3 % g, or gravitational velocity), and peak ground acceleration for 1.0 seconds (1.0 % g).

Hazus estimates the number of people displaced, the number of buildings and facilities/infrastructure damaged, the number of casualties, and the damage to transportation systems and utilities. Results produced by Hazus are reported at the census tract level. These results and the estimated impacts are summarized below in the vulnerability assessment.

People

Loss of utility service would have major impacts on the people of the County. The following tables indicate the number of projected households that would experience power and water loss, and the number of days the loss would last. As shown by Table 4-27 and Table 4-28 the 2,500-Year Probabilistic Scenario is expected to cause a longer delay in the recovery of potable water and electric power systems as well as cause more people to be without potable water or electric power compared to the Great Valley ShakeMap Scenario.

Table 4-27 Expected Potable Water and Electric Power System Performance – 2,500-Year Probabilistic Scenario

AFFECTED SERVICE	TOTAL NUMBER OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS WITHOUT SERVICE				
		AT DAY 1	AT DAY 3	AT DAY 7	AT DAY 30	AT DAY 90
Potable Water	44,100	36,567	36,100	35,057	24,608	0
Electric Power		36,801	27,393	14,104	2,168	44

Source: Hazus-MH 6.0

Table 4-28 Expected Potable Water and Electric Power System Performance – Great Valley ShakeMap Scenario

Affected Service	TOTAL NUMBER OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS WITHOUT SERVICE				
		AT DAY 1	AT DAY 3	AT DAY 7	AT DAY 30	AT DAY 90
Potable Water	44,100	8,513	6,254	2,238	0	0
Electric Power		3,315	2,451	1,222	157	4

Source: Hazus-MH 6.0

Sheltering is another concern during an earthquake – people may be displaced from their homes due to the earthquake, and those displaced people may need accommodations in temporary public shelters. Table 4-29 shows the projected total displacement and projected shelter needs for each scenario. The 2,500-Year Probabilistic Scenario is expected to result in many more displaced households and also people seeking shelter than the Great Valley ShakeMap Scenario.

Table 4-29 Shelter Requirements

	TOTAL POPULATION	TOTAL DISPLACED HOUSEHOLDS	TOTAL SEEKING SHELTER
2,500-YEAR PROBABILISTIC SCENARIO	152,486	2,371	1,588
GREAT VALLEY SHAKEMAP SCENARIO	152,486	121	96

Source: Hazus-MH 6.0

The Hazus modeled potential casualty numbers vary based on the magnitude and time of occurrence of the earthquake. Casualties are broken out by occupancy class, and severity is separated into one of four categories.

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

Hazus estimates are provided for three times of day: 2 AM, 2 PM, and 5 PM. These times represent the periods of the day when different sectors of the community are at their peak occupancy loads. The 2 AM estimate considers that the residential occupancy load is maximum, the 2 PM estimate considers that the educational, commercial, and industrial sector loads are maximum, and 5 PM represents peak commute time. Table 4-30 shows casualty estimates for the different times of day for each scenario. The 2,500-Year Probabilistic Scenario is expected to result in much more casualties and also more severe casualties than the Great Valley ShakeMap Scenario, shown in Table 4-31.

Table 4-30 Casualty Estimates – 2,500-Year Probabilistic Scenario

		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
2 AM	Commercial	6.42	1.78	0.28	0.56
	Commuting	0.06	0.07	0.13	0.03
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.07	0.02	0.00	0.01
	Industrial	9.53	2.65	0.42	0.82
	Other- Residential	294.52	72.12	9.25	17.88
	Single Family	210.24	32.87	1.67	2.86
	Total	**521**	**110**	**12**	**22**
2 PM	Commercial	574.36	158.59	25.16	49.05

		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
	Commuting	0.54	0.67	1.20	0.23
	Educational	230.38	62.92	10.17	19.90
	Hotels	0.01	0.00	0.00	0.00
	Industrial	70.21	19.45	3.07	5.99
	Other- Residential	126.17	31.09	4.21	7.84
	Single Family	66.67	10.43	0.62	0.90
	Total	**1,068**	**283**	**44**	**84**
5 PM	Commercial	446.20	122.91	19.53	37.54
	Commuting	9.31	11.45	20.50	3.91
	Educational	20.32	5.64	0.93	1.81
	Hotels	0.02	0.01	0.00	0.00
	Industrial	43.88	12.15	1.92	3.75
	Other- Residential	113.14	27.77	3.65	6.79
	Single Family	81.95	12.92	0.78	1.12
	Total	**715**	**193**	**47**	**55**

Source: Hazus-MH 6.0

Table 4-31 Casualty Estimates – Great Valley ShakeMap Scenario

		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
2 AM	Commercial	0.29	0.06	0.01	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.29	0.05	0.01	0.01
	Other- Residential	42.29	8.89	1.04	2.01
	Single Family	16.09	1.56	0.06	0.10
	Total	**59**	**11**	**1**	**2**
2 PM	Commercial	26.94	5.46	0.71	1.38
	Commuting	0.02	0.02	0.03	0.01
	Educational	14.37	3.13	0.45	0.88
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2.16	0.36	0.04	0.08
	Other- Residential	18.01	3.89	0.49	0.92
	Single Family	4.29	0.39	0.02	0.02
	Total	**66**	**13**	**2**	**3**
5 PM	Commercial	24.66	5.23	0.71	1.35
	Commuting	0.22	0.28	0.49	0.09
	Educational	0.34	0.04	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1.35	0.23	0.02	0.05
	Other- Residential	16.09	3.42	0.41	0.77
	Single Family	6.07	0.61	0.03	0.04
	Total	**49**	**10**	**2**	**2**

Source: Hazus-MH 6.0

Populations most vulnerable to earthquake hazards would be those that rely on specific services or electrical power which may not be available during or after an earthquake, or those which are homeless,

would have a difficult time evacuating due to age or disability, or cannot communicate easily due to speaking English less than well, for example.

Property

Unreinforced Masonry Building (URM)s – Unreinforced masonry building type structures consist of buildings made of unreinforced concrete and brick, hollow concrete blocks, clay tiles, and adobe. Buildings constructed of these materials are heavy and brittle, and typically provide little earthquake resistance. In small earthquakes, unreinforced buildings can crack, and in strong earthquakes, they have a tendency to collapse. These types of structures pose the greatest structural risk to life and safety of all general building types. Due to the public safety risks that are posed by URM buildings, the California legislature passed SB 547 (Government Code Section 8875 et seq.). This legislation went into effect on January 1, 1987, and required all cities and counties located in Seismic Zone 4 to conduct an inventory of potentially hazardous structures, including unreinforced masonry buildings. The County is located within Zone 4.

Hazus estimates the number of buildings that will be damaged during a modeled earthquake, and these estimates are provided in the figures and tables below. According to Hazus results, under the 2,500-year probabilistic scenario, the total building-related losses were $4.5 billion. By far, the largest loss was sustained by the residential occupancies which made up over 41% of the total loss. Under the Great Valley 14 (Kettleman Hills) ShakeMap Scenario, total building-related losses were $396 million. By far, the largest loss was also sustained by the residential occupancies, which made up over 41% of the total loss. Figure 4-18 and Figure 4-19 below provide summaries of the losses associated with the building damage under the two scenarios. The 2,500-Year Probabilistic Scenario is expected to result in much more economic losses than the Great Valley ShakeMap Scenario.

Figure 4-18 Earthquake Losses by Loss Type and Occupancy Type – 2,500 Probabilistic Scenario (in Millions of Dollars)

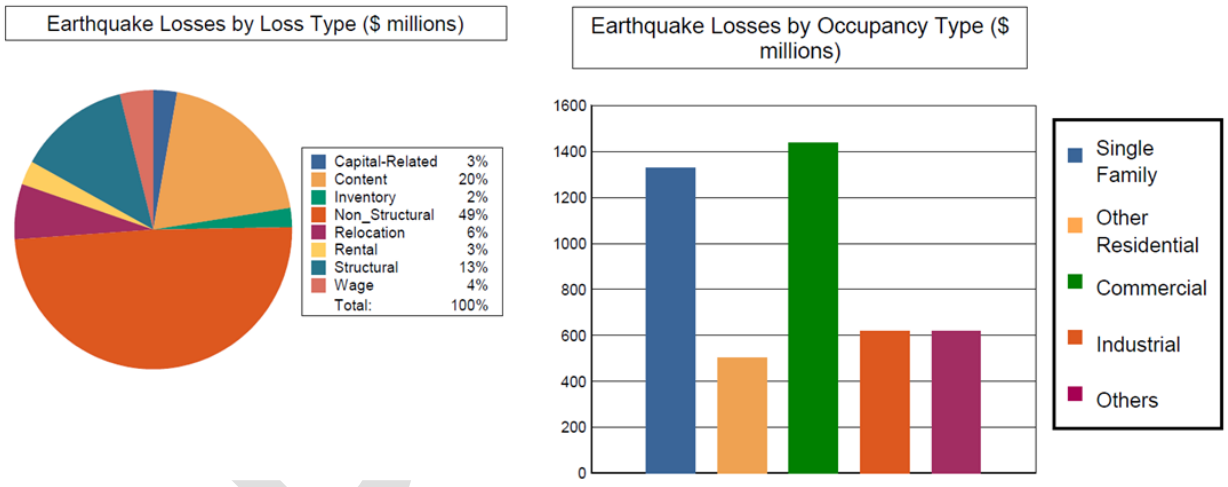


Figure 4-19 Earthquake Losses by Loss Type and Occupancy Type – Great Valley ShakeMap Scenario (in Millions of Dollars)

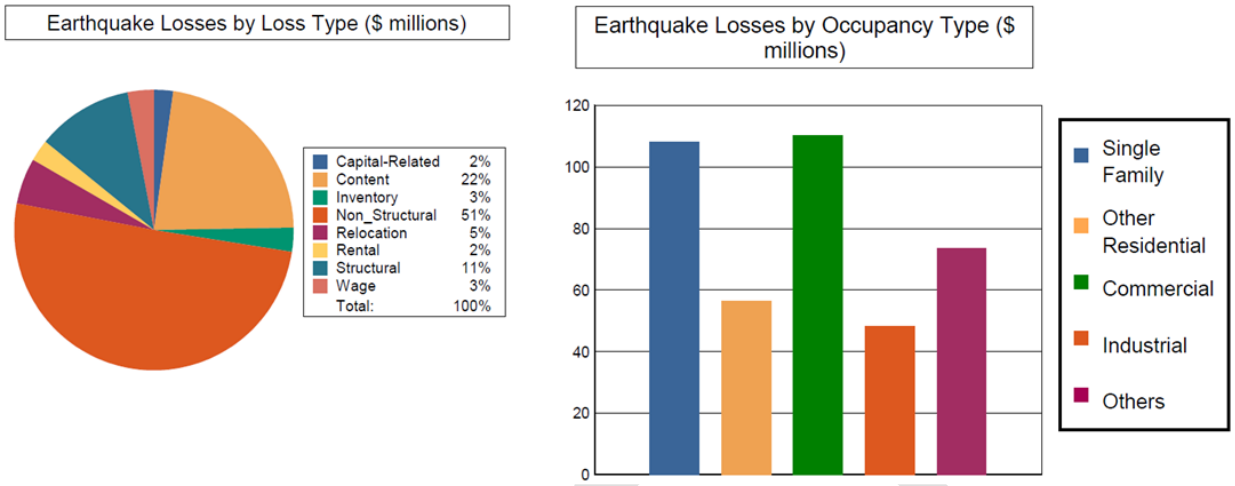


Table 4-32 and Table 4-33 show the expected building damage categorized by both building type and the degree of the expected damage. For each scenario, the majority of structures will either not be damaged or suffer slight to moderate damage. The 2,500-Year Probabilistic Scenario is expected to produce more severe building damage than the Great Valley ShakeMap Scenario.

Table 4-32 Expected Building Damage by Occupancy – 2,500-Year Probabilistic Scenario

	NONE		SLIGHT		MODERATE		EXTENSIVE		COMPLETE	
	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)
Agriculture	44.19	0.43	77.52	0.44	99.84	0.81	56.94	2.10	27.50	2.74
Commercial	288.25	2.80	481.07	2.71	799.30	6.47	529.91	19.52	219.47	21.85
Education	18.98	0.18	28.24	0.16	33.12	0.27	17.02	0.63	5.63	0.56
Government	10.07	0.10	15.52	0.09	23.61	0.19	16.26	0.60	6.54	0.65
Industrial	57.02	0.55	99.97	0.56	195.95	1.59	141.07	5.20	61.00	6.07
Other Residential	759.39	7.37	1404.03	7.90	1278.72	10.35	612.66	22.57	287.20	28.60
Religion	30.92	0.30	49.54	0.28	67.86	0.55	43.78	1.61	17.91	1.78
Single Family	9089.21	88.26	15624.33	87.87	9855.83	79.78	1296.67	47.77	378.95	37.74
Total	10,298		17,780		12,354		2,714		1,004	

Source: Hazus-MH 6.0

Table 4-33 Expected Building Damage by Occupancy – Great Valley ShakeMap Scenario

	NONE		SLIGHT		MODERATE		EXTENSIVE		COMPLETE	
	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)
Agriculture	228.77	0.60	42.91	0.89	24.87	2.18	7.42	4.10	2.04	4.42

	NONE		SLIGHT		MODERATE		EXTENSIVE		COMPLETE	
	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)	COUNTY	(%)
Commercial	1916.27	6.04	237.34	4.94	124.09	10.89	32.57	18.00	7.73	16.79
Education	86.63	0.23	10.40	0.22	4.57	0.40	1.15	0.63	0.26	0.55
Government	58.47	0.15	7.63	0.16	4.19	0.37	1.32	0.73	0.39	0.84
Industrial	448.84	1.18	62.01	1.29	34.77	3.05	7.74	4.28	1.64	3.56
Other Residential	3402.40	8.96	574.57	11.97	259.24	22.75	82.89	45.81	22.90	49.74
Religion	171.49	0.45	22.96	0.48	11.46	1.01	3.27	1.81	0.81	1.77
Single Family	31671.46	83.38	3842.34	80.05	676.35	59.35	44.57	24.63	10.27	22.32
Total	37,984		4,800		1,140		181		46	

Source: Hazus-MH 6.0

Figure 4-20 and Figure 4-21 below display the census tracts within the County that were analyzed in the two scenarios, color-coded by the amount of total building loss each tract experienced.

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Figure 4-20 Kings County Hazus 2,500-Year Probabilistic Scenario Total Building Loss (in Thousands of Dollars)

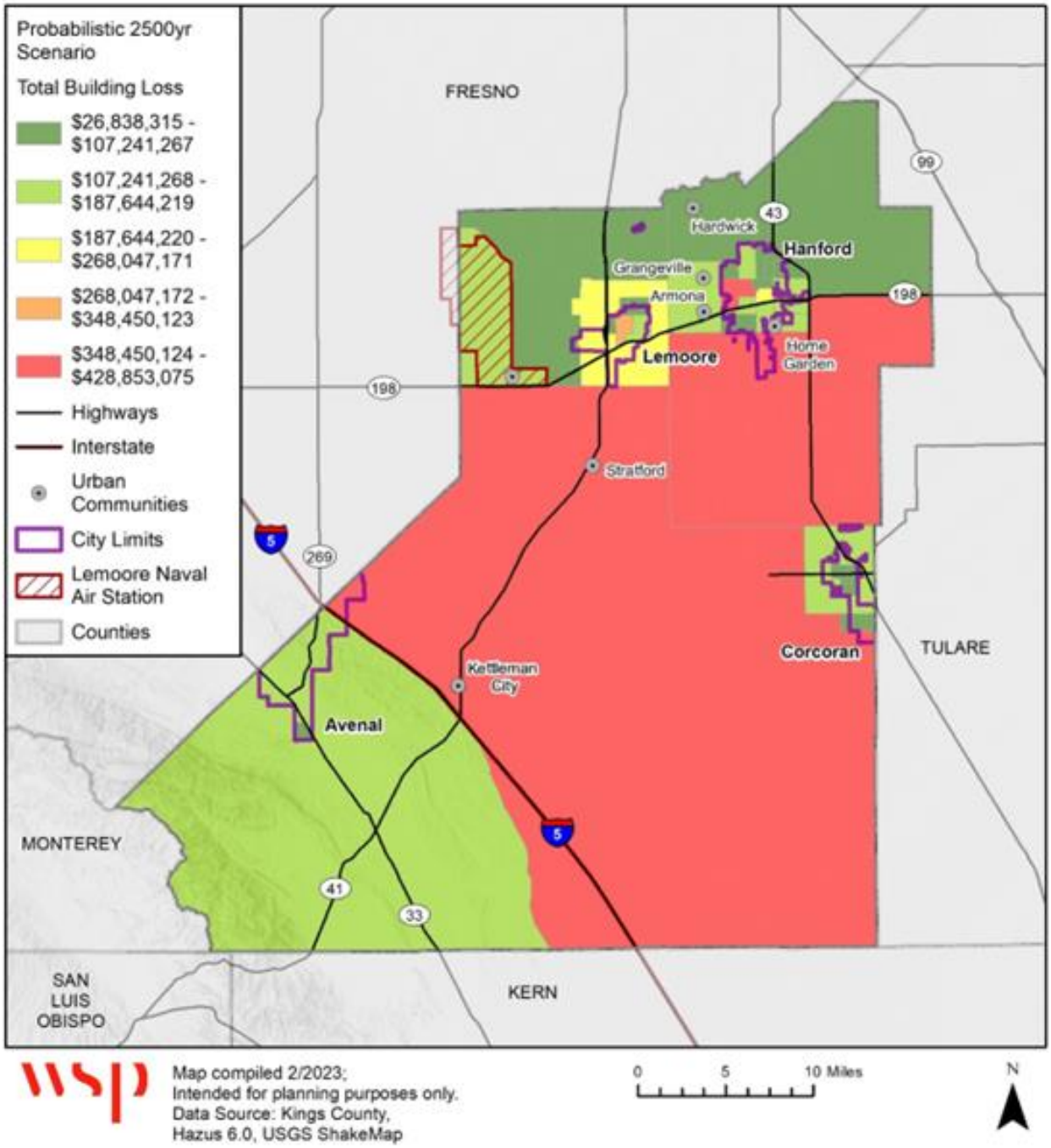
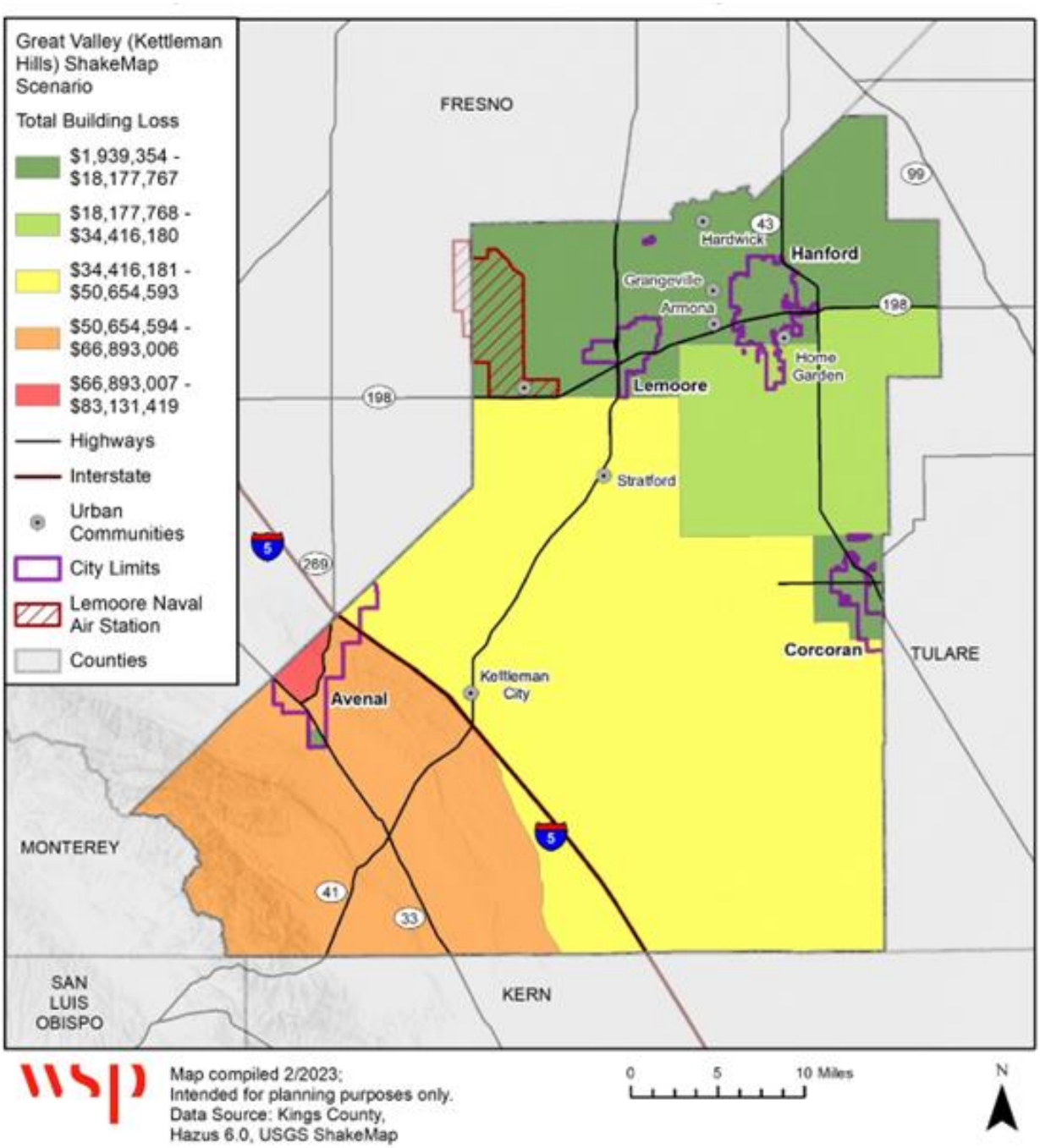


Figure 4-21 Kings County Great Valley ShakeMap Scenario Total Building Loss (in Thousands of Dollars)



Economy

Depending on its location and magnitude, an earthquake could have a devastating impact on the County's economy. Impacts would be related to debris cleanup and management, building and infrastructure damage, and losses related to business and infrastructure interruption. Hazus estimates the economic impacts of earthquakes. Losses estimated include building-related losses, and transportation and utility lifeline losses. The model estimates loss over a 15-year span after the incident.

Building losses are broken into two categories – direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building

and its contents. Business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake. Table 4-34 shows the economic losses under the two scenarios broken down by loss categories and occupancy types. The 2,500-year probabilistic scenario is expected to cause much more economic losses.

Table 4-34 Economic Losses (Millions of Dollars)

2,500-YEAR PROBABILISTIC SCENARIO						
Category	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses	132.51	70.22	403.1	35.6	75.57	717
Capital Stock Losses	1,195.44	432.9	1,035.41	584.42	543	3,791.17
Total	**1,327.95**	**503.12**	**1,438.51**	**620.02**	**618.57**	**4,508.17**
GREAT VALLEY SHAKEMAP SCENARIO						
Income Losses	6.9	6.09	28.87	2.54	6.98	51.37
Capital Stock Losses	101.28	50.41	81.43	45.81	66.63	345.57
Total	**108.18**	**56.5**	**110.3**	**48.36**	**73.6**	**396.94**

Source: Hazus-MH 6.0

Moreover, the economic losses associated with the disruption of lifeline systems, specifically transportation and utility lifelines are shown in Table 4-35 and Table 4-36.

Table 4-35 Lifeline System Losses for 2,500-Year Probabilistic Scenario – Transportation and Utility (Millions of Dollars)

2,500-YEAR PROBABILISTIC SCENARIO		
System	Inventory Value	Economic Loss
Highway	$2,452	$5.24
Railways	$1,162.69	$1.22
Light Rail	$0	$0
Bus	$4.3	$0.59
Ferry	$0	$0
Port	$0	$0
Airport	$135	$14.69
Potable Water	$130.34	$26.78
Wastewater	$78.2	$13.45
Natural Gas	$602.59	$70.2
Oil Systems	$0.12	$0.03
Electrical Power	$1,634.4	$1,338.7
Communication	$0.47	$0.59

Source: Hazus-MH 6.0

Table 4-36 Lifeline System Losses for Great Valley ShakeMap Scenario – Transportation and Utility (Millions of Dollars)

GREAT VALLEY SHAKEMAP SCENARIO		
SYSTEM	INVENTORY VALUE	ECONOMIC LOSS
Highway	$3,898.68	$15.2
Railways	$1,052.92	$4.28
Light Rail	$0	$0
Bus	$7.32	$0.79

GREAT VALLEY SHAKEMAP SCENARIO		
Ferry	$0	$0
Port	$0	$0
Airport	$158.47	$3.48
Potable Water	$130.34	$6.06
Wastewater	$78.2	$3.05
Natural Gas	$602.59	$41.47
Oil Systems	$0.12	$0
Electrical Power	$1,634.4	$392.76
Communication	$0.47	$0.03

Source: Hazus-MH 6.0

The 2,500-Year Probabilistic Scenario is also expected to result in much more lifeline system losses than the Great Valley ShakeMap Scenario.

Critical Facilities and Infrastructure

Hazus breaks critical facilities into two groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. HPL facilities include dams, levees, military installations, nuclear power plants and hazardous material sites. There are 12 hospitals in Kings with a total bed capacity of 142 beds. There are also 71 schools, 18 fire stations, 9 police stations and one emergency operation facility. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

On the day of the earthquake in the 2,500-Year Probabilistic Scenario, the model estimates that only 24 hospital beds (17%) would be available for use by patients already in the hospital and those injured by the earthquake. After one week, 49% of the beds would be back in service. By 30 days, 83% will be operational. The expected damages from the earthquake event are provided in Table 4-37.

Table 4-37 Expected Damage to Essential Facilities – 2,500-Year Probabilistic Scenario

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	2	1	0	0
Schools	71	32	0	0
EOCs	1	1	0	0
PoliceStations	9	2	0	0
FireStations	18	1	0	0

Source: Hazus-MH 6.0

On the day of the earthquake for the Great Valley ShakeMap Scenario, the model estimates that 126 hospital beds (89%) would be available for use by patients already in the hospital and those injured by the earthquake. After one week, 98% of the beds would be back in service. By 30 days, 100% will be operational. The expected damages from the earthquake event are provided in Table 4-38.

Table 4-38 Expected Damage to Essential Facilities – Great Valley ShakeMap Scenario

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	2	0	0	2
Schools	71	0	0	62
EOCs	1	0	0	1
PoliceStations	9	0	0	7
FireStations	18	0	0	15

Source: Hazus-MH 6.0

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven transportation systems that include highways, railways, light rail, bus, ports, ferry, and airports. There are also six utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power, and communications. The transportation systems inventory and expected damages from the earthquake, in terms of the number of structures and locations affected, are provided in Table 4-39 and Table 4-40 for the two scenarios, while losses in millions of dollars are summarized in Table 4-41 and Table 4-42. The total value of the lifeline inventory is over $6.2 billion. This inventory includes over 300 miles of highways, 166 bridges, and 6,554 miles of pipes.

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Table 4-39 Expected Damage to the Transportation Systems – 2,500-Year Probabilistic Scenario

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	109	0	0	109	109
	Bridges	166	15	3	152	158
	Tunnels	0	0	0	0	0
Railways	Segments	11	0	0	11	11
	Bridges	32	0	0	32	32
	Tunnels	0	0	0	0	0
	Facilities	5	5	0	5	5
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	2	2	0	0	2
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	4	4	0	3	4
	Runways	5	0	0	5	5

Source: Hazus-MH 6.0

Table 4-40 Expected Damage to the Transportation Systems – Great Valley ShakeMap Scenario

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	109	0	0	109	109
	Bridges	166	4	0	162	166
	Tunnels	0	0	0	0	0
Railways	Segments	11	0	0	11	11
	Bridges	32	0	0	32	32
	Tunnels	0	0	0	0	0
	Facilities	5	0	0	5	5
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	2	0	0	2	2
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	4	0	0	4	4
	Runways	5	0	0	5	5

Source: Hazus-MH 6.0

Table 4-41 Transportation System Economic Losses (Millions of dollars) – 2,500-Year Probabilistic Scenario

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2163.4977	0.0000	0.00
	Bridges	288.5037	39.8261	13.80
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**2452.0014**	**39.8261**	
Railways	Segments	967.2941	0.0000	0.00
	Bridges	182.0800	14.3146	7.86
	Tunnels	0.0000	0.0000	0.00
	Facilities	13.3150	5.1899	38.98
	Subtotal	**1162.6891**	**19.5045**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	4.2978	2.0739	48.25
	Subtotal	**4.2978**	**2.0739**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	37.3120	14.6894	39.37
	Runways	97.6853	0.0000	0.00
	Subtotal	**134.9973**	**14.6894**	
	Total	**3,753.99**	**76.09**	

Source: Hazus-MH 6.0

Table 4-42 Transportation System Economic Losses (Millions of dollars) – Great Valley ShakeMap Scenario

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2163.4977	0.0000	0.00
	Bridges	288.5037	5.2373	1.82
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**2452.0014**	**5.2373**	
Railways	Segments	967.2941	0.0000	0.00
	Bridges	182.0800	0.0128	0.01
	Tunnels	0.0000	0.0000	0.00
	Facilities	13.3150	1.2061	9.06
	Subtotal	**1162.6891**	**1.2189**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	4.2978	0.5863	13.64
	Subtotal	**4.2978**	**0.5863**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	37.3120	3.3081	8.87
	Runways	97.6853	0.0000	0.00
	Subtotal	**134.9973**	**3.3081**	
	Total	**3,753.99**	**10.35**	

Source: Hazus-MH 6.0

The replacement value of the transportation and utility lifeline systems is estimated to be $3.76 billion and $2.45 billion, respectively. The expected utility system facility damages in terms of total structures or systems affected, along with the inventory of this dataset, are summarized Table 4-43 and Table 4-44 for the two scenarios respectively. Economic losses in millions of dollars are found in Table 4-45 and Table 4-46.

Table 4-43 Expected Utility System Facility Inventory and Damages – 2,500-Year Probabilistic Scenario

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	130.3350
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**130.3350**
Waste Water	Distribution Lines	NA	78.2010
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**78.2010**
Natural Gas	Distribution Lines	NA	52.1340
	Facilities	2	124.2883
	Pipelines	22	429.1636
		Subtotal	**605.5859**
Oil Systems	Facilities	1	0.1180
	Pipelines	0	0.0000
		Subtotal	**0.1180**
Electrical Power	Facilities	23	1634.4347
		Subtotal	**1634.4347**
Communication	Facilities	4	0.4720
		Subtotal	**0.4720**
		Total	**2,449.10**

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 % After Day 1	with Functionality > 50 % After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	2	2	0	0	0
Oil Systems	1	1	0	0	1
Electrical Power	23	23	7	0	2
Communication	4	4	0	3	4

Source: Hazus-MH 6.0

Table 4-44 Expected Utility System Facility Inventory and Damages – Great Valley ShakeMap Scenario

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	130.3350
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**130.3350**
Waste Water	Distribution Lines	NA	78.2010
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**78.2010**
Natural Gas	Distribution Lines	NA	52.1340
	Facilities	2	124.2883
	Pipelines	22	429.1636
		Subtotal	**605.5859**
Oil Systems	Facilities	1	0.1180
	Pipelines	0	0.0000
		Subtotal	**0.1180**
Electrical Power	Facilities	23	1634.4347
		Subtotal	**1634.4347**
Communication	Facilities	4	0.4720
		Subtotal	**0.4720**
		Total	**2,449.10**

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 % After Day 1	with Functionality > 50 % After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	2	2	0	0	2
Oil Systems	1	0	0	1	1
Electrical Power	23	10	0	16	19
Communication	4	0	0	4	4

Source: Hazus-MH 6.0

Table 4-45 Utility System Economic Losses in Millions of Dollars – 2,500-Year Probabilistic Scenario

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	130.3350	26.7795	20.55
	Subtotal	**130.3350**	**26.7795**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	78.2010	13.4520	17.20
	Subtotal	**78.2010**	**13.4520**	
Natural Gas	Pipelines	429.1636	0.0000	0.00
	Facilities	124.2883	65.5907	52.77
	Distribution Lines	52.1340	4.6086	8.84
	Subtotal	**605.5859**	**70.1993**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1180	0.0333	28.22
	Subtotal	**0.1180**	**0.0333**	
Electrical Power	Facilities	1634.4347	1049.1264	64.19
	Subtotal	**1634.4347**	**1049.1264**	
Communication	Facilities	0.4720	0.1848	39.15
	Subtotal	**0.4720**	**0.1848**	
	Total	**2,449.15**	**1,159.78**	

Source: Hazus-MH 6.0

Table 4-46 Utility System Economic Losses in Millions of Dollars – Great Valley ShakeMap Scenario

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	130.3350	6.0639	4.65
	Subtotal	**130.3350**	**6.0639**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	78.2010	3.0461	3.90
	Subtotal	**78.2010**	**3.0461**	
Natural Gas	Pipelines	429.1636	0.0000	0.00
	Facilities	124.2883	40.4247	32.52
	Distribution Lines	52.1340	1.0436	2.00
	Subtotal	**605.5859**	**41.4683**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1180	0.0036	3.05
	Subtotal	**0.1180**	**0.0036**	
Electrical Power	Facilities	1634.4347	392.7571	24.03
	Subtotal	**1634.4347**	**392.7571**	
Communication	Facilities	0.4720	0.0259	5.49
	Subtotal	**0.4720**	**0.0259**	
	Total	**2,449.15**	**443.36**	

Source: Hazus-MH 6.0

Site specific expected utility system pipeline damages (including their inventory) are included in Table 4-47 and Table 4-48, while the potable water and electric power system performance limitations, damages, and inventory will be in Table 4-49 and Table 4-50.

Table 4-47 Expected Utility System Pipeline Damage (Site Specific) – 2,500-Year Probabilistic Scenario

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	4,049	5951	1488
Waste Water	2,430	2989	747
Natural Gas	76	54	13
Oil	0	0	0

Source: Hazus-MH 6.0

Table 4-48 Expected Utility System Pipeline Damage (Site Specific) – Great Valley ShakeMap Scenario

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	4,049	1348	337
Waste Water	2,430	677	169
Natural Gas	76	0	0
Oil	0	0	0

Source: Hazus-MH 6.0

Table 4-49 Expected Potable Water and Electric Power System Performance – 2,500-Year Probabilistic Scenario

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	44,100	36,567	36,100	35,057	24,608	0
Electric Power		36,801	27,393	14,104	2,168	44

Source: Hazus-MH 6.0

Table 4-50 Expected Potable Water and Electric Power System Performance – Great Valley ShakeMap Scenario

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	44,100	8,513	6,254	2,238	0	0
Electric Power		3,315	2,451	1,222	157	4

Source: Hazus-MH 6.0

In summary, a major earthquake would result in serious impacts on critical infrastructure. Hazus estimates impacts to critical facilities including hospitals, schools, Emergency Operation Centers (EOCs), police stations and fire stations. These impact estimates are shown in Table 4-51 and Table 4-52. As shown in the two tables, the 2,500-Year Probabilistic Scenario is expected to cause more damage and also more severe damage to critical facilities, as well as result in delays for the critical facilities to recover than the Great Valley ShakeMap Scenario. Major impacts on the critical facilities in the County will in turn result in significant impacts to socially vulnerable populations, particularly those communities that lack access to transportation or support systems and need to evacuate to neighboring counties for support.

Table 4-51 Expected Damage to Critical Facilities – 2,500-Year Probabilistic Scenario

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on Day 1
Hospitals	2	1	0	0
Schools	71	32	0	0
EOCs	1	1	0	0
Police Stations	9	2	0	0
Fire Stations	18	1	0	0
Total	101	37	0	0

Source: Hazus-MH 6.0

Table 4-52 Expected Damage to Critical Facilities – Great Valley ShakeMap Scenario

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on Day 1
Hospitals	2	0	0	2
Schools	71	0	0	0
EOCs	1	0	0	62
Police Stations	9	0	0	0
Fire Stations	18	0	0	1
Total	101	0	0	65

Source: Hazus-MH 6.0

Cultural, Historic and Natural Resources

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

Development Trends

Development Trends in the County is not anticipated to significantly affect vulnerability to earthquakes when designed according to modern building codes. However, Development Trends will result in a slight increase in exposure of the population, building stock, and related infrastructure to earthquakes.

4.5.5.8 Risk Summary

- The County is located in a geologically complex and seismically active region, albeit less so than other areas of California. There is a couple of active and potentially active faults close to the County. The County does not have a history of significant damaging earthquakes.
- The overall significance of earthquakes is High.
- A moderate earthquake occurring in or near Kings County could result in deaths, casualties, property damage, agricultural and environmental damage, and disruption of normal government and community services and activities.
- The location of the epicenter as well as the time of day and season of the year would have a profound effect on the number of deaths and casualties, as well as property damage.
- The hazard of earthquakes varies from place to place, dependent upon the regional and local geology.
- Effects on people – Hazus 2,500-year probabilistic scenario modeling results in estimates of 122 to 317 people needing hospitalization and between 22 to 84 deaths depending on the time of day the earthquake hits; Hazus Great Valley ShakeMap Scenario modeling results in estimates of 12 to 15 people needing hospitalization and between 2 to 3 deaths depending on the time of day the earthquake hits.
- Effects on property – Hazus 2,500-year probabilistic scenario modeling indicates about 16,072 buildings will be at least moderately damaged, with approximately $4.51 billion in losses; Hazus Great Valley ShakeMap Scenario modeling indicates about 6,167 buildings will be at least moderately damaged, with approximately $0.4 billion in losses.
- Effects on economy – The total economic loss estimated under Hazus 2,500-year probabilistic scenario is over $5.7 billion, which includes building and lifeline related losses based on the region's available inventory. The total economic loss estimated under Hazus Great Valley ShakeMap Scenario is almost $0.9 billion, which includes building and lifeline related losses based on the region's available inventory.
- Effects on critical facilities and infrastructure – Under the Hazus 2,500-year probabilistic scenario essential facility damage *(*police, fire, school, medical) is predicted to be medium; only 24 hospital beds (17%) would be available during the earthquake. Under the Hazus Great Valley ShakeMap Scenario, essential facility damage *(*police, fire, school, medical) is predicted to be very low; 126 hospital beds (89%) would be available during the earthquake.
- Cascading and Secondary Effects – Earthquakes can cause many cascading effects such as fires, flooding, hazardous materials spills, utility disruptions, liquefaction, landslides, and transportation emergencies. Ground shaking may cause tsunamis or seiche, the rhythmic sloshing of water in lakes or bays.

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Limited	Occasional	Catastrophic	Medium	Yes
City of Avenal	Significant	Occasional	Catastrophic	High	Yes
City of Corcoran	Limited	Occasional	Critical	Medium	Yes
City of Hanford	Limited	Occasional	Critical	Medium	Yes
City of Lemoore	Limited	Occasional	Critical	Medium	Yes

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4.5.6 EXTREME TEMPERATURES: FREEZE AND HEAT

4.5.6.1 Hazard Description

Extreme temperature events, both cold and hot, can have severe impacts on human health and mortality, natural ecosystems, agriculture, and other economic sectors.

Freeze

Extreme cold temperatures pose significant risks to human health and safety, including hypothermia, frostbite, carbon monoxide poisoning, and slips and falls. In addition, extreme cold can cause damage to infrastructure, such as frozen pipes and power outages, as well as agriculture through crop and livestock damage. Furthermore, extreme cold can disrupt transportation and shipping, leading to economic losses.

In 2001, the NWS implemented an updated Wind Chill Temperature index shown in Figure 4-22. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. Overall, freeze impacts would likely be limited in the planning area, with the greatest impact being on the agricultural industry.

Figure 4-22 NWS Wind Chill Chart

Temperature ° F

Wind (mph)	20	15	10	5	0	-5	-10	-15	-20
5	13	7	1	-5	-11	-16	-22	-28	-34
10	9	3	-4	-10	-16	-22	-28	-35	-41
15	6	0	-7	-13	-19	-26	-32	-39	-45
20	4	-2	-9	-15	-22	-29	-35	-42	-48
25	3	-4	-11	-17	-24	-31	-37	-44	-51
30	1	-5	-12	-19	-26	-33	-39	-46	-53
35	0	-7	-14	-21	-27	-34	-41	-48	-55
40	-1	-8	-15	-22	-29	-36	-43	-50	-57
45	-2	-9	-16	-23	-30	-37	-44	-51	-58
50	-3	-10	-17	-24	-31	-38	-45	-52	-60
55	-3	-11	-18	-25	-32	-39	-46	-54	-61
60	-4	-11	-19	-26	-33	-40	-48	-55	-62

= Extreme Danger – Heatstroke stroke highly likely

= Danger – Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity

= Extreme Caution – Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity

Source: The National Weather Service

Extreme Heat

Extreme heat can pose serious risks to human health and safety. The most common risks associated with exposure to extreme heat include dehydration, heat exhaustion, and heat stroke. In addition to the risks to human health and safety, extreme heat can have significant impacts on infrastructure, the economy, and agriculture. For example, high temperatures can cause power outages and damage to roads and other infrastructure. In agriculture, extreme heat can damage crops and livestock, leading to lower yields and economic losses for farmers.

Figure 4-23 shows the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes the air feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the Heat Index rises, so do health risks.

Figure 4-23 NWS Heat Index

Temperature ° F

Relative Humidity %	80	85	90	95	100	105	110	115	120
0	73	78	83	87	91	95	99	105	107
5	74	79	84	88	93	97	102	107	111
10	75	80	85	90	95	100	105	111	116
15	76	81	86	91	97	102	108	115	123
20	77	82	87	93	99	105	112	120	130
25	77	83	88	94	101	109	117	127	139
30	78	84	90	96	104	113	123	135	148
35	79	85	91	98	107	118	130	143	
40	80	86	91	101	110	123	137	151	
45	80	87	93	104	115	129	143		
50	81	88	95	107	120	135	150		
55	81	89	97	110	126	142			
60	82	90	100	114	132	149			
65	82	91	103	119	138	95			
70	83	93	105	124	144				
75	84	95	109	130	150				
80	84	97	113	136					
85	85	99	117	140					
90	86	102	122	150					
95	86	105	127						
100	87	108	132						

= Extreme Danger – Heatstroke stroke highly likely

= Danger – Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity

= Extreme Caution – Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity

= Caution – Fatigue possible with prolonged exposure and/or physical activity

Source: The National Weather Service

Table 4-53 summarizes temperature normals in the County with data from the National Weather Service (NWS).

Table 4-53 Kings County Temperature and Precipitation Summary

METRIC	HANFORD 1S (043747)
Period of Record	1899-2016
Winter Average Minimum Temperature*	36.2˚F

Winter Mean Temperature *	46.7˚F
Summer Average Maximum Temperature**	95.1˚F
Summer Mean Temperature**	60.4˚F
Average Annual Number of Days >90˚F	105.1
Average Annual Number of Days <32˚F	0.0
Mean Total Precipitation (in.)	8.38
Mean Snow Depth (in.)	0.0
Maximum Temperature	116˚F on July 28, 1933
Minimum Temperature	14˚F on January 6, 1913

Source: Western Regional Climate Center (WRCC)
*Winter = Dec., Jan., and Feb.

**Summer = Jun., Jul., and Aug

4.5.6.2 Geographic Area

Extensive – One of the defining features of temperature hazards is that they tend to be regional in nature, impacting a large geographical area simultaneously. This is due to the limited geographical extent of the County, which means that temperature hazards have the potential to affect most, if not all, of the planning area at the same time.

4.5.6.3 Past Occurrences

A search of records from 2000 to 2022 in the National Centers for Environmental Information (NCEI) Storm Events Database showed 161 extreme cold events and 52 extreme heat events in Kings County. These events are broken down by event type in Table 4-54 below.

Table 4-54 Extreme Temperature Events, 2017-2021

EVENT TYPE	EVENT COUNT (# OF DAYS)	TOTAL DEATHS	TOTAL INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Cold/Wind Chill	4	-	-	-	-
Extreme Cold/Wind Chill	4	-	-	-	-
Excessive Heat	7	-	-	$1,000,000	-
Frost/Freeze	150	-	-	-	$216,720,000
Heat	45	-	-	-	$106,600,000
Winter Weather	3	-	-	-	-
Total	213	0	0	$1,000,000	$323,320,000

Source: NCEI, 2023

Since 1950, there have been three State emergency declarations in the County for freeze events (refer to Table 4-1) although there have been no events since 2017. There have been no State or federal emergency declarations for extreme heat. The SHELDUS database recorded six incidents of freezes and severe cold between 1970 and 2005 (Kings County 2012). No injuries or deaths are recorded but millions of dollars in crop damage have occurred.

There have been 4 USDA disaster designations due to extreme temperatures in Kings County since 2012. They are summarized in Table 4-55.

Table 4-55 USDA Extreme Temperature Disaster Declarations, 2012-2021

YEAR	DESCRIPTION OF DISASTER
2012	Freezing temperatures, high winds, excessive rain
	Hailstorm, rain, cold temperatures
2016	excessive rain, high winds, cold temperatures, and hail
2018	Freeze

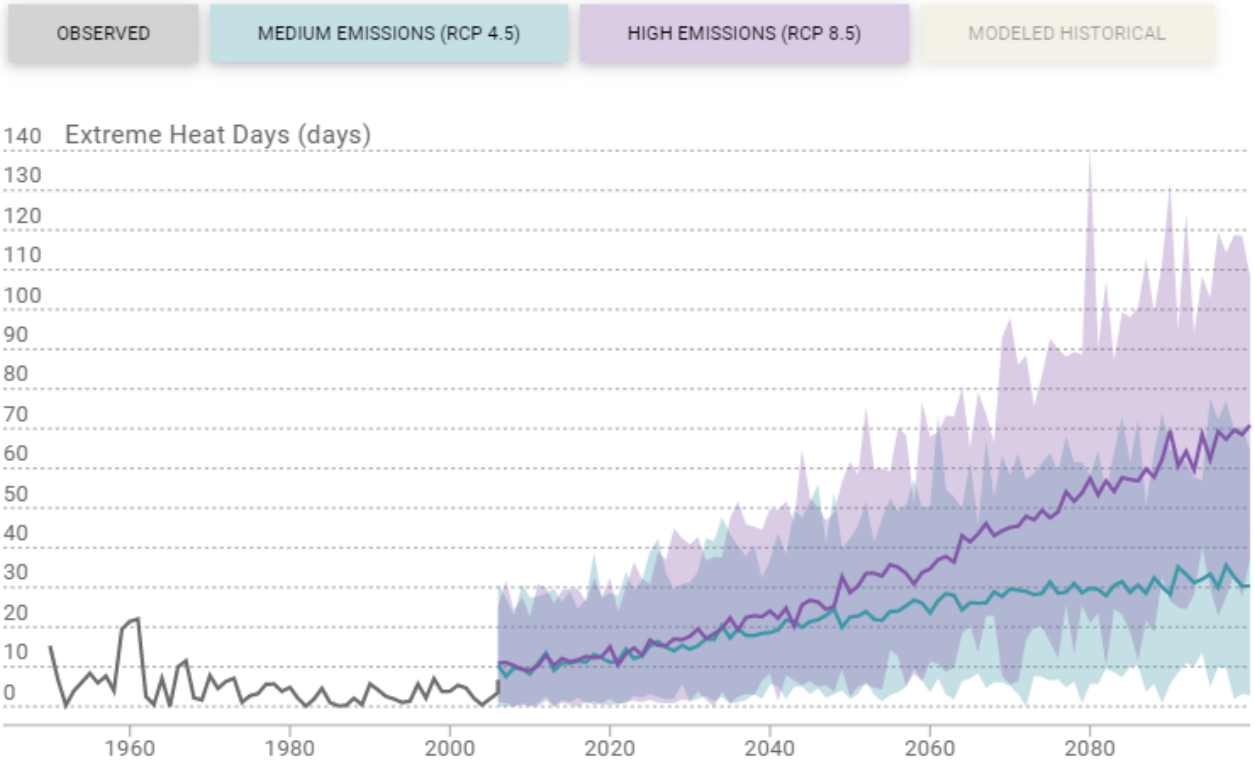
Source: USDA

4.5.6.4 Likelihood of Future Occurrence

Highly Likely – In the past, severe freezes have occurred every few years. Based on the NCEI data, 161 extreme cold events have occurred over a 23-year period, which equates to seven major events every year. This makes it highly likely that an extreme cold event will happen during any given year. Based on the NCEI data, 52 extreme heat events have occurred over a 23-year period, which equates to over two extreme heat events annually. This makes it highly likely that an extreme heat event will happen during any given year.

As climate change progresses, these events are likely to become more common. Future temperature estimates from Cal-Adapt for the County under high and low emission scenarios are shown in Figure 4-24. The graph shows the number of days per year when daily maximum temperature is above the extreme heat threshold of 104.4 ˚F. Note: The threshold temperature used in Cal-Adapt is location specific, and in this case for the County. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed in the County.

Figure 4-24 Future Extreme Heat Days in Kings County



Source: Cal-Adapt 2023

Regarding extreme cold temperatures, a study funded by NOAA's Climate Program Office's Modeling, Analysis, Predictions and Projections (MAPP) program, which used machine learning techniques to link extreme cold weather in the United States to Arctic warming, suggests that extreme cold events may

increase as well (Cohen et al 2021). Accelerated Arctic warming has been evident since the 1990s as one of the more robust signs of global warming. MAPP program's researchers concluded that Arctic warming and climate change are likely contributing to the increasing frequency of Arctic polar vortex stretching events, which deliver extreme cold from the north pole to the lower United States. One such event occurred in 2021 in Texas when a cold wave caused the collapse of the state's infrastructure and resulted in approximately $80-130 billion in direct and indirect economic losses (Cohen et al 2021).

4.5.6.5 Climate Change Considerations

Temperatures in California have risen almost 3˚F since the beginning of the 20th century (Frankson et al, 2022). Under RCP 8.5, the average temperature is likely to be about 9˚F hotter than the hottest year on record (Frankson et al, 2022). Increasing temperatures are likely to have the secondary effects of raising the snow line and increasing earlier snowpack melt, resulting in an increased likelihood that precipitation will fall as rain rather than snow, reducing water storage in the snowpack. Reduced snowpack availability has forced many agricultural producers to utilize groundwater, and over pumping has caused significant land subsidence in parts of the County.

Figure 4-25 below show the historic number of extreme heat days in the County, and Figure 4-26 shows the projected number of extreme heat days under the RCP 8.5 scenario anticipated by mid-century As shown, approximately 10 to 20 additional extreme heat days are anticipated by mid-century.

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Figure 4-25 Historical Number of Extreme Heat Days

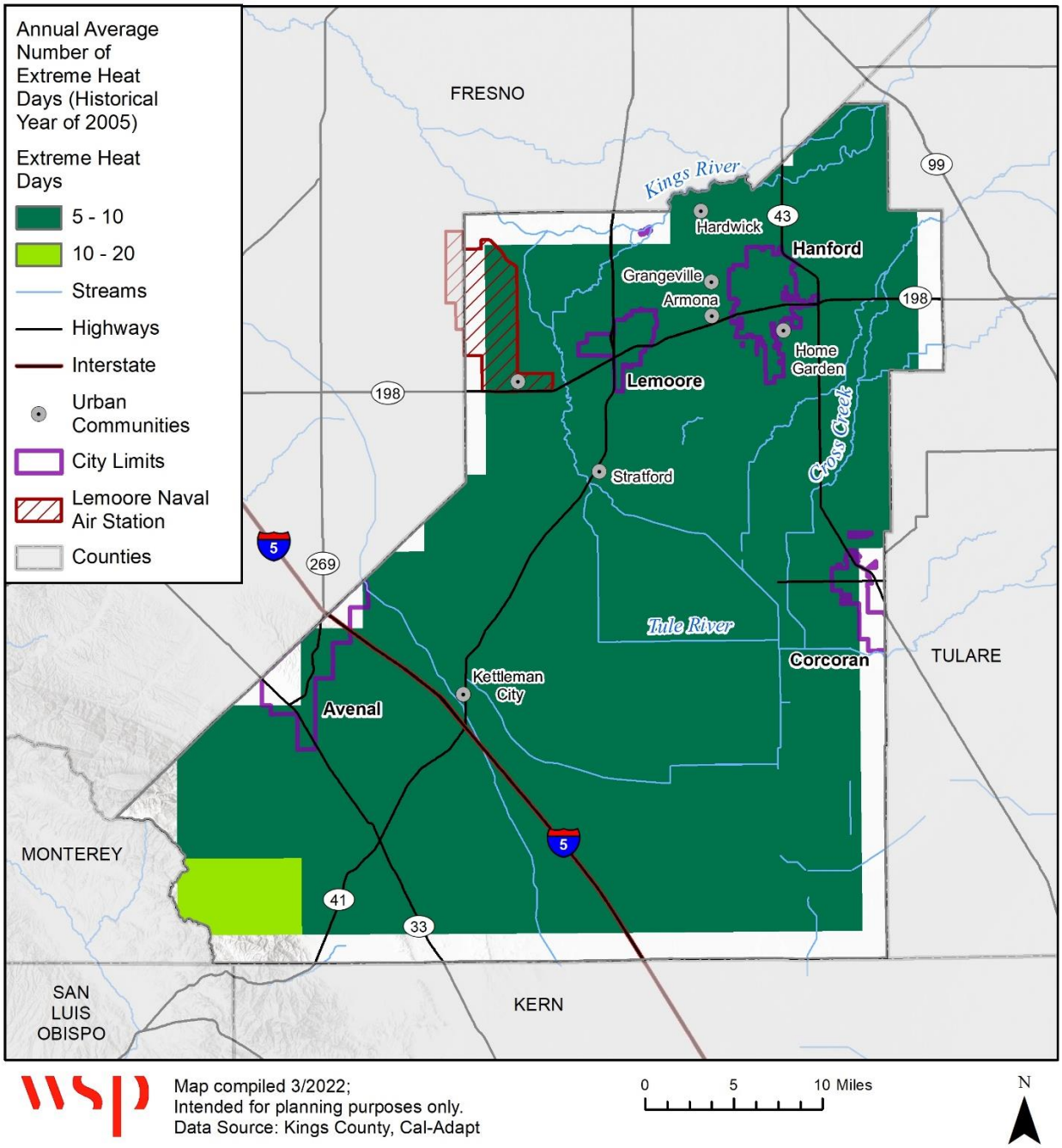
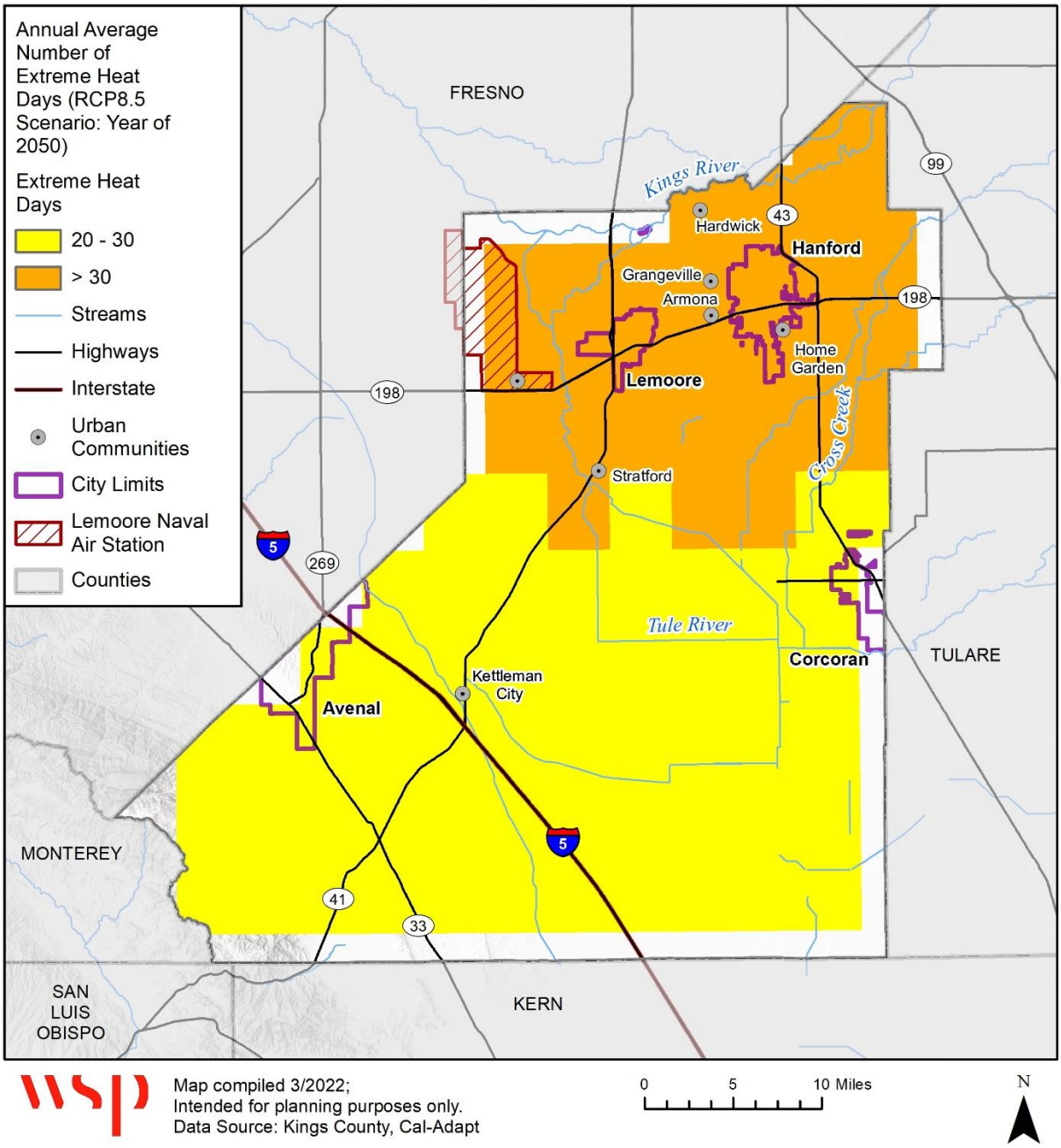


Figure 4-26 Projected Mid-Century Number of Extreme Heat Days



4.5.6.6 *Magnitude and Severity*

Limited – Extreme temperatures occur often in the County. According to the NCEI database, in the years between 2000 and 2022, extreme temperatures caused at least $1 million in property damage and over $323 million in crop damage. This equates to about $14 million in direct annualized loss due to extreme temperatures.

While there were no recorded deaths or injuries associated with these events, there are potential secondary impacts associated with lost time, maintenance costs, and damaged building contents. Even a minor event of extreme temperatures can have a significant impact on city resources, necessitating the activation of shelters, severe weather plans, and other measures.

4.5.6.7 Vulnerability Assessment

People

Heat kills by taxing the human body beyond its abilities, usually from heat stroke. In a normal year, more than 600 people in the United States are killed by extreme heat (CDC, 2022). The average annual temperature increases in California have already exceeded 3˚F in some places (Frankson et al, 2022). The daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4˚F – 5.8˚F by 2050 and 5.6˚F – 8.8˚F by 2100 (Bedsworth et al, 2018). Heat waves that result in public health impacts, also referred to as heat-health events, are projected to worsen. By 2050, average heat-health events are projected to last two weeks longer in the Central Valley (Bedsworth et al, 2018).

Heat disorders refer to a range of conditions that occur when the body's ability to regulate its temperature through circulation and sweating becomes compromised, or when there is an imbalance in the body's salt levels caused by excessive sweating. This imbalance may result from an inability to compensate for fluids and salt lost through perspiration or when heat gain exceeds the body's ability to remove it. When the core temperature of the body rises due to these factors, heat-related illnesses may develop. The 2018 California SHMP notes the 2006 heat wave led to 650 deaths in a 13-day period and in the past 15 years heat waves have claimed more lives in California than all other declared disaster events combined (CRNA, 2018). Heat waves are projected to cause two to three times more heat-related deaths by mid-century (CNRA, 2021).

Extreme cold temperatures can be very dangerous for human health and safety. The most common risks associated with exposure to extreme cold include hypothermia, frostbite, carbon monoxide poisoning, and slips and falls. Hypothermia can occur when the body loses heat faster than it can produce it, which can result in a dangerous drop in body temperature that may lead to unconsciousness or even death if left untreated. Frostbite is a condition in which the skin and underlying tissues freeze due to prolonged exposure to cold temperatures, and it can cause permanent tissue damage and even require amputation in severe cases. Carbon monoxide poisoning is also a danger, as people may use fuel-burning heaters or generators to stay warm in extreme cold, but if these appliances are not used properly or ventilated correctly, they can release dangerous levels of CO. Slips and falls are also a risk due to snow and ice on the ground, which can make walking and driving more difficult.

In the United States, cold weather-related deaths are more common than deaths from lightning, hurricanes, tornadoes, floods, or earthquakes (NWS, n.d.). Overall, a total of more than 19,000 Americans have died from cold-related causes since 1979, according to death certificates (EPA 2022). In recent years, U.S. death rates in winter months have been 8 to 12 percent higher than in non-winter months (EPA 2022). Much of this increase relates to seasonal changes in behavior and the human body, as well as increased exposure to respiratory diseases. Cold temperatures can also worsen pre-existing medical conditions such as cardiovascular and respiratory diseases

Traditionally, the very young and very old are considered at higher risk of the effects of extreme temperatures, as are people in poor physical health; but any populations outdoors in the weather are exposed, including otherwise healthy adults and persons experiencing homelessness. Arguably, the young-and-otherwise-healthy demographic may be more exposed and experience a higher vulnerability because of the increased likelihood that they will be out in the extreme temperatures, whether due to commuting for work or school, working outdoors such as construction, utilities, snow removal, or for recreational reasons.

While everyone is vulnerable to extreme temperature incidents, some populations are more vulnerable than others. For example, extreme heat poses the greatest danger for the County's outdoor laborers, who support the County's agriculture economy and are exposed to extreme temperatures and are at higher risk of heat-related illnesses than other populations of the County. In short, climate-vulnerable communities will experience the worst of these effects. Additionally, according to the Extreme Heat Action Plan prepared by the State, heat risk is associated and correlated with physical, social, political, and economic factors (CNRA 2021). When combined with existing health inequities and poverty, linguistic isolation, and housing insecurities, this hazard puts these individuals at a disproportionately high risk of heat-related illness. These socially vulnerable communities are dispersed throughout the County, but a higher concentration are location in the southern and central portions of the County.

Property

All property is vulnerable during severe weather events, but property and buildings are less likely to be vulnerable to extreme temperature events the same way as other severe weather events, like wind and

hail. However, as temperature variances occur separate from larger hazards or outside of the expected seasons, it is important to examine them as stand-alone hazards.

Extreme heat may overload demands for electricity due to the need to run air conditioners in homes and businesses during prolonged periods of exposure. Problems with power loss and water distribution also occur during periods of extreme heat. Power outages and rolling brownouts can result when high temperatures increase air conditioner use. Power outages can prevent water-pumping stations from operating.

Extreme cold temperatures impact structures when pipes or water mains freeze and burst, causing damage. Cold temperatures can also, in the most extreme of circumstances, make materials more fragile and breakable. Extreme cold temperatures may also lead to higher electricity and natural gas demands to maintain appropriate indoor heating levels combined with damages caused to the delivery infrastructure such as frozen lines and pipes.

Critical Facilities and Lifelines

Extreme heat has direct impacts on critical infrastructure, including road surfaces, power lines, and water pumping stations. During extreme heat events, road infrastructure may become damaged and buckle, while power lines may sag and experience power surges. Water pumping stations that rely on public utility systems may also be affected, leading to impacts on critical infrastructure. In addition, extreme heat can accelerate wear and tear on natural gas and electrical infrastructure (CNRA 2018a). As temperatures continue to rise, projected increases in summer demand may exceed the capacity of existing energy infrastructure, including substations and distribution line infrastructure and systems. This may result in peak demand exceeding the local utility's capacity for supply, which can lead to blackout conditions or Public Safety Power Shutoffs (PSPS).

Extreme cold events can have secondary impacts on a community's infrastructure, similar to those of extreme heat events. When extreme cold is accompanied by high winds or ice storms, power lines can be downed, causing a disruption in the transmission of power and shutting down electric furnaces, which may lead to frozen pipes in homes and businesses. Cold temperatures can also affect transportation, with exposed populations at risk while waiting for public transportation, particularly when combined with wind chill. In addition, some vehicles may not start, affecting the commute of the workforce and, in worst-case scenarios, the movement of emergency services personnel. Moreover, the loss of utilities or power outages during extreme cold events can have adverse secondary impacts on sensitive populations. Hospitals and clinics may experience a reduction in response or care capabilities due to electrical power outages.

Economy

The County has a large agricultural economy. As noted previously, outdoor laborers who are exposed to extreme heat are at a high risk of heat-related illnesses, and a long-term heat event could cause work interruptions. Crops are also impacted by heat events and could have an impact on the overall economy in the County. Prolonged freezing temperatures can also damage or destroy crops, affecting the economy and agricultural jobs in the County.

Between the years of 2017 and 2021, 12,972.9 acres of USDA-insured crops were lost in the County due to extreme heat and freeze events, resulting in over $13 million in indemnity payments. Of these payments, $8.8 million and 10,041.2 acres were due to heat, and $4.8 million and 2,931.7 acres were due to frost, freeze, and cold winter. This results in an annualized loss of $2.7 million for extreme weather events. Table 4-56 summarizes these agricultural losses.

Table 4-56 Crop Loss Due to Extreme Temperatures, 2017 – 2021

ROW LABELS	SUM OF DETERMINED ACRES	SUM OF INDEMNITY AMOUNT
Heat	**10,041.2**	**$8,874,778.14**
2017	1,757.5	$2,827,625.35
2018	676.2	$365,000.10
2019	104.2	$73,516.60
2020	1,091.3	$169,330.49
2021	6,412.0	$5,439,305.60

ROW LABELS	SUM OF DETERMINED ACRES	SUM OF INDEMNITY AMOUNT
Frost/Freeze/Cold Winter	**2,931.7**	**$4,837,850.97**
2017	300.8	$315,462.00
2018	2,165.0	$3,536,578.31
2019	111.2	$210,005.56
2020	26.4	$497,612.10
2021	328.3	$278,193.00
Grand Total	**12,972.9**	**$13,712,629.11**

Source: USDA RMA Crop Indemnity Reports, 2017-2021

Cultural, Historic and Natural Resources

Extreme cold can have significant effects on environmental resources, including water, soil, plant, and wildlife resources. In water bodies such as lakes, rivers, and ponds, extreme cold can cause ice cover to form, which can limit the amount of oxygen that is available for aquatic organisms and negatively impact aquatic ecosystems and wildlife. Soil can also freeze during extreme cold temperatures, affecting its health and nutrient availability, which can impact agricultural production. Furthermore, cold temperatures can damage or kill plants, particularly sensitive crops, leading to decreased growth rates and affecting agricultural production. Frost and freeze damage can also impact trees and other vegetation, potentially causing dieback. Wildlife can also be impacted by extreme cold events, with food availability limited, migration patterns altered, and physiological stress caused. In some cases, extreme cold events could lead to mass die-offs of wildlife populations.

Extreme heat can cause an increase in water temperatures in streams, rivers, and lakes. During storm events, increased and warmer runoff from impervious surfaces into streams can lead to a degradation of habitat. This impairs water quality and compromises aquatic species' metabolism and reproduction. Elevated water temperatures can inhibit aquatic life, especially if a species can only survive in a small range of water temperatures. The effects of thermal pollution are highly dependent upon air temperature conditions before the storm, suggesting that as temperatures rise, the impacts from heat pollution will also rise (Herb et al, 2008). Increasing temperatures may also cause species to shift habitats in elevation and latitude, and extended periods of extreme heat can stress both flora and fauna species. Extreme heat may cause temporary drought-like conditions. Several weeks of extreme heat will increase evapotranspiration and reduce moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist.

Development Trends

Since structures are not usually directly impacted by extreme temperature fluctuations, continued development is less impacted by this hazard than others in the plan. However, all structures in the planning area will be exposed to extreme weather events. Facilities with back-up generators are better equipped to handle a severe weather situation should the power go out. Additionally, pre-emptive measures such as construction of green buildings that require less energy to heat and cool, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposure to severe temperatures may help increase the overall durability of the buildings and the community to temperature variations. Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations in temperature. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme temperature events.

4.5.6.8 Risk Summary

- Extreme temperatures can have considerable impacts on human health, the natural environment, and the economy.
- On average there are 105.1 days per year above 90˚F. The highest recorded temperature for the County was 116˚F, while the lowest recorded temperature was 14˚F.
- Overall temperatures are expected to rise substantially throughout this century. The daily maximum average temperature is expected to rise by as much as 8.8˚F by 2100.

- Climate change is expected to result in higher average temperatures and more extreme heat events in the Central Valley. Climate change is also expected to result in more extreme cold events in the US.
- The County's agriculture economy is at risk of extreme temperatures from outdoor laborers being vulnerable to heat illnesses as well as crop losses due to heat, freeze, and frost.
- From 2017 to 2021, there were 12,973 acres of crop lost to extreme temperatures and a combined $13 million indemnity payments made for insured crop loss due to freeze/frost and heat events.
- The very young, the very old, people with poor physical health and those experiencing homelessness are more susceptible to the impacts of extreme temperatures.
- The significance of extreme temperatures in the County is **High**
- **Related hazards** – Agricultural Pest and Disease, Drought, Severe Weather, Wildfire

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Limited	High	Yes
City of Avenal	Extensive	Highly Likely	Limited	High	Yes
City of Corcoran	Extensive	Highly Likely	Limited	High	Yes
City of Hanford	Extensive	Highly Likely	Limited	High	Yes
City of Lemoore	Extensive	Highly Likely	Limited	High	Yes

4.5.7 FLOOD

4.5.7.1 Hazard Description

A flood is the temporary inundation of water or mud on normally dry land. Heavy or prolonged rain or dam collapse can cause inundation, as can flash floods. Urban flooding occurs in developed areas where the amount of water generated from rainfall and runoff exceeds the stormwater systems' capacity. As land is converted from agricultural to urban uses, it often loses its ability to absorb rainfall. Rain flows over impervious surfaces such as concrete and asphalt and into nearby storm sewers and streams. This runoff can result in the rapid rise of floodwaters. During urban floods, streets can become inundated, and storm drains often back up because of the volume of water and become blocked by vegetative debris, like yard waste, which can cause additional flooding. Flooding is one of the primary hazards in California, in addition to earthquakes and wildfire.

Floodplains are defined as the areas immediately adjacent to a channel from a river, stream, or other waterway. The area between the floodway and 1% annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the base flood elevation by more than 1 foot at any point. The areas between a waterway and the floodplain are most apparent during and after a flood event. Typical relationships between the floodway, the floodway fringe, and their significance to floodplain development are illustrated in Figure 4-27 below.

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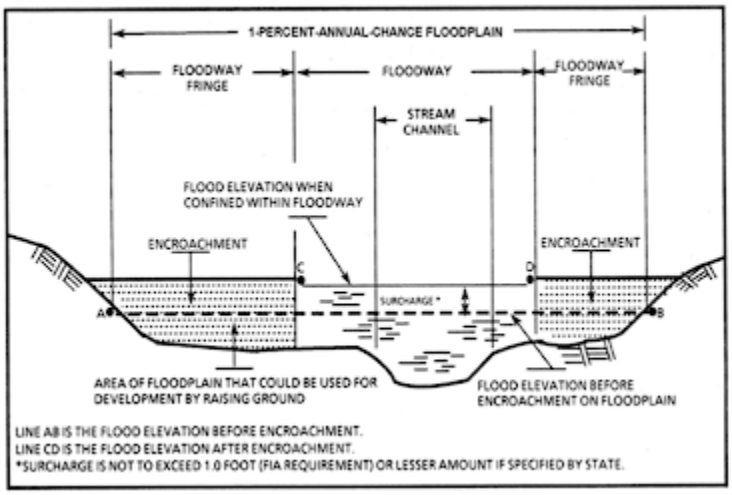
Figure 4-27 Floodway Schematic



Source: Guidance for Flood Risk Analysis and Mapping – FEMA, 2019

Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage and based on FEMA guidelines, the floodplain most often refers to the area that is inundated by the 1% annual-chance flood. The 1% floodplain is also referred to as the "100-year floodplain," meaning that it is an area that has a 1% chance of experiencing a flood of a certain magnitude or greater in any given year. Similarly, the 0.2% floodplain is also known as the "500-year floodplain," meaning that it is an area that has a 0.2% chance of experiencing a flood of a certain magnitude or greater in any given year. The 1%-annual-chance flood is the national minimum standard by which communities regulate their floodplains through the FEMA National Flood Insurance Program (NFIP). The floodway is the channel of the tributary and the land adjacent to it, whereas the flood fringe (shown above) is the remaining portion of the 100-year floodplain, excluding the floodway.

There are three types of flood events in the County planning area: riverine flooding (which includes flash flooding that can occur along intermittent creeks and channels called arroyos), localized flooding (urban stormwater flooding), and dam and levee incident flooding. These three types of flooding area summarized below.

Riverine flooding – Riverine flooding is a type of flooding that occurs when water levels in a river, stream, or other watercourse rise and overflow their banks, causing water to spread out and flood adjacent areas. This type of flooding is typically caused by heavy rainfall, snowmelt, or a combination of the two, and can be exacerbated by factors such as deforestation, urbanization, and poor land use practices that increase the amount of runoff entering waterways. Riverine flooding can be particularly dangerous and destructive, as it can cause rapid and unpredictable increases in water levels and currents, and can result in extensive property damage, loss of life, and economic disruption. Riverine flooding in the County can occur in Tulare Lake Basin and also occurs along intermittent creeks and drainages called arroyos, such as the Arroyo Equinado and Arroyo del Camino near the City of Avenal, that periodically convey water and during storm events runoff from these waterways can also cause flooding.

Localized flooding – Localized flooding is a type of flooding that occurs in a specific area, such as a neighborhood or street, rather than over a large geographic region. This type of flooding is typically caused by heavy rainfall that overwhelms drainage systems or by other local factors that impede the flow of water, such as blocked culverts or poorly designed stormwater infrastructure. Localized flooding can be sudden and intense, and can cause damage to homes, businesses, and infrastructure in the affected area. In some cases, localized flooding can also lead to flash flooding, a particularly dangerous and rapid form of flooding that occurs when water rises rapidly in a short period of time, often with little warning.

Levee Failure – Levees are raised areas along rivers or canals that prevent flooding by confining the water flow. They can be natural or manmade, and are usually made of dirt or concrete. While they provide strong flood protection, they are not failsafe and can be overtopped during severe flood events. Flooding from the failure of levees throughout the County or upstream is also of concern, as there are levees that

have breached along the Kings River (Serna 2017). The HMPC notes that the Cross Creek and Tule River channels were breached in early 2023. Dam failures or breaches also can result in flooding.

4.5.7.2 Geographic Area

Significant – The County, and in particular the Tulare Lake Basin, once served as the natural drainage of the Kings River, Cross Creek, Kern River, and Tule River as a part of the hydrologic watershed of the Sierra Nevada Mountains along the east side of the San Joaquin Valley. Canal and flood control development in the late 1800s and early 1900s redirected water flow and managed waterways through a series of canals, water storage and agricultural levies (Kings County 2010). This led to the conversion of thousands of acres of lake basin into farmable land.

These waterways and the lake basin remain the predominant flood prone areas as defined by FEMA Flood Insurance Rate Maps (FIRMs). Historically, floods have been a major cause of disaster in the County, and past flooding events have shown that the lake basin has been turned to as a default emergency overflow for extreme incidences of floodwater (Cassidy, 2023). The primary cause of local flooding is due to the drainage patterns that flow towards the Tulare Lake Basin, in southern Kings County. This area has no outlet to the ocean unless the water is pumped by artificial means out of the Tulare Lake Basin.

FEMA and the Federal Insurance Administration have assessed flood hazards for major streams in Kings County. Projected geographic areas and the extent of flooding are shown in the map on the following page. Figure 4-28 shows the extent of flooding from both a 100-year (1% annual chance) and 500-year (0.2% annual chance) flood event. As noted in the County's 2012 MJHMP, the average flooding season in Kings County occurs from November through June with the rainy season occurring between November and April and snowmelt in the nearby mountainous area occurring from April to June.

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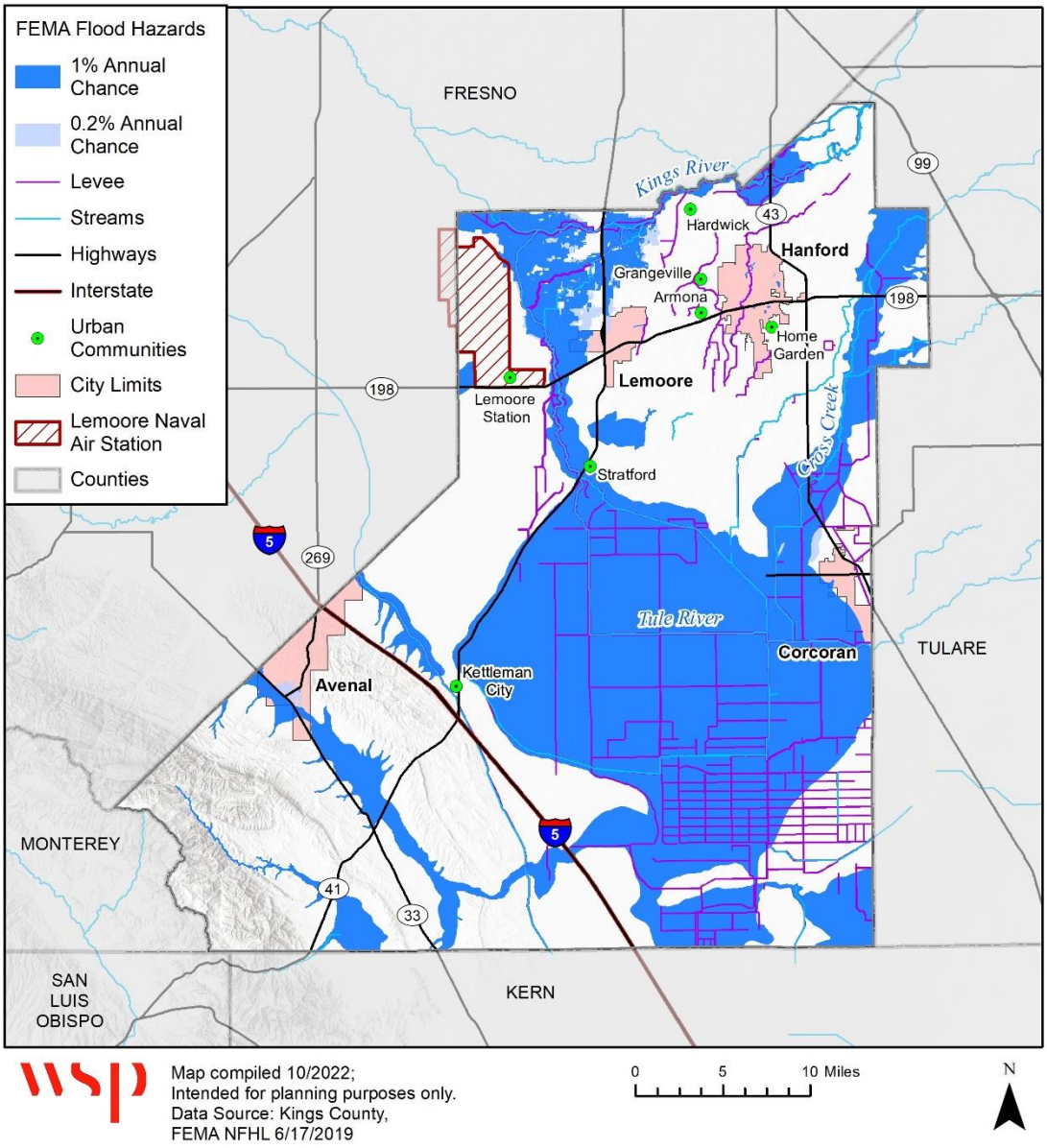
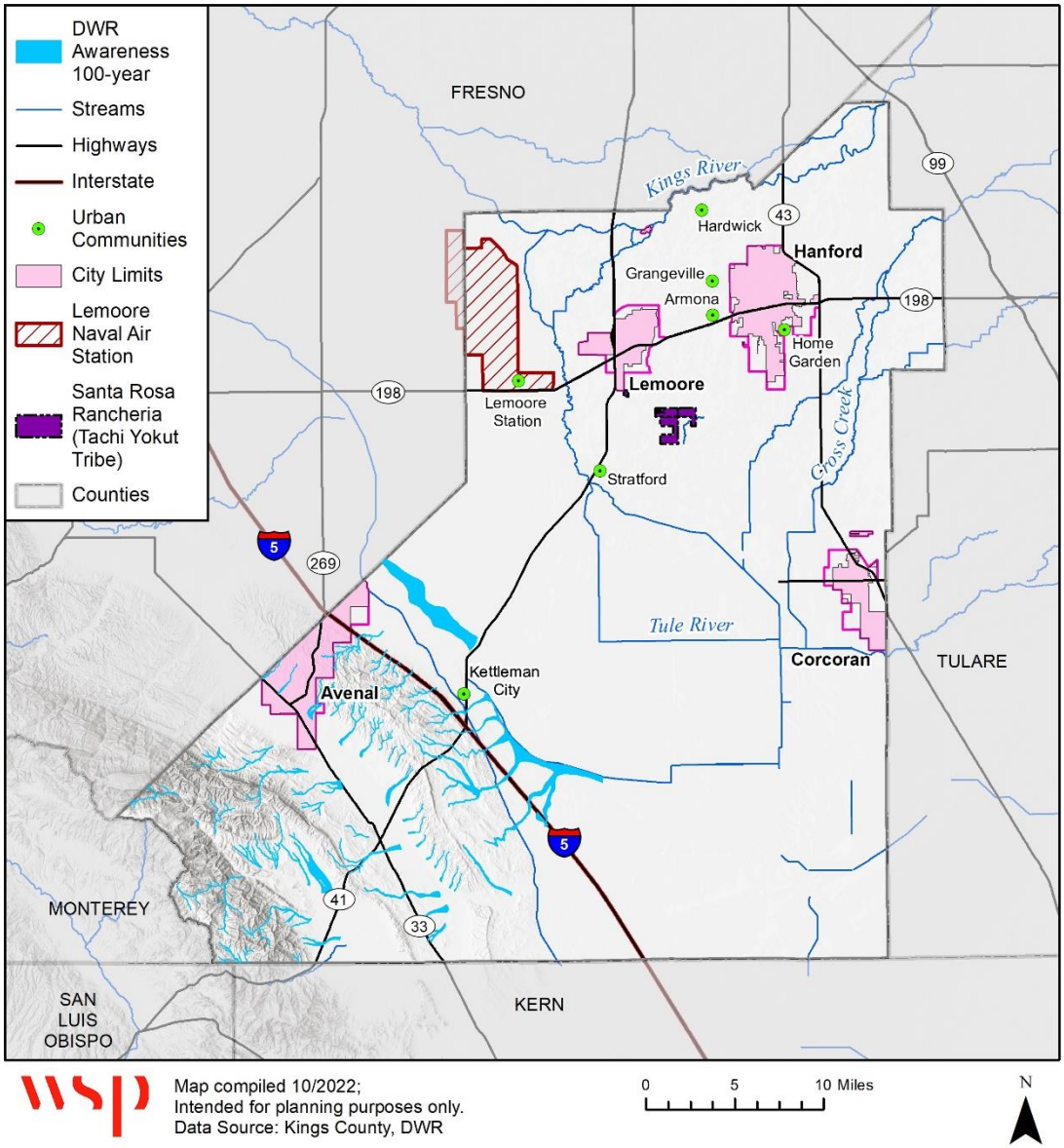
Figure 4-28 Kings County FEMA 1% & 0.2 Annual Chance Floodplain



Moreover, Figure 4-29 below shows the extent of a 100-year event based on data compiled by DWR's Awareness Floodplain Mapping project, which comes from DWR's Best Available Maps (BAM). These floodplains complement the FEMA 1% & 0.2% annual chance floodplains shown in Figure 4-29 above. According to DWR's BAM, no 200-year floodplains based on USACE's Comprehensive Study are located within the County.

Figure 4-29 Kings County DWR Awareness 100-Year Floodplains



4.5.7.3 Past Occurrences

California has a chronic and destructive flood history. Half of the 72 federally declared disasters in California between 1950 and 2000 were flood-related events. Between 1992 and 2002, every county in California was declared a federal disaster area at least once for a flooding event. Historically, floods have been the most frequent cause of disaster in the County. The primary cause of local flooding is the drainage pattern in the Tulare Lake Basin (Kings County MJHMP, 2012).

Significant flooding occurs in Kings County approximately every five years. Kings County was declared a disaster area by the federal government eight times between 1955 and 2012. FEMA's Flood Insurance Study (FIS) listed flooding events in 1950, 1952, 1955, 1958, 1962, 1963, 1969, 1970, 1971, 1973, 1978, 1980, 1982, 1985, 1986, 1995, 1997 and 2010. Heavy snow runoff caused flooding in the County in January of 1969.

Kings was the only county designated in this federal disaster declaration. Damage included $1.56 million in public costs and $1.25 million in private costs for a total of $2.81 million (Kings County MJHMP, 2012)

There have been 11 NCEI recorded flooding events in Kings County since 2012, detailed in Table 4-57 NCEI Recorded Flood Events in Kings County since 2012 below. Significant flooding also occurred at the beginning of 2023, during the development of this plan. The extent of the damage from this recent flooding event is currently being assessed, but it necessitated the activation of the County's Emergency Operation Center (EOC) and is likely to have caused significant damage to agricultural lands, County roads, bridges, other critical infrastructure, and substantial disruption to the local community. The flooding may have also caused damage to homes and businesses, which may require extensive repairs and reconstruction efforts.

Many tomato, cotton, and hay farms and orchards within the historically dry Tulare Lake outside of the City of Corcoran flooded in March 2023. Following a series of historically powerful and severe storms and increased runoff from the Sierra Nevada into the San Joaquin Valley through waterways and canals, thousands of acres of cropland in the County became inundated with flood waters for the first time in decades. Tulare Lake was once one of the largest freshwater lakes west of the Mississippi and was largely drained in the late 19th and early 20th centuries, as rivers that fed it were dammed and diverted for agriculture.

Source: San Francisco Chronicle, March 25, 2023

Table 4-57 NCEI Recorded Flood Events in Kings County since 2012

DATABASE	DECLARATION NUMBER	DECLARED DATE	DESCRIPTION
NCEI	442261	3/8/2013	Flood
	586928	6/5/2015	Flash Flood
	677961	1/8/2017	Flood
	675398	1/18/2017	Flood
	708242	6/22/2017	Flood
	779399	10/3/2018	Flash Flood
	815477	5/26/2019	Flood
	815480	5/26/2019	Flood
	816572	6/1/2019	Flash Flood
	930572	1/27/2021	Flood
FEMA	4308	4/1/2017	Flood

Source: National Centers for Environmental Information; FEMA

4.5.7.4 Likelihood of Future Occurrence

Highly Likely – Due to the history of past flooding events and the natural drainage pattern of the planning area, flooding in the County is likely to continue to occur in the future. The potential for failure of one of the many levees throughout the County could create more risk for flooding. The 1% annual chance flood is the flood that has a one percent chance in any given year of being equaled or exceeded. Based on past events, flooding events less severe than a 1% annual chance flood and those outside of the 1% annual chance floodplain occur frequently during periods of heavy rain or snowmelt. According to the NCEI Storm Events Database, there have been 10 flood events recorded for Kings County between 2012 and 2022. This means it is highly likely a flood event will occur in a given year.

4.5.7.5 Climate Change Considerations

California's Fourth Climate Assessment indicated shifts in California's precipitation regime to more dry days, more dry years, and a longer dry season, with increases in sporadic, heavy precipitation events and floods that are expected to exceed the State's flood control system capacity (CNRA 2018). With wildfires already being a problem in California, an increase in dry periods is expected to prime conditions for fires to occur, which will in turn worsen the potential for runoff and flooding associated with burned areas. Greater storm intensity is also projected with climate change, resulting in more direct runoff and flooding (CNRA 2018). The *San Joaquin Valley Regional Summary Report* from *the Fourth Climate Assessment* indicates that the frequency of catastrophic floods will increase in the coming years. This in turn will lead to increased stress on agriculture, natural ecosystems, water resources, land use and community development, transportation, energy, public health, and climate justice.

4.5.7.6 Magnitude and Severity

Critical – A portion of the County continues to be subject to inundation during flood events, as approximately 353,391 acres have been determined to be in the 1% & 0.2% annual chance floodplains, which combined cover 39.6% of the County. Therefore, a potential flood hazard would threaten a significant geographic area (10% – 50%) of the County. On the other hand, WSP analysis shows that if a flood event would occur, the damage associated with flooding could impact around 9% of the County's total improved parcels.

The occurrence of a flood can lead to life and property loss, damage to agricultural land, road and bridge closures and disruption of communication systems, resulting in significant disturbances to regular processes. Individuals living in low-lying trailer parks along the rivers and those experiencing homelessness are particularly vulnerable to such disasters. However, sufficient time is generally available to alert and warn those who might be affected. In the event of a catastrophic flood control structural failure, local response capabilities may be overwhelmed, necessitating mass evacuations to save lives. The impact on life safety will be determined by the warning time and the resources available to notify and evacuate the public. Loss of life is a possibility, and there may be associated health concerns, as well as negative effects on local buildings and infrastructure.

4.5.7.7 Vulnerability Assessment

Development in or near the floodplain puts lives and property at risk. Flood damage can include structure inundation, erosion of stream banks, road embankments, foundations footings for bridges, impact damage from debris, blockage of infrastructure, cropland destruction, sewage releases from damaged tanks, and economic loss to agriculture.

Certain health hazards are common in flood events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When floodwaters contain sewage or decaying animal carcasses, infectious disease becomes a concern. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts.

While there are some benefits associated with flooding, such as the replenishment of sediments and nutrients to agricultural lands, it is considered a hazard to develop in floodplains. Floods can cause many cascading effects. Flooding can damage infrastructure, and fire can break out as a result of dysfunctional electrical equipment. Hazardous materials can also get into floodways, causing health concerns and polluting water supplies. In many instances during a flood, the drinking water supply will become contaminated.

People

The total people at risk were estimated by multiplying the average number of persons per household in Kings County (3.17) and each applicable incorporated jurisdiction (Avenal – 3.59, Corcoran – 3.31, Hanford – 3.09, and Lemoore – 2.95) times the number of residential parcels in each floodplain to estimate the population residing in flood hazard areas. The average number of persons per household data was acquired from the 2021 ACS 5-Year Estimates.

Based on this analysis, which accounts for residents only and not workers, there are 1,126 residents living in the 1% annual chance flood zone throughout the County. Of all study areas, the unincorporated County has the most residents living in the 1% annual chance flood area, followed by the City of Corcoran. Table

4-58 below details population estimates by jurisdiction, followed a table for the 0.2% annual chance floodplain.

Table 4-58 Population Living in the 1% Annual Chance Flood Hazard Zone

Jurisdiction	Population
Avenal	22
Corcoran	132
Hanford	31
Lemoore	-
Unincorporated County	941
Total	1,126

Source: WSP Analysis 2023

The same analysis was conducted for the 0.2% annual chance floodplain, indicating that there are 7,181 residents living in the 0.2% annual chance flood zone throughout Kings County. The majority of people living in this floodplain are residents of the City of Avenal, with 5,529 people in the 0.2% annual chance floodplain. This population distribution is shown in Table 4-59.

Table 4-59 Population Living in the 0.2% Annual Chance Flood Hazard Zone

JURISDICTION	POPULATION
Avenal	5,529
Lemoore	1,437
Unincorporated County	216

Source: WSP 2023

Property

Historically, Kings County has been at risk of flooding primarily during the winter and spring months when river systems swell with heavier rainfall and runoff from winter snowmelt. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. But occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred in the past within the 100-year floodplain and in other localized areas in the County.

A flood vulnerability assessment was performed for the County using GIS overlay methodology. The County's parcel layer and associated assessor's building improvement valuation data were provided by the County and were used as the basis for the inventory. Kings County's effective FEMA Digital FIRM (DFIRM) dated June 17, 2019, was used as the hazard layer. A DFIRM is FEMA's flood risk data that depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events; this data is incorporated into the National Flood Hazard Layer (NFHL). Figure 4-28 summarizes the flood zones included on these maps.

Kings County Assessor Parcel data was used to estimate flood hazard impacts to parcels with improvement values greater than zero. An address point data layer provided by the County's GIS department was also used in combination to assess not only parcels' but also structures' exposure to flood hazard. FEMA's NFHL flood zones, with an effective date of June 17, 2019, were overlaid in GIS on the address points to identify structures/parcels that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event.

Building improvement values and counts for those parcels and structures were then extracted from the assessor's parcel data and address point data, and subsequently summed for the unincorporated county and jurisdictions. Results of the overlay analysis are shown in Table 4-60 for the 1% annual chance flood and Table 4-61 for 0.2% annual chance flood. The jurisdictional annexes provide more detailed information based on assessor property types. Property type refers to the land use of the parcel and includes Agricultural, Commercial, Exempt, Industrial, Multi-Family Residential, Multi-Use and Residential. Content values were estimated as a percentage of improved values based on their occupancy type, using FEMA/Hazus estimated content replacement values. This includes 100% of the improved

value for agricultural, commercial, exempt and multi-use parcels; 50% for multi-family residential and residential parcels; and 150% for industrial parcels. Improved and content values were then totaled to obtain total exposure. The locations of these parcels are displayed in Figure 4-30 below.

A loss estimate analysis was also performed based on depth damage functions developed by the Army Corp of Engineers and FEMA. The loss curves depict the expected flood losses associated with the depth of flooding at a structure. There are different depth damage curves for structure and content losses. For this analysis, an average flood depth of two feet is assumed. A depth damage ratio of 25% was used for structural loss by multiplying it by the total values, based on the FEMA damage curves, assuming a 2-foot-deep flood. This means that the estimated loss of a parcel is 25% of its total value. The results are shown in the loss estimate columns in Table 4-60 for the 1% annual chance flood and Table 4-61 for the 0.2% annual loss properties.

The result is an inventory of the number and types of improved parcels and structures subject to flooding. Results are organized by unincorporated County and incorporated jurisdictions. Detailed tables show counts of parcels by jurisdictions and land use type (Agricultural, Commercial, Exempt, Industrial, Multi-Family Residential, Multi-Use and Residential) within each flood zone. It is important to note that there could be more than one structure or building on an improved parcel (i.e., a condo complex occupies one parcel but might have several structures). The flood loss analysis does not account for business disruption, emergency services, environmental damages, or displacement costs, thus actual losses could exceed the estimate shown. Conversely, this analysis does not differentiate parcels that may have been developed since the County and cities adopted floodplain regulations, which would be mitigated to the 1% annual chance flood if developed in accordance with local floodplain regulations. Table 4-60 and Table 4-61 also do not include publicly-owned parcels that contain critical facilities and infrastructure; these vulnerable community lifelines are listed in Table 4-65.

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Figure 4-30 Kings County FEMA Flood Hazards

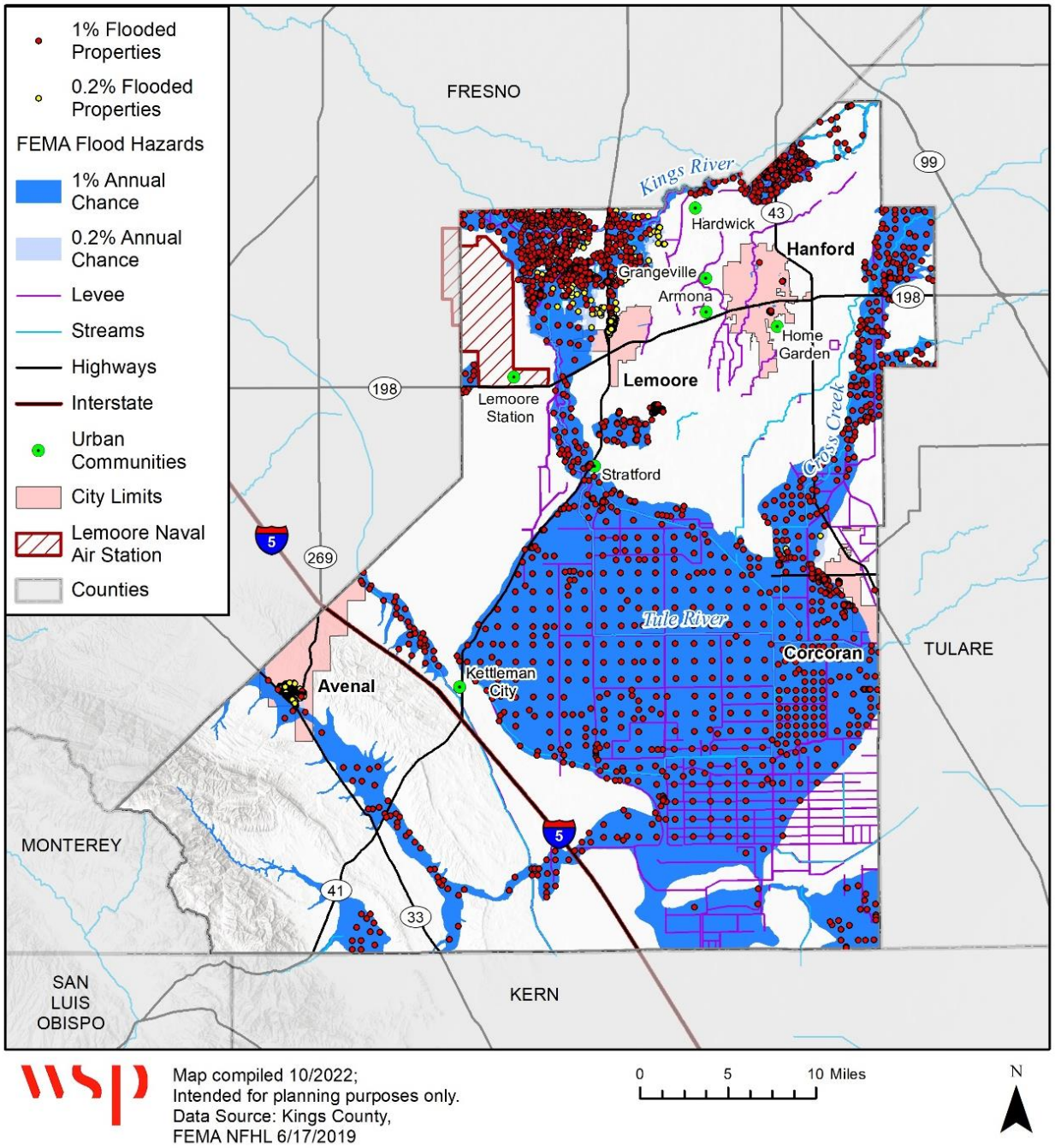

Table 4-60 1% Annual Chance Floodplain Exposure and Loss by Jurisdiction

JURISDICTION	PROPERTY TYPE	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	ESTIMATED LOSS	POPULATION
Avenal	Agricultural	2	2	$103,539	$103,539	$207,078	$51,770	
	Commercial	1	1	$11,386	$11,386	$22,772	$5,693	
	Exempt	2	2	$342,024	$342,024	$684,048	$171,012	
	Residential	5	6	$170,357	$85,179	$255,536	$63,884	22
	Total	10	11	$627,306	$542,128	$1,169,434	$292,358	22
Corcoran	Exempt	3	3	$225,007	$225,007	$450,014	$112,504	
	Residential	40	40	$5,726,687	$2,863,344	$8,590,031	$2,147,508	132
	Total	43	43	$5,951,694	$3,088,351	$9,040,045	$2,260,011	132
Hanford	Agricultural	1	1	$4,325	$4,325	$8,650	$2,163	
	Commercial	1	1	$6,900	$6,900	$13,800	$3,450	
	Exempt	1	1	$751,205	$751,205	$1,502,410	$375,603	
	Multi-Family Residential	1	9	$2,986,560	$1,493,280	$4,479,840	$1,119,960	28
	Residential	1	1	$269,146	$134,573	$403,719	$100,930	3
	Total	5	13	$4,018,136	$2,390,283	$6,408,419	$1,602,105	31
Lemoore	Agricultural	1	1	$11,954	$11,954	$23,908	$5,977	
	Exempt	1	1	$-	$-	$-	$-	
	Total	2	2	$11,954	$11,954	$23,908	$5,977	–
Unincorporated	Agricultural	147	151	$16,079,220	$16,079,220	$32,158,440	$8,039,610	
	Commercial	14	14	$9,450,042	$9,450,042	$18,900,084	$4,725,021	
	Exempt	1,243	1,338	$261,919,205	$261,919,205	$523,838,410	130,959,603	
	Industrial	2	2	$78,858	$118,287	$197,145	$49,286	
	Multi-Use	50	60	$14,465,996	$7,232,998	$21,698,994	$5,424,749	190
	Residential	221	237	$25,257,607	$12,628,804	$37,886,411	$9,471,603	751
	Total	1,677	1,802	$327,250,928	$307,428,556	$634,679,484	$158,669,871	941
	Grand Total	**1,737**	**1,871**	**337,860,018**	**$313,461,271**	**$651,321,289**	**$162,830,322**	**1,126**

Sources: Kings County Assessor's Office; NFHL Effective date 6/17/2019, FEMA; GIS analysis

Table 4-61 0.2% Annual Chance Floodplain Exposure and Loss by Jurisdiction

JURISDICTION	PROPERTY TYPE	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	ESTIMATED LOSS	POPULATION
Avenal	Agricultural	1	1	$163,000	$163,000	$326,000	$81,500	
	Commercial	97	119	$17,116,938	$17,116,938	$34,233,876	$8,558,469	
	Exempt	7	9	$109,198	$109,198	$218,396	$54,599	
	Industrial	9	10	$849,591	$1,274,387	$2,123,978	$530,994	
	Multi-Family Residential	29	112	$22,639,837	$11,319,919	$33,959,756	$8,489,939	402
	Multi-Use	6	9	$749,775	$749,775	$1,499,550	$374,888	32
	Residential	1,363	1,419	$114,303,823	$57,151,912	$171,455,735	$42,863,934	5,094
	Total	1,512	1,679	$155,932,162	$87,885,128	$243,817,290	$60,954,322	5,529
Lemoore	Commercial	3	4	$1,542,712	$1,542,712	$3,085,424	$771,356	
	Industrial	1	1	$399,406	$599,109	$998,515	$249,629	
	Multi-Family Residential	2	274	$34,356,891	$17,178,446	$51,535,337	$12,883,834	808
	Multi-Use	1	1	$3,821,051	$3,821,051	$7,642,102	$1,910,526	3
	Residential	212	212	$41,915,687	$20,957,844	$62,873,531	$15,718,383	625
	Total	219	492	$82,035,747	$44,099,161	$126,134,908	$31,533,727	1,437
Unincorporated	Agricultural	21	22	$1,511,667	$1,511,667	$3,023,334	$755,834	
	Exempt	66	71	$12,319,035	$12,319,035	$24,638,070	$6,159,518	
	Multi-Use	10	12	$3,312,255	$3,312,255	$6,624,510	$1,656,128	38
	Residential	52	56	$7,408,259	$3,704,130	$11,112,389	$2,778,097	178
	Total	149	161	$24,551,216	$20,847,087	$45,398,303	$11,349,576	216
	Grand Total	**1,880**	**2,332**	**$262,519,125**	**$152,831,375**	**$415,350,500**	**$103,837,625**	**7,181**

Sources: Kings County Assessor's Office; NFHL Effective date 6/17/2019, FEMA; GIS analysis

Significant areas of Kings County are at risk of being inundated by a 1% annual chance flood event. The unincorporated areas of the County are predominantly inundated by the 1% annual chance floodplain and have the greatest percentages of total loss from a 1% annual chance flood. The sites of Avenal, Corcoran and Lemoore are all somewhat exposed to both 1% and 0.2% annual chance flood events. The City of Hanford is the least vulnerable to flood events.

Based on this analysis, the County Planning Area has 1,737 parcels with 1,871 structures on them valued at over $651 million in the 1% annual chance floodplain. An additional 1,880 parcels with 2,332 structures on them valued at more than $415 million within the 0.2% annual chance floodplain. As a result, the total value of these exposed parcels and structures is approximately $1.07 billion. When factoring in FEMA's estimated loss ratio, the estimated total losses from both 1% and 0.2% annual chance flood events is over $266 million. However, development in the 500-year floodplain is typically not regulated, thus a large flood event could be extremely damaging in the County

Kings County joined the NFIP in 1980; each jurisdiction also participates in the NFIP. Table 4-62 below shows the NFIP entry dates of Kings County and its jurisdictions.

Table 4-62 NFIP Entry Date – Kings County & Jurisdictions

JURISDICTION	NFIP ENTRY DATE
Kings County	August 4, 1988
City of Avenal	April 5, 1989
City of Corcoran	November 28, 1997
City of Hanford	March 18, 1987
City of Lemoore	April 3, 1987

Source: Community Information System (CIS) 2023

As of April 18, 2023, in the unincorporated County, there are 173 flood insurance policies in force, of which there are 125 single family units and 48 non-residential. The number of policies in force by jurisdiction and flood zone are shown in Table 4-63. In the unincorporated County, there are 173 flood insurance policies in force, of which there are 241 single-family units, 3 2-4 family units, zero in all other residential, and 59 non-residential.

Table 4-63 Community Information System Policies in Force by Flood Zone and Jurisdiction

FLOOD ZONE	KINGS COUNTY	CITY OF AVENAL	CITY OF CORCORAN	CITY OF HANFORD	CITY OF LEMOORE
A01-30 & AE Zones	33	1	0	0	0
A Zones	51	0	0	2	0
AO Zones	0	0	0	0	0
AH Zones	0	0	0	0	0
atmospheric river (AR) Zones	0	0	0	0	0
A99 Zones	0	0	0	0	0
V01-30 & VE Zones	0	0	0	0	0
V Zones	0	0	0	0	0
D Zones	0	0	0	0	0
B, C & X Zone					
- Standard	89	0	4	13	9
- Preferred	0	1	0	0	0
Total	**173**	**1**	**4**	**15**	**9**

Source: Community Information System (CIS) 2023

NFIP data indicates that there are 202 insurance policies in the County representing $49,959,000 of insurance coverage in force. Since 1978 there have been 9 paid losses, totaling $18,946. This results in approximately $412 in annualized losses. Most of the losses have been in the unincorporated County. Table 4-64 provides details on flood insurance policies for each individual jurisdiction.

Table 4-64 Kings County Flood Insurance Policy Information

JURISDICTION	POLICIES	INSURANCE IN FORCE	NO. OF PAID LOSSES	TOTAL LOSSES PAID
Avenal	1	$277,000	1	$0
Corcoran	4	$1,202,000	0	$0
Hanford	15	$4,667,000	2	$2,246
Lemoore	9	$3,034,000	0	0
Unincorporated Kings County	173	$40,779,000	173	$16,700
Total	202	$49,959,000	9	$18,946

Source: FEMA NFIP Community Information System

FEMA insures properties against flooding losses through the NFIP. As part of the process to reduce or eliminate repetitive flooding to structures across the United States, FEMA has developed an official Repetitive Loss Strategy. The purpose behind the national strategy is to identify, catalog, and propose mitigation measure to reduce flood losses to the relatively few numbers of structures that absorb the majority of the premium dollars from the national flood insurance fund.

A repetitive loss property is defined by FEMA as "a property for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978". A repetitive loss property may or may not be currently insured by the NFIP. There are no repetitive loss properties or severe repetitive loss properties located within the County, based on NFIP data retrieved on April 18, 2023.

Critical Facilities and Lifelines

Key support facilities and structures most necessary to withstand the impacts of, and respond to, natural disasters are referred to as critical facilities. Examples of these critical facility types include utilities, transportation infrastructure, and emergency response and services facilities, given failures of components along major lifelines or even closures or inaccessibility to key emergency facilities could limit if not completely cut off transmission of commodities, essential services, and other potentially catastrophic repercussions. Floods and levee failure can disrupt, damage, or destroy these critical facilities, which in turn can impede the ability of Kings County to respond to and recover from a major flood event.

A GIS analysis of exposed critical facilities was conducted, similar to the parcel analysis, using HIFLD. The results of critical facilities throughout the County which are exposed to the various flood hazards are shown in Table 4-65 below and organized by the jurisdiction they are located in and the FEMA Lifeline category into which they are classified. The locations of these facilities are displayed in Figure 4-31 below.

Table 4-65 Critical Facilities Within the 1% and 0.2% Annual Chance Flood Hazard by FEMA Lifeline and Jurisdiction

FLOOD HAZARD ZONE	JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
1% Annual Chance	Avenal	-	1	-	-	-	-	1	2
	Corcoran	-	3	-	-	-	1	-	4
	Hanford	-	-	-	-	-	1	-	1
	Unincorporated	20	12	-	5	-	-	71	108
	Total	20	16	-	5	-	2	72	115
0.2% Annual Chance	Avenal	2	-	-	1	-	8	-	11
	Corcoran	-	-	-	-	-	-	-	-

FLOOD HAZARD ZONE	JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
	Hanford	-	-	-	-	-	-	-	-
	Unincorporated	-	-	-	-	-	-	-	-
	Total	2	-	-	1	-	8	-	11

Source: HIFLD, Kings County, WSP GIS Analysis

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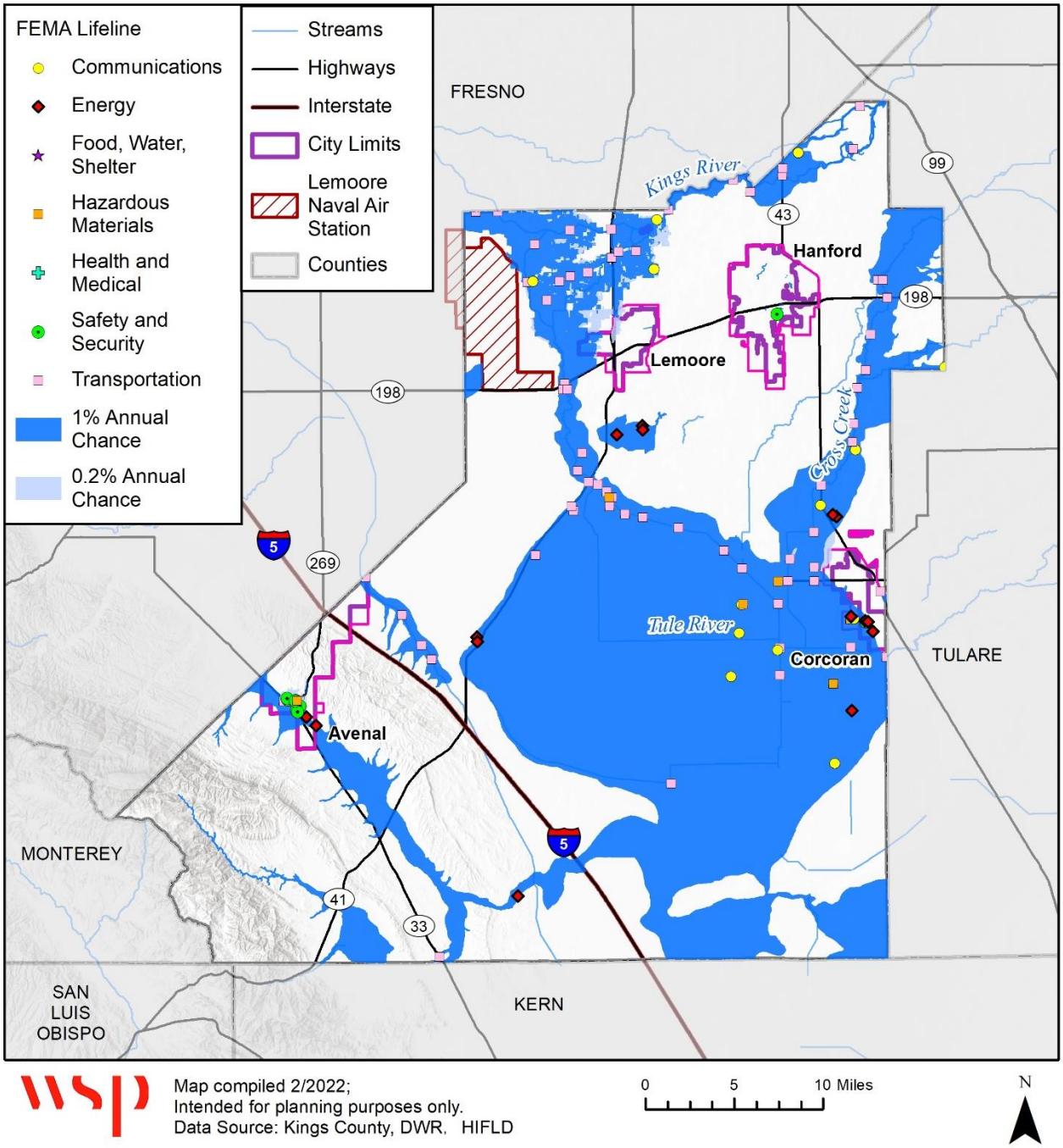
Figure 4-31 Kings County Critical Facilities & FEMA Flood Hazards



Economy

Flooding can have a major economic impact on the economy. Based on the flood loss analysis, there are 16 commercial structures worth an estimated $18.9 million in total value directly at risk of flooding in the 1% annual chance zone. Based on the loss analysis this could result in approximately $4.7 million in direct losses. In addition, there are 123 commercial structures worth an estimated $37.3 million in total value directly at risk of flooding in the 0.2% annual chance zone. Based on the loss analysis this could result in approximately $9.3 million in direct losses. This does not account for other indirect losses such as business interruption, lost wages, and other downtime costs.

Effects on the agricultural economy can be devastating, and a large amount of area at risk to flooding in the County is agricultural and lies within the Tulare Lake basin. Flooding can damage crops and livestock. In addition to the obvious impacts on crops and animals, flooding can have deleterious effects on soil and the ability to reinvigorate the agricultural activities impacted once the flood waters recede. Damage to water resources such as underground irrigation systems, water storage reservoirs, springs and other natural water bodies could have a serious effect on agriculture operations.

Cultural, Historic and Natural Resources

Natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters. Natural resources are generally resistant to flooding except where natural landscapes and soil compositions have been altered for human development or after periods of previous disasters such as drought and fire. Wetlands, for example, exist because of natural flooding incidents. These areas provide natural and beneficial functions to hold and absorb floodwaters. Areas recently suffering from wildfire damage may erode because of flooding, which can temporarily alter an ecological system.

Development Trends

The potential or likelihood of a flood event in the County increases with the annual onset of heavy rains in winter and spring months. Much of the historical growth in the problem areas connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards. For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in the 1% annual chance floodplains. As noted previously, a large amount of development has occurred in the 0.2% annual chance floodplain and these areas are not regulated or require flood mitigation, thus flood risk is increasing to a degree, although to the less frequent flood events.

The development trend in the County planning area consists of steady growth. Much of this growth is occurring in the urban and SOI areas; such growth can result in more impervious surfaces due to buildings and infrastructure and increase stormwater runoff. The California DOF projects that Kings County's population will increase by 3.0% by the year 2025 when compared to the year of 2021. The County's population is also projected to continue to grow through the year 2060. Such growth may consume previously undeveloped acres, and the increase in impervious surfaces could affect existing drainage and flood control facilities.

Changes in municipal boundaries such as annexations into the SOI may change the flood risk profile for certain communities. A GIS analysis of 1% and 0.2% annual chance flood exposure within SOI boundaries is summarized in the tables below. These parcels are included in Table 4-66 and Table 4-67, and they fall under "Unincorporated" in terms of their jurisdiction. Parcels shown below in these tables are also those that fall within each jurisdiction's SOI and are exposed to potential flood hazard events. As shown, only parcels located in the SOI of the Cities of Corcoran and Lemoore are exposed to 1% annual chance flood hazards. In addition, only two parcels located in the SOI of the City of Lemoore are exposed to 0.2% annual chance flood hazards.

Table 4-66 Sphere of Influence Risk to FEMA 1% Annual Chance Flood Hazard

	CORCORAN	LEMOORE	GRAND TOTAL
Improved Parcel Count	40	2	42
Building Count	44	2	46
Improved Value	$38,205,152	$25,742	$38,230,894
Estimated Content Value	$37,338,575	$25,742	$37,364,317
Total Value	$75,543,727	$51,484	$75,595,211
Population	96	-	96

Source: Kings County; WSP Analysis 2023

Table 4-67 Sphere of Influence Risk to FEMA 0.2% Annual Chance Flood Hazard

	LEMOORE	GRAND TOTAL
Improved Parcel Count	2	2
Building Count	2	2
Improved Value	$63,970	$63,970
Estimated Content Value	$47,370	$47,370
Total Value	$111,340	$111,340
Population	3	3

Source: Kings County; WSP Analysis 2023

4.5.7.8 Risk Summary

The overall significance of the flood hazard in the County is **High**

- Eleven flood events were recorded for Kings County between 2012 and 2022, which makes it is highly likely that a flood event occurs in a given year. Significant flooding also occurred during plan development in early 2023.
- Significant flooding occurs in the County through snowmelt, arroyos, and significant rainfall events. Flooding risks are present among the Tulare Lake Basin and several creeks and rivers, including the Kings River, the Arroyo Esquinado, and the Arroyo del Camino.
- The Tulare Lake Basin once served as the natural drainage of the Kings River, Cross Creek, Kern River, and Tule River as a part of the hydrologic watershed of the Sierra Nevada Mountains along the east side of the San Joaquin Valley. Canal and flood control development turned the area into farmable land, although the Basin is still subject to flooding during significant precipitation events.
- Key findings from the 2022 CVFPP indicate shifts in California's precipitation regime, which show more dry days, more dry years, a longer dry season, and increases in occasional heavy precipitation events and floods. These same studies project greater storm intensity with climate change, resulting in more direct runoff and flooding and as a result, high frequency flood events in conjunction with heavy precipitation and extreme storm events.
- Countywide there are 4,203 structures at risk within the limits of the 100-year and 500-year floodplain zones worth over $1.06 billion, with a loss estimate of over $578 million.
- Countywide approximately 8,307 persons live in the 100-year floodplain and 500-year floodplains.
- Levees and flood control dam infrastructure provide some protection, but also pose potential levee and dam failure risks.
- In March 2023, a series of AR events caused extensive flooding that rendered almost all emergency access routes in and out of the City of Corcoran unusable. As a consequence, State Route (SR) 43 to the north of Corcoran became the sole accessible route connecting Kings County to the City. Another alternative, SR 137, was available but located in Tulare County. The significance of these emergency access routes during flooding cannot be overstated, as they play a vital role in facilitating resource mobilization, emergency response efforts, and ensuring the overall safety of the public.

Related hazards – Severe weather: Heavy Rain, Wildfire, Landslide and Debris Flow.

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Critical	High	Yes
City of Avenal	Extensive	Highly Likely	Critical	High	Yes
City of Corcoran	Extensive	Highly Likely	Critical	High	Yes
City of Hanford	Extensive	Highly Likely	Critical	High	Yes
City of Lemoore	Extensive	Highly Likely	Critical	High	Yes

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4.5.8 LAND SUBSIDENCE

4.5.8.1 Hazard Description

Land subsidence is defined as the vertical sinking of the land over natural or manmade underground voids. Subsidence is common in several areas of California, usually as a result of groundwater pumping, peat loss, or oil and gas extraction. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. Weight, including surface developments such as roads, reservoirs, and buildings, and manmade vibrations from such activities as blasting and heavy truck or train traffic can accelerate the natural processes of subsidence, or induce subsidence over manmade voids.

The 2018 California SHMP profiles subsidence as a secondary impact of drought associated with the reduced availability of surface water and increased groundwater pumping in order to meet water needs. According to Smith, et al. (2018), approximately 1 million people in the San Joaquin Valley rely on groundwater pumping for drinking water, and thousands of farmers rely on groundwater to irrigate crops. While groundwater pumping occurs in both drought and non-drought years to support urban, rural, and agricultural water needs, the SHMP notes that it is greatly increased during dry years.

The primary source of water for the County is groundwater (Kings County, n.d.). As groundwater is extracted faster than the aquifers can recharge, significant subsidence of soil layers may occur. Often, once an aquifer has been compressed by subsidence, the deformation of shape is permanent, resulting in a decreased capacity to store water. In addition to the direct damage subsidence may cause to infrastructure, as foundations are warped subsidence also increases the risk of flooding as ground elevation changes.

4.5.8.2 Geographic Area

Extensive – Figure 4-32 below shows the vertical ground surface displacement measured in feet for Kings County and the surrounding areas. This DWR dataset represents measurements of vertical ground surface displacement in more than 200 of the high-use and populated groundwater basins across the State of California between January 2015 and January 2023. Vertical displacement estimates are derived from Interferometric Synthetic Aperture Radar (InSAR) data that are collected by the European Space Agency (ESA) Sentinel-1A satellite and processed by TRE ALTAMIRA Inc. (TRE), under contract with the California DWR as part of DWR's SGMA technical assistance to provide important SGMA-relevant data to GSAs for Groundwater Sustainability Plan (GSP) development and implementation. As shown in Figure 4-32, the red/orange areas experienced the most (negative) vertical ground surface displacement between June 2015 to January 2023, meaning that these areas have experienced the most land subsidence during this period of time. These areas include the northern and eastern portions of the County, including the cities of Corcoran, Hanford and Lemoore. Due to gaps in spatial coverage, the map below shows the approximate subsidence using the average of all reported values within each square grid area. Reported values are not evenly distributed within each square, and each square may have a different number of measurements.

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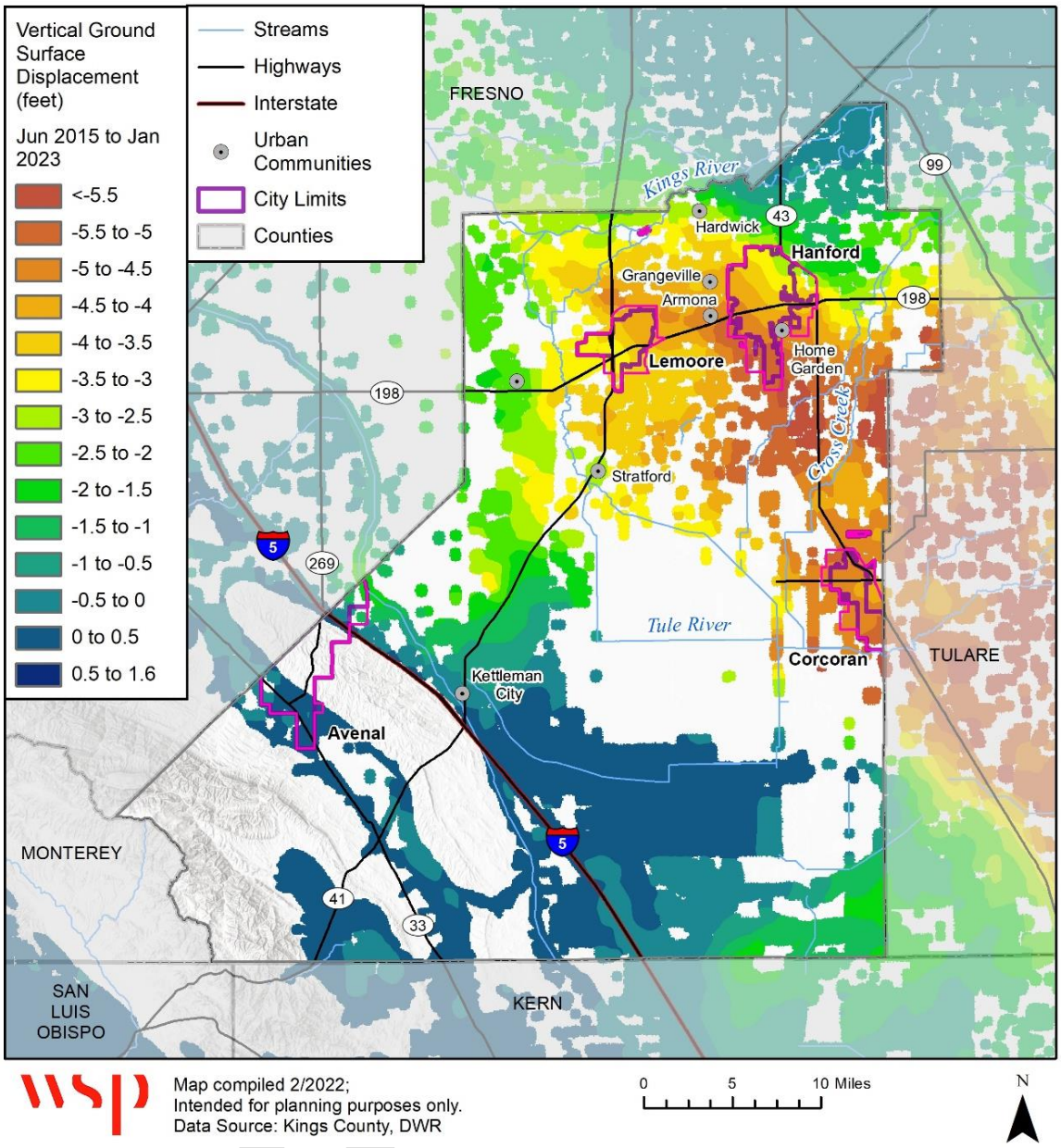
Figure 4-32 Kings County Vertical Ground Surface Displacement (Jun 2015 – Jan 2023)



Source: DWR 2023

4.5.8.3 Past Occurrences

Land subsidence from groundwater extraction in the San Joaquin Valley has been called the greatest human alteration of the Earth's surface (Galloway et al, 1999). This phenomenon is closely tied to the growth of agriculture and the accessibility of water in the region. Due to the semi-arid nature of the valley and the variation in streamflow on the east and west sides of the San Joaquin Valley, agriculture has become heavily dependent on the aquifer system. A brief history of land subsidence in the San Joaquin Valley from *Land Subsidence from Groundwater Use in California* by Borchers and Carpenter (2014) is summarized below.

> **The sinking of land caused by the removal of groundwater started in the 1920s, but accelerated during the post-World War II period when the demand for irrigation water increased, leading to the drilling of numerous wells. In 1955, the San Joaquin Valley supplied a**

quarter of all irrigation groundwater in the United States. By 1970, more than half of the valley, an area covering 5,200 square miles, had experienced subsidence of over one foot.

Although the connection between the decline of groundwater levels and subsidence in the Delano City area was identified early on, a comprehensive study of the regional impact of groundwater overdraft on subsidence was not conducted until the early 1950s. At that time, government agencies expressed worry about how subsidence could affect the Delta-Mendota Canal (which was under construction at the time) and the California Aqueduct (which was still in the planning stages).

The year 1954 saw the start of research into land subsidence through the collaboration of a Federal-State interagency committee and the USGS "Mechanics of Aquifers Project." Through field monitoring and research, the studies were able to determine the extent and magnitude of subsidence and its correlation to groundwater overdraft. The findings provided valuable information that enabled the strategic placement of the California Aqueduct, which, together with the Delta-Mendota Canal and the Friant-Kern Canal, brought surface water into the valley to reduce the dependence on groundwater.

By 1974, the importation of surface water had resulted in groundwater levels recovering by over 200 feet in certain regions on the west side of the valley. While this helped to decelerate the rate of subsidence, subsidence still persisted due to the slow drainage of water from the compacting clayey aquitards, especially in the Los Banos-Kettleman City area of the mid-valley and the Wasco-Tulare area of the southern valley.

The droughts that occurred after 1975 led to a rapid decline in groundwater levels despite lower pumping volumes than those in the 1960s. This was due to a reduction in storage space within the aquifer system and decreased hydraulic conductivity of the compacted aquitards, which restrict the drainage of water to the more permeable parts of the system. Despite water levels being notably higher than those in the 1960s, the observations indicated renewed land subsidence during drought periods.

The present drought, combined with a shift in cropping patterns from row crops and range land to permanent crops such as trees, has again led to increased dependence on aquifer systems for agricultural irrigation in the San Joaquin Valley. Currently, an area spanning about 2,700 square miles west of Tulare and east of Kettleman City is continuing to experience subsidence. The Lemoore Naval Air Station, located at the northwest edge of this area, has seen a total subsidence of over 10 feet between 1925 and 2010. The conversion to permanent crops and orchards that require year-round irrigation has been linked to increased groundwater extraction and changes in land use, which have contributed to the subsiding area. The sagging of canals, rivers, and flood bypass channels in these regions has led to a loss of freeboard and flow capacity.

4.5.8.4 Likelihood of Future Occurrence

Likely – Land subsidence has been a recurring issue in Kings County for decades and can be expected to continue in the future. The frequency of future land subsidence incidents in the County will largely be dependent on the mitigation actions and pumping regulations initiated by the State, the County, and local regulations. Based on past trends of gradual subsidence throughout the entire San Joaquin Valley and the continued dependence on groundwater pumping, it can be assumed that subsidence will continue in the future, with increased rates of subsidence during drought years.

The HMPC notes that at times agricultural operations are subjected to 0% - 5% allocations of surface water deliveries, which forces agriculture to rely upon groundwater to remain viable. This has resulted in some years of over drafting amounts of approximately 820,000 acre-feet per year (Bittle, 2023). The SGMA also helped establish local GSAs to manage groundwater sustainably within the four groundwater subbasins in the region: Tulare Lake, Kaweah, Kings, and Westside Subasins. Further, the development and implementation of each GSA's GSP should further mitigate the amount of over drafting in the future and help reduce subsidence rates. See Section 4.5.4, Drought for additional information on the Tulare Lake, Kawah, Kings, and Westside Subbasin GSPs.

4.5.8.5 Climate Change Considerations

Climate change is expected to result in increased temperatures and changes in precipitation patterns, which can lead to both extreme precipitation variability and prolonged periods of drought. Drought conditions can cause a reduction in soil moisture content while increasing the demand for water resources. In response, people may increase their use of groundwater, which can lead to increased land subsidence risk through the compaction of soil layers and the depletion of underground water resources.

Extreme precipitation variability present both challenges and opportunities. Extreme flooding occurred in the County following the series of AR events that hit the State in early 2023. The HMPC noted that these events could be beneficial if excess flood water were captured and used to enhance groundwater recharge. However, such strategic recharge projects require extensive knowledge of the soil, geology, and aquifer properties, as well as planning, permits, and infrastructure. These projects are eligible for funding through the DWR's Sustainable Groundwater Management Grant Program.

However, during periods of extended drought, water levels in aquifers may be drawn down to levels that are too low, which can cause the soil and rock layers to compress and settle. Once this occurs, the water cannot recharge the layers, leading to permanent subsidence and the permanent loss of groundwater storage capacity. This can have significant economic and environmental impacts, including damage to infrastructure, decreased agricultural productivity, and reduced access to water resources.

4.5.8.6 Magnitude and Severity

Limited – The rate of subsidence is difficult to predict, and it is also uncertain where exactly it will occur. This unpredictability makes it hard to assess the potential magnitude and severity of the subsidence's impact. As the County's different areas continue to sink at varying rates that range from approximately 0.5 feet to 2.5 feet of vertical ground surface displacement in the area south of Kettleman City in the County to 4.5 to 5.5 feet of vertical ground surface displacement in the area between the cities of Hanford and Corcoran, the impacts on infrastructure could become more evident (see Figure 4-31). It is likely that continued subsidence in the County could lead to further harm to infrastructure such as buildings, roads, and water storage and management systems, such as canals and aqueducts.

4.5.8.7 Vulnerability Assessment

Land subsidence due to groundwater pumping can permanently damage or collapse underground aquifers, increase flood risk in low-lying areas, and pose hazards to buildings, infrastructure, and water storage facilities. Subsidence can result in serious, localized structural damage to buildings, roads, irrigation ditches, canals, streams, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through decreased property values.

Property

The lack of detailed data on property damage due to land subsidence in Kings County makes it difficult to quantify past or potential future losses. Most subsidence instances result in relatively minor damage and settling of buildings. But in some cases, subsidence can result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines, potentially resulting in the complete loss of the structure.

People

This hazard typically results in property damage, not risk to human life. In the event of modest subsidence over time, property that people rely on like buildings, roads, rail lines, and underground infrastructure, such as sewer, electrical power, and water lines could be impacted. These impacts may also be due to related erosion or flooding hazards.

Critical Facilities and Lifelines

Land subsidence is a threat to critical infrastructures, including groundwater wells, levees, and aqueducts. As land sinks, it can cause the casings of wells to collapse and require repair. Water that had previously been advanced by gravity may require lift stations or pumps to be moved over distorted landscapes.

Economy

Damage resulting from land subsidence can cause direct economic losses in the form of needed structural repairs to affected buildings and facilities, as noted above. It can also result in indirect losses, such as from increased taxes and decreased property values. The HMPC notes that as a result of media coverage of subsidence in the area, lending institutions have applied higher interest rates due to perceived higher risk, placing greater financial burdens on lower-income communities. Subsidence may also impact agricultural industries and livelihoods dependent on those industries if transportation routes are affected.

Cultural, Historic and Natural Resources

Historic and cultural facilities are just as susceptible to subsidence related damage as other structures. However, there is not sufficient data to identify specific historical or cultural facilities at increased risk from this hazard.

Development Trends

While vulnerability to this hazard is not anticipated to increase with new development, increased water pumping resulting from the demand of new development has the potential to increase the frequency and severity of subsidence. Increased efforts to monitor and manage groundwater pumping, increased accuracy of mapping, and emphasis on appropriate grading and ground compaction during development will help alleviate vulnerability for future development in unknown areas of risk.

4.5.8.8 Risk Summary

- A significant portion of Kings County is at risk from ongoing land subsidence, and despite the gradual nature of this hazard, the observed and potential impacts to critical infrastructure makes the overall significance of this hazard **Medium**.
- The entire Kings County is vulnerable to land subsidence due to its dependence on agriculture and groundwater pumping; however, increased efforts on sustainable groundwater management and the implementation of the Tulare Lake, Kaweah, Kings, and Westside Subasins GSPs should alleviate this hazard risk in the future..
- Increased drought conditions resulting from climate change will likely result in more groundwater pumping, which could lead to more human-induced subsidence; groundwater sustainability planning and management could help offset future subsidence.
- Land subsidence can alter the flow of surface or underground water, an impact that may not be noticed until long after the fact.
- Related Hazards: Drought, Flood
-

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Likely	Limited	Medium	Yes
City of Avenal	Extensive	Likely	Limited	Medium	Yes
City of Corcoran	Extensive	Likely	Limited	Medium	Yes
City of Hanford	Extensive	Likely	Limited	Medium	Yes
City of Lemoore	Extensive	Likely	Limited	Medium	Yes

4.5.9 LANDSLIDE

4.5.9.1 Hazard Description

Landslides can refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under the gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Although landslides are primarily associated with steep slopes (i.e., greater than 15 percent), they may also occur in areas of generally low relief and occur as cut-and-fill failures, river bluff failures, lateral spreading landslides, collapse of mine-waste piles, and failures associated with quarries and open-pit mines.

The force of gravity acting upon a steep or moderately steep slope is the primary cause of a landslide. Slope failure occurs when the force of gravity pulling the slope downward exceeds the strength of the earth materials that comprise the slope to hold it in place. In addition to the force of gravity, other contributing factors to landslides can include rainfall, earthquakes, changes in groundwater, and human-induced modifications to existing slopes.

The potential for a landslide to occur exists anywhere weak or fractured materials rest upon a moderate to steep slope. The severity of a landslide depends in large part on the degree of development in the area in which it occurs and the geographic area of the slide itself. Generally speaking, landslides result in devastating consequences, but in very localized areas. A landslide occurring in an undeveloped area would be less severe because lives and property would not be affected; the only impacts would be to land, vegetation and wildlife. However, a landslide occurring in a developed area could have devastating effects, ranging from structure and infrastructure damage to injury and loss of life.

Mudslides are a mass of water and fine-grained earth that flows down a stream, ravine, canyon, arroyo, or gulch. If more than half of the solids in the mass are larger than sand grains (rocks, stones, boulders), the event is called a debris flow. A debris fan is a conical landform produced by successive mud and debris flow deposits, and the likely spot for a future event. Mud and debris flow problems can be exacerbated by wildfires that remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to the rapid development of destructive mudflows.

A rockfall is the falling of a detached mass of rock from a very steep to horizontal slope. Rockfalls are caused by the loss of support from underneath through erosion, or triggered by ice wedging, root growth, or ground shaking. Rockfalls and landslides are influenced by seasonal patterns, precipitation, and temperature patterns. Weathering and decomposition of geologic materials produce conditions favorable to rockfalls. Changes to an area or slope, such as cutting and filling activities, can also increase the risk of a rockfall. Rockfalls can threaten human life, impact transportation corridors, and communication systems and cause other property damage.

There are predictable relationships between local geology and landslide events. The downslope movement of earth material, either as a landslide, debris flow, mudslide, or rockslide, is part of the continuous, natural process of erosion. This process, however, can be influenced by a variety of causes that change the stability of the slope. Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, or by ground shaking caused by an earthquake. Slopes can also be modified artificially by grading, or by the addition of water or structures to a slope. Development that occurs on a slope can substantially increase the frequency and extent of potential slope stability hazards. Knowledge of these relationships can improve planning and reduce vulnerability.

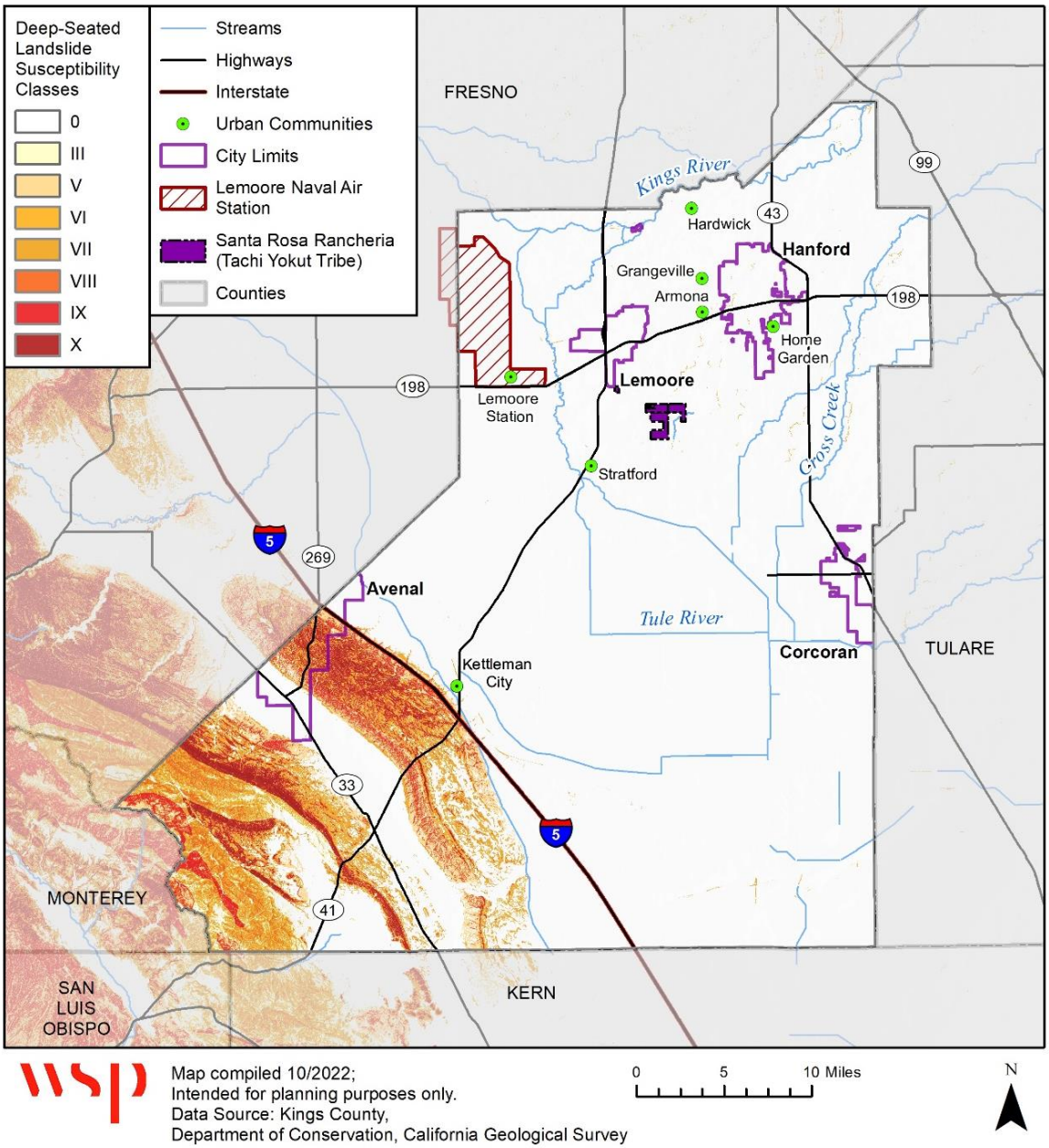
4.5.9.2 Geographic Area

Significant – As mentioned in the County's 2012 MJHMP, landslide hazards are uncommon throughout much of the county due to the flat topography. The southwestern County intersects with the Kettleman Hills and the Southern California Coastal Range. These areas of the County that are the most susceptible to landslides, and there are few past occurrences. Areas near rivers and streams are also subject to natural erosion, which may be increased during flood events.

Deep-seated landslide susceptibility in the County is depicted in Figure 4-33; areas in darker red colors have a higher susceptibility to landslide and most of these areas are concentrated west of SR 33. This map shows the relative likelihood of deep-seated land sliding based on regional estimates of rock strength and steepness of slopes. On the most basic level, weak rocks and steep slopes are most likely to generate landslides. The map uses detailed information on the location of past landslides, the location and relative strength of rock unites, and steepness of slope to estimate susceptibility to deep-seated land

sliding (0 to X, low to high, as shown in the Figure's legend). On very low slopes, landslide susceptibility is low even if there are weak rock and geologic materials, and that susceptibility increases with slope and weaker rocks. High landslide susceptibility classes (VIII, IX, and X) include very steep slopes with hard rocks and moderate to very steep slopes with weak rocks (Wills et al. 2011).

Figure 4-33 Kings County Deep – Seated Landslide Susceptibility



4.5.9.3 Past Occurrences

There have not been any disaster declarations associated with landslides or California Geological Survey (CGS) records of landslides in Kings County. However, the County's 2012 LHMP noted that landslides have occurred in the western part of the county, particularly in burn areas and after heavy rains. Heavy rain events caused a slope failure around a water line for Avenal in 1995, 1998, 2008 and 2010.

4.5.9.4 Likelihood of Future Occurrence

There is limited data on past events, but occasional landslides and debris flows are likely to occur in the western part of the county in the future. As mentioned in the County's 2012 MJHMP, winter and spring are typically the landslide/rock-fall seasons in California as rain falls and snow melts and saturates soils and temperatures enter into freeze/thaw cycles. Debris and mud flows generally occur during summer cloudbursts. Debris and mudslides and rock-fall can occur rapidly with little warning during torrential rains. Landslides typically have a slower onset and can be predicted to some extent by monitoring soil moisture levels and ground cracking or slumping in areas of previous landslide activity.

On the other hand, projected climate change-associated variance in rainfall events may result in more high-intensity rain events, which may increase landslide frequency. In addition, the increased potential of wildfire occurrence also escalates the risk of landslide and debris flows in the period following a fire. Refer to the Climate Change Considerations subsection below for more details on climate change's impact on landslide events.

4.5.9.5 Climate Change Considerations

Landslides can result from intense rainfall and runoff events. Projected climate change-associated variance in rainfall events may result in more high-intensity events, which may increase landslide frequency. In addition, the increased potential of wildfire occurrence also escalates the risk of landslide and debris flows in the period following a fire, when slopes lack vegetation to stabilize soils and burned soil surfaces allow more rainfall runoff. As climate change affects the length of the wildfire season, it is possible that a higher frequency of large fires may occur into late fall, when conditions remain dry. The wildfires can be followed by intense rains early in the winter, as occurred with the Thomas Fire in December 2017 and subsequent Montecito and Carpinteria debris flows in January 2018 that occurred in Santa Barbara County (CA SHMP 2018). Moreover, tree mortality resulting from drought, pests or any other threat could also pose an increase in landslides as the loss of trees would reduce the protection of steep slopes and thereby increase the probability of landslide occurrences.

4.5.9.6 Magnitude and Severity

Negligible – Figure 4-29 shows the relative extent of deep land sliding based on regional estimates of rock strength and steepness of slopes. The data used for the map utilizes detailed information on the location of past landslides, the location and relative strength of rock units, and the steepness of the slope in a methodology developed by Wilson and Keefer (1985) as implemented by Ponti et al (2008) to create classes of landslide susceptibility. These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. The convergence of factors suggests limited landslide potential in most of Kings County due to the very low slopes. However, there are areas on the west side where the potential increases due to an increase in slope and topography along the Southern California Coastal Range, mainly to the west of I-5. These areas are shown in darker orange and red in Figure 4-33.

Landslides are often triggered by other natural hazards such as earthquakes, heavy rain, flood, or wildfires. Landslide frequency is often related to the frequency of these other hazards. In Kings County, landslides typically occur during and after major storms so the potential for landslides largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils.

4.5.9.7 Vulnerability Assessment

Property

Landslides directly damage engineered structures in two general ways: 1) disruption of structural foundations caused by differential movement and deformation of the ground upon which the structure sits, and 2) physical impact of debris moving downslope against structures located in the travel path.

During the 2023 update of this plan, a GIS analysis of exposure to landslide hazard areas was performed. GIS analysis indicates approximately $126.4 million of property improvements are exposed, which takes into account improved values of properties. Table 4-68 summarizes landslide exposure by jurisdiction. GIS was used to intersect the parcel boundaries with a master address point layer to obtain the number of buildings per parcel. Only parcels with improvement values greater than zero were used in the analysis, this method assumes that improved parcels have a structure of some type.

Based on this analysis there is a total of 144 improved parcels together with 304 structures located within landslide hazard areas in the County. The majority of this exposure is to the west of I-5 and in the southwestern unincorporated County. None of the parcels from the cities of Corcoran and Lemoore are

exposed to landslide hazard. There is a high level of uncertainty as to the actual risk to these exposed parcels, thus a more specific loss estimation is not provided. A more detailed, site-specific analysis would be needed to assess actual risk within the identified parcels. The analysis results are shown below in Table 4-68.

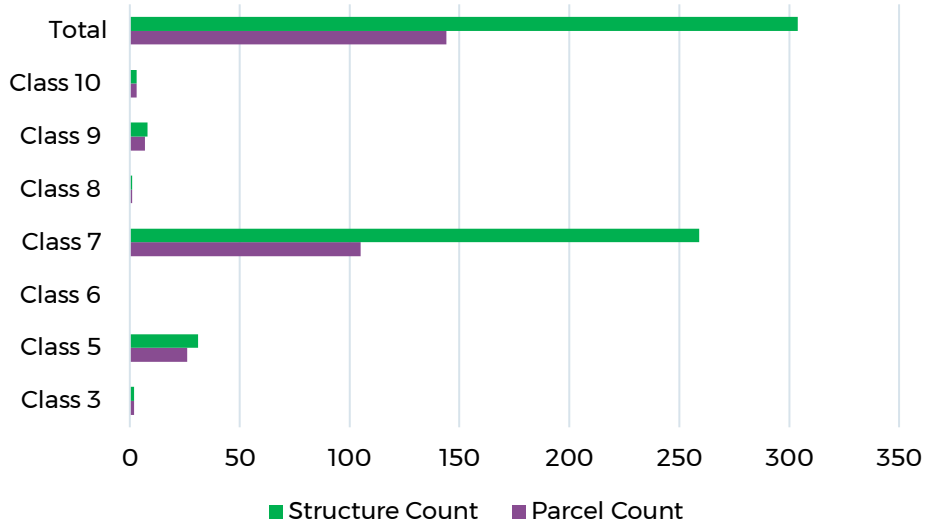
Table 4-68 Kings County Improved Parcels & Structures Potentially at Risk to Landslide

JURISDICTION	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	POPULATION
Avenal	22	22	$1,820,347	$1,197,668	$3,018,015	61
Hanford	37	188	$38,644,308	$25,007,092	$63,651,400	501
Unincorporated County	85	94	$29,768,911	$29,971,966	$59,740,877	73
Total	**144**	**304**	**$70,233,566**	**$56,176,725**	**$126,410,291**	**635**

Source: Department of Conservation, CGS, Kings County Assessor, Wood GIS Analysis

Figure 4-34 below further breaks down the numbers of exposed parcels by landslide class, as shown previously in Table 4-68; the higher the class the greater the susceptibility. As shown by Figure 4-34, most of the exposed parcels and structures are located within Class 7 landslide areas.

Figure 4-34 Total Parcel & Structure Counts by Landslide Class



Source: Department of Conservation, CGS, Kings County Assessor, Wood GIS Analysis

People

People could be susceptible if they are caught in a landslide or debris flow, potentially leading to injury or death. There is a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways. Similar to the methodology used in the flood section, the total people at risk were estimated by multiplying the average number of persons per household in the County and each applicable incorporated jurisdiction with the number of residential parcels in landslide-prone areas to estimate the population residing in landslide hazard areas. As shown in Table 4-68, there are approximately 635 people potentially residing in landslide susceptible areas. These areas include the Cities of Avenal and Hanford, as well as the unincorporated County to the west of I-5, SR 33 & SR 41. However, it is not likely that landslides will occur without warning and direct impacts to people are suspected to be minimal.

Critical Facilities and Lifelines

In addition to buildings, utilities and transportation structures are vulnerable to the impact and ground deformation caused by slope failures. They present a particular vulnerability because of their geographic extent and susceptibility to physical distress. Lifelines are generally linear structures that, because of their geographic extent, have a greater chance of being affected by ground failure due to greater hazard exposure.

Extension, bending, and compression caused by ground deformation can break lifelines. Failure of any component along the lifeline can result in the failure to deliver service over a large region. Once broken, transmission of the commodity through the lifeline ceases, which can have catastrophic repercussions including loss of power to critical facilities such as hospitals, impaired disposal of sewage, contamination of water supplies, disruption of all forms of transportation, and release of flammable fuels. Therefore, the overall impact of lifeline failures, including secondary failure of systems that depend on lifelines, can be much greater than the impact of individual building failures.

Table 4-69 below summarizes the results of the critical facilities analysis, highlighting the exposure of critical facilities throughout the County to landslide hazards. The critical facilities that are exposed to landslide hazards are located within the City of Avenal and unincorporated County. Many exposed critical facilities are located in the southwestern part of the County to the west of Interstate 5.

Table 4-69 Critical Facilities Within the Class 9 Landslide Hazard by FEMA Lifeline

JURISDICTION	LANDSLIDE CLASS	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
Avenal	5	1	-	-	-	-	-	-	**1**
	7	4	1	-	-	-	-	-	**5**
	9	-	1	-	-	-	-	-	**1**
	10	1	-	-	-	-	-	-	**1**
Unincorporated	5	10	2	-	1	-	-	2	**12**
	7	2	2	-	1	-	-	4	**9**
	8	2	-	-	-	-	-	-	**2**
	9	-	-	-	-	-	-	2	**2**
	10	6	-	-	-	-	-	-	**6**
Grand Total	**-**	26	4	-	1	-	-	8	**39**

Source: HIFLD, Kings County, WSP GIS Analysis

Economy

Economic impacts typically center around transportation routes temporarily closed by debris flow or landslide activity. These roads may be used to transport goods across the County or provide access by visitors and tourists. Depending on the amount of damage, the road may simply need to be cleaned off or may require some level of reconstruction.

Cultural, Historic and Natural Resources

As primarily a natural process, landslides and debris flows can have varying impacts on the natural environment. Debris flows have the potential to permanently alter the natural landscape. The impacts of landslides and debris flows on historical and cultural structures would be similar to the impacts on the general property.

Development Tends

The severity of landslide problems is directly related to the extent of human activity in hazard areas. Human activities such as property development and road construction can exacerbate the occurrence of landslides. Development Trends should take place carefully to prevent landslide damage to property or people. Adverse effects can be mitigated by early recognition, avoiding incompatible land uses in these areas, or by corrective engineering. Improving mapping and information on landslide hazards and incorporating this information into the development review process could prevent siting of structures and infrastructure in identified hazard areas.

A GIS analysis of exposure to landslide hazard within SOI boundaries is summarized in Table 4-70 below. These parcels are also included in Table 4-69, and they fall under "Unincorporated" in terms of their jurisdiction. Parcels shown below in Table 4-70 are those that fall within each jurisdiction's SOI and are exposed to potential landslide hazard events. As shown in Table 4-70, only two parcels with two structures located in the SOI of the City of Hanford are exposed to landslide hazard.

Table 4-70 Sphere of Influence Risk to Landslide Hazard

JURISDICTION	IMPROVED PARCEL COUNT	BUILDING COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	POPULATION
Hanford	2	2	$350,069	$525,104	$875,173	-
Total	**2**	**2**	**$350,069**	**$525,104**	**$875,173**	**-**

Source: HIFLD, Kings County, WSP GIS Analysis

Furthermore, as shown in Figure 4-33, areas west of I-5 are the most susceptible to landslide hazard in the County. However, the Community District areas, which are outlined in the County's 2035 General Plan Land Use Element and represent the County's future urban growth, are not located to the west of I-5. They are mostly SOIs that surround the County's current municipal boundaries, while most areas within current SOIs are not significantly exposed to landslide hazard. Therefore, landslide hazards currently pose a limited threat to these Development Trends areas.

4.5.9.8 Risk Summary

- The overall significance of landslides in Kings is **Low.**
- The geologic formations commonly associated with slope stability problems in Kings County are largely concentrated to the west of I-5 and in the southwestern portion of the County.
- Heavy rain events caused a slope failure around a water line for Avenal in 1995, 1998, 2008 and 2010; however, there have not been any disaster declarations associated with landslides or CGS records of landslides in Kings County.
- People are most commonly at risk if they are caught in a landslide or debris flow, including when driving through a hazard area.
- Property loss is rare, but GIS analysis shows some properties could be exposed to landslides.
- Landslides in adjacent counties can disrupt major transportation corridors, possibly affecting the local tourist economy and shipment of goods.
- Landslides and debris flows can destroy infrastructure such as water and sewer lines, electrical and telecommunications utilities and drainage. Disrupted transportation routes occur occasionally, usually during heavy rainstorms, and cause considerable inconvenience.
- **Related Hazards:** Flood, Severe Weather

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Significant	Occasional	Negligible	Low	No
City of Avenal	Significant	Occasional	Negligible	Low	No
City of Corcoran	Significant	Occasional	Negligible	Low	No
City of Hanford	Significant	Occasional	Negligible	Low	No
City of Lemoore	Significant	Occasional	Negligible	Low	No

4.5.10 PUBLIC HEALTH HAZARDS: PANDEMICS/EPIDEMICS

4.5.10.1 Hazard Description

A public health hazard spreads from one person to another through a variety of ways that include contact with blood and bodily fluids, breathing in an airborne virus, or being bitten by an insect.

The scale of a public health hazard outbreak or biological incident is described by the extent of the spread of disease in the community. An outbreak can be classified as an endemic, an epidemic, or a pandemic depending on the prevalence of the disease locally and around the world.

- An endemic is defined as something natural to or characteristic of a particular place, population, or climate. For example, threadworm infections are endemic in the tropics.
- An epidemic is defined as a disease that spreads rapidly through a demographic segment of the human population, such as everyone in a given geographic area, a similar population unit, or everyone of a certain age or sex, such as the children or women of a region.
- A pandemic is defined as an extensive epidemic with effects felt worldwide.

While many potentially devastating diseases are spread through ingestion or insects, airborne diseases and those spread through physical contact pose higher risks to the community as they are difficult to control. Diseases such as influenza, pertussis, tuberculosis, and meningitis are all spread through these methods and pose a threat to communities. Health agencies closely monitor for diseases with the potential to cause an epidemic and seek to develop and promote immunizations.

A pandemic is a global disease outbreak. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease could easily spread person-to-person, causing serious illness, and can sweep across the country and around the world in a very short time. The CDC is working closely with other countries and the World Health Organization (WHO) to strengthen systems to detect outbreaks that might cause a pandemic and to assist with pandemic planning and preparation.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Pandemics are generally thought to be the result of novel strains of viruses. Because of the process utilized to prepare vaccines, it is impossible to have vaccines pre-prepared to combat future pandemics. Additionally, for novel viruses, identification of symptoms, mode of transmission, and testing/identification may require development, causing significant delays in response actions. A portion of the human and financial cost of a pandemic is related to the lag time to prepare a vaccine to prevent the future spread of the novel virus. In some cases, current vaccines may have limited efficacy against novel strains.

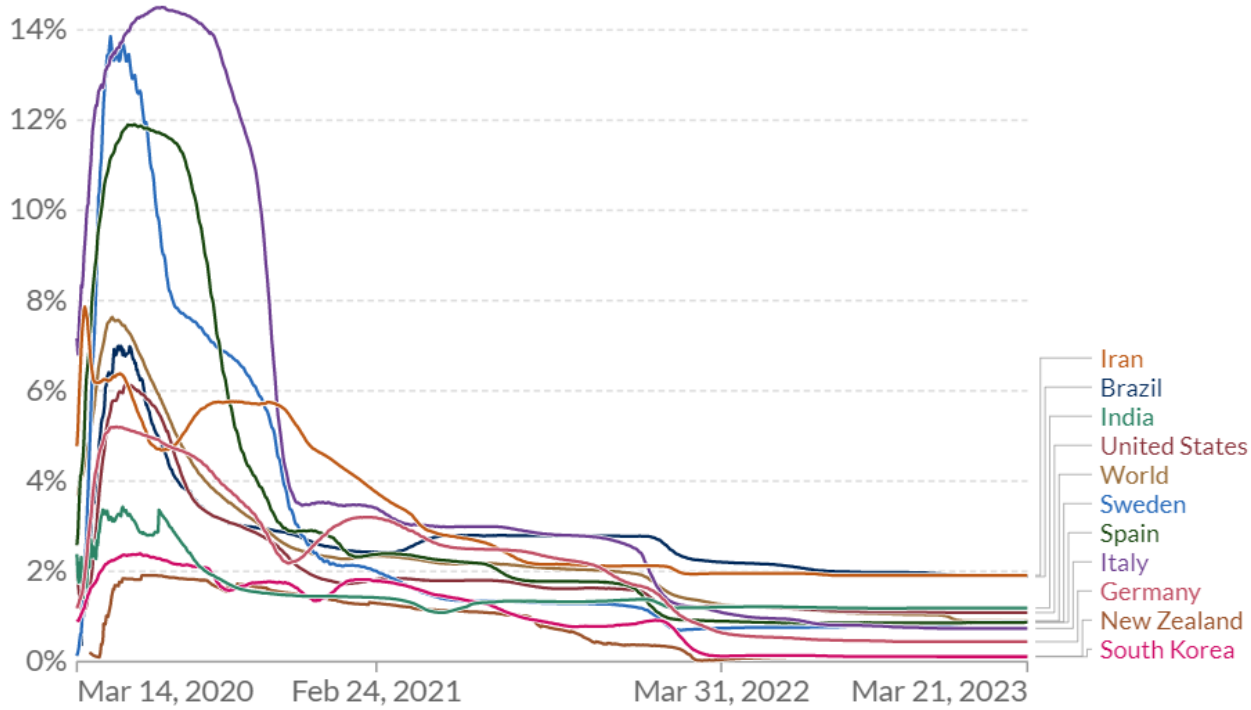
Even when there is a strong healthcare system in place, disease outbreaks can strain and overwhelm community resources. The County's vulnerable populations, young children, the elderly, under-resourced households, and those with underlying health conditions, will be the hardest hit during any disease outbreak. An especially severe outbreak could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Ongoing COVID-19 Pandemic

Since March 2020 and during the update of this plan, the County, the nation, and the world were dealing with the COVID-19 pandemic, confirming that the pandemic is a key public health hazard in the State. The COVID-19 virus has a much higher rate of transmission than the seasonal flu, primarily by airborne transmission of droplets/bodily fluids. Common symptoms include fever, cough, fatigue, shortness of breath or breathing difficulties, and loss of smell and taste.

Figure 4-35 below shows the case fatality rate of COVID-19 from March 14, 2020 to March 21, 2023. The case fatality rate (CFR) is the ratio between confirmed deaths and confirmed cases. As shown in the figure, the CFR was relatively much higher in 2020 and started dropping towards the end of 2020 and early 2021. The highest CFR that the US experienced was a bit higher than 6%. On the other hand, since early 2022, the US' CFR has been lower than 2%. However, as also mentioned by the figure's source – Our World In Data, CFR does not reflect the risk of dying from COVID-19 because the CFR relies on the number of confirmed cases, and many cases are not confirmed.

Figure 4-35 Case Fatality Rate of COVID-19 Up-to-Date



Source: Our World In Data – Global Change Data Lab

Moreover, as mentioned in CDC's most up-to-date summary on January 27, 2023, there is a rapid reduction in the overall US COVID-19-related mortality rate in March 2022. From April through September 2022, COVID-19–related mortality rates remained relatively stable. On the other hand, although overall COVID-19-related mortality rates declined, adults aged ≥65 years continued to have the highest mortality rates. During April–September 2022, the proportion of COVID-19-related deaths accounted for by adults aged ≥85 years increased to ~40% despite accounting for <2% of the U.S. population. COVID-19–related deaths among children remained rare (CDC 2023).

2022 US Mpox Outbreak

As discussed by CDC in February 2023, Mpox is a rare disease caused by infection with the mpox virus. Mpox virus is part of the same family of viruses as the variola virus, the virus that causes smallpox. Mpox symptoms are similar to smallpox symptoms, but milder, and mpox is rarely fatal. Mpox is not related to chickenpox.

Mpox was discovered in 1958 when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. Despite being named "monkeypox," the source of the disease remains unknown. However, African rodents and non-human primates (like monkeys) might harbor the virus and infect people.

The first human case of mpox was recorded in 1970. Prior to the 2022 outbreak, mpox had been reported in people in several central and western African countries. Previously, almost all mpox cases in people outside of Africa were linked to international travel to countries where the disease commonly occurs or through imported animals. These cases occurred on multiple continents.

People with mpox often get a rash that may be located on hands, feet, chest, face, or mouth or near the genitals. The incubation period is 3-17 days. During this time, a person does not have symptoms and may feel fine. The rash will go through several stages, including scabs, before healing. The rash can initially look like pimples or blisters and may be painful or itchy. Other symptoms of mpox can include: fever, chills, swollen lymph nodes, exhaustion, muscle aches and backache, headache, and respiratory symptoms (e.g., sore throat, nasal congestion, or cough). Mpox can spread to anyone through close, personal, often skin-to-skin contact. The risk is considered low for getting mpox by touching objects, fabrics, and surfaces that have been used by someone with mpox and not disinfected.

As of March 15, 2023, there are 86,500 global cases, while 30,262 of them are in the US. The WHO declared Monkeypox Spread a Global Health Emergency on July 23, 2022. Since the number of new cases remained low, the Biden Administration ended the mpox public health emergency declaration on January 31, 2023.

Valley Fever

Another example of a human health hazard that is endemic to the County is Valley Fever, or "cocci" which is a known but poorly understood secondary effect of drought conditions, and possibly a combination of wind and drought events followed by a rainy season. Valley Fever is an infection caused by a fungus (*Coccidioides immitis*) that lives in soil and dirt and areas with low rainfall, high summer temperatures, and moderate winter temperatures. Valley Fever is primarily a disease of the lungs and the infection can occur year-round. In California, it has been reported from most counties, but especially from the San Joaquin Valley and Central Coast. Anyone who lives in, works in, or visits a place with Valley Fever can be infected. According to the *Epidemiologic Summary of Valley Fever (Coccidioidomycosis) in California, 2019 Report*, published by the California Department of Public Health, Kings County was one of the counties that have the highest rates of Valley Fever in 2019.

People can get sick by breathing in a form of the Valley Fever fungus called spores. Spores are too small to be seen and they can get into the air with dust when it is windy or when dirt is distributed. Fortunately, Valley Fever cannot be spread from one person to another. About 60% of infected people will not get sick. People who do get sick can have symptoms such as fever, tiredness, and weight loss that last a month or more. Valley Fever can also infect the brain, joints, bone, skin, or other organs. This type of infection is rare; however, it can be serious and sometimes fatal. Most people who get Valley Fever fully recover and are usually protected from getting Valley Fever again.

4.5.10.2 Geographic Area

Extensive – Pandemics occur not only on a county or state level but on a national and global scale. Most communities in Kings County would likely be affected, either directly or by secondary impacts. Some indirect consequences may be the diversion of resources that may be otherwise available. Diseases usually spread throughout vulnerable populations and in areas where people live and work in close quarters. Depending on the specifics of the illness, these areas can include shelters, senior homes, schools, and places of business. In general, it is likely that the more populated areas may be affected sooner and may experience higher infection rates.

Kings County has reported 65,122 cases and 464 deaths from COVID-19 as of December 13, 2022. The current COVID-19 pandemic has affected all the jurisdictions in Kings County. Table 4-71 shows the total number of cases as well as the number of cases per total population specific to the jurisdictions within Kings County. Data specific to tribes are included in the nearest counties. Kings County comprises less than 1% of the statewide total cases and deaths. In general, it is likely that the more-populated areas municipal areas may be affected sooner and may experience higher infection rates.

Table 4-71 COVID-19 Cases by Jurisdiction (as of December 8, 2022)

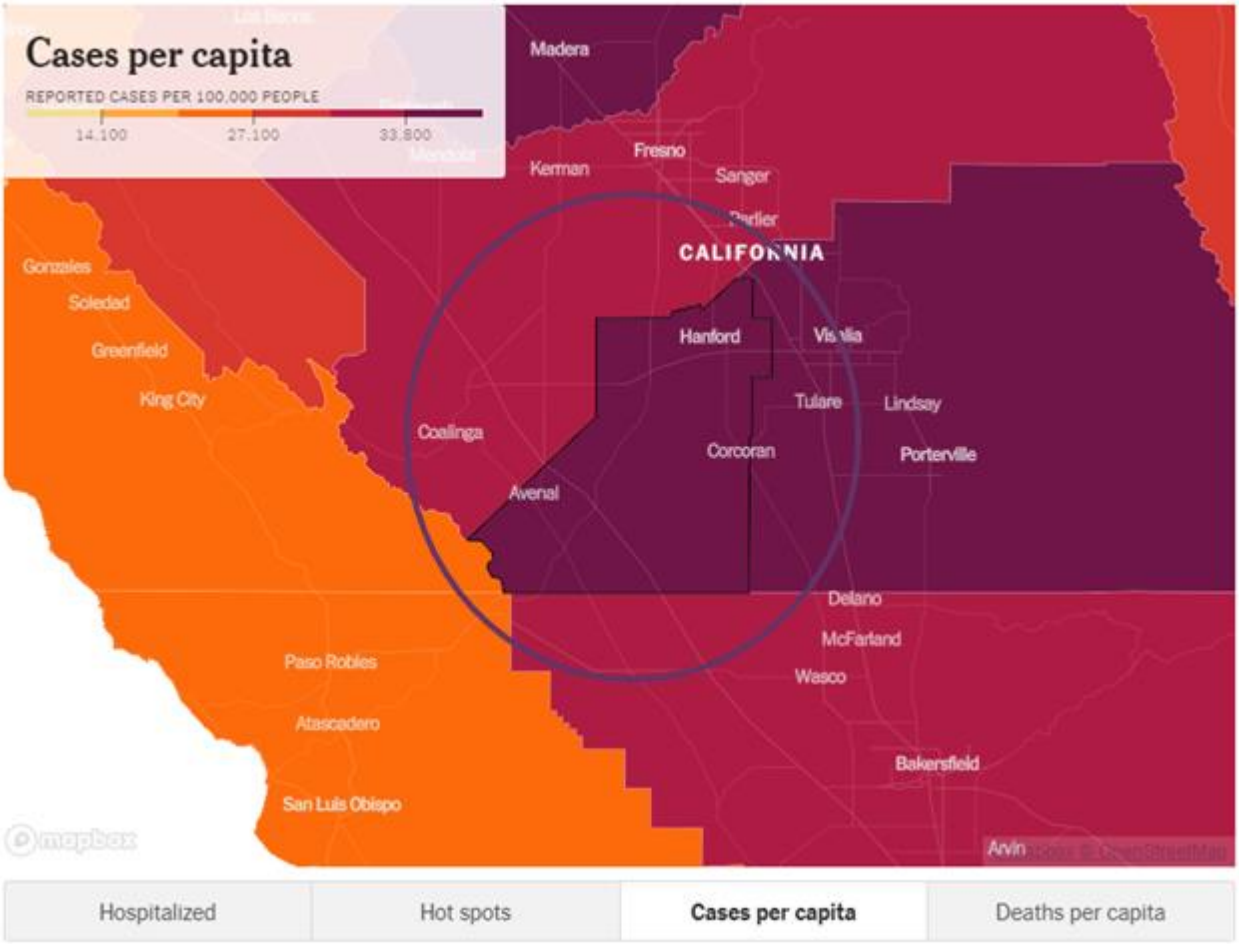
JURISDICTION	CASES	CASES PER TOTAL POP*.
City of Avenal	7,712	55.6%
City of Corcoran	11,584	51.2%
City of Hanford	25,589	44.6%
City of Lemoore	11,914	44.7%
Unincorporated County	4,166	13.3%
Total	60,974	40.1%

Source: Kings County Department of Public Health COVID-19 Dashboard

*Total population is based on U.S. Census Bureau ACS 2017-2021 5-Year Estimates

Moreover, according to the New York Times "*Tracking coronavirus in Kings County*" dashboard shown in Figure 4-36, Kings County has relatively high reported cases per 100,000 people.

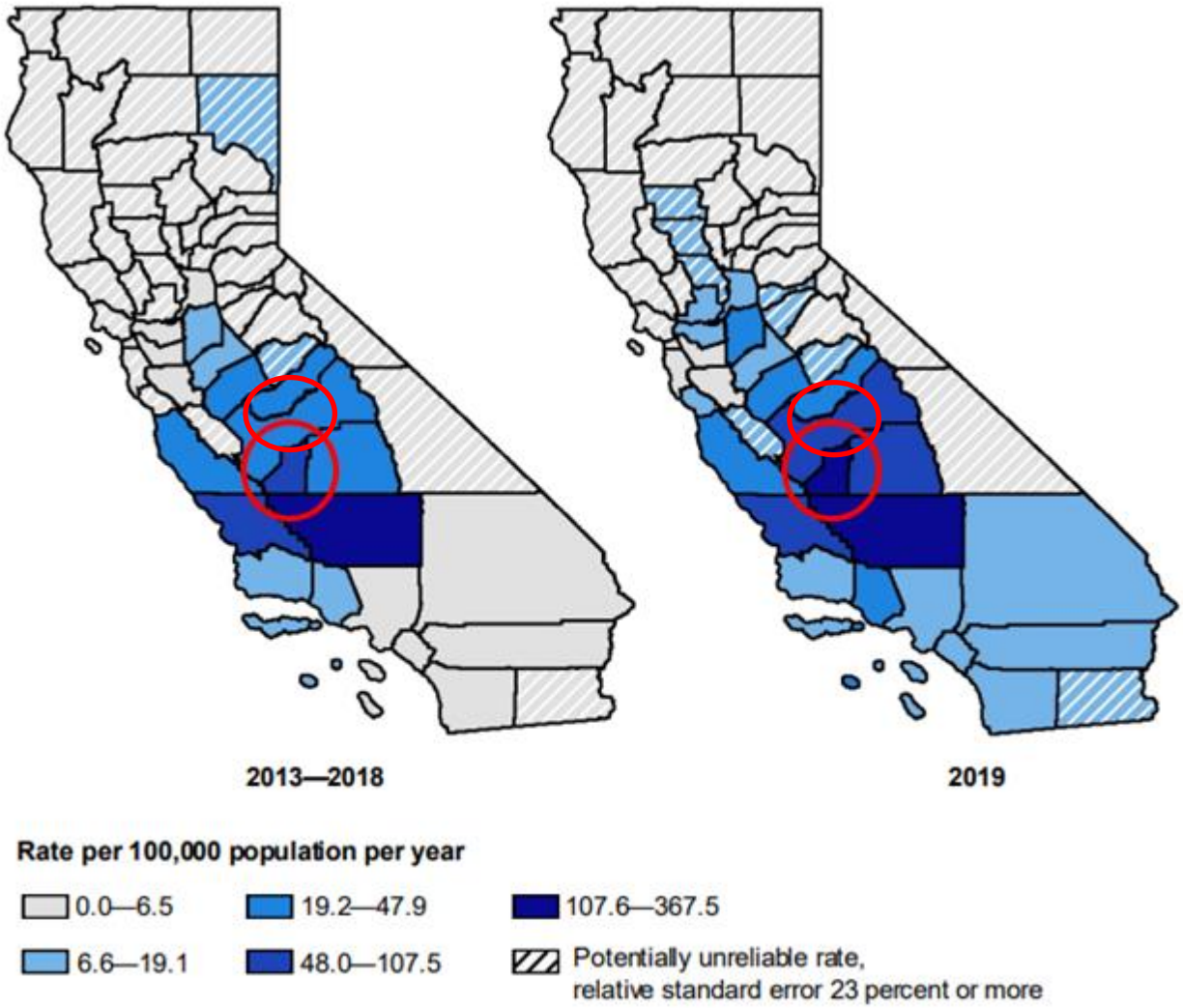
Figure 4-36 Reported Coronavirus cases per 100,000 people



Data source: The New York Times, December 14, 2022

With regards to Valley Fever, Figure 4-37 below shows Valley Fever Annual Incidence among California Counties in the year 2013 – 2018 and 2019.

Figure 4-37 Annual Incidence among California Counties in the year 2013 – 2018 and 2019



Source: Epidemiologic Summary of Valley Fever (Coccidioidomycosis) in California, 2019 Report, published by California Department of Public Health

4.5.10.3 Past Occurrences

Since the early 1900s, five lethal pandemics have swept the globe:

- 1918-1919 Spanish Flu: The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. At one point, more than 10% of the American workforce was bedridden.
- 1957-1958 Asian Flu: The 1957 Asian Flu pandemic killed 1.1 million people worldwide, including about 70,000 people in the United States, mostly the elderly and chronically ill. Fortunately, the virus was quickly identified, and vaccine production began in May 1957.
- 1968-1969 H3N2 Hong Kong Flu: The 1968 Hong Kong Flu pandemic killed one million people worldwide and approximately 100,000 people in the United States. Again, the elderly were more severely affected. This pandemic peaked during school holidays in December, limiting student-related infections, which may have kept the number of infections down. Also, people infected by the Asian Flu ten years earlier may have gained some resistance to the new virus.
- 2009-2010 H1N1 Swine Flu: This influenza pandemic emerged from Mexico in early 2009 and was declared a public health emergency in the US on April 26. By June, approximately 18,000 cases had

been reported in the US and the virus had spread to 74 countries. Most cases were fairly mild, with symptoms similar to the seasonal flu, but there were cases of severe disease requiring hospitalization and some deaths.

- 2020-Ongoing COVID-19: The COVID-19 or novel coronavirus was detected in December 2019 and was declared a pandemic in March 2020. As of December 14, 2022, 650 million cases and 6.66 million deaths have been reported globally, including approximately 99.2 million cases and 1.09 million deaths in the US. Worldwide there have been 13.05 billion vaccine doses administered. The response to the COVID-19 Pandemic included numerous public health orders, including stay-home orders, massive testing infrastructure, the establishment of alternate care sites to support the hospital system, and an unprecedented community-wide vaccination push.

4.5.10.4 Likelihood of Future Occurrence

Occasional – Although it is impossible to predict the next disease outbreak, recent history shows these outbreaks are not uncommon and are likely to reoccur. Based on the five pandemics that have affected the United States in roughly the last 100 years, a pandemic occurs on average roughly every 20 years. In other words, there is a 5% probability that a pandemic that affects the entire United States will occur in any given year.

For the current COVID-19 pandemic, due to the virus's ability to mutate and rapidly infect those who are not vaccinated, the pandemic may extend for several years, and booster vaccines may be necessary to prevent future outbreaks. In just the last couple of decades, the world has drastically increased points of transmissions through global travel and trade to levels unseen in human history – this may have a drastic impact on the frequency of pandemics and the speed with which they spread in coming years.

4.5.10.5 Climate Change Considerations

As the Earth's climate continues to warm, researchers predict wild animals will be forced to relocate their habitats — likely to regions with large human populations — dramatically increasing the risk of a viral jump to humans that could lead to the next pandemic. This link between climate change and viral transmission is described by an international research team led by scientists at Georgetown University, published on April 28, 2022, in *Nature*. The scholars noted that the geographic range shifts due to climate change could cause species that carry viruses to encounter other mammals, sharing associated viruses thousands of times, which may then further be spread to humans. In addition, rising temperatures caused by climate change will impact bats, which account for the majority of novel viral sharing. Bats' ability to fly will allow them to travel long distances and share viruses in geographically dispersed places. Altogether, the study suggests that climate change will become the biggest upstream risk factor for disease emergence — exceeding higher-profile issues like deforestation, wildlife trade and industrial agriculture. The authors highlight a need to pair wildlife disease surveillance with real-time studies of environmental change (GUMC 2022).

Another research article that was published on August 23, 2021, also reached a similar conclusion. The likelihood of an extremely infectious disease epidemic – similar to the COVID-19 pandemic – could triple in the coming decades. William Pan, Ph.D. – one of the study authors and an associate professor of global environmental health at Duke University, together with his colleagues looked at data from the past 400 years to estimate the chance of extreme epidemics each year. The rate of occurrence of epidemics varies widely across time, the researchers said, but the chance of an extreme epidemic can be calculated. Recent estimates show that infectious diseases that are passed from animals to humans – also called zoonotic diseases, such as COVID-19 – are becoming more common due to climate change (Crist, 2022).

4.5.10.6 Magnitude and Severity

Critical – The magnitude of a disease outbreak or public health emergency will range significantly depending on the aggressiveness of the virus in question, the ease of transmission, and the efficacy of public health and medical responses. Pandemic influenza is easily transmitted from person to person, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time.

Today, a large percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means a virus could spread around the globe within hours, quickly creating a pandemic. Under such conditions, there may be very little warning time. It is estimated that one to six months will have lapsed between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in

human and material resources that normally occur with other natural disasters. These aspects make influenza pandemic unlike most other public health emergencies or community disasters. Pandemics typically last for several months to years.

As seen with the ongoing COVID-19 pandemic, the rapid spread of a virus combined with the need for increased hospital and coroner resources, testing centers, first responders, and vaccination administration sites causes significant strain on the medical system and public health departments. Additionally, other public health-related triggers or commingled public health hazards (such as an outbreak of another pathogen) or even more contagious strains of COVID such as the recent Omicron, BA.5 and Delta B.1.617.2 variant, can quickly lead to even more outbreaks.

The Pandemic Intervals Framework (PIF) developed by WHO is a six-phased approach to defining the progression of an influenza pandemic. This framework is used to guide influenza pandemic planning and provides recommendations for risk assessment, decision-making, and action. These intervals provide a common method to describe pandemic activities that can inform public health actions. The duration of each pandemic interval might vary depending on the characteristics of the virus and the public health response.

The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1 through 3 correlate with preparedness in the pre-pandemic interval, including capacity development and response planning activities, while Phases 4 through 6 signal the need for response and mitigation efforts during the pandemic interval.

Pre-Pandemic Interval

Phase 1 is the natural state in which influenza viruses circulate continuously among animals (primarily birds) but do not affect humans.

Phase 2 occurs when an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is thus considered a potential pandemic threat. Phase 2 involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

Phase 3 represents the mutation of the animal influenza virus in humans so that it can be transmitted to other humans under certain circumstances (usually very close contact between individuals). At this point, small clusters of infection have occurred.

Phase 4 is characterized by verified human-to-human transmission of the virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upward shift in the risk for a pandemic. Phase 4 involves community-wide outbreaks as the virus continues to mutate and becomes more easily transmitted between people (for example, transmission through the air)

Phase 5 is characterized by verified human-to-human spread of the virus in at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.

Phase 6, the pandemic phase, is characterized by community-level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. The designation of this phase will indicate that a global pandemic is underway.

4.5.10.7 Vulnerability Assessment

People

Pandemics can affect large segments of the population for long periods. The number of hospitalizations and deaths will depend on the virulence of the virus. Risk groups cannot be predicted with certainty; the elderly, people with underlying medical conditions, and young children are usually at higher risk, but as discussed above, this is not always the case. People without health coverage or access to good medical care are also likely to be more adversely affected. According to the 2021 ACS 5-Year Estimates of the County, 10.3% of the County's population is 65 years of age or older, 7.5% of the population is 5 years of age or younger, and 16.4% experienced poverty in the prior 12 months.

However, impacts, mortality rates, speed and types of spread are disease-specific. As seen with the current COVID-19 pandemic statewide, according to the County Department of Public Health, the most

positive cases occurred in the 18-49 age group. This age group makes up more than 50% of the County's total cases. Hospitalizations and deaths, however, happened more within the 50+ age group. (KCDPH, 2023)

Property

Public health hazards would not have direct impacts on infrastructure or the built environment. Should infrastructure require human intervention to fulfill vital functions, these functions could be impaired by absenteeism, sick days and isolation, quarantine, and disease prophylaxis measures. As concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness. Additionally, traditional sheltering facilities, including shelters for persons experiencing homelessness or facilities to support displaced persons during an evacuation, cannot be done in a congregate setting. This requires additional planning considerations or the use of facilities that allow for non-congregate shelter settings which may require approval from FEMA and may have an increased cost.

Critical Facilities and Lifelines

The impacts of a public health hazard on critical infrastructure and lifelines would center on service disruption due to staff missing work and shortages in essential resources and supplies to perform services, as seen with personal protective equipment during the COVID-19 pandemic within the health and medical sector. Schools may also be forced to close due to faculty and staffing shortages.

While automated systems and services that allow for the physical distancing of staff from other persons may fare better through a public health hazard incident, all critical infrastructure sectors and lifelines would likely be affected due to the globalization of supply chains, services, and interdependency of most communities.

Economy

A widespread public health hazard outbreak could have devastating impacts on Kings County's economy. The economic impacts fall under two categories – economic losses as a result of the disease, and economic losses to fight the disease. Economic impacts as a result of diseases include those costs associated with lost work and business interruption. Depending on the disease and the type and rate of spread, businesses could see a loss of consumer base as people self-isolate or avoid travel. This could last for a protracted amount of time, compounding economic loss. Economic costs are also associated with incident response. Two of the biggest areas of cost are public information efforts and mass prophylaxis.

In a normal year, lost productivity due to illness costs US employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression. According to an October 2020 report by The Journal of American Medical Association (JAMA) Network, the estimated cumulative financial costs of the COVID-19 pandemic related to the COVID-19 economic recession and compromised health (premature death, mental health, long-term health impairment) in the US population was almost $16 trillion (Cultler and Summers 2020). Since March 2022, the California Small Business COVID-19 Relief Grant Program has been rolling out and supporting small businesses with grants ranging from $5,000 to $25,000. The entire financial support offered through the program exceeds $2 billion.

Cultural, Historic and Natural Resources

As mentioned previously, public health hazards would not have specific impacts on the built or natural environment, including historic and cultural resources. However, historic and cultural resources are often intertwined with the tourism industry, therefore reduced tourism could lead to impacts such as a loss of revenue needed for resource maintenance.

Impacts on natural resources can vary. Some ecosystems showed signs of improvement during the peak covid-19 lockdown. However, some zoonotic diseases can spread from animals to humans, wreaking havoc on both populations. Examples of zoonotic diseases include avian flu, swine flu, tuberculosis, plague, and rabies.

Development Trends

Population growth and development contribute to pandemic exposure. Development Trends in the County has the potential to change how infectious diseases spread through the community and impact human health in both the short and long term. New development may increase the number of people and facilities exposed to public health hazards and greater population concentrations (often found in

special needs facilities and businesses) put more people at risk. During a disease outbreak, those in the immediate isolation area would have little to no warning, whereas the population further away in the dispersion path may have some time to prepare and mitigate against disease depending on the hazard, its transmission, and public notification.

4.5.10.8 Risk Summary

In summary, the public health hazard is considered to be of overall **Medium** significance for Kings County. Variations in risk by jurisdiction are summarized in the table below, along with key issues from the vulnerability assessment.

- Pandemics affecting the U.S. occur roughly once every 20 years, meaning there is a roughly 5% chance a pandemic will happen each year, but they cannot be reliably predicted.
- Effects on people will vary, while the elderly, people with underlying medical conditions, and young children are usually at higher risk.
- Effects on property are typically minimal, although quarantines could result in short-term closures.
- Effects on economy: lost productivity due to illness and potential business closures could potentially have severe economic impacts. Social distancing requirements and fear of public gatherings could significantly reduce in-person commerce.
- Effects on critical facilities and infrastructure: community lifelines, such as healthcare facilities, like hospitals will be impacted and may be overwhelmed and have difficulty maintaining operations due to bed availability, medical staffing shortages, and lack of PPE and other supplies.
- Ongoing mitigation activities should focus on disease prevention, especially during flu season. This includes, but is not limited to, pre-season community outreach campaigns to educate the public about risks and available support; establishing convenient vaccination centers; reaching out to vulnerable populations and caregivers; and issuing advisories and warnings.
- Related Hazards: Human Conflict

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Critical	Medium	Yes
City of Avenal	Extensive	Highly Likely	Critical	Medium	Yes
City of Corcoran	Extensive	Highly Likely	Critical	Medium	Yes
City of Hanford	Extensive	Highly Likely	Critical	Medium	Yes
City of Lemoore	Extensive	Highly Likely	Critical	Medium	Yes

4.5.11 SEVERE WEATHER: GENERAL

The climate in the Central Valley is defined generally by hot, dry summers and foggy, rainy winters. Severe weather is generally any destructive weather event but usually occurs in Kings County as localized thunderstorms that bring heavy rain and strong winds that occur most often during the winter and spring months. The agricultural industry is among the most vulnerable asset to severe weather. Agricultural losses resulting from natural hazards can have dramatic impacts on the economic health of Kings County.

For this plan, severe weather is broken down as follows:

- Dense Fog
- Heavy Rain, Thunderstorm, Hail, Lightning
- High Wind/Tornado

NOAA's NCEI has been tracking adverse weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1996 to September 2022, and additional data for tornados (1950 – 1995), thunderstorm winds (1955-1995), and hail (1955-1995). This database contains 992 storm events that occurred in the County between January 1, 1950, and September 2022. Table 4-72 summarizes these events.

Table 4-72 NCEI Hazard Event Reports for Kings County, 1950-2022

HAZARD	# OF EVENTS	PROPERTY LOSS ($)	CROP LOSS ($)	DEATHS	INJURIES	USDA RMA LOSSES**
Cold/wind Chill*	4	$0	$0	0	0	$0
Dense Fog*	333	$3,911,000	$0	0	8	$0
Dense Smoke	0	$0	$0	0	0	$0
Drought*	64	$0	$0	0	0	$5,185,606
Excessive Heat*	24	$2,000,000	$0	0	0	$0
Extreme Cold/Wind Chill*	4	$0	$0	0	0	$0
Flash Flood	6	$0	$0	0	0	$0
Flood	19	$818,190	$1,000,000	0	0	$0
Frost/Freeze*	198	$0	$216,720,000	0	0	$10,965,935
Funnel Cloud	15	$0	$0	0	0	$0
Hail	25	$2,000	$4,360,000	0	5	$4,803,398
Heat*	93	$0	$106,600,000	0	0	$37,013,009
Heavy Rain	61	$131,000	$10,450,000	0	0	$17,638,076
High Wind*	41	$5,553,000	$300,000	1	6	$1,220,101
Lightning	10	$51,000	$400,000	0	0	$0
Strong Wind*	49	$453,400	$119,500	0	0	$0
Thunderstorm Wind*	32	$399,500	$4,000,000	1	0	$0
Tornado	8	$540,250	$0	0	1	$0
Wildfire*	3	$0	$0	1	0	$55,611
Winter Storm*	0	$0	$0	0	0	$0
Winter Weather*	0	$0	$0	0	0	$61,977,533
Total	992	$13,859,340	$343,949,500	3	20	$138,859,270

Source: National Center for Environmental Information Storm Events Database, www.ncdc.noaa.gov/stormevents/

* Hazards with wide extents reflect larger zones that extend beyond Kings County.

** USDA RMA data is for the year 2007 – 2020;

Hazards recorded in the USDA RMA database may not share the exact names used in the NCEI database: (NCEI Hazard Name – USDA RMA Name)

Heavy Rain – Excess Moisture/Precipitation/Rain

High Wind – Wind/Excess Wind

Winter Weather – Cold Winter/Cold Wet Weather

The NCEI table above summarizes adverse weather events that occurred in the County from 1950 to 2022. Only a few of the events actually resulted in state and federal disaster declarations. It is interesting to note that different data sources capture different events during the same time period, and often different information specific to the same events. While the HMPC recognizes these inconsistencies, this data provides value in depicting the County's overall hazard environment as it relates to severe weather.

Due to the size of the County and changes in elevation and climate, weather conditions can vary greatly across the County. The profiles that follow provide information from two weather stations in different parts of the County, the Hanford weather station in the northeastern county and the Avenal weather

station in the southwestern County. The temperature data from these two weather stations are displayed in Table 4-73.

Table 4-73 Hanford 1S and Avenal 9 Weather Station Summaries

METRIC	HANFORD 1S (043747)	AVENAL 9 SSE (040398)
Period of record	1899-2016	1955-1961
Winter Average Minimum Temperature*	36.2˚F	37.0˚F
Winter Mean Temperature *	46.7˚F	49.5˚F
Summer Average Maximum Temperature**	95.1˚F	100.4˚F
Summer Mean Temperature**	77.7˚F	81.2˚F
Average Annual Number of Days >90˚F	105	124
Average Annual Number of Days <32˚F	0.0	0.0
Mean Total Precipitation (in.)	8.38 in.	6.55 in.
Mean Snow Depth (in.)	0.0	0.3 in.

Source: WRCC

* Winter = Dec., Jan., and Feb.
** Summer = Jun., Jul., and Aug.

4.5.12 SEVERE WEATHER: DENSE FOG

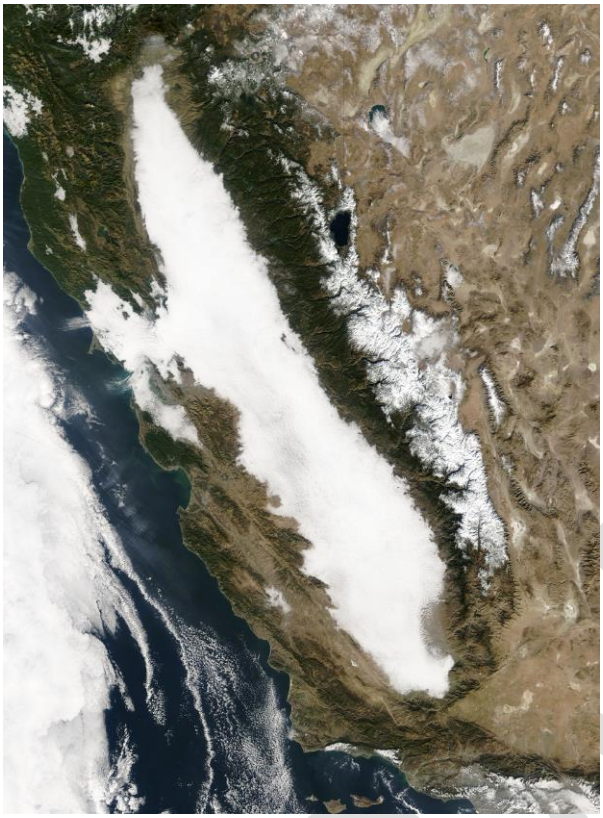
4.5.12.1 Hazard Description

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. For example, rain can cool and moisten the air near the surface until fog forms. A cloud-free, humid air mass at night can lead to fog formation, where land and water surfaces that have warmed up during the summer are still evaporating water into the atmosphere. This is called radiation fog. A warm moist air mass blowing over a cold surface also can cause fog to form, which is called advection fog.

The interior California valleys have a unique fog problem called the tule fog. The tule fog is a radiation fog, which condenses when there is high relative humidity, typically after heavy rain, calm winds, and rapid cooling during the night. The longer nights during the winter months create this rapid ground cooling, which results in a pronounced temperature inversion at a low altitude, creating a thick ground fog. Above the cold, foggy layer, the air is typically warm and dry. Once the fog has formed, turbulent air is necessary to break through the inversion. Daytime heating can also work to evaporate the fog in some areas. The tule fogs get their name from the tule reeds, which grew around the swamps and deltas of the great Tulare Lake that once covered the southern end of the San Joaquin Valley.

As noted in the County's 2012 MJHMP, the tule fog season in the County is typically December through February. Fog typically forms rapidly in the early morning hours. Tule fogs can last for days, sometimes weeks. Fog can have devastating effects on transportation corridors in the County. Nighttime driving in the fog is dangerous and multi-car pileups have resulted from drivers using excessive speed for the conditions and visibility. Tule fog has also been found to be connected to air pollution and exacerbates the naturally occurring fog. A study published in the Journal of Geophysical Research in 2019 found that air pollution is a key contributor to this seasonal fog, and due to the passage of the Clean Air Act in 1970, it has declined about 75 percent since 1980 (Gray et al., 2019). Figure 4-38 illustrates the extent of tule fog over the Central Valley.

Figure 4-38 Tule Fog over Central Valley



Source: NASA, Jeff Schmaltz, January 5, 2005

4.5.12.2 Geographic Area

Extensive – The San Joaquin Valley is hemmed in on three sides by mountain ranges, with resulting inversion layers trapping cooler air on the valley floor. This predisposes the County's planning area to severe episodes of fog in winter months, when barometric pressures are high, humidity is increased, and ambient temperatures are low. All areas of the County are vulnerable to dense fog events.

4.5.12.3 Past Occurrences

As shown in Table 4-72 above, the NCEI records 333 dense fog events that occurred in various zones that encompass Kings County, such as Southwestern San Joaquin Valley and Western San Joaquin Valley zones. Since dense fog events are recorded on a zonal basis, not all 333 dense fog events happened within Kings County. The followings are the descriptions of a few dense fog events that impacted Kings County, based on the NCEI database.

- **November 14 – 22, 2002:** Following the very substantial rain for the 3 days from the 7th through the 9th of the month, high pressure aloft built and resided over Interior Central California. Numerous vehicle accidents occurred due to the extremely poor visibilities on Central and Southern San Joaquin Valley roadways. There were 4 indirect traffic fatalities due to the dense fog with at least 32 injuries. On the morning of the 22nd, there were several separate accidents due to locally dense fog in North Kings and West Tulare Counties that resulted in indirect injuries. According to NCEI database, this dense fog event resulted in a total of $150,000 property losses.
- **January 11 – 17, 2003:** Widespread and dense morning fog continued throughout the Central and Southern San Joaquin Valley from the morning of the 11th through the morning of the 17th of January. Accidents were reported on the 7th, and 14th in Kings County due to very poor visibilities in dense fog. According to NCEI database, this dense fog event resulted in a total of $150,000 property losses.
- **January 31, 2018:** Areas of dense fog formed once again overnight in the San Joaquin Valley. The fog became dense in several locations during the early morning hours and resulted in several auto

accidents along State Route 198 near Hanford. Visibility of less than a quarter mile was reported in Hanford. California Highway Patrol was pacing traffic along State Highway 198 between the Kings/Tulare County line and Armona as several fog-related minor auto accidents were reported. Several school districts had delayed openings due to dense fog. According to NCEI database, this dense fog event resulted in a total of $100,000 property losses.

- **January 6, 2021**: High pressure built over central California on January 5. With mainly clear skies and light winds, areas of dense fog formed in the San Joaquin Valley during the early morning hours of January 6. Hanford reported visibility of below a quarter mile. A four-vehicle accident took place on State Route 198 at 08:09 am PST involving a big rig, a pickup truck and two cars. There was a minor injury from the collision. Visibility at both Hanford and Visalia (Tulare County) was at an eighth of a mile at the time of the accident. According to NCEI database, this dense fog event resulted in a total of $150,000 property losses.

4.5.12.4 Likelihood of Future Occurrence

Highly Likely – According to Table 4-72, 333 dense fogs impacted Kings County during a 27-year period, which equates to 12.3 events per year. Therefore, based on NCEI data and the fact that the tule fog prevails in the San Joaquin Valley, it is highly likely that fog events will continue to occur regularly in Kings County.

On the other hand, California's winter tule fog has declined due to climate change and the reduction in air pollution. Refer to the Climate Change Considerations subsection below for more details on climate change's impact on the Likelihood of Future Occurrence of fog events.

4.5.12.5 Climate Change Considerations

As mentioned in the previous section, California's winter tule fog has declined dramatically over the past three decades, which raised a red flag for the state's multibillion-dollar agricultural industry, according to researchers at UC Berkeley. Crops such as almonds, pistachios, cherries, apricots and peaches go through a necessary winter dormant period brought on and maintained by colder temperatures. Tule fog that descends upon the State's Central Valley between late fall and early spring, helps contribute to this winter chill.

When there is an insufficient rest period (or lack of dormant time for crops) it impairs the ability of farmers to achieve high-quality fruit yields. The UC Berkeley findings have implications for the entire country since many of these California crops account for 95 percent of U.S. production. The researchers also paired NASA and NOAA satellite records with data from a network of University of California weather stations, covering 32 consecutive winters. Based on the data, there was a great deal of variability from year to year, but on average, the researchers found a 46 percent drop in the number of fog days between the first of November and the end of February. Climate forecasts suggest that the accumulation of winter chill will continue to decrease in the Central Valley. Tule fog was also less prevalent in recent years in part due to the multi-year drought (Yang, 2015).

While the short-term fog variability is dominantly driven by climate fluctuations, the longer-term temporal and spatial changes in fog have been driven by changes in air pollution. In addition to the decrease in the accumulation of winter chill, the Clean Air Act has also greatly reduced the air pollution that would form fogs (Gray et al., 2019).

4.5.12.6 Magnitude and Severity

Critical – Tule fog forms on clear nights when the ground is moist, and the wind is near calm and can be widespread throughout the San Joaquin Valley. On nights like this, the ground cools rapidly. In turn, the moist air above it cools and causes water vapor to condense. Once it has formed, the air must be heated enough to either evaporate the fog or lift it above the surface so that visibilities improve. Common areas for tule fog to form include foothills and valleys. Visibility in tule fog is usually less than an eighth of a mile (about 600 ft or 200 m) but can be much lower. Visibility can vary rapidly; in only a few feet, visibility can go from 10 feet (3.0 m) to near zero.

Fog contributes to transportation accidents and is a significant life safety hazard. These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures.

In 2018, the NWS in Hanford, California developed the Experimental Fog Severity Index in conjunction with the NWS issues fog advisories to help give motorists warning of fog events. A dense fog advisory is

issued when widespread dense fog develops, and visibilities drop to one-quarter of a mile or less. The Experimental Fog Severity Index has five levels with level 5 being the most severe. Figure 4-39 describes each level of the Index.

Figure 4-39 National Weather Service Experimental Fog Severity Index

Source: NWS

4.5.12.7 Vulnerability Assessment

Property

Based on historic information, the primary effect of fog has not resulted in significant damages to property, and the losses are typically covered by insurance. Dense fog does result in substantial vehicle damage during transportation-related accidents.

People

Reduced visibility is the greatest risk to people when heavy fog is prevalent. Particularly when fog is dense, it can be hazardous to drivers, mariners and aviators and contributes to numerous accidents each year. To reduce injury and harm, people should avoid driving when dense fog is prevalent, if possible. If driving is pertinent, emergency services advise driving with lights on low beam, watching for California Highway Patrol (CHP) pace vehicles to guide through the fog, avoiding stopping on highways, and avoiding crossing traffic lanes.

Critical Facilities and Lifelines

Fog can have devastating effects on transportation corridors in the County. Multi-car pileups have resulted from drivers using excessive speed for the conditions and visibility. These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment

if a hazardous or nuclear waste shipment were involved. Other disruptions from tule or dense fog include delayed emergency response vehicles and school closures.

Economy

Economic impacts due to dense fog are generally related to road closures leading to a decrease in travel to businesses. Other economic impacts related to property damages are vehicles from accidents. As shown in Table 4-72 above there is a recorded $3,911,000 of property damages as a result of dense fog all of which are from traffic accidents in the Central Valley and San Joaquin Valley. Based on that amount, this region including Kings County has an estimated average annual loss expectancy of $144,852 due to dense fog events.

Cultural, Historic and Natural Resources

As referred to in the Climate Change Considerations section, California's winter tule fog has declined dramatically over the past three decades, raising a red flag for the State's multibillion-dollar agricultural industry. Crops such as almonds, pistachios, cherries, apricots and peaches go through a necessary winter dormant period brought on and maintained by colder temperatures and tule fog that descends upon the State's Central Valley between late fall and early spring.

Development Trends

Population and commercial growth both within and outside the County will increase the potential for complications with traffic accidents and commerce interruptions associated with dense fog.

4.5.12.8 Risk Summary

- Tule fog season begins in late fall and lasts from winter (November – March).
- Between 1950 and 2022 333 dense fog events impacted areas including Kings County during a 27-year period, which equates to 12.3 events per year.
- Dense fog events in the Central Valley and San Joaquin Valley have resulted in $3,911,000 in property damages, largely due to traffic accidents.
- California's winter tule fog has declined dramatically and is predicted to be less prevalent due to prolonged drought events and the reduction in air pollution.
- Fog can have devastating effects on transportation corridors and result in casualties; fog can prevent responders to arrive on the scene timely.
- **Related Hazards** – Hazardous Materials Incidents, Transportation Accidents

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Critical	Medium	Yes
City of Avenal	Extensive	Highly Likely	Moderate	Low	No
City of Corcoran	Extensive	Highly Likely	Moderate	Low	No
City of Hanford	Extensive	Highly Likely	Critical	Medium	Yes
City of Lemoore	Extensive	Highly Likely	Moderate	Low	No

4.5.13 SEVERE WEATHER: HEAVY RAIN, THUNDERSTORMS, HAIL, AND LIGHTNING

4.5.13.1 Hazard Description

Heavy Rain

A majority of adverse weather experienced in the County takes place in the winter months as heavy rain and thunderstorm events that are sometimes accompanied by high winds or dense fog. The County's weather is influenced by the Pacific Ocean and routine climate patterns such as El Niño, the warm phase of the El Niño-Southern Oscillation, a pattern found in the tropical Pacific when there are fluctuations in temperatures between the ocean and atmosphere. During El Niño, the surface winds across the entire tropical Pacific are weaker than normal and the ocean surface is at above-average temperatures in the central and eastern tropical Pacific Ocean (NOAA 2016). El Niño typically develops over North America during the winter season, causing the severe winter storms the County often experiences. This climate

pattern occurs every few years and brings with it above-average rain and snow across the southern region of the United States, especially in California.

Atmospheric rivers (ARs), another climate pattern that leads to adverse weather in the County, are responsible for up to 50 percent of California's precipitation annually and 65 percent seasonally (Arcuni 2019). An AR is a long, narrow region of the atmosphere, like a river in the sky, that transports most of the water vapor outside of the tropics. ARs can be 300 miles wide, a mile deep and more than 1,000 miles long, and carry an amount of water vapor roughly the same as the average flow of water at the mouth of the Mississippi River (NOAA 2015). Warm water storms over the Pacific Ocean lead to evaporation and create a high concentration of moisture in the air while prevailing winds create the distinctive river shape, which is often compared "to a fire hose pointed at California" (Arcuni 2019). When an AR reaches land, it releases water vapor in the form of rain or snow. ARs play an important role in the global water cycle and are closely tied to both water supply and flooding risk.

Research suggests that ARs contributed to the collapse of both Oroville Dam spillways in February 2017 (NASA Global Hydrology Resource Center), as well as the winter flooding in 1861-1862, which completely inundated Sacramento and is considered the worst flood event in California's history (Ingram 2013). When an AR forms in the tropical regions of the Pacific near Hawaii it is known as a Pineapple Express. This type of AR can produce as much as five inches in one day (NOAA 2018). In 2018 two Pineapple Express ARs hit California, causing significant heavy precipitation events throughout the State.

California was facing a severe drought when it was hit by 31 AR storms between October 2022 and March 2023. Although the number of storms was not unprecedented, their location, intensity, and duration had a significant impact on California's climate. As a result of these AR storms, the state experienced record-breaking snowfall and deadly flooding. (Toohey, 2023).

Thunderstorms

Thunderstorms are formed from a combination of moisture, rapidly rising warm air, and a force capable of lifting air, such as warm and cold fronts or a mountain. Thunderstorms may occur alone, in clusters, or in lines. As a result, several thunderstorms can affect one location in the course of a few hours. A thunderstorm can produce lightning, thunder, and rainfall and may also lead to the formation of tornadoes, hail, downbursts, and microbursts of wind. Electricity can be interrupted by lightning strikes. During the summer, climatic factors combine to promote the development of thunderstorms.

Hail

Hail forms on condensation nuclei such as dust or ice crystals, when supercooled water freezes on contact. In clouds containing large numbers of supercooled water droplets, these ice nuclei grow quickly at the expense of the liquid droplets. The hail grows increasingly larger. Once a hailstone becomes too heavy to be supported by the storm's updraft it falls out of the cloud. Hailstones are usually from the size of a pea to the size of a golf ball, and larger hailstones can cause property damage.

Lightning

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes with an average of about four strokes per flash. The length and duration of each lightning stroke vary but typically average about 30 microseconds.

4.5.13.2 Geographic Area

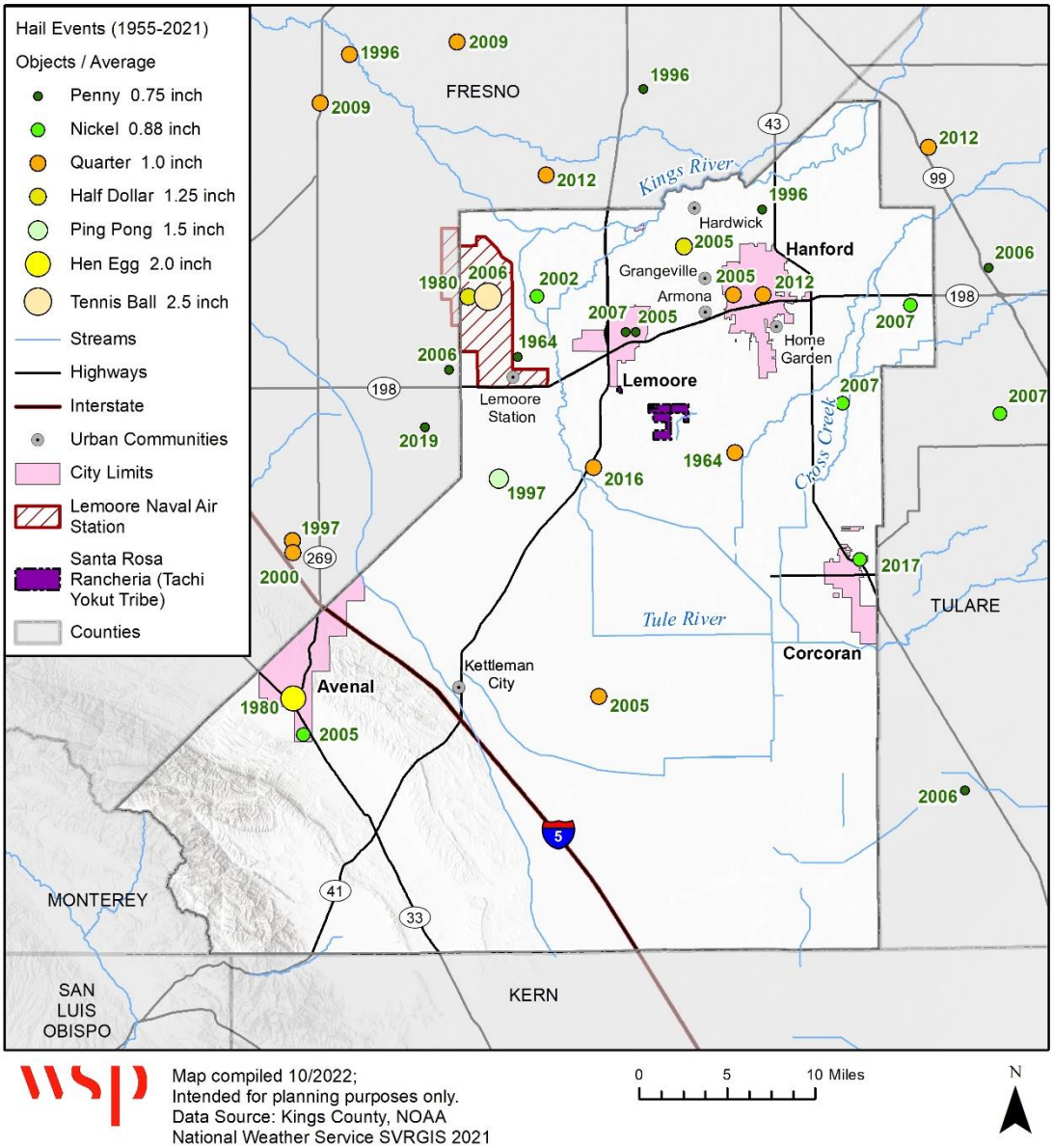
Extensive – Heavy rain is generally expansive in size. The entire County is susceptible to any of the effects of heavy rain and thunderstorms. Hail and lightning events are also common in the County, which can impact any area of the County during any month of the year.

4.5.13.3 Past Occurrences

Hail

Hail events are common in the County. Figure 4-40 shows that different areas within the planning area, SOI, and other areas in the vicinity have historically experienced hail events. Several hail events during which quarter and even golf ball-sized hailstones fell happened in recent years. Database for hail. Additionally, there have been three USDA disaster declarations that included hail since 2012 (S4657, S4170, and S3320).

Figure 4-40 Hail Events in Kings County, 1950 – 2021



As shown in Table 4-74, since 1950, there have been 25 reports of hail events that caused around $2,000 property loss and $4,060,000 crop loss. Table 4-74 shows the records collected from the NCEI Strom Events

Table 4-74 Hail Events in Kings County, 1950 – 2021

LOCATION	DATE	PROPERTY DAMAGE	CROP DAMAGE
KINGS CO.	1/22/1964	-	-
KINGS CO.	3/23/1964	-	-
KINGS CO.	3/6/1980	-	-
KINGS CO.	4/28/1980	-	-
KINGS CO.	3/12/1996	-	-
HANFORD	11/22/1996	$2,000	-
LEMOORE NAS	3/22/1997	-	$20,000

LOCATION	DATE	PROPERTY DAMAGE	CROP DAMAGE
STRATFORD	4/8/1999	-	$3,390,000
HANFORD	10/10/2000	-	$500,000
AVENAL	5/31/2002	-	-
(NLC)NAS LEMOORE	2/22/2005	-	-
KETTLEMAN CITY	4/28/2005	-	-
HANFORD	4/28/2005	-	-
LEMOORE	4/28/2005	-	-
HANFORD	4/28/2005	-	-
HANFORD	9/20/2005	-	-
AVENAL	3/10/2006	-	-
(NLC)NAS LEMOORE	2/22/2007	-	-
CORCORAN	9/22/2007	-	-
HANFORD MUNI ARPT	10/29/2007	-	-
CIMARRON	10/29/2007	-	-
CIMARRON	4/11/2012	-	$150,000
HANFORD	4/24/2016	-	-
STRATFORD	9/11/2017	-	-

Source: NCEI

Heavy Rain

Heavy rains and adverse storms occur in the County primarily during the late fall and winter but have a chance of occurring in every month of the year. According to information obtained from the WRCC, the majority of precipitation is produced by storms during January and other winter months. Precipitation during the summer months is in the form of rain showers and is rare.

The NCEI records show heavy rainstorms can cause widespread flooding, which can lead to extensive localized drainage issues. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can knock down very mature trees. Refer to the Flood section for more information related to flooding events in the County. There have been eight federal and state disaster declarations (1983, 1995 [two], 1997, 2005, 2017 [two], and 2023) for heavy rain, severe storm and flooding in Kings County. In addition, there have been three USDA disaster designations (2012 [two], and 2016) for excessive rainfall.

The NCEI Storm Events Database records 56 rain events in Kings County between 1950 and 2021, as shown in Table 4-75. No casualties are recorded for any of the events. As noted above there is a connection between heavy rain events and flooding and it is assumed that the property damages listed in the NCEI database are the results of flooding caused by heavy rain events. The heavy atmospheric rain conditions which hit California in late 2022 to early 2023 are not reflected in this dataset.

Table 4-75 Heavy Rain Events in Kings County, 1950 – 2021

EVENT TYPE	LOCATION	DATE	PROPERTY DAMAGE	CROP DAMAGE
Flash Flood	AVENAL	3/5/2001	-	-
	KETTLEMAN CITY	2/21/2005	-	-
	HANFORD MUNI ARPT	9/22/2007	-	-
	AVENAL	6/5/2015	-	-
	AVENAL	10/3/2018	-	-
	KETTLEMAN CITY	6/1/2019	-	-
Flood	HANFORD	3/12/1996	-	-
	LEMOORE	3/24/1998	-	-

EVENT TYPE	LOCATION	DATE	PROPERTY DAMAGE	CROP DAMAGE
	LEMOORE	3/28/1998	-	-
	LEMOORE	5/5/1998	-	-
	HANFORD	11/12/2001	-	-
	COUNTYWIDE	1/2/2006	$71,000	$1,000,000
	HANFORD MUNI ARPT	1/23/2008	$5,000	-
	HANFORD	10/13/2009	$2,000	-
	(NLC)NAS LEMOORE	1/19/2010	$25,000	-
	LEMOORE	12/29/2010	$75,000	-
	KETTLEMAN CITY	4/7/2011	$2,000	-
	HANFORD	6/5/2011	$1,000	-
	HANFORD MUNI ARPT	3/8/2013	-	-
	ROSSI	1/8/2017	$637,190	-
	AVENAL	1/18/2017	-	-
	HARDWICK	6/22/2017	-	-
	HANFORD	5/26/2019	-	-
	ARMONA	5/26/2019	-	-
	AVENAL	1/27/2021	-	-
Heavy Rain	HANFORD	2/1/1998	$20,000	$1,000,000
	HANFORD	5/1/1998	-	$73,600,000
	HANFORD	6/8/2000	-	$100,000
	HANFORD MUNI ARPT	5/31/2002	-	$ -
	AVENAL	3/15/2003	-	$ -
	HANFORD	4/1/2003	-	$8,900,000
	HANFORD	4/21/2003	$1,000	-
	COUNTYWIDE	5/1/2003	-	$5,500,000
	LEMOORE	12/14/2003	-	-
	COUNTYWIDE	12/28/2004	-	-
	COUNTYWIDE	1/1/2005	-	-
	COUNTYWIDE	1/7/2005	-	-
	COUNTYWIDE	1/24/2005	-	-
	AVENAL	2/18/2005	-	-
	LEMOORE	4/28/2005	-	-
	COUNTYWIDE	5/5/2005	-	-
	COUNTYWIDE	5/8/2005	-	$671,000
	KETTLEMAN CITY	9/20/2005	$10,000	-
	HANFORD MUNI ARPT	1/1/2006	-	-
	COUNTYWIDE	3/2/2006	-	-
	LEMOORE	3/28/2006	-	-
	COUNTYWIDE	4/2/2006	-	$2,200,000
	AVENAL	5/21/2006	-	-
	HANFORD	10/5/2011	$100,000	-
	CIMARRON	1/30/2014	-	-
	SHIRLEY	3/26/2014	-	-

EVENT TYPE	LOCATION	DATE	PROPERTY DAMAGE	CROP DAMAGE
	LEMOORE	11/1/2014	-	-
	HANFORD	12/11/2014	-	-
	CIMARRON	5/5/2016	-	-
	CIMARRON	5/5/2016	-	-
	CIMARRON	1/21/2017	-	-

Source: NCEI

Thunderstorms

County-level thunderstorm data is not available, however, as noted above, thunderstorm events are not uncommon in the County, especially during summer months.

Lightning

As noted above, lightning events are not uncommon in the County. As shown in Table 4-76, there have been 10 NCEI recorded lightning events in Kings County since 1950, which caused $451,000 in damage.

Table 4-76 Lightning Events in Kings County, 1950 – 2021

LOCATION	DATE	CROP DAMAGE	PROPERTY DAMAGE
AVENAL	5/31/2002	$5,000	-
HANFORD MUNI ARPT	5/31/2002	$5,000	-
HANFORD	5/31/2002	-	-
HANFORD	5/31/2002	$5,000	-
CORCORAN	7/30/2003	-	-
LEMOORE	4/28/2005	-	-
HANFORD MUNICIPAL AIRPORT	4/28/2005	$25,000	$400,000
COUNTYWIDE	10/24/2005	-	-
AVENAL	8/31/2007	$1,000	-
SHORT ACRES SUBDIVISION	9/11/2017	$10,000	-

Source: NCEI

4.5.13.4 Likelihood of Future Occurrence

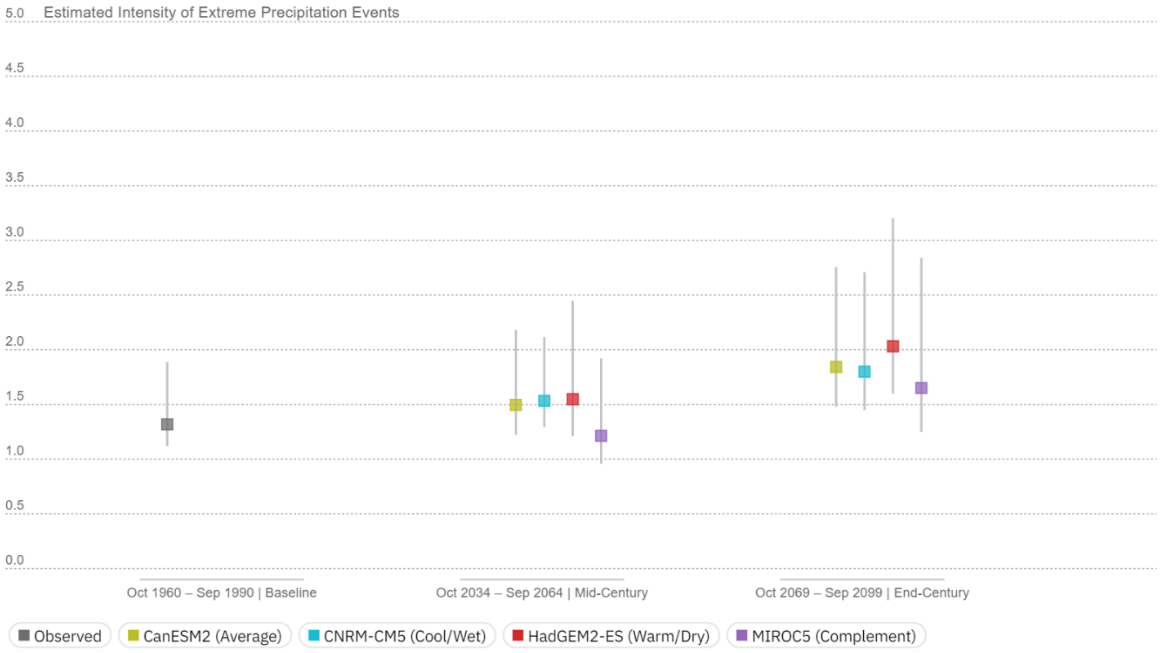
Highly Likely – Based on the NCEI data, there have been a combined 90 heavy rain, thunderstorms, hail, and lightning events in Kings County since 1950. Statistically, there is a 100% percent chance that a major hail, heavy rain, or lightning event will happen in any given year. The actual risk to the County is dependent on the nature and location of any given hazard event.

4.5.13.5 Climate Change Considerations

As average temperatures increase over time, warming in the atmosphere can trigger more frequent extreme weather events. Pacific Northwest National Laboratory researchers have found that ARs will reach the West Coast more frequently (Hagos et al., 2016). Currently, the West receives rain or snow from these ARs between 25 and 40 days each year. By the end of this century, days on which the ARs reach the coast could increase by a third, or between 35 and 55 days a year (Hagos et al., 2016).

Figure 4-41 shows the estimated intensity (return level) of extreme precipitation events which are exceeded on average once every 20 years and how it changes in a warming climate over historical, mid-century and late-century time periods, based on the Cal-Adapt tool. Under both the RCP 4.5 and RCP 8.5 scenarios, precipitation levels will increase throughout the century. Using the RCP 8.5 scenario and the CanESM2 model, referred to by Cal-Adapt as an "average" simulation, precipitation will increase from 1.32 inches to 1.85 inches by 2099 (as shown by the green squares in Figure 4-41). Using the same scenario and the CNRM-CM5 "cooler/wetter" model, precipitation will increase to 2.3 inches by 2099 (as shown by the blue squares in Figure 4-41).

Figure 4-41 Predicted Future Changes in Intensity of Extreme Precipitation Events Under Low-emissions and High-emissions Scenarios for Kings County



Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Climate Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado Boulder), LOCA Derived Products (Geospatial Innovation Facility).

For this graph from Cal-Adapt, an extreme precipitation event is defined as a day during a water year (Oct–Sep) with 1-day rainfall totals above the locally-defined extreme threshold of 0.33 inches.

Figure 4-42 shows the historic (1961-1991) annual 30-year average maximum precipitation for the County. Figure 4-43 shows the projected mid-century (2035-2064) annual 20-year average maximum precipitation for the County under the RCP 8.5 scenario.

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Figure 4-42 Kings County 30-Year Historical Maximum Annual Average Precipitation

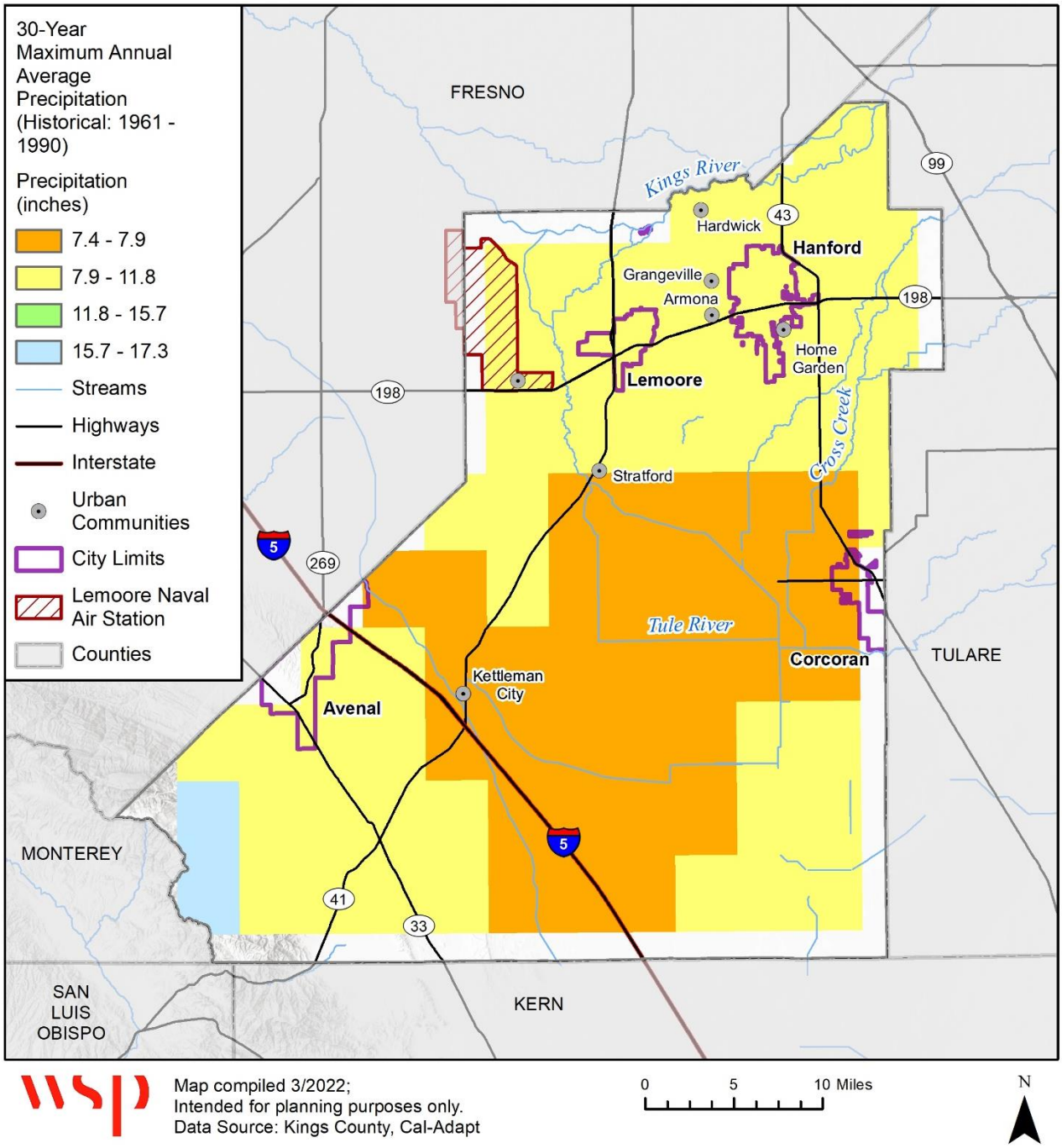
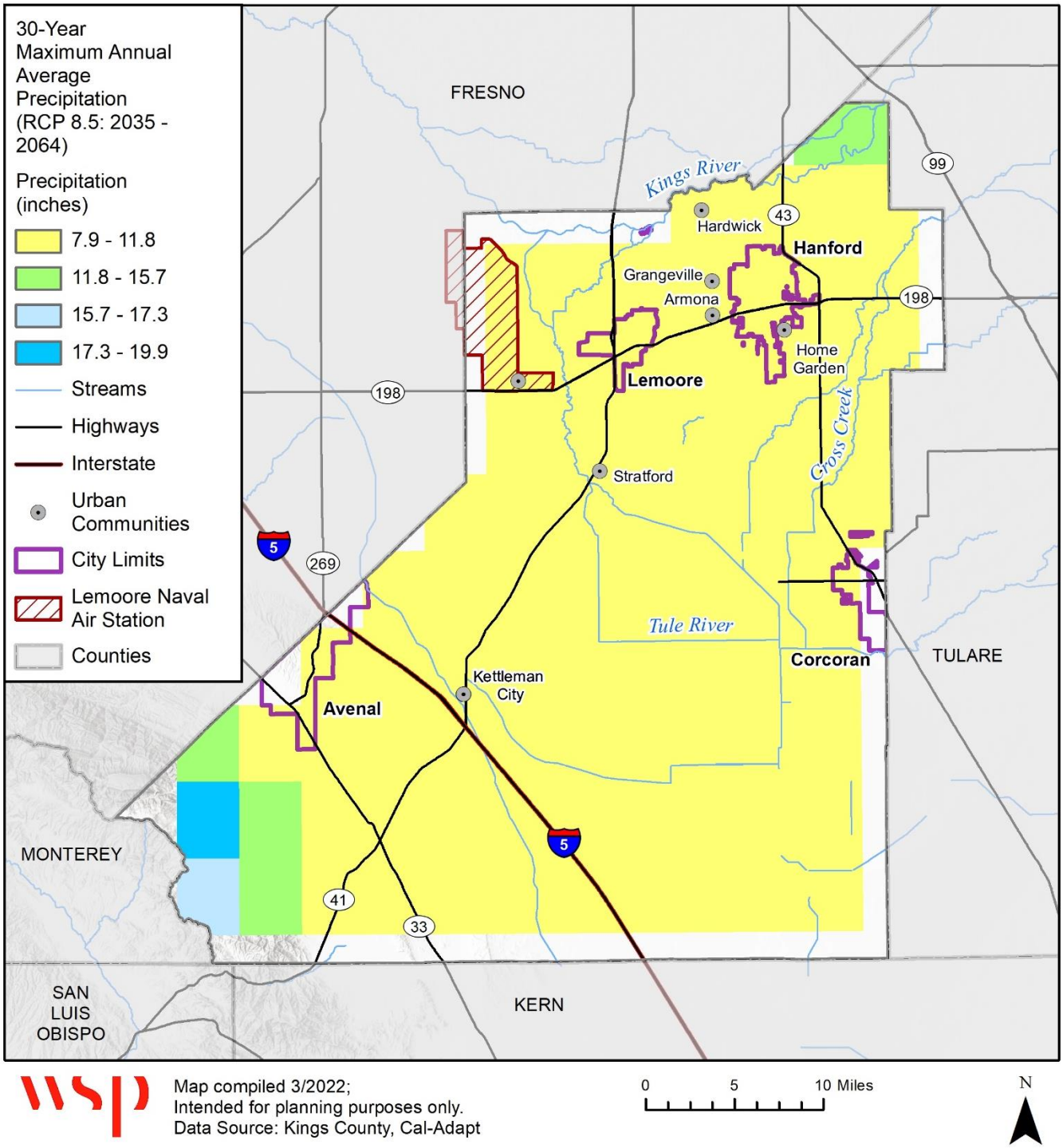


Figure 4-43 Kings County 30-Year Maximum Annual Average Precipitation



4.5.13.6 Magnitude and Severity

Critical – The extent of heavy rain, thunderstorms, hail, and lightning weather events can affect up to 50 percent of property in the County. These weather events can also shutdown of facilities and result in severe injuries.

Hail

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-77 indicates the hailstone measurements utilized by the NWS.

Table 4-77 Hail Measurements

AVERAGE DIAMETER	CORRESPONDING HOUSEHOLD OBJECT
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: NWS

There is no clear distinction between storms that do and do not produce hailstones. According to NOAA's National Severe Storms Laboratory, nearly all severe thunderstorms probably produce hail, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually the largest hailstones. In the life cycle of the multicell thunderstorm, the mature stage is relatively short so there is not much time for the growth of the hailstone. Supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general, hailstones two inches (5 cm) or larger in diameter are associated with supercells (a little larger than golf ball size which the NWS considers to be 1.75 inches.). Non-supercell storms are capable of producing golf ball-size hail.

In all cases, the hail falls when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft the larger the hailstone can grow. When viewed from the air, it is evident that hail falls in paths known as hail swaths. Hail swaths can range in size from a few acres to areas 10 miles wide and 100 miles long. In some instances, piles of hail have been so deep that snowplows were required to remove them, and occasional hail drifts (several feet of dime to nickle-sized hail) have been reported. Severe hailstorms can be destructive to property. Vehicles, roofs of buildings, and landscaping are the most commonly damaged by hail. Hail has also been known to cause injury to humans and occasionally has been fatal.

Heavy Rain

The heavy precipitation events that County and all of California experience are often the results of an AR. ARs are categorized by a unit of measurement known as the Integrated Water Vapor Transport (IVT), which takes into account the amount of water vapor in the system and the wind that moves it around. For a storm to be classified as an AR it has to reach an IVT threshold of 250 units; 1,000 IVT or more is considered to be "extreme" (Arcuni 2019). In 2019 a system for categorizing the strength and impacts of ARs was developed by the Center for Western Weather and Water Extremes (CW3E), out of the Scripps Institution of Oceanography at UC San Diego.

The newly developed scale ranks ARs into five categories from weak to exceptional. Unlike the Fujita Scale for tornadoes which focuses on potential damages, the AR scale accounts for both storms that may be hazardous and storms that can provide benefits to the local water supply. A category one AR is primarily beneficial, generally lasting only 24 hours and producing modest rainfall, while a category five

AR is considered "exceptional" and primarily hazardous, lasting for several days, and associated with heavy rainfall and runoff that may cause significant damages. Table 4-78 below describes the scale further. The CW3E developed the scale as a tool for officials with an operational need to assess flooding potential in their jurisdictions before the storms make landfall.

Table 4-78 Atmospheric River Categories

CATEGORY	DESCRIPTION	EXAMPLE
AR Cat. 1	Weak – Primarily beneficial	Feb. 2, 2017, AR hit California, lasted 24 hours at the coast, and produced modest rainfall.
AR Cat. 2	Moderate – Mostly beneficial, but also somewhat hazardous	Nov. 19-20, 2016, AR hit Northern California, lasted 42 hours at the coast, and produced several inches of rain that helped replenish low reservoirs after a drought.
AR Cat. 3	Strong balance of beneficial and hazardous	Oct. 14-15, 2016, AR lasted 36 hours at the coast, produced 5-10 inches of rain that helped refill reservoirs after a drought, but also caused some rivers to rise to just below flood stage.
AR Cat. 4	Extreme – Mostly hazardous, but also beneficial	Jan. 8-9, 2017, AR that persisted for 36 hours produced up to 14 inches of rain in the Sierra Nevada and caused at least a dozen rivers to reach flood stage.
AR Cat. 5	Exceptional – Primarily hazardous	Dec. 29, 1996, to Jan 2, 1997, AR lasted over 100 hours at the Central California coast. The associated heavy precipitation and runoff caused more than $1 billion in damages.

Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography at UC San Diego. Scale was developed by F. Martin Ralph Director of CW3E in collaboration with Jonathan Rutz of NWS.

In both February 2018 and 2019, the West Coast experienced six ARs. However, as shown in Figure 4-44, California experienced vastly different precipitation totals due to the location of the AR's landfall, as well as each AR's IVT. The ARs in February 2019 were all considered to be moderate to extreme, concentrated in California, and resulted in heavy precipitation; whereas the ARs in February 2018 had a negligible effect on California. Between October 2022 and March 2023, California was faced with an onslaught of additional ARs. Of the 31 ARs, one was categorized as extreme and six were strong. Almost half were moderate; 11 were weak (Toohey 2023). The strength of these ARs, as well as their locations, are shown in Figure 4-44.

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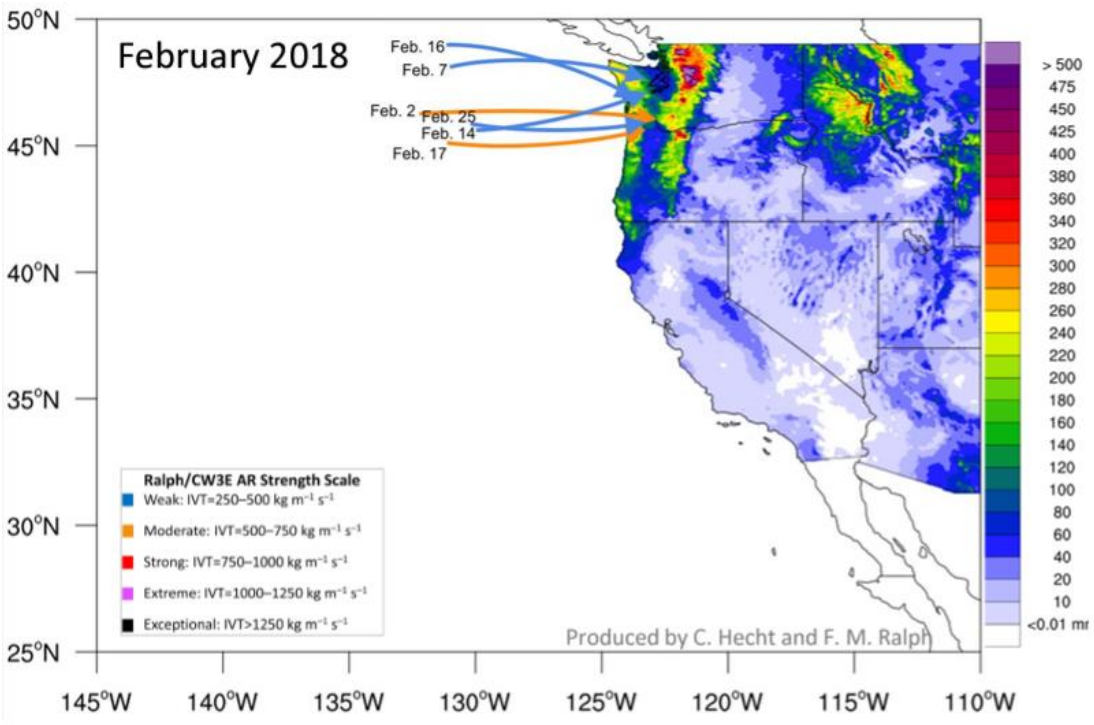
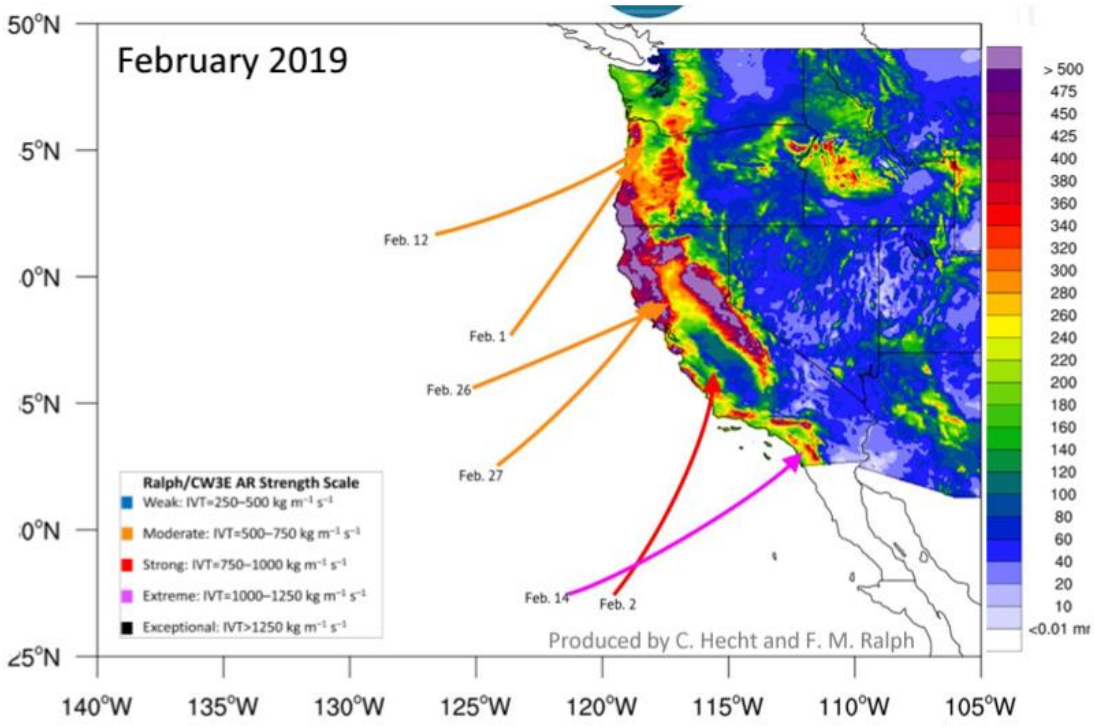
Figure 4-44 Atmospheric River Strength and Land Distribution, February 2018 vs. February 2019





Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography at UC San Diego

Figure 4-45 Atmospheric Rivers Strength, October 2022 through March 2023

Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, via the LA Times

Thunderstorms

Although thunderstorm events by themselves may not create significant damage or danger to the County, hail, lightning and high winds events that happen together with thunderstorm events can all have damaging effects.

Lightning

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. The County is at risk to experience lightning in any of these categories. The LAL is reproduced in Table 4-79.

Table 4-79 Lightning Activity Level Scale

CATEGORY	DESCRIPTION
LAL 1	No thunderstorms.
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period.

CATEGORY	DESCRIPTION
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

Source: NWS

4.5.13.7 Vulnerability Assessment

People

Exposure is the greatest danger to people from heavy rain events. People can be caught in rising waters and may need to be rescued. Populations at higher elevations with large stands of trees or power lines may be more susceptible to power outages, while populations in low-lying areas are at risk for possible flooding.

Vulnerable populations include the elderly, low-income, linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life-threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during hail, heavy rain, lightning, and thunderstorm events, and could suffer from the secondary effects of these hazards. Hikers and climbers in the area may also be more vulnerable to severe weather events.

Property

The County experiences a rainy season in the winter months through early spring. These winter storms can include significant precipitation. The primary effect of these storms has not resulted in significant injury or damages to people and property, or the losses are typically covered by insurance. It is the secondary hazards caused by weather that have had the greatest impact on the County. Damage and disaster declarations related to adverse weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the County. Utility outages, downing of trees, debris blocking streets and property damage can be a direct result of these storm events. Properties in poor condition may risk the most damage. Given the nature of these types of storms, the entire County is potentially at risk.

Critical Facilities and Lifelines

Transportation infrastructure can be affected by hail, heavy rain, and lightning events, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads in the western portion of the County. Of particular concern are roads providing access to isolated areas and the elderly, especially given that limited local roads and highways are available to move people and supplies throughout the region. Prolonged obstruction of major routes due to landslides, debris, or floodwaters can disrupt the shipment of goods and other commerce.

Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection would leave some populations isolated because residents would be unable to call for assistance. Lightning events can have similarly destructive effects on power and information systems. Failure of these systems would have cascading effects throughout the County and could disrupt critical facility functions. Downed power lines can cause blackouts, leaving large areas isolated.

Economy

The economic impact of heavy rain and hail events is typically short-term. Generally, long-term economic impacts center more around hazards that cascade from a heavy rain event such as flooding or fires. In general, all severe weather poses a risk to the agriculture economy in the County.

Table 4-80 below describes the crop losses related to heavy rain, thunder, hail, and lightning events. Kings County experiences an average of $1.6 million in annualized loss due to crop damages from heavy rain, thunder, hail, and lightning events.

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Table 4-80 Crop Loss due to Heavy Rain, Hail, Lightning in Kings County, 2007 – 2021

CAUSE	YEAR	SUM OF DETERMINED ACRES	SUM OF INDEMNITY AMOUNT
Excess Moisture/ Precipitation/ Rain	2007	70.4	$24,928
	2008	66.0	$10,014
	2009	329.0	$224,874
	2010	659.4	$283,860
	2011	5,629.3	$1,712,635
	2012	219.2	$41,044
	2013	205.9	$522,194
	2014	1,560.1	$3,501,416
	2015	523.6	$560,091
	2016	3,065.5	$2,085,683
	2017	2,354.0	$1,918,062
	2018	214.7	$328,600
	2019	3,999.7	$4,126,183
	2020	1,033.3	$1,686,385
	2021	318.6	$612,108
Hail	2007	35.0	$26,581
	2009	9.5	$8,404
	2010	2,237.3	$2,762,216
	2011	170.4	$256,672
	2012	27.6	$9,793
	2014	46.7	$20,870
	2015	11.0	$6,829
	2016	274.7	$256,324
	2017	114.2	$96,615
	2018	1,057.4	$1,001,332
	2019	200.4	$123,523
	2020	100.4	$270,721
	2021	12.0	$11,603
Other (Snow/ Lightning/ Etc.)	2015	109.1	$86,250
	2016	150.2	$191,290
	2020	437.5	$74,999
Grand Total		**25,242.1**	**$22,842,099**

Source: USDA RMA

Cultural, Historic and Natural Resources

As a natural process, the impacts of most heavy rain events by themselves are part of the overall natural cycle and do not cause long-term consequential damage. However, natural habitats such as streams and trees risk major damage. Prolonged rains can saturate soils and lead to slope failure and potentially landslide events. Flooding events can produce river channel migration or damage riparian habitat.

Development Trends

New critical facilities, such as communication towers should be built to withstand heavy rain damage. Development Trends projects should consider adverse weather hazards at the planning, engineering and architectural design stages to reduce vulnerability. Stormwater master planning and site review should

account for buildings to withstand heavy rain events considered for all new development. Thus, development trends in the County are not expected to increase overall vulnerability to the hazard but all development will be affected by adverse weather and storm events.

Continued development implies continued population growth, which raises the number of individuals potentially exposed to severe weather. Individual citizens, families, and businesses of the County need to be prepared to address severe weather events when they occur. It is recommended that citizens, families, and businesses have an emergency preparedness plan, such as storing extra supplies of food and water, as well as other related supplies such as flashlights, batteries, firewood and a battery-operated radio within their home or business. In addition, public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of severe weather.

4.5.13.8 Risk Summary

- During the 71-year period from 1950 to 2021, 24 hail events, 56 heavy rain events and 10 lightning events occurred in Kings County.
- The County experiences an estimated $1.6 million in annualized crop loss due to hail, heavy rain, and lightning events.
- As average annual precipitation is expected to increase, these events are likely to increase as well.
- Climate change is expected to increase atmospheric rivers in California, increasing heavy rain events.

Related Hazards – Flooding, Landslide

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Critical	Medium	Yes
City of Avenal	Extensive	Highly Likely	Critical	Medium	Yes
City of Corcoran	Extensive	Highly Likely	Critical	Medium	Yes
City of Hanford	Extensive	Highly Likely	Critical	Medium	Yes
City of Lemoore	Extensive	Highly Likely	Critical	Medium	Yes

4.5.14 SEVERE WEATHER: HIGH WIND/TORNADO

4.5.14.1 Hazard Description

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph that represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. These winds can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

For this hazard, three different classifications of windstorms were analyzed: high winds, strong winds, and thunderstorm winds. The most significant distinction between high winds and thunderstorm winds in the NCEI dataset is that high winds are most frequently reported in the winter months (December, January, and February) and are recorded on a zonal scale, whereas thunderstorm winds are most reported in the summer months (June, July, and August) and recorded on a local county or city scale. Strong winds are another type of windstorm, which originates from thunderstorms and are any wind exceeding 58 mph. Despite these differences, the wind speeds and associated impacts from these winds are comparable.

Tornadoes are another severe weather hazard that can affect the Kings County Planning Area. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential that fuels 300-mile-wide hurricanes across a path only 300-yards wide or less.

4.5.14.2 Geographic Area

Extensive – Wind and tornadoes have the potential to happen anywhere in the County. The resulting damage from wind and tornado events may be most severe in the downtown areas of incorporated communities where there are more large trees, infrastructure, and higher-density development.

The National Renewable Energy Laboratory (NREL) collects data on wind resources in the U.S. to help determine the location of new wind energy sites. Figure 4-46 from the NREL Wind Prospector Web viewer shows the average annual wind speed in Kings County at the height of 100 meters. The majority portions of the County have average wind speeds between 3.5 meters/second (7.8 miles/hour) and 5 meters/second (11.2 miles/hour). The southwestern and northwestern portions of the County, however, have relatively high average wind speeds – between 5 meters/second (11.2 miles/hour) and 6 meters/second (13.4 miles/hour).

As noted in the County's 2012 MJHMP, based on National Climate Data Center (NCC) data, tornado behavior, tornadoes are more likely to hit the flatter, lower elevations of Kings County and are more common in the eastern parts of the County around Hanford, Lemoore, and Corcoran.

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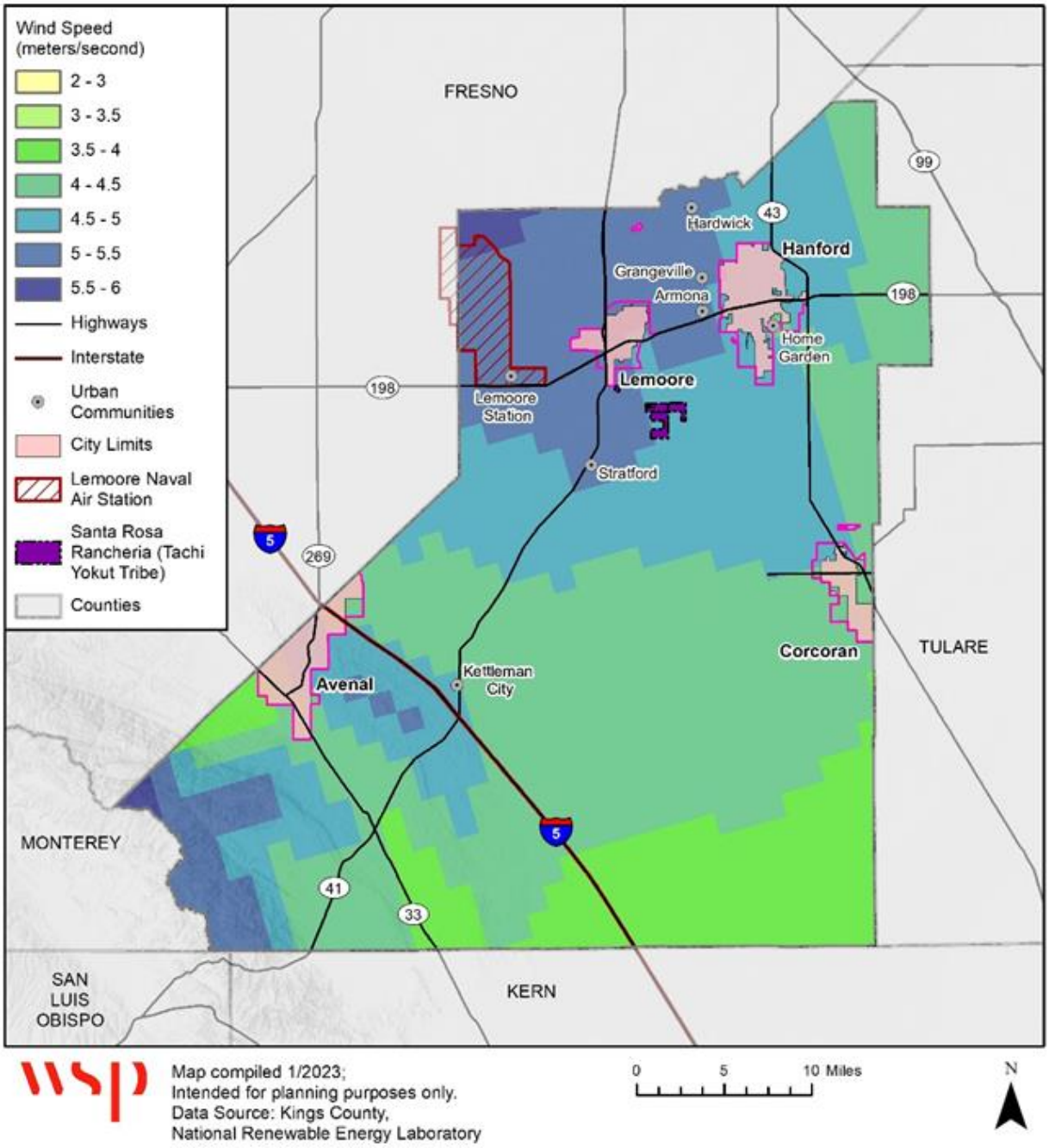
Figure 4-46 Kings County Average Annual Wind Speed at 100 meters



Source: NREL Wind Prospector

4.5.14.3 Past Occurrences

During the rainy season, the Kings Planning Area is prone to relatively strong thunderstorms, sometimes accompanied by high winds and tornadoes. While tornadoes do occur occasionally, most often they are of F0/EF0 intensity. The NCEI Storm Events Database does not record any tornado events that had a magnitude higher than F2 or EF1 in the Planning Area in the past. Table 4-81 shows the details of the most significant historic events recorded in NCEI, followed by additional descriptions of these events. In addition to the events listed in the NCEI database, there were three USDA disaster designations declared for the County that were related to high wind (and rain) in 2016 and 2017 (twice in 2017).

Table 4-81 Past High Wind and Tornado Events in Kings County, 1950-2021

HAZARD TYPE	DATE	LOCATION	MAGNITUDE	PROPERTY DAMAGES ($)	CROP DAMAGES ($)	DEATHS	INJURIES
Tornado	4/5/1980	Countywide	F2	$250,000	$0	0	1
Tornado	11/12/1996	Lemoore	F1	$250,000	$0	0	0
High Wind	2/3/2000	Countywide	-	$100,000	$0	1	4
High Wind	3/4/2001	Countywide	-	$250,000	$0	0	0
High Wind	10/13/2009	Countywide	-	$250,000	$0	0	0

Source: NCEI Storm Events Database

April 5, 1980: This F2 tornado event results in $250,000 of property damage and 1 injury.

November 22, 1996: The tornado event caused substantial damage to the Lemoore Naval Air Station administrative section but no injuries occurred. Damage included roof removal of the base recycling center, wind damage to roofs on several administrative structures, powerlines and poles, and fixed structures (static display aircraft). This F1 tornado event results in $250,000 of property damage.

February 3, 2000: Infrequent gusty wind occurred in Central California. Tehachapi and Frazier Park in the Kern County Mountains reported gusts of 45 knots. Bakersfield (Kern County) had gusts to 36 knots (41 miles/hour) and Lemoore had sustained wind at 21 knots (24 miles/hour) on the South San Joaquin Valley floor. Over 4,500 power company customers in the South San Joaquin Valley lost power due to downed, along with several weather-related vehicle accidents. This event resulted in 1 death, 4 injuries and $100,000 of property damage.

March 4, 2001: Strong southeast wind flow ripped through Interior California with various degrees of damage reported on the San Joaquin Valley floor to small structures and agriculture in addition to the damage in the Kern Mountains from strong wind around Frazier Park, Lebec, and Fort Tejon. Local utility companies reported more than 53 power poles downed and a dozen 70,000-volt power lines on the Southern San Joaquin Valley floor and in the Kern Mountains causing a power loss to at least 15,000 customers. Wind speed of 83 miles/hour was reported 5 miles east of Tehachapi (Kern County) with 55 miles/hour wind in Tehachapi Valley itself. This event resulted in $250,000 property damage.

October 13, 2009: This high wind event came with a heavy precipitation event through the Southern San Joaquin Valley. High wind gusts toppled trees, downed utility lines, and created areas of blowing dust with near-zero visibility. Gusts to 60 mph developed at the south end of the San Joaquin Valley near the base of the Grapevine (Kern County). This event resulted in $250,000 property damage.

Figure 4-47 and Figure 4-48 show the locations of the past wind and tornado events in Kings County based on data from NOAA's NWS Storm Prediction Center.

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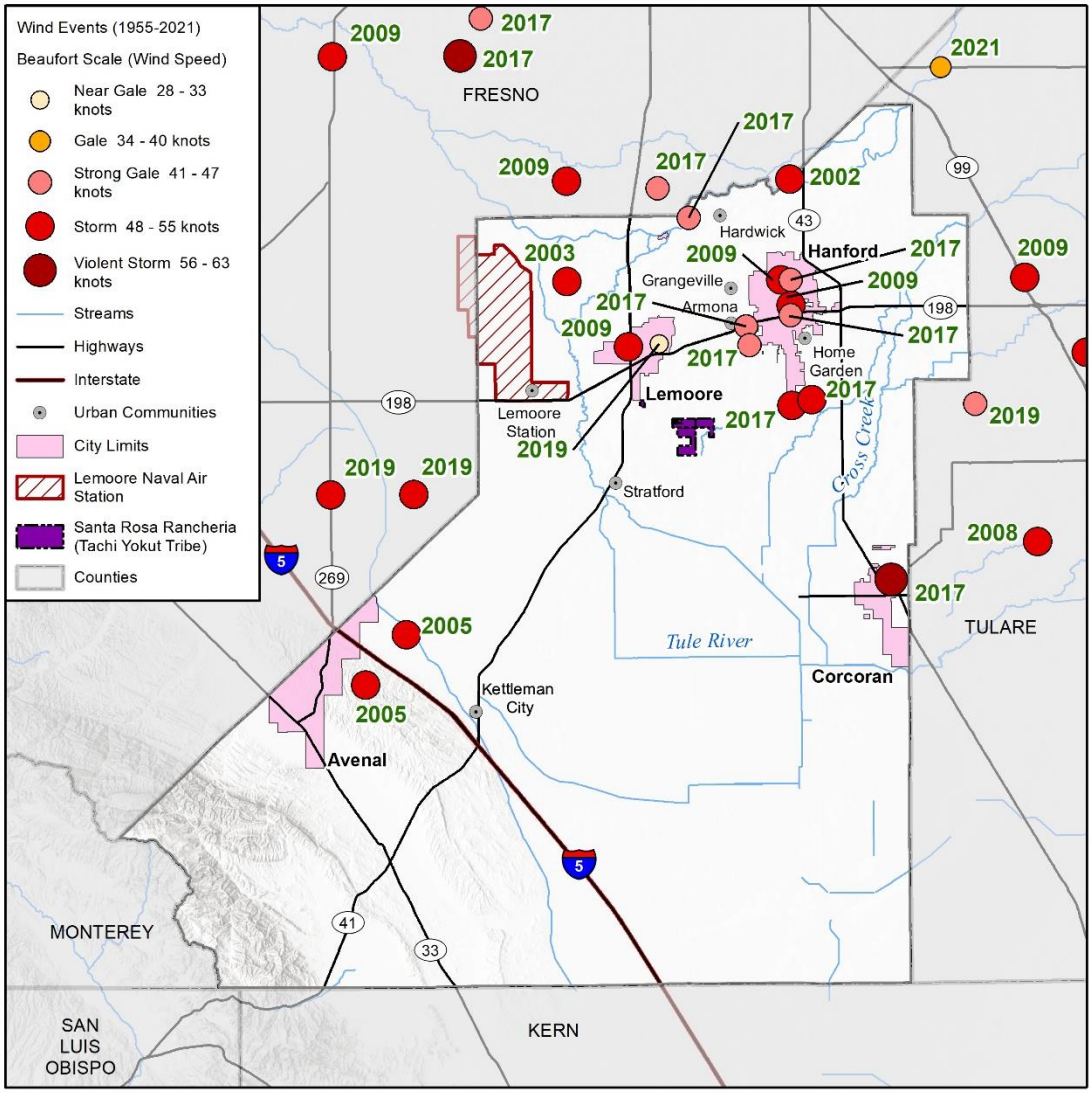
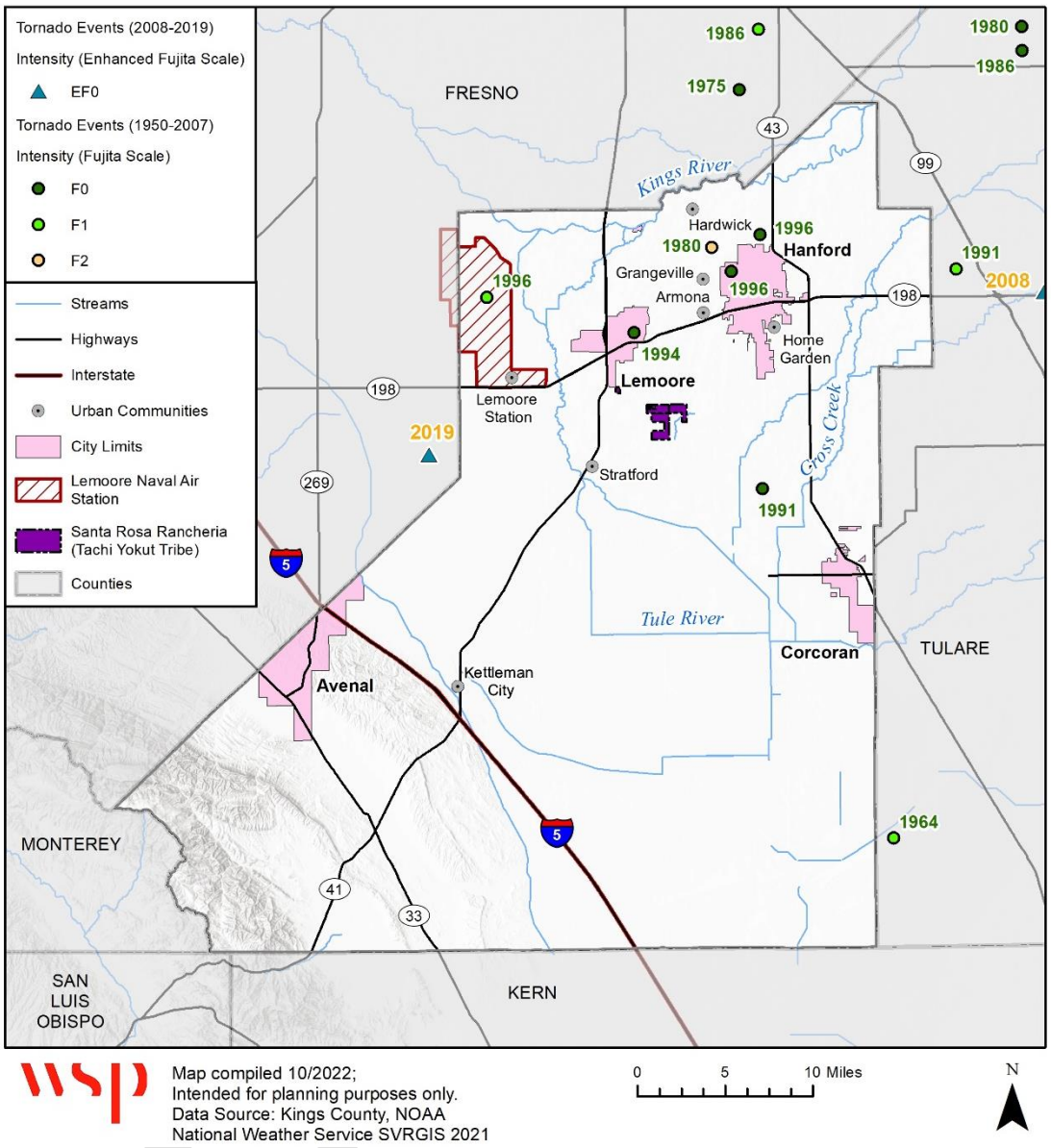
Figure 4-47 High Wind Events in Kings County, 1955 -2021



Map compiled 10/2022;
Intended for planning purposes only.
Data Source: Kings County, NOAA
National Weather Service SVRGIS 2021

Figure 4-48 Tornado Events in Kings County, 1950 -2019



4.5.14.4 Likelihood of Future Occurrence

Highly Likely – 139 high wind and tornado events have occurred in Kings County over 73 years of recordkeeping, which equates to almost two high wind or tornado event on an annual basis. Historical wind activity within the Planning Area indicates the County will likely continue to experience high wind during thunderstorm events with the potential of the formation of funnel clouds and low-intensity tornadoes during adverse weather conditions. The actual risk to the County is dependent on the nature and location of any given thunderstorm or tornado event.

Moreover, ongoing research has resulted in different conclusions on the effect of climate change on wind regimes. For other types of extreme weather events, such as tornadoes and severe thunderstorms, more research is also needed to understand how climate change will affect them. Refer to the Climate Change Considerations subsection below for more details on climate change's impact on fog events.

4.5.14.5 Climate Change Considerations

Studies referenced in California's Fourth Climate Assessment indicated that extreme fire weather, particularly in the form of hot and dry winds, can strongly influence shrub-land fire regimes. Strong winds have also been now associated with severe forest fires in California meaning climate change impacts on wind patterns may also affect forest health and wildfire susceptibility. However, ongoing research compiled in the recent climate assessment has resulted in different conclusions on the effect of climate change on wind regimes. The August 2021 IPCC report argues that in most places, wind speeds will be drastically reduced because of climate change, whereas in 2019, Scientific American reported that winds across the world were speeding up. The Maine Monitor suggests that a lack of wind can increase wildfire risks and aggravate drought. Unusual wind patterns combined with other climate change issues, such as hotter water temperatures, can also cause problems. At this time, these changing factors are not well understood and are still being incorporated into state and regional research and risk analysis. Hopefully, soon, scientists will be able to find a solution for the rapidly changing wind patterns (Garrison 2022).

For other types of extreme weather events, such as tornadoes and severe thunderstorms, more research is also needed to understand how climate change will affect them. These events occur over much smaller scales, which makes observations and modeling more challenging. Projecting the future influence of climate change on these events can also be complicated by the fact that some of the risk factors for these events may increase with climate change, while others may decrease, like the complexity of predicting future wind patterns, which is mentioned above. Even though some studies predict that climate change could provide the opportunity for more severe thunderstorms to form, this does not necessarily mean that more tornadoes will occur, given that only about 20% of supercell thunderstorms produce tornadoes. The fourth National Climate Assessment summarizes the complicated relationship between tornadoes and climate change: "…extreme weather, such as tornadoes, are also exhibiting changes which may be linked to climate change, but scientific understanding isn't detailed enough to project direction and magnitude of future change" (NatGeo 2022).

4.5.14.6 Magnitude and Severity

Critical – High winds and tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying the necessary emergency response.

In 2007, the NWS began rating tornadoes using the Enhanced Fujita Scale (EF-scale). The EF-scale is a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to the 28 indicators. These estimates vary with height and exposure. Standard measurements are taken by weather stations in open exposures. Table 4-82 describes the EF-scale ratings versus the previous Fujita Scale used prior to 2007 (NOAA n.d.).

Table 4-82 The Fujita Scale and Enhanced Fujita Scale

FUJITA SCALE			DERIVED		OPERATIONAL EF-SCALE	
F NUMBER	FASTEST ¼ MILE (MPH)	3-SECOND GUST (MPH)	EF NUMBER	3-SECOND GUST (MPH)	EF NUMBER	3-SECOND GUSTS (MPH)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135

3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: NWS.

Notes: EF – Enhanced Fujita F – Fujita mph – Miles per Hour

Figure 4-49 illustrates the potential impact and damage from a tornado.

Figure 4-49 Potential Impact and Damage from a Tornado

Source: NOAA NWS, Storm Prediction Center

The damaging effects of wind speed are measured using the Beaufort Wind Scale as shown in Table 4-83 below. This scale only reflects land-based effects and does not take into consideration the effects of wind over water.

Table 4-83 Beaufort Wind Scale

WIND SPEED (MPH)	DESCRIPTION – VISIBLE CONDITION
0	Calm; smoke rises vertically
1-4	Light air; direction of wind shown by smoke but not by wind vanes
4-7	Light breeze; wind felt on face; leaves rustle; ordinary wind vane moved by wind
8-12	Gentle breeze; leaves and small twigs in constant motion; wind extends light flag
13-18	Moderate breeze; raises dust and loose paper; small branches are moved
19-24	Fresh breeze; small trees in leaf begin to sway; crested wavelets form on inland water
25-31	Strong breeze; large branches in motion; telephone wires whistle; umbrellas used with difficulty
32-38	Moderate gale whole trees in motion; inconvenience in walking against wind

39-46	Fresh gale breaks twigs off trees; generally, impedes progress
47-54	Strong gale slight structural damage occurs; chimney pots and slates removed
55-63	Whole gale trees uprooted; considerable structural damage occurs
64-72	Storm very rarely experienced; accompanied by widespread damage
73+	Hurricane devastation occurs

Source: NWS

Based on NCEI records between 1955 and 2022 there have been a combined 116 strong wind/high wind/thunderstorm winds and 23 tornado/funnel cloud events in Kings County, which have resulted in a total of $6,946,250 in property damage and $4,420,000 in crop damage. The most damaging event took place on January 4, 2008. The first major winter storm of the new year arrived on the 4th, and brought heavy rain to the San Joaquin Valley. Very strong winds developed on the west side of the San Joaquin Valley with this storm. The strongest winds occurred in Avenal, where roofs were damaged, trees toppled and two glider planes lifted off the tarmac and flipped over at the local airport. Based on surveys of the sustained property damage, top winds were estimated at 70-75 mph. This high wind event was caused by an increase in local winds due to a combination of strong large-scale winds (synoptic winds due to the Pacific storm pattern) and the interaction of the nearby Coastal Mountain range. Two direct injuries also occurred in Avenal during the wind event. According to the NCEI database, this wind event resulted in $4,500,000 of property damages. Overall, high wind event impacts would likely be limited, with a majority of impacts being related to property damages caused by downed trees as well as power outages.

In the past 73 years, all the tornado events that have taken place in Kings County have been between F0-F1 or EF0 tornadoes. There was only one F2 tornado incident that happened in the year 1980. However, it should be noted that, although unlikely, larger tornadoes could occur. Should the County be hit by an EF-3 or higher tornado, it can be extrapolated that because of its relative size and the potential size and length of a tornado's path, a significant portion of the County could be impacted, resulting in property and crop damage and loss of life. The F2 tornado event that happened on April 5, 1980, resulted in $250,000 of property damage and one injury. A worse tornado event could result in more severe damage.

Tornado impacts to the County would likely be negligible, with less than 10 percent of the Planning Area affected by events in the EF0-2 range, though stronger tornadoes are possible. The impact on quality of life or critical facilities and functions in the affected area would depend on where the tornado occurred. Injuries or deaths are possible due to wind-thrown trees or property damage caused by wind events. Overall, impacts from high wind and tornado events would likely be negligible, with less than 10 percent of property severely damaged and shutdown of facilities due to loss of power for 24 hours or less.

4.5.14.7 Vulnerability Assessment

Property

General damages are both direct (what the wind event physically destroys) and indirect, which focuses on additional costs, damages and losses attributed to secondary hazards spawned by the event, or due to the damages caused by the wind event. Depending on the magnitude of the wind events as well as the size of the tornado and its path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage.

Secondary impacts of damage caused by wind events often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation infrastructure, create difficulties in reporting and responding to emergencies. These indirect impacts of a wind event put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Downed trees caused by a wind event are a common occurrence in the County. Falling trees can cause significant damage to property and put people at risk. Due to multiple years of drought in the County, many trees in the area have been impacted, making them more susceptible to blow-down during wind events.

People

Community members are the most vulnerable to high wind and tornado events. The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and

methods, and public storm shelters, all reduce the exposure of the population. However, there are also segments of the population that are especially exposed to the indirect impacts of high winds and tornadoes, particularly the loss of electrical power. According to the data obtained from emPOWER.com, a website maintained by the U.S. Department of Health and Human Services, 6%, or 1,047 of the 17,909 Medicare beneficiaries in the County rely on medical equipment that is dependent on electricity to live independently. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity. Nursing homes, community-based residential facilities, special needs housing facilities, and isolated communities are also vulnerable. Life support needs can be threatened when electrical outages are prolonged since backup power generally operates only with minimal functions for a short period of time.

PUBLIC SAFETY POWER SHUTOFF

High winds can cause trees or debris to damage electric lines and cause wildfires. As a result, utility providers may need to turn off power during severe weather events – high wind & other events that could increase wildfire risk. This is called a Public Safety Power Shutoff. In 2020, state-funded PSPS grant program was changed to "Community Power Resiliency", which will continue to support critical services vulnerable to power outage events, including schools, county election offices, and food storage reserves.

Following the unprecedented 2018 wildfire season in California, Pacific Gas & Electric (PG&E) announced it will be conducting PSPS when there are high winds and dry conditions and generally a heightened fire risk forecasted. 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 Kings County could be affected by the power outages. In addition to PG&E, Southern California Edison (SCE) also provides power to Kings County residents. According to SCE's official website, their service territories within Kings County are not designated as high fire threat areas or have a very low wildfire risk. Despite the low risk, SCE has been implementing its own Wildfire Response Plan, which outlines a range of activities and actions to help SCE prevent and respond to the increasing risk of wildfires, including a PSPS Protocol. PSPS is mentioned on SCE's website. SCE also has 24-hour hotlines for customers to call and report power outage events. In addition, SCE keeps an online platform where customers can check out current outage information, including the estimate on when the power will return.

Critical Facilities and Infrastructure

Both winds and tornadoes may impact exposed critical infrastructure such as power lines; depending on the impact and the function, this could cause a short-term economic disruption. The most common problems associated with tornadoes and high winds are loss of utilities. Downed power lines can cause power outages, leaving large parts of the County isolated, and without electricity, water, and communication. Damage may also limit timely emergency response and the number of evacuation routes. Downed electrical lines following a storm can also increase the potential for lethal electrical shock. Damaging winds can also cause wildfires.

Most structures, including the County's critical facilities, should be able to withstand and provide adequate protection from severe wind and tornadoes. Those facilities with backup generators should be fully equipped to handle severe wind and tornado events should the power go out. The impact of high wind on responders is similar to that of the general public. In the event of a tornado, there may be localized impacts on response personnel. Impacts on transportation corridors and communications lines affect first responders' ability to respond effectively. To maintain public confidence, jurisdictions must continue to adhere to building codes and facilitate new development that is built to the highest design standards to account for heavy winds and tornado winds.

On June 26, 2020, California Governor Gavin Newsom and the State Legislature approved the Fiscal Year 2020-2021 State Budget, which included a $50 million one-time General Fund appropriation to support State and local government efforts to mitigate the impacts of the investment-owned utility use of PSPS. In 2020, the name of the PSPS program was changed to "Community Power Resiliency". Building on the previous year's investments, the resiliency program will support critical services vulnerable to power outage events, including schools, county election offices, and food storage reserves.

According to the FY 2020-21 Community Power Resiliency Legislative Report by CalOES, the City of Avenal received $100,000 in funding to purchase a generator to enhance the resiliency of the Avenal Veteran's Hall against power outages. This facility also supported the resiliency areas of food storage

reserves and COVID-19 testing. The City of Corcoran received $300,000 in funding to purchase a portable generator and transfer switches to enhance the resiliency of groundwater wells against power outages. The City of Corcoran's action was highlighted in the report as in June 2021, the City utilized the generator when power was lost at a well site. The generator quickly restored power to the site, giving fire and paramedic stations access to clean water. In addition, Kings County received $94,826 in funding to purchase generator connections to enhance the resiliency of evacuation points against power outages.

Economy

Winds typically do not have long-term impacts on the economy, although wind does have an impact on the agriculture economy in the County. As shown in Table 4-84, wind events have been a leading cause of crop loss in the past 15 years (2007 – 2021), resulting in over $1.2 million in loss payments from the USDA and almost 2,905 acres lost to high wind events. Kings County experiences an estimated $82,313 annualized loss due to crop damages from excessive wind events.

Table 4-84 Crops Loss Due to High Wind, RMA Crop Indemnity Reports, 2007-2021

YEAR	NET DETERMINED ACRES	INDEMNITY AMOUNT
2007	273.7	$117,514
2008	1,552	$322,529
2009	326.3	$131,145
2010	18.8	$8,742
2011	-	-
2012	147.1	$3,555
2013	321.5	$101,829
2014	-	-
2015	42	$61,320
2016	89.6	$187,826
2017	68.9	$166,889
2019	0.75	$588.5
2020	-	-
2021	64.3	$82,759
Total	2,904.8	$1,234,698

Source: USDA RMA

Cultural, Historic and Natural Resources

High winds and tornadoes can cause massive damage to the natural environment, uprooting trees and other debris. This is part of a natural process, however, and the environment will return to its original state in time.

Development Trends

As the County continues to increase in population, the number of people and housing developments exposed to the hazard increases. Adherence to current building codes, coupled with proper education on building techniques and the use of sturdy building materials, attached foundations, and other structural techniques may minimize property vulnerabilities. Public shelters at parks and open spaces may help reduce the impacts of tornadoes and high wind events on the recreational populations exposed to storms.

4.5.14.8 Risk Summary

- Between 1950 and 2021 there were a combined 139 high wind (116) and tornado (23) events.
- Wind and tornado events have resulted in $6,946,250 in property damages. The most damaging event took place on January 4, 2008, with wind ranging from 70 to 75 mph causing two injuries and $4,500,000 in property damages.
- Excessive wind has caused 2,904.8 acres to be lost and $1,234,698 crop loss payment made by the USDA to farmers in the County.
- PSPS poses a risk to individuals in the County who depend on electricity to live independently. Six percent of Medicare Beneficiaries in the County are electricity dependent.

- **Related Hazards** – Extreme heat, Heavy Rain, Agriculture/Pest and Crop Disease, Wildfire

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Extensive	Highly Likely	Critical	Medium	Yes
City of Avenal	Extensive	Highly Likely	Critical	Medium	Yes
City of Corcoran	Extensive	Highly Likely	Critical	Medium	Yes
City of Hanford	Extensive	Highly Likely	Critical	Medium	Yes
City of Lemoore	Extensive	Highly Likely	Critical	Medium	Yes

4.5.15 WILDFIRE

4.5.15.1 Hazard Description

A wildfire is an uncontrolled fire spreading through vegetative fuels, such as grasslands, brush, or woodlands, and posing danger and destruction to property and watersheds. Generally, three major factors sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel** – Fuel is the material that feeds fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Manmade structures are also considered as a fuel source, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that can be modified by humans.
- **Topography** – An area's terrain and slope affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather –** Weather components such as temperature, relative humidity, wind, and lightning affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will more readily ignite and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most influential weather factor of the three and its influence can increase rates of spread regardless of temperature and relative humidity.

Wildfires can occur in areas essentially void of development, or in areas where development intermingles with the natural area known as the wildland-urban interface (WUI), a general term that applies to development adjacent to landscapes that support wildfire. Many wildfires occur in locations that abound in grasslands and brush. While wildfires are often the direct result of lightning strikes, they can be caused by downed powerlines or mechanical equipment or as the result of human activities like landscape debris burns, carelessness, or arson. Wildfires often start in undeveloped areas and public land areas, such as state and federal lands, but can spread to urban areas where structures and other human development are more concentrated. The predominant dangers from wildfires are injury or loss of life to people in the affected area and the destruction of vegetation, property, and wildlife.

Communities throughout California are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildfire risk is predominantly associated with WUI areas. However, significant wildfires can also occur in heavily populated areas, although urbanized and developed areas that are not contiguous with vast areas of wildlands are typically considered safer from wildfires.

The County is exposed to a variety of wildfire hazard conditions that vary based on fuels, topography, weather, and human behavior. CAL FIRE, as required by Government Code Section 51181, has undertaken a statewide program to map areas of potential wildfire severity, and to describe the potential for wildfires to occur in a given area; the resulting Fire Hazard Severity Zones (FHSZs) adopted in November 2007 for the State Responsibility Areas (SRA) and adopted in September 2007 for the Local Responsibility Area (LRA) are shown in Figure 4-50 below.

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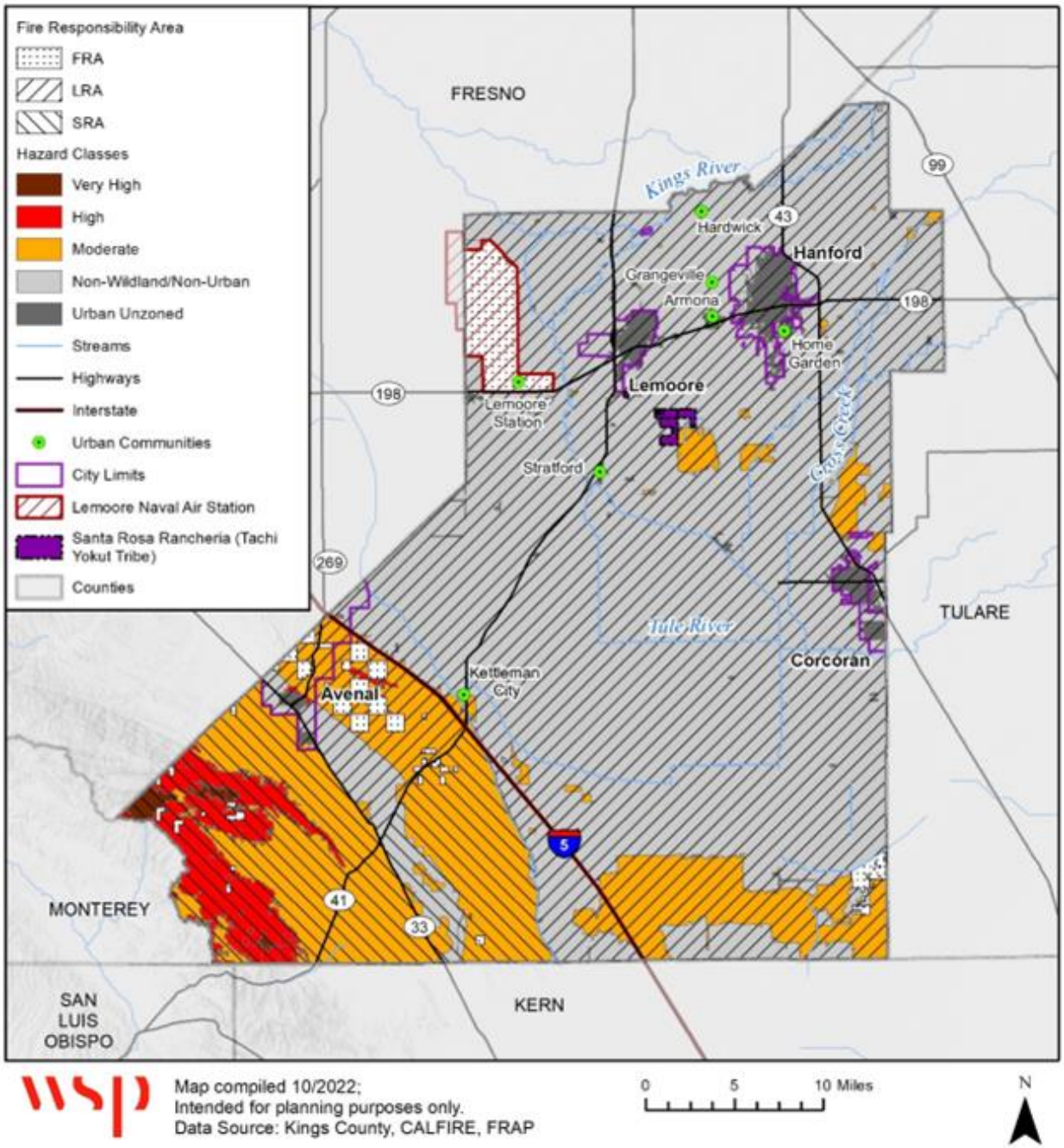
Figure 4-50 Kings County Federal, State, and Local Responsibility Severity Zones



4.5.15.2 Geographic Area

Significant – CAL FIRE has ranked fuel loading as low in most of the County, where crops and grasses are the primary sources of fuel. However, in the southwest corner, there are moderate fuel hazards from brush, pine, and grass, specifically in the area west of Interstate 5 and north of Highway 41..

The County is mostly flat, with a slight slope towards the topographic low point in the Tulare Lake Basin, which minimizes the fire risk for most of the county. However, elevations in the southwestern part of the County range from 500 feet at the Kettleman Plains to almost 3,500 feet at Table Mountain, creating a more varied terrain with a higher fire hazard in the steeply sloped areas of this region.

4.5.15.3 Past Occurrences

There have been no state or federal disaster declarations in Kings County due to wildfire. The 2012 Kings County MJHMP noted that although there are many fire starts, the fuels are "flashy," and most fires are quickly put out. Except for the Braley-Jones Ranch fire in 1951 near Stratford, all mapped fires have occurred west of Interstate 5. The largest was the Garza fire in 2017, which burned over 48,000 acres along the west side of Interstate 5, southwest of Avenal. See Table 4-85 and Figure 4-51 for the history of fires named by CAL FIRE in Kings County.

Table 4-85 Fire History in Kings County, 1950 – 2021

DATE	NAME OF FIRE	ACRES BURNED
06/04/1951	Braley-Jones Ranch	468
09/22/1968	Hughs	776
07/30/1969	Avenal Canyon	983
05/22/1979	Pyramid Hills	693
07/01/1979	State of California #32	2,292
05/25/1984	Flat Top	7,218
06/03/1989	Cal Oil	492
06/12/1994	York	1,012
09/04/1995	Tar	126
09/08/1995	Pyramid	397
04/27/1996	Skyline	20,567
05/01/1996	Hwy 41	3,198
08/13/1999	33	243
08/27/2001	Taylor	26
08/10/2007	Tar	5,644
8/19/2008	Avenal	946
07/09/2017	Garza	48,660
05/03/2020	Interstate 5	2,060
10/11/2021	Kettle	447

Source: Cal Fire Redbooks

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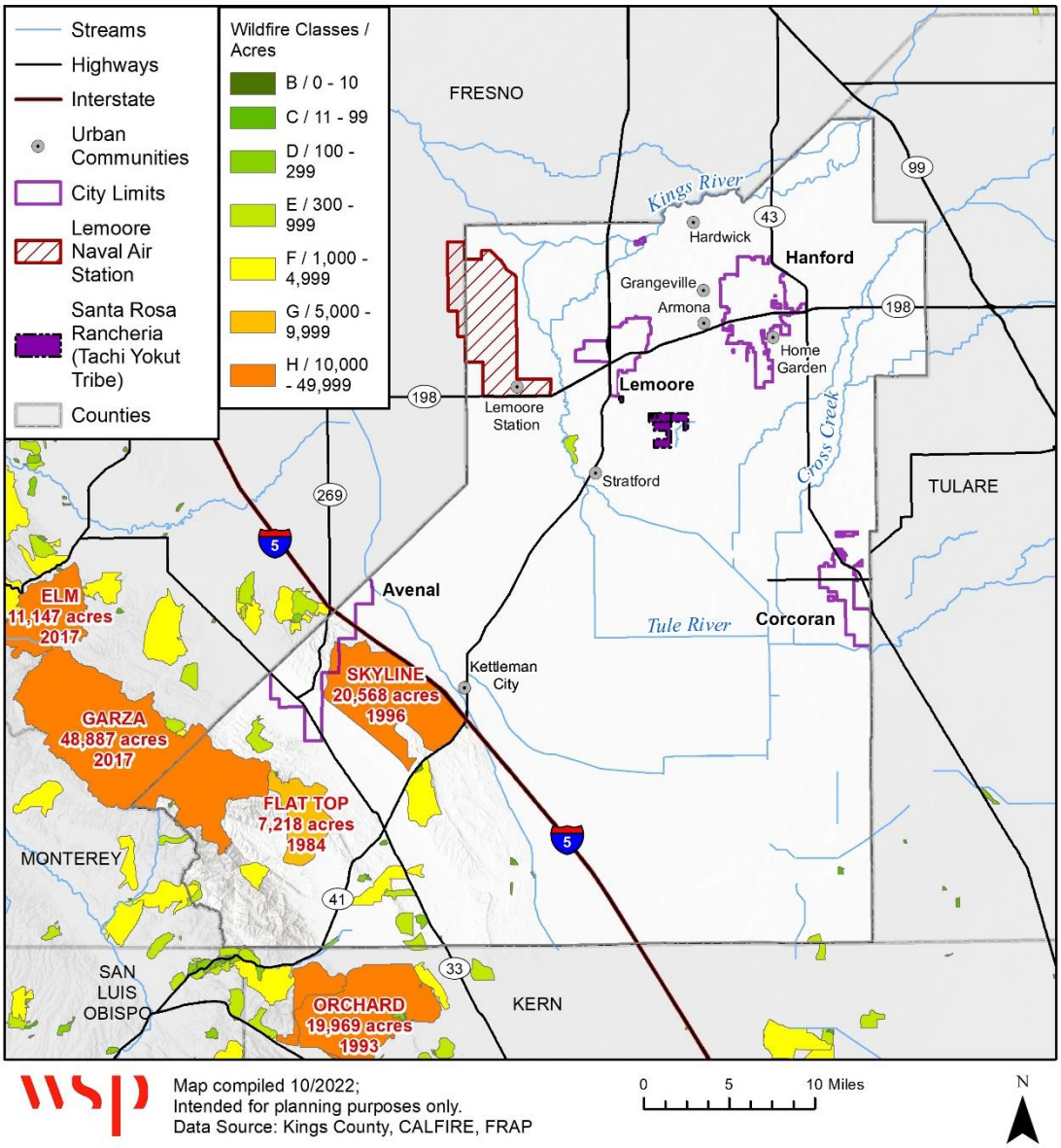
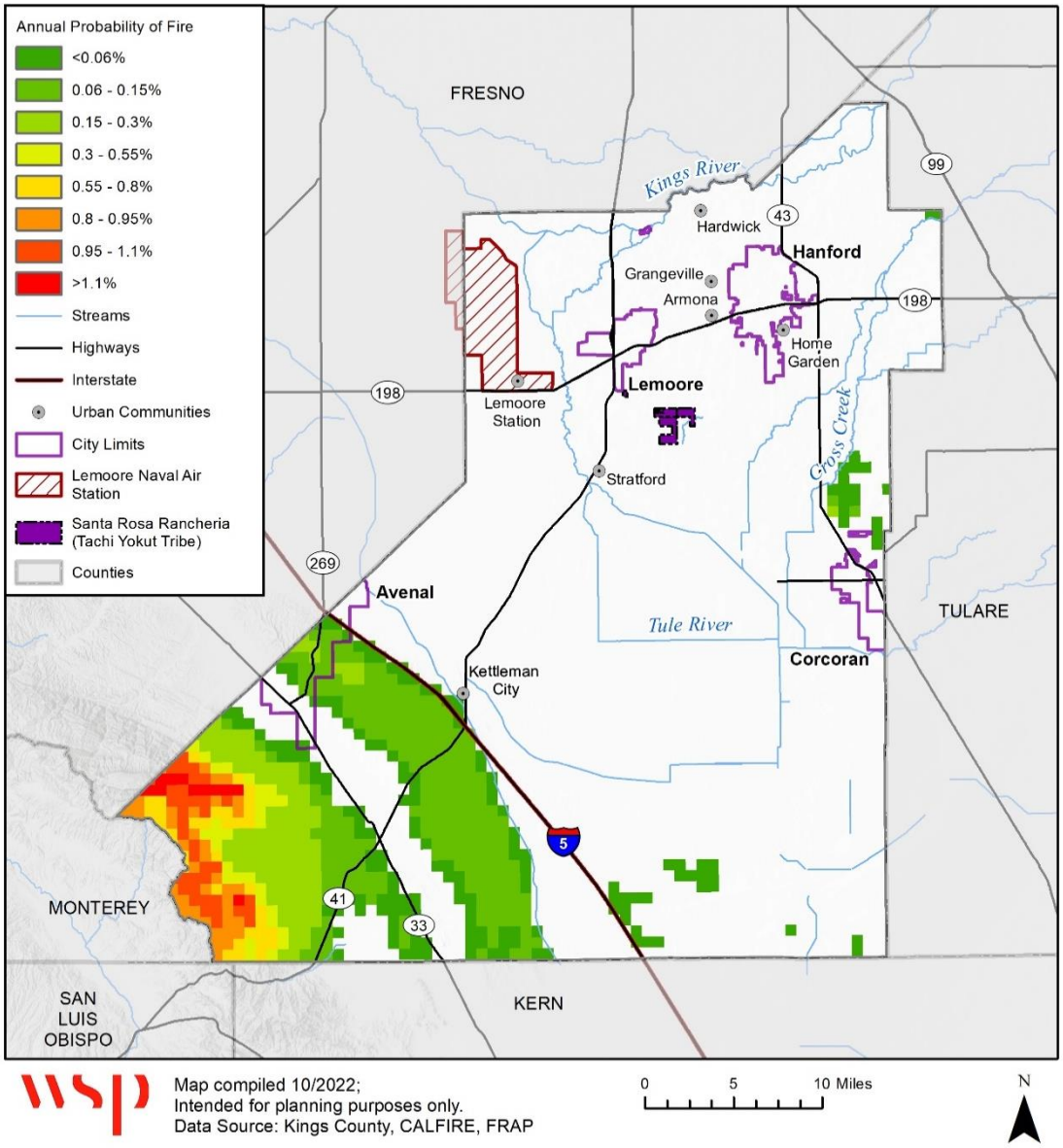
Figure 4-51 Fire History in Kings County, 1950 – 2021



4.5.15.4 *Likelihood of Occurrence*

Occasional – Fire starts are highly likely during each fire season, although they rarely result in large-scale wildfires in Kings County. Based on the recent fire history (2016-2021), there is a 60% chance that a fire will occur during any given year. Figure 4-52 shows the annual probability for wildfire in Kings County from 2023 – 2050, based on Cal FIRE data.

Figure 4-52 Kings County Annual Probability of Fire, 2023 – 2050

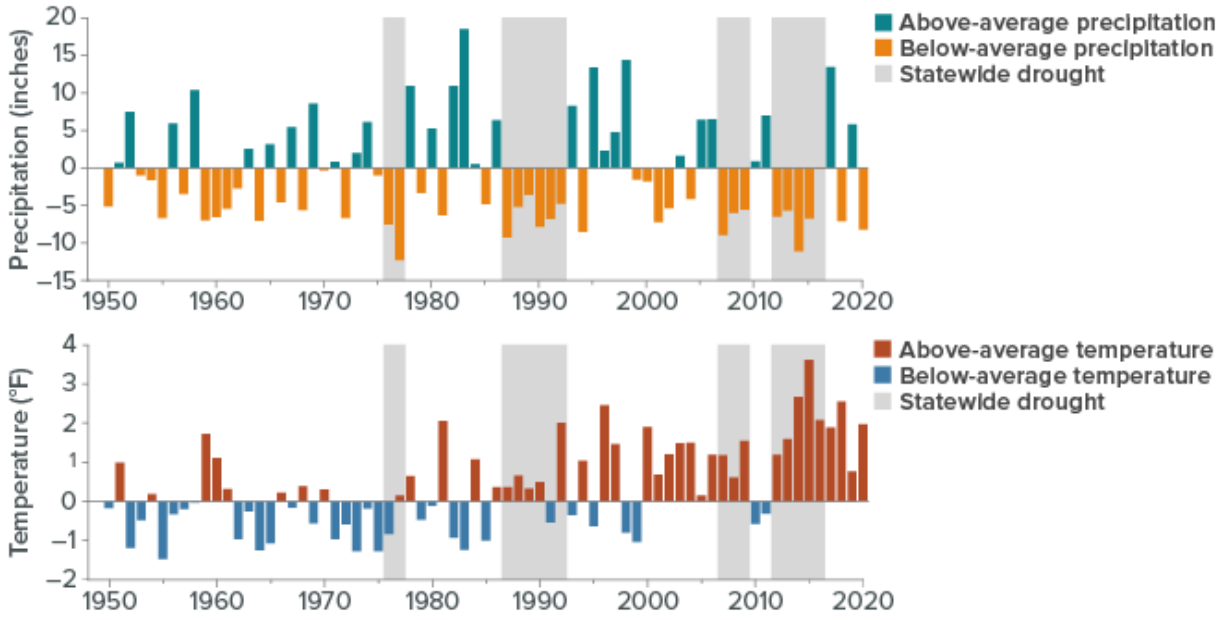


4.5.15.5 Climate Change Considerations

According to the 2018 California SHMP, climate change has the potential to impact the frequency, size, and severity of wildfire hazards statewide. Increasing temperatures and decreased precipitation statewide, as shown in Figure 4-53, may intensify wildfire threat and susceptibility to more frequent wildfires in the County.

Exactly how climate change will affect total precipitation is not clear, but models suggest that there is a tendency for wetter conditions in the northern part of the State and drier conditions in the south (CNRA 2018a). What is clear is that California is becoming exceptionally warm and dry, as evidenced by the 2012-2016 drought, the hottest drought in the State's recorded history (Mount et al, 2021). Forests in the State were weakened by this drought, which made them more susceptible to pests and pathogens and contributed to widespread tree mortality, creating an abundance of kindling for fire (CNRA 2018).

Figure 4-53 Average Statewide Precipitation and Temperature Patterns, 1950 – 2020



Source: Mount et al, WRCC, DWR

Current scientific models expect all of California will be affected by increased numbers of forest fires with added intensity due to longer warmer seasons, reduced distribution of biodiversity, lack of moisture, changes in ecosystems, drought impacts (e.g. pest diseases and continued spread of invasive species), and other impacts in coming years (Cal-Adapt, 2023). The extending of the wildfire season into winter months, coinciding with seasonal high wind patterns, has contributed to severe fires in recent years. Southern California experienced 29 wildfires in December of 2017 alone, and the deadliest and most destructive fire in California's history, the Camp Fire, happened in November of 2018 and resulted in 153,336 acres burned, 18,804 structures damaged, and 85 deaths (CAL FIRE, 2019; CAL FIRE, n.d.).

Projected wildfire occurrence estimates in annual area burned, based on different potential climate futures and GHG emission scenarios, are summarized from Westerling (2018) and presented in Figure 4-54 and Figure 4-55. These figures show the modeled projections of annual area burned for mid- and end-of-century timelines under both a high emissions scenario (Figure 4-55) and low emissions scenario (Figure 4-54). The projected future climate from these four models can be described as producing:

- CanESM2 – An average future climate simulation
- CNRM-CM5 – A cooler/wetter future climate simulation
- HadGEM2-ES – A warm/dry future climate simulation
- MIROC5 – The model simulation that is most unlike the first three for the best coverage of different possibilities.

Figure 4-54 Kings County Projected Annual Average Area Burned Under RCP 6.5

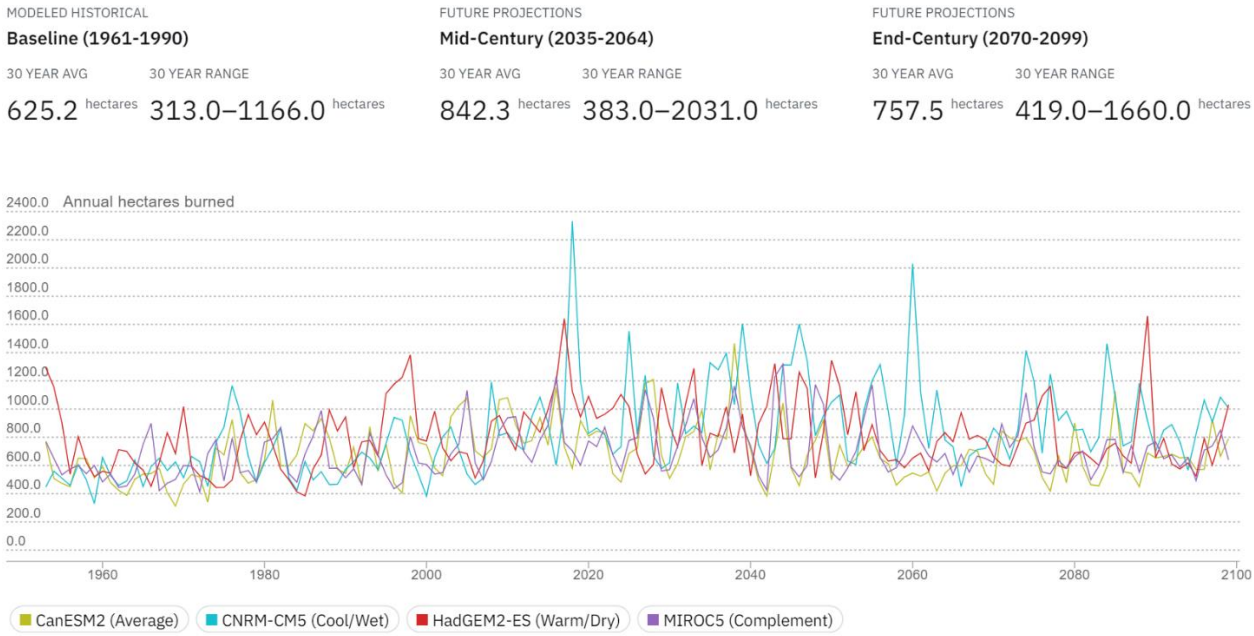
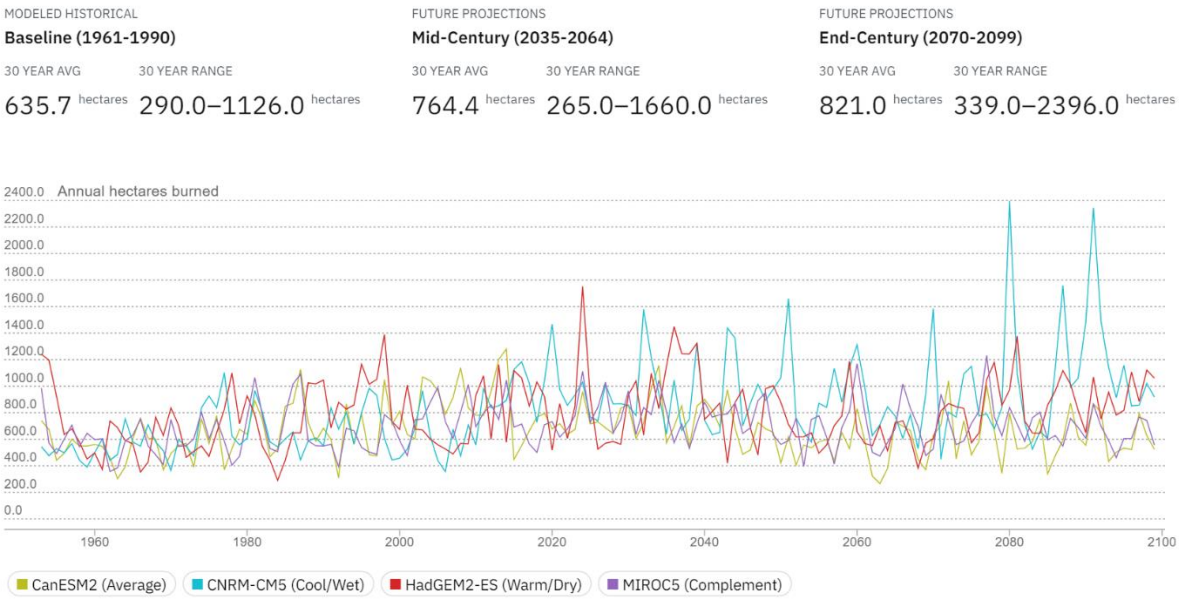


Figure 4-55 Kings County Projected Annual Average Area Burned Under RCP 8.5



The KBDI is a measure of the amount of precipitation required to return soil to full moisture capacity. A KBDI of zero indicates a total lack of moisture deficiency, while 800 represents drought conditions deep within soil layers. KBDI is cumulative, meaning values will increase on dry and warm days and decrease during rainy periods. It is a simplified proxy for favorability of occurrence and spread of wildfire but is not itself a predictor of fire. Figure 4-56 shows the historic number of days when KDBI is greater than or equal to 600, based on data from 2005, and Figure 4-57 shows the projected number of midcentury (2050) when KDBI will be greater or equal to 600 based on the RCP 8.5 scenario.

Figure 4-56 Kings County Historical Annual Number of Days When KDBI is Greater than or Equal to 600

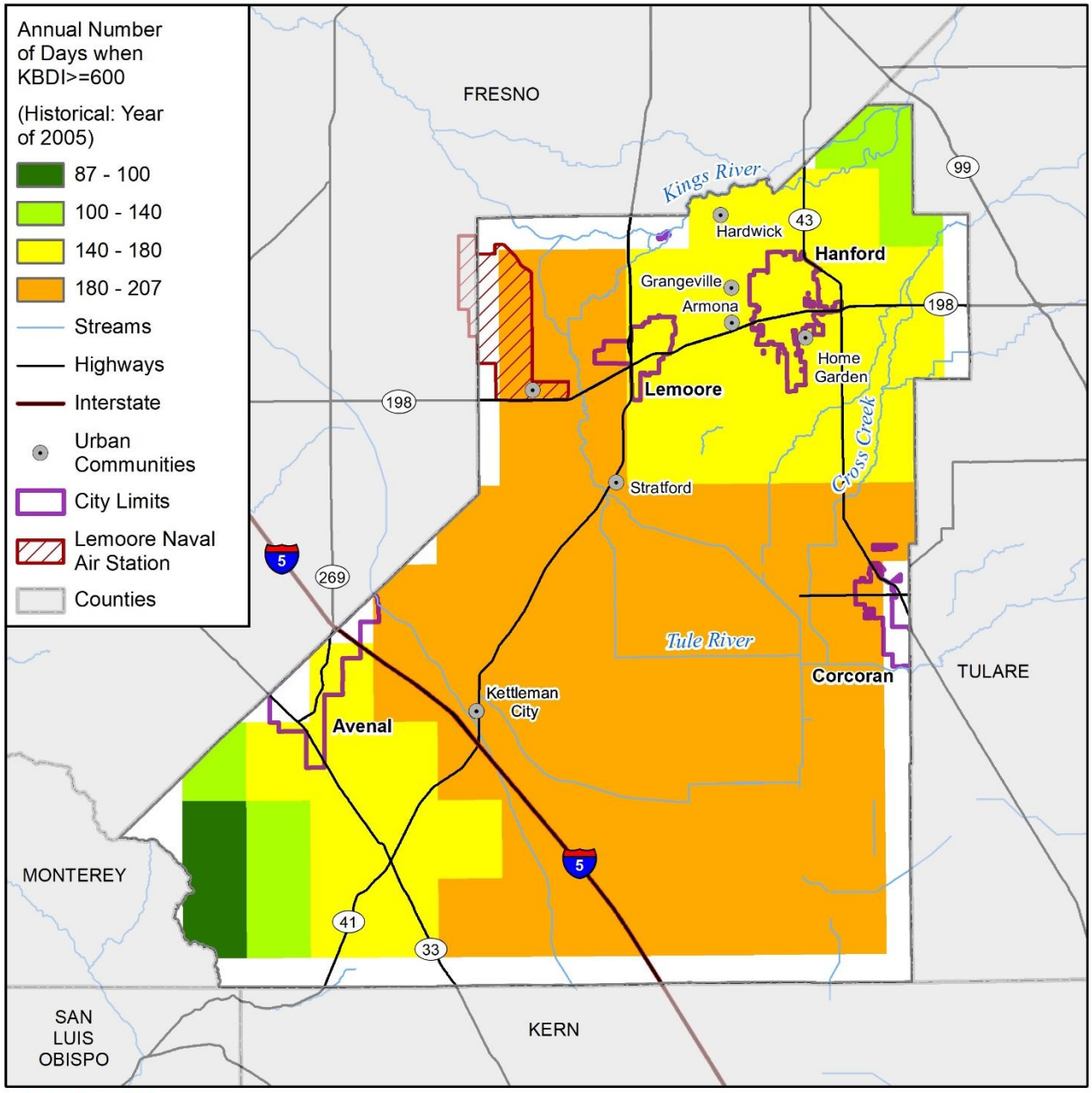
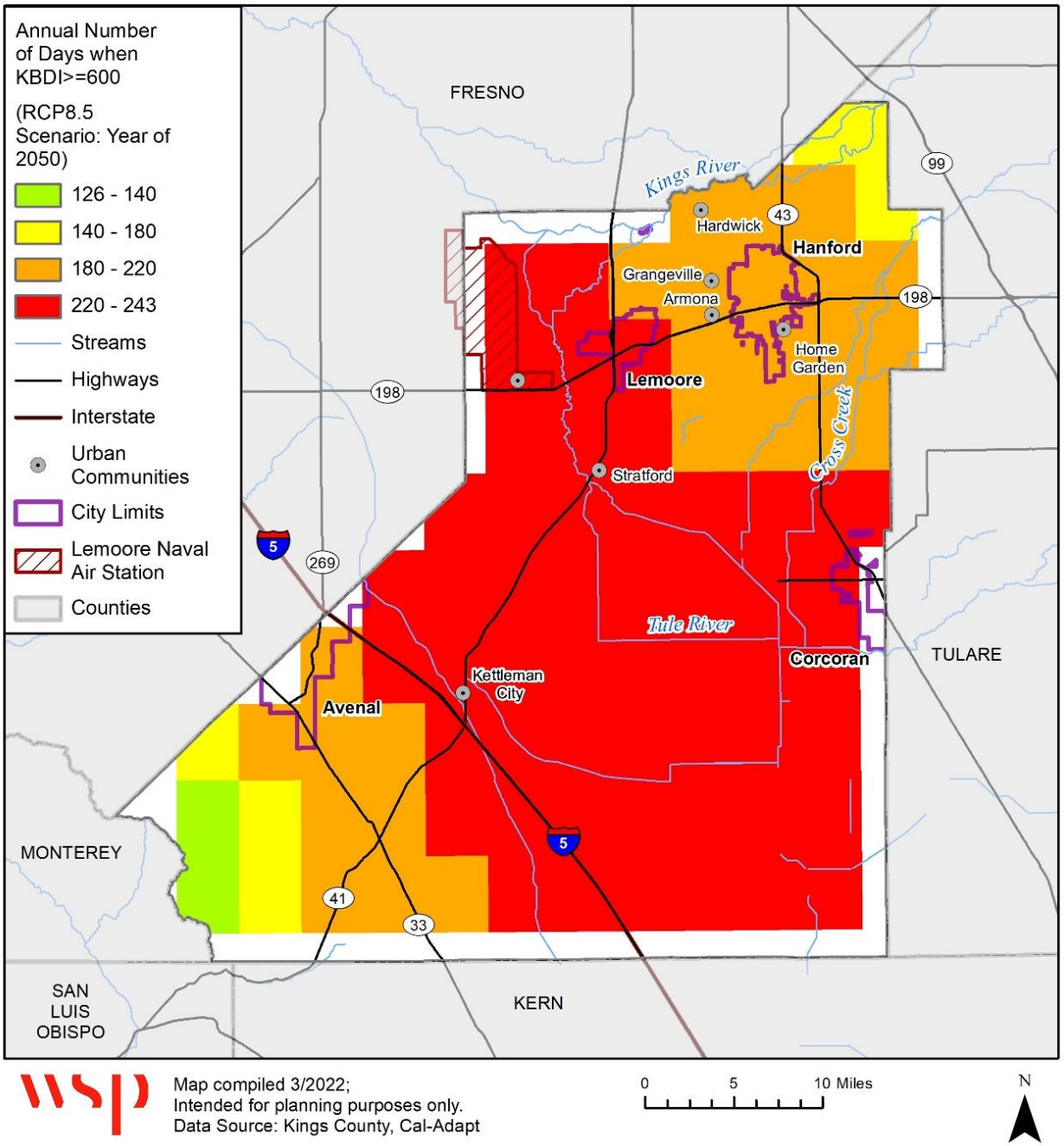


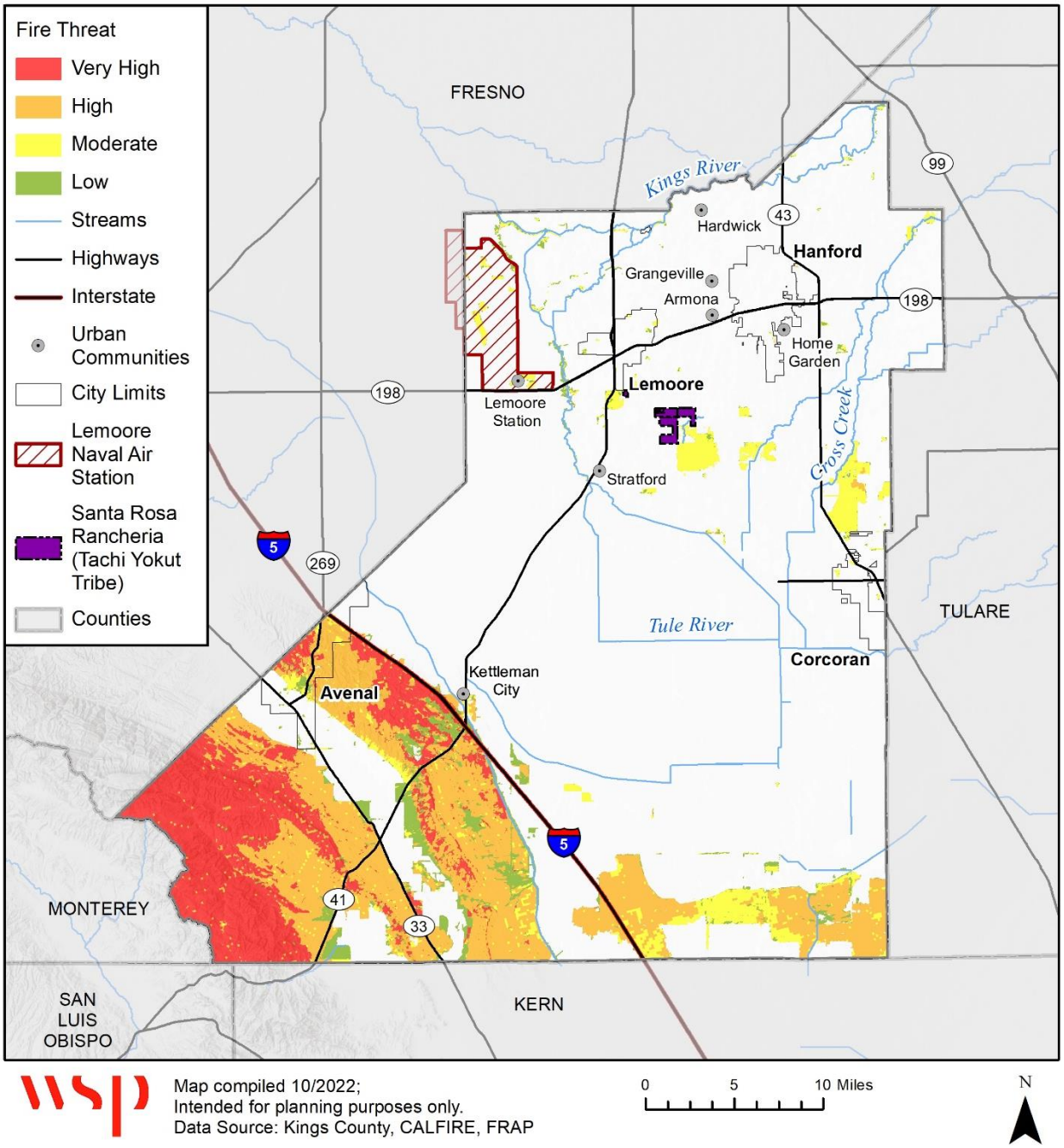
Figure 4-57 Kings County Mid-Century Annual Number of Days When KDBI is Greater than or Equal to 600



4.5.15.6 Magnitude and Severity

Negligible – Fire threat provides a measure of fuel conditions and fire potential in the ecosystem, representing the relative likelihood of "damaging" or difficult to control wildfire occurring for a given area. Fire Threat is not a risk assessment by itself but can be used to assess the potential for impacts on various assets and values susceptible to fire. Impacts are more likely to occur and/or be of increased severity for the higher threat classes. Fire threat is a combination of two factors: 1) fire probability, or the likelihood of a given area burning, and 2) potential fire behavior (hazard). These two factors are combined to create five threat classes ranging from low to extreme. Figure 4-58 below shows the wildfire threat areas throughout the County.

Figure 4-58 Kings County Fire Threat Areas



4.5.15.7 Vulnerability Assessment

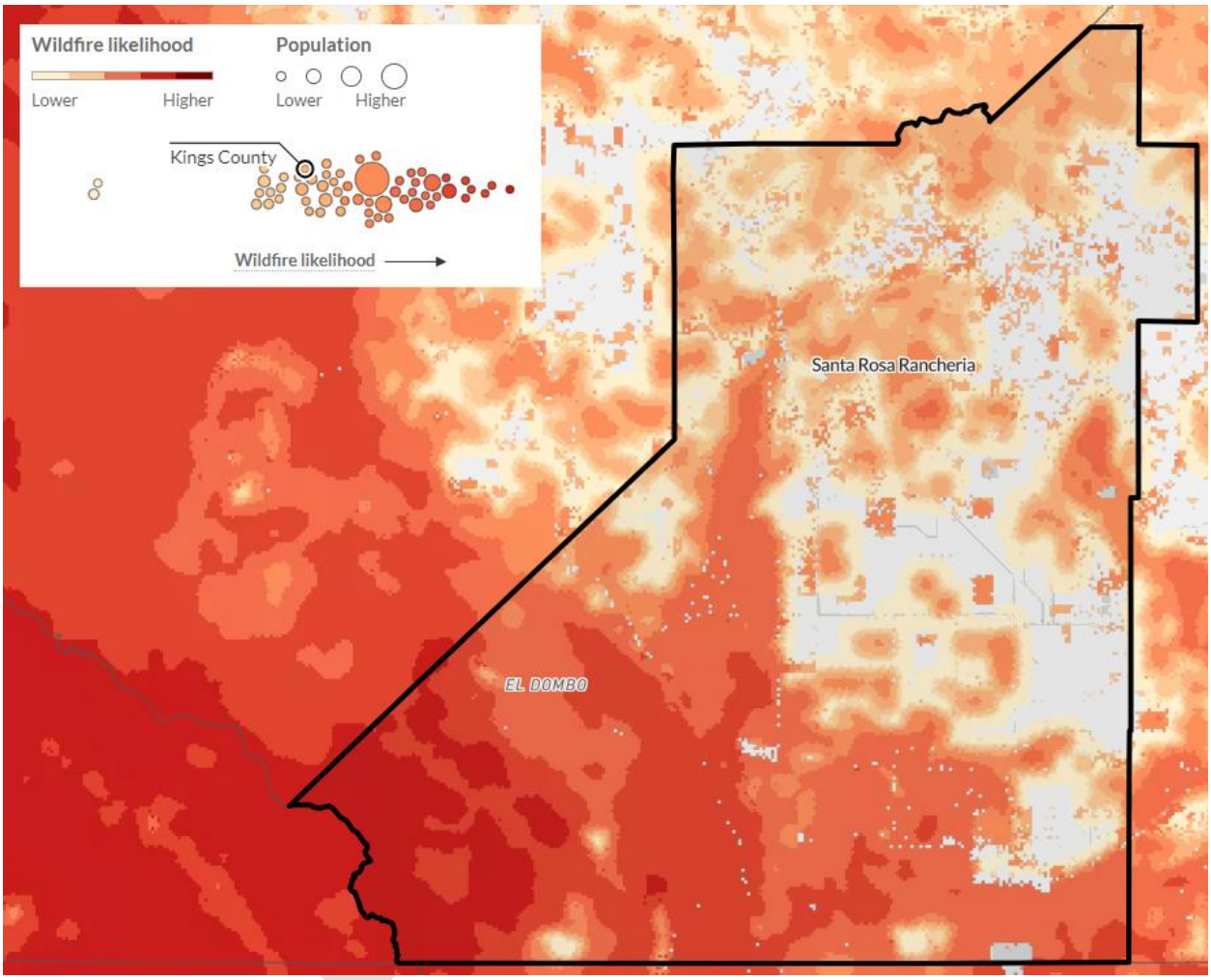
Typically, fire season in Kings County runs from early Spring to late Fall, and wildfires can start suddenly due to human activity or lightning strikes. These fires can last anywhere from a few hours to several months, with secondary effects including increased erosion, degraded air and water quality, and economic impacts from burned landscapes. Areas along the southwestern corner of the County face a higher risk than the central and more urbanized portion of the County.

Generally, this hazard is a medium concern given the increasing frequency and severity of wildfires in California. High fuel loads in some regions of the Planning Area along with geographical and topographical features create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, low relative humidity, and periodic winds, can result in frequent and

sometimes catastrophic fires. Even the relatively flat central parts of the County are not immune to fire; hot and sometimes windy weather combined with dry vegetation and a denser population can increase the number of ignitions.

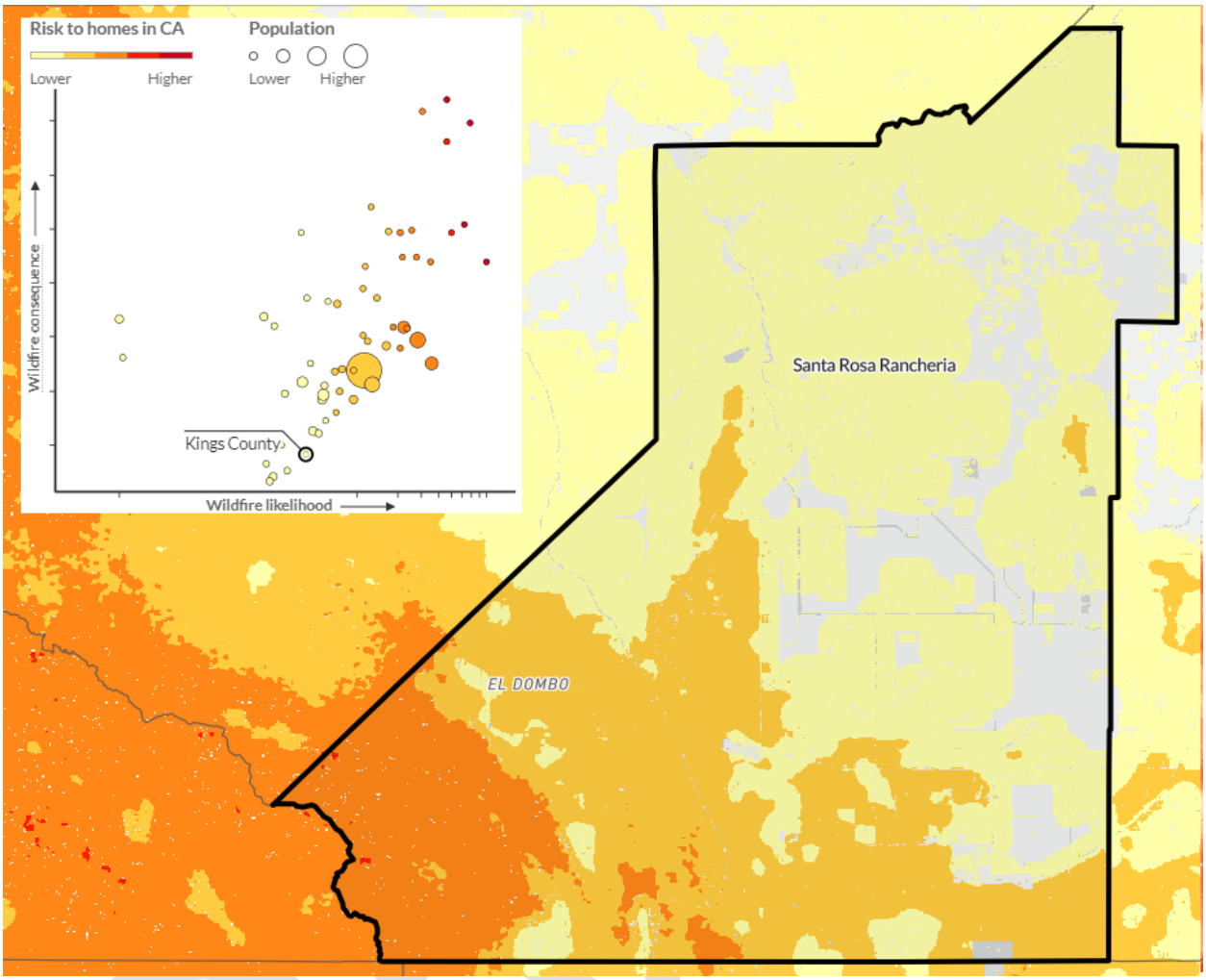
Figure 4-59 and Figure 4-60 are the results of *Wildfire Risk to Communities*, a nationwide risk study from the United States Forest Service that was designed to help communities understand, explore and reduce wildfire risk. These figures provide a perspective of wildfire risk and vulnerability compared to other California counties. Populated areas in Kings County have, on average, greater wildfire likelihood than 23% of counties in California (USFS 2021). Populated areas in Kings County also have, on average, a greater risk to homes than 19% of counties in California (USFS 2021).

Figure 4-59 Kings County Relative Wildfire Likelihood



Source: USFS 2021

Figure 4-60 Kings County Relative Wildfire Risk to Homes



People

Wildland fires result in a high risk for personal injury, loss of life to inhabitants of the fire area and firefighters, and losses of structures and personal property. Wildfires in or near the WUI frequently require emergency evacuation and sheltering, often for many days. As is shown in Table 4-86 below, approximately 3,052 people in Kings County reside in moderate, high and very high fire threat areas. The numbers were derived by taking the total number of residential, multi-family residential, and mixed use structures identified in the moderate, high and very high fire threat areas and multiplying them by the average household size of the County and cities based on the 2021 ACS 5-Year Estimates.

Table 4-86 Population at Risk to Fire Threat

JURISDICTION	POPULATION
Avenal	334
Corcoran	53
Lemoore	242
Unincorporated	2,089
Total	3,052

Source: Kings County, Cal FIRE, FRAP, U.S. Census Bureau, WSP GIS Analysis

In addition to the direct costs resulting from human injury and property destruction, secondary effects have the potential to continue impacting the community for years. Wildfires release gaseous pollutants, such as carbon monoxide, and hazardous air pollutants, such as particulate matter (i.e. polycyclic

aromatic hydrocarbons composed of acids, molds, metals, or soot), into the air where they can drift long distances, affecting millions of people (Borgschulte et al, 2022). These small particles easily slip into homes, where they are inhaled, causing negative cardiovascular and respiratory conditions. These effects are felt most acutely by first responders and sensitive populations, such as the young and the old.

Property

The potential impacts of wildfire on property include crop loss, injury and death of livestock and pets, and damage to infrastructure, homes and other buildings located throughout the wildfire risk area.

A wildfire threat assessment was performed for Kings County using the following GIS methodology. Similar to the methodology used by the flood analysis, address point data together with the assessor's parcel data were overlaid on a Fire Threat Layer. Improved parcels together with the structures on them were then assigned with wildfire threat area class (very high, high and moderate). It was assumed that every parcel with an improved value greater than zero was developed in some way, thus only improved parcels and their values were analyzed.

An analysis of the value of those parcels and structures – the improvement value plus the estimated value of building contents – quantifies the potential losses from wildfires by wildfire threat areas, as shown in

Table 4-87. The results show that over $145.8 million worth of property and approximately 270 improved parcels together with 747 structures are exposed to wildfire threat countywide. The majority of these buildings are in moderate wildfire threat areas. The unincorporated areas and the City of Lemoore make up the majority of this risk. Exempt residential and agricultural properties constitute the majority of the number of parcels and the projected losses. Exempt properties include but are not limited to wetlands, schools, museums, etc. The total values shown in these tables include both structure value and contents and can be used as an estimate of potential losses since wildfires typically result in a total loss.

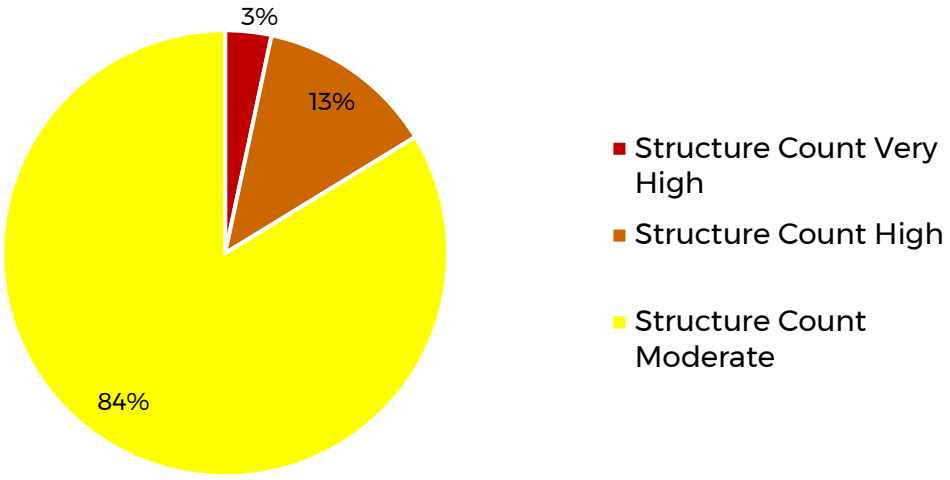
Table 4-87 Wildfire Hazard Exposure –Property Summary by Jurisdiction and Fire Threat Zone

JURISDICTION	AVENAL	CORCORAN	LEMOORE	UNINCORPORATED	TOTAL
Parcel Count Very High	-	-	-	15	15
Building Count Very High	-	-	-	15	15
Parcel County High	-	-	-	53	53
Building County High	-	-	-	58	58
Parcel County Moderate	18	15	82	69	202
Building County Moderate	100	16	82	376	674
Total Parcel County	18	15	82	137	270
Total Building Count	100	16	82	449	747
Improved Value	$11,097,454	$2,258,421	$18,202,253	$41,643,263	$84,298,845
Estimated Content Value	$5,905,592	$1,129,211	$9,101,127	$39,465,975	$61,507,495
Total Value	$17,003,046	$3,387,632	$27,303,380	$81,109,238	$145,806,340
Population	334	53	242	2,089	3,052

Source: Cal FIRE, Kings County Assessor, WSP GIS analysis

Figure 4-61 shows the composition of structures that are exposed to fire threats within the unincorporated County, categorized by fire threat zone.

Figure 4-61 Unincorporated County Parcels in Fire Threat Area



Critical Facilities and Lifelines

Critical facilities are those community components that are most needed to withstand the impacts of a disaster, as previously described in the Assets section. Wildfire impacts on critical facilities can include structural damage or destruction, risk to persons located within facilities, disruption of transportation, shipping, and evacuation operations, and interruption of facility operations and critical functions.

Critical facilities and infrastructure also create an increased risk for the occurrence of wildfires. Overhead electric transmission lines have been known to spark wildfires. According to data from the California Public Utilities Commission (CPUC), the State's three largest utility companies collectively reported 1,744 ignitions statewide between 2019-2021 (CPUC, 2023). Most of these instances were small, less than one acre in size, however these fires can grow rapidly under the right fire conditions. Identifying critical facilities and infrastructure and mitigating their potential risks is important both for maintaining the County's resilience and for reducing the potential impacts of wildfire.

The locations of critical facilities identified by HIFLD throughout the County are summarized by their exposure to the various wildfire threat levels in Table 4-88.

Table 4-88 Critical Facilities Within Wildfire Threat Zones by Jurisdiction and FEMA Lifeline

WILDFIRE THREAT ZONE	JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
Low	Avenal	2	1	-	-	1	-	-	4
	Unincorporated	8	2	-	-	-	-	16	26
	Total	10	3	-	-	1	-	16	30
Moderate	Avenal	3	1	-	-	-	-	1	5

WILDFIRE THREAT ZONE	JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, WATER, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	TOTAL
	Unincorporated	9	8	-	-	-	-	2	19
	Total	12	9	-	-	-	-	3	24
High	Avenal	1	1	-	-	-	-	-	2
	Unincorporated	4	1	-	-	-	-	-	5
	Total	5	2	-	-	-	-	-	7
Very High	Avenal	-	-	-	-	-	-	-	-
	Unincorporated	4	-	-	-	-	-	-	4
	Total	4	-	-	-	-	-	-	4

Source: Kings County, HIFLD, Cal FIRE, FRAP, WSP GIS Analysis

According to the analysis conducted, there are 35 critical facilities exposed to at least a moderate wildfire threat area. The highest rates of exposure to wildfire threat areas are facilities in the Communication and Energy Lifeline categories, both of which are crucial for response and evacuations in the event of a significant fire.

Economy

The economic impacts of wildfires include loss of property, direct agricultural sector job loss, secondary economic losses to businesses in or near wildland resources like parks and national forests, and loss of public access to recreational resources. Fire suppression may also require increased costs to local and state governments for water acquisition and delivery, especially during periods of drought when water resources are scarce. Effects on agriculture can be significant, which makes up a large portion of Kings County's economy. In addition to the obvious impacts on crops and animals, wildland fire can have damaging effects on soil and water that will impact agriculture for an extended period.

Cultural, Historic and Natural Resources

The County has three historic sites according to the California Office of Historic Preservation (refer to Subsection 4.2.1). Only one of these sites, No. 206 El Adobe de Los Robles Rancho, involves a structure. A re-built adobe house dating back to 1856, this structure is sensitive in nature and may not meet the latest building codes; it is expected that it might be at risk of wildfires (e.g., because of its potential inability to withstand significant heat). Parks and open spaces, particularly in the foothills, could also be at risk of a wildfire.

Development Trends

A fire threat GIS analysis within SOI boundaries is summarized in the table below. The methodology resembles what was used for the General Property subsection above. These parcels are also included in

Table 4-87, and they fall under "Unincorporated" in terms of their jurisdiction. Parcels shown below in Table 4-89 are those that fall within each jurisdiction's SOI and are located within different wildfire threat areas. As shown in Table 4-89, only parcels located within the SOIs of the Cities of Hanford and Lemoore are exposed to wildfire threat. The majority of these parcels are located in moderate fire threat areas.

Table 4-89 Sphere of Influence Fire Threat Analysis

Jurisdiction	Hanford	Lemoore	Total
Parcel Count High	2	0	2
Building Count High	2	0	2
Parcel Count Moderate	2	5	7
Building Count Moderate	2	6	8
Total Parcel Count	4	5	9
Total Building Count	4	6	10
Improved Value	$528,005	$1,862,074	$2,390,079
Estimated Content Value	$264,003	$1,126,907	$1,390,909
Total Value	$792,008	$2,988,981	$3,780,988
Population	12	18	30

Source: Kings County, HIFLD, Cal FIRE, FRAP, WSP GIS Analysis

Any population increases in the Planning Area will continue to make wildfire vulnerability a growing issue, especially as Development Trends expands into higher fire risk areas. These risks can however be managed with strong land use regulations and building code requirements, and with policies established in the Safety Element of the 2035 General Plan. For example, policies requiring fire-resistant vegetation, clustered development, and vegetation clear zones in areas with high and extreme fire hazard, can all decrease the County's vulnerability to fire.

4.5.15.8 Risk Summary

- The overall significance of wildfire in Kings County is **Medium**. These events are recurring in nature and can cause significant damage, loss of life, and disruption to critical infrastructure.
- The County experiences an average of one wildfire every 3 years and an average of 1,355 acres burned per year. As impacts of climate change such as increased temperatures and prolonged drought conditions continue in coming years, this frequency and intensity may increase.
- Powerlines and vehicle or equipment use present a significant source of ignitions.
- Wildfires can destroy homes, businesses, and critical infrastructure; almost $146 million worth of property in the County is located in a Fire Threat Zone.
- Wildfires can disrupt access to, or even destroy critical facilities and infrastructure; 24 critical facilities are in the Moderate Fire Threat Zone, 7 critical facilities are in the High Fire Threat Zone, and 4 critical facilities are in the Very High Fire Threat Zone.
- Wildfire impacts can include loss of property, direct agricultural sector job loss, secondary economic losses to businesses, and loss of public access to recreational resources.
- Wildfires can significantly impact water and air quality, even at great distances from the area burning. Damages to agriculture, natural resource areas, and habitats are very likely during a wildfire.
- **Related Hazards**: Agricultural Pests and Diseases, Drought, Extreme Temperatures

JURISDICTION	GEOGRAPHIC AREA	PROBABILITY OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	OVERALL SIGNIFICANCE	PRIORITY HAZARD?
Kings County	Significant	Likely	Negligible	Medium	Yes
City of Avenal	Limited	Likely	Negligible	Medium	Yes
City of Corcoran	Limited	Likely	Negligible	Low	No
City of Hanford	Limited	Likely	Negligible	Low	No
City of Lemoore	Limited	Likely	Negligible	Low	No

See HIRA Section.

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5 MITIGATION STRATEGY

Requirement §201.6(c)(3):

[The plan shall include the following:] 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 mitigation strategy process and mitigation action plan for the Kings County MJHMP. It describes how the County and participating jurisdictions met the requirements for the following from the 10-step planning process:

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

The mitigation strategy reflects the results of the collaborative work of the HMPC. Subsection 5.3 Mitigation Action Plan is based on the updated planning process, risk assessment, capability assessment, consequence analysis, goal setting, and the identification of mitigation actions. Taking all of these into consideration, the HMPC developed the following overall mitigation strategy, which builds upon the 2012 LHMP strategy:

- **Communicate** the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- **Implement** the action plan recommendations of this plan to reduce the County's vulnerability to hazards.
- **Use** existing rules, regulations, policies, and procedures already in existence. Given the flood hazard in the planning area, an emphasis should be placed on continued compliance with the NFIP.
- **Lessen** the impact of disasters and the speed of the response and recovery process.
- **Build** awareness to help the community become more sustainable and reliant to disasters.
- **Monitor** multi-objective management opportunities so that funding opportunities may be shared and packaged, and broader constituent support may be garnered.

5.1 MITIGATION GOALS AND OBJECTIVES

§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, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative, updated mitigation strategy as described further throughout this section.

Over a series of meetings during the 2022 – 2023 update process, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment update. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to update planning goals and objectives and the ultimate mitigation strategy for the Kings County planning area.

Mitigation goals are defined as general guidelines that explain what the County wants to achieve in terms of hazard and loss prevention. Goals are typically long-range statements representing community-wide visions. The HMPC reviewed the goals from the 2012 MJHMP which focused on reducing the impacts of natural hazards to life, property, and the environment, as well as agriculture and the economies of communities, and implementing identified mitigation activities. The goals were developed to be compatible with the goals of the community as expressed in the Health and Safety Element of the General Plan, and the 2015 EOP. The County's Mitigation Strategy is guided by the vision of a safe and resilient County. The mission is to integrate existing laws and programs into a mitigation strategy that will serve the citizens by reducing and preventing injury and damage from natural hazards.

Kings County routinely performs activities such as issuing building permits, approving development plans, and repairing roads. The County is conscious that these activities should reflect the vision and goals by using the most current building code, restricting development in hazard-prone areas, or making infrastructure decisions based on the risk assessment findings. As a result, goals were defined for 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. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. 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. Goals are listed below. The County decided not to develop specifc objective statements.

5.1.1 Mitigation Goals

- **Goal 1:** Reduce impacts of natural hazards to life, property, and the environment.
- **Goal 2:** Minimize impacts of natural disasters to agriculture and the economies of communities.
- **Goal 3:** Implement identified mitigation activities.
- **Goal 4:** Plan for and adapt to the effects of climate change.

5.2 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

§201.6(c)(3)(ii):

[The hazard 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. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

In order to identify and select mitigation measures to support the mitigation goals, each hazard identified in Section 4: Hazard Identification and Risk Assessment was evaluated. The HMPC analyzed a comprehensive set of viable mitigation alternatives for both new and existing buildings and infrastructure that would support identified goals and objectives and reduce or eliminate risks to persons or property or lessen the actual or potential effects or consequences of a disaster. Each HMPC member was provided with the following list of categories of mitigation measures, which originate from the NFIP CRS:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **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.
- **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.
- **Emergency services**: Actions that protect people and property during and immediately after a disaster or hazard event.
- **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.

At the HMPC Meeting #3, 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. These documents list the common alternatives for mitigation by hazard and actions funded by FEMA. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. This reference provides four categories of mitigation actions that were discussed at the HMPC meeting in addition to the NFIP/CRS categories. These include:

- Plans and Regulations
- Structure and Infrastructure Projects
- Education and Awareness
- Natural systems protection

Other alternatives discussed in the webinar include the four 'A's' of mitigation:

- **Alter** the physical nature of the hazard
  - Such as wildfire defensible space and fuels treatments, snow fences etc.
- **Avert** the hazard away from people, buildings, and infrastructure
  - Can include engineered solutions, drainage, and channel improvements, floodproofing, fuel breaks
- **Adapt** to the hazard
  - Through land use planning, building codes and design standards, warning systems etc.
- **Avoid** the hazard
  - Natural systems protection, open space, acquisition, or relocation of properties out of hazardous areas

As part of the review of mitigation options, long-term climate change adaptation strategies were also discussed. HMPC members were encouraged to incorporate climate change adaptation measures into the mitigation strategy of their respective jurisdictions by utilizing resources and guidance available on the Cal-Adapt website and California APG.

To facilitate the brainstorming process, the HMPC was provided a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. These materials are included in Appendix B. During a group activity during HMPC Meeting #3 the HMPC members were encouraged to develop mitigation alternatives that would protect future, as well as existing, development from hazards per the DMA 2000 regulations. A facilitated discussion then took place to examine the existing actions in the 2012 MJHMP and analyze the other possible mitigation alternatives. With an understanding of the alternatives, the group activity was conducted to generate a list of preferred mitigation actions. The result was new and updated project ideas with the intent of meeting the identified goals and mitigating identified hazards. These new and updated project actions were expanded on during numerous follow-up meetings with County OES staff and participating jurisdictions to focus on the refinement and prioritization of new mitigation activities.

Once new mitigation actions were defined, the HMPC selected and prioritized the mitigation actions by ranking them during another group activity that asked the participants to rank actions as either low, medium, or high-priority projects; additional information on this process is described below. WSP also discussed remaining information or mitigation gaps that needed to be addressed during the final follow-up meetings. These meetings were more focused on stakeholder group sessions intended to wrap up mitigation gaps, discuss opportunities for plan integration, and review the plan implementation and maintenance procedures.

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., different groups, different generations) Does it consider social equity, disadvantaged communities, or vulnerable populations?
- **Technical:** Will it work? (Is the action technically feasible? Does it solve the problem?)
- **Administrative:** Is there capacity to implement and manage the project? (adequate staffing, funding, and other capabilities to implement the project?)
- **Political:** Who are the stakeholders? Did they get to participate? Will there be adequate political and public support for the project?
- **Legal:** Does the jurisdiction have the legal authority to implement the action? Is it legal? Are there liability implications?
- **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?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the action address 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 D.

At the HMPC Meeting #3: mitigation strategy meeting, the HMPC reviewed and discussed the STAPLEE considerations to determine which of the identified actions were most likely to be implemented and effective. Prioritization of previous mitigation actions identified in the 2012 MJHMP that were carried forward in the updated plan. New actions identified during the 2022-2023 process also were prioritized based on the group activity and a follow-up discussion. With the STAPLEE criteria in mind, HMPC participants completed the group activity to select and rank the existing and new mitigation actions. The team was asked to prioritize projects with the above criteria in mind, essentially voting on the projects. The projects with the most high points or votes using a sticky dot exercise 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 a 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.

Cost-Benefit Review

A cost-benefit review was applied to prioritize the mitigation recommendations for implementation. The priority for implementing mitigation recommendations depends upon the overall cost-effectiveness of the recommendation when taking into account monetary and non-monetary costs and benefits associated with each action. The cost-benefit table for each hazard provides an analysis of the benefit, cost, and relative priority rank (High, Medium, and Low) for each mitigation activity. The guidelines are listed below.

- **High** – Benefits are perceived to exceed costs without further study or evaluation.
- **Medium** – Benefits are perceived to exceed costs but may require further study or evaluation prior to implementation.
- **Low** – Benefits and cost evaluations requires additional evaluation prior to implementation.

Funding projects that will help mitigate imminent hazards are cost-effective and assist in efforts to help communities recover from disasters. Most of the projects are already funded through general fund, application fees or state/federal funds. The majority of the projects are ongoing to ensure mitigation measures are implemented within the County. It is not anticipated that all future projects will be identified in the 2023 MJHMP. The County's MJHMP will also help guide local government to prioritize, be flexible, and identify critical mitigation strategy needs that may arise from a disaster when there is no time to update the local plan.

Benefit-cost was considered in greater detail in the development of the Mitigation Action Plan. For example, parameters were established for assigning the 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 an implementation schedule. 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 Kings County and the participating jurisdictions.

Cost-effectiveness will be considered in greater detail through a formal benefit-cost analysis when seeking FEMA mitigation grant eligibility and funding (e.g. HMGP, BRIC grant programs) for eligible actions associated with this plan. It is also important for the County to protect critical facilities and infrastructure. Areas of repetitive loss are high priorities for mitigation funding as they can drain County coffers.

5.2.2 Continued NFIP

The NFIP makes federally-backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The study presents water surface elevations for floods of various magnitudes, including the 1% annual chance flood (or 100-year flood) and the 0.2% annual chance flood (or 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRM), which are the principal tools for identifying the extent and location of the riverine flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities, they represent the minimum area of oversight under their floodplain management program.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Kings County and all four jurisdictions participate in the NFIP. Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these flood-prone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

Table 5-1 below shows the dates when Kings County and the jurisdictions joined the NFIP.

Table 5-1 Kings County and Its Jurisdictions' NFIP Entry Date

COUNTY/JURISDICTION	NFIP ENTRY DATE
Kings County	August 4, 1988
City of Avenal	April 5, 1989
City of Corcoran	November 28, 1997
City of Hanford	March 18, 1987
City of Lemoore	April 3, 1987

Source: CIS 2023

Post-FIRM structures built in compliance with the floodplain regulations are mitigated to withstand floods up through the 100-year event. The insurance rate is different for the two types of structures, as pre-FIRM structures are at higher risk of flooding. The effective date for the current countywide FIRM is September 16, 2015. The County and participating jurisdictions are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff. Maintaining compliance with the NFIP is an important component of flood mitigation and risk reduction.

Given the flood hazard and risk in the planning area and recognizing the importance of the NFIP in mitigating flood losses, an emphasis is placed on continued compliance with the NFIP by Kings County and all participating jurisdictions. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's requirements for adopting official FEMA floodplain maps and maintaining, enforcing, and updating local floodplain regulations.

5.3 MITIGATION STRATEGY ACTION PLAN

§201.6(c)(3)(iii)

[The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section 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.

§201.6(c)(3)(iv)

For multi - jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

This action plan was developed to present the recommendations developed by the HMPC for how the Kings County planning area 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 Previous Mitigation Actions

A review of 2012 mitigation actions progress reports indicates that Kings County has been successful in implementing actions identified in the 2012 MJHMP Mitigation Strategy, thus, working diligently towards meeting the 2012 plan goals.

The 2012 mitigation strategy contained 36 separate mitigation actions. One of these actions was multi-jurisdictional, four applied to the City of Avenal, nine applied to the City of Corcoran, six applied to the City of Hanford, five applied to the City of Lemoore, and the remaining 11 were County-wide actions.

As of July 2023, six of these actions have been completed, one has been deleted, and 29 actions are continuing and carried forward into the 2023 MJHMP. The table below summarizes progress implementing mitigation actions. The total continuing actions row summarizes the actions from 2012 that are either still in-progress, have annual implementation, or are continuing but not completed. The new actions in 2023 summarizes the number of actions that were identified during the 2022- 2023 plan update process.

Table 5-2 Mitigation Action Progress Summary for County

PROGRESS CATEGORY	# OF MITIGATION ACTIONS
Completed	6
Deleted	1
Continue In-Progress	25
Continue Not Started	4
Total Continuing Actions	29
New Actions in 2023	48
Grand Total	**77**

Source: HMPC 2023

Table 5-3 indicates the details for each of the 2012 mitigation action items that have been completed. One deleted action was multi-jurisdictional, three actions were completed by the County, two actions were completed by the City Corcoran, and one action was completed by the City of Avenal.

Table 5-3 Completed Mitigation Actions

ID	HAZARD(S) ADDRESSED	MITIGATION ACTION	LEAD AGENCY	ACTION STATUS NOTES
2	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Emergency Power System for the Emergency Operations Center at the Ken Brown Public Safety Center - Purchase, Install, test and utilize a 200 KW Propane/Natural Gas-powered emergency Generator system for the Emergency Operations Center.	Avenal OES/Police Department, Kings County OES	Completed in 2018, creating the City's EOC at the APD
5	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Expand the Veterans' Memorial Building and designate it as an emergency shelter.	City of Corcoran Public Works	Completed, 2020
7	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Assess vulnerability of critical infrastructure and lifeline utilities, that may be disrupted due to the construction of high speed rail through Kings County.	Kings County, Cities of Hanford and Corcoran	Deleted. Construction of high-speed rail has begun.
8	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	New Public Safety Building	Corcoran Police Department	Completed, October 2019
10	Drought, Earthquake, Extreme Heat, Flood, Fog, Freeze, Wildfire	Emergency Power Switching System for Primary Care Clinics	County Public Health Emergency Preparedness	Completed, December 2018
11	Drought, Earthquake, Extreme Heat, Flood, Fog, Freeze, Wildfire	Hospitals HVAC	County Public Health Emergency Preparedness	Completed, December 2018
14	Drought, Earthquake, Extreme Heat, Flood, Fog, Freeze, Wildfire	Transportable Shelter Caches for Displaced Populations	County Public Health Emergency Preparedness	Completed, December 2022

Source: HMPC 2023

5.3.2 Updated Action Plan

The results of the project identification and prioritization exercise from the third HMPC meeting are summarized in Table 5-4. These projects detail specific actions for reducing future hazard-related losses within Kings County. The projects are organized by jurisdictions and include notes about the department and partners necessary to implement the project.

Table 5-4 provides details on 77 existing and new mitigation actions, including the mitigation action description estimated cost, potential funding sources, timeline, indication of the goal(s) that the projects primarily align with, and are marked with their relative level of priority high, medium, and low. The following table also provides status/implementation notes that describe progress made on the actions so far, using the following categories, and, where applicable, notes if there were changes in the priority level from the previous plan:

- **Not Started:** Work has not begun
- **In Progress:** Work has begun but not completed
- **Annual Implementation:** Ongoing with no specific end date
- **New in 2023:** The action is new to this plan update; little to no work has been completed.

The Cost Estimate column describes the estimated project costs using the following categories:

- **Little to no cost**
- **Low**: Less than $10,000
- **Moderate**: $10,000-$100,000
- **High**: $100,000-$1,000,000
- **Very High**: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- **Short Term:** 1-2 years
- **Medium Term**: 3-5 years
- **Long Term**: 5+ years
- **Ongoing**: action is implemented every year

Of the 77 mitigation actions in the updated plan, 27 were carried over from the previous plan, two actions were revised, and 48 are new mitigation actions, including 13 Kings County actions and 35 jurisdiction-specific actions. Many of these mitigation actions are intended to reduce impacts to existing development. Those that protect future development from hazards, as required per the DMA 2000 regulations, are indicated by an asterisk in the action identification number. These actions include those that promote wise development and hazard avoidance, such as updating mapping and continued enforcement of floodplain development regulations.

Table 5-4 Kings County Mitigation Actions

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
KC-1	Goal 1, Goal 2, Goal 3	Drought, Subsidence	Water Recharge Basin Partnership Program Partner with the State and contiguous counties to improve coordination, planning, and investment in long-term water supplies by developing a comprehensive water recharge basin project to meet demands of ongoing growth and development.	Kings County	State DWR led joint powers authority should be developed to manage this multi-jurisdictional project. California Department of Water Resources (DWR), Kings County water and irrigation districts, Kings County OES, Community Development	High	Possible grant and bond funds through recent State Propositions, DWR Grants, HMGP	Food, Hydration, Shelter	Medium	Ongoing	Funding not secured but has been applied for with Hazard Mitigation Grant Program
KC-2	Goal 1, Goal 2, Goal 3	Dam Incidents, Earthquake, Flood, Dense Fog, Heavy Rain, Thunderstorms, Hail, and Lightning	Community Alert and Warning System - Purchase, install, test and utilize a community wide alert and early warning system that alerts residents by phone, email, cell phone and other electronic communication devices.	Kings County	Kings County OES, Sheriff and City Law Enforcement, Kings County Operational Area partners, county communications and Cal OES, State Department of Corrections, State High Speed Rail Authority.	High	HMGP, Emergency Management Performance Grant (EMPG), Homeland Security Grant Program (HSGP) and potentially the EOC Grant Program	Safety and Security; Communications	High	Ongoing	In progress. Funding has been secured through EMPG grant
KC-3	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	New County EOC Assessment - Develop a standing EOC group to review and discuss specifications, supervise the creation of construction	Kings County	Kings County OES, County Departments, Kings County Fire Department, Kings County Environmental Health, Kings County Information	High	General Fund, HMP Grants, EOC Grant Program, Partnership with State, County and Transportation Agencies, EMPG, Homeland Security Grant Program	Safety and Security; Communications	High	Short-term	Funding not secured yet

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			plans, identify funding mechanism and requirements, and identify the site for the new Kings County EOC.		Technology Department, and Kings County Public Works Department .						
KC-4*	Goal 1, Goal 2, Goal 3	Agricultural Pests and Disease, Dam Incidents, Earthquake, Flood, Land Subsidence, Landslide, Wildfire	Inter-jurisdictional GIS Program	Kings County	Kings County Community Development, OES, City GIS, IT, Cities of Avenal, Corcoran, Lemoore, and Hanford; special districts; water and irrigation districts; Local Agency Formation Commission of Kings County; and Kings County Association of Governments.	Moderate	Local government funds and possible grant funds through recent	Safety and Security; Communications; Transportation	Medium	Short-term	In progress. The County has been completely mapped; Hanford and Avenal have joined in on the project contracting with County GIS to meet their mapping needs. The project is planned to expand to include all the incorporated Cities and continue to create an integrated countywide GIS system and database.
KC-5	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Kings County Area Disaster Council - Review and update items related to the Kings County Area Disaster Council in the Kings County Emergency Services Ordinance to improve countywide coordination and the monitoring and implementation of the mitigation plan	Kings County	Kings County OES, County Admin Office, Board of Supervisors	Low	Kings County General Fund, EMPG	Safety and Security	High	Short-term	In Progress.: Organizational work to establish the Council was accomplished but formal meetings have not yet commenced.
KC-6	Goal 1, Goal 2, Goal 3	Agriculture and Pest Disease,	Livestock Disposal Plan -	Kings County	Kings County Agricultural	Moderate	Hospital Preparedness	Safety and Security	High	Short-term	Not started, funding not yet secured

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
		Public Health, Extreme Temperatures: Freeze and Heat	Establish a livestock disposal plan and compost team to address livestock fatality during extreme heat events.		Commissioner, Kings County Agricultural Advisory Committee, University of California at Davis Extension, Environmental Health Services, Natural Resources Conservation Service, Kings County Community Development Agency, Kings County Environmental Health, County OES, PHEP		Grant, the actual costs to bury the carcasses would be the responsibility of the animal facility owner/operator.				
KC-7	Goal 1, Goal 2, Goal 3	Earthquake, Extreme Temperatures: Freeze and Heat, Flood, Fog, Wildfire	Disaster Evacuation Routes - Ensure the maintenance and enhancement of established disaster evacuation routes	Kings County	Kings County Public Works Department, Kings County Sheriff / City Police, County OES, Human Services Agency (HAS), Kings Rural Area Transit, Public Health Emergency Preparedness, Kings County Planning Agency; Cities of Avenal, Corcoran, Lemoore, and Hanford; California Department of Transportation	Moderate	Gas tax, federal/state transportation funding, Kings County General Fund for staff time, Community Power Resiliency Allocation Program, EMPG, HMGP	Transportation	High	Short-term	In progress - funding has not been secured, may do this internally
KC-8	Goal 1, Goal 2, Goal 3	Fog	Traffic Safety Fog Events - Improve lighting and traffic controls at	Kings County	Kings County Public Works, Kings OES, County and City Law	Moderate	Cal Trans Grants, EMPG, HSGP	Transportation	Medium	Short-term	Not started, funding not secured yet

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			critical intersections and roadways to improve safety during fog events.		Enforcement, CHP, Caltrans						
KC-9	Goal 1	Multi Hazard	Automated Transportation App - Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events	Kings County	Kings County Public Works, Kings County Administration, City GIS and Emergency Management Department	Moderate	Community Power Resiliency Allocation Program, EMPG, HMGP	Transportation, Communications	Low	Short-term	New in 2023
KC-10*	Goal 2, Goal 3, Goal 4	Drought	Water Conservation Campaign - Create a water conservation campaign, utilizing social media, signage, and grass roots outreach	Kings County	Kings County Administration, Water Manager, Utility Districts	Low	DWR, FEMA HMA HMGP Funds	Food, Water, Shelter	High	Short-term	New in 2023
KC-11*	Goal 2, Goal 4	Drought	Floodwater Recharge Project - Create a flood water recharge project utilizing a feasibility study, pumps, and land for recharge.	Kings County	Kings County Administration, Water Manager, Utility Districts, City and County Engineering Departments	Very High	FEMA HMA HMGP Funds, DWR	Food, Water, Shelter	High	Medium-term	New in 2023
KC-12*	Goal 1, Goal 2, Goal 3, Goal 4	Drought, Subsidence	Land Subsidence Study - Conduct updated land subsidence study to understand elevation, shifts, and vulnerability.	Kings County	Kings County Administration, Water Manager, City and County Engineering Departments	Moderate	DWR, USACE, Cal OES	Safety and Security; Food, Water, Shelter; Transportation	Medium	Short-term	New in 2023
KC-13*	Goal 1, Goal 2	Flooding, Fire	Debris Management Plan - Create a flood channel	Kings County	Kings County Public Works, Water and	High	Proposition 68, Federal and State Resources	Safety and Security	High	Short-term	New in 2023

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			debris management plan to allow the flow of water, increase capacity, and remove fire hazards.		Irrigation Districts, City Public Works						
KC-14*	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Severe Weather, Drought, Subsidence	Develop a series of flood control basins on the Kings River that either recharge or store water during flood flows.	Kings County	Kings County Conservation District (KRCD), Local GSAs	Very High	DWR Grants	Safety and Security, and Food, Water, Shelter	High	Long-term	New in 2023
KC-15*	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Subsidence, Severe Weather	Sediment Removal - Remove sediment from the Kings to River to avoid future capacity issues.	Kings County	KRCD	Very High	HMPG Funds, Prop 68	Safety and Security	High	Medium-term	New in 2023
KC-16	Goal 1, Goal 4	Drought	Establish a Drought Task Force – Kings County will establish and convene a task force that develops water shortage preparedness planning efforts for domestic wells, privately supplied homes, and small state water systems.	Kings County	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems; Kings County Department of Public Health	High	General Fund	Water Systems, Safety and Security	High	Short-term	New in 2023
KC-17	Goal 1, Goal 2, Goal 4	Drought	Regularly review and incorporate information from the Water Storage Vulnerability Tool to update information	Kings County	Kings County Office of Emergency Services, Water Districts, Small Water Suppliers, Non-Transient Non-Community	Little to No Cost	General Fund	Water Systems	High	Short-term	New in 2023.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			about drought and water shortage vulnerabilities in the County's MJHMP, WSCPs, and Drought Resiliency Plan		Water Systems, Kings County Department of Public Health						
KC-18	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Water Shortage Contingency Plans (WSCPs) - The County will work with small water providers to develop a WSCP and update the plans every 5 years.	Kings County	Kings River Hardwick School, Hanford Christian School, Island Union School, Pioneer Union Elementary School, Lakeside Union School, Kings Ranch Ministries, Villa Terrace Apartments, Rollerland Company, Westlake Farms Headquarters, Couture Farms, State Water Resources Control Board (SWRCB)	Moderate	FEMA HMA, CA DWR	Water Systems	Medium	Short-term	New in 2023.
KC-19	Goal 1, Goal 2, Goal 3, Goal 4	Drought	County Drought Resiliency Plan – The County will develop a Drought Resiliency Plan that includes water districts, small water suppliers, and Non-Transient Non-Community Water Systems	Kings County	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water Systems	Moderate	FEMA HMA HMGP, DWR	Water Systems	Medium	Short-term	New in 2023.
KC-20	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Perform a countywide service area assessment to address the	Kings County	Water Districts, Small Water Suppliers, Non-Transient Non-Community Water	Moderate	FEMA HMA HMGP	Water Systems	Medium	Short-term	New in 2023.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			needs of maintaining an adequate level of service for all small public water systems.		Systems, Kings County Department of Public Health						
A-1	Goals 1, Goal 3, Goal 4	Earthquake, Land Subsidence, Landslide	Housing Rehabilitation Program	Avenal	City of Avenal Community Development Director	High	General Fund, Housing and Urban Development (HUD) Community Development Block Grant (CDBG) Funds, HOME, Cal Home Program	Food, Hydration, Shelter	Medium	Medium-term	Ongoing, homes continue to be rehabbed with these funds-first come first serve. The City has received funding from CDBG, HOME, and the Cal Home Program to rehabilitate homes. Under this program most homes are torn down and reconstructed to current codes.
A-2	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Drought, Earthquake, Land Subsidence	Vulnerability of Water Distribution System – Upgrade the two water transmission lines that supply water to the city and Avenal State Prison (one 18-inch line and one 12-inch line) that experience water leaks and movement due to earthquakes that lead to slope failure.	Avenal	City of Avenal Public Works Department	High	FEMA HMA HMPG, BRIC	Food, Hydration, Shelter	Medium	Long-term	In progress, expected to be completed December 2023.
A-3	Goal 1, Goal 3, Goal 4	Earthquake, Subsidence, Landslide	Loss Reduction Program for unreinforced masonry (URM) Buildings - Establish a loss reduction	Avenal	City of Avenal City Manager's Office, California Seismic Safety Commission, City of Avenal Public	Very High	FEMA HMA HMGP, BRIC, General Fund, Staff Time	Food, Hydration, Shelter	Medium	Long-term	In progress.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			program for URM buildings in compliance with the California URM Law of 1986. In response to the danger posed by the great number of potentially hazardous buildings in California, in 1986 the state legislature enacted the URM building law (Chapter 250, Statutes of 1986: SF547 [Alquist]; Government Code Section 8875 et seq.). The law is aimed at mitigating the hazards posed by URMs and applies to all jurisdictions in California's Seismic Hazard Zone 4, the region of highest earthquake activity in the nation, in which Avenal is located.		Works Department						
A-4	Goal 2, Goal 4	Earthquake	Replace Existing Valves at Tank Sites with Earthquake Valves to Protect Water Supply	Avenal	City of Avenal Public Works	Moderate	General Fund	Safety and Security	Medium	Medium Term	New in 2023
A-5	Goal 2, Goal 3, Goal 4	Drought	Water Supply Rehabilitation - Install valve at the City water	Avenal	DWR, City of Avenal, Westlands Water District	Very High	FEMA HMA HMGP, BRIC, USDA DWSRF, DWR Urban	Food, Hydration, Shelter	Low	Medium Term	New in 2023

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			source to isolate from joint use facilities to maintain water supply during unexpected outages of Westland Water District facility.				Community Drought Relief Grant Program				
A-6	Goal 1, Goal 2, Goal 3, Goal 4	Flood	Improve Flow Design for Arroyo Esquinado Channel	Avenal	City of Avenal Public Works Department	Moderate	FEMA HMA HMGP, BRIC	Water Systems	Medium	Medium Term	New in 2023
A-7	Goal 1, Goal 2, Goal 3, Goal 4	Flood	Stormwater Drainage Master Plan	Avenal	City of Avenal Public Works Department	Moderate	General Fund	Water Systems	Medium	Medium Term	New in 2023
A-8*	Goal 1, Goal 2, Goal 3, Goal 4	Flood	Investigate Capacity for Floodwater Conveyance Facilities (Drainage Ditches and Culverts) along Arroyo del Camino	Avenal	City of Avenal Public Works Department	Moderate	FEMA HMA HMGP, BRIC, General Fund	Water Systems	Low	Medium Term	New in 2023
A-9*	Goal 1, Goal 2, Goal 3, Goal 4	Land Subsidence	Conduct updated Land Subsidence Study to understand Elevation, Shifts, and Vulnerability.	Avenal	Kings County Administration, Water Management Agencies, City of Avenal Public Works Department	Moderate	DWR, FEMA HMA HMGP, USACE	Safety and Security, Food and Water, Shelter, Transportation	Medium	Long Term	New in 2023
A-10	Goal 1, Goal 2, Goal 3, Goal 4	Wildfire	Undergrounding of Utilities along City's Main Corridors	Avenal	Kings County Fire Department	High	FEMA HMA HMGP, US Forest Service WUI Grants	Energy	Medium	Medium Term	New in 2023
C-1	Goal 1, Goal 2, Goal 3	Extreme Temperatures: Freeze and Heat	Equip and maintain the Recreational Association of Corcoran (RAC) Gymnasium Building, and Corcoran Transit Station with	Corcoran	City of Corcoran Public Works Department	High	FEMA HMA HMGP, Other State Grants	Safety and Security	High	Long Term	This project has been carried over from the 2007 and 2012 MJHMPs. This action has also been modified to now include the RAC Building and the Corcoran Transit

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			climate control features and designate each site as an Emergency Warming and Cooling Center for Sensitive Populations								Station. These facilities are already in use for this purpose and now need to be maintained for this use.
C-2	Goal 1, Goal 3	Extreme Temperatures: Extreme Heat	Emergency Power System for the Corcoran Depot Apartment complex operated by the Kings County Housing Authority.	Corcoran	City of Corcoran Public Works, Kings County Office of Emergency Services	High,	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program	Energy	High	Short Term	Revised Action in 2023. Use of the Veteran's Hall is no longer needed now that the RAC gymnasium is outfitted and serves a larger population. The next critically identified need area is the Corcoran Depot apartment complex as it houses a concentrated area of senior and special needs individuals.
C-3	Goal 1, Goal 2, Goal 3, Goal 4	Multi-Hazard, Earthquake, Flood, Land Subsidence	Assess the Vulnerability of Critical Facilities – Assess vulnerability of critical facilities, including police/fire stations, hospitals, schools, and others, to identify and prioritize projects for multi-hazard risk reduction.	Corcoran	City of Corcoran Public Works, Police Department	High	General Fund	Water Systems	High	Ongoing	This was carried over from the 2012 MJHMP. The Police Department building is a newly constructed building that shifted all Police Department operations to the new facility in 2019. Other City facilities are routinely reviewed through risk management authority in order to maintain current insurance.
C-4	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Assess Community Lifelines related to Water Distribution	Corcoran	City of Corcoran Public Works Department	High	Department of Water Resources (DWR) and Regional Water	Safety and Security, Water Systems	High	Ongoing	This was carried over from the 2007 MJHMP. Upgrades and investments are routinely planned for

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			Systems – Assess vulnerability of lifeline utilities, including water distribution systems, to identify and prioritize projects for multi-hazard risk reduction.				Quality Control Board (RWQCB)				the City's CIP and funding through grants, loans and other City funding. The City's Water system is monitored and upgraded to maintain reliable system services, which also pro-actively addresses challenges posed by the drought. The City's Wastewater ponds and connecting system were recently upgraded using American Rescue Plan (ARP) funding.
C-5	Goal 1, Goal 4	Earthquake, Extreme Temperatures: Extreme Heat and Freeze, Flood, Severe Weather	Develop a Program to Support Vulnerable Populations during Emergency Events	Corcoran	City of Corcoran Police Department	Moderate	General Fund	Safety and Security	High	Ongoing	Ongoing. This project was carried over from the 2012 MJHMP. The program identifies available community resources that can be activated and/or relied upon during times of emergency events.
C-6*	Goal 1, Goal 2, Goal 3, Goal 4	Multi-Hazard, Earthquake, Flooding, Wildfire	Update the City's General Plan Safety Element and Integrate the next MJHMP Update and City of Corcoran Annex	Corcoran	City of Corcoran Community Development Department	High	General Fund	Safety and Security	High	Ongoing	This project was carried over from the 2007 and 2012 MJHMPs and has been revised. The City will integrate the City of Corcoran Annex during each 5-year update; the last General Plan Update was in 2007 and will be next updated as part of a comprehensive update.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
C-7*	Goal 1, Goal 2, Goal 3, Goal 4	Agricultural Pest and Disease, Drought, Earthquake, Extreme Temperatures, Flood, Subsidence, Landslide, Public Health Hazards, Fog, Heavy Rain, Thunderstorms, Hail and Lightning, Wildfire	Natural Hazards Review Criteria - Implement natural hazard review criteria for new development to improve long term loss prevention.	Corcoran	Kings County Community Development Department	High	General Fund	Safety and Security	High	Ongoing	This action is carried over from the 2007 and 2012 MJHMPs. It was implemented through the adoption of the 2006 IBC and 2007 General Plan. It was implemented again through subsequent updates to the Building Code. It also involves the use of natural and manmade wind barriers and strict enforcement of all seismic D1 design category requirements.
C-8	Goal 3	Cyber Threat	Use antivirus solutions, malware, and firewalls to block threats	Corcoran	City of Corcoran, Public Works Department	Moderate	General Fund	Safety and Security; Communications	Medium	Ongoing	New Action in 2023. The City has assessed network vulnerabilities and is currently Implementing measures for cybersecurity. Monitoring and evaluation will be ongoing to evaluate changes and risks.
C-9	Goal 1, Goal 2, Goal 3	Multi-Hazard, Dam Incidents	Community Alert and Warning System	Corcoran	City of Corcoran, Corcoran Police Department, and Kings County OES	Moderate	Emergency Management Performance Grant (EMPG), Homeland Security Grant Program (HSGP), High Hazard Potential Dam (HHPD)	Safety and Security, Water Systems	High	Ongoing	New Action in 2023. The City has implemented NIXLE Alert System, and utilizes City associated social media for community announcements. Extended Countywide alert notification system is in Progress through Kings County OES – Funding has been

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
											secured through a EMPG Grant.
C-10	Goal 1, Goal 2, Goal 3	Drought	Public Education Program for Water Conservation	Corcoran	City of Corcoran, City Public Works Department	Low	General Fund, City Water Enterprise Fund, and Department of Water Resources funding.	Water Systems	High	Ongoing	New Action in 2023. The City is currently implementing citywide water meter installation along with public use property water use application, water restriction notifications, and enhancing water utility payment information. Together, these systems are providing enhanced water conservation education to the public and is anticipated to affect greater conservation headed into 2024 summer.
C-11*	Goal 1, Goal 2, Goal 3, Goal 4	Flooding, Drought, Subsidence	Corcoran Flood Protection – Multi-Agency Strategic Plan for Upstream Floodwater Diversion to Reduce Tulare Lake Flooding	Corcoran	City of Corcoran, Cross Creek Flood Control District, other Water & Irrigation Districts representing the Tulare Lake Basin, and DWR	Very High	FEMA HMA HMGP, DWR Riverine Stewardship Program and Urban Stream Restoration Program, Prop 68 Funds (Floodplain Management, Protection, and Risk Awareness Grant Program)	Water Systems	High	Long Term	New Action in 2023. Acknowledges that the USACE controls water releases from Pine Flat, Terminus, Schaefer, and Isabella Dams, and water and irrigation districts in Kings, Tulare, Fresno, and Kern counties. It is critical to beneficial groundwater recharge and management.
C-12*	Goal 1, Goal 3, Goal 4	Flooding	Enhanced Erosion Control and Protection of the Flood Control Levee	Corcoran	City of Corcoran, Cross Creek Flood Control District	High	FEMA HMA HMGP, DWR Urban Community Drought Relief Program	Safety and Security	Medium	Long Term	New Action in 2023. DWR response to 2023 flooding provided erosion control measures

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
											along the Corcoran Levee for enhanced erosion control. This established a flood response measure that can be replicated in future years with flood disasters.
C-13*	Goal 2, Goal 3, Goal 4	Flooding, Drought, Subsidence	Increase Reservoir Storage for Control of Floodwater	Corcoran	Cross Creek Flood Control District, City of Corcoran, USACE, Kings County, Other Water Districts	Very High	FEMA HMA HMGP, DWR Grants	Water Systems	High	Long Term	New in 2023.
C-14	Goal 3	Public Health Hazards	Utilize trainings and exercises, epidemiology, and surveillance to control and combat public health risks	Corcoran	Kings County, City of Corcoran	Moderate	General Fund	Health and Medical	Medium	Short Term	New Action in 2023. This would be a Kings County Public Health Department initiated effort that the City supports and helps to facilitate in Corcoran.
C-15*	Goal 1, Goal 2, Goal 3	Flooding	Update the City's Storm Drain Master Plan every Few Years to included Planned Growth Areas	Corcoran	City of Corcoran	Low	General Fund	Water Systems	Low	Short Term	New Action in 2023. This is needed infrastructure for the City to diversify disbursement of stormwater drainage within the City. New Action in 2023; this was integrated from the Safety Element (Policy 4.16)
C-16*	Goal I, Goal 2, Goal 3	Flooding	Continue to Participate with the Cross Creek Flood Control District to Ensure Levees Protecting Corcoran from Tulare Lake Flooding are Adequately Monitored	Corcoran	City of Corcoran, Cross Creek Flood Control District	Low	General Fund	Water Systems, Safety and Security	High	Short Term	New Action in 2023. This is ongoing monitoring and maintenance efforts that are needed. New Action in 2023; this was integrated from the Safety Element (Policy 4.17).

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
H-1	Goal 1, Goal 2, Goal 3	Drought, Earthquake, Extreme Temperatures, Flood, Public Health Hazards, Wildfire	Public Education Program for All Hazards	Hanford	County and City Public Works, Kings County Health Dept., Kings County OES	Low	General Fund	Safety and Security	High	Ongoing	In Progress, the Hanford Fire Department hired a Fire Mashal to lead Community Risk Reduction and public education program for the department. Outreach now includes numerous events such as school programs and other monthly events.
H-2	Goal 1, Goal 3	Drought	Retrofits to Water Storage Tanks – Two water storage tanks holding 800,000 gallons of water need to be seismically retrofitted against seismic and fire hazards following earthquakes	Hanford	City of Hanford Public Works Department	Moderate	DWR Grants, HMGP	Food, Water Shelter	High	Ongoing	In progress. Drilled two new wells to feed the system and added two additional 500,000 water tanks being proposed as part of the City Infrastructure Plan.
H-3	Goal 1, Goal 2, Goal 3	Earthquake	GIS Database of Unreinforced Masonry (URM) Buildings	Hanford	City of Hanford Fire Department, Kings County Community Development, OES, City GIS, IT	Moderate	General Fund	Safety and Security; Communication; Transportation	Medium	Short Term	Not started, funding not secured yet.
H-4	Goal 1, Goal 3, Goal 4	Earthquake	Retrofit 58 URM Buildings in Downtown Hanford	Hanford	City of Hanford City Manager's Office	Very High	FEMA HMA HMGP	Food, Hydration, Shelter	Medium	Long Term	In progress, in certain cases, the City has required developers to conform to the most recent California Building Code.
H-5	Goal 1, Goal 2, Goal 3	Earthquake, Land Subsidence, Landslide	Assessment of Critical Facilities	Hanford	City of Hanford Fire Department	Moderate	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	In progress. All pre-1933 buildings have been collected in the pre-incident planning documents. Schools,

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
											apartments, daycares data are being tracked into pre-incident software. Fire has completed a Fire specific Community Risk Assessment and Standard of Cover for the City of Hanford. Public Works has developed an internal plan for critical infrastructure (water distribution, lifeline utilities, etc.).
H-6	Goal 1, Goal 2	Earthquake, Dam Incidents, Flood, Wildfire	Disaster Evacuation Routes - Ensure the maintenance and enhancement of established disaster evacuation routes	Hanford	City of Hanford City Manager's Office, City of Hanford Public Works Department, Kings County OES	Moderate	General Fund	Transportation	Medium	Medium Term	Not started.
H-7	Goal 1	Dam Incidents, Earthquake, Flood, Subsidence, Landslide, Fog, Severe Storms, Wildfire	Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events.	Hanford	Kings County Public Works, Kings County Administration	Moderate	Community Power Resiliency Allocation Program, Emergency Management Performance Grant (EMPG), HMGP	Transportation, Communication	Low	Short Term	New in 2023
H-8	Goal 1, Goal 2	Flooding, Wildfire	Create a flood channel debris management plan to allow the flow of water, increase capacity, and remove fire hazards.	Hanford	Kings County Public Works, Water and Irrigation Districts, City Public Works	High	Proposition 68, Federal and State Resources	Safety and Security	High	Short Term	New in 2023

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
H-9	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Severe Weather, Drought, Subsidence	Develop a series of flood control basins on the Kings River that either recharge or store water during flood flows.	Hanford	Kings County Conservation District (KRCD), Local GSAs	Very High	DWR Grants, FEMA HMA HMGP, BRIC	Safety and Security, and Food, Water, Shelter	High	Long Term	New in 2023
H-10	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Severe Weather	Evaluate federal levees to determine height and make-up of levees to protect during 100-year storm events.	Hanford	United States Army Corps of Engineers (USACE), KRCD	Very High	USACE Grants	Safety and Security	High	Long Term	New in 2023
H-11	Goal 1, Goal 2, Goal 3, Goal 4	Flood, Subsidence, Severe Weather	Remove sediment from Kings River to avoid future capacity issues.	Hanford	KRCD	Very High	HMPG Funds. Prop 68	Safety and Security	High	Medium Term	New in 2023
H-12	Goal 1, Goal 2, Goal 3, Goal 4	Drought, Subsidence	Conduct updated land subsidence study to understand elevations, shifts, and vulnerability.	Hanford	Kings County Administration, Water Management Agencies	Moderate	DWR, USACE, Cal OES	Safety and Security, Food, water, Shelter, Transportation	Medium	Short Term	New in 2023
H-13	Goal 3	Cyber-attack	Use antivirus solutions, malware, and firewalls to block threats	Hanford	Kings County, Avenal, Corcoran, Hanford, Lemoore	Moderate	General fund	Safety and Security, Communications	Medium	Ongoing	New in 2023
H-14	Goal 3	Public Health Hazards	Utilize trainings and exercises, epidemiology and surveillance to control and combat public health risks	Hanford	County and City Public Health Departments	Moderate	General Fund	Health and Medical	Medium	Ongoing	New in 2023
H-15	Goal 1, Goal 3	Earthquake, Drought	Safety Building & Community Center – Create a safety building for police and fire administration. Building will house EOC and a	Hanford	Hanford Police and Fire Departments	Moderate	General Fund	Safety and Security	Medium	Medium Term	New in 2023

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			community center								
H-16	Goal 1, Goal 3, Goal 4	Extreme Temperatures	Extreme Weather Shelter - Develop plan for center to assist at-risk populations during extreme weather events. Coordinate with regional plans for consistency.	Hanford	Hanford Community Development Agency, Police and Fire Department	Moderate	General Fund, APGP	Food, Hydration, Shelter	High	Medium Term	New in 2023
H-17	Goal 1, Goal 3, Goal 4	Dam Incidents, Earthquake, Flood, Dense Fog Heavy Rain, Thunderstorms, Hail, and Lightning, High Wind and Tornado, Wildfire	Grangeville Overpass - Design and build an overpass for the train tracks to allow emergency vehicle access during a hazard event.	Hanford	Hanford Public Works, Community Development, and Administration	Very High	General Fund	Transportation	High	Long Term	New in 2023
H-18	Goal 1, Goal 3, Goal 4	Dam Incidents, Earthquake, Flood, Dense Fog Heavy Rain, Thunderstorms, Hail, and Lightning, High Wind and Tornado, Wildfire	Assess the Capacity and Viability of Designate Evacuation Routes and Develop Evacuation Plan for All Hazard Scenarios	Hanford	Hanford Public Works, Community Development, and Administration	Very High	General Fund	Transportation	High	Long Term	New in 2023
L-1	Goal 1, Goal 3	Multi-Hazard: Drought, Earthquake, Extreme Heat, Flood, Fog, Freeze, Wildfire	Public Education Program for All Hazards	Lemoore	City of Lemoore, City Public Works, Kings County Health Department, Kings County OES,	Low	General Fund, FEMA HMA HMGP, EMPG	Safety and Security; Communications	High	Short Term	In Progress. This project entails establishing a training program to educate citizens about hazards and encourage households to have emergency kits, plans, and drills in place.
L-2	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Long-Term Water Supply – Improve coordination, planning, and	Lemoore	City of Lemoore, Kings County Water District,	Moderate	DWR Funds	Water Systems	High	Short Term	In Progress. The City has installed a new well head and is actively pursuing

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			investment in long-term water supplies to meet demands of ongoing growth and development		Kings County, Kings County COG						funding sources to complete treatment and connection to water supply for development on the south side of town.
L-3	Goal 1, Goal 2, Goal 3, Goal 4	Multi-Hazard, Earthquake, Flood, Land Subsidence	Assess the Vulnerability of Critical Water Facilities	Lemoore	City of Lemoore Public Works, Police Department	High	Water Fund	Water Systems	High	Medium Term	In Progress, The City regularly performs routine assessments evaluating the integrity of the water systems and performs routine maintenance to ensure longevity and reliability.
L-4	Goal 1, Goal 4	Multi-Hazard, Earthquake, Extreme Temperatures: Extreme Heat and Freeze, Flood, Severe Weather	Develop a Program to Support Vulnerable Populations during Emergency Events	City of Lemoore	City of Lemoore Police Department	Moderate	General Fund, Staff Time, APGP, EMPG	Safety and Security, Communications, Health and Medical	High	Medium Term	Ongoing. This project was carried over from the 2012 MJHMP. The program identifies available community resources that can be activated and/or relied upon during times of emergency events. The City of Lemoore continues to coordinate with local partners to assess preparedness and response activities to identify gaps and improve support efforts.
L-5*	Goal 1, Goal 3, Goal 4	Multi-Hazard	Municipal GIS Program – Establish a centralized, inter-jurisdictional GIS program in partnership with the County of Kings to improve all phases of	City of Lemoore	City of Lemoore Planning Department	Low	FEMA HMA HMGP, ESRI, General Fund	Communications	High	Medium Term	Ongoing. This project was completed as part of the 2012 MJHMP but carried forward in that plan as an ongoing effort. The City continues to participate in the Municipal GIS Program with the Kings County

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			emergency management.								Planning Department.
L-6	Goal 1, Goal 3	Multi-Hazard, Dam Incidents, Earthquake, Flood, Subsidence, Landslide, Fog, Severe Storms, Wildfire	Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events	City of Lemoore	Kings County Public Works, Kings County Administration, Kings County, City of Lemoore	Low	FEMA HMA HMGP	Transportation	Low	Medium Term	New Action in 2023.
L-7	Goal 1, Goal 2, Goal 3, Goal 4	Drought	Public Education Program for Water Supply and Conservation	City of Lemoore	City of Lemoore Administration Department, Finance Department	Low	FEMA HMA HMGP, DWR Grants	Water Systems	Medium	Short Term	New Action in 2023. The City of Lemoore recently hired a Water Conservation Officer to provide public education on water supply and conservation measures.
L-8	Goal 1, Goal 2, Goal 3, Goal 4	Flood	Well Protection and Flood Mitigation – Protect Wells from Floodwaters during Future Flooding Events by Building Infrastructure and Protection around the Well Sites	City of Lemoore	City of Lemoore Public Works	High	FEMA HMA HMGP, DWR Funds, USDA DWSRF	Water Systems	Medium	Medium Term	New Action in 2023. The City of Lemoore Public Works Department has created berms around City wells and is researching additional protective measure solutions.
L-9	Goal 1, Goal 2	Flood, Wildfire	Create a flood channel debris management plan to allow the flow of water, increase capacity, and remove fire hazards.	City of Lemoore	City of Lemoore, Kings County Public Works, Water and Irrigation Districts, City Public Works, Kings County	High	FEMA HMA HMGP	Safety and Security, Water Systems	High	Medium Term	New Action in 2023. The City will coordinate with partner agencies to evaluate areas of concern and assist with local plan efforts.
L-10*	Goal 1, Goal 2, Goal 3, Goal 4	Drought, Subsidence	Conduct updated land subsidence study to understand	City of Lemoore	City of Lemoore, Kings County Administration, Water	Moderate	DWR, USACE, Cal OES	Safety and Security, Food, water, Shelter, Transportation	Low	Short Term	New Action in 2023. The City currently performs subsidence

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			elevations, shifts, and vulnerability.		Management Agencies						studies at areas of concern.
L-11	Goal 3	Cyber Attack	Use antivirus solutions, malware, and firewalls to block threats	City of Lemoore	Kings County, Avenal, Corcoran, Hanford, Lemoore	Moderate	General fund, HSGP	Safety and Security, Communications	Medium	Short Term	New Action in 2023 City of Lemoore IT staff will assess cyber security needs and seek solutions to improve security measures.
L-12	Goal 3	Public Health Hazards	Utilize trainings and exercises, epidemiology and surveillance to control and combat public health risks	City of Lemoore	County and City Public Health Departments	Moderate	General Fund	Health and Medical	Low	Short Term	New Action in 2023. The City does not have a Public Health Department, but will coordinate with the Kings County Public Health Department during public health emergencies.
L-13	Goal 1, Goal 3	Dam Incidents	Develop plan addressing communication and evacuation for vulnerable populations in areas potentially impacted by Pine Flat Dam failure.	City of Lemoore	Kings County OES	Low	General Fund	Communications, Safety and Security	Low	Short Term	New Action in 2023. The City will coordinate with Kings County OES to create a response plan addressing the impacts of a dam failure.

NOTES:

- HMA – Hazard Mitigation Assistant Program
- HMGP – Hazard Mitigation Grant Program
- HSGP – Homeland Security Grant Program
- EMPG – Emergency Management Performance Grant
- Community Power Resiliency Allocation Grant Program – formerly the Public Safety Power Shutoff (PSPS) Program Funds
- DWR – Department of Water Resources Grant Funds
- Proposition 68 – water bond funds allocated to recreation, ecosystem protection, habitat conservation, and climate resilience projects
- KRCD – Kings River Conservation District Funds (funding from the California Department of Conservation [DOC])
- USACE – U.S. Army Corps of Engineers Funds
- APGP – Adaptation Planning Grant Pro

Table 5-5 provides a summary of the individual mitigation actions by jurisdiction specific to the municipalities that participated in the 2022-2023 plan update. Together with the County goals, objectives, and actions the tables provide an overview of all the mitigation actions proposed. More details on jurisdiction-specific mitigation actions can be found in the respective jurisdictional annexes.

Table 5-5 Jurisdictional Mitigation Action Summary

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
City of Avenal					
A-1	Multi-Hazard, Earthquake, Land Subsidence, Landslide	Housing Rehabilitation Program	City of Avenal Community Development Director	Medium	Ongoing, homes continue to be rehabbed with these funds-first come first serve. The City has received funding from CDBG, HOME, and the Cal Home Program to rehabilitate homes. Under this program most homes are torn down and reconstructed to current codes.
A-2	Multi-Hazard, Flood, Drought, Earthquake, Land Subsidence	Vulnerability of Water Distribution System – Upgrade the two water transmission lines that supply water to the city and Avenal State Prison (one 18-inch line and one 12-inch line) that experience water leaks and movement due to earthquakes that lead to slope failure.	City of Avenal Public Works Department	Medium	In progress, expected to be completed December 2023.
A-3	Multi-Hazard, Earthquake, Subsidence, Landslide	Loss Reduction Program for unreinforced masonry (URM) Buildings - Establish a loss reduction program for URM buildings in compliance with the California URM Law of 1986. In response to the danger posed by the great number of potentially hazardous buildings in California, in 1986 the state legislature enacted the URM building law (Chapter 250, Statutes of 1986: SF547 [Alquist]; Government Code Section 8875 et seq.). The law is aimed at mitigating the hazards posed by URMs and applies to all jurisdictions in California's Seismic Hazard Zone 4, the region of highest earthquake activity in the nation, in which Avenal is located.	City of Avenal City Manager's Office, California Seismic Safety Commission, City of Avenal Public Works Department	Medium	In progress.
A-4	Earthquake	Replace Existing Valves at Tank Sites with Earthquake Valves to Protect Water Supply	City of Avenal Public Works	Medium	New in 2023
A-5	Drought	Water Supply Rehabilitation - Install valve at the City water source to isolate from joint use facilities to maintain water supply during unexpected	DWR, City of Avenal, Westlands Water District	Low	New in 2023

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
		outages of Westland Water District facility.			
A-6	Flood	Flow Design for Arroyo Esquinado Channel	City of Avenal Public Works Department	Medium	New in 2023
A-7	Flood	Stormwater Drainage Master Plan	City of Avenal Public Works Department	Medium	New in 2023
A-8	Flood	Investigate Capacity for Floodwater Conveyance Facilities (Drainage Ditches and Culverts) along Arroyo del Camino	City of Avenal Public Works Department	Low	New in 2023
A-9	Land Subsidence	Conduct updated Land Subsidence Study to understand Elevation, Shifts, and Vulnerability.	Kings County Administration, Water Management Agencies, City of Avenal Public Works Department	Medium	New in 2023
A-10	Wildfire	Undergrounding of Utilities along City's Main Corridors	Kings County Fire Department	Medium	New in 2023
City of Corcoran					
C-1	Extreme Temperatures: Freeze and Heat	Equip and maintain the Recreational Association of Corcoran (RAC) Gymnasium Building, and Corcoran Transit Station with climate control features and designate each site as an Emergency Warming and Cooling Center for Sensitive Populations	City of Corcoran Public Works Department	High	This project has been carried over from the 2007 and 2012 MJHMPs. This action has also been modified to now include the RAC Building and the Corcoran Transit Station. These facilities are already in use for this purpose and now need to be maintained for this use.
C-2	Extreme Temperatures: Extreme Heat	Emergency Power System for the Corcoran Depot Apartment complex operated by the Kings County Housing Authority. Installation of an emergency generator system would provide emergency power to a site already used for shelter, cooling, and medical device power to support the life and safety of socially vulnerable populations (senior and special needs populations) during emergencies residing at the Complex	City of Corcoran Public Works, Kings County Office of Emergency Services	High	Revised Action in 2023. Use of the Veteran's Hall is no longer needed now that the RAC gymnasium is outfitted and serves a larger population. The next critically identified need area is the Corcoran Depot apartment complex as it houses a concentrated area of senior and special needs individuals.
C-3	Multi-Hazard, Earthquake, Flood, Land Subsidence	Assess the Vulnerability of Critical Facilities – Assess vulnerability of critical facilities, including police/fire stations, hospitals, schools, and others, to identify and prioritize projects for multi-hazard risk reduction.	City of Corcoran Public Works, Police Department	High	This was carried over from the 2012 MJHMP. The Police Department building is a newly constructed building that shifted all Police Department operations to the new facility in 2019. Other City facilities are routinely reviewed through risk

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
					management authority in order to maintain current insurance.
C-4	Drought	Assess Community Lifelines related to Water Distribution Systems – Assess vulnerability of lifeline utilities, including water distribution systems, to identify and prioritize projects for multi-hazard risk reduction	City of Corcoran Public Works Department	High	This was carried over from the 2007 MJHMP. Upgrades and investments are routinely planned for the City's CIP and funding through grants, loans and other City funding. The City's Water system is monitored and upgraded to maintain reliable system services, which also pro-actively addresses challenges posed by the drought. The City's Wastewater ponds and connecting system were recently upgraded using American Rescue Plan (ARP) funding.
C-5	Multi-Hazard, Earthquake, Extreme Temperatures: Extreme Heat and Freeze, Flood, Severe Weather	Develop a Program to Support Vulnerable Populations during Emergency Events	City of Corcoran Police Department	High	Ongoing. This project was carried over from the 2012 MJHMP. The program identifies available community resources that can be activated and/or relied upon during times of emergency events.
C-6	Multi-Hazard, Earthquake, Flooding, Wildfire	Update the City's General Plan Safety Element and Integrate the next MJHMP Update and City of Corcoran Annex	City of Corcoran Community Development Department	High	This project was carried over from the 2007 and 2012 MJHMPs and has been revised. The City will integrate the City of Corcoran Annex during each 5-year update; the last General Plan Update was in 2007 and will be next updated as part of a comprehensive update.
C-7	Multi-Hazard, Agricultural Pest and Disease, Drought, Earthquake, Extreme Temperatures, Flood, Subsidence, Landslide, Public Health Hazards, Fog, Heavy Rain, Thunderstorms, Hail and Lightning, Wildfire	Natural Hazards Review Criteria - Implement natural hazard review criteria for new development to improve long term loss prevention.	Kings County Community Development Department	High	This action is carried over from the 2007 and 2012 MJHMPs. It was implemented through the adoption of the 2006 IBC and 2007 General Plan. It was implemented again through subsequent updates to the Building Code. It also involves the use of natural and manmade wind barriers and strict enforcement of all seismic D1 design category requirements.
C-8	Cyber Threat	Use antivirus solutions, malware, and firewalls to block threats	City of Corcoran, Public Works Department	Medium	New in 2023. The City has assessed network vulnerabilities and is currently Implementing measures for cybersecurity. Monitoring and evaluation will

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
					be ongoing to evaluate changes and risks.
C-9	Dam Incidents	Community Alert and Warning System	City of Corcoran, Corcoran Police Department, and Kings County OES	High	New in 2023. The City has implemented NIXLE Alert System, and utilizes City associated social media for community announcements. Extended Countywide alert notification system is in Progress through Kings County OES – Funding has been secured through a EMPG Grant.
C-10	Drought	Public Education Program for Water Conservation	City of Corcoran, City Public Works Department	High	New in 2023. The City is currently implementing citywide water meter installation along with public use property water use application, water restriction notifications, and enhancing water utility payment information. Together, these systems are providing enhanced water conservation education to the public and is anticipated to affect greater conservation headed into 2024 summer.
C-11	Multi-Hazard, Flooding, Drought, Subsidence	Corcoran Flood Protection – Multi-Agency Strategic Plan for Upstream Floodwater Diversion to Reduce Tulare Lake Flooding	City of Corcoran, Cross Creek Flood Control District, other Water & Irrigation Districts representing the Tulare Lake Basin, and DWR	High	New in 2023. Acknowledges that the USACE controls water releases from Pine Flat, Terminus, Schaefer, and Isabella Dams, and water and irrigation districts in Kings, Tulare, Fresno, and Kern counties. It is critical to beneficial groundwater recharge and management.
C-12	Flooding	Enhanced Erosion Control and Protection of the Flood Control Levee	City of Corcoran, Cross Creek Flood Control District	Medium	New in 2023. DWR response to 2023 flooding provided erosion control measures along the Corcoran Levee for enhanced erosion control. This established a flood response measure that can be replicated in future years with flood disasters. New Action in 2023
C-13	Multi-Hazard, Flooding, Drought, Subsidence	Increase Reservoir Storage for Control of Floodwater	Cross Creek Flood Control District, City of Corcoran, USACE, Kings County, Other Water Districts	High	New in 2023.
C-14	Public Health Hazards	Utilize trainings and exercises, epidemiology, and surveillance	Kings County, City of Corcoran	Medium	New in 2023. This would be a Kings County Public Health Department initiated effort that

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
		to control and combat public health risks			the City supports and helps to facilitate in Corcoran.
C-15	Flooding	Update the City's Storm Drain Master Plan every Few Years to included Planned Growth Areas	City of Corcoran	Low	New in 2023. This is needed infrastructure for the City to diversify disbursement of stormwater drainage within the City. New Action in 2023; this was integrated from the Safety Element (Policy 4.16)
C-16	Flooding	Continue to Participate with the Cross Creek Flood Control District to Ensure Levees Protecting Corcoran from Tulare Lake Flooding are Adequately Monitored	City of Corcoran, Cross Creek Flood Control District	High	New in 2023. This is ongoing monitoring and maintenance efforts that are needed. New Action in 2023; this was integrated from the Safety Element (Policy 4.17)
City of Hanford					
H-1	Multi-hazard	Public Education Program for All Hazards	County and City Public Works, Kings County Health Dept., Kings County OES	High	In Progress, the Hanford Fire Department hired a Fire Mashal to lead Community Risk Reduction and public education program for the department. Outreach now includes numerous events such as school programs and other monthly events.
H-2	Drought	Retrofits to Water Storage Tanks – Two water storage tanks holding 800,000 gallons of water need to be seismically retrofitted against seismic and fire hazards following earthquakes	City of Hanford Public Works Department	High	In progress. Drilled two new wells to feed the system and added two additional 500,000 water tanks being proposed as part of the City Infrastructure Plan.
H-3	Earthquake	GIS Database of Unreinforced Masonry (URM) Buildings	City of Hanford Fire Department, Kings County Community Development, OES, City GIS, IT	Medium	Not started, funding not secured yet.
H-4	Earthquake	Retrofit 58 URM Buildings in Downtown Hanford	City of Hanford City Manager's Office	Medium	In progress, in certain cases, the City has required developers to conform to the most recent California Building Code.
H-5	Multi-Hazard	Assessment of Critical Facilities	City of Hanford Fire Department	Medium	In progress. All pre-1933 buildings have been collected in the pre-incident planning documents. Schools, apartments, daycares data are being tracked into pre-incident software. Fire has completed a Fire specific Community Risk Assessment and Standard of Cover for the City of Hanford. Public Works has developed an internal plan for critical infrastructure (water

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
					distribution, lifeline utilities, etc.).
H-6	Multi-Hazard	Disaster Evacuation Routes - Ensure the maintenance and enhancement of established disaster evacuation routes	City of Hanford City Manager's Office, City of Hanford Public Works Department, Kings County OES	Medium	Not started.
H-7	Multi-Hazard	Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events.	Kings County Public Works, Kings County Administration	Low	New in 2023
H-8	Flooding, Wildfire	Create a flood channel debris management plan to allow the flow of water, increase capacity, and remove fire hazards.	Kings County Public Works, Water and Irrigation Districts, City Public Works	High	New in 2023
H-9	Multi-Hazard	Develop a series of flood control basins on the Kings River that either recharge or store water during flood flows.	Kings County Conservation District (KRCD), Local GSAs	High	New in 2023
H-10	Multi-Hazard	Evaluate federal levees to determine height and make-up of levees to protect during 100-year storm events.	United States Army Corps of Engineers (USACE), KRCD	High	New in 2023
H-11	Multi-Hazard	Remove sediment from Kings River to avoid future capacity issues.	KRCD	High	New in 2023
H-12	Drought, Subsidence	Conduct updated land subsidence study to understand elevations, shifts, and vulnerability.	Kings County Administration, Water Management Agencies	Medium	New in 2023
H-13	Cyber-attack	Use antivirus solutions, malware, and firewalls to block threats	Kings County, Avenal, Corcoran, Hanford, Lemoore	Medium	New in 2023
H-14	Public Health Hazards	Utilize trainings and exercises, epidemiology and surveillance to control and combat public health risks	County and City Public Health Departments	Medium	New in 2023
H-15	Earthquake, Drought	Safety Building & Community Center – Create a safety building for police and fire administration. Building will house EOC and a community center	Hanford Police and Fire Departments	Medium	New in 2023
H-16	Extreme Temperatures	Extreme Weather Shelter - Develop plan for center to assist at-risk populations during extreme weather events.	Hanford Community Development Agency, Police	High	New in 2023

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
		Coordinate with regional plans for consistency.	and Fire Department		
H-17	Multi-Hazard	Grangeville Overpass - Design and build an overpass for the train tracks to allow emergency vehicle access during a hazard event.	Hanford Public Works, Community Development, and Administration	High	New in 2023
H-18	Multi-Hazard	Assess the Capacity and Viability of Designate Evacuation Routes and Develop Evacuation Plan for All Hazard Scenarios	Hanford Public Works, Community Development, and Administration	High	New in 2023
City of Lemoore					
L-1	Multi-Hazard: Drought, Earthquake, Extreme Heat, Flood, Fog, Freeze, Wildfire	Public Education Program for All Hazards	City of Lemoore, City Public Works, Kings County Health Department, Kings County OES	High	In Progress. This project entails establishing a training program to educate citizens about hazards and encourage households to have emergency kits, plans, and drills in place.
L-2	Drought	Long-Term Water Supply – Improve coordination, planning, and investment in long-term water supplies to meet demands of ongoing growth and development	City of Lemoore, Kings County Water District, Kings County, Kings County COG	High	In Progress. The City has installed a new well head and is actively pursuing funding sources to complete treatment and connection to water supply for development on the south side of town
L-3	Multi-Hazard, Earthquake, Flood, Land Subsidence	Assess the Vulnerability of Critical Water Facilities	City of Lemoore Public Works, Police Department	High	In Progress, The City regularly performs routine assessments evaluating the integrity of the water systems and performs routine maintenance to ensure longevity and reliability.
L-4	Multi-Hazard, Earthquake, Extreme Temperatures: Extreme Heat and Freeze, Flood, Severe Weather	Develop a Program to Support Vulnerable Populations during Emergency Events	City of Lemoore Police Department	High	Ongoing. This project was carried over from the 2012 MJHMP. The program identifies available community resources that can be activated and/or relied upon during times of emergency events. The City of Lemoore continues to coordinate with local partners to assess preparedness and response activities to identify gaps and improve support efforts.
L-5	Multi-Hazard	Municipal GIS Program – Establish a centralized, inter-jurisdictional GIS program in partnership with the County of Kings to improve all phases of emergency management.	City of Lemoore Planning Department	High	Ongoing. This project was completed as part of the 2012 MJHMP but carried forward in that plan as an ongoing effort. The City continues to participate in the Municipal GIS Program with the Kings County Planning Department.

ID	HAZARD(S) MITIGATED	PROJECT TITLE	LEAD AGENCY AND PARTNERS	PRIORITY	PROJECT DESCRIPTION
L-6	Multi-Hazard, Dam Incidents, Earthquake, Flood, Subsidence, Landslide, Fog, Severe Storms, Wildfire	Develop a transportation routing app, similar to the Caltrans app, to divert traffic due to road conditions during hazard events	Kings County Public Works, Kings County Administration, Kings County, City of Lemoore	Low	New Action in 2023.
L-7	Drought	Public Education Program for Water Supply and Conservation	City of Lemoore Administration Department, Finance Department	Medium	New Action in 2023. The City of Lemoore recently hired a Water Conservation Officer to provide public education on water supply and conservation measures.
L-8	Flood	Well Protection and Flood Mitigation – Protect Wells from Floodwaters during Future Flooding Events by Building Infrastructure and Protection around the Well Sites	City of Lemoore Public Works	High	New Action in 2023. The City of Lemoore Public Works Department has created berms around City wells and is researching additional protective measure solutions.
L-9	Flood, Wildfire	Create a flood channel debris management plan to allow the flow of water, increase capacity, and remove fire hazards.	City of Lemoore, Kings County Public Works, Water and Irrigation Districts, City Public Works, Kings County	High	New Action in 2023. The City will coordinate with partner agencies to evaluate areas of concern and assist with local plan efforts.
L-10	Drought, Subsidence	Conduct updated land subsidence study to understand elevations, shifts, and vulnerability.	City of Lemoore, Kings County Administration, Water Management Agencies	Low	New Action in 2023. The City currently performs subsidence studies at areas of concern.
L-11	Cyber Attack	Use antivirus solutions, malware, and firewalls to block threats	City of Lemoore	Medium	New Action in 2023 City of Lemoore IT staff will assess cyber security needs and seek solutions to improve security measures
L-12	Public Health Hazards	Utilize trainings and exercises, epidemiology and surveillance to control and combat public health risks	City of Lemoore, County and City Public Health Departments	Low	New Action in 2023. The City does not have a Public Health Department, but will coordinate with the Kings County Public Health Department during public health emergencies.
L-13	Dam Incidents	Develop plan addressing communication and evacuation for vulnerable populations in areas potentially impacted by Pine Flat Dam failure.	City of Lemoore, Kings County OES	Medium	New Action in 2023. The City will coordinate with Kings County OES to create a response plan addressing the impacts of a dam failure.

6 PLAN ADOPTION, IMPLEMENTATION, AND MAINTENANCE

6.1 ADOPTION

DMA Requirements §201.6(c)(3):

[The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Kings County and the participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan. The governing board for each participating jurisdiction has adopted this MJHMP by passing a resolution.

Implementation and maintenance of the plan are critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This section provides an overview of the overall strategy for plan implementation and maintenance, and outlines the method and schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

6.2 IMPLEMENTATION

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned to the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

Implementation will be accomplished by adhering to the schedules identified for each action (see Section 5 for County mitigation actions and the annexes for local participating jurisdiction mitigation actions), and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits of each project to the Kings County community and its stakeholders. These efforts include the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. The three main components of implementation are:

- **Implement** the action plan recommendations of this plan;
- **Utilize** existing rules, regulations, policies, and procedures already in existence; and
- **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 themselves to be better prepared. Also, publicize the success stories that are achieved through the HMPC's ongoing efforts.

During the implementation of these efforts, it is important to maintain constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements, should grants be pursued. When funding becomes available, the participating jurisdictions will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

For this update, the County's implementation program will emphasize mitigation projects and setting priorities based on loss reduction consistent with DMA requirements.

6.2.1 Role of the HMPC in Implementation and Maintenance

With the adoption of this plan, the participating jurisdictions will be tasked with plan implementation and maintenance. The participating jurisdictions, led by the Kings County OES agree to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Keep the concept of mitigation at the forefront of community decision-making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in the implementation and update of this plan;
- Report on plan progress and recommended changes to the Kings County Board of Supervisors and the governing boards of the other participating jurisdictions; and
- Inform and solicit input from the public.

The primary duty of the participating jurisdictions is to see the plan successfully carried out, and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the county website (and others as appropriate).

6.3 MAINTENANCE AND MONITORING

Requirement §201.6(c)(2)(i):

[The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as required or as progress, roadblocks, or changing circumstances are recognized. This section describes how public participation will be integrated throughout the plan maintenance and implementation process. It also explains how the mitigation strategies outlined in this plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land use planning processes and building code enforcement and implementation. The plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant.

6.3.1 Maintenance Schedule

In order to track progress and update the mitigation strategies identified in the action plan, the HMPC will revisit this plan at the following times or occurrences:

- Annually, to assess if mitigation actions/projects have been completed;
- Following a significant hazard event;
- Following a disaster declaration; or
- Any other time the HMPC sees it is prudent or necessary.

Annual Reviews: The HMPC will meet annually to assess progress on plan implementation. Kings County's OES Department will facilitate these reviews and an associated meeting. The timing of the annual meeting is recommended for the first or second quarter of each year to identify potential mitigation grants, some of which have a submittal period in the fourth quarter. A template for the annual meeting and a summary report is provided in Appendix E. Another tool developed during the 2022 -2023 update process to facilitate regular review and implementation and make the plan more of a "living document" is the MJHMP website, where the updated 2023 MJHMP and HMPs from previous years are available for public access. Various links to additional disaster and emergency preparation, hazard mitigation, as well as other related local, state, and federal-level information are also included on the MJHMP website. This website is accessible from the Kings County OES homepage. The County can use the MJHMP to post updates on the plan implementation process, such as grants submitted, grants pending review, and grant awards.

Critical Facility Database Maintenance: Moving forward the County and its municipalities will maintain the critical facility database that was prepared during the 2022-2023 update. The County's OES Manager will work with the County GIS Manager to lead periodic reviews of the database and assess the need for updates.

Five-Year Update: This plan will be updated, approved, and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000. Efforts to begin the update should begin no later than November 2027 in order to provide at least 9 to 12 months to facilitate the planning process, update the plan, and provide adequate time for public review. The County will monitor planning grant opportunities from the Cal OES and FEMA for funds to assist with the update. This may include submitting a BRIC grant application. This grant should be submitted in 2024, as there is a three-year performance period to expend the funds, and there is no guarantee that the grant will be awarded when initially submitted. This allows time to resubmit the grant in subsequent years if needed. Updates to this plan will follow the most current FEMA and Cal OES planning guidance. The next plan update should be completed and reapproved by Cal OES and FEMA Region VIII by October 2028.

6.3.2 Maintenance and Evaluation Process

The HMPC will continually observe the incorporation process, evaluation method, updating method, continued public participation, and completion of the action/projects to assure that the HMPC and the plan itself are performing as anticipated. By monitoring these processes, the HMPC will then be able to evaluate them at the time of the plan update, determining if any changes are needed.

The every five-year MJHMP plan update provides an opportunity to determine whether there have been any significant changes in the County that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, increased exposure to hazards, increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the MJHMP.

The plan review provides County officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses that were avoided due to the implementation of specific mitigation measures. The process for setting new priorities based on loss reduction is also emphasized in this MJHMP update process. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned.

During the five-year plan update process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the MJHMP:

- Do the goals address current and expected conditions?
- Are the goals and objectives consistent with changes in state and federal policy?
- Complete status update on all mitigation projects. What strategies should be revised?
- Has the nature or magnitude of risks changed (current and expected conditions)?
- Are the current resources appropriate for implementing the MJHMP?
- Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did the County and participating agencies and other partners participate in the plan implementation process as assigned?

The County of Kings is committed to involving the public in the continual reshaping and updating of the MJHMP, as discussed in Subsection 6.3.4.

6.3.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is the incorporation of the HMP recommendations and their underlying principles into other county and city plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. This plan should also be cross-referenced when related planning mechanisms are updated. As previously stated above, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment and jurisdictional annexes, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

These existing mechanisms include (but are not limited to) the following:

- County and local general plans (General Plan Safety Element)
- Community service district area plans and master plans
- County and local emergency operations plans
- County and local ordinances
- Flood/stormwater management/master plans
- Community wildfire protection plans
- GSPs
- Stormwater Resource Plans
- Urban Water Management Plans (UWMPs)
- CIPs
- Other plans and policies outlined in the capability assessments in the jurisdictional annexes
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in the updates to the planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As an action step to ensure integration with other planning mechanisms, the County OES Manager or designee will discuss this topic at the annual meeting of the HMPC described above in Subsection 6.3.1. The HMPC will discuss where there are opportunities to incorporate the plan into other planning mechanisms and who would be responsible for leveraging those opportunities. HMPC members representing local jurisdictions will work with their jurisdictional LPTs to integrate their identified mitigation actions into their local plans and programs. Efforts to integrate the HMP into local plans, programs, and policies will be reported at the annual HMPC plan review meeting, and a record of successful integration efforts will be kept.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan. Examples of a process for incorporation of the MJHMP into specific existing or upcoming planning mechanisms include:

- Each community (County, Avenal, Corcoran, Hanford, and Lemoore) should adopt (by reference or incorporation) this MJHMP into the Safety Element of their General Plan(s), as encouraged by AB 2140. Evidence of such adoption (by formal, certified resolution) shall be provided to Cal OES and FEMA to become eligible or maintain eligibility for CDDA funding. Also, specific risk and vulnerability information from the Kings County MJHMP can be incorporated into the General Plan; which, can in turn, inform the development of hazard overlay zones, or other policy changes designed to minimize hazard impacts.

6.3.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. Efforts will be made to involve the public in the plan maintenance, evaluation, and review process. This includes maintaining a digital version of the plan on the County OES website for public review. In addition, information on who to contact within the OES will be posted with the plan. The Kings County OES will maintain a file of comments received for reference during the next five-year update. Any revisions to the plan that may occur as a result of a disaster will also be made public and posted on the County website.

The next five-year update process also provides an opportunity to solicit participation from new and existing stakeholders and publicize success stories from the plan implementation and seek additional public comment. A public hearing(s) or survey to receive public comment on the plan will be held during the plan update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted, and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets as well as email and social media announcements.

Public involvement strategies that were used during the 2022 – 2023 planning process are captured in the Outreach Strategy in Appendix F. The appendix can serve as a reference for continued public involvement over the next several years and lays the foundation for outreach associated with the next formal five-year update. The HMPC should incorporate the following engagement concepts from the Outreach Strategy:

- Collaborate with Community Based Organizationss and faith-based organizations (i.e. Kings Tulare Homeless Alliance).
- Create stories and mitigation success announcements to use for publishing at media outlets.
- Distribute emails and postcards and newsletters to the public about hazard mitigation
- Participate in existing community events to share information about hazard mitigation (e.g., community farmer's markets, library events, senior centers).
- Continue to use the County's MJHMP Webpage as a distribution point or repository for HMP information.

7 PLAN ADOPTION

DMA Requirement §201.6(c)(5):

[The plan shall include…] Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council).

7.1 ELEMENT E.1 FORMAL PLAN ADOPTION DOCUMENTATION

Adoption by the local governing body demonstrates the community's commitment to implementing the mitigation strategy and authorizes responsible agencies to execute their actions. The final plan is not approved until Kings County and each participating jurisdiction adopt the plan and FEMA receives documentation of formal adoption by the governing body of each jurisdiction requesting approval. This plan is for Kings County, the unincorporated County, and its incorporated cities of Avenal, Corcoran, Hanford, and Lemoore.

Kings County and the four participating cities plan to submit this plan to the Kings County Board of Supervisors (BOS), and their respective city councils upon successful completion of State and federal review and following the issuance of an Approved Pending Adoption (APA) designation from FEMA. This provides an efficient approval process if FEMA determines the MJHMP requires revisions because the County and each participating city can make these revisions prior to initiating the local plan adoption process.

Once FEMA issues APA notification, adoption by each participating jurisdiction must take place within one year for each jurisdiction to become or remain eligible for FEMA HMA program funding. Given this is a multi-jurisdictional planning process, Kings County will coordinate the adoption of all four jurisdictions adoption process as soon as the plan receives APA status. Because each City/Board governing body has different meeting schedules, Kings County will also coordinate with each participating jurisdiction/agency regarding the timing of their adoptions to submit adoption documentation to Cal OES and FEMA at the same time.

Once the County records and submits the adoption documentation to Cal OES and FEMA, FEMA will issue an official approval letter stating which jurisdictions/agencies have adopted and are approved and eligible for FEMA HMA program funding. The approval letter will include an expiration date five years from the date of the letter and attached to the approval letter will be a final FEMA Local Mitigation Plan Review Tool that provides feedback on the strengths of the plan, recommendations for plan improvements during future plan updates, and suggestions for implementing the mitigation strategy.

7.2 GENERAL PLAN SAFETY ELEMENT INTEGRATION

The MJHMP was prepared consistent with the Kings County General Plan Health and Safety Element. The planning mechanisms cover common overlapping natural hazard issues and mutually-reinforcing policies and implementation programs. California Government Code Section 65302.10, (AB 2140) encourages California counties and cities to adopt their current, FEMA-approved LHMPs into the Safety Element of their General Plan. This adoption by reference or incorporation of the MJHMP into the Health and Safety Element of the General Plan follows plan approval and makes Kings County and each participating jurisdiction eligible to be considered for part or all of its local-share costs on eligible public assistance funding to be provided by the State under the CDAA. As such, AB 2140 compliance provides additional funding after a disaster occurs and this is an optional state incentive to help counties and cities become more resilient to natural hazards. Because compliance with AB 2140 expires when the MJHMP expires, the County must re-adopt the plan into the Health and Safety Element during update cycles to ensure continued compliance and funding eligibility. Additionally, each participating jurisdiction must adopt their annex into their own General Plan Safety Element, as the annex jurisdictions are not covered under the County's General Plan Safety Element adoption.

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