Irvine Ranch
WATER DISTRICT

IRVINE RANCH WATER DISTRICT

PUBLIC REVIEW DRAFT LOCAL HAZARD MITIGATION PLAN

JULY 2021

Michael Baker
INTERNATIONAL

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN - DRAFT

Lead Agency:

IRVINE RANCH WATER DISTRICT
15600 Sand Canyon Ave,
Irvine, CA 92618
Contact: Ms. Alix Stayton, Safety Specialist
(626) 598-1627

Prepared by:

MICHAEL BAKER INTERNATIONAL
5 Hutton Centre Drive, Suite 500
Santa Ana, California 92707
Contact: Ms. Noelle Steele
(949) 855-3683

DE NOVO PLANNING GROUP
Contact: Ms. Starla Barker, AICP
(949) 396-8193

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SECTION 1: INTRODUCTION AND PURPOSE

Natural disasters can cause significant damage to communities, businesses, public infrastructure, and the environment. The impacts specific to water and wastewater utilities and the individuals they serve can be immense, and infrastructure damage, like other damage caused by natural or manmade disasters, can impact public health and safety, the ability to respond to disaster, and can result in regional economic impacts. Because of this fact, it is important that water and wastewater utilities, which maintain public infrastructure and provide essential public services, enhance their ability to withstand and rebound from disasters. While no utility can protect itself against all potential impacts of natural hazards, utilities can reduce potential impacts by taking action to become more resilient.

Irvine Ranch Water District (IRWD) has worked for decades to improve local reliability and resiliency. These efforts have been founded in innovative planning, capital improvement projects, and enhancing emergency management practices. IRWD has also collaborated with other local and regional water agencies, service area cities and the County of Orange to enhance reliability and resiliency of both water and wastewater treatment through mutually beneficial projects.

In an effort to formalize existing efforts related to natural hazards and hazard mitigation planning, along with establishing a clear understanding of potential hazards and a coordinated plan to address these risks, IRWD developed this Local Hazard Mitigation Plan (LHMP). The LHMP is a blueprint for IRWD to reduce threats posed by natural hazards that may impact its infrastructure or operations. The LHMP will also enable IRWD to focus planning for and proactively mitigating natural hazards. This will allow IRWD to return to "normal" as soon as possible, with fewer impacts to people, facilities, and infrastructure, following a natural or man-made disaster.

1.1 PLAN PURPOSE

This LHMP identifies natural and human-induced hazards that threaten IRWD infrastructure and operations, and provides resources, information, and strategies to reduce these threats, resulting in overall risk reduction. The purpose of the LHMP is to provide IRWD with clear direction for hazard mitigation action planning.

This plan focuses on the mitigation component of the cycle shown in Figure 1.1, *Disaster Response Cycle*. Hazard mitigation plays an important role in reducing the impacts of disasters by identifying effective and feasible actions to reduce the risks posed by potential hazards before the incident occurs. IRWD has developed this plan in order to be consistent with current standards and regulations, ensuring that the understanding of hazards facing the community reflects best available information and present-day conditions.

Exhibit 1-1 Disaster Response Cycle

The LHMP does not supersede any internal or current IRWD plans or strategies; nor does the LHMP supersede any plans or strategies of IRWD customer cities. Rather, the LHMP enhances the ability to identify, inform, and mitigate hazard risks that are unique to the service area. Information in this plan will be used to help guide and coordinate mitigation

activities and serve as a tool for IRWD decision-makers to specifically direct mitigation activities and resources.

1.2 MITIGATION GOALS

The following goals for reducing disaster risk have been identified for the IRWD LHMP:

- **Reduce the Potential for Damage:** To reduce damage to IRWD critical assets from natural and man-made hazards.
- **Create a Decision Tool for Management:** To provide information so IRWD may act to address vulnerabilities.
- **Promote Compliance with State and Federal Program Requirements:** To ensure IRWD can take full advantage of State and federal grant programs, policies, and regulations.

1.3 PLAN AUTHORITY

FEDERAL

The federal Robert T. Stafford Disaster Relief and Emergency Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000 (DMA 2000) and supported by various regulations, directs hazard mitigation planning activities such as this plan. Water districts and purveyors are not required to prepare a LHMP, but the Stafford Act requires State, local, and tribal governmental entities that wish to be eligible for federal hazard mitigation grant funds to submit a hazard mitigation plan that outlines the processes for identifying the natural and man-made hazards, risks, and vulnerabilities of each jurisdiction (United States Code [USC] Title 42, Section 5156[a]). The Federal Emergency Management Agency (FEMA) has promulgated Code of Federal Regulations (CFR) Title 44, Part 201 to carry out the hazard mitigation planning requirements in the Stafford Act. These regulations direct the planning process, plan content, and FEMA approval of hazard mitigation plans.

This LHMP complies with the Stafford Act and DMA 2000, along with the appropriate sections of Title 44 of the CFR, including Parts 201, 206, and 322.

STATE

California Government Code Section 8685.9 (Assembly Bill [AB] 2140) limits the State of California's share of disaster relief funds paid out to local governments to 75 percent of the funds not paid for by federal disaster relief efforts, unless the jurisdiction has adopted a valid hazard mitigation plan consistent with DMA 2000. This LHMP is consistent with current standards and regulations, as outlined by the Governor's Office of Emergency Services (Cal OES) and FEMA. It uses the best available information and its mitigation actions reflect best practices and community values. This LHMP meets the requirements of current State and federal guidelines and ensures IRWD is eligible for all appropriate benefits under State and federal law and practices.

1.4 PLAN ADOPTION

Following FEMA approval, the IRWD Board of Directors will formally adopt the LHMP as its own Hazard Mitigation Plan. A copy of the resolution will be provided in Appendix A.

1.5 PLAN ORGANIZATION

The LHMP is organized into seven sections to reflect the logical progression of activities undertaken to develop the plan and includes all relevant documentation required to meet the necessary criteria for FEMA approval. Each section is briefly described below:

Section 1.0, Introduction and Purpose: Introduction describes the background, purpose, and mitigation goals of the plan, as well as the authority established for its development.

Section 2.0, Planning Process: Planning Process describes the LHMP planning process, as well as the meetings and outreach activities undertaken to engage partner agencies, stakeholders, and the public.

Section 3.0, Jurisdictional Profile: Jurisdictional Profile provides the history and geography of IRWD, along with a list of critical facilities and facilities of concern.

Section 4.0, Hazard Assessment: Hazards Assessment identifies and profiles the natural and human-induced hazards that affect the IRWD service area. The assessment includes the history, risk of future occurrence, and any effects of climate change on the frequency and intensity of identified hazards, where applicable. The selection of hazards and their prioritization is also discussed. This section also identifies the vulnerability and risk to the community and critical facilities associated with each hazard.

Section 5.0, Mitigation Strategy: Mitigation Strategy identifies the specific hazard mitigation actions to reduce potential risks to IRWD'S critical facilities and associated impacts to the residents and businesses it serves, in order to improve resiliency, and assesses capabilities to implement and achieve the mitigation actions.

Section 6.0, Plan Maintenance: Plan Maintenance discusses implementation of the plan, including the process to monitor, evaluate, update, and maintain the LHMP, and identifies opportunities for continued public involvement.

Section 7.0, References: References identifies the various resources utilized throughout development of the LHMP.

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SECTION 2: PLANNING PROCESS

Hazard mitigation planning in the United States is guided by statutory regulations described in the Disaster Mitigation Act of 2000 (DMA 2000) and implemented through Title 44 Code of Federal Regulations (CFR) Parts 201 and 206. FEMA's hazard mitigation plan guidelines outline a four-step planning process for the development and approval of hazard mitigation plans. Table 2-1, *DMA 2000 CFR Crosswalk*, lists the specific CFR excerpts that contain the requirements for approval, and identifies the applicable section of this LHMP.

Table 2-1
DMA 2000 CFR Crosswalk

DMA 2000 (44 CFR 201.6)	2021 LHMP Section
(1) Organize Resources	Section 2
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordination with other agencies
(2) Assess Risks	Section 4
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
3) Develop the Mitigation Plan	Section 5
201.6(c)(3)(i)	Set goals (Section 1)
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	Section 6
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

This section describes each stage of the planning process used to develop this LHMP. The LHMP planning process provides a framework to document the plan's development and follows the Federal Emergency Management Agency (FEMA)-recommended steps. The LHMP follows a prescribed series of planning steps which includes organizing resources; assessing risk; developing the mitigation plan; drafting, reviewing, and revising the plan; and adopting and submitting the plan for approval. Each step is described in this section.

2.1 ORGANIZING RESOURCES

One of the first steps in the planning process involved organization of resources, including identifying the LHMP Project Management Team, convening the LHMP Planning Team, and reviewing background material and documents.

2.1.1 LHMP PROJECT MANAGEMENT TEAM

The LHMP Project Management Team was responsible for day-to-day coordination of the LHMP work program, including forming and assembling the LHMP Planning Team; scheduling meetings; preparing, reviewing, and disseminating meeting materials; coordinating, scheduling, and participating in community engagement activities and meetings; and coordinating document review. The LHMP Project Management Team included staff from the IRWD Safety Department, who also participated on the LHMP Planning Team.

The LHMP Project Management Team worked with the LHMP Consultant Project Management Team throughout the development of the LHMP. The LHMP Consultant Project Management Team, consisting of hazard mitigation/planning professionals, provided guidance and support to

IRWD through facilitation of the planning process, data collection, community engagement, and meeting materials and document development.

2.1.2 LHMP PLANNING TEAM

In addition to IRWD staff, an invitation via email was sent to the following local and neighboring agencies advising them of IRWD's efforts to prepare a LHMP and requesting their involvement in preparation of the plan, including an invitation to attend LHMP Planning Team meetings:

- California State Water Resources Control Board;
- City of Costa Mesa (Office of Emergency Management);
- City of Irvine (Office of Emergency Management);
- City of Newport Beach (Police Department);
- City of Orange (Fire Department);
- City of Santa Ana (Emergency Management);
- City of Tustin (Tustin Police Department);
- Municipal Water District of Orange County (Water Emergency Response Organization of Orange County);
- Orange County Fire Authority; and,
- Orange County Sherriff Department.

The LHMP Planning Team consisted of IRWD staff, representing a diverse cross-section of departments and responsibilities. Members of the LHMP Planning Team represented the following IRWD departments:

- Automation;
- Collection Systems;
- Construction Services;
- Contracts & Risk Management and Safety;
- Electrical Services – Maintenance Operations;
- Engineering – Operations Support;
- Engineering – Planning
- Facilities Services & Fleet Services – Maintenance Operations;
- Field Services;
- Information Systems;
- Mechanical Services – Maintenance Operations;
- Michelson Water Recycling Plant Operations/Biosolids;
- Natural Treatment System Operations;
- Public Affairs;
- Regulatory Compliance;
- Safety Department;
- Water Operations Department;
- Water Quality; and
- Water Resources.

The Planning Team worked together to ensure the success of the planning process and is responsible for the LHMP implementation and future maintenance. The LHMP Planning Team's key responsibilities included:

- Participation in LHMP Planning Team meetings;
- Collection of valuable local information and other requested data;
- Decision on plan process and content;
- Development and prioritization of mitigation actions for the LHMP;
- Review and comment on plan drafts; and
- Coordination in the public engagement process.

Table 2-2, *LHMP Planning Team*, identifies the LHMP Project Management Team and LHMP Planning Team members along with their roles in the LHMP development.

Table 2-2
LHMP Planning Team

Name	Title/Role	Organization	LHMP Planning Team Role
IRWD Project Management Team			
Alix Stayton	Safety Specialist/LHMP Project Manager and Primary Point of Contact	Irvine Ranch Water District	LHMP Project Manager – Organization of LHMP Planning Team and meetings; participation in LHMP Planning Team meetings; facilitator of focused department meetings; development and participation in community outreach, hazard identification, capabilities assessment, mitigation actions and prioritization; and plan coordination and review. Served as primary point of contact for IRWD and the Consultant Project Management Team, LHMP Planning Team and the public.
Emilyn Zuniga	Safety Manager/LHMP Management Team	Irvine Ranch Water District	LHMP Project Management Team and LHMP Planning Team – Oversight and input on development and organization of LHMP Planning Team and meetings, participation in LHMP Planning Team meetings, hazard identification, capabilities assessment, mitigation actions and prioritization, and plan review.
LHMP Planning Team			
Allen Shinbashi	Manager of Risk & Contracts, Contracts & Risk Management	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions, Focus Group Discussions, Plan Review.
Amy Stonich	Assistant Director of Community Development	City of Lake Forest	Hazard Identification and Plan Review.
Andy Lauridsen	Fire Captain/Emergency Services Coordinator	Orange City Firefighters	Mitigation Actions and Plan Review.
Ashley Melchor	Management Assistant	City of Lake Forest	Mitigation Actions and Plan Review.
Baryic Hunter	Division Chief	Operations District 4, Orange County Fire Authority	Capabilities Assessment and Plan Review.
Cheryl Clary	Executive Director, Finance and Administration	Irvine Ranch Water District	Mitigation Actions and Plan Review.
Colt Martin	Mechanical Services Manager, Mechanical Services – Maintenance Operations	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussions, and Plan Review.
Dave Crowe	Construction Manager, Construction Services	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.

Table 2-2 (continued)
LHMP Planning Team

Name	Title/Role	Organization	LHMP Planning Team Role
Deniene Rivenburg	Public Affairs Specialist, Public Affairs	Irvine Ranch Water District	Hazard Identification and Plan Review.
Derek Moreno	Asset Systems Analyst	Irvine Ranch Water District	Mitigation Actions, Focus Group Discussion, and Plan Review.
Dorien McElroy	Collections Systems Manager, Collection Systems	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Dustin Grinstead	Administrative Captain for Chief Sherwood	Orange County Fire Authority – Division 2	Hazard Identification and Plan Review.
Eric Akiyoshi	Engineering Manager, Planning	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Plan Review, Focus Group Discussion.
Gaspar Garza	Operations Manager, MWRP Operations/Biosolids	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Ian Swift	Natural Resources Manager, Natural Treatment System Operations	Irvine Ranch Water District	Hazard Identification, Mitigation Actions, Focus Group Discussion, and Plan Review.
Jacob Moeder	Senior Engineer, Capital Projects	Irvine Ranch Water District	Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
James Colston	Director, Water Quality and Regulatory Compliance	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions, Focus Group Discussion, and Plan Review.
Jason Dempsey	Emergency Services Administrator, Police Department	City of Costa Mesa	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, and Plan Review.
Joe Lam	Automation Manager, Automation	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
John Dayer	Facilities/Fleet Manager, Facilities Services & Fleet Services – Maintenance Operations	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
John Fabris	Public Affairs Manager, Public Affairs	Irvine Ranch Water District	Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Jose Zepeda	Director, Recycling Operations	Irvine Ranch Water District	Capabilities Assessment, Mitigation Actions and Plan Review.
Ken Pfister	Operations Manager, Water Operations	Irvine Ranch Water District	Hazard identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Kevin Burton	Executive Director, Technical Services	Irvine Ranch Water District	Mitigation Actions and Prioritization, and Plan Review.
Lars Oldewage	Water Quality Manager, Water Quality	Irvine Ranch Water District	Mitigation Actions, Focus Group Discussion, and Plan Review.
Lisa Haney	Regulatory Compliance Manager, Regulatory Compliance	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Malcolm Cortez	Engineering Manager, Engineering – Operations Support	Irvine Ranch Water District	Hazard Identification, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.

Table 2-2 (continued)
LHMP Planning Team

Name	Title/Role	Organization	LHMP Planning Team Role
Marina Lindsay	Water Resources Planner, Planning	Irvine Ranch Water District	Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion and Plan Review.
Matthew Barba	Firefighter Paramedic, Station 6	Orange City Firefighters	Mitigation Actions and Plan Review.
Natalie Palacio	Water Resources Specialist	Irvine Ranch Water District	Mitigation Actions, Focus Group Discussion, and Plan Review.
Oliver Pacifico	Water – South Coast Section	State Water Resources Control Board	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, and Plan Review.
Owen O'Neill	Electrical & Instrumentation Manager, Electrical Services – Maintenance Operations	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Randy Williams	Network and Cybersecurity Manager, Information Systems	Irvine Ranch Water District	Hazard Identification, Mitigation Actions, Focus Group Discussion, and Plan Review.
Richard (Rick) Mykitta	Director of Maintenance	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions, Focus Group Discussion and Plan Review.
Robert (Bobby) Simmons	Emergency Management Administrator	Office of Emergency Management, City of Irvine	Hazard Identification and Plan Review.
Sarah Fetterling	Sergeant	Tustin Police Department	Capabilities Assessment and Plan Review.
Scott Toland	Senior Engineer	Irvine Ranch Water District	Mitigation Actions and Prioritization, Focus Group Discussion, and Plan Review.
Sharlyn de la Paz	Senior Management Analyst	City of Lake Forest	Hazard Identification and Plan Review.
Stephen Foster	Emergency Management Coordinator	City of Tustin	Mitigation Actions and Prioritization, and Plan Review.
Steve Rhyner	Emergency Operations Coordinator	Emergency Management, City of Santa Ana	Hazard Identification and Plan Review.
Todd Colvin	Water Maintenance Supervisor, Field Services	Irvine Ranch Water District	Mitigation Actions, Focus Group Discussion, and Plan Review.
Thomas Malone	Director for Information Services	Irvine Ranch Water District	Hazard Identification, Capabilities Assessment, Mitigation Actions and Prioritization, and Plan Review.
Vicki Osborn	Director of Emergency Management	Metropolitan Water District of Orange County	Hazard Identification, Capabilities Assessment, and Plan Review.
Wendy Chambers	Executive Director of Operations	Irvine Ranch Water District	Capabilities Assessment, Mitigation Actions and Prioritization, and Plan Review.

The LHMP Planning Team held four meetings, as summarized in Table 2-3, *LHMP Planning Team Meeting Summary*. Meetings were held virtually via Microsoft Teams, to accommodate the COVID-19 related "safer at home" mandates in place during the first half of 2021. Meeting materials, including PowerPoint presentations, roll-call sheets, agendas, notes, and other relevant handouts, are provided in Appendix B, *LHMP Planning Team Meetings*.

Table 2-3
LHMP Planning Team Meeting Summary

Date	Meeting	Discussion Items
January 27, 2021	Planning Committee Meeting #1	• Project goals, objectives, and expectations • Purpose and requirements of the LHMP • Hazard identification and prioritization • Critical facilities introduction
February 24, 2021	Planning Committee Meeting #2	• Summary of hazards/hazard profiles • Risk assessment methodology • Critical facilities discussion • Capabilities assessment and identification • Public involvement update
March 31, 2021	Planning Committee Meeting #3	• Risk assessment and vulnerability overview • Critical facilities discussion and update • Mitigation strategy discussion • Public involvement update
May 5, 2021	Planning Committee Meeting #4	• Hazard mitigation goals • Risk assessment and vulnerability overview/updates • Public involvement, survey summary • Mitigation strategy discussion

The LHMP Project Management Team hosted additional focused discussions throughout the LHMP development process with specific LHMP Planning Team members. The intent of the focus discussions was to allow for more detailed questions and information sharing specific to the LHMP Planning Team members' areas of expertise and job responsibilities. Topics of discussion included: critical facilities identification, LHMP goals articulation, mitigation action development (including priority and timeline assignment), and capabilities identification. These focused discussions allowed for more complete information to be presented during the LHMP Planning Team meetings, and meaningful discussion to occur.

2.1.3 PUBLIC OUTREACH

A public outreach and engagement strategy were developed to maximize public involvement in the LHMP planning process. The LHMP public outreach strategy included a dedicated webpage, community survey, and public review draft distribution, as described below; refer to Appendix B.

WEBPAGE

A dedicated webpage was developed on IRWD's website for the LHMP and development process. The webpage provided information on the LHMP and how the public can be involved in the planning process. A link to complete the community survey was posted to encourage participation. The website was updated throughout the planning process and provided notifications and access to LHMP materials. The draft LHMP was also made available for review through this webpage.

COMMUNITY SURVEY

A community survey was developed to obtain input from IRWD customers about various hazards and hazard mitigation topics. In addition to basic demographic information (e.g., zip code and age), the survey asked participants to identify specific safety concerns, including identifying what hazards they felt were most likely to impact their neighborhood or property. Participants were also asked what actions they had taken to be more resistant to hazards, and preferences for the IRWD communication methods. Information gained from the survey was presented to the LHMP

Planning Team during Meeting #4 and was used to identify potential mitigation actions and assist in ranking the mitigation action prioritization and timeline.

The survey was open between February 2 to March 31, 2021 and was made available on the LHMP webpage, as mentioned above. A blog post regarding the survey was posted on IRWD's "Liquid News" segment on February 2, 2021. Additionally, the survey link was included with two cycles of IRWD's "Pipelines" newsletter, included within IRWD's monthly billing. The survey was also posted on IRWD social media pages (Facebook and Instagram). Members of the LHMP Planning Team also distributed the survey link to their colleagues and constituents. Ultimately, the survey received 1,750 responses. Over 800 survey participants provided their contact information and requested to be notified when the public review draft LHMP was made available.

PUBLIC REVIEW DRAFT LHMP

A public review draft LHMP was made available on the LHMP webpage for the public to review and comment for a two- week (14-day) period beginning July 20, 2021 to August 3, 2021. Additionally, the public review draft LHMP link was emailed directly to the survey respondents who requested to be notified. Information was provided on how to submit comments or ask questions regarding the draft LHMP.

BOARD OF DIRECTORS

The draft LHMP was considered by the IRWD Board of Directors, as part of their regularly scheduled public meeting on November XX, 2021. The presentation included an overview of the LHMP and the plan development process. Following the presentation, the Board of Directors adopted the LHMP.

2.1.4 REVIEW AND INCORPORATE EXISTING INFORMATION

The LHMP Planning Team referenced a variety of plans, studies, data, and technical reports available from local, State, and federal sources to prepare the LHMP. Primary resources reviewed and incorporated as part of the LHMP planning process are listed in Table 2-4, *Primary Plan Resources*. A complete list of resources is included in Section 7.0, *References*.

Table 2-4
Primary Plan Resources

Plans, Studies, Reports and Other Technical Data/Information	Planning Process/Area of Document Inclusion
California Department of Forestry and Fire Protection (CAL FIRE)	Hazard Profiles; Vulnerability Assessment; Mitigation Strategy
Cal-Adapt	Hazard Profiles; Vulnerability Assessment; Mitigation Strategy
California Department of Water Resources	Hazard Profiles
California Geological Survey	Hazard Profiles; Vulnerability Assessment
FEMA Local Hazard Mitigation Plan Guidance	Multiple Plan Sections
FEMA Map Service Center	Hazard Profiles; Vulnerability Assessment
IRWD Dam Emergency Action Plans (Rattlesnake, San Joaquin, Sand Canyon, Santiago Creek, Syphon) and Approved Inundation Maps	Hazard Profiles, Vulnerability Assessment, Mitigation Strategy (for information about High Hazard Potential Dams)
IRWD Emergency Operations Plan	Multiple Plan Sections
IRWD Sewage Treatment Master Plan	Mitigation Strategy
IRWD Urban Water Management Plan	Hazard Profiles; Vulnerability Assessment
IRWD Water Shortage Contingency Plan Update	Hazard Profiles; Vulnerability Assessment; Mitigation Strategy
IRWD Water Supply Reliability Evaluation	Mitigation Strategy
IRWD Water System Risk and Resilience Assessment	Multiple Plan Sections
National Oceanic and Atmospheric Administration	Hazard Profiles
National Weather Service	Hazard Profiles

Table 2-4 (continued)
Primary Plan Resources

Plans, Studies, Reports and Other Technical Data/Information	Planning Process/Area of Document Inclusion
Orange County and Orange County Fire Authority Local Hazard Mitigation Plan	Hazard Profiles
Orange County General Plan	Hazard Profiles
Orange County Regional Water and Wastewater MJHMP	Hazard Profiles; Vulnerability Assessment
Southern California Earthquake Data Center	Hazard Profiles
State of California Multi-Hazard Mitigation Plan	Hazard Profiles
U.S. Drought Monitor	Hazard Profiles; Vulnerability Assessment
U.S. Geological Survey	Hazard Profiles; Vulnerability Assessment

2.2 ASSESS RISKS

In accordance with FEMA requirements, the LHMP Planning Team identified and prioritized the natural hazards affecting IRWD and assessed the service area's associated vulnerability from those hazards. Results from this phase of the LHMP planning process aided subsequent identification of appropriate mitigation actions to reduce risk from these hazards; refer to Section 5.0, *Mitigation Strategy*.

2.2.1 IDENTIFY/PROFILE HAZARDS

Based on a review of past historical hazards, as well as a review of existing plans, reports, and other technical studies, data, and information, the LHMP Planning Team determined which specific hazards could affect IRWD infrastructure and operations. Content for each hazard profile is provided in Section 4.0, *Hazards Assessment*.

2.2.2 ASSESS VULNERABILITIES

Hazard profiling exposed the unique characteristics of individual hazards and begins the process of determining which areas within the IRWD service area are vulnerable to specific hazard events. The vulnerability assessment included input from the LHMP Planning Team and a GIS overlaying method for mapped hazard risk assessments. Using these methodologies, IRWD infrastructure impacted by hazards were identified and potential loss estimates were determined, where available. The vulnerability assessments for each hazard is provided in Section 4.0.

2.3 DEVELOP MITIGATION PLAN

2.3.1 IDENTIFY GOALS

Internally, IRWD reviewed mitigation goals from hazard mitigation plans of customer cities and local/regional water and wastewater purveyors. An internal focus group developed three mitigation goals to include in the LHMP. The mitigation goals were then presented to the Planning Team for discussion, comment, and incorporation into the LHMP. The Mitigation Goals are included in Section 1.0, *Introduction*.

2.3.2 DEVELOP CAPABILITIES ASSESSMENT

A capabilities assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to IRWD for mitigation action implementation, prescribed in the LHMP. The LHMP Project Management and Planning Team identified the planning and regulatory;

administrative and technical; financial; and education and outreach capabilities to implement mitigation actions, as detailed in Section 5.0.

2.3.3 IDENTIFY MITIGATON ACTIONS

As part of the LHMP planning process, the LHMP Planning Team worked to identify and develop mitigation actions, after which mitigation actions were prioritized as “high”, “medium” or “low”. The process began with the LHMP Planning Team identifying issues or concerns associated with the profiled hazards and vulnerabilities, then identifying potential ways in which the issue or concern could be addressed. During this process, the capabilities assessment was also referenced to better understand if the capability already existed and needed to be expanded, or if the capability was not currently available. A detailed discussion of the identification and prioritization of mitigation actions is provided in Section 5.0.

2.3.4 PLAN ADOPTION AND SUBMITTAL

This plan will be submitted to Cal OES and FEMA for review. Upon receiving “approvable pending adoption” notification from FEMA, this plan will be presented to IRWD Board of Directors for their consideration and approval. If approved, a copy of the resolution will be provided in Appendix A, *IRWD Adoption Resolution*.

2.3.5 PLAN MAINTENANCE

Plan maintenance procedures, found in Section 6.0, include the measures IRWD will take to ensure the LHMP’s continuous long-term implementation. The procedures also include the manner in which the LHMP will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document.

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SECTION 3: JURISDICTIONAL PROFILE

IRWD is an independent special district serving multiple jurisdictions in central Orange County, California; refer to Exhibit 3-1, *Regional Location*. IRWD provides potable drinking water, wastewater collection and treatment, recycled water, and urban runoff treatment to customers in the service area. IRWD also participates in water banking activities to create emergency supplies and protect against drought conditions or other water shortages. IRWD provides water and wastewater services to approximately 425,208 residential customers and serves a district daytime population of over 600,000 people.[1]

IRWD's water supply portfolio includes groundwater (clear and treated), imported water, recycled water, and local surface water; a breakdown of water distribution by type is outlined in Table 3-1, *IRWD Water Portfolio*.

Table 3-1
IRWD Water Portfolio

Water by Source/Type	Acre-Feet per Year
Groundwater	27,382
Recycled Water	24,913
Treated Groundwater	19,523
Imported Water	17,398
Local Surface Water	5,165
TOTAL WATER	**94,381**

Irvine Ranch Water District, *Irvine Ranch Water District: An Overview,* https://www.irwd.com/images/pdf/about-us/factsheet.pdf, published February 2020, accessed May 1, 2021.

IRWD is governed by a five-member publicly elected Board of Directors, responsible for IRWD's policies and decision making. Day-to-day operations are supervised by the General Manager and IRWD staff.

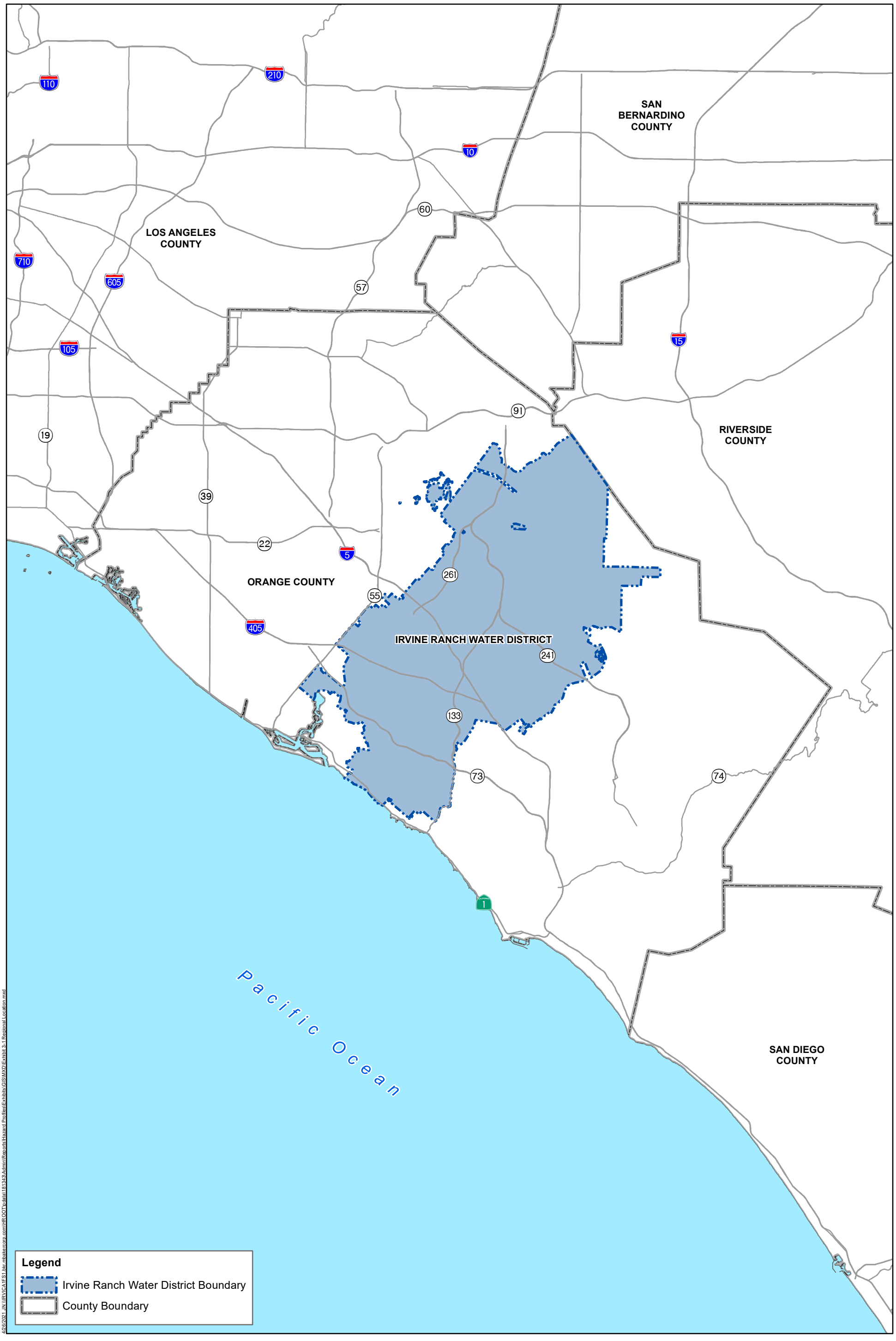
3.1 PHYSICAL SETTING

IRWD provides both water and wastewater services in six cities and several unincorporated communities within central Orange County, California; refer to Exhibit 3-2, *Irvine Ranch Water District Service Area*. The service area encompasses approximately 181 square miles (about 20 percent of Orange County) extending from the Pacific Coast to the Santa Ana Mountain foothills. IRWD customer cities include Irvine, portions of Costa Mesa, Lake Forest, Newport Beach, Orange, Tustin, and unincorporated areas of Orange County.

3.2 HISTORY

IRWD has provided potable water and wastewater services to residents in Orange County since 1961. Shortly after IRWD was established, the Board of Directors implemented a vision to integrate water recycling into the design of the community. In 1967, IRWD began providing recycled water for irrigation, industrial, and other non-potable uses within the service area. This vision in the early years of IRWD's history has resulted in more than 25 percent of the service area water demands being met with recycled water. For the past 60 years, IRWD has expanded potable water and wastewater services in an urbanizing service area.

[1] Irvine Ranch Water District. *About Us*. https://www.irwd.com/about-us. Accessed March 11, 2020.



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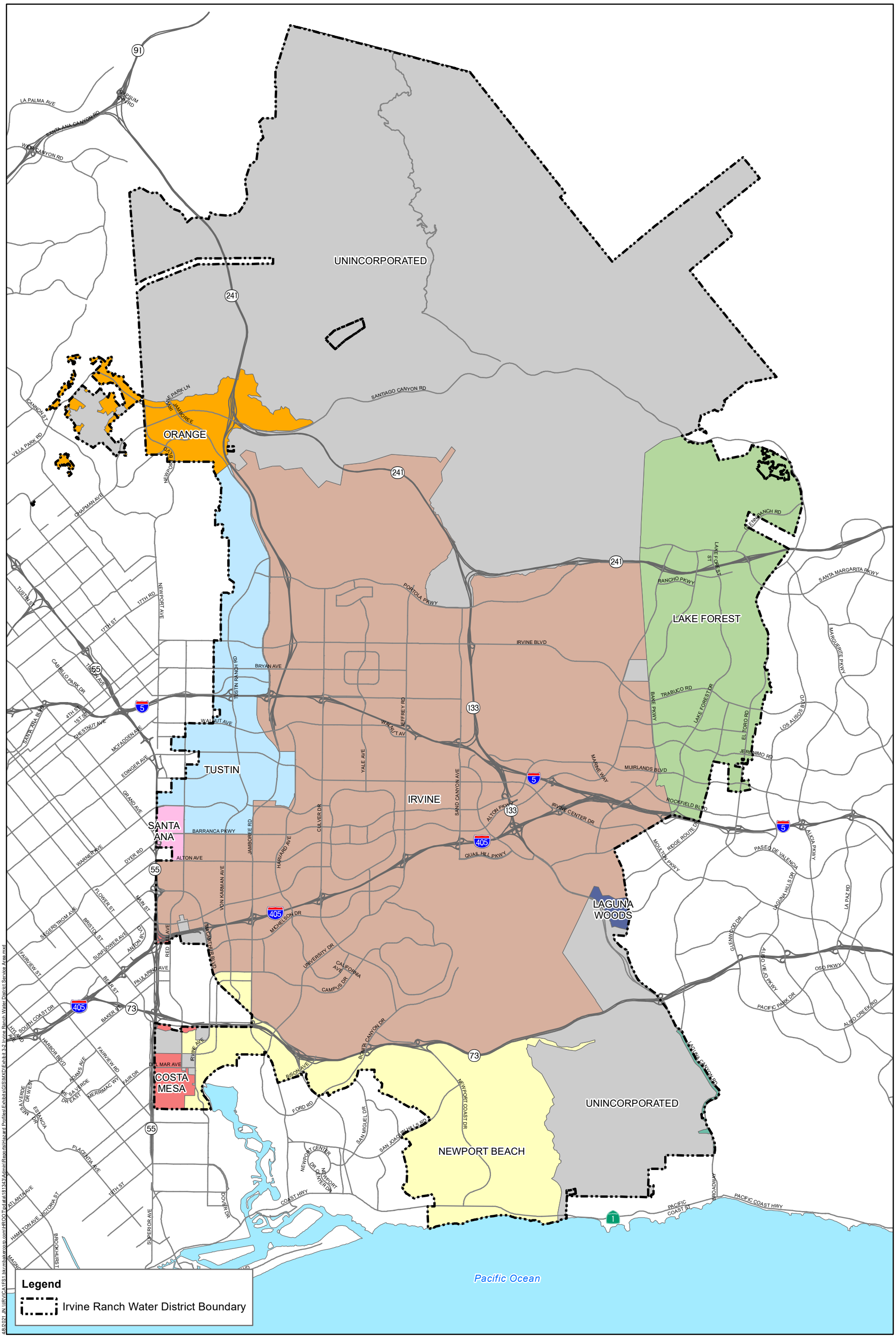
Irvine Ranch Water District Local Hazard Mitigation Plan

Regional Location

Data Source: IRWD, 2021, State of California, 2007

Exhibit 3-1



Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District Service Area

Data Source: IRWD, 2021

Exhibit 3-2

In 1979, IRWD began developing local water supplies to reduce dependence on imported water – primarily expanding groundwater and surface water supplies within the IRWD service area. In 1990, over 66 percent of IRWD's water portfolio depended on imported water. In 2020, imported water accounted for 18 percent of the portfolio due to the expansion of groundwater, surface water, and recycled water.[2]

In 1997, IRWD began treating urban runoff by reconstructing wetlands at the San Joaquin Marsh and Wildlife Sanctuary in Irvine. Runoff from the nearby San Diego Creek is diverted into a series of manmade water quality treatment ponds and wetlands, where natural ecosystems remove sediment, nutrients, pathogens and other contaminants from dry weather runoff. This gives plants and soils the time to naturally remove nitrates and other pollutants before the water enters the Upper Newport Back Bay and eventually the Pacific Ocean.[3]

Over the last 20 years, IRWD has consolidated with five local water districts through mutual agreement. The benefits of consolidation, in which smaller water districts in Orange County become incorporated into IRWD, include lower rates and charges for customers, improved customer service, increased operational efficiencies, lower administrative costs, enhanced reliability, and equitable treatment of all areas within the consolidated district. Table 3-2, *Consolidated Districts in IRWD History*, shows each water district or company that IRWD has consolidated with, as well as the cities/communities to which each district previously provided services.

Table 3-2
Consolidated Districts in IRWD History

Water District/Company	Serviced Cities/Communities	Consolidation Date
Orange Park Acres Mutual Water Company	East of the City of Orange	June 1, 2008
Santiago County Water District	East of the City of Orange and the City of Tustin	July 6, 2006
Los Alisos Water District	The City of Laguna Hills, Laguna Woods, the City of Lake Forest, west of the City of Mission Viejo, north of the Aliso Viejo	January 1, 2001
Carpenter Irrigation District	N/A	December 31, 1998
Santa Ana Heights Mutual Water Company	N/A	1997
Source: Irvine Ranch Water District, *Consolidations*, https://www.irwd.com/about-us/consolidations, accessed March 11,2021.		

3.3 CRITICAL FACILITIES AND FACILITIES OF CONCERN

The LHMP Planning Team identified 83 critical facilities and facilities of concern for incorporation in the hazard vulnerability/risk analysis; refer to Table 3-3, *Irvine Ranch Water Districts Critical Facilities and Facilities of Concern*. All listed critical facilities and facilities of concern are owned, operated, and maintained by IRWD with the exception of Critical Facility #5, Met Source Water (maintained by the Municipal Water District of Orange County). The critical facilities label is assigned to facilities that are vital and significant to providing potable water and wastewater services to IRWD customers. The failure of a critical facility would result in significant issues in maintaining service to customers and may result in a disruption of service. Some critical facilities are the sole source of water at their location, do not have a backup option, or provide service to areas with known hazards or risk. Facilities of concern are important in providing potable water and wastewater services to IRWD customers but are not critical to providing these services. A

[2] Irvine Ranch Water District. *Irvine Ranch Water District: An Overview.* https://www.irwd.com/images/pdf/about-us/factsheet.pdf. February 2020
[3] Irvine Ranch Water District. *Services, Urban Runoff.* https://www.irwd.com/services/urban-runoff#:~:text=IRWD%20began%20treating%20urban%20runoff,for%20seven%20to%2010%20days, accessed Mary 11, 2021.

facility of concern failure would create slowdowns or challenges, but ultimately IRWD would be able to maintain service to customers in the short-term.

IRWD critical facilities are identified on Exhibit 3-3, *Irvine Ranch Water District - Critical Facilities and Facilities of Concern*. For graphical and clarity purposes, Critical Facility #3, Distribution System and Critical Facility, and Critical Facility #63, Sewer Collection System, are shown on their own exhibits; refer to Exhibit 3-4, *Irvine Ranch Water District – Distribution System* and Exhibit 3-5, *Irvine Ranch Water District – Sewer Collection System*. It is also noted that two assets, Critical Facility #58, Enterprise Information System, and Critical Facility #59, Supervisory Control and Data Acquisition (SCADA) System, are technology assets, and thus are not mapped on Exhibits 3-4 and 3-5 (and on the following exhibits in Section 4.0).

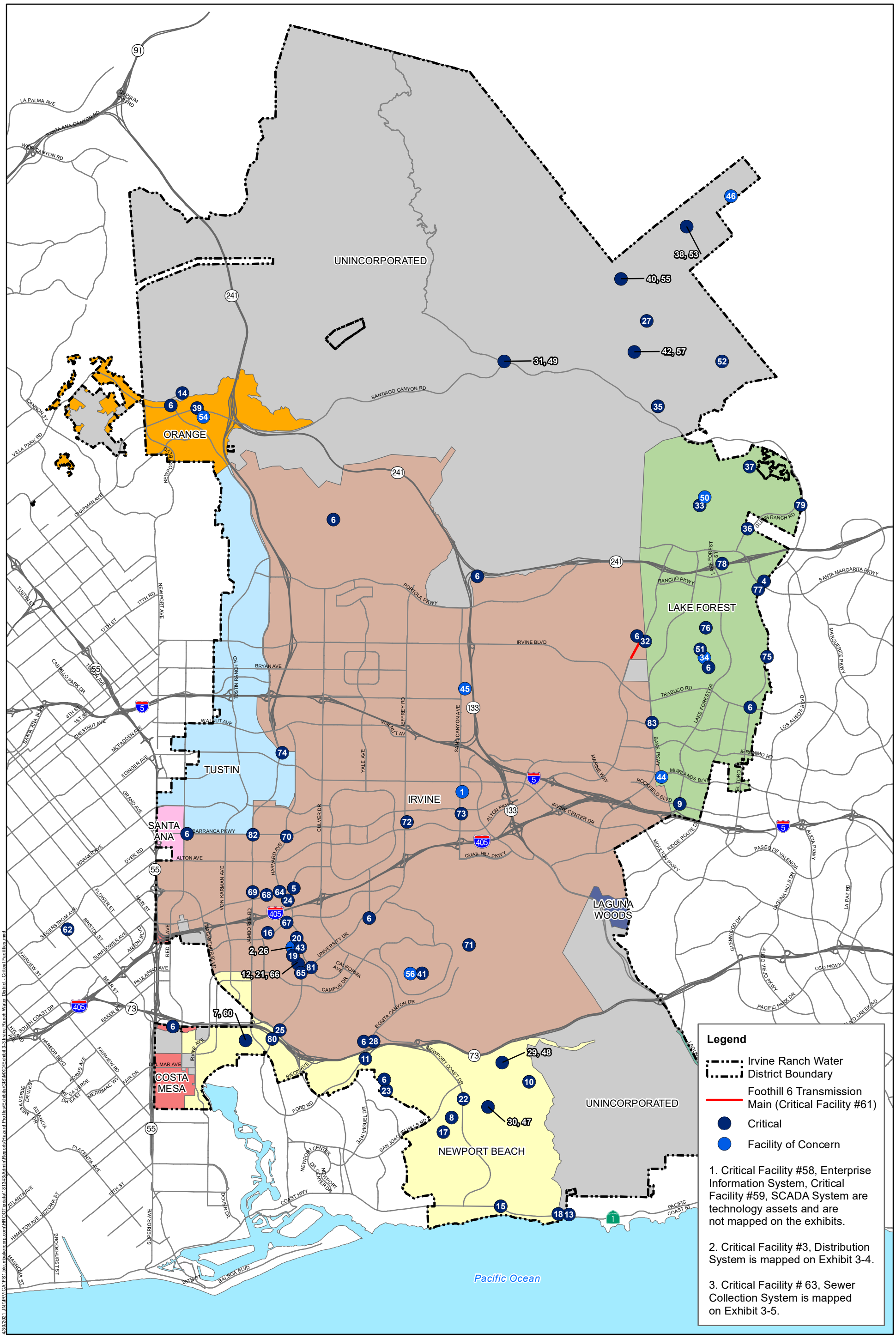
Where available, the LMHP Project Management Team and LHMP Planning Team identified a facility's potential loss value, comprised of replacement and contents values for each facility. If a critical facility or facility of concern is destroyed in a hazard event, the replacement and contents values indicate the cost to replace the entire facility and any contents within the facility. Typically, the cost to repair a damaged facility would be less than the replacement value. While the replacement and contents values are used throughout this plan to estimate potential losses, it is noted that the actual cost to recover from a hazard event will depend on the type and magnitude of the event.

Table 3-3
Irvine Ranch Water Districts Critical Facilities and Facilities of Concern

ID	Name	Facility Type	Critical Facility	Facility of Concern
1	Headquarters Building	Administrative Offices		X
2	Michelson Biosolids	Biosolids Treatment		X
3	Distribution System	Distribution System	X	
4	El Toro Diversion Structure	Diversion Structure	X	
5	San Mateo Diversion	Diversion Structure	X	
6	Met Source Water	Intake	X	
7	Bayview	Lift Station	X	
8	Buck Gully	Lift Station	X	
9	Canada	Lift Station	X	
10	Coastal Ridge	Lift Station	X	
11	Coyote Canyon	Lift Station	X	
12	Duck Club	Lift Station	X	
13	El Morro School	Lift Station	X	
14	Irvine Park	Lift Station	X	
15	Los Trancos Low Flow	Lift Station	X	
16	Michelson	Lift Station	X	
17	Montecito	Lift Station	X	
18	Muddy Canyon Low Flow	Lift Station	X	
19	MWRP MPS-3	Lift Station	X	
20	MWRP Auto Shop	Lift Station	X	
21	MWRP Caretaker Housing	Lift Station	X	
22	Newport Coast	Lift Station	X	
23	San Joaquin Housing	Lift Station	X	
24	HATS Lift Station	Lift Station	X	
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	X	
26	Michelson Operations Center	Operations Staff Offices		X
27	Benner Reservoir	Pump Station	X	
28	Coastal OC 63-Zn.4 Pump Station	Pump Station	X	
29	Coastal Zn 6-7 Pump Station	Pump Station	X	

Table 3-3 (continued)
Irvine Ranch Water Districts Critical Facilities and Facilities of Concern

ID	Name	Facility Type	Critical Facility	Facility of Concern
30	Coastal Zn. 4-6 Pump Station	Pump Station	X	
31	Fleming Pump Station	Pump Station	X	
32	Foothill Zn 4-6 Pump Station	Pump Station	X	
33	Foothill Zn 6-6A Pump Station	Pump Station	X	
34	Lake Forest 4-5 West	Pump Station		X
35	Manning Pump Station	Pump Station	X	
36	Portola Hills Zn 6-8	Pump Station	X	
37	Portola Hills Zn 8-9 Pump Station	Pump Station	X	
38	Read Pump Station	Pump Station	X	
39	Santiago Hills Zn 5-6	Pump Station	X	
40	Shaw Pump Station	Pump Station	X	
41	Turtle Rock Zn 3-4 Pump Station	Pump Station	X	
42	Williams Canyon Pump Station (Benner)	Pump Station	X	
43	Michelson MWRP	Recycled Water	X	
44	Los Alisos Water Recycling Plant (LAWRP)	Recycling Plant		X
45	Central Irvine Zn 1 Reservoir	Reservoir		X
46	Chapman Reservoir	Reservoir		X
47	Coastal Zn 4 Reservoir	Reservoir	X	
48	Coastal Zn 6 Reservoir	Reservoir	X	
49	Fleming Reservoir	Reservoir	X	
50	Foothill Zn 6 Reservoir	Reservoir		X
51	Lake Forest Zn 4 Tank 1 & Tank 2	Reservoir	X	
52	Modjeska Reservoir	Reservoir	X	
53	Read Reservoir	Reservoir	X	
54	Santiago Canyon Zn 5	Reservoir		X
55	Shaw Reservoir	Reservoir	X	
56	Turtle Rock Zn 3	Reservoir		X
57	Williams Canyon Reservoir	Reservoir	X	
58	Enterprise Information System	Technology	X	
59	SCADA System	Technology	X	
60	Bayview Telemetry	Telemetry Site	X	
61	Foothill 6 Transmission Line	Transmission Main	X	
62	Deep Aquifer Treatment System (DATS)	Treatment System	X	
63	Collection System	Wastewater Collection System	X	
64	Harvard Area Trunk Diversion Structure (HATS)	Diversion Structure	X	
65	S1	Siphon	X	
66	S2	Siphon	X	
67	S3	Siphon	X	
68	S4	Siphon	X	
69	S5	Siphon	X	
70	S6	Siphon	X	
71	S7	Siphon	X	
72	S8	Siphon	X	
73	S9	Siphon	X	
74	S10	Siphon	X	
75	S11	Siphon	X	
76	S12	Siphon	X	
77	S13	Siphon	X	
78	S14	Siphon	X	
79	S15	Siphon	X	
80	S16	Siphon	X	
81	S18	Siphon	X	
82	S19	Siphon	X	
83	S17	Siphon	X	



4/30/2021 J:\IRVINE\GIS\MXD\Exhibit 3-3 Irvine Ranch Water District - Critical Facilities.mxd

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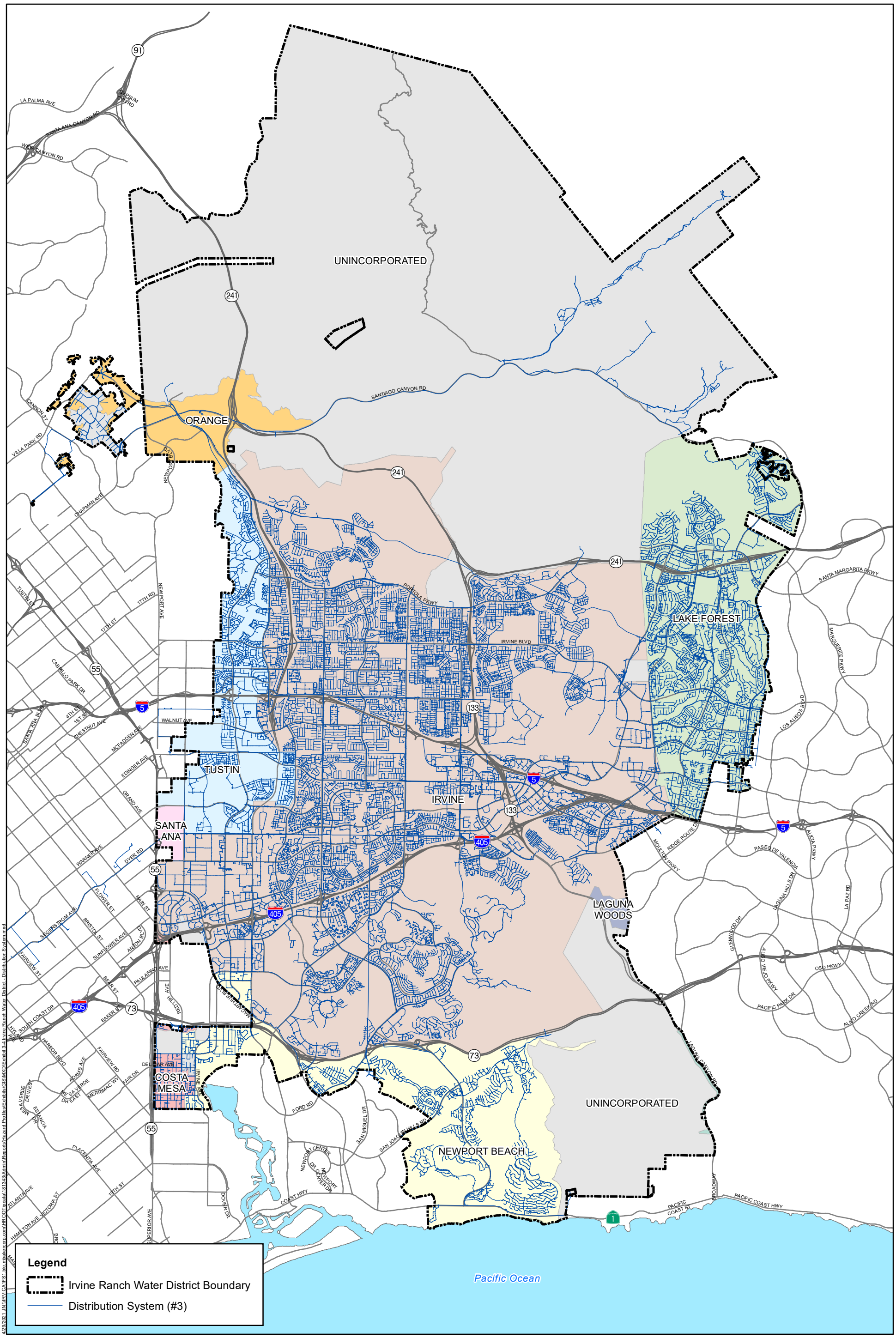
Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District - Critical Facilities

Data Source: IRWD, 2021

Exhibit 3-3



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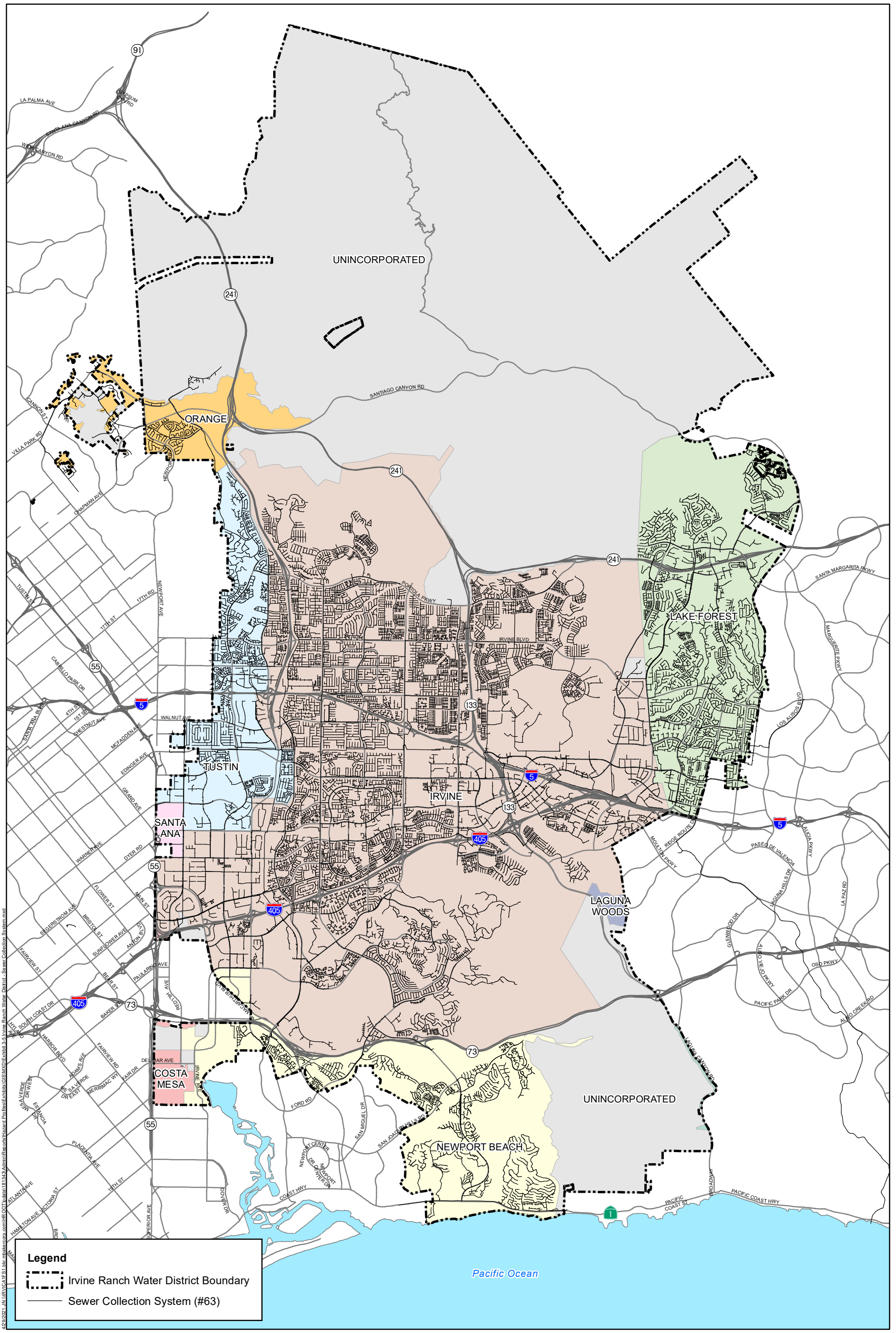
Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District - Distribution System

Source: IRWD, 2021

Exhibit 3-4



Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District - Sewer Collection System

Source: IRWD, 2021

Exhibit 3-5

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SECTION 4: HAZARD ASSESSMENT

4.1 HAZARD IDENTIFICATION AND PRIORITIZATION

4.1.1 HAZARD IDENTIFICATION

The first step in developing the risk assessment is identifying the hazards. Federal Emergency Management Agency (FEMA) guidance identifies several hazards that may affect communities. The list of hazards is comprehensive, but not meant to be exhaustive or limit a community from identifying other hazards within their plans. Additionally, a community may not be susceptible to all hazards identified for consideration. In reviewing the FEMA list of hazards, the Planning Team discussed the potential for each hazard to affect the community. The team discussed previous occurrences within the IRWD service area, considerations of the local geography, and the Planning Team's professional experience and knowledge. Table 4-1, *IRWD Hazard Identification*, summarizes the Planning Team's discussion and determination of hazards for inclusion in the LHMP.

Table 4-1
IRWD Hazard Identification

Hazards	Include in LHMP?	Discussion of Hazard's Inclusion or Exclusion
Avalanche	No	Not applicable to IRWD as snowfall does not regularly occur within the jurisdiction, and there is no historical record of avalanche in the area.
Climate Change	Yes	Climate change is closely correlated with several hazards profiled in the LHMP and may exacerbate hazards that affect IRWD. Therefore, climate change is discussed within each hazard profile.
Coastal Erosion	No	Coastal erosion was evaluated by the Planning Team as an identified hazard, due to the small coastal section of IRWD's jurisdiction. A draft of the hazard was prepared, in coordination with sea level rise and tsunami. Upon further research, it was confirmed that projected coastal erosion within IRWD's jurisdiction is considered minor and no critical infrastructure was identified as vulnerable. Additionally, IRWD has not experienced impacts due to coastal erosion. Thus, the Planning Team elected to remove coastal erosion from the LHMP and no mitigation actions are included.
Coastal Storm	Yes	Coastal storms are evaluated together with the severe storm hazard profile, below.
Dam Failure	Yes	IRWD owns and maintains several dams and reservoirs located upstream of highly populated areas within the jurisdiction. Critical infrastructure is located within mapped inundation zones.
Disease/Pest Management	No	Not applicable; disease and pest management is not a hazard that impacts the operation of water/wastewater facilities and infrastructure.
Drought	Yes	The IRWD water portfolio includes groundwater and imported surface water supply, both of which are susceptible to drought. IRWD has experienced several historical droughts, including the most recent State-declared drought emergency from 2014 through 2017.
Earthquake Fault Rupture	Yes	Mapped fault lines are known within the IRWD service area. Fault rupture is included under the Seismic Hazards profile.
Expansive Soils	Yes	Portions of the IRWD service area include known expansive soils. This hazard is profiled under Geological Hazards.
Extreme Heat	No	Extreme heat is not a hazard that typically affects the IRWD service area, which is characterized by mild temperatures; nor would extreme heat traditionally affect the operations of water/wastewater services.
Flood	Yes	Significant portions of the IRWD service area are located within FEMA mapped floodplains and have experienced historic flooding. Localized flooding can also occur during severe rainstorms.

Table 4-1 (continued)
IRWD Hazard Identification

Hazards	Include in LHMP?	Discussion of Hazard's Inclusion or Exclusion
Geological Hazards	Yes	IRWD is located in an area with known and mapped geological hazards. This topic includes expansive soils and land subsidence.
Hailstorm	No	Not applicable; significant hailstorms rarely occur within the IRWD service area.
Hazardous Materials	Yes	Hazardous materials (including intentional or accidental releases) could compromise IRWD water supplies and infrastructure. This topical area is included under the Human-Induced Hazards profile.
Human-Caused Hazards	Yes	The Planning Team identified the following human-induced hazards within the IRWD jurisdiction: hazardous materials release (including an IRWD release or an external release) and terrorism/sabotage (including cyberattacks). Heightened security concerns have resulted in increased measures to protect infrastructure systems.
Hurricane	No	Hurricanes do not occur within the IRWD jurisdiction.
Land Subsidence	Yes	Portions of the IRWD service area include mapped land subsidence. This hazard is profiled under Geological Hazards.
Landslide/Mudflow	Yes	The IRWD service area includes mapped landslide hazard zones. Additionally, portions of the service area have experienced mudflow incidents.
Lightning	No	Significant lightning events do not typically occur within the IRWD service area.
Liquefaction	Yes	The IRWD service area is located within mapped liquefaction hazard zones. Liquefaction is included under the Seismic Hazards profile.
Sea Level Rise	No	Sea level rise was evaluated by the Planning Team as an identified hazard due to the small coastal section of IRWD's jurisdiction. A draft of the hazard was prepared, in coordination with coastal erosion and tsunami. Upon further research, it was confirmed that projected sea level rise mapping within IRWD's jurisdiction is considered minor and no critical infrastructure was identified as vulnerable. Additionally, IRWD has never experienced impacts from sea level rise historically and all other flooding incidents/information are covered in the Flood profile. Thus, the Planning Team elected to remove sea level rise from the LHMP and no mitigation actions are included.
Seismic Hazards	Yes	The IRWD service area is located within a seismically active region in southern California, and is susceptible to ground shaking, fault rupture, and liquefaction. For organizational purposes, these three hazards are profiled together under seismic hazards.
Severe Winter Storm	Yes	The climate within southern California does not result in severe winter storms such as ice storms, blizzards or significant snowfall. However, the IRWD service area does experience heavy rain events that could impact operations. For purposes of the LHMP, heavy rain events are profiled under Severe Weather.
Tornado	No	Tornados do not regularly occur within the IRWD service area.
Tsunami	No	Tsunami was evaluated by the Planning Team as an identified hazard, due to the small coastal section of IRWD's jurisdiction. A draft of the hazard was prepared, in coordination with sea level rise and coastal erosion. Upon further research, it was confirmed that projected tsunami inundation mapping within IRWD's jurisdiction is considered minor and no critical infrastructure was identified as vulnerable. Additionally, IRWD has never experienced impacts from a tsunami historically and Orange County infrequently experiences tsunami occurrences. Thus, the Planning Team elected to remove tsunami from the LHMP and no mitigation actions are included.
Volcano	No	The IRWD service area is not located within the vicinity of a known active volcano.
Wildfire	Yes	Large portions of the IRWD service area are located within mapped high fire hazard zones, and wildfire season regularly occurs within the IRWD service area resulting in impacts to IRWD operations.

Table 4-1 (continued)
IRWD Hazard Identification

Hazards	Include in LHMP?	Discussion of Hazard's Inclusion or Exclusion
Wind	No	Regular wind does not occur within the IRWD service area.
Windstorm	Yes	Santa Ana winds commonly occur in the IRWD service area between September and May. Windstorms can impact power transmission lines and create power outages. Windstorms are evaluated under the Severe Weather profile, and power outages are outlined as a secondary impact.

4.1.2 HAZARD PRIORITIZATION

Following FEMA's guidance for preparation of Local Hazard Mitigation Plans, the Planning Team used a Microsoft Excel-based tool to prioritize the identified hazards assigning each hazard a ranking of 1 to 4, where one is the lowest score and four is the highest, for the following criteria:

- Probability (likelihood of occurrence);
- Location (size of potentially affected area);
- Maximum Probable Extent (intensity of damage); and
- Secondary Impacts (severity of secondary impacts to community).

The rankings were assigned based on group discussion, knowledge of past occurrences, and familiarity with IRWD's vulnerabilities. The four criteria were assigned a weighted value (recommended by FEMA and confirmed by the Planning Team) based on the importance of the criterion; refer to Table 4-2, *Hazard Ranking Methodology*. The hazard rankings were multiplied by weighted factors to obtain a score for each criterion. A higher weight was given to the criterion considered more important or significant. For example, the probability of the hazard's occurrence received a higher weight than the potential secondary impacts. The scores for location, maximum probable extent (anticipated damage), and secondary impacts for each hazard were added together to determine the total impact score for each hazard. The total impact score was then multiplied by the overall probability score to determine the final score for each hazard. The final scores were used to determine the prioritization of each hazard based on the following FEMA recommended scale:

- Low Threat: 0 to 12;
- Medium Threat: 12.1 to 42; and
- High Threat: 42.1 and above.

Table 4-3, *Hazard Rankings*, identifies the criterion scores, final scores, and the hazard planning consideration (threat level) for each hazard based on discussions with the Planning Team and the prioritization process described above.

Table 4-2
Hazard Ranking Methodology

Probability (2.0): Based on the estimated likelihood of occurrence from historical data.	
Probability (2.0): **Estimated likelihood of occurrence from historical data.**	**Score**
Unlikely – less than 1% probability in next 100 years or has a recurrence interval of greater than every 100 years	1
Somewhat Likely – between 1% and 10% probability in next year or has a recurrence interval of 11 to 100 years	2
Likely – between 10% and 100% probability in next year or has a recurrence interval of 10 years or less	3
Highly Likely – near 100% probability in next year or happens every year	4

Table 4-2 (continued)
Hazard Ranking Methodology

Probability (2.0): Based on the estimated likelihood of occurrence from historical data.	
Location (0.8): **Size of geographical area of community affected by the hazard.**	
Affected Area	**Score**
Isolated	1
Small	2
Medium	3
Large	4
Maximum Probable Extent (0.7): **Anticipated damage to a typical facility/structure in the community.**	
Impact	**Score**
Negligible – less than 10% damage	1
Limited – between 10% and 25% damage	2
Critical – between 25% and 50% damage	3
Catastrophic – more than 50% damage	4
Secondary Impacts (0.5): **Estimated secondary impacts to the community at large.**	
Impact	**Score**
Negligible – no loss of function, downtime, and/or evacuations	1
Limited – minimal loss of function, downtime, and/or evacuations	2
Moderate – some loss of function, downtime, and/or evacuations	3
High – major loss of function, downtime, and/or evacuations	4

Table 4-3
Hazard Rankings

Hazard Type	Probability	Location	Maximum Probable Extent	Secondary Impact	Total Score	Hazard Planning Consideration (Threat Level)[1]
Climate Change[2]	N/A	N/A	N/A	N/A	N/A	N/A
Coastal Erosion[3]	1	1	1	2	5.00	Low
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Dam/Reservoir Failure	1	1	1	4	7.00	Low
Drought	4	4	1	1	35.20	Medium
Fault Rupture/Seismic Hazards/Groundshaking	4	2	2	3	36.00	Medium
Flood	2	1	3	4	19.60	Medium
Geological Hazards (Expansive Soils, Subsidence)	1	1	1	1	4.00	Low
Hazardous Materials Spill	2	2	2	3	18.00	Medium
Terrorism	1	3	3	3	12.00	Low
Sabotage/Vandalism	1	1	1	2	5.00	Low
Landslide/Mudflow	3	2	3	3	31.20	Medium
Liquefaction	1	2	3	3	10.40	Low
Sea Level Rise[3]	1	1	1	1	4.00	Low
Tsunami[3]	1	1	1	1	4.00	Low
Wildfire	4	3	2	2	38.40	Medium
Windstorm	4	4	1	1	35.20	Medium
Power Outage[4]	4	2	1	2	26.40	Medium

1. Refer to Table 4-2 for the hazard ranking methodology. The total score is based on an equation that provides a weighted value to each category by its importance.
2. The Planning Team did not rank climate change, due to the interconnected nature with the other identified hazards. Climate change is profiled with each identified hazard in Section 4.2, below.
3. As outlined in Table 4-1, coastal erosion, sea level rise, and tsunami were listed as a potential hazard that could impact IRWD, and thus were included in the hazard ranking process. After further research, it was found these hazards have not historically impacted IRWD and hazard maps did not intersect with IRWD infrastructure. Thus, coastal erosion, sea level rise, and tsunami were not included in the LHMP and no mitigation actions are identified.
4. Power outage is included as a secondary impact, under the Severe Weather profile in Section 4.2.

Many hazards identified by the Planning Team are recognized to be interconnected or interrelated. Where appropriate, hazard profiles below may include references to other hazard profiles. Additionally, as part of the hazard identification and prioritization process, the Planning Team determined that some hazards could be combined for clarity purposes within a larger hazard category. Some hazards were expanded or renamed to reflect conditions for the IRWD service area more accurately. Thus, the Geologic Hazards profile includes both Expansive Soils and Land Subsidence Hazards. Human-Caused Hazards includes Hazardous Materials and Terrorism/Sabotage (Cyberattacks). Seismic Hazards includes Fault Rupture, Ground Shaking and Liquefaction. Severe Weather includes Coastal/Winter Storm, Windstorm (Santa Ana Winds), and Power Outage as a secondary impact.

It is noted that Power Outage is not a direct hazard, but a secondary impact from other natural disasters (primarily windstorm, but potentially wildfire as well). The Planning Team and survey participants are extremely concerned about the ramifications of Power Outages and the effects on IRWD infrastructure and operations; thus, Power Outage is discussed under Severe Weather.

Climate change is not a stand-alone hazard but has the potential to exacerbate other natural hazards in the IRWD service area. The Planning Team decided climate change would be included under each applicable hazard profile, with a discussion about how the hazard would intersect or become more significant with the impacts of climate change.

The following hazards are discussed within the LHMP:

- Dam/Reservoir Failure;
- Drought Hazards;
- Flood Hazards;
- Geologic Hazards (Expansive Soils, Land Subsidence);
- Human-Caused Hazards (Hazardous Materials, Terrorism/Sabotage [Cyberattacks]);
- Landslide and Mudflow;
- Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction);
- Severe Weather (Coastal/Winter Storm, Windstorm [Santa Ana Winds], Power Outage [Secondary Impact]); and
- Wildfire.

4.2 HAZARD IDENTIFICATION AND PRIORITIZATION

This section contains profiles for the hazards identified as having the potential to occur in the IRWD service area. Each hazard includes a description of the hazard, location of where the hazard may occur, severity of the hazard, history of the hazard, the probability of the hazard's future occurrence, and the intersection with climate change (if applicable).

4.2.1 DAM/RESERVOIR FAILURE

Description

A dam is an artificial barrier preventing the flow of water or a barrier built across a watercourse for impounding water. Dam failure is the uncontrolled release of impounded water from behind a dam. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism can all cause dam infrastructure to fail. Dam failure causes downstream flooding of varying velocities that in extreme cases can result in loss of life

and property. Damage caused by dam failure varies greatly depending on the rate and amount of water released by failure.

Reservoirs are defined as an artificial lake, pond, impoundment, or tank, used to store water (both potable and non-potable). Reservoirs can be created on the surface by constructing dams to store water. Additionally, tank reservoirs can be constructed to store water above ground, on the surface, or below ground. Reservoir failure is the uncontrolled release of impounded water from a reservoir. Flooding (associated with heavy rain events), earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism activities can all cause a reservoir to fail. Seismic activity may also cause inundation by the action of a differential movement of a reservoir and the water within, causing shearing or buckling of the reservoir infrastructure.

Dam or reservoir failures are most likely to happen for the following reasons:[1]

- Overtopping, caused by water spilling over the top of the dam/reservoir, usually a precursor of failure because of inadequate spillway design, debris blockage of spillways, or settlement of the crest;
- Foundation defects, including settlement or slope stability;
- Cracking caused by natural settling of a dam or seismic movements;
- Inadequate maintenance and upkeep; and/or
- Piping, when seepage through a dam is not properly filtered, soil particles continue to progress and form sinkholes in the dam/reservoir.

Because dam and reservoir failure can have severe consequences, FEMA and Cal OES require all dam owners to develop an Emergency Action Plan (EAP) for warning, evacuation, and post-flood actions. In the event of a major dam failure, mutual aid from all levels of government would be required for an extended period. Recovery efforts would include the removal of debris, clearing roadways, demolishing unsafe structures, assistance in reestablishing public services, and providing continued care for the affected population.

IRWD dams are regulated by the Department of Water Resources, Division of Safety of Dams (DSOD). DSOD ensures dam safety by:[2]

- Reviewing and approving dam enlargements, repairs, alterations, and removals, and ensuring that the dam appurtenant structures are designed to meet minimum requirements;
- Performing independent analyses to understand dam and appurtenant structures performance (including structural, hydrologic, hydraulic, and geotechnical evaluations);
- Overseeing construction to ensure work is performed in accordance with approved plans/specifications;
- Inspecting each dam on an annual basis to ensure safety and performance standards; and,
- Periodically reviewing the stability of dams/major appurtenances, as well as new findings regarding earthquake hazards and hydrologic estimates in California.

[1] Association of State Dam Safety Officials, *Dam Failures and Incidents,* https://damsafety.org/dam-failures, accessed May 11, 2021.
[2] California Department of Water Resources, *Division of Safety of Dams*, https://water.ca.gov/Programs/All-Programs/Division-of-Safety-of-Dams, accessed March 16, 2021.

DSOD is responsible for assigning each jurisdictional dam a downstream hazard classification. This classification is based only on potential downstream impacts to life and property, should the dam fail when operating with a full reservoir. This hazard status is not related to the condition of the dam or the likelihood of the dam to fail in either the short or long-term future. Additionally, dams in southern California usually do not operate at full capacity at all times of the year, as most do not receive significant flows from rivers or streams. Thus, hazard risks and classifications are a worst-case scenario assessment. The DSOD definitions for downstream hazards are borrowed from the Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures, and are outlined in Table 4-4, *DSOD Downstream Hazard Potential Classification Levels*.

Table 4-4
DSOD Downstream Hazard Potential Classification Levels

Downstream Hazard Potential Classification	Potential Downstream Impacts to Life and Property
Low	No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.
Significant	No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
High	Expected to cause loss of at least one human life.
Extremely High	Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more.
Source: California Department of Water Resources, Division of Safety of Dams, *Definitions of Downstream Hazard and Condition Assessment*, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/Definitions-of-Downstream-Hazard-and-Condition-Assessment.pdf, accessed March 16, 2021.	

Due to the highly urbanized nature of the IRWD service area, dam infrastructure (five dams at the time of this writing) is classified as "extremely high." As noted above, this is not reflective of the likelihood for the specific infrastructure to fail; this classification is due to the highly populated areas downstream of IRWD dams. As discussed previously, DSOD inspects dams once annually and provides a condition assessment. This condition assessment is a more accurate tool to evaluate infrastructure risk. DSOD uses the National Inventory of Dams (NID) condition rating definitions, with additional criteria, as a guideline in assigning condition assessments. This rating system is outlined in Table 4-5, *DSOD Condition Assessment Rating Levels*.

Table 4-5
DSOD Condition Assessment Rating Levels

Rating	National Inventory of Dams Definitions	California DSOD Additional Criteria
Satisfactory	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.	None.
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.	• Dam has a long-standing deficiency that is not being addressed in a timely manner. • Dam is not certified and its safety is under evaluation. • Dam is restricted and operation of the reservoir at the lower level does not mitigate the deficiency.
Poor	A dam safety deficiency is recognized for loading conditions that may realistically occur. Remedial action is necessary. A poor rating may also be used when uncertainties exist as to critical analysis parameters that identify a potential dam safety deficiency. Further investigations and studies are necessary.	Dam has multiple deficiencies or a significant deficiency that requires extensive remedial work.
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.	None.

Table 4-5 (continued)
DSOD Condition Assessment Rating Levels

Rating	National Inventory of Dams Definitions	California DSOD Additional Criteria
Not Rated	The dam has not been inspected, is not under State jurisdiction, or has been inspected but, for whatever reason, has not been rated.	None.

Source: California Department of Water Resources, Division of Safety of Dams, *Definitions of Downstream Hazard and Condition Assessment*, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/Definitions-of-Downstream-Hazard-and-Condition-Assessment.pdf, accessed March 16, 2021.

Location/Extent

As a water purveyor, IRWD owns and maintains several critical dams and reservoirs within the service area for potable and recycled water storage. IRWD dams are listed below in Table 4-6, *IRWD Dams*, and reservoirs are listed in Table 4-7, *IRWD Reservoirs*.

Table 4-6
IRWD Dams

Dam Name	Hazard Classification	Type	Size	DSOD Rating
Rattlesnake Canyon	Extremely High	Recycled Water	1,480 acre-feet	Satisfactory
Syphon Canyon	Extremely High	Recycled Water	535 acre-feet	Satisfactory
San Joaquin	Extremely High	Recycled Water	3,036 acre-feet	Satisfactory
Santiago Creek	Extremely High	Potable/Non-Potable Water Storage	25,000 acre-feet	Poor*
Sand Canyon	Extremely High	Recycled Water	768 acre-feet	Satisfactory

*At the time of this LHMP writing, Santiago Creek Dam is listed with a "Poor" rating due to the spillway structure . To maintain safety, IRWD is minimizing use of the spillway by implementing an Interim Lake Level Operations Plan approved by the DSOD, while preparing for infrastructure improvements in the near future.

Source: Irvine Ranch Water District, *DSOD Safety Rating for IRWD Dams*, https://www.irwd.com/images/pdf/construction/DSOD_safety_rating_for_dams_chart_031721_temp.pdf, accessed May 11, 2021.

Table 4-7
IRWD Reservoirs

Reservoir Name	Address	Area Served
Benner Reservoir	28741 Williams Canyon Road	Williams Canyon
Central Irvine Zone 1 Reservoir	13826 Sand Canyon Avenue, Irvine 92620	Zone 1
Chapman Reservoir	14909 Mill Road	Chapman Zone
Coastal Zone 2 Reservoir	22433 Newport Coast Drive, Newport Beach, 92657	Zone 2
Coastal Zone 4 Reservoir	21474 Vista Ridge Road, Newport Beach, 92657	Zone 4
Coastal Zone 6 Reservoir	20783 Vista Ridge Road, Newport Beach, 92657	Zone 6
East Irvine Zone 3 #1	13497 Alton Parkway, Irvine 92618	Zone 3
East Irvine Zone 3 #2	13497 Alton Parkway, Irvine 92618	Zone 3
East Irvine Zone 4	21515 Magazine Road, Irvine, 92618/12848 1/2 Alton	Zone 4
Fleming Reservoir	7431 Silverado Canyon Road	Lower Silverado Canyon
Foothill Zone 6 Reservoir	2 Touraine Place, Foothill Ranch 92610	Zone 6
Foothill Zone 6A Reservoir	71 Tessara Avenue, Foothill Ranch 92610	Zone 6A
Lake Forest Zone Tank 1 and Tank 2	21082 Wisteria, Lake Forest 92630	Zone 4
Modjeska Reservoir	29265 Modjeska Canyon Road	Modjeska Canyon
Orchard Zone 5 Reservoir	10703 Culver Drive, Irvine 92602	Orchard Hills
Portola Hills Zone 8 Reservoir	18967 Saddleback Ranch Road, Lake Forest 92679	Zone 8
Portola Hills Zone 9 Reservoir	18181 Santiago Canyon, Trabuco 92679	Zone 9
Portola Springs Zone 6 Reservoir – Rattle Snake Canyon Dam Reservoir	8631 Portola Parkway, Irvine	Zone 6
Quail Hill Zone 3 Reservoir	17500 1/2 Pine Needles, Irvine 92603	Zone 3
Quail Hill Zone 4 Reservoir	108 1/2 Luminous, Irvine	Zone 4
Read Reservoir	30500 Silverado Canyon Road,	Upper/Middle Silverado Canyon
Santiago Canyon Zone 5	1802 East Santiago Canyon Road, Orange 92862	Zone 5

Table 4-7 (continued)
IRWD Reservoirs

Reservoir Name	Address	Area Served
Shaw Reservoir	28914 Olive Drive,	Middle Silverado Canyon
Turtle Rock Zone 3	13.5 Minaret, Irvine	N/A
Williams Canyon Reservoir	27600 Williams Canyon Road	Williams Canyon
Source: Irvine Ranch Water District, *Water System Risk and Resilience Assessment: A Comprehensive Analysis Consistent with America's Water Infrastructure Act of 2018*, March 30, 2020.		

The geographic extent from dam or reservoir failure is dependent on the type of infrastructure and amount of water stored at the time of the hazard incident. Inundation maps were prepared for the listed dams as part of the recent EAP effort through DSOD and Cal OES. Inundation maps show flooding that could result from a hypothetical failure of a dam or its critical components, such as spillways and other outlets. The failure scenario evaluated assumes instantaneous failure of the entire dam. As mentioned previously, inundation maps are based on worst-case scenarios and are not based on any specific information about the condition of the dam.

Dam and reservoir inundation vulnerability exhibits and tables are included in Appendix C, *Dam/Reservoir Failure Vulnerability Assessment*. Generally speaking, inundation from a failure of Santiago Creek Dam would be the most severe out of the five "extremely high" hazard dams owned and operated by IRWD. Failure of the facilities would vary, and could result in substantial inundation of the communities surrounding and/or downstream.

Additionally, IRWD infrastructure and the service area is at risk from dam infrastructure outside of IRWD control. Prado Dam is a flood control dam on the Santa Ana River, located north of State Route (SR) 91 and east of the SR-71, within Riverside County. This dam was constructed in 1941 by the U.S. Army Corps of Engineers, with a gross storage capacity of 217,000 acre-feet. The dam and reservoir are managed by the U.S. Army Corps of Engineers and OCWD.[3] Due to the age of Prado Dam, infrastructure failure is a concern. Inundation from Prado Dam failure has the potential to impact downstream IRWD infrastructure.

Previous Occurrences

IRWD has never experienced a major dam failure resulting in significant flooding or inundation; further, no such major dam failures resulting in significant flooding or inundation has occurred in Orange County history. IRWD has experienced spillway infrastructure erosion at the Santiago Dam during a major storm in Feburary 1969. During this peak event, large storms caused high flows at both Santiago Dam and the neighboring Villa Park Dam, filling both reservoirs to capacity. A gauge downstream measured a historical peak flow of 6,600 cubic feet per second (cfs) recorded on February 25, 1969.[4] After the 1969 winter floods, the Army Corps of Engineers authorized the Santa Ana River Mainstream project and constructed both the Prado Dam and Bond Street groundwater replenishment project to increase flood storage; thus, it is unlikely that Santiago Dam or Villa Park Dam will fill to capacity during future storm events.[5] Refer to Section 4.2.3 for further discussion regarding historical flood hazards. A minor landslide occurred near the perimeter of the Santiago Creek Dam, and IRWD in coordination with DSOD implemented maximum storage restrictions as a safety response measure.

[3] U.S. Army Corps of Engineers, *Prado Dam*, https://www.spl.usace.army.mil/Missions/Asset-Management/Prado-Dam/, accessed March 16, 2021.
[4] Irvine Ranch Water District & Serrano Water District, *Emergency Action Plan for Santiago Creek Dam,* https://www.irwd.com/images/pdf/construction/dam-emergency-action-plans/eap_santiago_creek_2021-02-12_post.pdf, *accessed July 15, 2021.*
[5] City of Villa Park, *Villa Park Dam,* https://villapark.co/villa-park-dam/, accessed July 15, 2021.

Maintenance and other safety measures have been implemented due to conditions at both Rattlesnake Dam and Sand Canyon Dam. Rattlesnake Dam has storage restrictions to keep the water surface level six feet below the designed maximum storage elevation. IRWD may wish to further restrict the water storage or construct physical improvements to the dam in the future. In the past the Sand Canyon Dam spillway has required maintenance to mitigate past risks. The spillway eroded in specific areas, and slurry materials was placed to maintain structural integrity. Capacity at Sand Canyon Dam has diminished since the dam was constructed in 1942, due to sedimentation.[6]

Historically, the most significant dam failures in California have occurred outside of the IRWD service area. The closest dam failures to IRWD's service area resulting in significant inundation occurred in the City of Los Angeles (St. Francis Dam Disaster of 1928 and Baldwin Hills Dam Disaster of 1963). Both incidents are considered major civil engineering disasters and resulted in significant loss of life and property in the City of Los Angeles.

The City of Westminster (north of the IRWD service area within Orange County) experienced a reservoir (tank) failure in September 1998. A five-million-gallon municipal water storage tank ruptured because of corrosion and construction defects. No loss of life occurred, but the inundation destroyed most of the storage facility, along with flooding over 30 private residences. Through a Public Works Mutual Aid agreement, Orange County Public Works Department assisted the City of Westminster in clean-up and repair activities. A new reservoir facility came online in March 2003.[7]

Probability of Future Occurrences

As there has only been one water storage structure failure that resulted in significant flooding/inundation in over one hundred years of Orange County history, the probability for future events within IRWD jurisdiction is anticipated to remain low. IRWD maintains all dams and reservoirs in accordance with state and federal regulations, along with a district specific Dam Safety Program, available for review on the IRWD website. The IRWD dam safety program is driven by Risk Informed Decision Making (RIDM), which includes: consequence assessment, data summary report, potential failure modes, and the dam safety program framework.

IRWD continually monitors, inspects, and operates dams and reservoirs with safety in mind. In addition to state-mandated inspections, IRWD's dam safety team conducts an extra semiannual inspection of San Joaquin, Rattlesnake, Sand Canyon and Syphon reservoirs and quarterly inspections of Santiago Creek Reservoir. IRWD visually inspects all five dams daily. Caretakers live onsite at San Joaquin, Rattlesnake, Sand Canyon and Santiago Dams. Regular maintenance and infrastructure upgrades are crucial to the IRWD dam safety program to ensure the probability of future occurrences remain low.

Despite best planning efforts however, dam/reservoir failure resulting in flooding within the community could occur due to severe seismic activity. While the probability of future occurrences remains low, an incident has the potential to be highly destructive due to the urbanized nature of the IRWD inundation area.

Since the Baldwin Hills Dam failure in 1963, the State of California implemented stringent dam standards, regulations, and inspection schedules. In the past 50 years, there have been few

[6] Irvine Ranch Water District, *Emergency Action Plan for San Canyon Dam*, https://www.irwd.com/images/pdf/construction/dam-emergency-action-plans/eap_sand_canyon_2019-10-25_post.pdf, accessed July 15, 2021.
[7] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.

incidents in California as a result of these regulations. The Oroville Dam Crisis in 2017 is the most recent major dam incident, where erosion at the Oroville Dam spillway and emergency spillway threatened the structural integrity of the main weir and gate. Emergency repairs ultimately prevented dam failure. The crisis served as a reminder of the ongoing risk prevented by dams and triggered additional inundation mapping and emergency preparedness planning requirements for California dams.

Climate Change
Dam/reservoir failure is not directly correlated with climate change, and the effects of climate change do not increase or decrease the likelihood of dam/reservoir infrastructure failure. Dam and reservoir failure could be caused by seismic activity; similarly, the likelihood of seismic activity does not increase or decrease due to the effects of climate change. However, severe storm events and flooding incidents could put increased strain on dam and reservoir infrastructure. Repetitive severe storm events could increase the "wear and tear" and require additional maintenance and infrastructure improvements to protect the dam integrity. Severe storm events could also oversaturate soils and compromise dam/reservoir infrastructure integrity. However, the threat of dam/reservoir failure is only indirectly impacted or associated with climate change.

4.2.2 DROUGHT HAZARDS

Description
Drought is defined as an extremely dry climatic period where the available water falls below a statistical average for a region. Drought is also defined by factors other than rainfall, including vegetation conditions, agricultural productivity, soil moisture, water levels in reservoirs, and stream flow. Droughts or water shortages are a gradual phenomenon, occurring over multiyear periods and increasing with the length of dry conditions. When precipitation is less than normal for a period of time, the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth to water in wells increases. If dry weather persists and water supply problems develop, the dry period can become a drought. Drought cycles are common in southern California and are influenced by cyclical El Niño and La Niña events.

The term "drought" can have different meanings depending on how a water deficiency affects day to day activities. Drought is a complex natural hazard, which is reflected in the following four definitions commonly used to describe it:

- Agricultural – Agricultural drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Hydrological – Hydrological drought is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- Meteorological – Meteorological drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Regulatory – Regulatory drought can occur when the availability of water is reduced due to imposition of regulatory restrictions on the diversion and export of water out of a watershed to another area. A significant percentage of water in southern California is imported from other regions (Colorado River and Northern California) via aqueducts. Correspondingly, drought in California can be made worse by water availability conditions in the regions at which the water originates.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (i.e., deforestation), land degradation, and the construction of dams can affect the hydrological characteristics of a region. Because regions are geographically interconnected by natural systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable stream flow and a higher incidence of hydrologic drought downstream. Land use change is one way human actions can alter the frequency of water shortage even when no change in precipitation has been observed.[8]

Droughts can cause public health and safety impacts, as well as economic and environmental impacts. Public health and safety impacts of drought are primarily associated with catastrophic wildfire risks and drinking water shortage risks for small water systems in rural areas and private residential wells. Examples of other impacts include costs to homeowners due to loss of residential landscaping, degradation of urban environments due to loss of landscaping, agricultural land fallowing and associated job loss, degradation of fishery habitat, and tree mortality with damage to forest ecosystems. Drought conditions can also result in damage to older infrastructure that is located within dry soils with potential to leak or break. Dead or dying vegetation poses a risk to falling and damaging structures and infrastructure systems.

In Orange County, drought conditions typically result in implementation of large-scale conservation efforts. Drought conditions often increase reliance on groundwater supplies, and extended periods of drought can deplete these reserves. As a result of the drought history in southern California, IRWD has aggressively diversified its water source portfolio to reduce reliance on imported water and has implemented innovative water recycling technology and water banking systems.

Drought conditions have also resulted in drier brush and an increase in the size and severity of wildfires. Water and wastewater infrastructure systems located within areas susceptible to wildfires are at a greater risk of being impacted. Damage or failure to water and wastewater infrastructure systems can significantly reduce or even interrupt service to customers. For more on wildfire hazards, refer to Section 4.2.9, *Wildfire*.

Location/Extent

Droughts are generally widespread events that affect the entire IRWD service area, and the larger southern California region. The geographic extent of drought conditions usually extend to every resident and business owner receiving water from IRWD. IRWD relies on local groundwater, native water, imported water from other regions (e.g., northern California and Colorado River) via aqueducts, and recycled water. As a result, droughts can decrease the amount of groundwater available as well as be caused or made worse by conditions in the regions in which the water originates. Regional groundwater management in Orange County aims to regulate groundwater usage and prevent overreliance on groundwater resources during drought years.

Drought severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity. The magnitude of drought is usually measured in time and the severity of the hydrologic deficit.

[8] National Drought Mitigation Center, *Drought Basics*, https://drought.unl.edu/Education/DroughtBasics.aspx, accessed February 8, 2021.

The U.S. Drought Monitor is a map released weekly that indicates the portions of the United States that are experiencing drought and the severity of the drought based on five classifications: abnormally dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought: moderate (D1), severe (D2), extreme (D3), and exceptional (D4); refer to Table 4-8, *Drought Severity Classification*.

Table 4-8
Drought Severity Classification

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested.
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed.
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions.
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.
Source: U.S. Drought Monitor, *Drought Classification,* https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx, accessed February 8, 2021.		

The Drought Monitor is not a forecast but looks backward; providing a weekly assessment of drought conditions based on how much precipitation did or did not fall. Because drought is a slow-moving hazard, it may take more than one good rainfall to end a drought, especially if an area has been in drought for a long time.

Exhibit 4-1, *Drought Monitor Map*, depicts the drought monitor map, which identifies areas of drought and labels them by intensity as shown in Table 4-8. As of May 24, 2021, central Orange County is classified as “Severe Drought” by the U.S. Drought Monitor.

Previous Occurrences

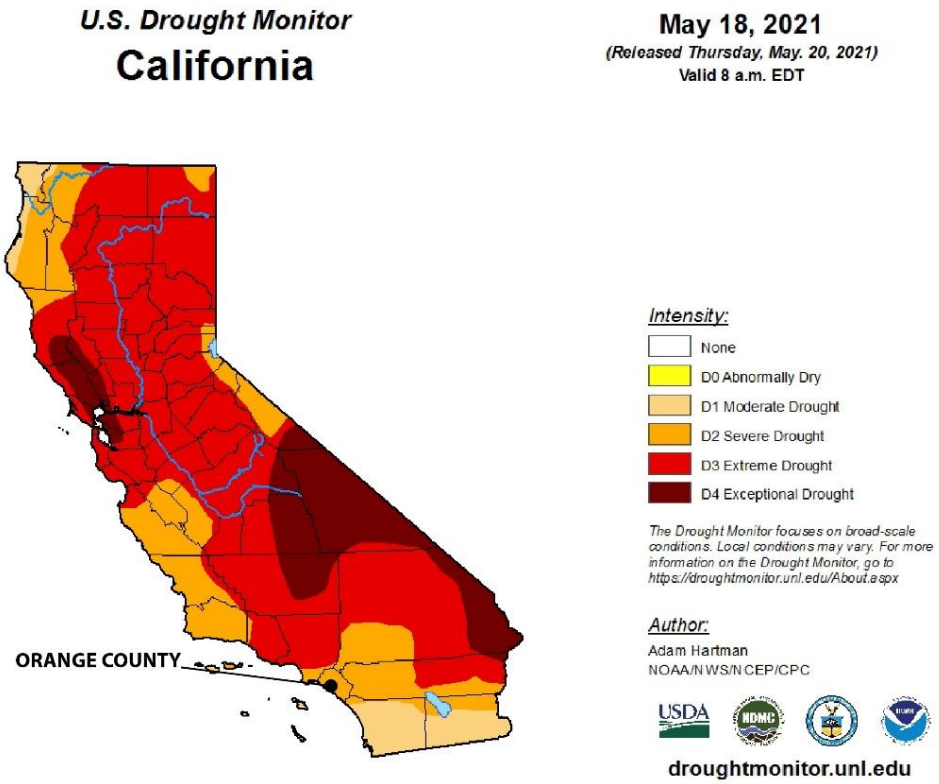
Although defining drought can be challenging across a large geography, California has experienced numerous severe droughts over the past century. FEMA declared one drought emergency for California in January 1977, and other drought emergency declarations have been declared by the State. According to the 2018 State Hazard Mitigation Plan, from 1972 to 2016, there were fifteen drought State Emergency Proclamations in California.[9]

The most severe drought on record began in 2012 and continued through 2017. On January 17, 2014, the Governor of California declared a State drought emergency, and on April 1, 2014, the Governor announced the first-ever mandatory 25-percent Statewide water use reduction and a series of actions to help save water, increase enforcement to prevent wasteful water use, streamline the State’s drought response, and invest in new technologies that would make California more drought resilient. At the time of the announcement, the volume of Sierra Nevada snowpack was approximately 14 percent of normal. Despite multiple storms in February 2014, drought conditions persisted. By the end of May 2014, all of California was in a condition of “extreme” or “exceptional” drought. At the same time, the volume of the Sierra Nevada snowpack had decreased to less than 10 percent of normal and water stored in Lake Oroville, the major reservoir for the State Water Project, was at 58 percent of normal.[10] On April 7, 2017, the

[9] California Governor’s Office of Emergency Services, *2018 California State Hazard Mitigation Plan*, https://www.caloes.ca.gov/HazardMitigationSite/Documents/003-2018%20SHMP_FINAL_ACK-TOC.pdf, published September 2018, accessed February 8, 2021.
[10] California Department of Water Resources, *California’s Most Significant Droughts: Comparing Historical and Recent Conditions*, February 2015.

Governor issued an executive order ending the drought emergency in Southern California, including Orange County.

Exhibit 4-1
Drought Monitor Map



Source: United States Drought Monitor, California, https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA, accessed May 24, 2021.

IRWD did not experience water reliability issues during the 2012-2017 drought. IRWD implemented the State-wide water conservation efforts, meeting the required 25-percent reduction. Several of these water conservation programs have remained in place after the emergency drought restrictions lifted in 2017.

Currently, Orange County (including the IRWD service area) is located within a "severe drought" area as identified by the U.S. Drought Monitor. Drought conditions rapidly intensified throughout California in first half of 2021, as a result of the dry winter and warm/dry spring. Most of the State has received less than a half-inch of rain since April 1, 2021.[11] On May 10, 2021, Governor Gavin Newsom declared a State of Emergency for several northern and central California Counties in the Klamath River, Sacramento – San Joaquin Delta and Tulare Lake Watersheds.[12] Thus far, no emergency declarations have included Orange County and IRWD has not experienced any immediate drought impacts.

[11] The Washington Post, *California facing drought crisis as water shortages mount and fire danger escalates,* dated May 21, 2021, accessed May 24, 2021.
[12] Executive Department State of California, *Proclamation of a State of Emergency*, dated May 10, 2021.

IRWD utilizes diverse water sources, recycled water, water banking, and water use efficiency programs to ensure water reliably to the IRWD service area during drought conditions. Table 4-9, *Historical Droughts*, shows the historical droughts that have occurred in California from 1827 through the present.

Table 4-9
Historical Droughts

Date	Area Affected	Notes
1827 – 1916	Statewide	Multiyear: 1827–29, 1843–44, 1856–57, 1863–64 (particularly extreme), 1887–88, 1897–1900, 1912–13.
1917 – 1921	Statewide except central Sierra Nevada and north coast	Simultaneous in affected areas, 1919–20. Most extreme in north.
1922 – 1926	Statewide except central Sierra Nevada	Simultaneous in effect for entire State only during 1924, which was particularly severe.
1928 – 1937	Statewide	Simultaneously in effect for entire State, 1929–34. Longest in State's history.
1943 – 1951	Statewide	Simultaneously in effect for entire State, 1947–49. Most extreme in south.
1959 – 1962	Statewide	Most extreme in Sierra Nevada and central coast.
1976 – 1977	Statewide, except for southwestern deserts	Two significantly dry years in State's history. Most severe in northern two-thirds of State.
1987 – 1992	Statewide	Moderate, continuing through 1989. Most extreme in northern Sierra Nevada.
2000 – 2002	Statewide	Most severe in southern California.
2007 – 2009	Statewide	Twelfth driest 3-year period on record at the time. Most severe in western San Joaquin Valley.
2012 – 2017	Statewide	Most severe California drought on record.

Sources: Paulson, R. W., E. B. Chase, R. S. Roberts, and D. W. Moody, *Compilers, National Water Summary 1988-89: Hydrologic Events and Floods and Droughts: U.S. Geological Survey Water-Supply Paper*.
California Department of Water Resources, *California's Most Significant Droughts: Comparing Historical and Recent Conditions*, February 2015.

Probability of Future Occurrences

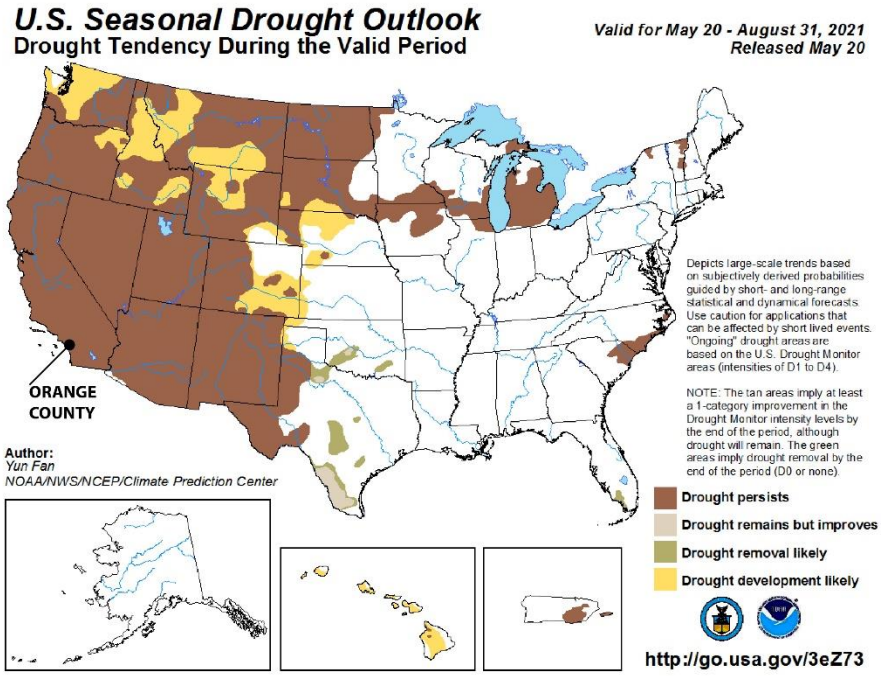
Based on previous occurrences and trends in California, the likelihood that the IRWD service area will experience drought conditions in the future is considered high. The U.S. Seasonal Drought Outlook depicts large-scale trends based on U.S. Drought Monitor areas (intensities of D1 to D4), as shown in Exhibit 4-2, *U.S. Seasonal Drought Outlook*. The southern California region, including the IRWD service area, is currently indicating that drought development is likely to persist . Based on available data, drought is considered to have a high probability for reoccurrence within the IRWD service area. Additionally, Orange County has been in severe or extreme drought for a total of 343 months, or 31 percent of the time since 1920 and 54 percent of the time since 1960.

Climate Change

Climate change is a phenomenon that could exacerbate drought hazards. In Governor Brown's 2014 drought emergency declaration, he noted that droughts could occur more regularly in the future. According to the 2018 State Hazard Mitigation Plan, climate scientists studying California found that drought conditions are likely to become more frequent and persistent over the twenty-first century due to changing weather patterns, such as more frequent and extended periods of high temperature conditions. The experiences faced by water supply agencies during the most recent drought (2012-2017) underscore the need to examine water storage, distribution, management, conservation, and use policies more closely. Decreasing snowmelt, reduced precipitation, and higher temperatures are all expected effects of changing weather patterns. Furthermore, the California Adaptation Planning Guide states that the pressure climate change

places on ground water reliance during times of drought is not sustainable.[13] When coupled with increasing populations and increasing demand for water in southern portions of California, these conditions may result in future water shortages for the IRWD service area.

Exhibit 4-2
U.S. Seasonal Drought Outlook



Source: National Weather Service Climate Prediction Center, U.S. Seasonal Drought Outlook, https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php, accessed May 24, 2021.

4.2.3 FLOOD HAZARDS

Description
Flooding occurs when a waterway (either a natural or artificial drainage channel) receives more water than it is capable of conveying. Depending on how long these conditions last and the amount of runoff the waterway receives in proportion to its capacity, the rising water level may eventually overtop the waterway's banks or any other boundaries to the drainage area, resulting in flooding.

Floods often occur during heavy precipitation events, when the amount of rainwater exceeds the capacity of storm drains or flood control channels. Floods can also happen when infrastructures such as levees, dams, or culverts fail, or when a section of drainage infrastructure fails, and water cannot be drained from an area quickly enough. These failures can be linked to precipitation events or can be a consequence of other emergency situations (i.e., flood infrastructure compromised due to an earthquake).

[13] California Governor's Office of Emergency Services, *California Adaptation Plan*, https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf, published June 2020, accessed February 8, 2021.

FEMA defines flood or flooding as a general and temporary condition of partial or complete inundation of normally dry land areas from:

- The overflow of inland or tidal waters;
- The unusual and rapid accumulation or runoff of surface waters from any source; or,
- Mudslides (i.e., mudflows) which are proximately caused by flooding and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.

Floods can be caused by a number of factors, including:

- Weather and climate patterns (e.g., El Niño, La Niña, Pineapple Express, Atmospheric River, etc.)
    - El Nino and La Nina are complex weather patterns resulting from variations in ocean temperatures in the equatorial Pacific. Warner or colder than average ocean temperatures in one part of the world can influence weather around the globe. El Nino and La Nina episodes typically last 9 to 12 months, but some prolonged events may last for years.[14]
    - Pineapple Express is a name given to an atmospheric river on the West Coast. It is a channel in the atmosphere that moves vast amounts of moisture and can result in massive rain showers.

- Hydrologic features such as reservoirs, ponds, lakes, river, etc., can have a large impact on the amount of flooding.
- The absorption capacity of the ground depends on the composition of soil and bedrock of the area. Less absorbent soil conditions in addition to lack of proper storm infrastructure can result in flooding.
- Type and density of vegetation is related to moisture absorption affecting the flow of water.
- Patterns of land use/urbanization relates to the pervious and impervious nature of the ground.
- Expected level, age, and condition of flood management infrastructure can impact flooding conditions.
- Large-scale wildfires dramatically alter the terrain and ground conditions. Vegetation absorbs rainfall, reducing runoff. However, wildfires leave the ground charred, barren, and unable to properly absorb water, creating conditions ripe for flash flooding and mudflow. Flood risk remains significantly higher until vegetation is restored – up to five years after a wildfire.[15]

In some cases, the force of flood can be enough to carry away large objects and damage structures, causing considerable damage to buildings and infrastructure. Floods can also saturate and weaken the soil, potentially making structures or infrastructure more susceptible to damage or collapse. Flooding can also affect water quality, as large volumes of water can transport contaminants into water bodies and overload storm/wastewater systems. Additionally, large increases in water volume can cause water body erosion and loss of aquatic habitat. Flooding can also cause economic loss to people and government due to the destruction of property and infrastructure.

[14] National Oceanic and Atmospheric Administration, *What are El Nino and La Nina?* https://oceanservice.noaa.gov/facts/ninonina.html, February 15, 2021.
[15] Federal Emergency Management Agency, *Flood Risk Increases After Fires Are Out – Buy Flood Insurance Now*, https://www.fema.gov/fact-sheet/4562/flood-risk-increases-after-fires-are-out-buy-flood-insurance-now, February 15, 2021.

Location/Extent

Orange County's terrain is naturally susceptible to flooding. Many rivers, creeks, and streams flow through natural floodplains within the IRWD service area on their way to the ocean. IRWD jurisdiction is primarily located within the Santa Ana River Watershed, Newport Bay Watershed, and Newport Coastal Watershed, and to a lesser extent the Aliso Watershed and San Juan Creek Watershed.[16] Storm drain collection facilities within the IRWD service area are the responsibility of the local cities and county. The Orange County Flood Control District (OCFCD) is the agency responsible for regional flood control. The major drainage feature within the IRWD service area is the San Diego Creek, that drains to the Newport Bay before reaching the Pacific Ocean. Other drainages include Silverado Creek and the Williams Creek, along with minor drainages distributed throughout the IRWD service areas.

Food zones in IRWD's jurisdiction are determined by Flood Insurance Rate Maps (FIRMS), produced by FEMA in partnership with various communities. A FIRM is the official flood map that shows hazard areas. These may include high-hazard (Special Flood Hazard Areas [SFHA]), moderate- to low-hazard areas, and undetermined areas. A SFHA map shows the 100-year floodplain, divided into Zone A and AE. A FIRM also includes 500-year flood plains and higher, classified as moderate and minimal risk areas. A 100- and 500-year flood is an event that has a 1 in 100 (1 percent) and 1 in 500 (0.2 percent) chance, respectively of occurring in any given year. This data is incorporated into FIRMs to support the National Flood Insurance Program (NFIP) and provide the basis for community floodplain management regulations and flood insurance requirements.

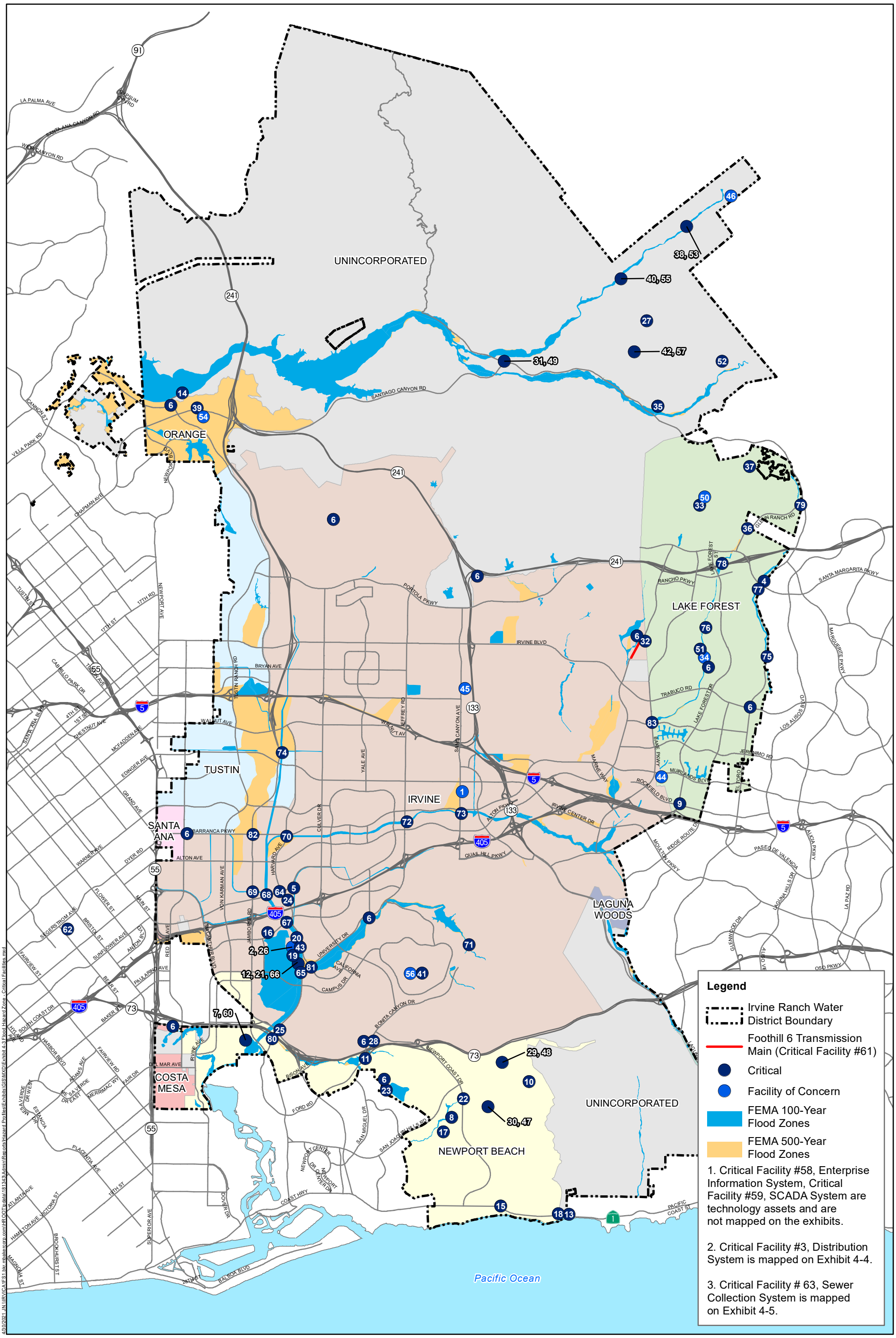
Exhibit 4-3, *Flood Hazard Zone – Critical Facilities*, Exhibit 4-4, *Flood Hazard Zone – Distribution System*, and Exhibit 4-5, *Flood Hazard Zone – Sewer Collection System*, show the locations of flood zones in the IRWD service area. Significant 100-year flood zones are located within the City of Irvine primarily associated with San Diego Creek and ultimately draining into the upper Newport Back Bay.

In 2014, IRWD prepared a Letter of Map Revision (LOMR) with FEMA to update the Flood Insurance Rate Map (FIRM) 0287J, as new flood control improvements were constructed to protect the Michelson Water Reclamation Plant. The LOMR reflects the Michelson Water Reclamation Plant as located outside of the 100-year flood zone. Other significant 100-year flood zones are located along Silverado Creek and Irvine Lake in unincorporated Orange County. While less extensive, 500-year flood zones are located within the City of Orange and Tustin. Isolated 100-year and 500-year flood zones can be found distributed throughout the IRWD service area. Refer to Table 4-10, *Acreage by Flood Zones*, for the amount of IRWD's service area located within 100-year or 500-year flood zone.

Table 4-10
Acreage by Flood Zones

Zone	Risk	Area (Acres)
100-year flood zone	1% annual flood risk	4,055.32
500-year flood zone	0.2% annual flood risk	2,197.33
Source: Michael Baker International GIS, FEMA.		

[16] Orange County Open Data ARCGIS, *Orange County – Our Watersheds*, https://data-ocpw.opendata.arcgis.com/datasets/orange-county-our-watersheds?geometry=-118.009%2C33.555%2C-117.142%2C33.755, accessed February 15, 2021.



N W E S

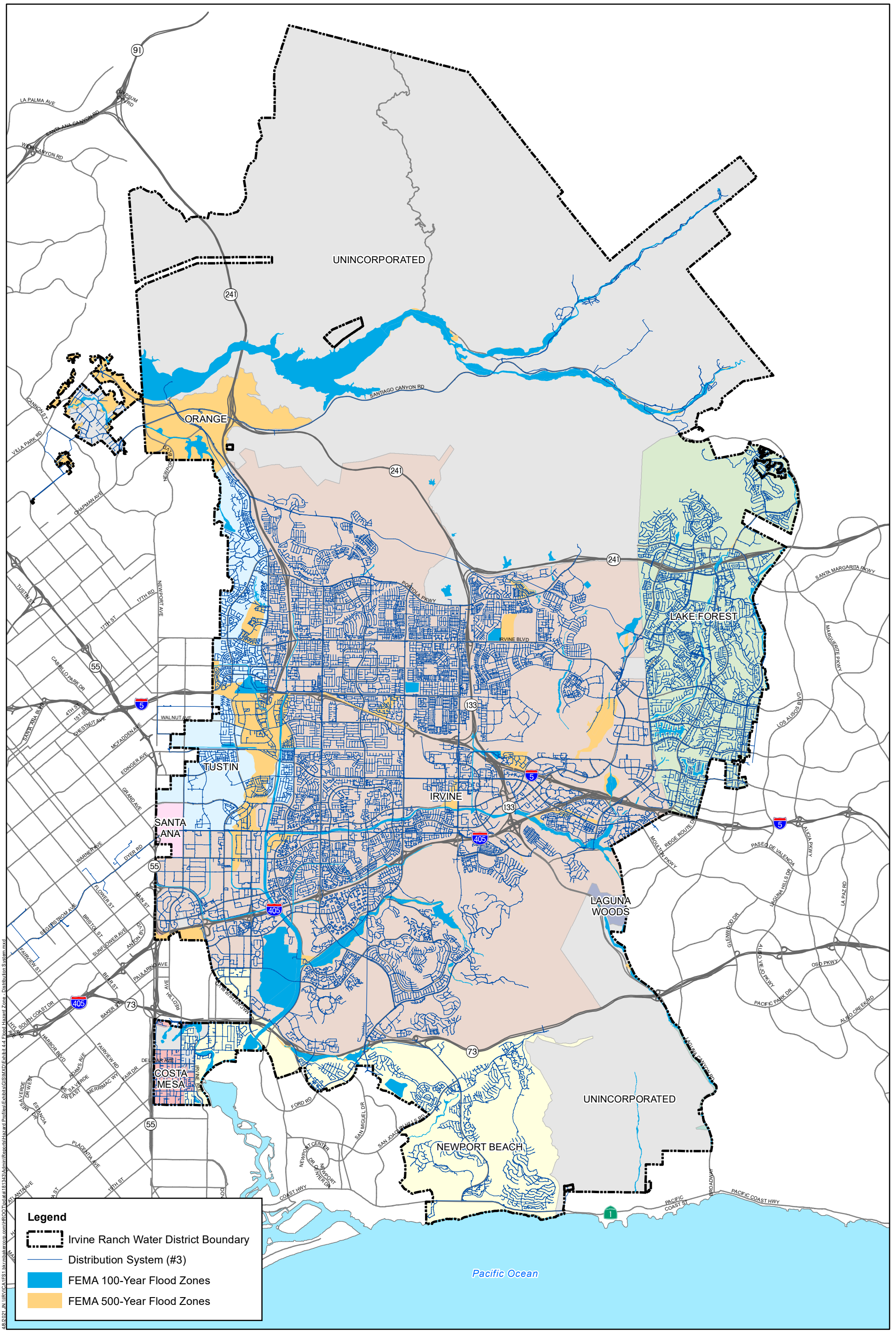
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Critical Facilities

Data Source: IRWD, 2021, FEMA, 2009

Exhibit 4-3



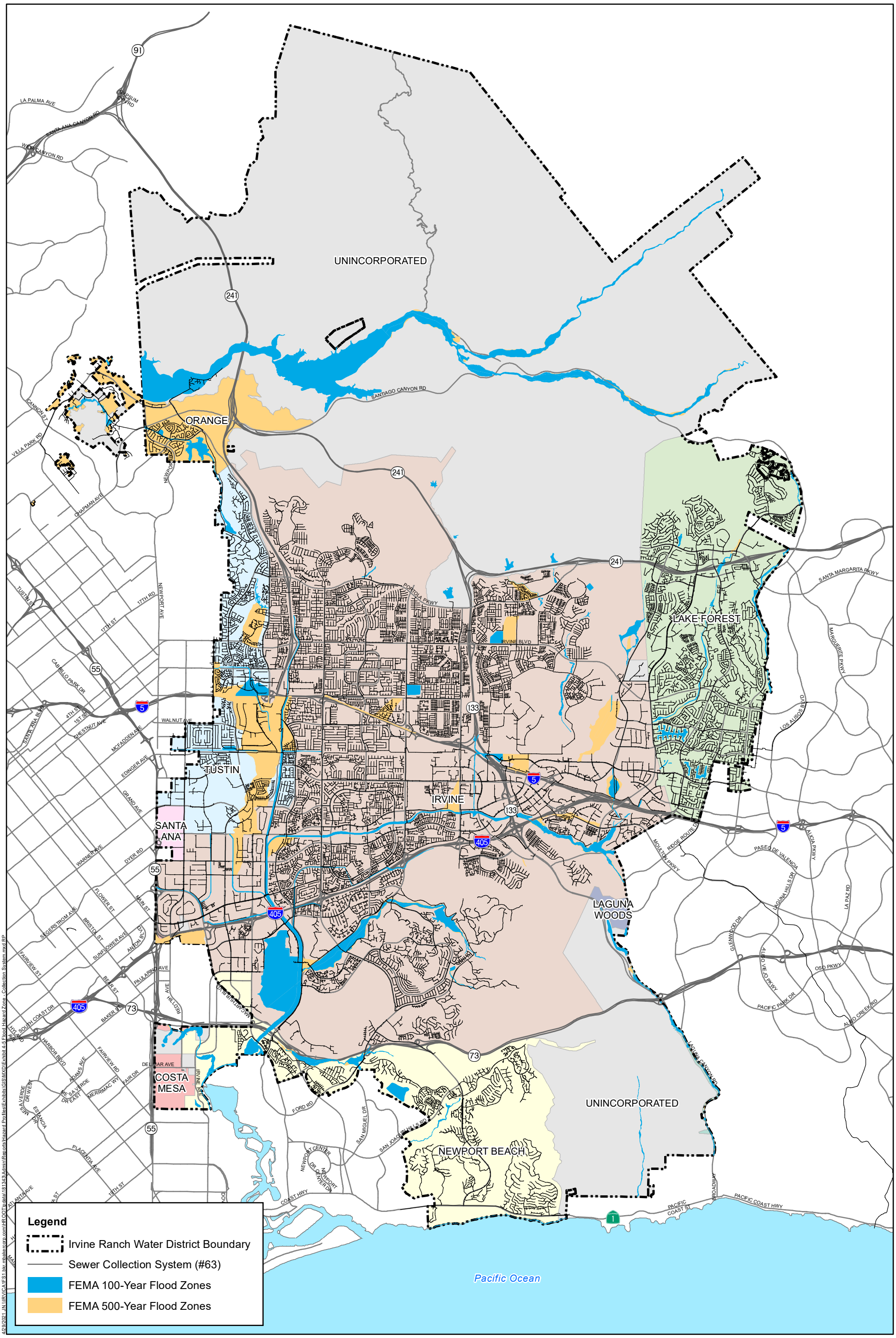
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Distribution System

Source: IRWD, 2021, FEMA, 2009

Exhibit 4-4



4/29/2021 J:\N\IRVICA1FS1.bkr mpakercorp.com\HROOT\data\181343\Admin\Reports\Hazard Profiles\Exhibits\GIS\MXD\Exhibit 4-5 Flood Hazard Zone - Collection System.mxd RP

0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Sewer Collection System

Source: IRWD, 2021, FEMA, 2009

Exhibit 4-5

Localized flooding can occur outside of mapped flood hazard zones during heavy rain events associated with extensive runoff. Localized flooding typically occurs when significant amounts of rain fall over a short time period and/or, as a result of overloaded or blocked stormwater drainage systems that cause sheet flow into streets and low-lying areas.

The extent or magnitude of flooding is measured by percentage and annual chance floods. The flooding areas are classified as 1 in 100 (one percent) or high risk, and 1 in 500 (0.2 percent) or moderate risk of flooding. Areas having a chance of less than 0.2 percent are classified as low risk areas. Floods are measured by stream gauges that are installed in bodies of water near populated areas. They are installed and operated by the United States Geological Survey (USGS) and monitor water levels constantly.

Previous Occurrences

The two most significant floods in Orange County history include the Flood of 1938 and 1969. During February and March 1938, a tropical storm centered around Los Angeles, Orange, and Riverside Counties, caused catastrophic flooding in several watersheds including the Santa Ana River and San Diego Creek (within the IRWD service area). From February 27 to March 4, 1938, an average of 22.5 inches of rainfall overtopped stream banks and caused mass flooding across the southern California region. A total of 87 people were killed during this disaster, 45 of those deaths occurred in Orange County (primarily in Atwood/Placentia). At this time, IRWD was not yet founded and the majority of the service area was unincorporated Orange County and sparsely populated.[17]

In January and February 1969, two major storms caused mass flooding across Orange County. On Feburary 5, 1969, Orange County was declared a national disaster area. Santiago Dam and Villa Park Dam both reached capacity, with maximum peak outflows. Although the safety of the dams was never threatened, maximum peak outflows caused serious downstream erosion including structural damage to the Santiago Dam spillway. Approximately 2,000 Orange and Santa Ana residents were evacuated from homes bordering Santiago Creek. Specific areas of the IRWD service area were more affected than others. The flood triggered a mudslide in Silverado Canyon, killing five and injuring seventeen.[18]

Additionally, NOAA's Storm Event Database summarizes flood events of regional significance, specifically affecting the IRWD service area. While these incidents are not as significant as the floods in 1938 and 1969, they are included for informational purposes below: These incidents include:[19]

- In February 1998, a deep low pressure trough moved through southern California with moderate to heavy rain flooding. The most serious flooding occurred in the cities of Irvine and Newport Beach, and a local State of Emergency was declared in Irvine. Numerous swift-water and standing-water rescues were made as flooding surrounded residential areas and cars. A large sink hole formed and forced the closure of Santiago Canyon Road for several days.

[17] US Geological Survey, *Floods of March 1938 in Southern California*, https://pubs.usgs.gov/wsp/0844/report.pdf, accessed February 15, 2021.
[18] City of Irvine, Local Hazard Mitigation Plan Public Review Draft, prepared June 2020.
[19] National Oceanic and Atmospheric Administration, *Storm Events Database – Event Types Flood, Orange County, California*, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Flood&beginDate_mm=10&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=10&endDate_dd=31&endDate_yyyy=2020&county=ORANGE%3A59&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA, accessed February 15, 2021.

- In September 2015, a broad upper level Pacific trough moved through the west coast, resulting in locally heavy rainfall. A debris flow occurred within the Silverado Canyon area.

In addition, localized flooding occurs in repeating locations within the IRWD jurisdiction, primarily within the coastal and canyon areas. In 2011, the Silverado and Williams Canyon area within the IRWD jurisdiction experienced localized flooding and minimal mudflow. A pipeline adjacent to Williams Canyon Creek surfaced during this incident. IRWD is currently working to permit repairs to protect the pipeline from further damage.

Probability of Future Occurrences
Based on the frequency of severe weather events and the capacity of existing facilities, there is a medium probability of a flood occurring within the IRWD service area. For areas located within the 100-year flood zone, this medium probability results in a one percent chance in a given year that this area will be inundated by flood waters. For moderate flood hazard areas located within the 500-year flood zone, the probability decreases to 0.2 percent chance in a given year that the area will be inundated by flood water. Minimal flood hazard areas are located outside the 0.2 percent annual chance for a flood zone. Exhibits 4-3 through 4-5 denote the 100- and 500-year flood zones within the IRWD service area. Flooding is most likely to occur within these delineated areas. As previously discussed, historical flooding in the canyons and coastal areas of the IRWD service area indicate the likelihood of future occurrences.

Climate Change
Climate change is likely to have a direct effect on flooding within IRWD's jurisdiction. According to research conducted by University of California, Los Angeles, California will experience extremely wet and extremely dry seasons by the end of the century. It is predicted that "over the next 40 years, the State will be 300 to 400 percent more likely to have a prolonged storm sequence as severe as the one that caused the legendary California flood more than 150 years ago."[20] Since this flooding incident, significant flood control measures have been implemented and Orange County has grown from an agrarian community to a major urban metropolitan area. While there has been regional flood control infrastructure implemented since the 1930s, such a flood could still have significant impacts. While the annual rainfall averages remain constant, the wet season may be narrower, leading to downpours in short periods of time that overwhelm infrastructure and lead to increased floods.

4.2.4 GEOLOGIC HAZARDS

Description

Expansive Soils
Expansive soils are those that have the ability to expand or contract, changing in volume based on their moisture content. They are typically composed of a form of expansive clay mineral that readily absorbs water and swells, leading to an increase in volume when wet, and shrinkage when dry.[21] Expansive soils pose a particular risk within the southwestern United States, where large clay deposits are subject to alternating periods of rainfall and drought. As expansive soils expand and contract with changes in moisture, the shrink-swell process can cause fatigue and cracking

[20] UCLA Newsroom, *Study forecasts a severe climate future for California*, https://newsroom.ucla.edu/releases/california-extreme-climate-future-ucla-study, accessed February 15, 2021.
[21] Jones, Lee. Encyclopedia of Engineering Geology, *Expansive Soils,* https://doi.org/10.1007/978-3-319-12127-7_118-1, accessed May 11, 2021.

for infrastructure or foundations placed directly on or within expansive soils. Expansive soils can cause stress on water/wastewater facilities, particularly infrastructure located underground.

Expansive soils underlying compact topsoil can lead to unstable slope conditions, eventually resulting in landslides. As expansive soil expands and contracts, compact topsoil creeps downhill. Facilities built on slopes with underlying expansive soils are vulnerable to movement or damage from topsoil creep or landslides. Refer to Section 4.2.6, *Landslide and Mudflow*, for further details about landslide hazards.

Land Subsidence
The USGS defines land subsidence as a gradual settling or sudden sinking of the Earth's surface due to removal or displacement of earth materials.[22] The primary causes include aquifer-system compaction associated with groundwater withdrawals, drainage of organic soils, underground mining, and natural compaction or collapse, such as with sinkholes or thawing permafrost. More than 17,000 square miles of the U.S. have been directly affected by subsidence, with 80 percent of known land subsidence in the U.S. occurring as a consequence of groundwater use.

In southern California, the primary cause of land subsidence is groundwater extraction in areas where aquifer recharge is exceeded by the amount of water extracted, a phenomenon known as "over-drafting." Depletion of aquifers creates a lower water table, allowing for permanent land subsidence and a reduction in the total storage capacity of the aquifer system. Damage to infrastructure, reduction in water quality, and potential intrusion from seawater in coastal areas have been documented as a result of land subsidence. Conditions typical to southern California, including an arid climate, high population density, and frequent drought conditions all exacerbate over-drafting incidents.

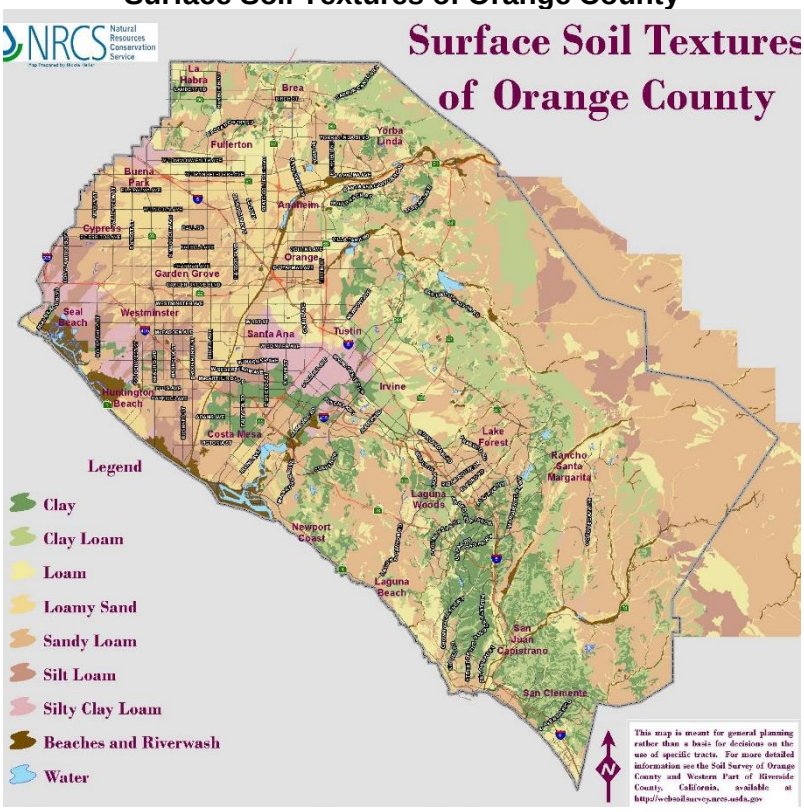
Location/Extent

Expansive Soils
Based on Natural Resources Conservation Service (NRCS) mapping, soils that could be defined as expansive underly significant portions of Orange County, including part of the IRWD jurisdiction. Consensus among experts suggests that due to the diversity of soil conditions throughout the County, no structures are completely safe from the effects of expansive soils, including cracking, sinking, or slipping.[23]

Exhibit 4-6, *Surface Soil Textures of Orange County*, depicts the NRCS mapped soil surface textures prepared for the Metropolitan Water Department of Orange County (MWDOC), showing clay, clay loam, and silty clay loam occurring through much of the IRWD service area. IRWD facilities within areas of underlaying clay soils or on slopes, or within areas subject to flooding or landslides may be especially vulnerable to the effects of expansive soils, due to the increased soil movement common under these conditions. Facilities in areas of high fire risk may also be vulnerable, due to increased soil exposure following a fire.

[22] U, S. Geologic Survey, *Land Subsidence,* https://www.usgs.gov/mission-areas/water-resources/science/land-subsidence?qt-science_center_objects=0#qt-science_center_objects, accessed May 11, 2021.
[23] County of Orange, *General Plan: Safety Element*, https://www.ocgov.com/civicax/filebank/blobdload.aspx?blobid=40234, prepared 2005, accessed May 11, 2021.

Exhibit 4-6
Surface Soil Textures of Orange County



Source: Municipal Water District of Orange County, Orange County Surface Soils Textures Map, https://www.mwdoc.com/save-water/resources/technical-resources/soils/, accessed January 27, 2021.

The severity of impacts from expansive soils can vary from cosmetic to functional and structural damage. Cosmetic damage refers to damage affecting only the physical appearance, such as cracking in plaster or drywall. Functional damages refer to situations where the use of the structure was impacted or otherwise diminished. Structural damage includes situations where an entire foundation or structure requires replacement. The magnitude of an expansive soil hazard depends on the kind of IRWD infrastructure affected – impacts on a critical water or wastewater facility could have significant ramifications in water delivery or the timely treatment of wastewater. Functional or structural dam or reservoir damage because of expansive soils could also occur; refer to Section 4.2.1, *Dam/Reservoir Failure* for further details.

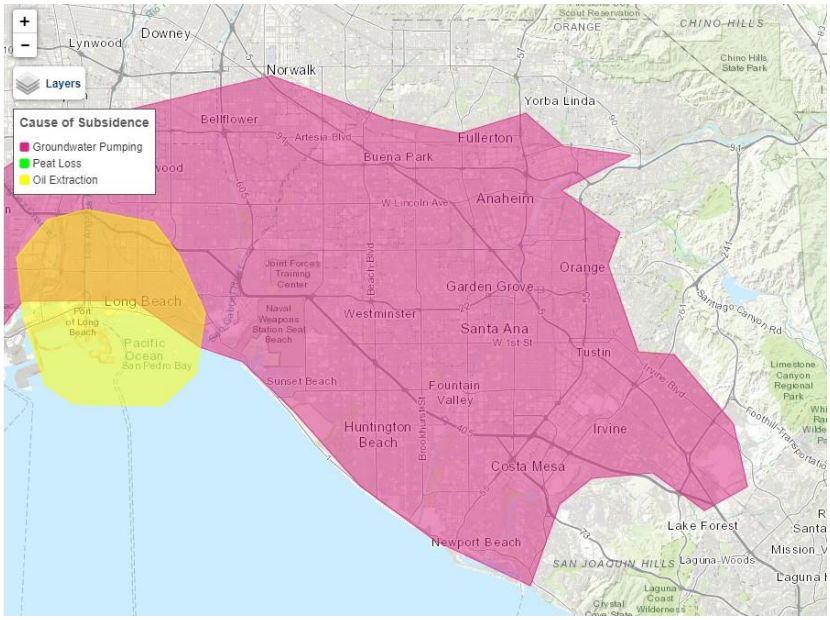
Land Subsidence

Land subsidence affects much of the west coast, including areas of Orange County. The major area in Orange County affected by land subsidence extends between Newport Beach and Huntington Beach on the coast and approximately five miles inland. Referred to as the Talbert Gap, this area formed millennia ago from alluvial deposition processes of the Santa Ana River, and has been subject to saltwater intrusion as a consequence.[24] According to the USGS online map viewer, the area of land subsidence in Orange County resulted from groundwater pumping. USGS mapping, depicted in Exhibit 4-7, *USGS Areas of Land Subsidence in California*, shows

[24] Liles, Thomas & Sovich, *Saltwater Intrusion in Orange County, California: Planning for the Future,* https://olemiss.edu/sciencenet/saltnet//swica1/liles-thomas-sovich-exabs.pdf, accessed February 9, 2021.

an area of subsidence extending southeast from the general vicinity of Orange, Tustin, and Irvine to Lake forest, overlapping with portions of the IRWD service area.

Exhibit 4-7
USGS Areas of Land Subsidence in California



Source: U. S. Geologic Survey, Areas of Land Subsidence in California, https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html accessed February 9, 2021

Because land subsidence is a slow-moving and on-going hazard, it is difficult to estimate the severity of long-term impacts.

Previous Occurrences

Expansive Soils
Although expansive soils are known to exist within Orange County, there are no reported occurrences of expansive soils causing substantial damage within the IRWD service area. Expansive soils would likely be identified at a local level on a site-by-site basis. There are no known occurrences of IRWD infrastructure being impacted by expansive soils.

Land Subsidence
Land subsidence has been documented historically in Orange County in the IRWD service area and is attributed to groundwater pumping and overdraft conditions beginning in the early 20th century. By the 1950s, continued development in Orange County strained local groundwater resources. The local water table dipped below sea level, resulting in subsidence and seawater intrusion, primarily between the cities of Newport Beach and Huntington Beach.[25] The Orange County Water District (OCWD) was established to manage regional groundwater aquifers within the County and identified major subsidence and saltwater intrusion at the Talbert Gap. Part of the affected area lies within the IRWD service area. While land subsidence is a recognized phenomenon to occur within Orange County and the IRWD service area, there are no known occurrences of IRWD infrastructure being impacted by land subsidence. Recognizing the impacts

[25] Ibid.

of groundwater basin over-drafting, IRWD works closely with OCWD to strategically manage groundwater resources as part of a complete water portfolio.

Probability of Future Occurrences

Expansive Soils
Based upon NRCS soil mapping, expansive soils will continue to occur within the IRWD service area. The climatic processes that exacerbate expansive soils, including alternating periods of rainfall and drought, will also continue.[26] Potential impacts associated with expansive soils are typically addressed during site design and development review when constructing new infrastructure.

Land Subsidence
As drought and population pressures continue to burden regional aquifers, the possibility for overdraft exists in the future. To mitigate these issues, OCWD updated the County-wide Groundwater Management Plan in 2015 to set forth basin management goals and objectives, and outline management practices. This plan meets the Sustainable Groundwater Management Act requirement and will be updated every five years per State requirements. IRWD coordinates with OCWD regarding groundwater resources and follows the regional regulations and guidelines regarding extractions. While areas in Orange County have previously experienced overdraft, the regional management and leadership from OCWD on groundwater resources will ensure the likelihood of overdraft in the future is low. As overdraft conditions are mitigated, land subsidence associated with these activities will remain unlikely.

Climate Change

Expansive Soils
According to the 2018 State Hazard Mitigation Plan, climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the twenty-first century due to changing weather patterns such as more frequent and extended periods of high temperature conditions.[27] With high temperatures likely to produce extended drought conditions, periods of intense rain are also likely to occur. According to research conducted by the University of California, Los Angeles, California will experience extremely wet and extremely dry seasons by the end of the century.[28] As alternating patterns of wet and dry become more pronounced, the shrink-swell process behind the destructive force of expansive soils will likely intensify, leading to a greater potential for structural damage.[29] Drought and increasingly powerful storm events driven by climate change are also likely to increase the rates of fires and floods, leading to exposed soils and greater potential for landslides triggered by expansive soils processes.

Land Subsidence
While drought driven by climate change is likely to continue and place an increased burden on local aquifers, regional leadership and groundwater sustainability plans reduce the likelihood of future overdraft conditions. Reductions in overdraft conditions reduce the likelihood of land

[26] National Weather Service - Climate Prediction Center, *U.S. Seasonal Drought Outlook*, https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php, accessed February 8, 2021.
[27] California Governor's Office of Emergency Services, *2018 California State Hazard Mitigation Plan,* https://www.caloes.ca.gov/HazardMitigationSite/Documents/003-2018%20SHMP_FINAL_ACK-TOC.pdf, published September 2018, accessed February 8, 2021.
[28] University of California Los Angeles Newsroom, *Study forecasts a severe climate future for California*, https://newsroom.ucla.edu/releases/california-extreme-climate-future-ucla-study, accessed May 11, 2021.
[29] Mitchel, PW., *Climate Change Effects on Expansive Soil Movements*, https://www.cfms-sols.org/sites/default/files/Actes/1159-1162.pdf, accessed February 9, 2021.

subsidence occurrences. Additionally, IRWD has taken critical steps to diversify the water portfolio and reduce dependence on groundwater resources. Neighboring jurisdictions reliant on Orange County aquifers have done the same. Thus, while drought is expected to continually occur in the southern California region, land subsidence is not likely to occur in the IRWD service area.

4.2.5 HUMAN CAUSED HAZARDS

Description

Hazardous Materials
A hazardous material means that, because of its quantity, concentration, or physical or chemical composition, poses a significant present or potential hazard to human health and safety or to the environment if released. The term "release" means spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, unless permitted or authorized by a regulatory agency.[30] Hazardous materials can be in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazardous materials accidents can occur during production, storage, transportation, use, or disposal.[31]

The impacts of a hazardous materials release can vary, depending on the type and amount of material released. Hazardous materials exposure can include the following effects: skin/eye irritation; difficulty breathing; headaches; nausea; behavior abnormalities; cancer; genetic mutations; physiological malfunctions (i.e., reproductive impairment, kidney failure); physical deformations; or birth defects.[32]

Terrorism/Sabotage
Domestic terrorism is defined by the Federal Bureau of Investigation (FBI) as perpetuated by individuals and/or groups inspired by or associated with a primarily U.S. based movement that espouses extremist ideologies of a political, religious, social, racial, or environmental nature. International terrorism is perpetuated by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (i.e., State sponsored).[33] The U.S. Federal Code states that terrorism must be intended to 1) intimidate or coerce a civilian population; 2) influence the policy of a government by intimidation or coercion; or, 3) affect the conduct of a government by mass destruction, assassination, or kidnapping.[34] Following serious international and domestic terrorism incidents since the early 2000s, this type of hazard has become a growing concern.

Terrorism can be utilized by a variety of agents and delivery systems. IRWD water supplies and infrastructure are considered potential terrorist targets, particularly dams and reservoirs. For example, a terrorist attack that utilizes explosives could damage a dam and trigger significant inundation with little warning. Other types of weapons that could be utilized are chemical or biological weapons to contaminate drinking water supply.

[30] Health and Safety Code Division 20, Chapter 6.95, *Hazardous Materials Release Response Plans and Inventory*, Article 1.
[31] Department of Homeland Security, *Hazardous Materials Incidents*, https://www.ready.gov/hazardous-materials-incidents, accessed February 16, 2021.
[32] U.S. Environmental Protection Agency, *Health and Ecological Hazards Caused by Hazardous Substances*, https://www.epa.gov/emergency-response/health-and-ecological-hazards-caused-hazardous-substances, February 16, 2021.
[33] Federal Bureau of Investigation, *Terrorism,* https://www.fbi.gov/investigate/terrorism, accessed February 16, 2021.
[34] U.S. Federal Code Title 18, Chapter 113B, Section 2331.

Other types of terrorism could include cyberterrorism. All of Orange County's water utilities utilize Supervisory Control and Data Acquisition system (SCADA), which operate over telecommunication lines and/or radio systems. This leaves IRWD and other water agencies potentially vulnerable to hacking or other malicious attacks.

Location/Extent

Hazardous Materials
Hazardous materials are generated, transported, used, and stored by facilities owned and operated by IRWD for the purposes of potable water and wastewater treatment activities. Localized hazardous materials spills pose low magnitude risks to IRWD water supplies and systems, as minor spills would likely be quickly identified and addressed. However, there is the potential for a major hazardous materials spill to severely impact water supplies through groundwater intrusion or direct contamination of the water source.

The magnitude and severity of the hazard would be highly dependent on the type of spill, location, and the extent to which hazardous materials enter the water system. Hazardous materials can be flammable, radioactive, infectious, corrosive, toxic/poisonous, or otherwise reactive. For example, a radioactive material spill would have a much further-reaching extent when compared to a paint spill. Climate conditions can also affect the severity of hazardous materials spills. Heavy rains or winds could spread hazardous materials over a larger geographical area and create challenging cleanup conditions.

Additionally, hazardous materials are generated, transported, used, and stored by facilities within the IRWD jurisdiction by other entities. Uses known to handle hazardous materials within the IRWD service area include gas stations, dry cleaners, medical facilities, and commercial/retail business. Most hazardous materials operations by other entities within the IRWD service area are small-scale and pose minimal risk to IRWD infrastructure.

Terrorism/Sabotage
Terrorism and sabotage are difficult to predict the specific location and severity of impacts. Both IRWD water and wastewater infrastructure are vulnerable to terrorism or sabotage attacks but would have varying magnitudes or severity of impacts. The most severe impacts would occur if a full dam or reservoir was attacked, resulting in the inundation of property and infrastructure downstream (refer to Section 4.2.1 for further discussion regarding Dam/Reservoir Failure). Attacks on water or wastewater treatment facilities could threaten water distribution or timely wastewater treatment activities for an unknown period of time, potentially affecting a range of IRWD customers.

Unlike physical terrorism attacks, cyberterrorism is not location based. Hacking could occur from great distances away from the IRWD service area, but impacts could be severe and widely distributed throughout the jurisdiction.

Previous Occurrences

Hazardous Materials
Previous occurrences of hazardous materials spills in the IRWD service area included sewage, saline water/brine, petroleum, and chemicals. The majority of past incidents were minor in scope and did not impact drinking water to IRWD customers. IRWD reports hazardous materials spills immediately after detection and initiates cleanup activities with the appropriate regulatory and law

enforcement agencies. IRWD has not experienced major spills that have interrupted service to customers, by either internal accidents or accidents from external entities that affected IRWD.

Terrorism/Sabotage
IRWD has not experienced any high-profile terrorism or sabotage attacks on infrastructure or critical facilities. Generally speaking, Orange County has not experienced significant attacks or threats from domestic or international terrorist organizations. Several organizations in Orange County are dedicated to the advisory notification, investigation, and analysis of terrorist events/activities, including: Orange County Joint Terrorism Task Force, Orange County Private Sector Terrorism Response Group, and Orange County Intelligence Assessment Center (OCIAC).[35] IRWD is also a member of the Water Emergency Response Organization of Orange County (WEROC), which provides direct and consistent access to emergency training and advisement by the OCIAC.

Probability of Future Occurrences

Hazardous Materials
As the IRWD service area continues to become more urbanized, hazardous materials use and transport will likely continue into the future. IRWD implements applicable polices and regulations regarding the use and storage of hazardous materials; additionally, partner cities within the jurisdiction also implement hazardous materials regulations from the County, State and federal government. IRWD regularly reviews hazardous chemical technology improvement and assesses the potential for adopting less-hazardous chemicals as they become available. Both the federal government and the State require hazardous materials handling to be reported with the local Certified Unified Program Agency (CUPA). Because of the preventative action taken by IRWD and customer cities, the probability and likelihood for future contamination is considered medium.

Terrorism/Sabotage
Because of the dynamic nature of a terrorist threat and the open nature of California society and public spaces, all jurisdictions are vulnerable to a terrorist attack. The probability of a physical terrorist attack on IRWD infrastructure is low; however, a small probability does exist for future occurrence. The prevalent use of technology and the Internet increases the likelihood for cyberterrorism incidents against IRWD, however, IRWD has taken and continues to take steps to lessen this risk.

Climate Change

Hazardous Materials
Accidental hazardous materials releases are caused by human error, unrelated with climate change. However, hazardous materials releases can result from infrastructure failure during a natural hazard event, such as a wildfire or severe winter storm. Climate change could cause an increase in these types of natural hazards in the IRWD service area. Hazardous materials releases during wildfire or severe weather events could spread contamination to large geographic areas and amplify long-term impacts to human and ecological health.

Terrorism/Sabotage
As terrorism and sabotage events are human caused, these types of hazards are not directly tied to climate change impacts. However, the interaction of natural hazards and global climate change

[35] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.

could increase the frequency and severity of events. Significant and prolonged climate change impacts can cause conflicts regarding natural resources and livelihood insecurity, as well as food insecurity or water scarcity. Terrorist organizations could operate more easily in fragile and conflict-affected environments.[36]

4.2.6 LANDSLIDE AND MUDFLOW

Description

Landslide
Landslide is a generalized term for a falling mass of soil or rocks. When a hillside or other slope becomes unstable, downslope movement of rock and soil occurs under the direct influence of gravity. Landslides can include events such as rock falls, topples, slides, spreads and flows. Landslides are often sudden, although some occur very slowly over a long period of time. Loose and fractured materials are more likely to slide than compact materials or solid rock, and steep slopes are at greater risk than gentle rises. Areas that have been recently burned by wildfires are more susceptible to sliding because the fire destroys the plant cover that helps stabilize slopes.

Landslides are usually induced by either earthquakes or moisture. The shaking of an earthquake can decrease slope stability, or in a more severe instance, can fracture the earth material enough that it slides. Moisture-induced landslides can occur when the ground soaks up enough water that it becomes loose and unstable. This is often the result of intense or long-lasting rainfall but can also result from a pipeline burst or overwatering landscapes. In some cases, hillside erosion from rainfall can cause instability and result in landslides. If the slide is wet enough to become mud, the event is known as a mudslide or a mudflow (refer to the mudflow discussion below).
Regardless of the cause or specific form, a landslide can damage or destroy structures built on the sliding material or in its path. Underground infrastructure, such as pipelines or telecommunication lines, may be severed during a landslide. This could lead to infrastructure-induced flooding if water pipes or sewage lines are broken. In addition to property damage, landslides can crush or bury people, creating a risk of serious injury or death.

Natural processes can cause landslides or re-activate historical landslide sites. The removal or undercutting of shoreline-supporting material along bodies of water by currents and waves produces countless small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause additional failure (lateral spreading) that can occur on gentle slopes above steep streams and riverbanks.

Mudflow
A mudflow is a river of rock, earth and other debris, including vegetation that is saturated with water. While landslides can occur without the presence of soil (such as a rock landslide), mudflows consist of material that contains at least 50 percent sand, silt and clay-sized particles. The high percentage of water gives the mudflow a rapid rate of movement down a slope, posing extremely dangerous conditions to people and property. Mudflows normally occur when a landslide moves down slope as a semi-fluid mass scouring or partially scouring soils from the slope along the path. Flows often triggered by earthquakes or heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances.

[36] Climate Diplomacy Organization, *Insurgency, Terrorism and Organized Crime in a Warming Climate*, https://www.climate-diplomacy.org/publications/insurgency-terrorism-and-organised-crime-warming-climate, accessed February 16, 2021.

Wildland fires on hills covered with chaparral are often a precursor to mudflows or debris flows in burned out canyons. The extreme heat of a wildfire can create impervious soil conditions by creating a waxy-like layer just below the ground surface. Because the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil into a sheet of mud and debris. Debris flows can often originate miles away from unsuspecting persons, and approach them at a high rate of speed with little warning.

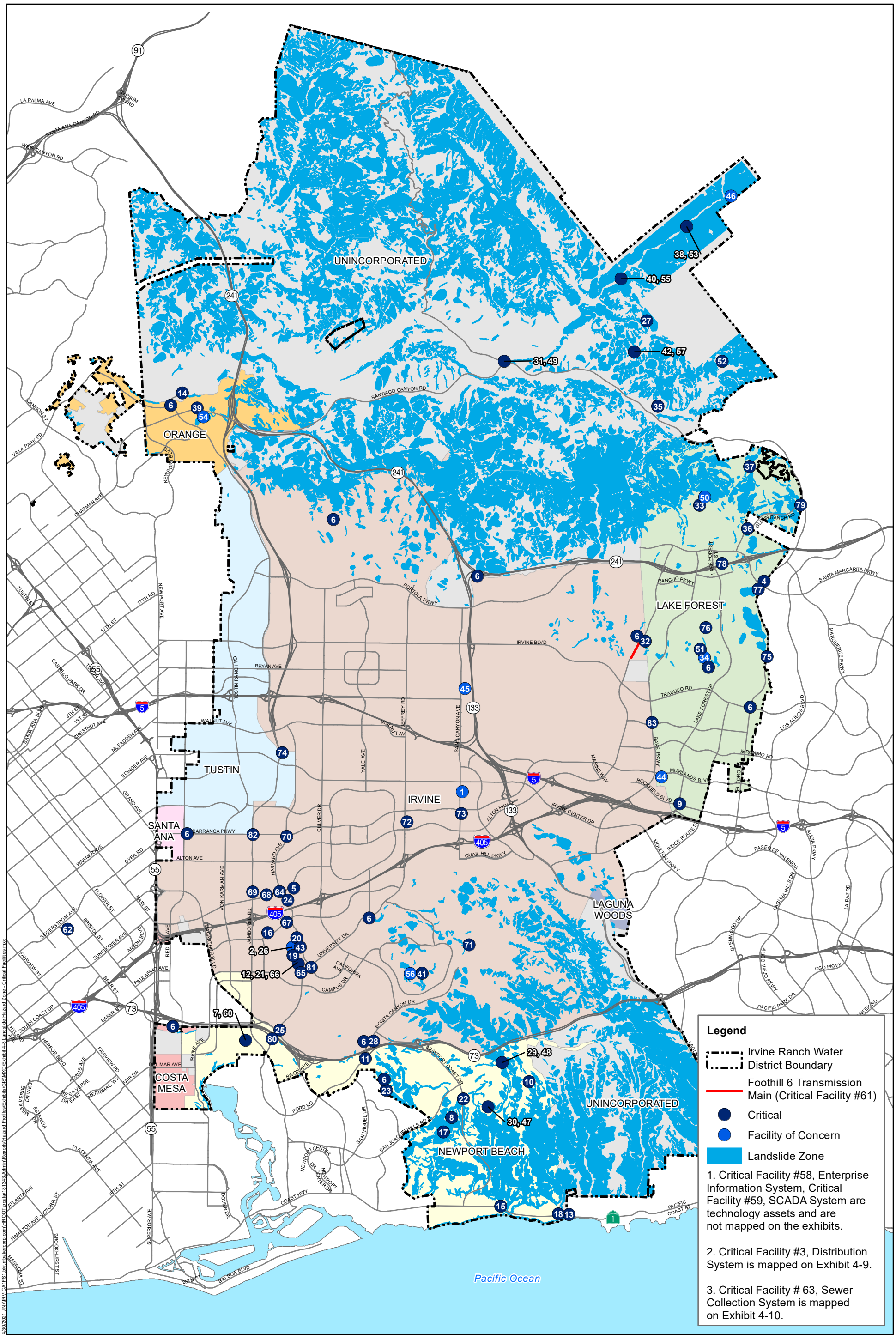
Location/Extent

Exhibit 4-8, *Landslide Hazard Zone – Critical Facilities*, Exhibit 4-9, *Landslide Hazard Zone – Distribution System*, and Exhibit 4-10, *Landslide Hazard Zone – Sewer Collection System*, identifies landslide hazard areas within the IRWD service area based on the terrain, geologic, geotechnical, and seismological data. These areas are susceptible to earthquake-induced hazards and do not depict areas that could be at risk for moisture-induced landslides. According to the County of Orange and Orange County Fire Authority Hazard Mitigation Plan, locations at risk from landslides or debris flows (mudflows) include areas with the following conditions: [37]

- On or close to steep hills;
- Steep road-cuts or excavations;
- Existing landslides or places of known historic landslides (such sites often have tilted powerlines, trees tilted in various directions, cracks in the ground, and irregular-surfaced ground);
- Steep areas where surface runoff is channeled, such as below culverts, V-shaped valley, canyon bottoms, and steep stream channels;
- Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons; and/or
- Canyon areas below hillside mountains that have recently (within one to six years) been subjected to wildfire.

Landslide hazard zones are distributed throughout the IRWD service area, particularly in the steep and hilly unincorporated Orange County areas in the northern and southern portion of the service area. Landslides are less likely to occur within the topographically flat areas in central Irvine, Tustin, and Lake Forest, correlating with the most urbanized portions of the service area. Areas of steep slopes and the creeks that convey surface runoff from the community serve as locations at risk for landslides and mudflows within IRWD's service areas. The location of IRWD's infrastructure within and adjacent to high wildfire hazard areas also makes it more susceptible to experiencing impacts from landslides and mudflows associated with heavy rain events following a wildfire event. Specifically, infrastructure located in the City of Newport Beach, City of Lake Forest, and unincorporated communities would be highly susceptible to potential wildfires; refer to Section 4.2.9 regarding wildfire hazard zones.

[37] County of Orange and Orange County Fire Authority, *Local Hazard Mitigation Plan*, adopted November 2015.



Legend

- Irvine Ranch Water District Boundary
- Foothill 6 Transmission Main (Critical Facility #61)
- Critical
- Facility of Concern
- Landslide Zone

1. Critical Facility #58, Enterprise Information System, Critical Facility #59, SCADA System are technology assets and are not mapped on the exhibits.

2. Critical Facility #3, Distribution System is mapped on Exhibit 4-9.

3. Critical Facility # 63, Sewer Collection System is mapped on Exhibit 4-10.

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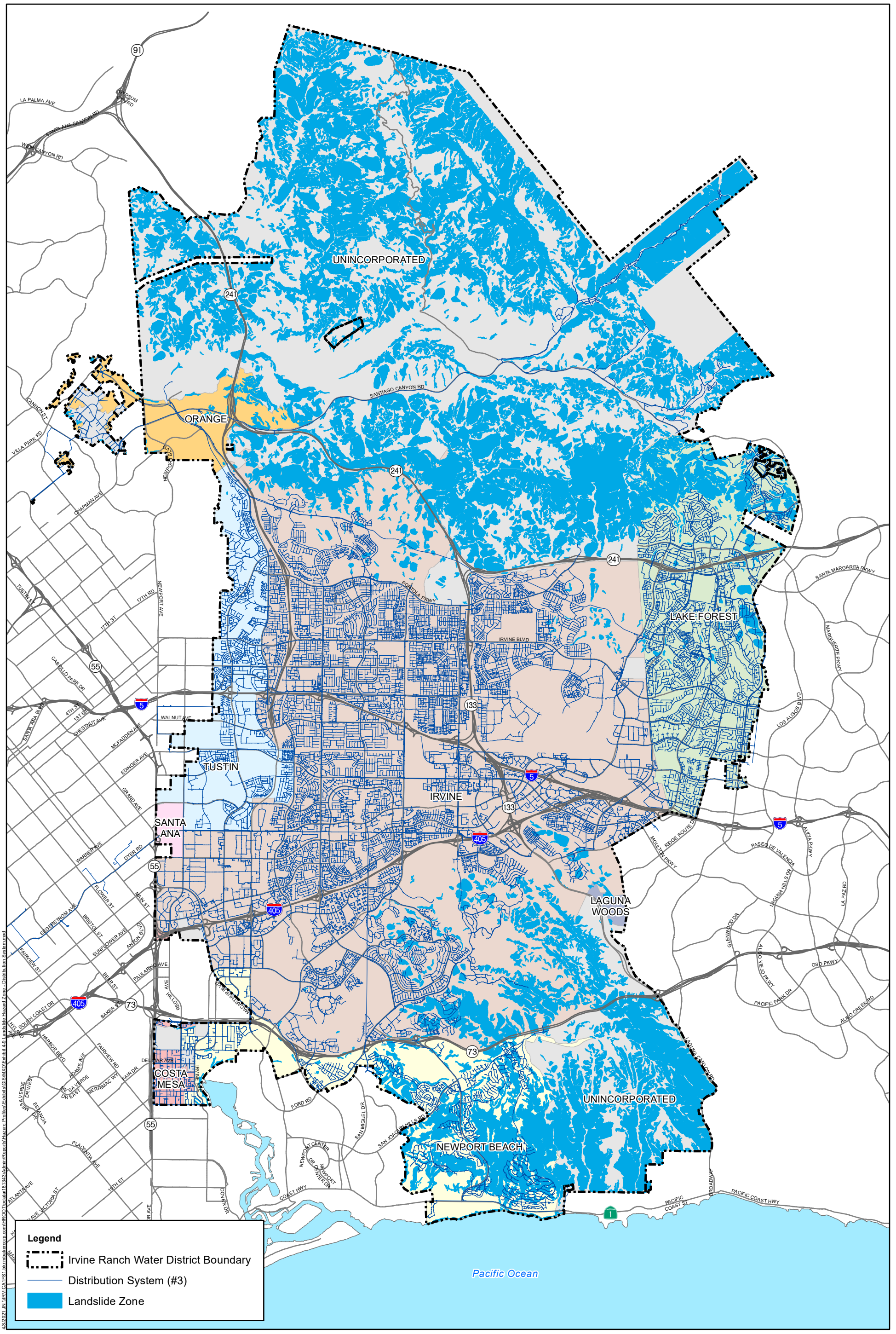
Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Critical Facilities

Data Source: IRWD, 2021, CGS, 2016

Exhibit 4-8



Legend

- Irvine Ranch Water District Boundary
- Distribution System (#3)
- Landslide Zone

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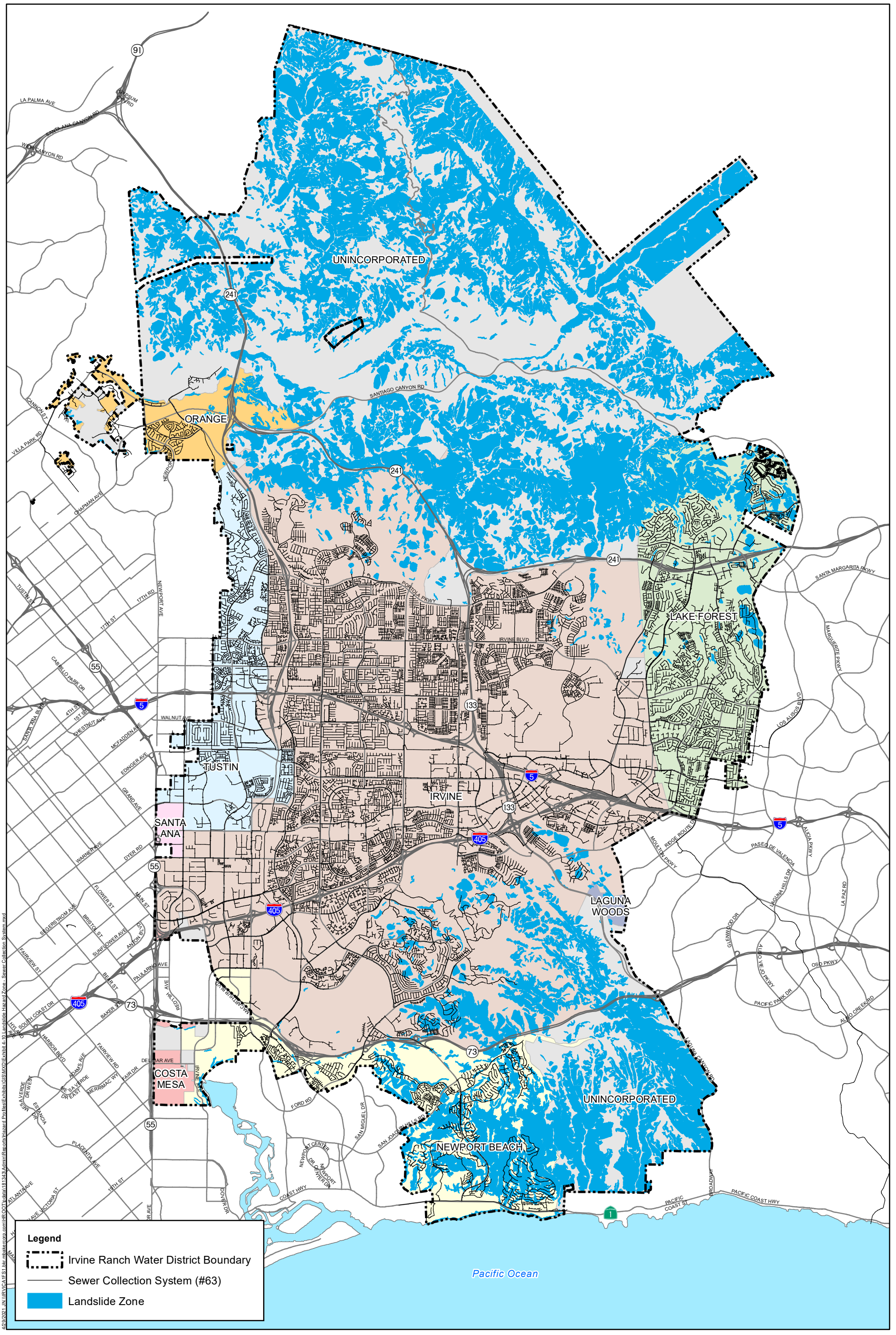
Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Distribution System

Source: IRWD, 2021, CGS, 2016

Exhibit 4-9



0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Sewer Collection System

Source: IRWD, 2021, CGS, 2016

Exhibit 4-10

Landslides and mudflows have different predictability and velocity levels depending upon the nature and location of the event. Slow landslides may damage structures and infrastructure and are difficult to stabilize due to their large size. However, slow landslides allow people to evacuate before there is the danger of loss of life. Landslides and mudflows with high velocity can destroy structures or other lifeline utilities and can cause significant loss of life or injury. The severity of a landslide is often measured by the amount of material that slides (e.g., in cubic feet). Mudflows tend to be more fluid and because they flow down a stream or creek, they can extend beyond the community in which they originated. Mudflows can occur suddenly without time for adequate warning and reach 100 miles per hour. Monitoring of weather conditions and understanding historic fire conditions within the area can help to identify conditions in which mudflows are likely.

Previous Occurrences

The IRWD service area has not experienced a major landslide. In 2011, the Silverado and Williams Canyon area within the IRWD jurisdiction experienced localized flooding and minimal mudflow. A pipeline adjacent to Williams Canyon Creek surfaced during this incident. IRWD is currently working to permit repairs to protect the pipeline from further damage.

Moderate mudflows regularly occur in the canyons area of IRWD's jurisdiction, primarily during heavy rains after a significant wildfire. A more recent mud and debris flow occurred in Silverado Canyon during January and March 2021 within the IRWD service area, in locations surrounding the Bond Fire, which burned over 6,000 acres in December 2020.[38] IRWD infrastructure remained unharmed during these mudflows, but substantial cleanup efforts were required to remove debris and reestablish access to facilities.

Regionally, the southern California area has experienced major landslide incidents. Landslides were triggered by both the 1971 San Fernando Earthquake and the 1994 Northridge Earthquake in Los Angeles County. Historically, Orange County has experienced several moisture-induced landslides, including the 1978 and 2005 Blue Bird Canyon Landslides (Laguna Beach), 2005 Southcoast Water District (SCWD) Landslide (Laguna Niguel), and 2018 Cannon Cliff Landslide (Dana Point).[39]

Regionally, major mudflows have been triggered by the recent increase in wildfires in southern California. Most recently in January 2018, Santa Barbara County experienced heavy rains directly onto the Thomas Fire burn area in the steep hills of the Montecito community. A major mudflow of up to 15 feet in height was triggered, destroying 100 homes, damaging over 300 homes, and killing 23 people. A natural gas pipeline burst, and a small brush fire broke out. Over 20,000 people lost power. Mud and debris flooded Highway 101 and the freeway was closed in both the north and south direction for almost two weeks.[40]

Probability of Future Occurrences

Landslides and mudflows are considered to have a medium probability of occurring within IRWD's jurisdiction. There are several areas located throughout the IRWD service area that have a higher probability of landslides, particularly the hilly and less urbanized areas of unincorporated Orange County in the northern and southern portions of the service area. With the recent and reoccurring

[38] Los Angeles Times, *Winter Storms Trigger Mudslide in Southern California, Clogs Roadways*, https://www.latimes.com/california/story/2021-01-29/winters-storm-triggers-mudslide-in-southern-california-clogs-roadways, accessed February 16, 2021.
[39] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.
[40] The San Luis Obispo Tribune, *A year ago, debris flows brought unfathomable destruction to Montecito*, https://www.sanluisobispo.com/news/local/article224213780.html, accessed Feburary 16, 2021.

wildfires, burn areas are highly susceptible to landslides or mudflows during heavy rains. Additionally, landslides can be caused by earthquake activity, which was determined to have a high probability of occurring in the IRWD service area.

Climate Change
There is no known link between climate change and seismic activity, and therefore climate change is not expected to directly affect earthquake-induced landslides. In southern California, climate change is anticipated to create more severe drought patterns and increase the frequency of intense storms. Drought conditions cause soil to dry out over time, reducing the ability for soils to absorb precipitation when storms occur. Decreased absorption can result in increased amounts of runoff with the potential for landslide and/or mudflow conditions. More significant or frequent storm events can also result in increased precipitation to be absorbed by the soil of slopes within IRWD's jurisdiction, causing hillside destabilization and increasing the frequency of landslide events or mudflows.

Additionally, climate change is expected to increase the length and severity of the wildfire season. Orange County is increasingly susceptible to a longer wildfire season, triggered by abnormally strong Santa Ana winds, dry conditions, and extreme heat. When wildfires burn slopes, the devegetation and destabilization of soil can also result in landslides or mudflows during winter rains. As climate change extends the wildfire season, mudflows and landslides are likely to increase in frequency as well.

4.2.7 SEISMIC HAZARDS

Description
The USGS defines an earthquake as a sudden slip on a fault and the resulting ground shaking and radiated seismic energy caused by the slip (or any other sudden stress changes in the earth).[41] Earthquakes occur without warning, and result in effects such as fault rupture, ground shaking, and liquefaction, described below.

Fault Rupture
Fault rupture or surface faulting is the differential movement of two sides of a fracture, where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults, which occur based on the type of underlying fault. Faults occur at boundaries between large sections of the earth's surface, called tectonic plates. Most of California sits on the North American plate, but coastal areas (including IRWD's jurisdiction) are on the Pacific Plate. The San Andreas Fault is the main boundary between the North American and Pacific Plates, but other fault lines can be found up to 200 miles away. The presence of the San Andreas Fault and other regional faults is the reason for California's frequent seismic shaking and other tectonic activity.

Ground Shaking
Ground shaking or ground motion is the seismic shaking of the earth's surface during an earthquake. When a fault ruptures or slips, seismic waves radiate and cause the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can further amplify ground motion.[42] Seismic ground shaking can be strong enough to result in widespread devastation or be virtually

[41] U.S. Geological Survey, *Earthquake Glossary – Earthquake*, https://earthquake.usgs.gov/learn/glossary/?term=earthquake, accessed February 15, 2021.
[42] U.S. Geological Survey, *Earthquake Glossary – Ground Motion*, https://earthquake.usgs.gov/learn/glossary/?term=ground%20motion, accessed February 15, 2021.

undetectable by the average person. The intensity of seismic shaking is a result of the release by the fault rupture (how much of the accumulated stress was released), the length of the rupture (the longer the slip along the fault line, the greater the shaking), and the depth at which the rupture occurs (ruptures that occur closer to the surface often cause stronger shaking). Usually, areas closest to the rupture (epicenter) experience the greatest shaking, although differences in geology and soil can have an impact.

Seismic shaking can damage or destroy buildings and structures and may cause partial or total collapse. Ground movement can damage or destroy infrastructure beneath the ground, such as utility lines and pipes. This in turn, can cause hazardous materials releases, water main breaks, and other dangerous situations resulting from infrastructure failure. Falling debris and structures can also create a risk of personal injury or death.

Liquefaction
Liquefaction is a phenomenon that occurs when ground shaking causes saturated soils (primarily clay-free deposits such as sand or silt) to lose strength and act like a viscous fluid. Certain soils are more susceptible to liquefaction, particularly younger and looser sediment with a higher water table. According to FEMA, liquefaction causes three types of ground failure, as described below:[43]

- Lateral spreads involve the lateral movement of large soil blocks as a result of liquefaction of an underlying layer. They generally develop on gentle slopes, most commonly between 0.3 and 3 degrees. Horizontal movements commonly are as much as 10 to 15 feet. However, where slopes are particularly favorable, and duration of ground shaking is long, lateral movement may be as much as 100 to 150 feet. Lateral spread usually breaks up internally, forming numerous fissures and scarps.

- Flow failures consist of liquefied soil or blocks of intact material riding on a layer of liquefied soil and are the most catastrophic type of ground failure caused by liquefaction. They commonly move several feet but can travel up to dozens of miles under certain conditions. Flow failures usually form in loose saturated sands or silts on slopes greater than three degrees.

- Loss of bearing strength occurs when the soil supporting buildings or other structures liquefies. When large deformations occur, structures settle and tip. The general subsurface geometry required for liquefaction-caused bearing failures is a layer of saturated, cohesionless soil that extends from near the ground surface to a depth equal to about the width of the building.

Location/Extent

Fault Rupture
The IRWD service area is located within the southern California region, known to be seismically active. Two faults have been mapped by USGS within the IRWD jurisdiction, as described below:

- San Joaquin Hills Thrust fault: This fault is a recently discovered southwest-dipping blind thrust fault originating near the southern end of the Newport-Inglewood Fault close to

[43] Federal Emergency Management Agency, *Multi-Hazard Identification and Risk Assessment - Subpart D: Seismic Hazards*, published January 1, 1997.

Huntington Beach, at the western margins of the San Joaquin Hills. Rupture of the entire area of this blind thrust fault could generate an earthquake as large as magnitude 7.3. In addition, a minimum average reoccurrence interval of about 1,650 and 3,100 years has been estimated for moderate-sized earthquakes on this fault.[44]

- Pelican Hill fault: This fault was mapped in the San Joaquin Hills, and appears to be confined to older bedrock units, with no impact on the younger, Holocene terrace/alluvial deposits. Thus, this fault zone is not considered active. According to the City of Newport Beach Local Hazard Mitigation Plan, no further geological studies are considered warranted at this time for this particular fault.[45]

In addition to the fault zones mapped above, several active faults of regional significance could pose a threat to the IRWD service area. The closest active faults of significance to the IRWD jurisdiction are discussed below:

- Elsinore Fault Zone/Whittier Fault/Chino Fault: Located in the northeast portion of Orange County, the Elsinore Fault Zone follows a general line easterly of the Santa Ana Mountains into Mexico. This is one of the largest fault zones in southern California, but in historical times one of the seismically quietest zones. The main trace of the Elsinore Fault is about 180 km, excluding the connections to Whittier, Chino and Laguna Salada faults. The last major earthquake on this fault line occurred on May 1910 (M 6.0) with no surface rupture found. The interval between major ruptures is estimated at 250 years, with probable magnitudes between 6.5 to 7.5. At the northern end of the Elsinore Fault Zone, the fault splits into two significant segments: the 25-mile-long Whittier Fault (probable magnitude between 6.0 and 7.2) and the 25-mile-long Chino Fault (probable magnitude between 6.0 and 7.0). Also included in the northern portion of the fault zone are the Glen Ivy North and Glen Ivy South faults.[46]

- Newport-Inglewood-Rose Canyon Fault Zone: The Newport-Inglewood segment extends from the Santa Monica Mountains in a southeast direction to the western part of Orange County (Newport Beach/Costa Mesa), then continues approximately four miles offshore into the San Diego Bay (Rose Fault Zone). The last major earthquake on this fault line occurred on March 10, 1933 (M 6.4) with no surface rupture found. This incident resulted in 120 deaths and over $50 million in property damage. The interval between major ruptures is unknown, with probable magnitudes between 6.0 – 7.4. The main trace of this fault zone is estimated to be 105 kilometers, but portions of the fault zone are difficult to map because the surface trace is discontinuous in the Los Angeles Basin. Due to the urbanized nature of communities along this fault line, the Newport-Inglewood-Rose Canyon Fault Zone is considered one of southern California's top seismic dangers.[47]

- San Andreas Fault Zone: One of the most well-known faults in California, the San Andreas Fault is the main boundary between the Pacific and North American tectonic plates. Over

[44] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.
[45] City of Newport Beach, *Local Hazard Mitigation Plan,* updated 2016.
[46] Southern California Earthquake Data Center, *Elsinore Fault Zone,* https://scedc.caltech.edu/earthquake/elsinore.html, accessed February 15, 2021.
[47] Southern California Earthquake Data Center, *Newport-Inglewood Fault Zone,* https://scedc.caltech.edu/earthquake/newport.html, accessed February 15, 2021.

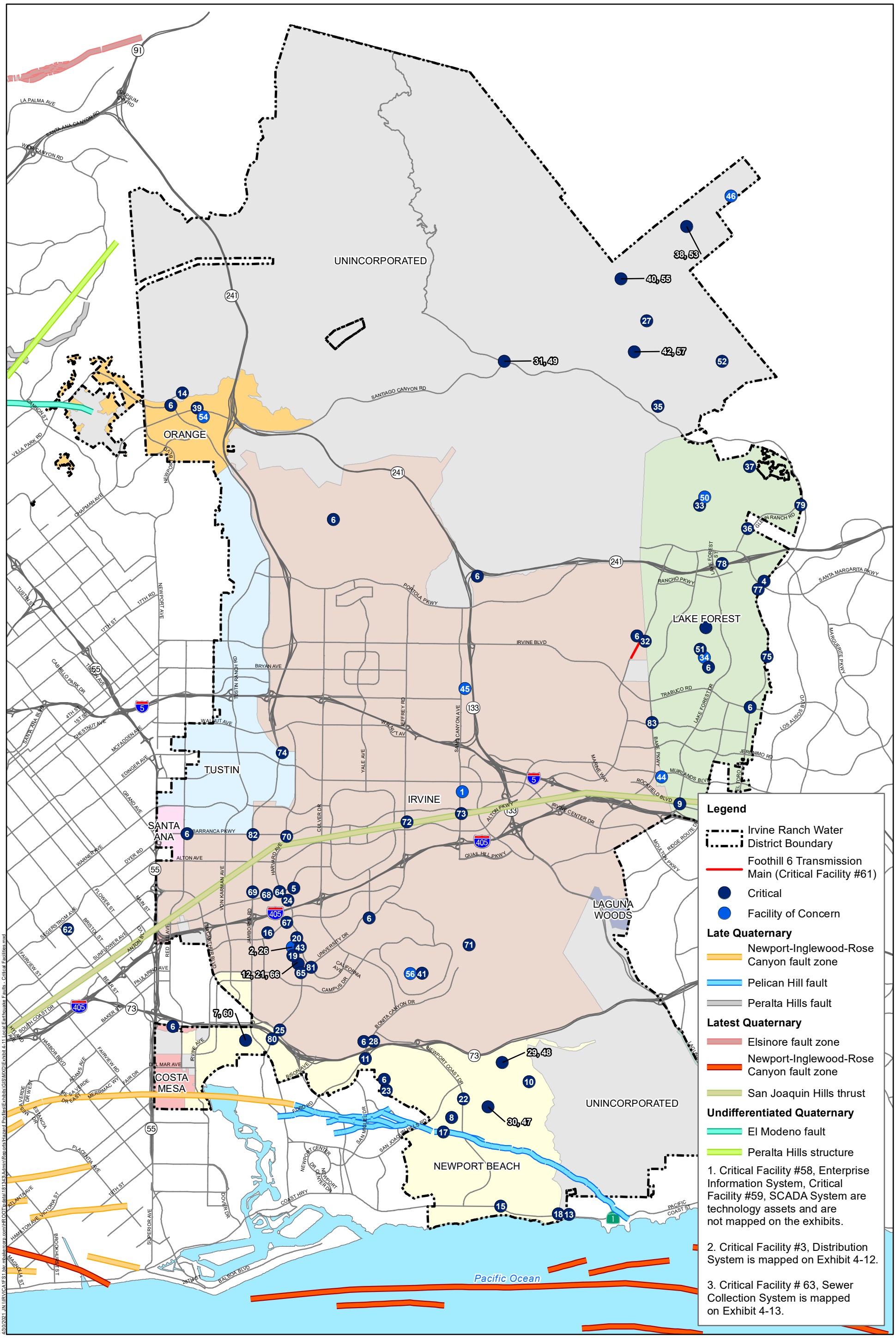
1,200 kilometers of this fault line has been mapped from Cape Mendocino in northern California to the Salton Sea in southern California. The San Andreas Fault is located approximately 35 miles northeast of Orange County. While several major earthquakes in California history have been attributed to the San Andreas Fault (namely, the 1906 San Francisco earthquake), the southern Mojave segment is more fractured and geographically complex. The last major fault rupture in the southern portion occurred in January 1857, and the interval between major ruptures is an average of about 140 years. Probable magnitudes for earthquakes range from 6.8 to 8.0.[48]

- San Jacinto Fault Zone: The San Jacinto Fault Zone is a right-lateral strike-slip fault, located approximately 30 miles northeast of Orange County (passing through the Cities of Hemet and San Bernardino). This fault is 210 kilometers in length, including the Coyote Creek fault line as part of the San Jacinto Fault Zone. The most recent surface rupture occurred in April 1968, on the Coyote Creek fault segment. The estimated interval between surface ruptures is between 100 and 300 years, per segment. Probable magnitudes would be between 6.5 to 7.5. Other active segments of the San Jacinto Fault Zone include the Casa Loma fault, Clark fault, Glen Helen fault and Lytle Creek fault. Inactive faults include Hot Springs and Buck Ridge Faults, with the last rupture estimated in the Late Quaternary period at the extreme northern end of the fault zone.[49]

Exhibit 4-11, *Fault Zones – Critical Facilities*, Exhibit 4-12*, Fault Zones – Distribution System*, and Exhibit 4-13, *Fault Zones – Sewer Collection System*, show the intersection of IRWD critical facilities against mapped fault zones in the jurisdiction.

Fault ruptures that occur outside of the IRWD jurisdiction could have a significant impact on drinking water supplies. As a portion of IRWD's water portfolio relies on imported water from the State Water Project, failure of regional or state-wide infrastructure as a result of fault ruptures could disrupt water supplies for undetermined lengths of time.

[48] Southern California Earthquake Data Center, *San Andreas Fault Zone,* https://scedc.caltech.edu/earthquake/sanandreas.html, accessed February 15, 2021.
[49] Southern California Earthquake Data Center, *San Jacinto Fault Zone, https://scedc.caltech.edu/earthquake/sanjacinto.html,* accessed February 15, 2021.



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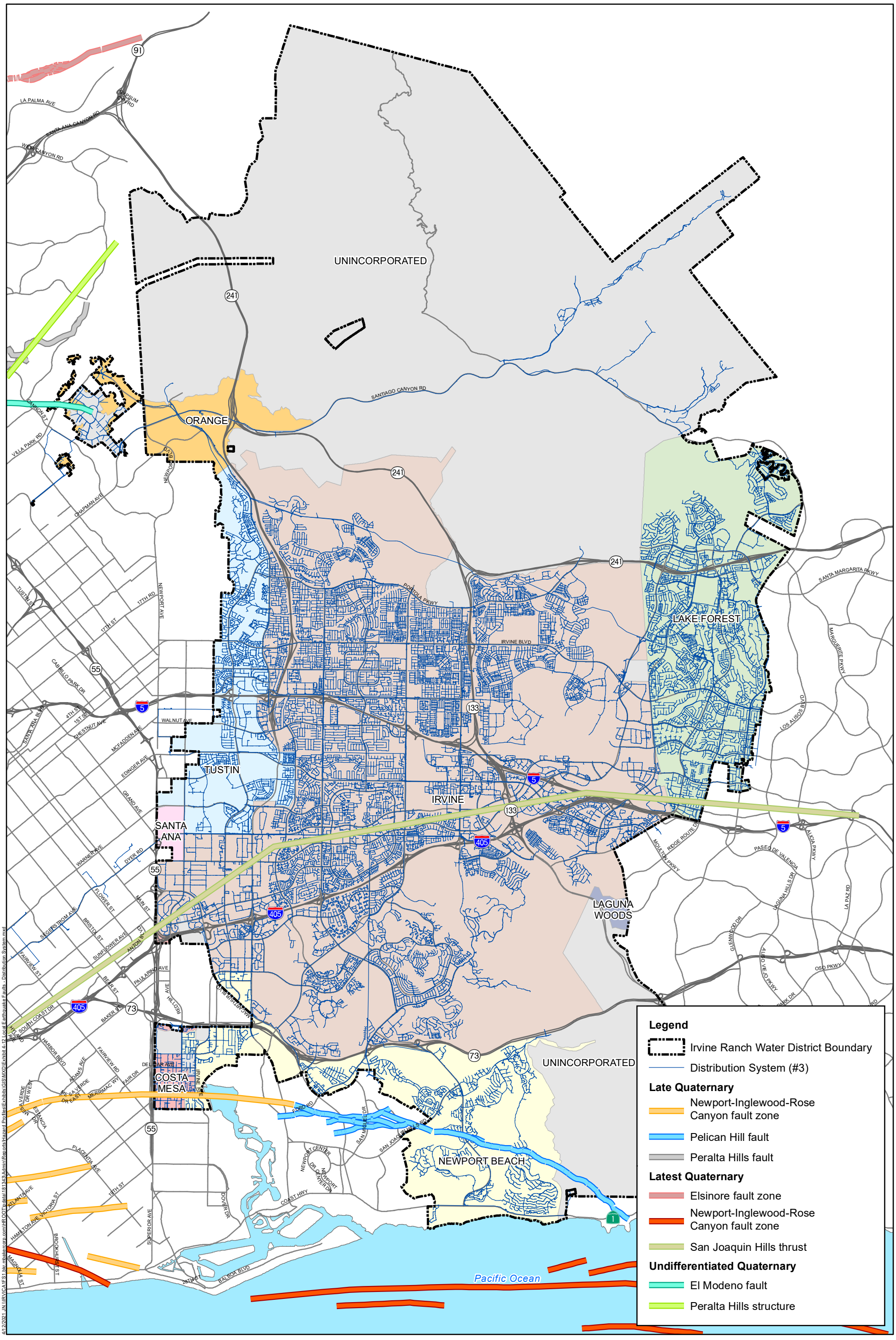
Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Critical Facilities

Data Source: IRWD, 2021, USGS, 2018

Exhibit 4-3



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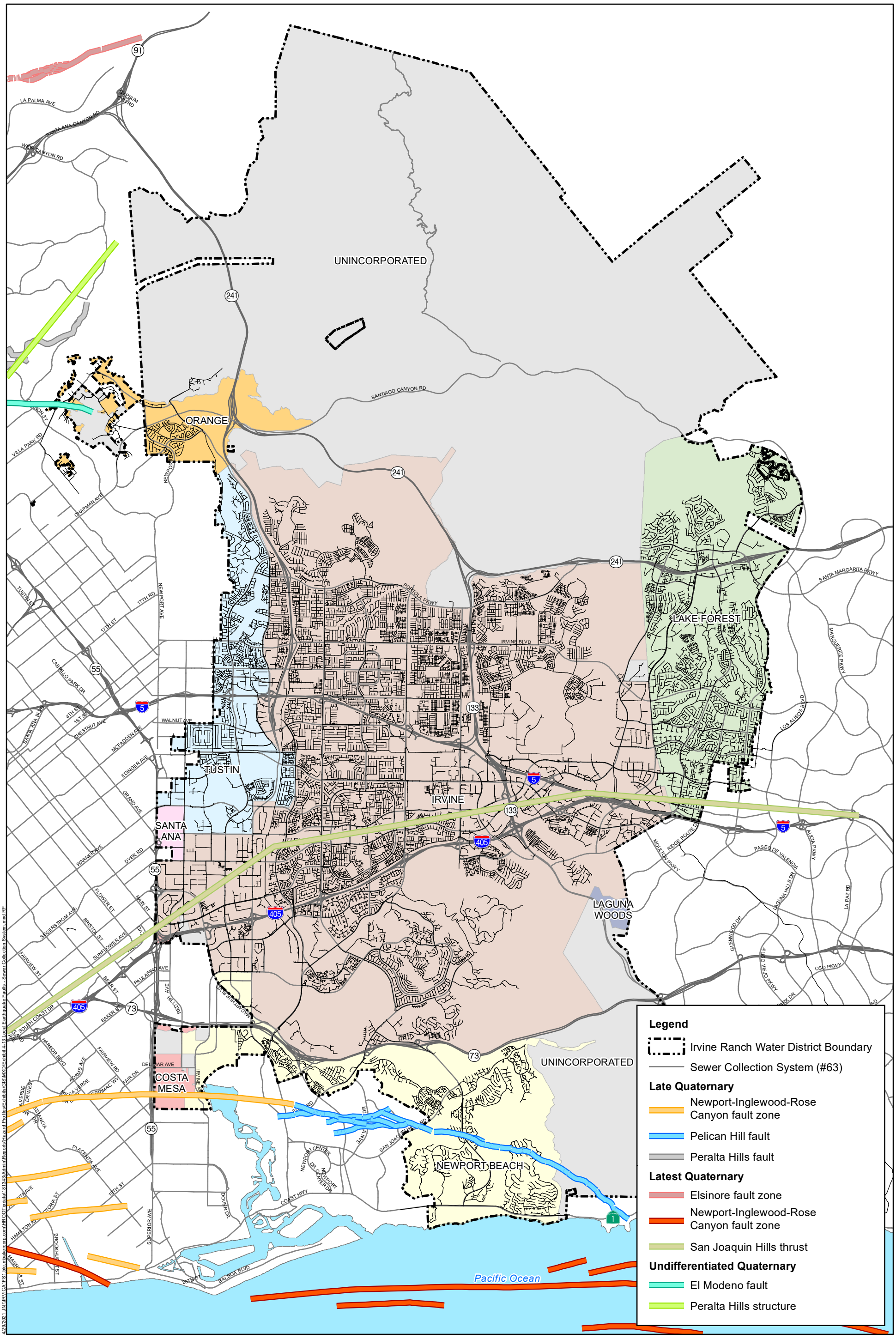
Irvine Ranch Water District Local Hazard Mitigation Plan

Local Earthquake Faults - Distribution System

Source: IRWD, 2021, USGS, 2018

Exhibit 4-12



4/29/2021 -\\N:\RVICA1FS1.bkr.mpakercorp.com\HROOT\data\181343\Admin\Reports\Hazard Profiles\Exhibits\GIS\MXD\Exhibit 4-13 Local Earthquake Faults - Sewer Collection System.mxd RP

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Irvine Ranch Water District Local Hazard Mitigation Plan

Local Earthquake Faults - Sewer Collection System

Source: IRWD, 2021, USGS, 2018

Exhibit 4-13

Ground Shaking

The extent and magnitude of seismic ground shaking is measured by the Richter Magnitude Scale and the Modified Mercalli Intensity Scale. The Richter scale was developed in 1935 and measures the magnitude of ground shaking from the logarithm of wave amplitude created by seismographs. Adjustments are included for variation in the distance between the seismograph and the earthquake epicenter. Magnitude is expressed in whole numbers and decimal fractions beginning at zero with no upper limit, as described in Table 4-11, *Richter Scale of Earthquake Magnitude*. The Richter Scale of an earthquake is not an adequate measurement of damage, as low magnitude earthquakes in high density environments can still generate significant damage.[50]

Table 4-11
Richter Scale of Earthquake Magnitude

Magnitude Level	Category
1.0 – 2.9	Micro
3.0 – 3.9	Micro
4.0 – 4.9	Light
5.0 – 5.9	Moderate
6.0 – 6.9	Strong
7.0 – 7.9	Major
8.0 or higher	Great
Source: Encyclopedia Britannica, *Richter Scale*, https://www.britannica.com/science/Richter-scale, accessed February 15, 2021.	

The Modified Mercalli Intensity (MMI) Scale consists of a series of certain key impacts and responses from ground shaking such as people wakening from sleep, movement of furniture, damage to chimneys, and destruction. The MMI Scale was developed in 1931, with twelve increasing levels of intensity ranging from imperceptible shaking to catastrophic destruction. The levels do not have a mathematical basis and the MMI Scale is an arbitrary ranking based on observed effects.

Thus, the MMI level of intensity is a more meaningful level of severity to the non-scientist because the actual impacts are referenced. Refer to Table 4-12, *The Modified Mercalli Intensity Scale Summary*, for further information.

Table 4-12
The Modified Mercalli Intensity Scale Summary

Intensity	Shaking	Description/Damage
I	Non felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only be few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.

[50] U.S. Geological Survey, *The Severity of an Earthquake*, https://pubs.usgs.gov/gip/earthq4/severitygip.html, accessed February 15, 2021.

Table 4-12 (continued)
The Modified Mercalli Intensity Scale Summary

Intensity	Shaking	Description/Damage
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specifically designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
Source: U.S. Geologic Survey, *The Modified Mercalli Intensity Scale*, https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects, accessed February 15, 2021.		

Magnitude and intensity measure different characteristics of earthquakes but are often correlated. Magnitude measures the energy released at the source of the earthquake, determined by measurements on seismographs. Intensity measures the strengths of shaking produced by an earthquake at a certain location and is determined by effects on people, structures, and the natural environment. Refer to Table 4-13, *Moment Magnitude and Modified Mercalli Intensity Scale Comparison*, for the intensities typically observed at locations near the epicenter of earthquakes with different magnitudes.

Table 4-13
Moment Magnitude and Modified Mercalli Intensity Scale Comparison

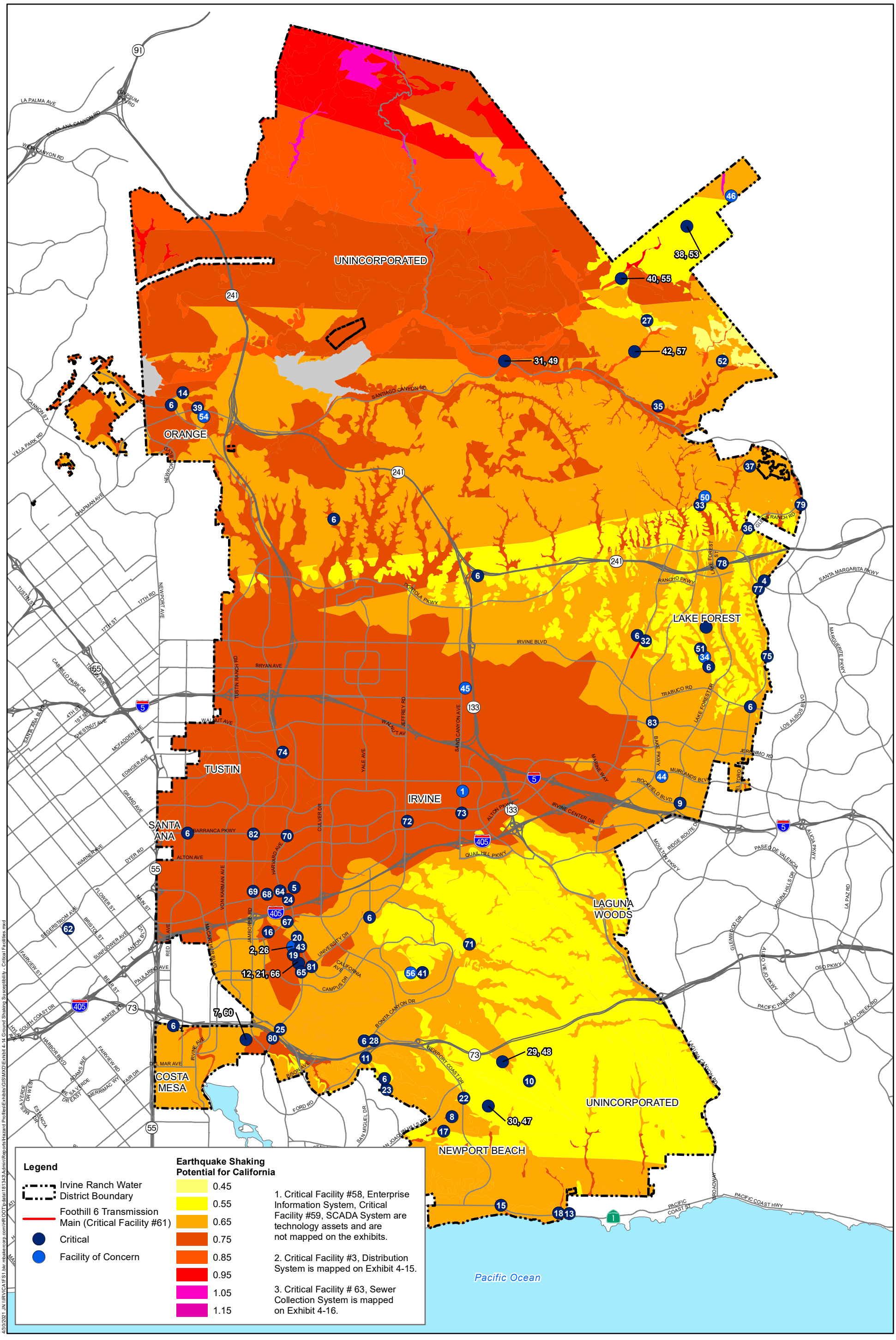
Moment Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II – III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.9	VII – IX
7.0 or higher	VIII or higher
Source: U.S. Geological Survey, *Earthquake Magnitude, Energy Release, and Shaking Intensity,* https://www.usgs.gov/natural-hazards/earthquake-hazards/science/earthquake-magnitude-energy-release-and-shaking-intensity?qt-science_center_objects=0#qt-science_center_objects, accessed February 15, 2021.	

Exhibit 4-14, *Ground Shaking Susceptibility – Critical Facilities*, Exhibit 4-15, *Ground Shaking Susceptibility – Distribution System* and Exhibit 4-16, *Ground Shaking Susceptibility – Sewer Collection System*, illustrate the range of potential ground shaking in the IRWD jurisdiction.

Strong ground shaking that occurs outside of the IRWD jurisdiction could have a significant impact on drinking water supplies. As a portion of IRWD's water portfolio relies on imported water from the State Water Project, failure of regional or State-wide infrastructure as a result of ground shaking could disrupt water supplies for undetermined lengths of time.

Liquefaction

The potential for liquefaction exists in areas susceptible to ground shaking with loose soils and/or shallow groundwater. Given the active faults in the region and the presence of geologically young, unconsolidated sediments and hydraulic fills, liquefaction is possible throughout significant portions of the IRWD service area. The California Geological Survey's Seismic Hazard Zonation program identifies and maps areas prone to liquefaction; refer to Exhibit 4-17, *Liquefaction Hazard Zone – Critical Facilities*, Exhibit 4-18, *Liquefaction Hazard Zone – Distribution System*, and Exhibit 4-19, *Liquefaction Hazard Zone – Sewer Collection System*.



Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Critical Facilities

Data Source: IRWD, 2021, CGS, 2016

Exhibit 4-14

UNINCORPORATED
ORANGE
TUSTIN
IRVINE
SANTA ANA
COSTA MESA
LAKE FOREST
LAGUNA WOODS
NEWPORT BEACH
UNINCORPORATED
Pacific Ocean

Legend

- Irvine Ranch Water District Boundary
- Distribution System (#3)

Earthquake Shaking Potential for California

0.45	0.75
0.55	0.85
0.65	0.95
	1.05
	1.15

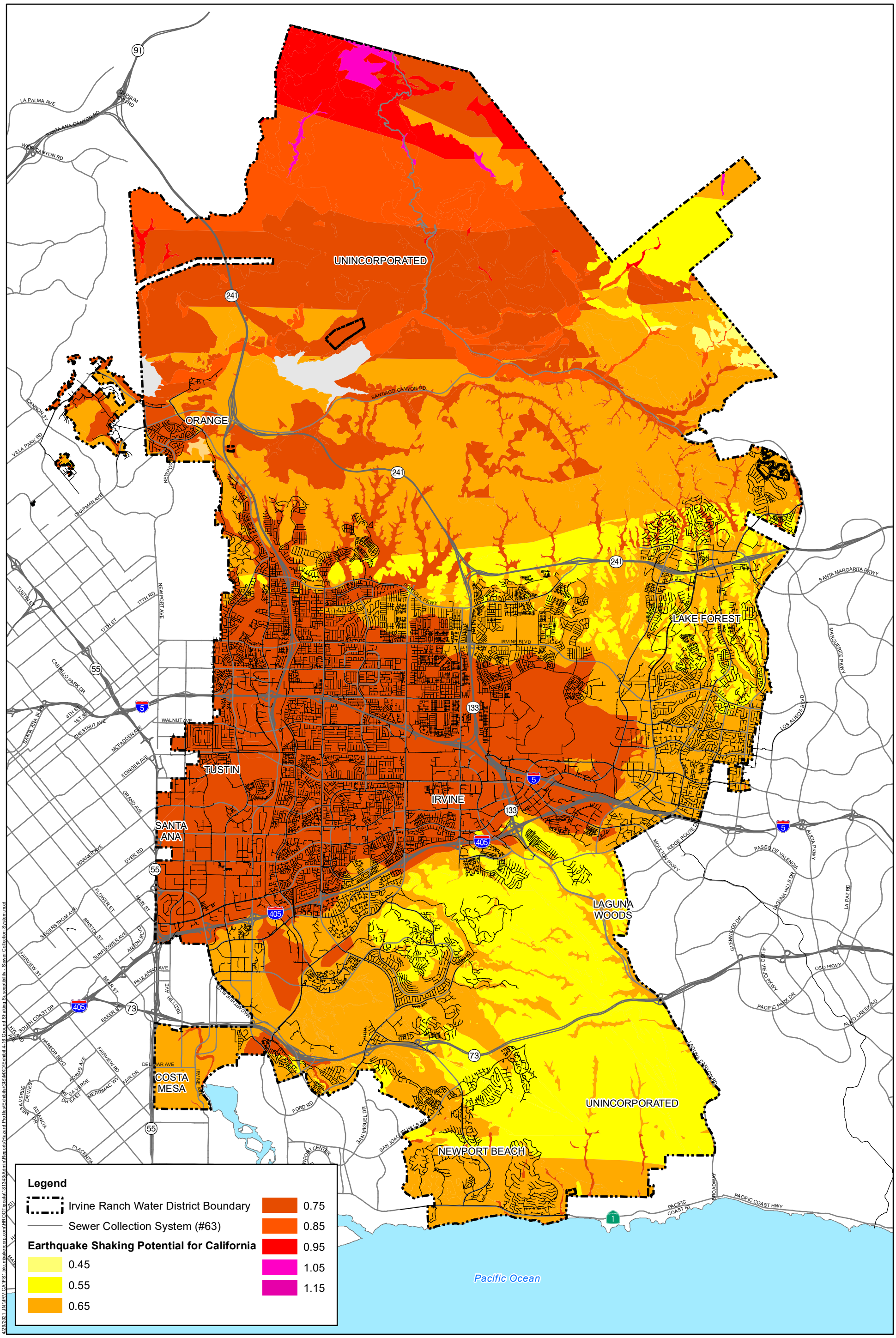
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Distribution System

Source: IRWD, 2021, CGS, 2016

Exhibit 4-15



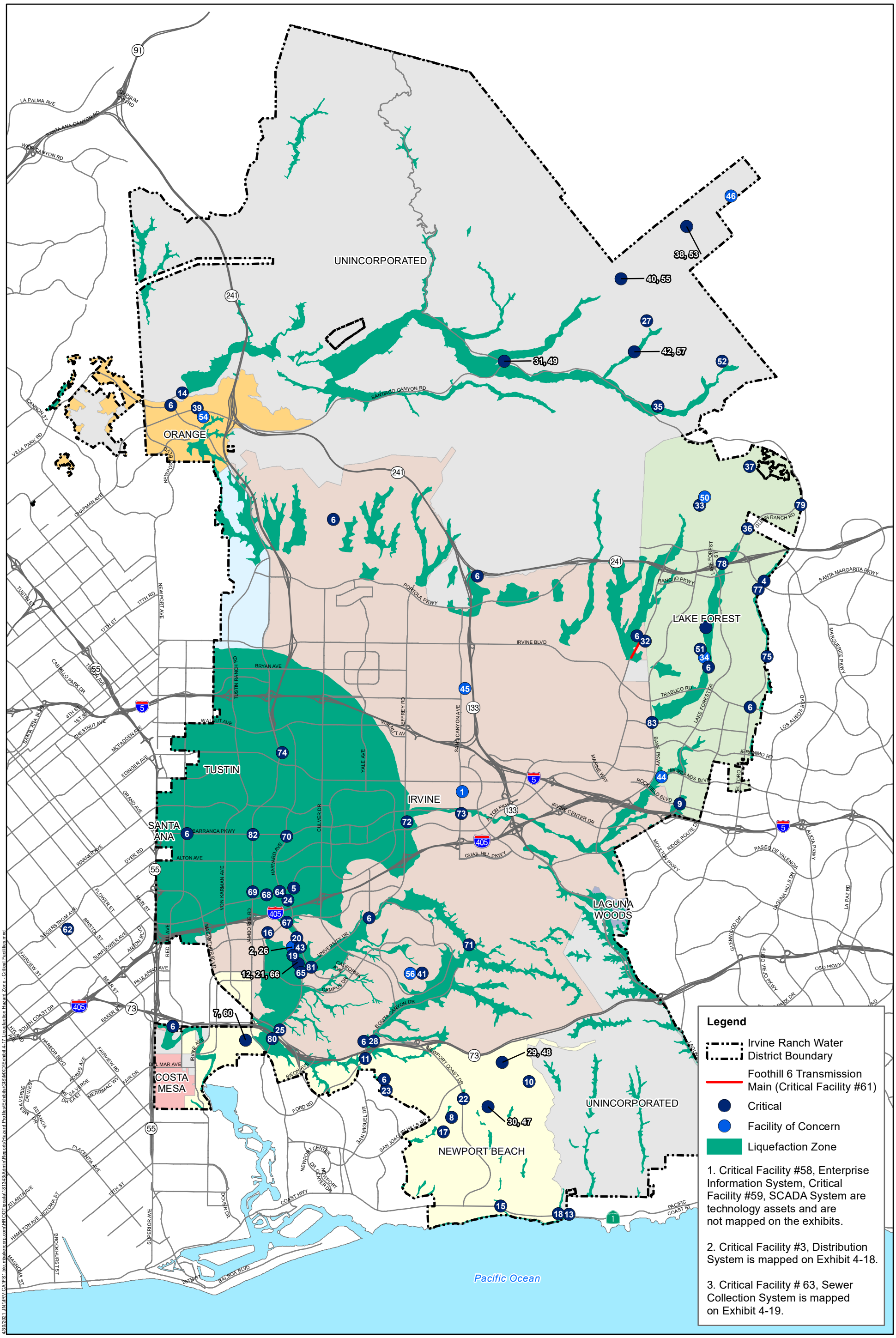
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Sewer Collection System

Source: IRWD, 2021, CGS, 2016

Exhibit 4-16

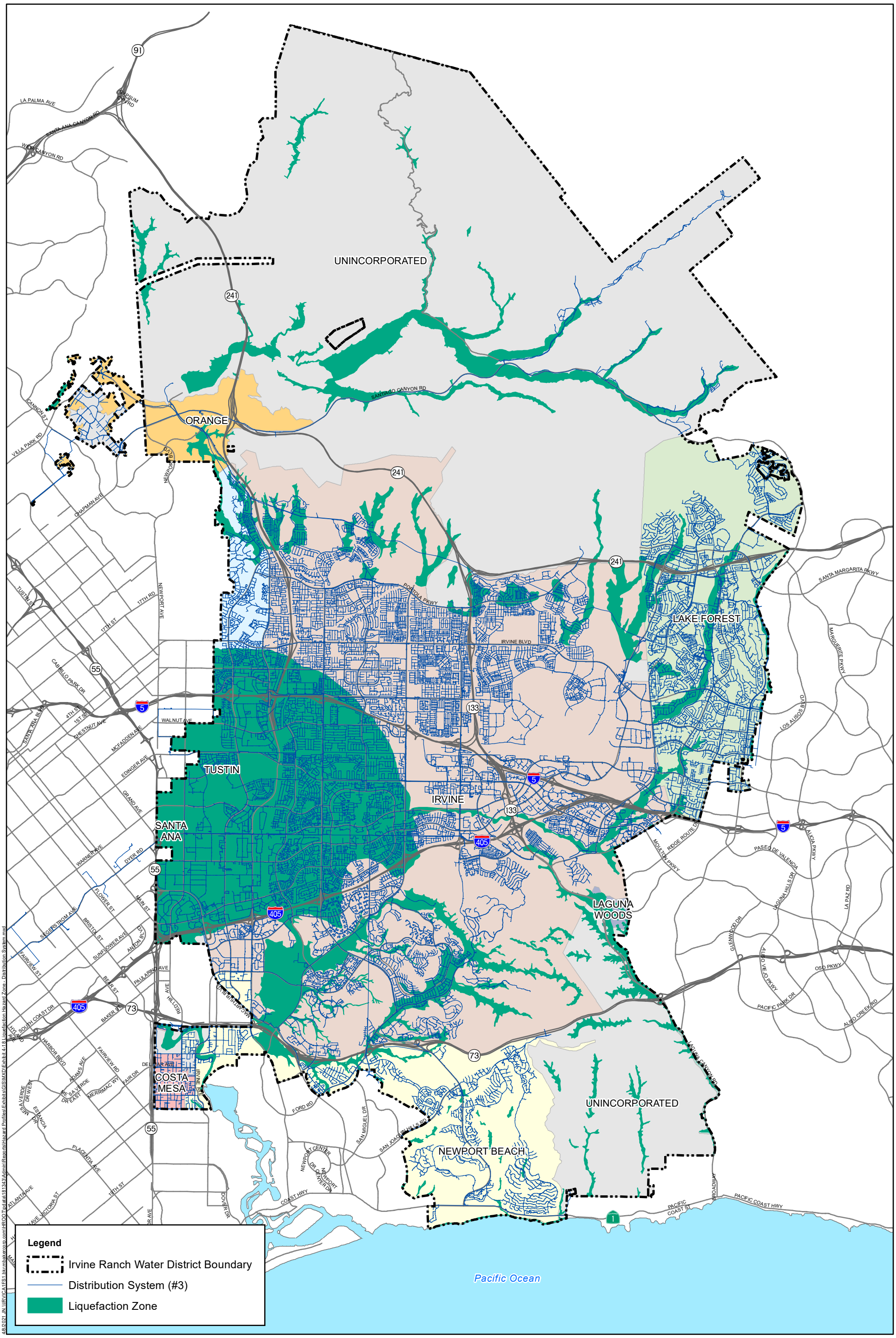


Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Critical Facilities

Data Source: IRWD, 2021, CGS, 1998, 2001, 2002

Exhibit 4-17

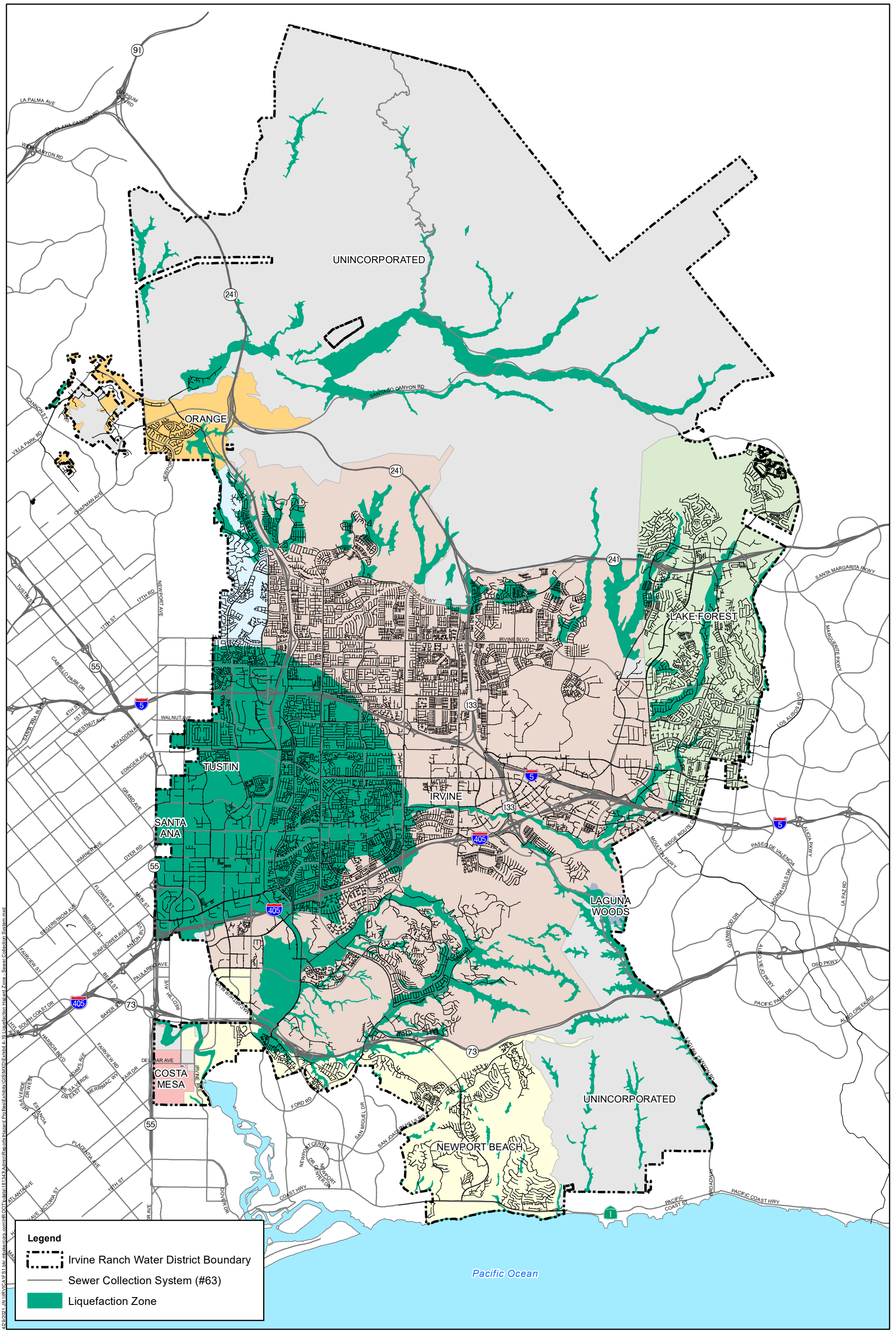


Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Distribution System

Source: IRWD, 2021, CGS, 1998, 2001, 2002

Exhibit 4-18



4/29/2021 JN:\IRVICA\FS1.bkc.mbakecorp.com\ROOT\data\181343\Admin\Reports\Hazard Profiles\Exhibits\GIS\MXD\Exhibit 4-19 Liquefaction Hazard Zone - Sewer Collection System.mxd

0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Sewer Collection System

Source: IRWD, 2021, CGS, 1998, 2001, 2002

Exhibit 4-19

Large liquefaction zones are located in the City of Irvine, City of Tustin, and the City of Santa Ana. Various drainages in the unincorporated communities of the IRWD service area have been mapped as soil liquefaction hazard areas.

Previous Occurrences

Fault Rupture & Ground Shaking
As discussed above, a variety of faults are located within or near the IRWD service area. Table 4-14, *Major Earthquake Faults of Particular Concern*, identifies faults of concern for the IRWD jurisdiction and last major ruptures.

Table 4-14
Major Earthquake Faults of Particular Concern

Fault Name	Type of Faulting	Last Major Rupture	Slip Rate	Interval Between Major Ruptures	Probable Magnitudes
Elsinore	Right-lateral strike-slip	May 15, 1910 Magnitude 6.0 (no surface rupture)	Roughly 4.0 mm/year	Roughly 250 years	6.5-7.5
Newport-Inglewood	Right-lateral; local reverse slip	March 10, 1933 Magnitude 6.4 (no surface rupture)	0.6 mm/year	Unknown	6.0-7.4
San Andreas	Right-lateral strike-slip	April 18, 1906 Magnitude 7.9	20 to 35 mm/year	Varies; between 20 and 300 years	6.8-8.0
San Jacinto	Right-lateral strike-slip; minor right-reverse	April 9, 1968 Magnitude 6.5	7 to 17 mm/year	Varies; between 100 and 300 years	6.5-7.5
San Joaquin Hills	Blind thrust	Unknown; potentially 1855	0.42 to 0.79 mm/year	Unknown	>7.0

Sources:
Southern California Earthquake Center, *Significant Earthquakes and Faults*, http://scedc.caltech.edu/significant/fault-index.html, accessed February 15, 2021.
Grant, Lisa B. et al, *Coastal Uplift of the San Joaquin Hills, Southern Los Angeles Basin, California, by a Large Earthquake since A.D. 1635*, Bulletin of the Seismological Society of America, Volume 92, No. 2, pp 590–599, March 2002.

Table 4-15, *Significant Historical Earthquakes in Southern California*, identifies major earthquakes that have occurred in southern California. Several of these earthquakes occurred prior to IRWD's establishment in 1961; therefore, specific information regarding IRWD impacts from these incidents are not available. However, ground shaking was experienced in the IRWD service area from the earthquakes below that occurred after 1961. The Northridge and Whittier Narrows Earthquakes both resulted in major disaster declarations from the federal government, which included Orange County as a designated area.[51] To date, no historical earthquakes have caused damage or significantly impacted IRWD infrastructure. Continued and regular maintenance and/or seismic retrofitting will be required in the future to further safeguard against seismic hazards.

Table 4-15
Significant Historical Earthquakes in Southern California

Earthquake Name	Year	Estimated Magnitude
Wrightwood	1812	7.5
Los Angeles	1855	6.0
San Bernardino	1858	6.0
Elsinore	1910	6.0
San Jacinto	1918	6.8

[51] Federal Emergency Management Agency, *California Northridge Earthquake (DR-1008-CA)*, https://www.fema.gov/disaster/1008, accessed February 15, 2021.

Table 4-15 (continued)
Significant Historical Earthquakes in Southern California

Earthquake Name	Year	Estimated Magnitude
North San Jacinto	1923	6.3
Long Beach	1933	6.4
San Fernando	1971	6.5
Whittier Narrows	1987	5.8
Newport Beach	1989	4.7
Northridge	1994	6.7
Chino Hills	2008	5.4
Ridgecrest Sequence	2019	6.4 and 7.1
Source: Southern California Earthquake Data Center, *Earthquake Information: Chronological Earthquake* Index, https://scedc.caltech.edu/earthquake/chronological.html, accessed May 26, 2021.		

Liquefaction

Comprehensive, historic accounts of damage within the IRWD service area from liquefaction are not readily available. The Irvine Local Hazard Mitigation Plan does not report any local liquefaction incidents in recent history but does report that liquefaction occurred at the mouth of the San Gabriel River at Alamitos Bay as a result of the Long Beach Earthquake in 1933.[52] Regionally, some damage in Los Angeles County during the Northridge earthquake of 1994 was due to liquefaction as opposed to ground shaking.[53]

Probability of Future Occurrences

Fault Rupture & Ground Shaking

The IRWD service area is known as seismically active, and thus the probability for future seismic hazard occurrences is considered high. Given the significant seismic shaking events in the region, it is certain that such events will continue. The USGS Uniform Earthquake Rupture Forecast Version 3 released in 2017 provides a perspective of the likelihood each California region will experience a magnitude 6.7 or larger earthquake in the next 30 years; refer to Table 4-16, *Likelihood of One or More Earthquakes Occurring in the Next 30 Years in Orange County Region by Fault*.

Table 4-16
Likelihood of One or More Earthquakes Occurring in the Next 30 Years in Orange County Region by Fault

Magnitude	Elsinore Fault	Newport-Inglewood Fault	Southern San Andreas Fault	San Jacinto Fault	San Joaquin
M ≥ 6.7	3.66%	0.70%	19.21%	5.41%	0.42%
M ≥ 7.0	1.82%	0.63%	12.86%	5.39%	0.40%
M ≥ 7.5	0.90%	0.20%	10.21%	5.28%	0.24%
M ≥ 8.0	<0.01%	--	3.24%	2.75%	--
Notes: 1. M≥6.7 means magnitude greater than or equal to 6.7, and likewise for the other magnitude thresholds. 2. The 30-year period measured by this report is 2014 to 2044; a 30-year period is the typical duration of a homeowner mortgage. 3. Percentages for fault sections closest to IRWD jurisdiction.					
Source: U.S. Department of the Interior and U.S. Geological Survey, *The Third California Earthquake Rupture Forecast (UCERF3),* Google Earth file with fault probabilities, March 2015.					

[52] City of Irvine, *Local Hazard Mitigation Plan Public Review Draft*, June 2020.
[53] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.

Liquefaction
As significant portions of the IRWD service area are located within an identified liquefaction zone, the likelihood for future occurrences is considered medium. Because seismic activity is expected to continue in the southern California region, liquefaction should also be expected and anticipated as a secondary impact from this hazard.

However, it should be noted that liquefaction would only be triggered by a significant earthquake on one of the faults close to or within the IRWD service area. Regional faults such as the San Andreas and San Jacinto Fault Zones, are statistically more likely to produce a significant earthquake when compared to the Newport-Inglewood Fault or San Joaquin Fault. At the same time, these regional faults are located miles away from the IRWD service area and may not generate enough ground shaking to trigger liquefaction within the jurisdiction.

Climate Change
Earthquakes are caused by seismic activity, which is not correlated with climate change. Thus, fault ruptures or ground shaking is not more likely to occur as climate change impacts become more significant. However, climate change could bring more severe rain events increasing the amount of water saturation in loose soils. The increased saturation combined with an earthquake event could cause liquefaction or landslides to occur.

4.2.8 SEVERE WEATHER

Description

Coastal/Winter Storm
According to the National Weather Service/National Oceanic and Atmospheric Administration, a severe thunderstorm must have at least one of the following: 1) hail that is one inch in diameter or larger; or 2) winds of 58 miles per hour or greater.[54] About 10 percent of thunderstorms in Orange County are classified as severe. They usually occur when cool, moist air moves in to break a prolonged hot spell. The storms are usually short-lived, infrequent, and no more than a quarter of a mile wide. Over the interior mountain areas, storms are more intense, and they may become unusually severe on occasion at intermediate and high elevations. Although not defined as severe weather, the IRWD service area experiences heavy rain events that can result in localized flooding, mudflows, and fallen tree limbs or brush that block roadways and drainage systems.

Santa Ana Winds
High winds are defined as those that last longer than one hour at greater than 39 miles per hour (mph) or for any length of time at greater than 57 mph. High winds that affect the IRWD service area are usually the Santa Ana winds. Santa Ana winds push dry air from the inland deserts of California and the Southwest over the mountains that lie between these desert areas and coastal California. Santa Ana winds are created when high pressure over the high desert of the Great Basin region causes winds to blow from the east, toward the Pacific Ocean and the lower air pressure offshore. The phenomenon usually occurs during the fall and early winter (October through March) and is usually accompanied by warmer than average temperatures. Hot and very dry winds dry out vegetation, increasing the fuel available to feed fires. Gusty winds also fan flames and spread fire.[55]

[54] National Weather Service, *What Constitutes a Severe Thunderstorm*, https://www.weather.gov/bmx/outreach_svr, accessed Feb 8, 2021
[55] Los Angeles Times, *Etymology of the name "Santa Ana winds*", http://people.atmos.ucla.edu/fovell/LATimes_SantaAna.html, published January 2008, accessed Feb 8, 2021

Power Outage
Power outages are a major secondary effect of severe weather events in the IRWD service area. An outage could result in damaged power equipment or equipment failures and can affect multiple counties for hours. This type of event can range from a moderate event to a catastrophic regional event that may threaten human life, safety, and health, or interferences with vital services. During severe weather incidents such as high winds or severe flooding, Southern California Edison (SCE) may implement an operational practice called Public Safety Power Shutoffs (PSPS) to preemptively shut off power in high-risk areas during potentially dangerous fire conditions. This program is designed to proactively prevent SCE facilities from starting a wildfire when winds and temperatures are high.

Strong Santa Ana winds, high temperatures, and low humidity are all severe weather conditions that could trigger a PSPS event. It is possible for extreme weather incidents outside of the IRWD service area to trigger a PSPS that affects the jurisdiction (i.e., strong winds affecting regional infrastructure that powers SCE grids in Orange County). The frequency of these events depends on the weather and environmental factors, and SCE makes decisions based on internal threat thresholds, assessment of real-time information, and situational awareness data. When possible, SCE intends to notify customers prior to a PSPS event. When weather forecasts indicate extreme fire conditions, SCE begins predictive modeling to assess the potential impacts while monitoring weather watch alerts from the National Weather Service. Three days prior to the forecasted PSPS, SCE would coordinate first with local government, the emergency management community, first responders, and other critical infrastructure/service providers. Two days prior to the forecasted PSPS, notices would go out to SCE customers with a follow-up one day before a notice of power shut off. It is noted that actual or sudden onset of extreme weather conditions could impact the intended coordination and notification efforts.[56]

Outside of the PSPS events, there is the potential for unplanned power outages to occur within the IRWD service area. SCE defines a major outage as a large unexpected outage caused by either accidents or natural disasters. While uncommon, loss of electrical power is a potential secondary effect of heavy rains or strong winds. Other types of events that could occur is mechanical power failure due to aging equipment, without being a secondary effect of natural hazards impacts.

Location/Extent

A severe winter storm or Santa Ana wind activity would occur throughout the entirety of the IRWD service area. Specific magnitudes and the severity of impacts are outlined below.

Coastal/Winter Storm
One of the indicators for a heavy rain season is the Oceanic Niño Index (ONI), used to monitor the El Niño-Southern Oscillation (ENSO). To calculate the ONI, scientists from the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center calculate the average sea surface temperature in the El Niño 3.4 region (area of the east-central equatorial Pacific Ocean) for each month, and then average it with values from the previous and following months. This running three-month average is compared to a 30-year average. The observed difference from the average temperature in that region, whether warmer or cooler, is the ONI

[56] Southern California Edison, *Public Safety Power Shutoff*, https://www.sce.com/wildfire/psps, accessed February 16, 2021.

value for that three-month "season". Based on the ONI, the El Niño (warm) and La Niña (cool) events in the tropical Pacific are categorized as weak, moderate, strong, or very strong.[57]

The NOAA additionally calculates the monthly averages of each region and sub-region of California. These calculations are based on the data collected by weather stations. There are approximately six weather service stations that collect precipitation data for municipalities within the IRWD service area; refer to Table 4-17, *Monthly Average Precipitation in IRWD Service Area*.

Table 4-17
Monthly Average Precipitation in IRWD Service Area

Weather Station	Monthly Average Precipitation
Silverado Canyon, CA	1.9 inches
Silverado Canyon ESE	2.0 inches
Irvine Ranch, CA	1.9 inches
Irvine 4.1 NNE	1.4 inches
Newport Beach Harbor	1.05 inches
Santa Ana John Wayne Airport	0.39 inches
Source: National Oceanic and Atmospheric Administration, *Data Tools*: *2018 Monthly Summaries*, https://gis.ncdc.noaa.gov/maps/clim/summaries/monthly, accessed March 17, 2021.	

Typically, within the IRWD service area, municipal drainage infrastructure systems are able to accommodate heavy rain events. During uncharacteristically heavy winter storms or rain events (such as those caused by an El Niño weather pattern), these drainage systems may not be sufficient to move stormwater flows and thus, result in flooding (refer to Section 4.2.3). Severe storms could also cause overtopping of dams or reservoirs (refer to Section 4.2.1) or threaten slope stability (refer to Section 4.2.4 and Section 4.2.6).

Santa Ana Winds
Santa Ana winds blow westward through the canyons and into the coastal areas of southern California, including the IRWD service area. The winds would not be location specific, but instead would impact the entire planning area.

Wind speeds are typically 35 knots through and below passes and canyons with gusts up to 50 knots. Stronger Santa Ana winds can have gusts greater than 60 knots over widespread areas with gusts greater than 100 knots in some areas. Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of a sea breeze. The sea breeze which typically blows onshore daily, can moderate the Santa Ana winds during the late morning and afternoon hours. Santa Ana winds are an important forecast challenge because of the high fire danger associated with them. Santa Ana winds can adversely affect power utilities that have transformers and power lines, in turn affecting the ability of some water and wastewater utilities to operate when back-up generation is unavailable (planned power outages because of high wind/wildfire conditions are discussed in Section 4.2.9). The magnitude and severity of Santa Ana winds are similar throughout the planning area.

The severity and magnitude of hurricane winds are measured using the Saffir-Simpson Hurricane Wind Scale. Although hurricane events are not typical within IRWD customer cities, the scale can be used to measure strong winds that are not associated with a hurricane event. The scale uses measurements in pressure, wind speed, and damage potential to identify the types of damage associated with sustained wind events; refer to Table 4-18, *Saffir-Simpson Hurricane Wind Scale*.

[57] National Oceanic and Atmospheric Administration, *Climate Variability: Oceanic Niño Index*, https://www.climate.gov/news-features/understanding-climate/climate-variability-oceanic-ni%C3%B1o-index, accessed Feb 8, 2021

Table 4-18
Saffir-Simpson Hurricane Wind Scale

Category	Sustained Wind Speed	Description of Damage
1	74–95 mph	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96–110 mph	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111–129 mph	**Devastating damage:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130–156 mph	**Catastrophic damage:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 mph or higher	**Catastrophic damage:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
Source: National Hurricane Center, *Saffir-Simpson Hurricane Wind Scale*, https://www.nhc.noaa.gov/aboutsshws.php, accessed February 2021.		

Power Outage

SCE designates High Fire Risk Areas as areas with circuits within California Public Utilities Commission's (CPUC) Tier 2 (elevated risk) and Tier 3 (extreme risk) Fire Threat Areas. The CPUC Fire-Threat Map was developed with input from the U.S. Forest Service, California Department of Forestry and Fire Protection, and the State's investor-owned utilities, including SCE. SCE uses their own thresholds prior to initiating a PSPS event. When evaluating weather and environmental conditions, SCE considers a variety of factors which include but are not limited to:

- National Weather Service Red Flag Warnings;
- SCE meteorological assessments;
- SCE Fire Potential Index;
- SCE Fire Scientist assessments;
- Real-time situational awareness information;
- SCE Fire Management/Office of Emergency Management input;
- Concerns from local or State fire authorities;
- Mandatory or voluntary evacuation orders in place;
- Expected impact of de-energizing circuits on essential services (including public safety agencies, water pumps, traffic controls, etc.); and
- Other operational considerations to minimize wildfire ignitions.

The magnitude of impacts to IRWD infrastructure would depend on the length of time power is out and the size of the impacted area. Many of IRWD's critical infrastructure systems have generators or secondary power sources in case of SCE power loss. In addition to this, IRWD can transport and install temporary, portable generators if the primary backup generators fail. However, significant periods of PSPS could impact water delivery to IRWD customers or the timely treatment of wastewater.

Previous Occurrences

Coastal/Winter Storm
The rainy season in the IRWD service area traditionally occurs between November and early May; although, severe rains have occurred during other times of the year when weather conditions permit. Refer to the flood hazard profile (Section 4.2.3) for a summary of significant regional storms that resulted in heavy rains within the IRWD jurisdiction. The MWDOC Multi-Jurisdictional Hazard Mitigation Plan reports three winter storms in 2017 that began on January 18 and occurred over six days. The heavy rains, combined with already saturated soil, produced flash flooding that spanned across multiple cities within the IRWD service area. Cities, such as Santa Ana and Newport Beach, experienced street flooding with one to three feet of water, Responders conducted rescue operations on the Santa Ana River in the City of Orange. The storms resulted in a Presidential Disaster Declaration for 16 counties throughout the state.[58]

Santa Ana Winds
Santa Ana winds occur annually between October and March in the IRWD service area. The MWDOC Multi-Jurisdictional Hazard Mitigation Plan reports several major high wind events in Orange County history since 1998, with wind speeds up to 105 knots. While winds are regularly experienced, no major damage has been incurred by IRWD.

Power Outage
IRWD has never experienced a jurisdiction-wide power outage due to severe weather or an SCE PSPS. Short-term power losses have occurred as isolated incidents, without major impacts to IRWD infrastructure. IRWD maintains infrastructure to account for short-term losses in power at many facilities. Historically, wildfires have resulted in long duration SCE service interruptions that have extended up to one week or longer. Instances like these have required significant replacement of SCE infrastructure to return power to IRWD facilities.

Probability of Future Occurrences
Based on previous occurrences and weather trends in southern California and Orange County, there is a medium probability that heavy rains will occur in the IRWD service area. The probability of future Santa Ana winds is considered high. The probability of power outages as a secondary impact is also considered high, based on the continued Santa Ana wind and wildfire conditions in the southern California region.

Climate Change
Climate change will affect the frequency and intensity of heavy rain events. According to research conducted by UCLA, California will experience both extremely wet and extremely dry seasons by the end of the century. Climate scientists predict that “over the next 40 years, the State will be 300 to 400 percent more likely to have a prolonged storm sequence as severe as the one that caused the legendary California flood more than 150 years ago.” This could increase secondary effects, such as flooding, erosion, or wildfire events.

Climate change could also increase the severity and frequency of Santa Ana wind occurrences. Stronger than normal Santa Ana winds have occurred in recent years, which were likely exacerbated by climate change.

[58] Municipal Water District of Orange County, *Orange County Regional Water and Wastewater Hazard Mitigation Plan*, adopted August 2019.

SCE reports that increased power outages are directly related to climate change, and that PSPS will become "the new normal during high fire/wind events". PSPS will become increasingly necessary to mitigate fire risk if increased severity and duration of extreme weather events occur as predicted.

Additionally, climate change may result in storm events and Santa Ana winds occurring outside of traditional seasons of the year.

4.2.9 WILDFIRE

Description
A wildfire is defined as an unplanned and unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fire where the object is to extinguish the fire. Wildfire is a natural part of the southern California ecosystem, helping to clear brush and debris, and is a necessary part of various species' life cycles. Wildfires can be sparked by lightning, accidents, or arson.

Human activity has changed the buffer zone between urbanized and undeveloped areas, known as the wildland-urban interface, where naturally fire-prone landscapes abut developed neighborhoods. The natural setting of a wildland-urban interface can make these areas highly desirable places to live, and many of these areas in California are now developed. This development has brought more people into wildfire-prone areas. The availability of fuel and increasing encroachment into the wildland-urban interface have made wildfires a common and dangerous hazard in southern California. Certain development patterns pose more difficult fire problems. These include multi-story, wood frame, high-density apartment developments; multi-story research developments; large continuous developed areas with combustible roofing materials; and facilities that use and/or store hazardous materials. Features of structural conditions that affect fire control include the type and use of a structure, area of building, number of stories, roof covering, and exposures to the building.

Certain conditions must be present for significant interface fires to occur. The most common conditions include hot, dry and windy weather, the inability of fire protection forces to contain or suppress the fire, the occurrence of multiple fires that overwhelm committed resources, and a large fuel load (dense vegetation). The three primary factors that lead to high wildfire fuel loads in Orange County are drought, insect infestation causing tree decimation (bark beetles), and wildfire suppression. Road side ignition and arson have both occurred in Orange County and triggered wildfires as well. Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought, and development.

During wildfire season, SCE monitors weather conditions in fire prone areas. To prevent strong winds and extreme heat from causing fire accidents, SCE may proactively turn off power in a PSPS. Power outages as a secondary effect is discussed in detail within the Severe Weather Hazard Profile.

Location/Extent
CAL FIRE prepares wildfire hazard severity maps including mapping areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies and influence how people construct buildings and protect property to reduce risk associated with wildland fires. While FHSZ do not predict when or where a wildfire will occur, they do identify

areas where wildfire hazards could be more severe and therefore are of greater concern. Zones are designated on varying degrees from moderate, high, and very high.
A large portion of land within the IRWD service area is open space and includes rugged topography with highly flammable native vegetation, making wildland fires a significant risk to IRWD infrastructure. Infrastructure in certain areas of the IRWD jurisdiction, such as the cities of Newport Beach, Orange, Lake Forest, Irvine and Laguna Woods are located within a Very High Hazard Wildfire Zone under Local Responsibility; refer to Exhibit 4-20, *Wildfire Hazard Zone – Critical Facilities*, Exhibit 4-21, *Wildfire Hazard Zone – Distribution System*, and Exhibit 4-22, *Wildfire Hazard Zone – Sewer Collection System*.

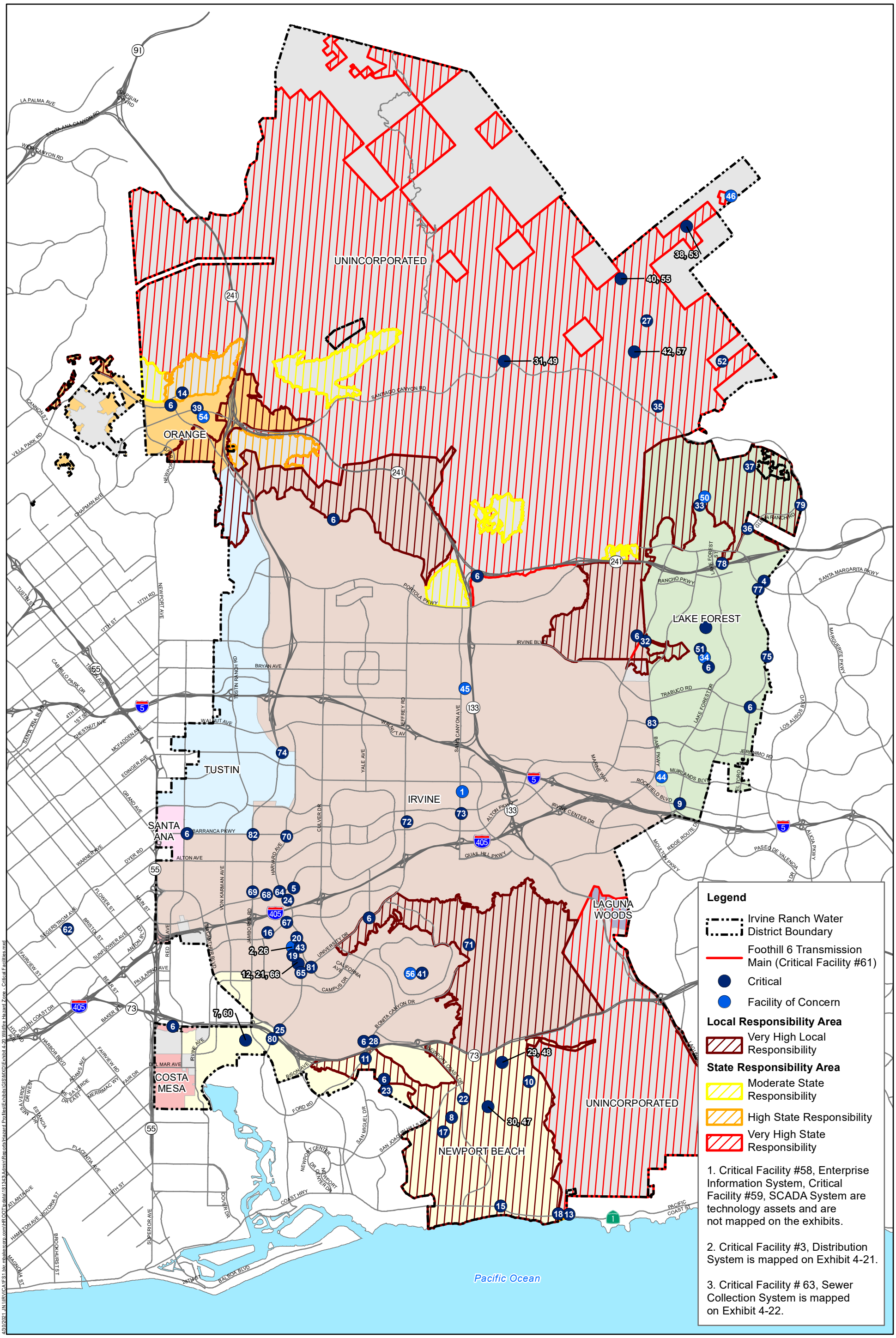
Additionally, unincorporated Orange County areas within the northern IRWD service area are located in Very High Wildfire Zones under State Responsibility. This area can experience long duration service interruptions during major wildfire incidents because of damaged SCE infrastructure.

Fire protection challenges occur where development is located within and directly adjacent to wildland urban interface areas. As the number of structural features increases, so does the risk of incidence of fire. Wildfires are not measured on a specific scale and are usually classified by size or impact. The size and severity of any fire depends on the availability of fuel, weather conditions, and topography, although wildfires in the wildland urban interface do not need to be significant in acreage to be damaging. Due to the location of development within and adjacent to Moderate, High, and Very High Fire Hazard Severity Zones, there is the potential for a wildfire to spread quickly within the IRWD service area, depending on the conditions and nature of the fire.

Previous Occurrences

Major Fires in Orange County History
Fire season in southern California traditionally has occurred between May and September. However, it should be noted that Orange County has experienced some of its most devastating fires during the fall and winter (outside of the traditional fire season), including the Laguna Fire, Freeway Complex Fire, and recent Bond Fire, described below.

Table 4-19, *Recent Fires in Orange County*, summarizes wildfire activity in Orange County dating back to 1996. These fires have resulted in varying impacts with the amount of acreage ranging from three acres to over 23,000 acres. These fires have occurred both within and outside of what has been referred to as the traditional wildfire season. In comparison to Table 4-20, *Major Wildfires in Orange County History*, identifies the most significant historical fires in Orange County dating back to 1948 in terms of the amount of acreage claimed.



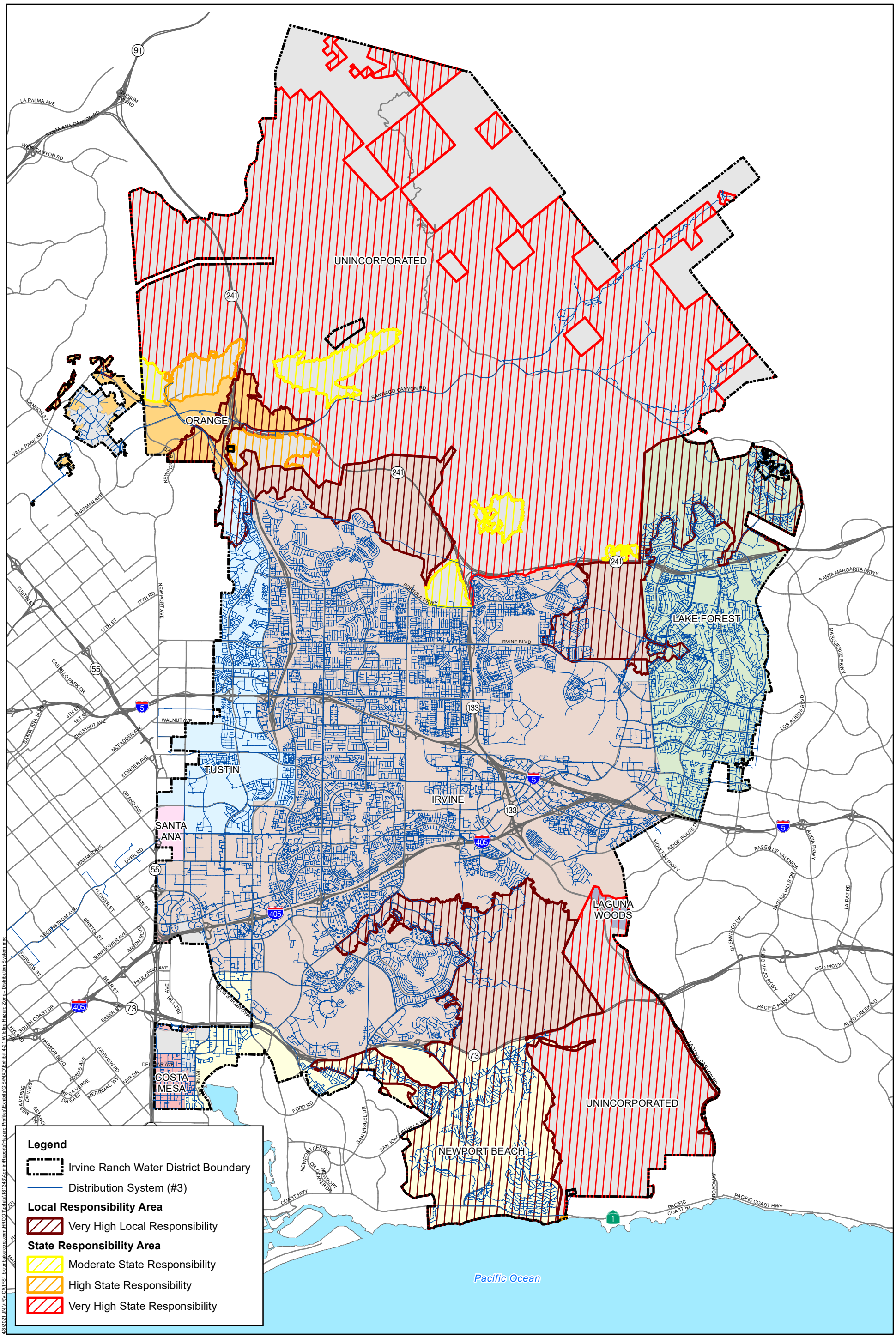
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Critical Facilities

Data Source: IRWD, 2021, CALFIRE, 2018

Exhibit 4-20



4/8/2021 J:\N:\RIV\ICA\TFS1-bkr.mbakercorp.com\HROOT\pdata\181343\Admin\Reports\Hazard Profiles\Exhibits\GIS\MXD\Exhibit 4-21 Wildfire Hazard Zone - Distribution System.mxd

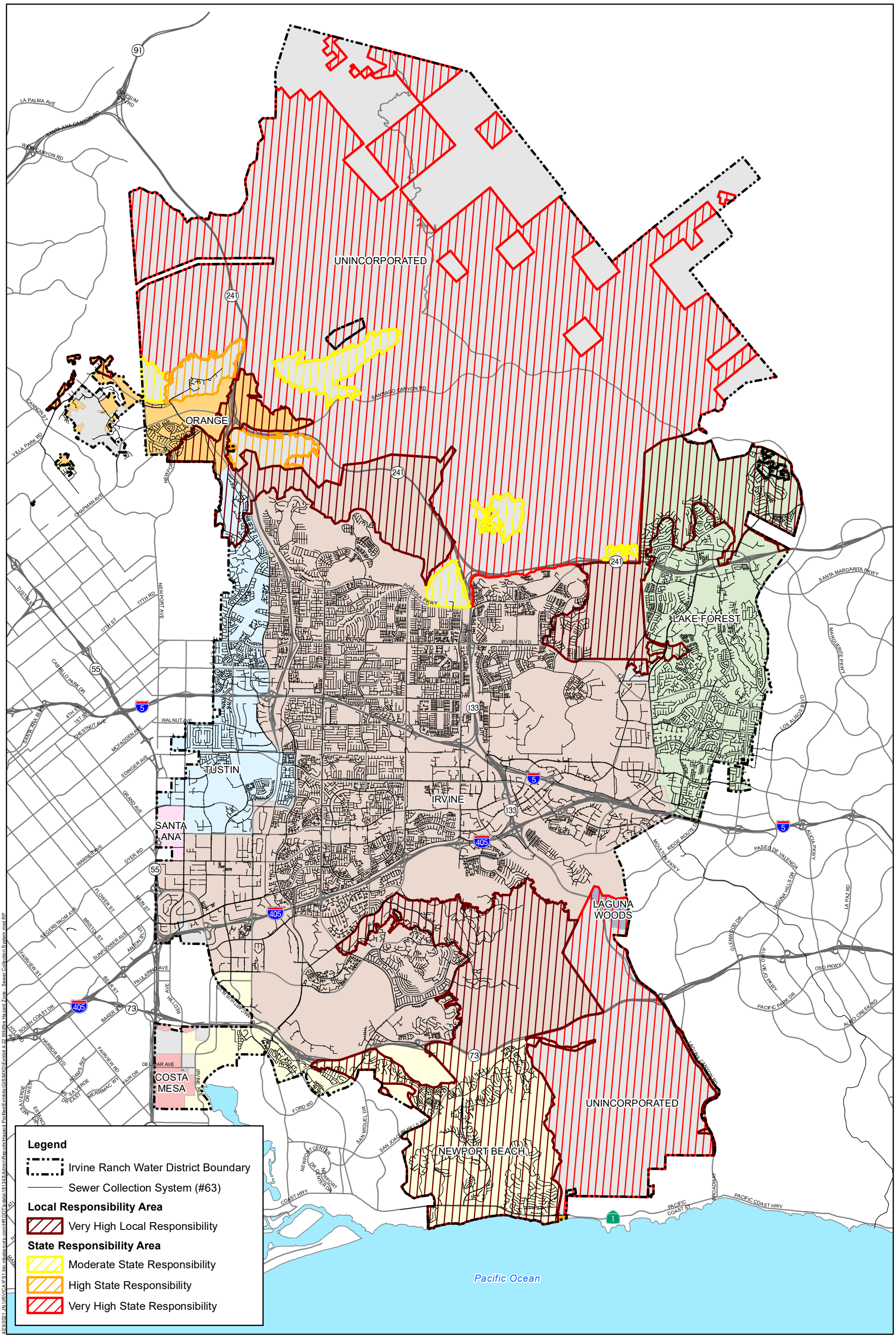
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Distribution System

Source: IRWD, 2021, CALFIRE, 2018

Exhibit 4-21



0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Sewer Collection System

Source: IRWD, 2021, CALFIRE, 2018

Exhibit 4-22

Table 4-19
Recent Fires in Orange County

Location	Name	Begin Date	Acres Claimed
Lemon Heights	N/A	10/21/1996	Unknown
El Toro MCAS	N/A	10/13/1997	6,000
Santiago Canyon	N/A	8/31/1998	9,000
Fountain Valley	N/A	12/9/1998	Unknown
Mission Viejo	N/A	12/27/1999	38
San Clemente	N/A	8/22/2000	Unknown
San Clemente	N/A	9/11/2000	500
Laguna Beach	N/A	8/7/2001	Unknown
El Toro MCAS	N/A	9/9/2001	30
Trabuco	N/A	1/23/2002	Unknown
Anaheim	N/A	2/9/2002	2,400
Yorba Linda	N/A	4/21/2002	Unknown
Mission Viejo	N/A	5/13/2002	1,100
Los Alamitos	N/A	5/14/2002	Unknown
Mission Viejo	N/A	5/14/2002	Unknown
Costa Mesa	N/A	7/16/2002	30
Garden Grove	N/A	7/29/2002	Unknown
Yorba Linda	N/A	11/20/2002	477
Mission Viejo	N/A	11/26/2002	3
Santa Ana Mountains	Sierra Fire	2/6/2006	10,854
Santa Ana Mountains	Windy Ridge Fire	3/11/2007	2,036
Santa Ana Mountains	Santiago Fire	10/21/2007	28,400
Santa Ana Canyon	Freeway Complex Fire	11/15/2008	30,305
Santa Ana Mountains	Long Canyon	9/23/2010	40
Santa Ana Mountains	Falls Fire	8/5/2013	1,416
Santa Ana Mountains	Silverado Fire	9/12/2014	1,600
Santa Ana Mountains	Canyon Fire	9/25/2017	2,662
Anaheim Hills	Canyon 2 Fire	10/9/2017	9,000
Aliso Viejo Canyon Park	N/A	6/2/2018	200
Trabuco Canyon	Holy Fire	8/6/2018	23,136
Loma Ridge	Silverado Fire	10/26/2020	12,466
Chino Hills	Blue Ridge Fire	10/26/2020	13,964
Loma Ridge	Bond Fire	12/2/2020	6,686

Sources: National Oceanic and Atmospheric Information - National Centers for Environmental Information, *Storm Events Database*, https://www.ncdc.noaa.gov/stormevents/, accessed February 16, 2021; CALFIRE, 2020 CalFIRE Incidents, https://www.fire.ca.gov/incidents/2020/, accessed February 16, 2021.

Table 4-20
Major Wildfires in Orange County History

Fire Name	Year	Acres Claimed
Green River	1948	53,079
Steward	1958	69,444
Paseo Grande	1967	51,075
Indian	1980	28,408
Owl	1980	18,332
Gypsum	1982	19,986
Laguna	1993	16,682
Ortega	1993	21,010
Sierra	2006	10,584
Santiago	2007	28,517
Freeway Complex	2008	30,305
Holy Fire	2018	23,136
Silverado Fire	2020	12,466

Table 4-20 (continued)
Major Wildfires in Orange County History

Fire Name	Year	Acres Claimed
Blue Ridge Fire	2020	13,964
Source: County of Orange and Orange County Fire Authority, Local Hazard Mitigation Plan, adopted November 2015; CALFIRE, *2020 CalFIRE Incidents,* https://www.fire.ca.gov/incidents/2020/, accessed February 16, 2021. NOTE: Major fires in Orange County are defined as burning more than 10,000 acres in total.		

Some of the most recent fires within IRWD's service areas or within the vicinity of the service area are described below.

Silverado Fire
The most recent major fire in Orange County, the Silverado Fire originated on October 26, 2020 in Silverado Canyon. Extreme winds and low humidity levels created the most dangerous conditions seen since October 2019 in the larger Los Angeles area.[59] The cause of the fire was thought to be related to a lashing wire connected to telecommunication lines that came into contact with SCE's overhead primary conductor. Over 90,000 residents in Orange County were evacuated, primarily in the Cities of Irvine and Lake Forest, within the IRWD service area.[60] Over 1,200 firefighters were deployed, and two firefighters were critically injured. A total of five structures were destroyed, and another nine damaged. The Governor declared a State of Emergency to deploy further resources to Orange County.[61]

Challenges fighting the Silverado Fire emerged when the Blue Ridge Fire broke out in northeast Orange County later in the same day that the Silverado Fire began. The Blue Ridge Fire was located north of SR-91 in the Yorba Hills area. Concerns emerged as conditions for the Silverado Fire appeared to replicate the 2007 Santiago Fire footprint, but firefighting efforts were able to slow the spread before the Silverado Fire reached the same extent as the Santiago Fire. A total of 12,466 acres were burned in the Silverado Fire, and 13,964 acres were burned in the Blue Ridge Fire. IRWD facilities relied on emergency generators to maintain water service for customers and firefighting services. No facilities were damaged by the wildfire.

Bond Fire
The Bond Fire broke out on December 17, 2020, outside of the traditional southern California fire season (usually consisting of late summer to early autumn). Uncharacteristically warm temperatures combined with strong winds resulted in the wildfire spreading north of the Silverado Fire burn area, prompting evacuations in the Santa Ana mountains, Trabuco Canyon, and Portola Hills (City of Lake Forest) neighborhoods. Ultimately, 6,686 acres were burned, 31 structures destroyed and 21 structures damaged. While this wildfire is not one of the largest or most significant fires in Orange County history, this occurrence outside of the traditional fire season poses concern for future extended wildfire seasons locally.[62] IRWD facilities relied on emergency generators to maintain water service for customers and firefighting services. No facilities were damaged by the wildfire.

[59] The Washington Post, *California wildfires force tens of thousands to evacuate Orange County amid strong winds*, https://www.washingtonpost.com/weather/2020/10/27/california-wildfires-orange-county-winds/, accessed May 12, 2021.
[60] The Laist, *Silverado Fire: 2 Firefighters Critically Injured, Evacuations for 90,000 Residents*, https://laist.com/latest/post/20201026/silverado-fire-irvine-day-1, accessed February 16, 2021.
[61] CalFIRE, *2020 Incidents Mapper – Blue Ridge and Silverado Fires*, https://www.fire.ca.gov/incidents/2020/, accessed February 16, 2021.
[62] CalFIRE, *Bond Fire*, https://www.fire.ca.gov/incidents/2020/12/2/bond-fire/, accessed February 16, 2021.

Other Wildfires

During the Santiago Wildfire in 2007, electricity and communication links were lost to nine reservoirs, six pump stations, and a small water treatment plant. IRWD crews implemented emergency operations procedures to keep the water flowing to fire fighters by connecting emergency generators, operating pumps, and manually measuring reservoir depths in areas where loss of power disabled electronic monitoring systems. Because of these efforts, water service to residents and fire fighters was maintained throughout the episode. An estimated 10 million gallons of water per day assisted in fighting the Santiago Wildfire.[63]

IRWD experienced the loss of one facility during the Santiago Wildfire. The Portola Zone 9 Booster Pump Station (originally built in 1987, serving the Zone 9 system in Portola Hills) was destroyed during this fire. The pump station was replaced in 2008, incorporating fire-proof design and protective features. Vegetation around the facility has been removed, and the updated design is less susceptible to wildfire hazards. Additionally, the District stationed a permanent emergency generator at the booster pump station to improve the reliability of the water system during power outages caused by wildfires in the nearby canyons.[64]

Probability of Future Occurrences

Wildfires have a high probability of occurring due to the developed nature and geographic extent of the FHSZ within the IRWD service area. IRWD's service area is continually exposed to Santa Ana winds during the summer and autumn; however, these winds can occur at other times of the year (as demonstrated by the recent Bond Fire). Additionally, with the increase of major regional fires in southern California, it is highly probable that fires of regional significance will occur in Orange County, Riverside County, and San Bernardino County, that could impact the IRWD service area. The wildland-urban interface is likely to experience increased rates of wildfires in future years. The recent fires in Orange County demonstrate the ability for a wildfire to begin in one place and spread to other cities or to cross county lines.

Climate Change

Several of the largest California wildfires have occurred in the past two years, including the Mendocino Complex Fire, Thomas Fire, and Carr Fire. During 2018, the Camp Fire became the deadliest wildfire in California history, killing 86 civilians and burning 153,000 acres in Butte County. Southern California experienced several severe fires in recent history, including the Woolsey Fire. Three significant wildfires occurred in Orange County during 2020, prompting mass evacuations across the IRWD service area.

Climate change and global warming patterns are expected to cause an increase in temperatures, as well as more frequent and intense drought conditions. As mentioned previously, the severity of a wildfire is dependent on the amount of oxygen, heat, wind, relative humidity, and fuel. Excessive heat and low humidity during the summer and fall months are likely to occur. It is possible that higher temperatures could cause local native chaparral and scrub ecosystems to change to grasslands. This would increase dry plant matter, which could cause wildfires to move more quickly or spread into developed areas.

It is well documented that regional wildfires will likely become an increased threat, which could have secondary consequences for IRWD. Specifically, parts of Riverside and San Bernardino counties could see wildfire risk increase between 50 and 100 percent. Wildfires release smoke, ash, and other particulate matter that substantially degrade air and water quality. Thus, fires

[63] Irvine Ranch Water District, *Santiago Fire – 2007*, https://www.irwd.com/services/santiago-fire-2007, accessed March 15, 2021.
[64] Notice of Exemption, *Project Name: Portola Zone 9 Booster Pump Station Generator Project*, November 21, 2021.

located in different parts of Orange, Riverside, or San Bernardino counties can negatively impact air and water quality within the IRWD service area.

4.3 VULNERABILITY/RISK ASSESSMENT

Vulnerability describes how exposed or susceptible to damage an asset is, and depends on an asset's construction, condition, contents, and economic value of functions. A vulnerability analysis predicts the extent of injury/damage on the built environment that may result from a hazard event of a given intensity in a specific area. Due to the interrelatedness of water and wastewater infrastructure and the key role IRWD plays in public health and safety, vulnerabilities from one hazard are often interrelated with other hazard vulnerabilities. Indirect effects can be significant and have the potential to be more widespread and damaging than direct effects. For example, damage to a major water distribution line could result in significant disruptions and outages that would far exceed the cost of repairing the distribution line. IRWD customers who were not impacted directly by the hazard impacts could be impacted by the secondary impacts.

The vulnerability assessment below quantifies, to the extent feasible using the best available data, IRWD assets at risk to hazards and estimates potential losses. This section focuses on the profiled hazards and risks specific to IRWD's jurisdiction.

4.3.1 METHODOLOGY

For each hazard profiled in Section 4.2, *Hazard Identification and Prioritization*, a vulnerability/risk assessment is provided in this section. The vulnerability/risk assessment gives equal weight to all hazards, regardless of the identified probability. The specific hazard and associated probability are considered as part of the mitigation prioritization, discussed in Section 5.0, *Mitigation Strategy*. This assessment considers the physical threats to IRWD critical facilities and facilities of concern. It should be noted that actual losses will depend on the type, location, magnitude, and extent of the actual hazard event.

The critical facilities and facilities of concern listed in Section 3.0, *Jurisdictional Profile*, were mapped in GIS and overlaid with mapped hazard areas (those hazards that have a specific geographic area) to determine which assets are located in each hazard area. Hazard area and critical facility overlays were conducted for the following hazards: flood, landslide, fault zones, ground shaking susceptibility, liquefaction (specific to seismic conditions), wildfire and dam inundation. Dam inundation mapping included the failure of five extremely high hazard dams owned and operated by IRWD, including: Rattlesnake Canyon Dam, Sand Canyon Dam (Main Dam), Sand Canyon (Spillway), San Joaquin Dam, Santiago Dam, and Syphon Canyon Dam. Dam inundation mapping exhibits and detailed vulnerability assessment are located within Appendix C, *Dam/Reservoir Failure Vulnerability Assessment* maintained separately by IRWD.

Overlays were not prepared for the following hazards: drought, geologic hazards (land subsidence and expansive soils), human-caused hazards (hazardous materials releases, terrorism/sabotage), and severe weather. These hazards are not geographically defined and have the potential to affect the entire IRWD jurisdiction. Due to the geographic distribution of Critical Facility #3, Distribution System, and Critical Facility #63, Sewer Collection System, both facilities are identified by the number of linear miles located within the mapped hazard area. For the purposes of this LHMP and vulnerability assessment, it is assumed that drought, geologic hazards, human-caused hazards, and severe weather could impact IRWD's entire jurisdiction, including all critical facilities and facilities of concern.

Replacement values for the critical facilities and facilities of concern (where available) are provided to estimate the potential losses based on the method described above. For the critical facilities and facilities of concern that were previously identified as a "critical asset" in the IRWD Water System Risk and Resilience Assessment (RRA) (dated March 2020), the replacement costs were already identified and were extracted for use in the Vulnerability/Risk Assessment for this LHMP. For critical facilities or facilities of concern that were not included in the IRWD RRA, the LHMP Project Management Team coordinated with the IRWD Finance Department to identify replacement costs.

After coordination with the Finance Department, information was missing for seven critical facilities. For these facilities, the LHMP Project Management Team coordinated with the IRWD Engineering Department for professional judgements and opinions on critical facility replacement values. For Critical Facility #4, El Toro Diversion Structure, and Critical Facility #5, San Mateo Diversion Structure, the replacement value was based on estimates for a private lift station and an increase in size. Four lift stations (Critical Facility #12, Duck Club, Critical Facility #20, MRWP Auto Shop, Critical Facility #21, MWRP Caretaker Housing, and Critical Facility #23, San Joaquin Housing) replacement values were estimated to be $300,000 each based on estimates for the manhole, pump, and prevailing wage costs.

Siphon replacement costs (Critical Facilities #65 to #83) were developed by identifying the diameter of the siphon, multiplying the length of the siphon by an estimated replacement cost per foot for deep sewer below a creek. This estimate is provided for informational purposes only, as there is no other cost information for siphons within the IRWD library. IRWD has inherited all siphon facilities during water district consolidation processes and has never constructed one as a district. If a hazard event resulted in a total loss or failure of any siphons, IRWD would not replace siphon facilities "as is" and instead would replace with newer technology.

Replacement costs are not included for Critical Facility #5, Met Source Water, as these facilities are maintained by the Metropolitan Water District of Orange County for the purposes of distributing imported water to IRWD.

Finally, the replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system. The replacement cost for Critical Facility #63, Sewer Collection System, is a replacement cost for the total system. It is noted that it is unlikely that a hazard incident would cause failure of the entire distribution system or sewer collection system, but these replacement costs are included as a "worst-case" scenario evaluation.

4.3.2 VULNERABILITY/RISK ASSESSMENT

Dam/Reservoir Failure

Dam and reservoir failures have the capacity to cause environmental and property damage, loss of human life, and displacement to persons residing in the inundation path. Currently, inundation mapping is available for the following five extremely high hazard dams owned and operated by IRWD: Rattlesnake Canyon Dam, Syphon Canyon Dam, San Joaquin Dam, Santiago Creek Dam, and Sand Canyon Dam. The critical facilities within these dam inundation areas, illustrative exhibits and additional vulnerability analysis are included as Appendix C.

The threat and extent of damage from dam inundation is dependent on the location of the incident and the size/severity of the failure. Dam inundation maps indicate "sunny-day" failure scenarios and estimate total failure at maximum capacity of either the dam or an appurtenant structure.

Incidents could be less severe than the mapped inundation (e.g., if a total failure occurred when the dam was at 20 percent capacity). A failure could result in critical facility and infrastructure inundation (e.g., roads, water, wastewater, electricity, natural gas), resulting in short-term interruption or extended loss of IRWD service, loss of business income, and displacement of individuals and businesses. Inundation or failure of transportation or other utility infrastructure could disrupt IRWD response to critical facilities. An immediate catastrophic dam failure, depending on the size of dam and the population downstream, could exceed the response capability of public safety personnel and resources, or significantly impair the ability to respond.

Additionally, portions of the IRWD service area are vulnerable to dam inundation and flooding from dam and reservoir facilities operated by other public agencies outside of the jurisdiction. The most significant example is Prado Dam with a gross storage capacity of 217,000 acre-feet. Inundation mapping from Prado Dam failure is not publicly accessible, and thus the potential area of impact is currently unknown.

Drought

Drought conditions would affect the entirety of IRWD's service area; therefore, all critical facilities/facilities of concern, infrastructure systems, structures, and customers within the jurisdiction are within the drought hazard area. Droughts do not typically result in physical damage to buildings and infrastructure, but instead would potentially limit the availability of water supplies for delivery to IRWD customers.

Prolonged drought conditions often result in strict conservation measures, such as targeted reduction percentages or penalties for using potable water above a specific threshold. Higher rates or penalties could disproportionately impact lower-income households or residents on a fixed income. IRWD maintains a diverse water portfolio to limit reliance on imported water. Additionally, IRWD operates in a drought-proof recycled water program to ensure reliable supplies during times of drought. Several water conservation programs implemented during the 2011 – 2017 statewide drought remain in place at IRWD, including conservation rebates and a free home water assessment for residential customers.

Flood

Flood-prone areas in IRWD's jurisdiction, as identified by FEMA, are primarily located within and adjacent to major drainages within the service area. Table 4-21, *Facilities in a Flood Hazard Zone*, identifies the critical facilities within the flood hazard zone; there are no facilities of concern located within the flood hazard zone.

Table 4-21
Facilities in a Flood Hazard Zone

Map ID	Name	Asset Type	Flood Zone	Total Loss Potential
3	Distribution System – 20.25 miles	Distribution System	FEMA 100 YR	$790,000,000.00[1]
3	Distribution System – 55.06 miles	Distribution System	FEMA 500 YR	$790,000,000.00[1]
6	Met Source Water	Intake	FEMA 100 YR	N/A
12	Duck Club	Lift Station	FEMA 100 YR	$300,000.00
14	Irvine Park	Lift Station	FEMA 100 YR	$2,605,484.00
21	MWRP Caretaker Housing	Lift Station	FEMA 100 YR	$300,000.00
40	Shaw Pump Station	Pump Station	FEMA 100 YR	$1,649,200.00
53	Read Reservoir	Reservoir	FEMA 100 YR	$3,306,300.00

Table 4-21 (continued)
Facilities in a Flood Hazard Zone

Map ID	Name	Asset Type	Flood Zone	Total Loss Potential
63	Sewer Collection System – 15.06 miles	Wastewater Collection System	FEMA 100 YR	$781,131,700.00[2]
63	Sewer Collection System – 37.94 miles	Wastewater Collection System	FEMA 500 YR	$781,131,700.00[2]
65	S1	Siphon	FEMA 100 YR	$585,00.00
66	S2	Siphon	FEMA 100 YR	$1,266,000.00
67	S3	Siphon	FEMA 100 YR	$1,302,000.00
68	S4	Siphon	FEMA 100 YR	$1,365,000.00
69	S5	Siphon	FEMA 100 YR	$222,000.00
70	S6	Siphon	FEMA 100 YR	$444,000.00
72	S8	Siphon	FEMA 100 YR	$807,000.00
73	S9	Siphon	FEMA 100 YR	$870,000.00
74	S10	Siphon	FEMA 100 YR	$549,000.00
75	S11	Siphon	FEMA 100 YR	$948,000.00
77	S13	Siphon	FEMA 100 YR	$1,122,000.00
78	S14	Siphon	FEMA 100 YR	$432,000.00
81	S18	Siphon	FEMA 100 YR	$807,000.00
83	S17	Siphon	FEMA 100 YR	$324,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

Significant flood events could result in inundation or damage to the critical facilities identified above, which could impact IRWD's ability to provide potable water and wastewater services to customers. While there are a few potable water assets (distribution system, intake, pump station and reservoir) listed in Table 4-21, the majority of the assets located within the flood zone are critical to providing prompt and efficient wastewater services. IRWD does not have any repetitive loss or severe repetitive loss properties, as defined by FEMA.

Geologic Hazards

Land subsidence and expansive soils are considered under the geologic hazards profile. Both hazards are known to exist within the majority of Orange County, and thus are assumed to apply to the entirety of the IRWD jurisdiction. Therefore, all critical facilities and facilities of concern within the IRWD service area are considered at risk for land subsidence and expansive soil hazards. Geologic hazards are more likely to result in physical damages to structures, primarily underground distribution/collection systems and the foundations for other IRWD assets. Damaged IRWD water and wastewater infrastructure could cause service interruptions, depending on the significance of the incident.

Human-Caused Hazards

Human-induced hazards have the potential to affect all of the IRWD jurisdiction, and therefore all critical facilities within the jurisdiction are within the human-induced hazards area. Hazardous materials spills could occur due to an IRWD operations related accident or an unintended release by an outside individual or entity that impacts IRWD facilities or operations. Although hazardous materials could result in damages to structures, the most significant impact is the potential human health hazards or potable water contamination. IRWD has several plans and programs in place to dictate follow-up actions in the case of unintentional release. Terrorism and sabotage attempts (including cyberattacks) are more likely to cause damage to physical structures and infrastructure systems. Recent cyberattacks against water districts have involved remotely adjusting chemical levels used in the potable water sterilization process to deadly levels if consumed by humans.

IRWD has information technology (IT) defense programs in place, and conduct tabletop exercises to evaluate and prepare for internal responses to both physical threats and cyberattacks.

The entire IRWD jurisdiction is susceptible to harm associated with a human-induced hazard. However, the extent of harm or injury is highly dependent upon the nature of the actual incident. Hazardous materials releases, terrorism, sabotage and cyberattacks could damage the environment, interfere with water quality, and delay service to IRWD customers. Damage to water and wastewater infrastructure systems could interrupt service or cause long-term outages. Hazardous materials spills that contaminate potable water sources could involve costly long-term clean-up actions and measures. Attacks focused on dam or reservoir infrastructure could cause structural failure or inundation. Cyberattacks could involve the release of sensitive IRWD data or interfere with other remote communication systems.

Landslide/Mudflow

Within the IRWD jurisdiction, areas of steep slopes are mapped as at-risk for landslides. Table 4-22, *Facilities in a Landslide Hazard Zone*, identifies critical facilities and one facility of concern located within zones with mapped potential for landslides.

Table 4-22
Facilities in a Landslide Hazard Zone

Map ID	Name	Asset Type	Total Loss Potential
Critical Facilities			
3	Distribution System – 40.65 miles	Distribution System	$790,000,000.00[1]
8	Buck Gully	Lift Station	$1,935,024.00
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	$6,999,844.00
27	Benner Reservoir	Pump Station	$1,138,600.00
52	Modjeska Reservoir	Reservoir	$4,478,500.00
53	Read Reservoir	Reservoir	$3,306,300.00
57	Williams Canyon Reservoir	Reservoir	$2,653,400.00
63	Collection System – 31.68 miles	Wastewater Collection System	$781,131,700.00[2]
Facilities of Concern			
46	Chapman Reservoir	Reservoir	$1,510,400.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

Critical facilities within the mapped landslide zone include both water and wastewater collection facilities, along with one reservoir listed as a facility of concern. It is noted that there are areas within the IRWD service area that may be susceptible to landslide conditions due to moisture-induced conditions or other steep slopes that were not mapped in the hazard zone. Further, areas susceptible to mudflow conditions are not specifically defined. Mudflows have historically occurred in canyon areas and have also occurred in wildfire hazard zones in the past.

Both landslides and mudslides could result in damages to critical facilities and other IRWD infrastructure. Depending on the nature of the hazard incident, landslides and mudslides could also impede access to critical facilities and infrastructure thus causing service interruptions or outages.

Seismic Hazards

The IRWD service area is located within a seismically active region, and experiences different vulnerabilities from the following seismic hazards: ground shaking, fault rupture and liquefaction. The entire IRWD jurisdiction is at risk to seismic ground shaking, and thus all critical facilities, facilities of concern and IRWD infrastructure is at risk in the event of an earthquake. The extent of damage would depend upon the location and magnitude of the earthquake. Damage to IRWD infrastructure could be significant and result in the disruption of both potable water delivery and wastewater services. Depending on the extent of the earthquake, transportation systems and other utility services (i.e., communication) could be hindered which would further disrupt the IRWD response.

Three critical facilities are within close proximity to mapped fault lines within the IRWD service area, outlined in Table 4-23, *Facilities in a Fault Rupture Zone*. Fault ruptures could physically impact the outlined critical facilities by displacing foundations or underground infrastructure, potentially disrupting IRWD service.

Table 4-23
Facilities in a Fault Rupture Zone

Map ID	Name	Asset Type	Total Loss Potential
Critical Facilities			
3	Distribution System	Distribution System	$790,000,000.00[1]
17	Montecito	Lift Station	$1,935,024.00
63	Collection System	Wastewater Collection System	$781,131,700.00[2]
1.Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system. 2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.			

The IRWD jurisdiction is also susceptible to seismic-induced liquefaction, and mapped liquefaction zones are known throughout the service area. Table 4-24, *Facilities in a Liquefaction Hazard Zone*, identifies the critical facilities and facilities of concern located within the liquefaction hazard area. Similar to groundshaking and fault rupture hazards, liquefaction can physically damage critical facilities and other IRWD infrastructure, particularly pipelines within soils subject to liquefaction. Again, depending on the extent of the liquefaction incident, transportation systems and other utility services could be hindered which would further disrupt the IRWD response. Damaged infrastructure can result in IRWD service interruptions or outage.

Table 4-24
Facilities in a Liquefaction Hazard Zone

Map ID	Name	Asset Type	Total Loss Potential
Critical Facilities			
3	Distribution System – 475.14 miles	Distribution System	$790,000,000.00[1]
4	El Toro Diversion Structure	Diversion Structure	$500,000.00
5	San Mateo Diversion	Diversion Structure	$500,000.00
6	Met Source Water	Intake	N/A
9	Canada	Lift Station	$3,508,247.00
12	Duck Club	Lift Station	$300,000.00
15	Los Trancos Low Flow	Lift Station	$1,935,024.00
18	Muddy Canyon Low Flow	Lift Station	$1,935,024.00
19	MWRP MPS-3	Lift Station	$4,226,529.00
21	MWRP Caretaker Housing	Lift Station	$300,000.00
22	Newport Coast	Lift Station	$6,999,844.00

Table 4-24 (continued)
Facilities in a Liquefaction Hazard Zone

Map ID	Name	Asset Type	Total Loss Potential
24	HATS Lift Station	Lift Station	$5,115,644.00
28	Coastal OC 63-Zn.4 Pump Station	Pump Station	$3,076,700.00
42	Williams Canyon Pump Station (Benner)	Pump Station	$1,649,200.00
43	Michelson MWRP	Recycled Water	$500,000,000.00
61	Foothill 6 Transmission Line	Transmission Main	$504,104.32
63	Collection System – 387.35	Wastewater Collection System	$781,131,700.00[2]
64	Harvard Area Trunk Diversion Structure (HATS)	Diversion Structure	$5,115,644.00
65	S1	Siphon	$585,000.00
66	S2	Siphon	$1,266,000.00
67	S3	Siphon	$1,302,000.00
68	S4	Siphon	$1,365,000.00
69	S5	Siphon	$222,000.00
70	S6	Siphon	$444,000.00
71	S7	Siphon	$1,056,000.00
72	S8	Siphon	$807,000.00
73	S9	Siphon	$870,000.00
74	S10	Siphon	$549,000.00
75	S11	Siphon	$948,000.00
76	S12	Siphon	$738,000.00
77	S13	Siphon	$1,122,000.00
80	S16	Siphon	$951,000.00
81	S18	Siphon	$807,000.00
82	S19	Siphon	$180,000.00
Facilities of Concern			
2	Michelson Biosolids	Biosolids Treatment	$250,000,000.00
26	Michelson Operations Center	Operations Staff Offices	$20,900,000.00
44	Los Alisos Water Recycling Plant (LAWRP)	Recycling Plant	$10,185,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

Severe Weather

Severe weather includes winter storms and windstorms (Santa Ana winds). Both of these natural hazards could impact the entire IRWD service area; therefore, all critical facilities and the entirety of the jurisdiction is located within a severe weather hazard area. Heavy rain events and Santa Ana winds could cause damage to IRWD infrastructure, although it is usually not significant enough to impact service operations or critical facilities.

Power outages are more likely to occur during a severe weather event, primarily strong associated with Santa Ana wind events. Proactive power outages are becoming more common during predicted strong Santa Ana wind conditions due to the risk of wildfires. The associated power outages impact IRWD's ability to deliver water and wastewater services and require IRWD to rely on generators while SCE power is unavailable.

Wildfire

A significant portion of the IRWD service area is located within a fire hazard zone (ranked very high, high, and moderate). Table 4-25, *Facilities in a Wildfire Hazard Zone*, identifies the critical

facilities and facilities of concern located within the fire hazard zones. These include both water and wastewater facilities.

Table 4-25
Facilities in a Wildfire Hazard Zone

Map ID	Name	Asset Type	Wildfire Hazard Zone	Total Loss Potential
Critical Facilities				
3	Distribution System – 184.77 miles	Distribution System	Very High Local Responsibility	$790,000,000.00[1]
3	Distribution System – 36.81 miles	Distribution System	Very High, High and Moderate State Responsibility	$790,000,000.00[1]
6	Met Source Water	Intake	Very High Local Responsibility	N/A
8	Buck Gully	Lift Station	Very High Local Responsibility	$1,935,024.00
10	Coastal Ridge	Lift Station	Very High Local Responsibility	$2,605,484.00
11	Coyote Canyon	Lift Station	Very High Local Responsibility	$2,605,484.00
14	Irvine Park	Lift Station	High State Responsibility	$2,605,484.00
15	Los Trancos Low Flow	Lift Station	Very High Local Responsibility	$1,935,024.00
17	Montecito	Lift Station	Very High Local Responsibility	$1,935,024.00
18	Muddy Canyon Low Flow	Lift Station	Very High State Responsibility	$1,935,024.00
22	Newport Coast	Lift Station	Very High Local Responsibility	$6,999,844.00
23	San Joaquin Housing	Lift Station	Very High Local Responsibility	$300,000.00
27	Benner Reservoir	Pump Station	Very High State Responsibility	$1,138,600.00
29	Coastal Zn 6-7 Pump Station	Pump Station	Very High Local Responsibility	$2,671,800.00
30	Coastal Zn. 4-6 Pump Station	Pump Station	Very High Local Responsibility	$2,268,700.00
31	Fleming Pump Station	Pump Station	Very High State Responsibility	$2,268,700.00
32	Foothill Zn 4-6 Pump Station	Pump Station	Very High Local Responsibility	$3,076,700.00
33	Foothill Zn 6-6A Pump Station	Pump Station	Very High Local Responsibility	$2,671,800.00
35	Manning Pump Station	Pump Station	Very High State Responsibility	$1,649,200.00
36	Portola Hills Zn 6-8	Pump Station	Very High Local Responsibility	$3,076,700.00
37	Portola Hills Zn 8-9 Pump Station	Pump Station	Very High Local Responsibility	$3,076,700.00
38	Read Pump Station	Pump Station	Very High State Responsibility	$1,649,200.00
40	Shaw Pump Station	Pump Station	Very High State Responsibility	$1,649,200.00
42	Williams Canyon Pump Station (Benner)	Pump Station	Very High State Responsibility	$1,649,200.00
47	Coastal Zn 4 Reservoir	Reservoir	Very High Local Responsibility	$8,813,300.00
48	Coastal Zn 6 Reservoir	Reservoir	Very High Local Responsibility	$1,230,590.00
49	Fleming Reservoir	Reservoir	Very High State Responsibility	$1,556,800.00
53	Read Reservoir	Reservoir	Very High State Responsibility	$3,306,300.00
55	Shaw Reservoir	Reservoir	Very High State Responsibility	$1,728,100.00
57	Williams Canyon Reservoir	Reservoir	Very High State Responsibility	$2,653,400.00
61	Foothill 6 Transmission Line	Transmission Line	Very High Local Responsibility	$504,104.32
63	Collection System – 148.58	Wastewater Collection System	Very High Local Responsibility	$781,131,700.00[2]
63	Collection System – 2.68	Wastewater Collection System	Very High, High and Moderate State Responsibility	$781,131,700.00[2]
71	S7	Siphon	Very High Local Responsibility	$1,056,000.00
78	S14	Siphon	Very High Local Responsibility	$432,000.00
79	S15	Siphon	Very High Local Responsibility	$915,000.00
Facilities of Concern				
46	Chapman Reservoir	Reservoir	Very High State Responsibility	$1,510,400.00
50	Foothill Zn 6 Reservoir	Reservoir	Very High Local Responsibility	$7,794,900.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

Depending upon the location and extent of the wildfire, transportation routes could become impaired or inaccessible and as a result limit IRWD's ability to respond to threatened critical facilities.

4.3.3 LAND USE AND DEVELOPMENT TRENDS/CHANGES IN DEVELOPMENT

IRWD is the primary water and wastewater provider to a service area that equals approximately 20 percent of Orange County. It is estimated IRWD serves a daytime population greater than 600,000 individuals with over 118,263 drinking water service connections and a residential population of 425,208. Depending on the hazard and its magnitude and duration, a considerable number of people and businesses could be impacted. The primary concern is a hazard event that results in the loss of water supply and wastewater services to the IRWD jurisdiction. As discussed above, a variety of hazards could impact vulnerable infrastructure, as well as indirect damage resulting from business disruption.

Although Orange County is generally urbanized and nearly built out, the Southern California Association of Governments (SCAG) projects continued population, employment, and housing growth into 2045. The SCAG 6th Cycle Final Regional Housing Needs Assessment (RHNA) Allocation Plan was approved in March 2021 and identifies housing growth by county and city to accommodate projected population growth needs. The County of Orange and all cities are currently in the process of updating their respective Housing Elements to accommodate the RHNA projected housing needs. The RHNA Allocation for IRWD customer cities is outlined in Table 4-26, *RHNA Allocation for IRWD Customer Cities*. It is important to note that the RHNA allocation for the City of Irvine would be planned within the IRWD service area. The remaining jurisdictions (City of Costa Mesa, Lake Forest, Newport Beach, Orange and unincorporated Orange County) only have a portion of land located within the IRWD service area. Thus, the total RHNA allocation is not expected to occur entirely in the IRWD service area. Planned growth within these jurisdictions may occur within the IRWD service area to varying extents, and locations for new housing units would not be finalized until the adoption of the jurisdiction's updated Housing Element.

Table 4-26
RHNA Allocation for IRWD Customer Cities

Jurisdiction	Total RHNA Allocation	RHNA Allocation by Income Level			
		Very-Low Income	Low Income	Moderate Income	Above Moderate Income
City of Costa Mesa[1]	11,760	2,919	1,794	2,088	4,959
City of Irvine[2]	23,610	6,396	4,235	4,308	8,671
City of Lake Forest[1]	3,236	956	543	559	1,178
City of Newport Beach[1]	4,845	1,456	930	1,050	1,409
City of Orange[1]	3,936	1,067	604	677	1,588
City of Tustin[1]	6,782	1,724	1,046	1,132	2,880
Unincorporated Orange County[1]	10,406	3,139	1,866	2,040	3,361

1. Only a portion of the listed City/unincorporate County jurisdiction is located within the IRWD service area. Thus, the total RHNA allocation is not expected to occur entirely in the IRWD service area, but areas of planned growth may be located within the portions of the IRWD service area.
2. The entirety of the City of Irvine is located within IRWD jurisdiction, and thus this planned growth would occur within the IRWD service area.
Source: Southern California Association of Government, *SCAG 6th Cycle Final RHNA Allocation Plan (Approved by HCD on 3/22/31)*, https://scag.ca.gov/sites/main/files/file-attachments/6th-cycle-rhna-final-allocation-plan.pdf?1616462966, accessed May 12, 2021.

The County of Orange and IRWD's customer cities maintain General Plans that identify planned growth and development for their respective jurisdictions, including both residential and non-residential land uses. At the time of this LHMP writing, growth is specifically occurring within the City of Irvine and City of Tustin (with significant residential and commercial developments planned within the Great Park/historic Marine Corps Air Station El Toro and Tustin Legacy/historic Marine

Corps Air Station Tustin). IRWD will continue to work with customer cities and the community to identify service needs, including the construction, expansion, or modification of water and wastewater infrastructure. The construction of new facilities or infrastructure would be completed in coordination with customer cities to ensure compliance with appropriate codes and regulations, including consideration of potential hazards.

Due to the highly developed nature of the IRWD service area, along with the presence of natural hazards throughout the jurisdiction, development and population growth has continued to occur within areas of risk. Recent drought conditions have placed a greater emphasis on the ability for new development to be served by water supplies and planning for prolonged drought conditions. Recent wildfire activity (including wildfires outside the traditional wildfire season) has blurred the edge of the urban-wilderness interface and are bringing hazardous conditions closer to urbanized areas. IRWD continues to coordinate with the applicable public safety agencies to meet the demands of the respective communities while strengthening local infrastructure and overall reliability of service in the event of a hazard. IRWD has modified infrastructure with these hazards in mind to mitigate potential threats.

4.3.4 VULNERABLE POPULATIONS

Water supplies used for safe drinking, sanitation and hygiene are relied upon by the entire population. The social threat to IRWD customers is generally discussed in this section, as specific population data pertaining to vulnerable populations is not readily available. However, it is noted that there are populations within the IRWD service area that would be considered more vulnerable in the event of a hazard that affects water and wastewater infrastructure. Hazard events may have different impacts on different vulnerable populations. Vulnerable populations include those that are reliant on others for their wellbeing, such as young children, individuals with disabilities, individuals dependent on medical equipment, and individuals with impaired mobility, as well as people with low socioeconomic levels. Age, socioeconomic status, access to services, physical and mental conditions, and other conditions affect the ability to prepare for and respond to a hazard event. Disabled persons typically are unable to care for themselves completely and they rely on others. Lower-income households are less likely to have financial resources to implement mitigation actions in their homes and are less likely to have the financial means to recover as a result of a hazard event. Both disabled persons and lower-income households may not have access to other drinking water sources if potable water supplies were cut off and may not have the ability to purchase supplies elsewhere. Depending on the nature of the hazard incident, the ability to travel out of the affected area could be challenging or impossible if water/wastewater services are interrupted for a period of time. Due to the dynamic nature of hazards, the extent of impacts can vary greatly. Vulnerable populations are more significantly impacted in the event of a natural or man-made disaster.

4.3.5 SUMMARY OF VULNERABILITY

Table 4-27, *Risk Assessment Summary*, shows a summary of critical facilities and facilities of concern that intersect with hazards in the IRWD service area. These critical facilities that intersect with a hazard area are indicated with a “Y” and a red-shaded cell. Critical facilities that do not fall within the hazard area are designated with an “N” and a green-shaded cell. The risks of drought, geologic hazards (land subsidence and expansive soils), human-caused hazards (hazardous materials releases, terrorism/sabotage), and severe weather are equal throughout the jurisdiction.

Table 4-27
Risk Assessment Summary

Map ID	Facility	Dam/Reservoir Failure	Drought	Flood	Geologic Hazards	Human-Caused Hazards	Landslide/Mudslide	Seismic Hazards – Liquefaction	Seismic Hazards – Ground Shaking	Seismic Hazards – Fault Rupture	Severe Weather	Wildfire
1	Headquarters Building	N	Y	N	Y	Y	N	N	Y	N	Y	N
2	Michelson Biosolids	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
3	Distribution System	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	El Toro Diversion Structure	N	Y	N	Y	Y	N	Y	Y	N	Y	N
5	San Mateo Diversion	N	Y	N	Y	Y	N	Y	Y	N	Y	N
6	Met Source Water	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
7	Bayview	N	Y	N	Y	Y	N	N	Y	N	Y	N
8	Buck Gully	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
9	Canada	N	Y	N	Y	Y	N	Y	Y	N	Y	N
10	Coastal Ridge	N	Y	N	Y	Y	N	N	Y	N	Y	Y
11	Coyote Canyon	Y	Y	N	Y	Y	N	N	Y	N	Y	Y
12	Duck Club	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
13	El Morro School	N	Y	N	Y	Y	N	N	Y	N	Y	N
14	Irvine Park	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
15	Los Trancos Low Flow	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
16	Michelson	N	Y	N	Y	Y	N	N	Y	N	Y	N
17	Montecito	N	Y	N	Y	Y	N	N	Y	Y	Y	Y
18	Muddy Canyon Low Flow	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
19	MWRP MPS-3	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
20	MWRP Auto Shop	N	Y	N	Y	Y	N	N	Y	N	Y	N
21	MWRP Caretaker Housing	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
22	Newport Coast	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
23	San Joaquin Housing	N	Y	N	Y	Y	N	N	Y	N	Y	Y
24	HATS Lift Station	N	Y	N	Y	Y	N	Y	Y	N	Y	N
25	University	Y	Y	N	Y	Y	Y	N	Y	N	Y	N
26	Michelson Operations Center	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
27	Benner Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
28	Coastal OC 63-Zn.4 Pump Station	N	Y	N	Y	Y	N	Y	Y	N	Y	N
29	Coastal Zn 6-7 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
30	Coastal Zn. 4-6 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
31	Fleming Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
32	Foothill Zn 4-6 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
33	Foothill Zn 6-6A Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
34	Lake Forest 4 - 5 West	N	Y	N	Y	Y	N	N	Y	N	Y	N
35	Manning Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
36	Portola Hills Zn 6-8	N	Y	N	Y	Y	N	N	Y	N	Y	Y
37	Portola Hills Zn 8-9 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
38	Read Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
39	Santiago Hills Zn 5-6	N	Y	N	Y	Y	N	N	Y	N	Y	N
40	Shaw Pump Station	N	Y	Y	Y	Y	N	N	Y	N	Y	Y
41	Turtle Rock Zn 3-4 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	N
42	Williams Canyon Pump Station (Benner)	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
43	Michelson MWRP	Y	Y	N	Y	Y	N	Y	Y	N	Y	N

Table 4-27 (continued)
Risk Assessment Summary

Map ID	Facility	Dam/Reservoir Failure	Drought	Flood	Geologic Hazards	Human-Caused Hazards	Landslide/Mudslide	Seismic Hazards – Liquefaction	Seismic Hazards – Ground Shaking	Seismic Hazards – Fault Rupture	Severe Weather	Wildfire
44	Los Alisos Water Recycling Plant (LAWRP)	N	Y	N	Y	Y	N	Y	Y	N	Y	N
45	Central Irvine Zn 1 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	N
46	Chapman Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
47	Coastal Zn 4 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
48	Coastal Zn 6 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
49	Fleming Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
50	Foothill Zn 6 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
51	Lake Forest Zn 4 Tank 1 & Tank 2	N	Y	N	Y	Y	N	N	Y	N	Y	N
52	Modjeska Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	N
53	Read Reservoir	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y
54	Santiago Canyon Zn 5	N	Y	N	Y	Y	N	N	Y	N	Y	N
55	Shaw Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
56	Turtle Rock Zn 3	N	Y	N	Y	Y	N	N	Y	N	Y	N
57	Williams Canyon Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
58	Enterprise Information System	N	Y	N	Y	Y	N	N	Y	N	Y	N
59	SCADA System	N	Y	N	Y	Y	N	N	Y	N	Y	N
60	Bayview Telemetry	N	Y	N	Y	Y	N	N	Y	N	Y	N
61	Foothill 6 Transmission Line	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
62	Deep Aquifer Treatment System (DATS)	Y	Y	N	Y	Y	N	N	Y	N	Y	N
63	Collection System	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
64	Harvard Area Trunk Diversion Structure (HATS)	N	Y	N	Y	Y	N	Y	Y	N	Y	N
65	S1	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
66	S2	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
67	S3	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
68	S4	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
69	S5	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
70	S6	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
71	S7	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
72	S8	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
73	S9	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
74	S10	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
75	S11	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
76	S12	N	Y	N	Y	Y	N	Y	Y	N	Y	N
77	S13	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
78	S14	N	Y	Y	Y	Y	N	N	Y	N	Y	Y
79	S15	N	Y	N	Y	Y	N	N	Y	N	Y	Y
80	S16	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
81	S18	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
82	S19	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
83	S17	N	Y	Y	Y	Y	N	N	Y	N	Y	N

SECTION 5: MITIGATION STRATEGY

Hazard mitigation strategies are used to reduce hazard impacts on critical facilities and facilities of concern identified by IRWD. This section is developed from an in-depth review of the vulnerabilities and capabilities described in the previous plan section. Overall, the actions represent IRWD's approach for reducing and/or eliminating the potential losses as identified in the Vulnerability/Risk Assessment section.

5.1 HAZARD MITIGATION OVERVIEW

5.1.1 FEMA'S NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Program (NFIP) provides affordable flood insurance to property owners, renters, and businesses by encouraging communities to adopt and enforce floodplain management regulations. Participation in the NFIP is optional; however, property owners who live in a non-participating community with flood-prone areas are not able to buy flood insurance through the program. Communities with mapped floodplains cannot receive federal grants or loans for development activities in flood-prone areas and cannot receive federal disaster assistance to repair flood damaged buildings in mapped floodplains if they are not participants of the NFIP.

All customer cities within the IRWD service area are participants in the NFIP[1], including Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange, and Tustin. As a water purveyor, IRWD does not participate directly in the NFIP but instead participates in the program through the six customer cities. As each city has adopted floodplain management regulations that meet or exceed the NFIP requirements, IRWD infrastructure is plan checked and evaluated against the appropriate regulations during the permitting process. Thus, IRWD participates in the NFIP through coordination with customer cities. At the time of this LHMP writing, IRWD does not purchase flood insurance through the NFIP and instead purchases flood insurance through a separate mechanism.

5.1.2 HAZARD MITIGATION GOALS

The mitigation goals (presented in Section 1.0, *Introduction and Purpose*) serve as the basis for direction to promote sound public policy designed to protect IRWD critical facilities, facilities of concern, and infrastructure from hazard incidents. The plan goals guide the direction of future IRWD activities aimed at reducing risk and preventing loss or interruption of water/wastewater services from hazards. The goals also serve as checkpoints as IRWD begins to implement mitigation action items.

The hazard mitigation actions identified below list the activities that IRWD will use to reduce risk of potential hazards. These mitigation actions were identified through discussions and collaboration with the LHMP Project Management Team, LHMP Planning Team, and direct conversations with specific department managers at IRWD. Some of these actions may be eligible for funding through federal and State grant programs, or other funding sources as made available to IRWD. The mitigation actions are intended to address the comprehensive range of identified hazards. Several actions may address risk reduction from multiple hazards (specifically outlined as appropriate).

[1] Federal Emergency Management Agency, *FEMA's National Flood Hazard Layer (NFHL) Viewer*, https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd, accessed May 25, 2021.

5.1.3 HAZARD MITIGATION PRIORITIZATION

The LHMP Project Management Team and the LHMP Planning Team discussed each mitigation action to identify the priority, using the following as guidance:

- High Priority: Top organizational priority and is generally a well-detailed project idea. Protects population, resource, or property at high risk. Uses feasible methods, techniques, or technology.
- Medium Priority: A good idea that needs more information or is an action that addresses a moderate hazard.
- Low Priority: An idea that needs a lot more information or will take a lot of preliminary action to build support.

The hazard ranking completed as part of the first LHMP Planning Team meeting and additional discussion during the fourth LHMP Planning Team meeting influenced the priority/timeline of the specific mitigation action. For example, some actions may require further study or information but were identified as a high priority because of current conditions (i.e., heightened risk of the hazard, probability of future occurrences, or lack of redundancy established in a specific portion of the service area). Several actions were identified as high priority, while the nature and complexity of the action involves a "long-term" timeline of five or more years. The LHMP Planning Team considered the frequency and severity of the hazard; the vulnerability of IRWD critical facilities and infrastructure; the impacts the mitigation action would avoid or reduce; the benefits of the action on the community; the critical facilities that would benefit; the environmental benefits of the action; and the capability of IRWD (and external partners, when appropriate) to implement the action.

The LHMP Planning Team reviewed the STAPLE/E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria, as described in Table 5-1, *STAPLE/E Review and Selection Criteria*, when considering and prioritizing the mitigation actions. This methodology, as endorsed by FEMA, provides for social, technical, administrative, political, legal, economic, and environmental factors to be considered when reviewing potential actions.

5.1.4 HAZARD MITIGATION BENEFIT – COST REVIEW

FEMA requires LHMP preparers to analyze the benefits and costs of a range of mitigation actions that can reduce the effects of each hazard within their communities. Benefit-cost analysis is used in hazard mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit-cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now in order to avoid disaster-related damages later. The analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk.

Table 5-1
STAPLE/E Review and Selection Criteria

STAPLE/E REVIEW	SELECTION CRITERIA
Social	• Is the proposed action socially acceptable to the jurisdiction and surrounding community? • Are there equity issues involved that would mean that one segment of the jurisdiction and/or community is treated unfairly? • Will the action cause social disruption?
Technical	• Will the proposed action work? • Will it create more problems than it solves? • Does it solve a problem or only a symptom? • Is it the most useful action in light of other jurisdiction goals?
Administrative	• Can the jurisdiction implement the action? • Is there someone to coordinate and lead the effort? • Is there sufficient funding, staff, and technical support available? • Are there ongoing administrative requirements that need to be met?
Political	• Is the action politically acceptable? • Is there public support both to implement and to maintain the project?
Legal	• Is the jurisdiction authorized to implement the proposed action? • Are there legal side effects? Could the activity be construed as a taking? • Will the jurisdiction be liable for action or lack of action? • Will the activity be challenged?
Economic	• What are the costs and benefits of this action? • Do the benefits exceed the costs? • Are initial, maintenance, and administrative costs considered? • Has funding been secured for the proposed action? If not, what are the potential funding sources (public, nonprofit, and private)? • How will this action affect the fiscal capability of the jurisdiction? • What burden will this action place on the tax base or local economy? • What are the budget and revenue effects of this activity? • Does the action contribute to other jurisdiction goals? • What benefits will the action provide?
Environmental	• How will the action affect the environment? • Will the action need environmental regulatory approvals? • Will it meet local and State regulatory requirements? • Are endangered or threatened species likely to be affected?

A hazard mitigation plan must demonstrate that a process was employed which emphasized a review of benefits and costs when prioritizing the mitigation actions. The benefit-cost review must be comprehensive to the extent that it can evaluate the monetary as well as the nonmonetary benefits and costs associated with each action. The benefit-cost review should at least consider the following questions:

- How many customers will benefit from the action?
- How large an area is impacted? Which areas would benefit from the action?
- How critical are the facilities that benefit from the action (e.g., which is more beneficial to protect, the lift station or the administrative building)?
- Environmentally, does it make sense to do this project for the overall service area?

These questions were considered to help determine the appropriateness of mitigation actions. Those actions that did not have adequate benefits to IRWD were excluded from the list of mitigation actions.

5.2 HAZARD MITIGATION OVERVIEW

The LHMP Project Management Team and Planning Team worked together to identify mitigation actions and establish the responsible department, priority level and timeline. The process used is outlined below:

- Review of the vulnerability and risk assessment presented in Section 4.0;
- Review of the capability's assessment presented in Section 5.3;
- Review of the results of the community survey and feedback received as part of the focus outreach meetings; and
- The LHMP Planning Team's discussion of concerns/issues that need to be addressed to reduce hazards to critical facilities and the community.

Table 5-2, *Hazard Mitigation Actions*, identifies the mitigation action, hazard(s) addressed, the IRWD Department (and external partner, when appropriate) responsible for implementation, priority, and implementation timeline. The timeline for implementation is defined as follows:

- Ongoing: currently in process; or, 1-2 years and ongoing thereafter;
- Short-Term: 1 to 2 years;
- Medium-Term: 3 to 4 years; and
- Long-Term: 5+ years.

The majority of mitigation actions outlined below are anticipated to be funded through the IRWD budget. However, IRWD may also explore funding for specific mitigation actions through local, state, or federal grant programs.

Table 5-2
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
1	Coordinate with the County of Orange for opportunities to allow shared communication space on cell towers for IRWD. Shared space would allow for IRWD SCADA radio communication only.	All Hazards	Information Systems	High	Ongoing
2	Build redundancy into the wastewater collection, treatment, disposal, and non-potable distribution system to mitigate major structural defects.	All Hazards	Recycling Operations, Engineering	High	Ongoing
3	Identify additional back-up communication systems (such as satellite phones or radio) for purchase, to utilize if primary communication systems become unavailable. Ensure that coverage includes the entirety of the IRWD service area. Include annual training opportunities.	All Hazards	Safety, Information Services, Facilities/Fleet	High	Short Term
4	Develop a technical communications plan to build redundancy and evaluate the cost/benefit and feasibility of different communications systems.	All Hazards	Safety, Information Services, Facilities/Fleet	High	Short Term
5	Implement and maintain both internal and external alert/warning systems to effectively communicate hazard threats to staff and customers. Include utilization of the alert/warning system in a regular training program.	All Hazards	Customer Service, Safety, Public Affairs	High	Ongoing
6	Implement and maintain information sharing mechanisms/platforms for involved departments to utilize during a disaster response. Ensure the platform can be viewed on network devices and mobile devices, while maintaining data security.	All Hazards	Safety, Information Services	High	Short Term
7	Evaluate and study the practicality of an alternate regulatory lab, in the case of failure at Michelson. Consider the feasibility of locating and certifying an alternative regulatory lab site at LAWRP.	All Hazards	Water Quality	Low	Medium Term
8	Develop and maintain Specific Hazard Response Plans (SHRPs) as vulnerabilities become apparent. Include SHRPS in regular training and exercise programs.	All Hazards	Safety, related departments	Medium	Ongoing
9	Maintain Water Emergency Response Organization of Orange County (WEROC) membership for communication and collaboration opportunities with regional water districts, including identification and implementation of mitigation actions with shared benefits.	All Hazards	Safety	High	Ongoing
10	Enhance phone system to support phone connectivity when people are working offsite through Voice over Internet Protocol (VoIP).	All Hazards	Information Services	Medium	Ongoing
11	Establish alternate route mapping for critical facilities that avoid bridges, and incorporate into the IRWD EOP once complete.	All Hazards	Engineering, Water Operations, Recycling Operations, Safety	Medium	Medium Term
12	Conduct an update of the IRWD Energy and Greenhouse Gas Master Plan.	All Hazards	Water Resources	Medium	Long Term

Table 5-2 (continued)
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
13	Evaluate dam improvements to increase resiliency in coordination with the Dam Safety Program and Implementation Plan.	Dam/Reservoir Failure	Engineering	High	Ongoing
14	Seek funding opportunities to further study, plan and implement the IRWD potable reuse program.	Drought	Water Resources	Medium	Medium Term
15	Continue to proactively monitor drought conditions or water conservation warnings issued by state agencies or regional water authorities.	Drought	Water Resources	Medium	Ongoing
16	Prepare a Recycled Water Shortage Contingency Plan.	Drought	Water Resources	Medium	Short Term
17	Implement the Kern Fan Groundwater Storage Project. The project develops water recharge and recovery facilities in the San Joaquin Valley Groundwater Basin to recharge, store, recover and deliver State Water Project water, Central Valley Project water, Kern River water available with existing right holders, and water from other sources when available.	Drought	Water Resources	Medium	Long Term
18	Implement the Syphon Reservoir Improvement Project to increase the capacity of the existing reservoir. The existing dam would be replaced with a new and larger engineered dam and allow for additional recycled water storage during periods of low demand (winter months) for use during periods of high demand.	Drought	Engineering Department	Medium	Medium Term
19	Conduct an inflow & infiltration study to determine where 50 year and 100 year flood waters would collect. Study outcomes should include the following: • What assets, including the collections conveyance system, would be affected? • What facilities or equipment would need rehabilitation or replacement after a 50 year or 100 year flood? How should that work be prioritized? • What would be the cost of the necessary temporary equipment to get the service area up and running, during the replacement/rehabilitation project? • How would these impacts on the wastewater system affect potable water operations? Will they contaminate storage wells? • How would this affect IRWD's recycled water business? What measures could IRWD take to prevent or mitigate any of the identified damage?	Flood	Engineering, Recycling Operations	Low	Long Term
20	Assess permanently elevating water-sensitive equipment and anchoring fuel tanks in flood-prone locations.	Flood	Engineering	Low	Long Term
21	Regularly check and maintain radar flood level gauges located in San Diego Creek.	Flood	Electrical and Instrumentation	High	Ongoing

Table 5-2 (continued)
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
22	Designate alternative locations for residual dirt and fill storage, away from the Michelson Yard.	Flood	Construction, Facilities	Low	Short Term
23	Continue coordination with police and public safety agencies for IRWD-preferred response actions during localized flooding incidents, to prevent increased flood waters impacting IRWD facilities associated with the lifting of manhole covers.	Flood	Safety, Collection Systems, in coordination with WEROC (external partner)	Low	Medium Term
24	Continue to coordinate with customer cities and the County to ensure proper storm drain maintenance, to prevent against localized flooding due to sediment or debris in the drainage system.	Flood	Safety, Collection Systems, in coordination with WEROC (external partner)	Medium	Ongoing
25	Continue to conduct geotechnical studies for geologic hazards on new construction projects when appropriate, to evaluate vulnerabilities for land subsidence and expansive soils.	Geologic Hazards (Land Subsidence, Expansive Soil)	Engineering	High	Ongoing
26	Continue to support customer cities and the County in community outreach actions regarding the proper handling, storage, and disposal of hazardous materials.	Human-Caused Hazards (Hazardous Materials)	Safety, Public Affairs	Medium	Ongoing
27	Continue to monitor and track regulatory requirements and updates as they relate to hazardous materials storage and response actions.	Human-Caused Hazards (Hazardous Materials)	Safety	High	Ongoing
28	Develop a Cybersecurity Plan in coordination with a consultant and include an IS/Network focused Business Continuity Plan (BCP).	Human-Caused Hazards (Terrorism/Sabotage, Cyberattacks)	Information Services	High	Short Term
29	Evaluate and study critical facilities and facilities of concern that could benefit from protective retaining wall installation.	Landslide/Mudflow	Engineering	Low	Long Term
30	Following wildfire events continue to partner with CAL FIRE, Orange County Office of Emergency Preparedness, Orange County Fire Authority, and Orange County Sheriff's Department, to identify the potential for and location of landslide and/or mudflow events associated with heavy rainfall.	Landslide/Mudflow	Engineering, Safety, in coordination with WEROC (external partner)	Medium	Ongoing
31	Consider development of a project utilizing the recent hyper-local landslide study and resulting report (2021 WERT report) in combination with assessment of canyon facilities to determine potential for additional mitigation projects protecting against debris flow.	Landslide/Mudflow	Water Operations, Collection Systems, Facilities, Engineering in coordination with Operational Area partners and WEROC (external partner).	Low	Medium Term
32	Continue to conduct geotechnical studies to determine the potential for onsite landslides in any new construction project.	Landslide/Mudflow	Engineering	High	Ongoing
33	Implement the Santiago Creek Dam Improvements Project. The proposed activity includes removal and replacement of the existing outlet tower, outlet works and spillway facilities, in accordance with recommendations from the DSOD.	Multiple Hazards – Drought, Flood, Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering Department; Serrano Water District, Department of Safety of Dams (external partners)	High	Medium Term

Table 5-2 (continued)
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
34	Assess the communications resilience in canyon areas; address capacity of canyon facilities to communicate with each other (some are linked and dependent), as well as sending communications back to IRWD staff in other locations monitoring facility status.	Multiple Hazards – Flood, Landslide/Mudflow, Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Automation, Information Systems, Facilities	Medium	Short Term
35	Establish procedures for staging District vehicles, materials, and equipment at alternative work locations prior to significant storm events.	Multiple Hazards – Flood, Severe Weather (Coastal Storm/Winter Storm)	Safety, Fleet, all relevant departments	Medium	Short Term
36	Continue to locate electrical generators at Water Treatment Plants for short-term power solutions.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical and Mechanical	High	Ongoing
37	Perform monthly maintenance checks on permanent and portable back-up generators, and check fuel supply.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Mechanical	High	Ongoing
38	Seek funding opportunities to rehabilitate or replace aging generators in order to maintain critical water and wastewater operations during power outages.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Engineering, Safety	High	Short Term
39	Coordinate with Southern California Edison prior to any planned power outage to ensure generator capacity and provide time to pre-position supplies as applicable.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Safety, in coordination with WEROC (external partner)	High	Ongoing
40	Establish a communication plan with Southern California Edison for use during an unplanned power outage to assess the potential duration and extent of the power outage, and associated need for generators and supplies.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Safety, in coordination with WEROC (external partner)	High	Ongoing
41	Utilize data from ongoing generator replacement project to develop further wildfire and power outage mitigation projects, once above study results become available.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Engineering, Water Operations, Collection Systems, Maintenance	High	Medium Term
42	The necessity for fire agency escorts into fire-affected areas has complicated physical access to facilities for refueling. Increase the capacity of current portable fueling equipment to allow better access to affected facilities with fewer trips during active fire activity. This project will also increase efficiency during power outages that do not involve wildfires.	Multiple Hazards – Severe Weather (Windstorm/Santa Ana Winds, Power Outage), Wildfire	Fleet, Maintenance	Medium	Medium Term

Table 5-2 (continued)
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
43	Extend battery life for the Supervisory Control and Data Acquisition (SCADA) system by purchasing long runtime or extended long runtime uninterruptible power supply (UPS) to prevent outages in canyon facilities. Evaluate which locations would benefit from the upgraded UPS.	Multiple Hazards - Wildfire, Windstorm (Power Outage)	Automation	Medium	Medium Term
44	Monitor changes/updates to building codes and seismic regulations to determine if IRWD-owned critical facilities may need seismic retrofits as they age and building codes are updated.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	High	Ongoing
45	If any IRWD-owned critical facility is determined to be seismically vulnerable, identify a plan to conduct structural retrofitting, including funding sources.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	High	Long Term
46	As repair and rehabilitation needs are identified in vertical structural facilities, consider options that increase seismic stability and resiliency as needed. Make improvements in accordance with current codes.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	High	Ongoing
47	Consider developing and seeking funding for an evaluation program to determine the seismic vulnerability of critical assets.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	Medium	Medium Term
48	Include assessment and mitigation of potential liquefaction conditions in the scope of any new building or infrastructure project.	Seismic Hazards (Liquefaction)	Engineering	High	Ongoing
49	Annually review defensible space, brush clearing and weed abatement needs for all canyon water facilities.	Wildfire	Facilities	Medium	Ongoing
50	Collaborate with the California Department of Fish and Wildlife (CDFW), CAL FIRE, and local firefighting agencies to establish a defensible space strategy in compliance with existing plans and environmental policies that provides IRWD the ability to maintain/remove vegetation around critical facilities in the wildfire hazard zone.	Wildfire	Facilities, Safety, in coordination with WEROC (external partner)	Medium	Short Term
51	Evaluate opportunities to enhance infrastructure building hardscape (including protective walls) and undergrounding power lines as appropriate.	Wildfire	Engineering	Medium	Medium Term
52	Conduct a study to assess canyon facilities: • Which facilities are in the historic fire field? With increased fire activity, is that area growing/changing? • Which facilities could be further fire hardened or have protective retaining walls added? • How should IRWD prioritize any mitigation measures planned?	Wildfire	Engineering, Water Operations, Collection Systems, Maintenance	Medium	Medium Term

Table 5-2 (continued)
Hazard Mitigation Actions

#	Mitigation Action	Hazard(s) Assessed	Responsible Department	Priority	Timeline
53	Develop measures to improve access to canyon facilities for fueling and maintenance during wildfires. Collaboration with fire agencies and pre-planning with WEROC are two possibilities.	Wildfire	Safety, Water Operations, Collection Systems, Maintenance	High	Short Term

5.3 CAPABILITIES ASSESSMENT

This capabilities assessment is designed to identify existing IRWD departments, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this plan. To create this capability assessment, the LHMP Project Management Team and LHMP Planning Team collaborated to identify capabilities and mechanisms available to IRWD for reducing damage from future hazard events. After initial identification, the capabilities were reviewed again and updated in the context of developing the mitigation actions.

The capabilities assessment considered the following types of resources:

- Planning and regulatory capabilities are based on the implementation of ordinances, policies, local laws, and State statutes, and plans and programs that relate to guiding and managing growth and development.
- Administrative and technical capabilities refer to the staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. It also refers to the ability to access and coordinate these resources effectively.
- Financial capabilities are the resources that a jurisdiction has access to or is eligible to use to fund mitigation actions.
- Education and outreach capabilities are programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Refer to Table 5-3, *Capabilities Assessment*, below for the summary of IRWD capabilities.

Table 5-3
Capabilities Assessment

Resource	Description and Ability to Support Mitigation
Planning and Regulatory	
General Plan Responsible Department: Community Development Department at City of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange, and Tustin, County of Orange	A municipal General Plan establishes long-range growth, development planning and community character visioning. General Plans contain policies and programs designed to provide a basis for land use decisions, including associated water and wastewater infrastructure as appropriate. IRWD complies with the goals, policies, and objectives of the General Plans for each respective municipal jurisdiction within the IRWD service area.
Zoning Ordinance Responsible Department: Community Development Department at City of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange, and Tustin, County of Orange	A municipal Zoning Code implements the General Plan (outlined above) by establishing regulations for land use control within the jurisdiction, including controls designed to minimize risk associated with known regional natural hazards or mapped hazard zones. Zoning is used to protect public health, safety, and welfare. IRWD complies with the Zoning Ordinances for each respective municipal jurisdiction within the IRWD service area.
Subdivision Ordinance Responsible Department: Community Development Department at City of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange and Tustin, County of Orange	A municipal Subdivision Ordinance regulates the development of public infrastructure/utilities, housing commercial, industrial and other uses, as land is subdivided into buildable lots. Subdivision Ordinances account for the risk of natural hazards on future development. IRWD complies with applicable Subdivision Ordinances and regulations, and coordinates with the respective municipal jurisdictions within the IRWD service area.

Table 5-3
Capabilities Assessment (continued)

Resource	Description and Ability to Support Mitigation
Building Codes, Permitting and Inspections Responsible Department: Community Development Department at City of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange and Tustin, County of Orange	A building code regulates the standards, materials, and occupancy of constructed buildings within the jurisdiction. Often, cities and counties adopt the California Building Code, with amendments. IRWD complies with all building code regulations, along with permitting and inspection requirements, with the respective municipal jurisdictions within the IRWD service area.
National Flood Insurance Program Responsible Department: Community Development Department at City of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange and Tustin, County of Orange	The National Flood Insurance Program (NFIP) provides affordable flood insurance to property owners, renters and businesses by encouraging communities to adopt and enforce floodplain management regulations. All customer cities within the IRWD service area participate in NFIP. IRWD complies with the floodplain regulations set forth by the respective municipal jurisdictions within the IRWD service area.
Emergency Operations Plan Responsible Department: IRWD Safety Department	The IRWD Emergency Operations Plan (EOP) outlines responsibility and resource deployment during and following emergencies or disasters. The EOP was updated in 2020 as part of the American Water Infrastructure Act (AWIA) requirements. The EOP outlines the emergency organization, activation, and Emergency Operations Center (EOC) operations. The EOP includes a Continuity of Operations Plan, outlining a clear chain of command, line of succession, and plans for backup or alternate emergency facilities in the case of an extreme emergency or disaster. Additionally, the EOP includes an outline of a Disaster Recovery Plan, located in Appendix H of the EOP. The Disaster Recovery outline includes recovery organization, plan of action, and completion of recovery actions, to later be expanded in a formal plan. Together, the EOP and LHMP provide a mitigation and response strategy to hazard events.
Capital Improvement Plan Responsible Department: IRWD Engineering Department, Capital Projects Department	The Capital Improvement Program (CIP) is established to provide for the planning, funding, design, construction, maintenance, and repair of IRWD facilities, property or infrastructure. The CIP is a "roadmap" that IRWD establishes to plan and manage capital and infrastructure assets. The CIP would be used to identify and fund mitigation actions identified in the LHMP that involve physical facilities and infrastructure improvements.
Urban Water Management Plan Responsible Department: IRWD Water Resources Department and Environmental Compliance Department	The Urban Water Management Plan (UWMP) is prepared every five years, to support IRWD's long-term resource planning and ensure adequate water supplies are available to meet existing and future water supply needs. The UWMP also addresses drought conditions, and the ability of IRWD to continue supplying water to customers. IRWD is in the process of updating the UWMP for 2021. The UWMP can be used in coordination with the LHMP to implement mitigation actions associated with drought and water supply reliability (redundancy).
Groundwater Management Plan Responsible Department: IRWD Water Resources Department and Environmental Compliance Department, Orange County Water District (external)	Orange County Water District (OCWD) is the responsible agency for regional groundwater basin resources and updated the County-wide Groundwater Management Plan in 2015. The Groundwater Management Plan update sets forth basin management goals and objectives, and outlines management practices in accordance with the Sustainable Groundwater Management Act. The intent is to prevent overdraft conditions and ensure sustainable supply for utilization in drought years. IRWD works with OCWD as a major water producer and works cooperatively where service areas overlie the basin. The Groundwater Management Plan and coordination with OCWD can be used to implement mitigation actions associated with geologic hazards, drought and water supply reliability.
Overflow Emergency Response Plan (Sewer System Management Plan) Responsible Department: IRWD Recycling Operations Department	The Overflow Emergency Response Plan supports orderly and effective response to Sanitary Sewer overflow incidents. This plan provides guidelines for IRWD to follow in responding to, cleaning up, and reporting Sanitary Sewer Overflows within the service area. The Overflow Emergency Response Plan outlines response procedures that can be used to prevent future sewer overflows/spills caused by natural or manmade hazards.

Table 5-3
Capabilities Assessment (continued)

Resource	Description and Ability to Support Mitigation
Dam Emergency Action Plan and Inundation Maps Responsible Department: IRWD Engineering Department, Operations Department	The IRWD extremely high hazard dam Emergency Action Plans (EAP) identify incidents that can lead to emergency conditions at the dam, identifies areas that could be affected by inundation, and specifies pre-planned actions to be followed to minimize property damage, loss of infrastructure/water resources, and loss of life. The EAP is reviewed and approved by the California Office of Emergency Services (Cal OES), and the inundation maps are approved by the California Department of Water Resources, Division of Safety of Dams (DSOD). IRWD is responsible for five dam EAPs: Rattlesnake Canyon Dam, Syphon Canyon Dam, San Joaquin Reservoir Dam, Santiago Dam, and Sand Canyon Dam. The EAPs identify specific vulnerabilities that have been incorporated into the LHMP, and dam specific risk evaluations coordinate with identified mitigation actions.
Baker Water Treatment Plant Emergency Action Plan Responsible Department: IRWD Safety Department	The Baker Water Treatment Plant (BWTP) Emergency Action Plan (EAP) provides emergency preparedness guidelines and procedures for IRWD employees in the case of emergencies as outlined by California Code of Regulations (CCR) Title 8. The BWTP EAP identifies vulnerabilities associated with specific natural/manmade hazards, including some pre-hazard mitigation actions. Together, the LHMP and EAP provide a mitigation and response strategy for hazards at BWTP.
Michelson Operations Center Emergency Action Plan Responsible Department: IRWD Safety Department	The Michelson Operations Center (MOC) Emergency Action Plan (EAP) provides emergency preparedness guidelines and procedures for IRWD employees in the case of emergencies as outlined by CCR Title 8. The MOC EAP identifies vulnerabilities associated with specific natural/manmade hazards, including some pre-hazard mitigation actions. Together, the LHMP and EAP provide a mitigation and response strategy for hazards at MOC.
Water System Risk and Resilience Assessment Responsible Department: IRWD Risk Department	The Water System Risk and Resilience Assessment (RRA) develops a risk baseline for IRWD critical assets, as well as an analysis of potable water system resilience and recommendations for enhancement. The RRA was prepared in 2018 in accordance with the American Water Infrastructure Act. The RRA identified vulnerabilities similar to the LHMP and includes recommendations for mitigation actions to increase resilience and reduce risk.
Dam Safety Program Responsible Department: Engineering Operations Support, IRWD	The Dam Safety Program ensures continual monitoring, inspection, and maintenance for IRWD dams and reservoirs. The Dam Safety Program exceeds current state standards and establishes a Risk-Informed Decision-Making process to identify and reduce risk. The program outlines safe operation and management, design, regulation and oversight, and commitment to community conversation. IRWD is currently implementing the Dam Safety Program that addresses risk identified in dam portfolio assessment. The Dam Safety Program works with the LHMP to provide a foundation for infrastructure and safety protocols at IRWD's five "extremely high" hazard dams.
Water Supply Reliability Evaluation Responsible Department: Water Resources & Environmental Compliance, IRWD	The Water Supply Reliability Evaluation (Evaluation) provides an updated understanding of how current and projected conditions, such as imported water supply shortages, climate change, and facility outages impact water supply. This Evaluation includes an analysis of IRWD's ability to maintain a minimum level of service under a reasonably foreseeable hydrologic and system outage conditions and emergency scenarios. The Evaluation, in coordination with the LHMP, evaluates vulnerabilities of drought and climate change, and includes recommendations to maintain water service to IRWD customers.
Cybersecurity Assessment Responsible Department: Network and Cyber Security, IRWD	The Cybersecurity Assessment analyzes IRWD's cybersecurity controls and the ability to remediate vulnerabilities. The assessment provides a high-level analysis of IRWD's cyber weaknesses, so security teams can begin implementing controls to mitigate them. The assessment in coordination with the LHMP evaluates vulnerabilities related to terrorism and sabotage of IRWD's technology assets, and work together to implement mitigation actions to reduce risk.
Sewage Treatment Master Plan & Potable Reuse Program Responsible Department: Water Resources, Capital Projects	The Sewage Treatment Master Plan outlines IRWD's long-term vision for a potable reuse program. Sewage treated at LAWRP could be treated to advanced purified water, conveyed to Baker WTP, and treated again for domestic purposes. This would offset the need for import water and improve IRWD's drought resiliency. This program can be utilized in coordination with the LHMP to identify and mitigate risks related to drought resiliency.

Table 5-3
Capabilities Assessment (continued)

Resource	Description and Ability to Support Mitigation
Hazardous Materials Program Responsible Department: IRWD Safety, Operations and Regulatory Compliance	The IRWD Hazardous Materials Program includes a Hazardous Materials Emergency Response Plan, training for current HazMat Team members and employees working on site near certain hazardous materials, regular equipment maintenance and periodic exercises. This program can be utilized in coordination with the LHMP to manage and mitigate risks related to hazardous materials use.
Administrative and Technical	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Four engineering teams are staffed within the following IRWD departments: Capital Improvements, Development and Inspection Services, Operations, and Support and Planning. Each department employs engineers trained in construction practices related to buildings and infrastructure, and staff has the capability to implement mitigation actions.
Engineers with an understanding of natural hazards and/or infrastructure	Four engineering teams are staffed within the following IRWD departments: Capital Improvements, Development and Inspection Services, Operations, and Support and Planning. Each department employs engineers trained with an understanding of natural hazards and how they affect IRWD infrastructure. Staff has the capability to implement mitigation actions.
Emergency manager	The Safety Specialist in the Safety Department is a full-time emergency manager, with extensive experience in emergency preparedness, response and recovery. The emergency manager writes and implements related plans, provides training, manages exercise projects, and/or develops and facilitates safety exercises. The Safety Specialist is the Project Manager for the LHMP and has the capability to implement mitigation actions.
Emergency Response Team	The IRWD ERT is comprised of managers and supervisors in the Water Operations and Recycling Operations Department. The ERT is supported by Safety, Security and other departments as needed (Facilities, Mechanical/Electrical, Fleet, Finance or HR).
Personnel skilled in Geographic Information Systems	The Planning Department employs a full-time Geographic Information Systems (GIS) group to maintain internal databases and assist with mapping and infrastructure planning.
Resource development staff or grant writers	The Water Resources and Water Efficiency Departments employ staff with experience in grant preparation and writing.
Water Emergency Response Organization of Orange County (WEROC) membership	WEROC is administered by the Municipal Water District of Orange County (MWDOC), supports and manage countywide emergency preparedness, planning, response, and recovery efforts among Orange County water and wastewater utilizes. IRWD participates in trainings and exercises and utilizes resources from WEROC for emergency preparedness purposes.
Financial	
Federal Emergency Management Agency	The Federal Emergency Management Agency (FEMA) is the federal agency responsible for hazard mitigation, emergency preparedness, and emergency response and recovery activities. It provides guidance to State and local governments on hazard mitigation activities, including best practices and how to comply with federal requirements. FEMA also provides funding for hazard mitigation actions through grant programs.
California Governor's Office of Emergency Services	Cal OES is responsible for overseeing and coordinating emergency preparedness, response, recovery and homeland security activities within California. Cal OES regularly dispatches team members to join first responders, emergency leaders and those affected by disasters that threaten public safety, to provide information essential to the public. Cal OES can assist in obtaining funding for mitigation actions identified in the plan and providing guidance on future plan updates.
Development Impact Fees	IRWD collects developer impact fees during the plan check and permitting process, to off-set infrastructure improvements and increased water/wastewater service demand related to new developments within the service area.
Emergency Reserve Fund	IRWD holds and maintains and emergency reserve fund for emergency needs.

Table 5-3
Capabilities Assessment (continued)

Resource	Description and Ability to Support Mitigation
Education and Outreach	
AlertOC	AlertOC is a mass notification system designed to keep Orange County residents and businesses informed of emergencies and certain community events. By registering with AlertOC, time-sensitive voice messages from the County are sent directly to participants via text or automated voice recording.
Emergency Preparedness Outreach	Disasters cannot be prevented; however, the community can reduce the effects of disasters before they occur, prepare for what could happen, and improve response and recovery. Some mitigation actions pertain to outreach and information to the community and can be implemented through a variety of programs and events in coordination with IRWD and other partner agencies and stakeholders.
IRWD Website, E-Newsletter, Social Media, Brochures and Pamphlets	The IRWD Public Affairs Department maintains the IRWD website, writes the monthly e-newsletter, and posts regularly though IRWD social media channels. These various forms of communication provide an opportunity to convey information and implement mitigation actions specific to educating and informing the community regarding all hazards and ways to reduce impacts from the hazards.
How can these capabilities be expanded upon and improved to reduce risk? Multiple mitigation measures are priority projects to expand on IRWD capabilities, including new plans and programs. Examples of opportunities to expand capabilities include the development of: Technical Communications Plan, Specific Hazard Response Plans, Critical Facility alternate route mapping, Potable Reuse Program, and Cybersecurity Plan.	

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SECTION 6: PLAN MAINTENANCE AND CAPABILITIES

This section identifies the formal process that ensures the LHMP remains an active and relevant document for IRWD. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an update every five years to ensure IRWD maintains eligibility for federal and State hazard mitigation funding. This section also describes how IRWD will integrate public participation throughout the plan maintenance and implementation process. Finally, this section describes how IRWD intends to incorporate the mitigation actions outlined in this plan into existing planning mechanisms and programs.

6.1 PURPOSE OF THE PLAN AND AUTHORITY

Under the direction of the Project Management Team, (comprised of the Safety Specialist and Safety Manager) the LHMP Planning Team (identified in Section 2.0, *Planning Process*) will be responsible for the on-going maintenance of this LHMP. The Project Management Team will take the primary lead by coordinating maintenance of this plan with the LHMP Planning Team, including undertaking the formal review process and updating of the plan. Key IRWD departments are identified below.

- Automation;
- Collection Systems;
- Construction Services;
- Contracts & Risk Management and Security;
- Electrical Services – Maintenance Operations;
- Engineering – Operations Support;
- Engineering – Planning;
- Facilities Services & Fleet Services – Maintenance Operations;
- Field Services;
- Information Services;
- Mechanical Services – Maintenance Operations;
- Michelson Water Recycling Plant Operations/Biosolids;
- Natural Treatment System Operations;
- Public Affairs;
- Regulatory Compliance;
- Safety Department;
- Water Operations Department;
- Water Quality; and
- Water Resources.

In addition to IRWD staff, the following partner agencies who participated on the Planning Team during plan preparation should be included in the maintenance and update activities:

- California State Water Resources Control Board;
- City of Costa Mesa (Office of Emergency Management);
- City of Irvine (Office of Emergency Management);
- City of Lake Forest (Management Services);
- City of Newport Beach (Police Department);
- City of Orange (Fire Department);
- City of Santa Ana (Emergency Management);

- City of Tustin (Tustin Police Department);
- Municipal Water District of Orange County (Water Emergency Response Organization of Orange County); and
- Orange County Fire Authority.

Although specific LHMP Planning Team members may change, the IRWD staff positions and departments and other partner agencies and organizations should continue to be included in the plan implementation and maintenance process.

The Project Management Team will facilitate the Planning Team meetings and will assign tasks such as updating and presenting the plan to other departments, stakeholder groups, and/or elected officials. The Planning Team will be responsible for maintaining and updating the plan and will coordinate implementation of the plan through their respective positions and agencies. Plan implementation and evaluation will be a shared responsibility among all LHMP Planning Team members.

6.1.1 EVALUATION

At a minimum, an annual LHMP Planning Team meeting will be conducted to evaluate the progress of the plan and incorporate the actions into other planning documents. This review will include the following:

- Summary of any hazard events that occurred during the prior year and their impacts on the community;
- Review of successful mitigation initiatives identified in the plan;
- Brief discussion regarding why targeted mitigation actions were not completed;
- Reevaluation of mitigation actions to determine if the timelines for identified projects need to be amended (such as changing a long-term project to a short-term project due to funding availability);
- Recommendations for new mitigation actions;
- Changes in, or potential for, new funding options/grant opportunities;
- Integration of new data and maps that can be used to inform the plan; and
- Evaluation of any other planning programs or initiatives from IRWD that involve hazard mitigation.

The purpose of the annual evaluation will be to ensure consideration and implementation of the LHMP and document progress in order to inform future LHMP updates.

6.2 METHOD AND SCHEDULE FOR UPDATING THE PLAN WITHIN FIVE YEARS

Section 201.6.(d)(3) of Title 44 of the Code of Federal Regulations requires that local hazard mitigation plans be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act of 2000 (DMA 2000). Monitoring the progress of the mitigation actions will be on-going throughout the five-year period between the adoption of the LHMP and the next update effort. The LHMP Planning Team will meet on an annual basis to monitor the status of the implementation of mitigation actions and develop updates as necessary.

IRWD intends to update the plan on a five-year cycle from the date of initial plan adoption. It is anticipated that this update process will be initiated at least one year prior to expiration of the existing plan. The cycle may be accelerated to less than five years based on the following triggers:

- A presidential disaster declaration that impacts IRWD; and/or
- A hazard event that causes loss of life.

Should a significant disaster occur within the IRWD jurisdiction, the LHMP Planning Team will reconvene to review and update the LHMP as appropriate.

6.2.1 PROCESS

The intent of the five-year update process will be to add new planning process methods, jurisdictional profile data, hazard data and events, vulnerability analyses, mitigation actions, and goals to the adopted plan so that the LHMP will always be current and up to date. Based on the needs identified by the Planning Team, the update will, at a minimum, include the elements below:

1. The update process will be convened through a Planning Team identified by the Project Management Team.
2. The hazard risk assessment will be reviewed and updated using best available information and technologies.
3. Based on new/updated information and available funding, the evaluation of critical facilities/facilities of concern and mapping will be updated and improved.
4. The mitigation actions will be reviewed and revised to account for any actions completed, deferred, or changed to account for changes in the risk assessment or new IRWD policies identified under other planning mechanisms, as appropriate.
5. The draft update will be sent to appropriate agencies for comment.
6. The public will be given an opportunity to comment prior to adoption.
7. The IRWD Board of Directors will adopt the updated LHMP.

The Project Management Team will coordinate with responsible IRWD departments and external partners identified for each mitigation action. These responsible departments and external partners will monitor and evaluate the progress made on the implementation of mitigation actions and report to the LHMP Planning Team on an annual basis. Working with the LHMP Planning Team, these responsible departments and external partners will be asked to assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate. A LHMP Mitigation Action Progress Report worksheet or tracking mechanism will assist departments and external partners responsible for implementing mitigation actions in reporting on the status and assessing the effectiveness of the mitigation actions.

Information from the IRWD departments and external partners will be used to monitor mitigation actions and inform the annual evaluation of the LHMP. The following questions will be considered as criteria for evaluating the plan's effectiveness:

- Has the nature or magnitude of hazards affecting IRWD or the service area changed?
- Are there new hazards that have the potential to impact IRWD or the service area?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the LHMP?

- Should additional local resources be committed to address identified hazards?

An annual LHMP review questionnaire worksheet will be used to provide guidance to the LHMP Planning Team on what should be included in the evaluation. Future updates to the LHMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the LHMP, which require changes to the risk assessment, mitigation strategy, and other components of the plan, will be incorporated into the next update of the LHMP in 2026. The questions identified above would remain valid during the preparation of the 2026 plan update.

6.3 ADOPTION

The IRWD Board of Directors is the responsible entity for adopting the LHMP. This formal adoption should take place every five years. Once the plan has received "FEMA Approval Pending Adoption," the Board of Directors will need to adopt the plan. Upon adoption, the IRWD Safety Department will transmit the adopted plan to FEMA for final approval.

6.4 IMPLEMENTATION THROUGH EXISTING PROGRAMS AND PLANNING MECHANISMS

The effectiveness of the LHMP depends on implementation of the plan and incorporation of the outlined mitigation actions into existing plans, policies, and programs. This plan includes a range of action items that, if implemented, would reduce loss or interruption of service in the IRWD planning area. Together, the mitigation action items in the LHMP provide the framework for activities that IRWD choses to implement over the next five years. IRWD has identified the plan's goals and prioritized actions that will be implemented (resources permitting) through existing plans, policies, and programs.

The LHMP Project Manager (Safety Specialist) is responsible for overseeing the plan's implementation and maintenance through IRWD's existing programs and planning mechanisms. The Safety Specialist, or designated appointee, will assume lead responsibility for facilitating LHMP implementation and maintenance meetings. Upon adoption of the plan, IRWD will use the LHMP as a baseline of information on the hazards that impacts operations and infrastructure. The LHMP can also build upon related planning efforts and mitigation programs that are already occurring within the IRWD service area. This will also facilitate applying for funding opportunities as they become available. Progress on implementing mitigation actions through other IRWD planning programs and mechanisms should be monitored and integrated into future updates.

By adopting a resolution to approve this LHMP, IRWD agrees to reference and incorporate the document into planning documents, programs, decisions, processes, and regulations. The LHMP will be reviewed and considered by internal IRWD departments, as applicable plans or programs are created or updated in the future. Upon creating or updating new plans, programs or policies, IRWD will review this LHMP and consider the following:

- What hazard and/or vulnerability information should be considered and/or integrated into this plan?
- Are there opportunities for this plan to support and/or implement mitigation actions?
- What mitigation actions can and should be integrated into this plan?
- Are there other community mechanisms that mitigation can be integrated?
- Is there information from this plan that can be integrated into the next LHMP update?

Some of the ways IRWD will integrate information from this LHMP into planning mechanisms are described below.

Planning and zoning law require California cities to adopt a comprehensive, long-term general plan for the physical development of the city. General plans are required to address natural hazards that could impact the jurisdiction and plan for the impact of natural hazards. IRWD utilizes General Plans for cities within the service area to understand natural hazards and to identify future development/growth and the associated demands to water and wastewater services. This information informs various IRWD plans such as the Capital Improvement Program (CIP) and Urban Water Management Plan (UWMP). IRWD will use both these plans and the LHMP as complementary documents that work together to reduce the risk of natural hazards in the service area.

IRWD updated the UWMP for 2021. UWMPs are intended to be integrated with other urban planning requirements and management plans, including LHMPs. As the documents were prepared concurrently, the updated UWMP is not incorporated by reference in the LHMP but the UWMP preparers reviewed and commented on the draft LHMP during the Planning Team review period. The update interval is five years.

The CIP identifies capital projects and equipment purchases, that provides a link between the annual general plan and annual budget. As part of the annual review and update of the CIP, the mitigation actions identified in this LHMP will be reviewed to determine which actions should be included within the CIP.

IRWD recently prepared a Risk and Resilience Assessment (RRA) and updated the existing Emergency Operations Plan (EOP) in accordance with the America's Water Infrastructure Act of 2018 (AWIA). The RRA and EOP are incorporated by reference into the LHMP, and IRWD integrated pertinent information from the RRA and EOP into this LHMP. Similarly, the LHMP will be incorporated into the RRA and EOP at the time of update. The update interval is five years.

IRWD also recently prepared five approved Emergency Action Plans for extremely high hazard dams within the jurisdiction: Rattlesnake, San Joaquin, Sand Canyon, Santiago Creek and Syphon Dams. Inundation mapping prepared in accordance with DSOD standards was incorporated into Section 4.2.1 and Appendix C for evaluation of dam/reservoir failure hazards and vulnerability assessment. Any significant updates to the EAPs will result in a review of the LHMP hazard profiles (including exhibits), risk assessment and mitigation actions, to ensure consistency. Dam EAPs must be updated annually.

This LHMP will be added or incorporated by reference into all IRWD emergency plans as they are updated. The hazard profiles, risk assessment and mitigation actions will be reviewed during updates to these plans. Further, mitigation actions not currently provided in the LHMP will be identified for consideration as part of the HMP update.

Other opportunities for integration of this LHMP include education programs and continued coordination between IRWD and the identified external partners. IRWD maintains a website and utilizes social media to provide updated information to customers and the service area. In the future, IRWD may provide in-person educational events and activities to further inform the community.

6.5 CONTINUED PUBLIC INVOLVEMENT

IRWD is dedicated to involving the public in review and updates to the LHMP. The public will continue to be informed on LHMP actions through the IRWD website and through the annual progress report to the IRWD Board of Directors. The adopted LHMP will remain permanently available for review on the IRWD website, with contact information for interested parties to direct comments and concerns. All public feedback will be reviewed and considered for incorporation (if deemed appropriate) into the next LHMP update.

Upon initiation of the LHMP update, a new public involvement strategy will be developed based on guidance from the Planning Team. This strategy will be based on the needs and capabilities of IRWD at the time of the update. At a minimum, this strategy will include the use of the IRWD website, email distribution lists, and social media, as well as coordination with partner agencies and organizations.

6.6 POINT OF CONTACT

Alix Stayton, Safety Specialist
Irvine Ranch Water District
3512 Michelson Drive, Irvine, California 92612
Mailing Address: PO Box 57000, Irvine, California 92619-7000
(626) 598-1627
stayton@irwd.com

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Michael Baker
INTERNATIONAL

5 Hutton Centre Drive, Suite 500
Santa Ana, CA 92707
(949) 472-3505

MBAKERINTL.COM

APPENDIX

APPENDIX A

IRWD Adoption Resolution

APPENDIX B

LHMP Planning Team Meetings

B.1

Planning Team Meetings

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PROJECT MANAGEMENT TEAM KICK-OFF MEETING
November 18, 2020, 10:30 AM
Via WebEx

AGENDA

ATTENDEES

Irvine Ranch Water District
Alix Stayton, Safety Specialist
Emilyn Zuniga
Marina Lindsay
Jenny Roney

Michael Baker International
Noelle Steele, Project Manager
Eddie Torres, Project Principal

De Novo Planning Group
Starla Barker, Technical Consultant

1. **Introduction and Roles/Responsibilities**
   - Primary contacts and communications
   - Information gathering and dissemination
   - Planning process documentation

2. **HMP Planning Team Organization**
   - Participants (names, titles, agencies, email, telephone number)
   - Meetings – monthly/consistent day and time
     - Virtual format platform/preferences

3. **Work Program and Schedule**
   - Resource identification and data needs
     - Emergency operations plans/emergency action plans, capital improvement plan, OC Water Reliability Study, general plans, any other hazard related assessments or reports
   - Community engagement strategy
     - Online community survey, web content/social media

4. **Additional Discussion/Questions**

5. **Next Steps/Action Items**

Steele, Noelle

Subject: IRWD Local Hazard Mitigation Plan Kick-Off Meeting - WebEx Link

Start: Wed 11/18/2020 10:30 AM
End: Wed 11/18/2020 11:30 AM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Steele, Noelle
Required Attendees: Alix Stayton; Emilyn Zuniga; Marina Lindsay; Jenny Roney; Torres, Eddie; s[redacted]

Webex link for the LHMP kick-off meeting is below. Agenda to follow. Thank you!

Noelle Steele
-- Do not delete or change any of the following text. --

When it's time, join your Webex meeting here.

[redacted]

Join using Microsoft Lync or Microsoft Skype for Business

Dial 1731576129.mbakermeet@lync.webex.com

If you are a host, click here to view host information.

Need help? Go to http://help.webex.com

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PROJECT MANAGEMENT TEAM KICK-OFF MEETING
November 18, 2020, 10:30 AM
Via WebEx

MEETING MINUTES

ATTENDEES

Irvine Ranch Water District
Alix Stayton, Safety Specialist
Emilyn Zuniga, Safety Manager
Marina Lindsay, Water Resources Planner
Jenny Roney, HR Representative

Michael Baker International
Noelle Steele, Project Manager
Eddie Torres, Project Principal

De Novo Planning Group
Starla Barker, Technical Consultant

1. Introduction and Roles/Responsibilities

- Primary contacts and communications
  - Alix serving as Project Manager and primary contact for IRWD
  - Noelle serving as Project Manager and primary contact for Baker
- Information gathering and dissemination
  - Baker will rely on IRWD to guide/provide information, specifically localized information
- Planning process documentation
  - Baker will document the planning process, including any team meeting minutes, ppt presentation, attendee lists and pictures to append in the plan.

2. HMP Planning Team Organization

- Participants (names, titles, agencies, email, telephone number)
  - Potential Planning Team Members, Internal department suggestions: Operations, Maintenance, Engineering & Water Quality, Public Affairs (include representatives from both water and wastewater facilities)
  - External suggestions: city representatives and their emergency services provider (Newport, Irvine, Lake Forest, Costa Mesa, Tustin, Santa Ana, Orange); county representative (EMD, OCSD, OCFA); Cal Fire/County representative; State Water Resource Board representative; MWDOC representative

Michael Baker
INTERNATIONAL

        - **Action Item:** Alix and Noelle to coordinate in developing list/matrix of HMP team members
    - Include preface in HMP Team invitation that meetings will be meaningful, conducting work to build the plan with minimal work required outside of meeting participation.
- Meetings – recommend monthly/consistent day and time
    - Virtual format platform – via WebEx
    - Establish regular date/time for standing meetings, likely Tues/Weds
    - Anticipate the first meeting schedule in January
        - **Action Item:** Alix to follow up with best day of week/time

3. Work Program and Schedule

- Resource identification and data needs
    - Requested Data: Emergency operations plans/emergency action plans, capital improvement plan, OC Water Reliability Study, general plans, any other hazard related assessments or reports, hazardous materials response plan, dam EAPs and inundation maps
        - **Action Item:** Noelle to follow up with Alix on data needs file transfer
- Community engagement strategy
    - Online community survey, web content/social media to be developed
    - Utilize HMP planning team members to disseminate survey link within their jurisdiction (using existing social media channels, newsletter lists, etc.)
    - Community engagement will occur alongside/concurrently with HMP meetings

4. Additional Discussion/Questions

- Schedule Discussion
    - Assume approximately 36 weeks (9 months) for plan development, with the first HMP meeting hosted virtually in January
    - Overall schedule is dependent on Cal OES and FEMA review time
        - **Action Item:** Noelle to provide a draft schedule to distribute to the team

5. Next Steps/Action Items

- Action items listed above in **bold underline**, above and in the table below:

Action Item	Due Date
Alix and Noelle to coordinate in developing list/matrix of HMP team members	On or before December 17, 2020
Alix to follow up with best day of week/time to set a standing HMP team meeting.	On or before December 17, 2020
Noelle to follow up with Alix on data needs and the file transfer process	On or before November 20, 2020
Noelle to provide a draft schedule to distribute to the team	On or before December 17, 2020 (reliant on scheduling HMP team meetings, above)

Steele, Noelle

Subject: EXTERNAL: Hazard Mitigation plan workgroup meeting #1
Location: Microsoft Teams Meeting

Start: Wed 1/27/2021 1:30 PM
End: Wed 1/27/2021 3:30 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Alix Stayton

Good afternoon,

This will serve as the kickoff meeting for the IRWD Local Hazard Mitigation Plan (LHMP) project. The Michael Baker team will provide insight into the project scope, schedule and process. Please forward this meeting to anyone you think should attend; this first meeting will allow stakeholders to better understand who should represent their department for this project going forward. This will be the first of three workgroup meetings for this project, all on the last Wednesday of the month (Jan, Feb and Mar 2021). We understand that folks may be able to attend part of a meeting, or only some of the three-part series. We appreciate your time and will continue to keep you in the loop and provide opportunities for review and comment along the way.

Please call, text or email anytime with questions about this project. We are excited to get the project under way.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT

[redacted]

Microsoft Teams meeting

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Eddy, Clara

From: Alix Stayton [redacted]
Sent: Monday, January 25, 2021 3:40 PM
To: Emilyn Zuniga; Ken Pfister; Gaspar Garza; Dorien McElroy; Owen O'Neill; Colton Martin; Todd Colvin; Dave Crowe; John Dayer; Malcolm Cortez; Eric Akiyoshi; Ian Swift; Allen Shinbashi; Randy Williams; Joe Lam; Lars Oldewage; Lisa Haney; John Fabris; Steele, Noelle
Cc: Wendy Chambers; Jose Zepeda; Richard Mykitta; Kevin Burton; Thomas Malone; Cheryl Clary; James Colston; Marina Lindsay; Malik, Anisha
Subject: EXTERNAL: Hazard Mitigation plan workgroup meeting #1

Follow Up Flag: Follow up
Flag Status: Completed

Good afternoon,

This is a friendly reminder that the first working group call for the IRWD LHMP will be conducted this Wednesday, January 27th from 1:30-3:30pm. We will review the scope and schedule of the project, identify and prioritize hazards for plan focus, and discuss critical assets that should be included. We look forward to speaking with you.

If you cannot attend, please feel free to forward this invitation to a representative. Call or email anytime with questions or to change your department's representative on this distribution list.

Microsoft Teams meeting

Join on your computer or mobile app
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Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch
WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

Eddy, Clara

From: Alix Stayton [redacted]
Sent: Monday, January 25, 2021 3:38 PM
To: [redacted]
Cc: Steele, Noelle; Emilyn Zuniga
Subject: EXTERNAL: Reminder: HazMit Plan kickoff call Wednesday, January 27th from 1:30-3:30pm

Follow Up Flag: Follow up
Flag Status: Completed

Good afternoon,

This is a friendly reminder that the first working group call for the IRWD LHMP will be conducted this Wednesday, January 27th from 1:30-3:30pm. We will review the scope and schedule of the project, identify and prioritize hazards for plan focus, and discuss critical assets that should be included. We look forward to speaking with you.

If you cannot attend, please feel free to forward this invitation to a representative. Call or email anytime with questions or to change your jurisdiction/agency's representative on this distribution list.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting
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Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #1
January 27, 2020

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Alix Stayton	Safety Specialist, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	✓
Allen Shinbashi	Manager of Risk & Contracts, Contracts & Risk Management	Irvine Ranch Water District	[redacted]	[redacted]	✓
Amy Stonich	Assistant Director of Community Development	City of Lake Forest	[redacted]	[redacted]	✓
Anisha Malik	Planner	Michael Baker International	[redacted]	[redacted]	✓
Baryic Hunter	Division Chief	Operations District 4, Orange County Fire Authority	[redacted]	[redacted]	
Colt Martin	Mechanical Services Manager, Mechanical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Dave Crowe	Construction Manager, Construction Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Denien Rivenburg	Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	✓
Dorien McElroy	Collections Systems Manager, Collection Systems	Irvine Ranch Water District	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #1
January 27, 2020

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Dustin Grinstead	Admin Captain for Chief Sherwood	Orange County Fire Authority	[redacted]	[redacted]	✓
Emilyn Zuniga	Safety Manager, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	✓
Eric Akiyoshi	Engineering Manager, Planning	Irvine Ranch Water District	[redacted]	[redacted]	✓
Gaspar Garza	Operations Manager, MWRP Operations/Biosolids	Irvine Ranch Water District	[redacted]	[redacted]	✓
Ian Swift	Natural Resources Manager, Natural Treatment System Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
James Colston	Director Water Quality Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Jason Dempsey	Emergency Services Administrator	City of Costa Mesa	[redacted]	[redacted]	✓
Joe Lam	Automation Manager, Automation	Irvine Ranch Water District	[redacted]	[redacted]	✓
Joe Meyers	Emergency Management Coordinator	Tustin Police Department	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #1
January 27, 2020

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
John Dayer	Facilities/Fleet Manager, Facilities Services & Fleet Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
John Fabris	Public Affairs Manager, Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	
Joyce LaPointe	Lieutenant	Office of Emergency Management, Costa Mesa Police Department	[redacted]	[redacted]	
Katie Eing	Disaster Services Coordinator	Newport Beach Police Department	[redacted]	[redacted]	
Ken Pfister	Operations Manager, Water Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Lars Oldewage	Water Quality Manager, Water Quality	Irvine Ranch Water District	[redacted]	[redacted]	
Lisa Haney	Regulatory Compliance Manager, Regulatory Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Malcolm Cortez	Engineering Manager, Engineering – Operations Support	Irvine Ranch Water District	[redacted]	[redacted]	✓
Marina Lindsay	Water Resources Planner, Planning	Irvine Ranch Water District	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #1
January 27, 2020

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Noelle Steele	Project Manager	Michael Baker International	[redacted]	[redacted]	✓
Oliver Pacifico	Water – South Coast Section	State Water Resources Control Board	[redacted]	[redacted]	✓
Owen O'Neill	Electrical & Instrumentation Manager, Electrical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Randy Williams	Network and Cybersecurity Manager, Information Systems	Irvine Ranch Water District	[redacted]	[redacted]	✓
Richard (Rick) Mykitta	Director of Maintenance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Robert (Bobby) Simmons	Emergency Management Administrator	Office of Emergency Management, City of Irvine	[redacted]	[redacted]	✓
Robert Stefano	Deputy Chief of Operations	Emergency Operations Section, Orange City Fire Department	[redacted]	[redacted]	
Shane Sherwood	Division Chief	Operations District 2, Orange County Fire Authority	[redacted]	[redacted]	
Sharlyn de la Paz	Senior Management Analyst	City of Lake Forest	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #1
January 27, 2020

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Starla Barker	Technical Consultant	De Novo Planning	[redacted]	[redacted]	✓
Steve Rhyner	Emergency Operations Coordinator	Emergency Management, City of Santa Ana	[redacted]	[redacted]	✓
Thomas Malone	Director for Information Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Todd Colvin	Water Maintenance Supervisor, Field Services	Irvine Ranch Water District	[redacted]	[redacted]	
Vicki Osborn	Director of Emergency Management	Metropolitan Water District of Orange County	[redacted]	[redacted]	✓

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #1
Wednesday, January 27, 2021
1:30 PM – 3:30 PM via Microsoft Teams

MEETING SUMMARY

Presentation/Discussion:

- Introductions
    - Introduce the sign in sheet/roll call and group introductions

- Project Goals, Objectives & Expectations
    - Working meetings to create the plan; adoption of a LHMP means availability of certain FEMA funds to IRWD
    - HMP Goals
    - Data Needs
    - Planning Team Meetings

- Purpose and Requirements of the LHMP
    - FEMA focuses on natural hazards and natural hazard mitigation in their review
    - Importance of Planning Process – FEMA looks at the process of plan development, and who was involved
    - Review of existing plan studies and technical information that would be important
    - Approved for 5 years and update process every 5 years
    - For hazards that can be mapped, they will be incorporated into the plan
    - Submittal goes to Cal OES first, then FEMA

- Hazard Identification and Prioritization
    - Reviewed previously evaluated hazards for EOP and RRA updates (based on AWIA and EPA guidelines)
    - FEMA suggested hazards presented; highlighted the hazards that were included in the MWDOC LHMP; identified potential hazards that the team may want to consider/discuss further

- Hazard Prioritization Activity
- Critical Facilities Discussion

Next Steps/Action Items:

Irvine Ranch
WATER DISTRICT

IRVINE RANCH WATER DISTRICT

HAZARD MITIGATION PLAN

January 27, 2021, 1:30 PM

Michael Baker
INTERNATIONAL

Agenda

- Introductions
- Project goals, objectives & expectations
- Purpose and requirements of LHMP
- Hazard identification and prioritization
- Critical facilities
- Next steps
- Questions/additional discussion

Project Goals, Objectives and Expectations

Project Goals and Objectives

- Identify and address hazards specific to the IRWD service area
- Identify mitigation actions to reduce the severity/impact of the hazard
- Achieve certification by FEMA for hazard mitigation funding

Disaster Mitigation Act (DMA) of 2000 requires states and local governments prepare a multi-hazard mitigation plan as a precondition for receiving FEMA mitigation project grants.

Irvine Ranch WATER DISTRICT

Roles and Responsibilities

Our Job

- Facilitate the process
- Provide technical expertise
- Maintain schedule
- Do the heavy work
- Ensure FEMA-compliant plan

Your Job

- Participate
- Meet internal deadlines
- Provide agency-specific information/local insight
- Ensure plan is feasible and meets needs

Irvine Ranch WATER DISTRICT

Data Needs

- Plans/studies
- Policies/programs
- Technical and GIS data
- Intrinsic/historic knowledge
- Photos
- Asset inventory for loss estimations

Provide any information or resources to Alix Stayton

Irvine Ranch WATER DISTRICT

HMP Planning Team Meetings

- Four Planning Team meetings:
  - Meeting #1: January 27th
  - Meeting #2: February 24th
  - Meeting #3: March 31st
  - Meeting #4: early May
- Review of draft plan – mid June

Purpose and Requirements of the LHMP

Irvine Ranch WATER DISTRICT

What is Hazard Mitigation?

- **Sustained actions taken to reduce or eliminate long-term risk to life and property from hazards**

What is a Hazard Mitigation Plan?

- **A plan based on a community's values and needs**
- **Results from a process oriented approach (important)**
- **Focuses on mitigation strategies (making the future safer)**

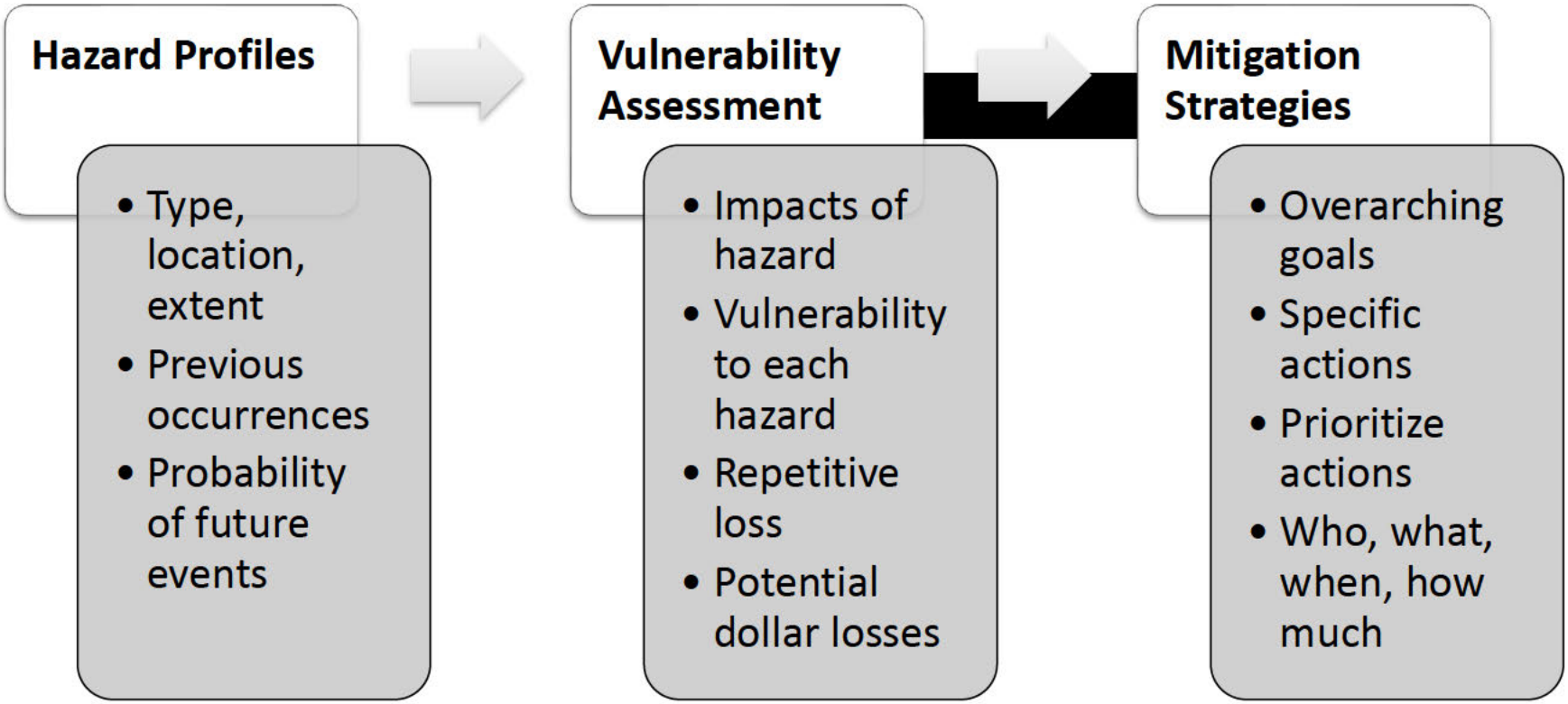
Irvine Ranch WATER DISTRICT

Plan Requirements

- Provide and **document** opportunities for stakeholder and public involvement
- Review and **incorporate** existing plans, studies, reports, and technical information
- **Document how** the plan was prepared and **who** was involved
- **Identify how** the plan will be monitored, evaluated, and updated within a five-year cycle
  - Provide for continued public participation in plan maintenance

Irvine Ranch WATER DISTRICT

LHMP Development



Summarize and Document Risk Assessment

Mitigation Strategy

- Comprehensive range of mitigation actions and projects
  - Emphasize existing and new infrastructure
- Types of mitigation actions
  - Local plans and regulations
  - Structure and infrastructure projects
  - Natural systems protection
  - Education and awareness programs
- Action Plan
  - Incorporate into existing plans and policies
  - Identify who is responsible, funding mechanism, other resources, when completed and how purchased

Plan Adoption

- Plan submitted to Cal OES/FEMA for Review
  - Receive "Approval Pendi[redacted]
- IRWD adopts the LHMP
  - Must be adopted within one calendar year
  - Documentation of adoption (resolution) provided to FEMA
- FEMA issues approval letter

Irvine Ranch WATER DISTRICT

Relationship to Previously Prepared Plans

- **Emergency Operations Plan (Sept. 2020)**
  - Approved by the EPA
  - Focus is response after the emergency or natural hazard has already occurred
- **Water System Risk and Resilience Assessment (March 2020)**
  - Approved by the EPA
  - Focus is risk & resilience based on criteria established in AWIA (signed into law in 2018)
- **Emergency Action Plans for IRWD Dams/Reservoirs**
  - Approved by Cal OES
  - Focus is emergency response and criteria established in SB 92 (signed into law June 2017)

Hazard Identification and Prioritization

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Previously Evaluated Hazards

- **EOP**
  - Earthquake
  - Active Shooter
  - Power Outage
  - Water Interruption
  - Wildfire
  - Major Sewer Overflow
  - Flood – General
  - Flood – MWRP
  - Water Contamination
  - Explosive Device
  - Hazardous materials
- **R&RA**
  - [redacted]
  - Contamination: Chemical, Bio-Toxin, or Pathogen
  - Sabotage, Physical: Insider or Outsider
  - Sabotage, Cyber: Insider or Outsider
  - Theft, Cyber: Insider or Outsider
  - Theft, Physical: Insider or Outsider
  - Dependency: Utility or Key Supplier
  - Natural: Earthquake, Liquefaction, Flood or Wildfire

FEMA-Suggested Hazards

Avalanche	Flood	Sea level rise
Climate change	Geological hazards	Seismic hazards
Coastal erosion	Hailstorm	Severe winter storm
Coastal storm	Hazardous materials	Tornado
Dam failure	Human-caused hazards	Tsunami
Disease/pest management	Hurricane	Volcano
Drought	Land subsidence	Wildfire
Earthquake fault rupture	Landslide and mudflow	Wind
Expansive soils	Lightning	Windstorm
Extreme heat	Liquefaction	

Irvine Ranch WATER DISTRICT

Potential Hazards

Avalanche	Flood	Sea level rise
Climate change	Geological hazards	Seismic hazards
Coastal erosion	Hailstorm	Severe winter storm
Coastal storm	Hazardous materials	Tornado
Dam/Reservoir failure	Human-caused hazards	Tsunami
Disease/pest management	Hurricane	Volcano
Drought	Land subsidence	Wildfire
Earthquake fault rupture	Landslide and mudflow	Wind
Expansive soils	Lightning	Windstorm
Extreme heat	Liquefaction	

Irvine Ranch WATER DISTRICT

Proposed Hazards List

- Climate Change
- Coastal Hazards – coastal erosion, sea level rise, tsunami
- Dam/reservoir failure
- Drought
- Flood
- Geologic hazards – expansive soils, land subsidence
- Human-caused hazards – [redacted]s, terrorism, power outage
- Landslide/mudflow
- Seismic hazards – fault rupture, ground shaking, liquefaction
- Severe Weather – coastal storm, winter storm, windstorm (Santa Ana winds)
- Wildfire/urban fire

Irvine Ranch WATER DISTRICT

Hazard Prioritization

- Four criteria
  - Probability (likelihood of occurrence)
  - Location (size of potentially affected area)
  - Maximum Probable Extent (intensity of damage)
  - Secondary impacts (severity of impacts to community)
- A value of 1 – 4 is assigned for each criteria

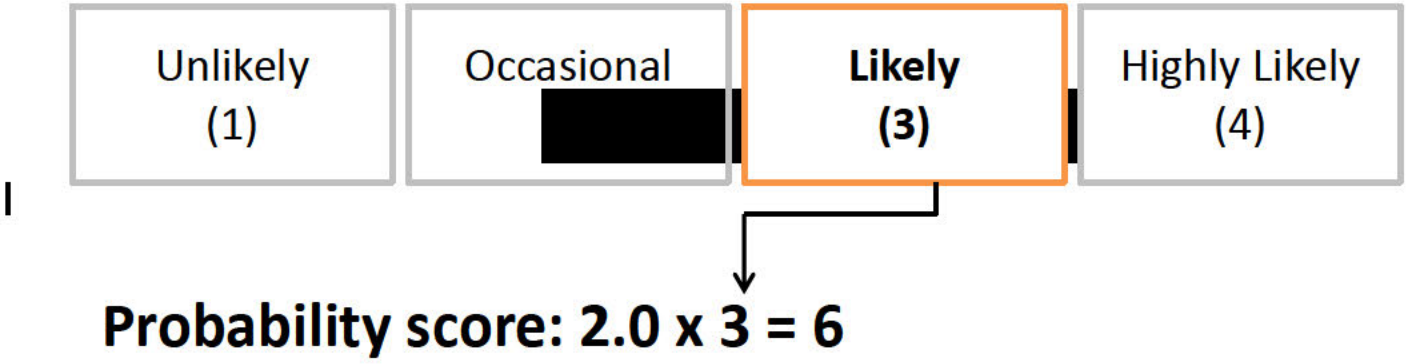
- Every criteria has an [redacted]
  - Can be used to weigh the influence of an individual criterion
  - Criteria and importance values are combined to calculate a Total Score

Irvine Ranch WATER DISTRICT

Score Example: Avalanche

Probability

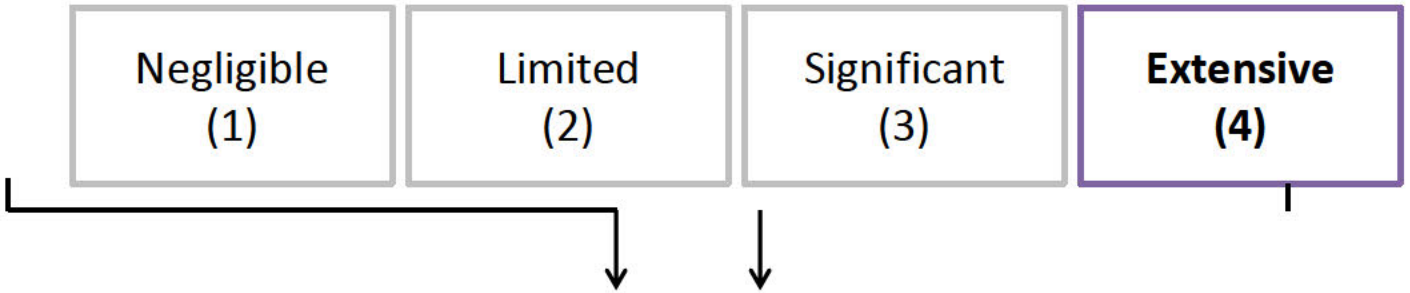
Importance score: 2.0



Probability score: 2.0 x 3 = 6

Location

Importance score: 0.8



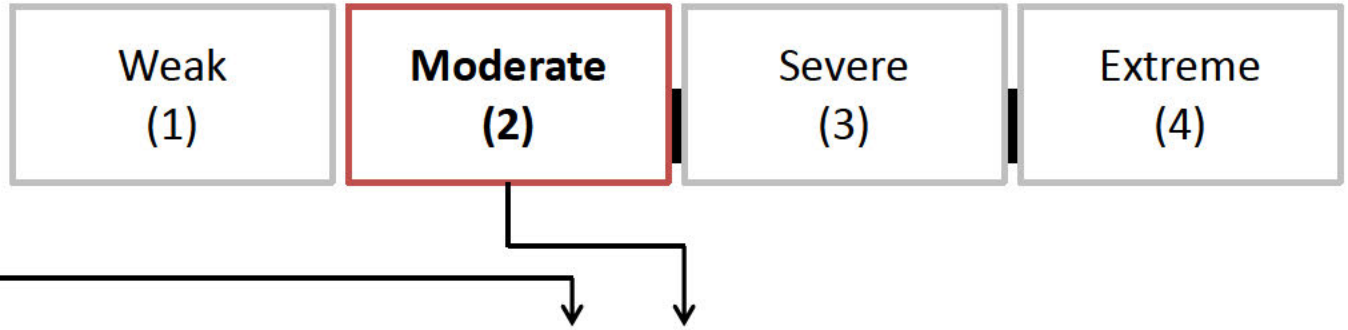
Affected Area score: 0.8 x 4 = 3.2

Irvine Ranch WATER DISTRICT

Score Example: Avalanche

Maximum Probable Extent

Importance score: 0.7



Primary Impact score: 0.7 x 2 = 1.4

Secondary Impacts

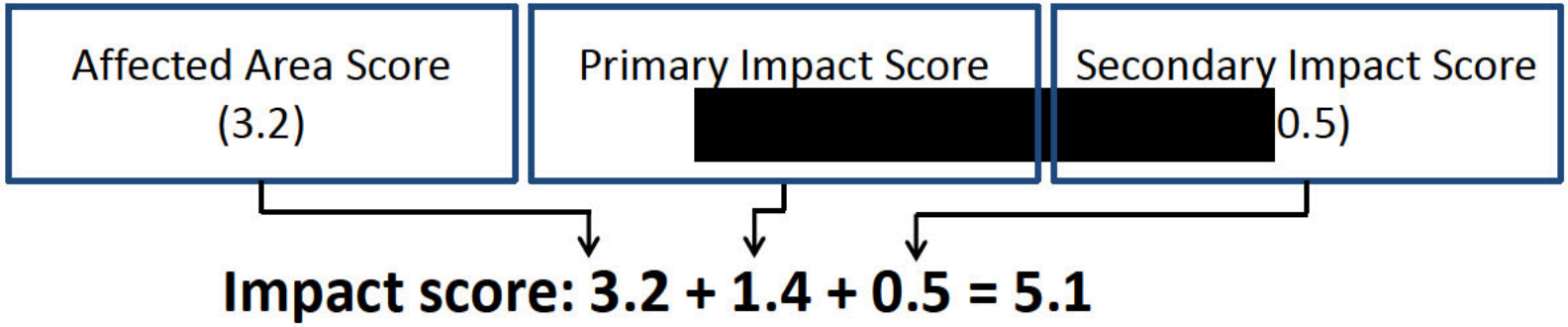
Importance score: 0.5

Secondary Impacts score: 0.5 x 4 = 0.5

Irvine Ranch WATER DISTRICT

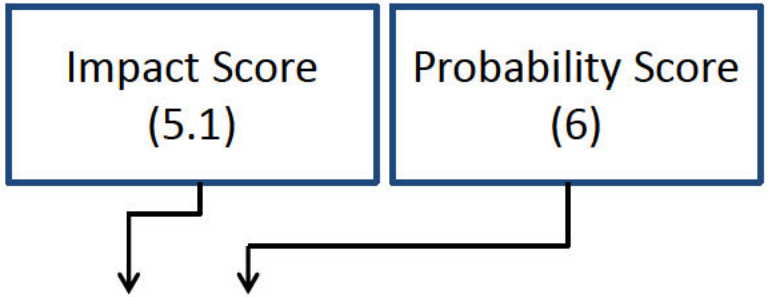
Score Example: Avalanche

Impact

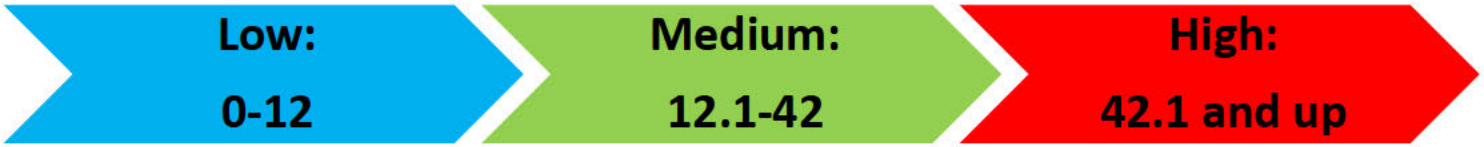


Impact score: 3.2 + 1.4 + 0.5 = 5.1

Total Score



Total Score: 5.1 x 6 = 30.6 (Medium)



Irvine Ranch WATER DISTRICT

Hazard Prioritization Exercise

Irvine Ranch WATER DISTRICT

Critical Facilities

Critical Facilities

- Standard FEMA Definition:
  - *Facilities or infrastructur [redacted] for the delivery of vital services*
- Proposed Definition for IRWD HMP:
  - *Public infrastructure used to provide water to IRWD customers and to maintain wastewater services for public health and safety*

Irvine Ranch WATER DISTRICT

Critical Facilities Approach

- Proposed Approach:
  - Utilize identified "critical [redacted]D Risk and Resilience Assessment (March 2020)
  - Build upon this list to include wastewater treatment facilities/infrastructure
  - Add or subtract any facilities as necessary

Critical Facilities List - DRAFT

Asset Type	Critical Asset
Building	Headquarters Building
Building	Chemical Storage Building
Building	Michelson Operations Center
Building	LAWRP Fuel Facility
Building	Michelson Ops Complex LF
All	Distribution System
All	Single Source Supply Transmission Mains
All	SCADA System
All	Enterprise Information System
All	Met Source Water
All	Dyer Road Ground Water System
All	Dyer Road Groundwater (GW) Complex LF
WTP	Dyer Rd Initial Disinfection Facility (IDF)
WTP	Dyer Rd Primary Disinfection Facility (PDF)
WTP	Lake Forest Baker Filtration

Critical Facilities List - DRAFT

Asset Type	Critical Asset
Pump Station	Turtle Rock Zn 3-4 Pump Station
Pump Station	East Irvine Zn. 1-3 Pump Station
Pump Station	Foothill Zn 6-6A Pump Station
Pump Station	Foothill Zn 4-6 Pump Station
Pump Station	Coastal Zn. 4-6 Pump Station
Pump Station	Coastal Zn. 7 Pump Station & H
Pump Station	Portola Hills Zn 8 – 9 Pump Station
Pump Station	Coastal OC 63-Zn.4 Pump Station
Pump Station	Turtle Rock Zn 1-3 Pump Station
Pump Station	Portola Hills Zn 6-8
Pump Station	Lake Forest Zn 1-2 West Pump Station
Pump Station	Quail Hill Zn 3-4 Pump Station
Pump Station	Shaw Pump Station
Pump Station	Read Pump Station
Pump Station	Fleming Pump Station

Critical Facilities List - DRAFT

Asset Type	Critical Asset
Pump Station	William Canyon Pump Station
Pump Station	Cabinland Booster Pump Station
Pump Station	Manning Pump Station
Pump Station	Santiago Hills Zn 5-6

Critical Facilities List - DRAFT

Asset Type	Critical Asset
Reservoir	Foothill Zn 6 Reservoir
Reservoir	Foothill Zn 6A Reservoir
Reservoir	Coastal Zn 2 Reservoir
Reservoir	Coastal Zn 4 Reservoir
Reservoir	Portola Hills Zn 8 Reservoir
Reservoir	Portola Hills Zn 9 Reservoir
Reservoir	Orchard Zn 5 Reservoir
Reservoir	Lake Forest Emergency Storage #1 Zn 1 & Zn 2 (4) Reservoir
Reservoir	Quail Hill Zn 3 Reservoir
Reservoir	Quail Hill Zn 4 Reservoir
Reservoir	Portola Springs Zn 6 Reservoir – Rattle Snake Canyon Dam Res
Reservoir	Shaw Reservoir
Reservoir	Read Reservoir
Reservoir	Chapman Reservoir

Critical Facilities List - DRAFT

Asset Type	Critical Asset
Reservoir	Fleming Reservoir
Reservoir	Williams Canyon Reservoir
Reservoir	Modjeska Reservoir
Reservoir	Benner Reservoir
Reservoir	Santiago Canyon Zn 5
Reservoir	Fleming Pump Station & Reservoir LF
Reservoir	Central Irvine Zn 1 Reservoir

Critical Facilities

- Risk assessment looks at what facilities are in hazard zones
  - Considers replacement cost and value to the community
- Mitigation strategies reflect vulnerabilities of critical facilities
  - Strengthen existing vulnerable facilities
  - Avoid building new facilities in at-risk areas

Next Steps

What We Need From You:

- Provide data needs – by **February 10th** or sooner
  - Forward to Alix Stayton, [redacted]
- Distribute survey within your jurisdiction
  - Via newsletters, social media, and other meetings
  - Link via Survey Monkey disseminated by Feb 5th
  - Survey will be open for 30 days
- Attend Meeting #2: **February 24th**

Irvine Ranch WATER DISTRICT

Next Steps

- Develop content for IRWD's [redacted]unity outreach
- Preparation of hazard profiles and mapping
- Initiate risk assessment
- Planning Team Meeting
  - Meeting #2: February 24th
  - Meeting #3: March 31st

Irvine Ranch WATER DISTRICT

Timeline

- HMP Meeting #2: Feb. 24th
  - Preliminary findings from risk asse[redacted]ntory review, group analysis/risk factor development
- HMP Meeting #3: March 31st
  - Identification of goals, discussion of capability assessment, mitigation action development
- HMP Meeting #4: early May
  - Prioritization of mitigation actions, development of implementation strategy and plan maintenance process
- Draft LHMP for Planning Team Review: early June
- Draft LHMP for Public Review: early July

[redacted]

Questions/Additional Discussion?

Forward all data/information to:

Alix Stayton

stayton@irwd.com

(626) 598 – 1627 (cell)

Irvine Ranch WATER DISTRICT

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #1
Wednesday, January 27, 2021
1:30 PM – 3:30 PM via Microsoft Teams

MEETING SUMMARY

Presentation/Discussion:

- Introductions
    - Introduce the sign in sheet/roll call and group introductions

- Project Goals, Objectives & Expectations
    - Working meetings to create the plan; adoption of a LHMP means availability of certain FEMA funds to IRWD
    - HMP Goals: Look at IRWD water/wastewater infrastructure systems and how the local hazards impact these systems/ability to provide services; focus is to identify the actions to reduce the severity of the impact
    - Hazard mitigation planning differs from previous/existing response plans, mitigation looking to proactively reduce severity of impacts to these hazards
    - Data Needs – request planning team participants to provide Alix (IRWM PM) with any information, plans/policies, mitigation activities, GIS data, etc., that may be relevant. If not sure, still send it. Historical knowledge & day to day operations of each participant is what helps make the plan meet IRWD needs
    - Planning Team Meetings – identified four monthly meetings, two hours each; anticipate draft plan for review by June

- Purpose and Requirements of the LHMP
    - FEMA focuses on natural hazards and natural hazard mitigation in their review
    - Importance of Planning Process – FEMA looks at the process of plan development, and who was involved
    - Review of existing plan studies and technical information that would be important
    - Approved for 5 years and update process every 5 years
    - For hazards that can be mapped, they will be incorporated into the plan
    - Submittal goes to Cal OES first, then FEMA

- Hazard Identification and Prioritization
    - Reviewed previously evaluated hazards for EOP and RRA updates (based on AWIA and EPA guidelines)
    - FEMA suggested hazards presented; highlighted the hazards that were included in the MWDOC LHMP; identified potential hazards that the team may want to consider/discuss further
        - *Question from Tom Malone (Director for Information Services, IRWD) – should cyber security breach be considered as a hazard?*

- *Answer from Noelle Steele (Project Manager, Michael Baker International) – recommend locating under terrorism hazard profile and if it is a mitigable concern.*

- *Question from Rick Mykitta (Director of Maintenance, IRWD) — is the overlap of some of the FEMA hazards intentional?*
  - *Answer from Noelle Steele (Project Manager, Michael Baker International) – yes, the FEMA hazards do incorporate some overlap. Our proposition for organizational structure is to evaluate a few hazards together, to reduce redundancy (i.e., all seismic hazards under one profile)*
- *Question from Owen O'Neill (Electrical & Instrumentation Manager, IRWD)— is the loss of electrical power due to equipment failure a hazard to be profiled?*
  - *Answer from Noelle Steele (Project Manager, Michael Baker International): Yes, was included as a human induced hazard under MWDOC, if the team thinks there are mitigable actions IRWD could be involved with then we can incorporate it on its own*
  - *Answer from Alix Stayton (Project Manager, IRWD): Owen's group has done things already which we can incorporate into the plan*
  - *Answer from Starla Barker (Technical Consultant, De Novo Planning Group): Power outage could also be tied to fires or winds, so there are opportunities to discuss implications and secondary impacts from a natural hazard*
- *Question from Dorien McElroy (Collection Systems Manager, IRWD): Consider looking at ruptured infrastructure and water mainline breaks? IRWD has an overflow emergency response plan (OERP)*
  - *Answer from Noelle Steele (Project Manager, Michael Baker International): For hazard mitigation planning purposes, we would evaluate the hazard behind the ruptured infrastructure, such as seismic hazards. Important to evaluate the cause behind the damage, in order to properly mitigate. Approach differs from emergency response efforts.*
  - *Answer from Vicki Osborn (Director of Emergency Management, WEROC): Recommends incorporating flood and severe weather under the same profile*
- *Question from Eric Akiyoshi (Engineering Manager, IRWD): How will climate change be incorporated into the hazard profiles?*
  - *Answer from Noelle Steele (Project Manager, Michael Baker International): Two options for documenting climate change as a hazard; evaluate how climate change exacerbates each hazard (within each separate profile) or evaluate climate change as its own hazard; FEMA requires the analysis/evaluation of climate change to be incorporated into HMP.*
  - *Comment from Eric Akiyoshi, (Engineering Manager, IRWD): I like that De Novo and MBI have been talking to Alix about Climate Change and incorporating this as a potential "amplifier" for any other given hazard, not so much as a hazard on its own. Maybe we can take a straight forward example first (e.g. Earthquake) for hazard ranking tool.*

- *Question from David Crowe (Construction Manager, IRWD): Have you ever included a simple mainline break to the list? If we have a linebreak there are two hospitals within 200 feet from each other, and we have a break. Is that something we would look into?*
    - *Answer from Noelle Steele (Project Manager, Michael Baker International): We would look into the hazard behind the mainline break – for example, seismic or soil instability.*
    - *Comment from Rick Mykitta (Director of Maintenance, IRWD): Is criticality exercise something we would be discussing?*
    - *Answer from Starla Barker (Technical Consultant, De Novo Planning Group): The facility could be in an area susceptible to multiple hazards. But we are wanting to focus on how likely these hazards are to happen. The score in the hazard ranking tool will help in understanding the secondary impacts, and we can review and go back and adjust.*
    - *Answer from Noelle Steele: We can talk about the specific main water line of concern when we go through critical facilities later in the presentation.*

- Hazard Prioritization Activity
    - Presented the hazard prioritization activity, and discussion based on previous hazards in the service area/community based on the committee's best knowledge. Human related hazards – hazardous material spill, power outage, terrorism/sabotage – added to the hazards list. Generally discussed combining hazards under a major heading where appropriate (e.g., seismic hazards including ground shaking, fault rupture and liquefaction under one profile). The planning team prioritized the hazards, but ran out of meeting time to finish the exercise. Noelle Steele and Starla Barker recommended an IRWD focus group completes the prioritization exercise off-line for the hazards that were not prioritized below. Specific notes during the hazard prioritization activities are attached to these minutes. *NOTE: This information is now included in the hazard ranking worksheet (below).*

HAZARD RANKING WORKSHEET - IRWD LHMP						DATE: 2/3/2021
Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Location	Primary Impact	Secondary Impacts		
Climate Change					0.00	Low
Coastal Erosion	1	1	1	2	5.00	Low
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Dam/Reservoir Failure	1	1	1	4	7.00	Low
Drought	4	4	1	1	35.20	Medium
Fault Rupture/Seismic Hazards/Groundshaking	4	4	4	4	64.00	High
Flood	2	1	3	4	19.60	Medium
Geological Hazards - expansive soils/subsidence	1	1	1	1	4.00	Low
Hazardous Materials Spill					0.00	Low
Terrorism/Sabotage					0.00	Low
Landslide/Mudflow					0.00	Low
Liquefaction					0.00	Low
Sea Level Rise					0.00	Low
Tsunami					0.00	Low
Wildfire	4	3	2	2	38.40	Medium
Windstorm	4	4	1	1	35.20	Medium
Power Outage	4	2	1	2	26.40	Medium

- Critical Facilities Discussion:

- Critical facilities from the AWIA Risk and Resiliency Document were presented and discussed, as a starting point for discussion purposes. The definition of critical facilities was provided to the team.
- Request for any additional infrastructure/facilities to include or remove from the list. Noted that IRWD intends to add wastewater facilities and pump stations to the list, as they were not required for the AWIA analysis but should be included as critical infrastructure.
- IRWD to discuss and evaluate internally and resubmit to Michael Baker.

Next Steps/Action Items:

- Michael Baker - developing content for IRWD's website, preparing hazard profiles and mapping, developing community outreach survey, initiate risk assessment.
- Forward plans/policies that may be relevant and provide value to this effort to Alix by Feb. 15th
- Provide any additional input on critical facilities by Feb. 15th
- Attend Meeting on February 24th at 1:30 PM.

Following the Planning Team Meeting

- IRWD completed the hazard ranking tool for the prioritization of the following five hazards: hazardous materials spill, terrorism/sabotage, landslide/mudflow, liquefaction, sea level rise, tsunami. This information has been incorporated into the notes and action items for the HMP. The updated hazard ranking worksheet was completed on March 4, 2021 and a screenshot is provided below.

HAZARD RANKING WORKSHEET - IRWD LHMP					DATE: 3/4/2021	
Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Location	Primary Impact	Secondary Impacts		
Climate Change					0.00	Low
Coastal Erosion	1	1	1	2	5.00	Low
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Dam/Reservoir Failure	1	1	1	4	7.00	Low
Drought	4	4	1	1	35.20	Medium
Fault Rupture/Seismic Hazards/Groundshaking	4	2	2	3	36.00	Medium
Flood	2	1	3	4	19.60	Medium
Geological Hazards - expansive soils/subsidence	1	1	1	1	4.00	Low
Hazardous Materials Spill	2	2	2	3	18.00	Medium
Terrorism	1	3	3	3	12.00	Low
Sabotage/Vandalism	1	1	1	2	5.00	Low
Landslide/Mudflow	3	2	3	3	31.20	Medium
Liquefaction	1	2	3	3	10.40	Low
Sea Level Rise	1	1	1	1	4.00	Low
Tsunami	1	1	1	1	4.00	Low
Wildfire	4	3	2	2	38.40	Medium
Windstorm	4	4	1	1	35.20	Medium
Power Outage	4	2	1	2	26.40	Medium

Attachment 1, Hazard Prioritization Activity Discussion

- Alix Stayton, IRWD: Is the hazard mitigation project more subjective for hazard prioritization purposes?
    - Eric Akiyoshi, IRWD: Are there metrics we can use for probability? For example, with drought it seems like it should be more data driven (similar to earthquake).
    - Noelle Steele, Michael Baker: For this exercise we can base it off our expertise, the data will then later be incorporated into the plan preparation. Professional judgment is sufficient for the exercise.
    - Starla Barker, De Novo Planning Group: We can revisit the worksheet after drafting profiles. Some of the information is readily available, but more localized information will also be incorporate based on your local experience. Whether or not it has affected you as an agency. Identify any red flags that might not have the level of probability that we thought. Recommend we don't profile climate change in this case. It gets wrapped into all the other hazards and doesn't need to be something we have to prioritize on its own.
- Windstorm Discussion:
    - Rick Mykitta, IRWD: Have we seen the entire district impacted by winds?
    - Colt Martin, IRWD: I think it is more so the winds will be all within the area and not necessarily cause a power outage. The impact of windstorm could be negligible but it could hit the entire area.
    - Ken Pfister, IRWD: No impact to service area from the winds except the power loss.
    - Rick Mykitta, IRWD: Most of power outages we get are manmade (proactive shutoffs).
    - Owen O'Neill, IRWD: Power outages are not dependent on the winds blowing in our district/service area. It could be the winds are in another area and they hit a circuit tied to us. They can be linked but wind and power are separate from each other.
    - Rick Mykitta, IRWD: If we are looking at the windstorm itself, it doesn't have consequences. The reaction of Edison is tied to the windstorms.
- Power Outage:
    - Colt Martin, IRWD: A transponder caught fire and we were out power for a while.
    - Rick Mykitta, IRWD: How can we address PSPS (Public Safety Power Shutoff) in these exercises? It puts us in a place that is not optimal.
    - Owen O'Neill, IRWD: The impact of these need to be acknowledged. We've been lucky so far and we are dependent on the power system that we have to back us up. But we need to look at this and provide for it. We aren't set up for multiple day outages.
    - Noelle Steele, Michael Baker International: In the past we have incorporated it in the fire portion and we can incorporate it in one of the overarching hazard types.
    - Alix Stayton, IRWD: Maybe it makes sense under wildfire because that is when it would be most urgent.
- Severe Storms/Winter Storms
    - Eric Akiyoshi, IRWD: To Rick's earlier comment, severe storms and flooding would overlap more.
    - Rick Mykitta, IRWD: I think they should go together, but the probability of this on its own is a 2-3. Canyon areas are vulnerable particularly after a wildfire.
    - James Colston, IRWD: Too much flow, someone pops a manhole, there are things that happen even if you have excellent engineers.
    - Colt Martin, IRWD: Defer to others—even under the worst storms in the 90s, did we have significant accessibility issues? Some sites become more difficult to get to (mudslides, etc)

    - Eric Akiyoshi, IRWD: Two or three spots that keep happening over and over again. So how should we rank it?
    - Noelle Steele, Michael Baker International: I would go with a 2, limited primary and moderate secondary. It doesn't sound like a frequent impact or that it would cause a loss of function.
    - Starla Barker, De Novo Planning Group: We want to capture these instances and issues in the plan and discuss in the plan. When we get to mitigation actions, it is where we want to focus. We will have a more detailed discussion about this later as well.
- Dams/ Reservoirs
    - Rick Mykitta, IRWD: Risk informed decision making with our dam programs, we are moving our whole safety program in that direction.
    - Noelle Steele, Michael Baker International: FEMA has provided a lot of dam guidance related to safety recently.
    - Rick Mykitta, IRWD: Which way should we think about this? From mechanisms or operationally?
    - Noelle Steele, Michael Baker International: We want to focus from an operations standpoint. In a drought most reservoirs aren't at their capacity anyways, so we can keep this as more limited.
    - Rick Mykitta, IRWD: Even though the most catastrophic event is the least likely, we need to capture the intensity of it. Primary impact could be low but the secondary to the community could be very high.
- Flood
    - Rick Mykitta, IRWD: If we do a good job keeping the creeks cleaned out, then our flood risks go down.
    - Eric Akiyoshi, IRWD: I thought about all our canyon areas with flooding. We've built infrastructure to prevent treatment plants from flooding as well.
    - Rick Mykitta, IRWD: We have partnerships with our downstream organizations as well and they've been keeping everything cleared as well.
    - Dave Crowe, IRWD: If the Irvine dam broke, would we put that under this or dams?
    - Rick Mykitta, IRWD: Part of the district is going to be higher than the overall area.

Hazard Ranking Tool

The importance of each category is a weight assigned to each category. In the default setting of this tool, probability is weighted more highly than other categories. The user can define these weights based on the relative importance of these categories to the community for its decision-making process.

Probability

The probability of a hazard occurring should be based on estimated likelihood of occurrence from historical data. These definitions are from FEMA in the Local Mitigation Planning Workbook, March 2013. *This tool assigns numeric values to each level of probability.*

Definitions:

Unlikely: Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.

Occasional: 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.

Likely: 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.

Highly Likely: 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.

Location

Based on size of geographical area of community affected by hazard. Definitions are from the FEMA Local Mitigation Planning Handbook, March 2013.

Definitions:

Negligible: less than 10 percent of planning area or isolated single point occurrences.

Limited: 10 to 25 percent of the planning area or limited single point occurrences.

Significant: 25-75 percent of planning area or frequent single-point occurrences.

Extensive: 75 to 100 percent of planning area or consistent single-point occurrences.

Maximum Probable Extent (Primary Impact)

Based on percentage of damage to typical facility in a community. Definitions are from the FEMA Local Mitigation Planning Handbook, March 2013.

Definitions:
Weak: Limited classification on scientific scale, slow speed of onset or short duration of event, result in little to no damage.

Moderate: Moderate classification of scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days.

Severe: Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months.

Extreme: Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.

Secondary Impacts

Based on estimated secondary impacts to community at large. These impacts are not from FEMA but constitute important impacts that ripple through communities.

Definitions:
Negligible: no loss of function, downtime, and/or evacuations

Limited: minimal loss of function, downtime, and/or evacuations

Moderate: some loss of function, downtime, and/or evacuations

High: major loss of function, downtime, and/or evacuations

Hazard Planning Consideration

Hazard planning consideration is a numerical score calculated for each hazard. This score enables users to rank the potential impacts of hazards and get a sense for their relative dangers. These values are not derived from FEMA guidance but have been widely used in hazard planning.

Each hazard is scored along four categories on a scale of 1-4. These values are then multiplied by the importance assigned to each category.

Overall Importance

The overall importance of a hazard is a summary descriptor use defined by the FEMA Local Mitigation Handbook. There are no numeric ratings assigned to the overall importance of a hazard though these designations are roughly equivalent to the numeric scoring used in this tool.

Definitions:

Low: Two or more criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with minimal or unknown record of occurrences or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.

High: The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

HAZARD RANKING WORKSHEET - IRWD LHMP					DATE: 2/22/2021	
Hazard Type	**Probability**	**Impact**			**Total Score**	**Hazard Planning Consideration**
		Location	**Primary Impact**	**Secondary Impacts**		
Climate Change					0.00	Low
Coastal Erosion	1	1	1	2	5.00	Low
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Dam/Reservoir Failure	1	1	1	4	7.00	Low
Drought	4	4	1	1	35.20	Medium
Fault Rupture/Seismic Hazards/Groundshaking	4	4	4	4	64.00	High
Flood	2	1	3	4	19.60	Medium
Geological Hazards - expansive soils/subsidence	1	1	1	1	4.00	Low
Hazardous Materials Spill					0.00	Low
Terrorism/Sabotage					0.00	Low
Landslide/Mudflow					0.00	Low
Liquefaction					0.00	Low
Sea Level Rise					0.00	Low
Tsunami					0.00	Low
Wildfire	4	3	2	2	38.40	Medium
Windstorm	4	4	1	1	35.20	Medium
Power Outage	4	2	1	2	26.40	Medium

Probability

Based on estimated likelihood of occurrence from historical data

Importance
2.0

Probability	Score
Unlikely	1
Occasional	2
Likely	3
Highly Likely	4

Location

Based on size of geographical area of community affected by

Importance
0.8

Affected Area	Score
Negligible	1
Limited	2
Significant	3
Extensive	4

Maximum Probable Extent (Primary Impact)

Based on percentage of damage to typical facility in community

Importance
0.7

Impact	Score
Weak - little to no damage	1
Moderate - some damage, loss of service for days	2
Severe - devastating damage, loss of service for months	3
Extreme- catastrophic damage, uninhabitable conditions	4

Secondary Impacts

large

Importance
0.5

Impact	Score
Negligible - no loss of function, downtime, and/or evacuations	1
Limited - minimal loss of function, downtime, and/or evacuations	2
Moderate - some loss of function, downtime, and/or evacuations	3
High - major loss of function, downtime, and/or	4

Total Score = Probability x Impact, where:

Probability = (Probability Score x Importance)

Impact = (Affected Area + Primary Impact + Secondary Impacts), where:

Affected Area = Affected Area Score x Importance

Primary Impact = Primary Impact Score x Importance

Secondary Impacts = Secondary Impacts Score x Importance

Hazard Planning Consideration

Total Score	Range	Distribution	Hazard Level
0.0	12.0	10	Low
12.1	42.0	6	Medium
42.1	64.0	1	High

The probability of each hazard is determined by assigning a level, from unlikely to highly likely, based on the likelihood of occurrence from historical data. The total impact value includes the affected area, primary impact

HAZARD RANKING WORKSHEET - IRWD LHMP

DATE: 2/22/2021

Hazard Type	Probability	Impact			Hazard Planning Consideration
		Location	Primary Impact	Secondary Impacts	
Climate Change					
Coastal Erosion	Unlikely	Negligible	Weak	Limited	
Coastal Storm/Severe Winter Storm	Likely	Limited	Moderate	Limited	
Dam/Reservoir Failure	Unlikely	Negligible	Weak	High	
Drought	Highly Likely	Extensive	Weak	Negligible	
Fault Rupture/Seismic Hazards/Groundshaking	Highly Likely	Extensive	Extreme	High	
Flood	#REF!	#REF!	#REF!	#REF!	
Geological Hazards - expansive soils/subsidence	Occasional	Negligible	Severe	High	
Hazardous Materials Spill	Unlikely	Negligible	Weak	Negligible	
Terrorism/Sabotage					
Landslide/Mudflow					
Liquefaction					
Sea Level Rise					
Tsunami					
Wildfire					
Windstorm					
Power Outage					

Probability

Based on estimated likelihood of occurrence from historical data

Importance: 2.0

Score	Probability
1	Unlikely
2	Occasional
3	Likely
4	Highly Likely

Maximum Probable Extent (Primary Impact)

Based on percentage of damage to typical facility in community

Importance: 0.7

Score	Impact
1	Weak
2	Moderate
3	Severe
4	Extreme

Location

Based on size of geographical area of community affected by hazard

Importance: 0.8

Score	Affected Area
1	Negligible
2	Limited
3	Significant
4	Extensive

Secondary Impacts

Based on estimated secondary impacts to community at large

Importance: 0.5

Score	Impact
1	Negligible
2	Limited
3	Moderate
4	High

Overall Importance (Based on overall hazard to community)

Low	Minimal impact on the planning area. Hazards have minimal or unknown record of occurrences or minimal mitigation potential.
Medium	Event's impacts on the planning area are noticeable but not devastating. Hazards with a high extent rating but very low probability rating.
High	Event is likely/highly likely to occur with sever strength over a significant to extensive portion of the planning area.

Steele, Noelle

From: Alix Stayton [redacted]
Sent: Thursday, March 4, 2021 10:18 AM
To: Steele, Noelle
Cc: Emilyn Zuniga
Subject: EXTERNAL: updated hazard prioritization list
Attachments: IRWD Worksheet_Team Prioritization focus group.xlsx

Follow Up Flag: Follow up
Flag Status: Completed

Good morning,

I went back to engineering at Eric and Rick's request (you might remember they had different views on the scoring we did for the seismic events item) and worked through IRWD code compliance/retrofitting data, and potential issues with underground assets. Seismic events have been re-scored and both Engineering and Maintenance are now in agreement on that.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

HAZARD RANKING WORKSHEET - IRWD LHMP						DATE: 3/4/2021
Hazard Type	**Probability**	**Impact**			**Total Score**	**Hazard Planning Consideration**
		Location	**Primary Impact**	**Secondary Impacts**		
Climate Change					0.00	Low
Coastal Erosion	1	1	1	2	5.00	Low
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Dam/Reservoir Failure	1	1	1	4	7.00	Low
Drought	4	4	1	1	35.20	Medium
Fault Rupture/Seismic Hazards/Groundshaking	4	2	2	3	36.00	Medium
Flood	2	1	3	4	19.60	Medium
Geological Hazards - expansive soils/subsidence	1	1	1	1	4.00	Low
Hazardous Materials Spill	2	2	2	3	18.00	Medium
Terrorism	1	3	3	3	12.00	Low
Sabotage/Vandalism	1	1	1	2	5.00	Low
Landslide/Mudflow	3	2	3	3	31.20	Medium
Liquefaction	1	2	3	3	10.40	Low
Sea Level Rise	1	1	1	1	4.00	Low
Tsunami	1	1	1	1	4.00	Low
Wildfire	4	3	2	2	38.40	Medium
Windstorm	4	4	1	1	35.20	Medium
Power Outage	4	2	1	2	26.40	Medium

Probability	Importance
Based on estimated likelihood of occurrence from historical data	2.0
Probability	Score
Unlikely	1
Occasional	2
Likely	3
Highly Likely	4

Location	Importance
hazard	0.8
Affected Area	Score
Negligible	1
Limited	2
Significant	3
Extensive	4

Maximum Probable Extent (Primary Impact)	Importance
Based on percentage of damage to typical facility in community	0.7
Impact	Score
Weak - little to no damage	1
Moderate - some damage, loss of service for days	2
Severe - devastating damage, loss of service for months	3
Extreme- catastrophic damage, uninhabitable conditions	4

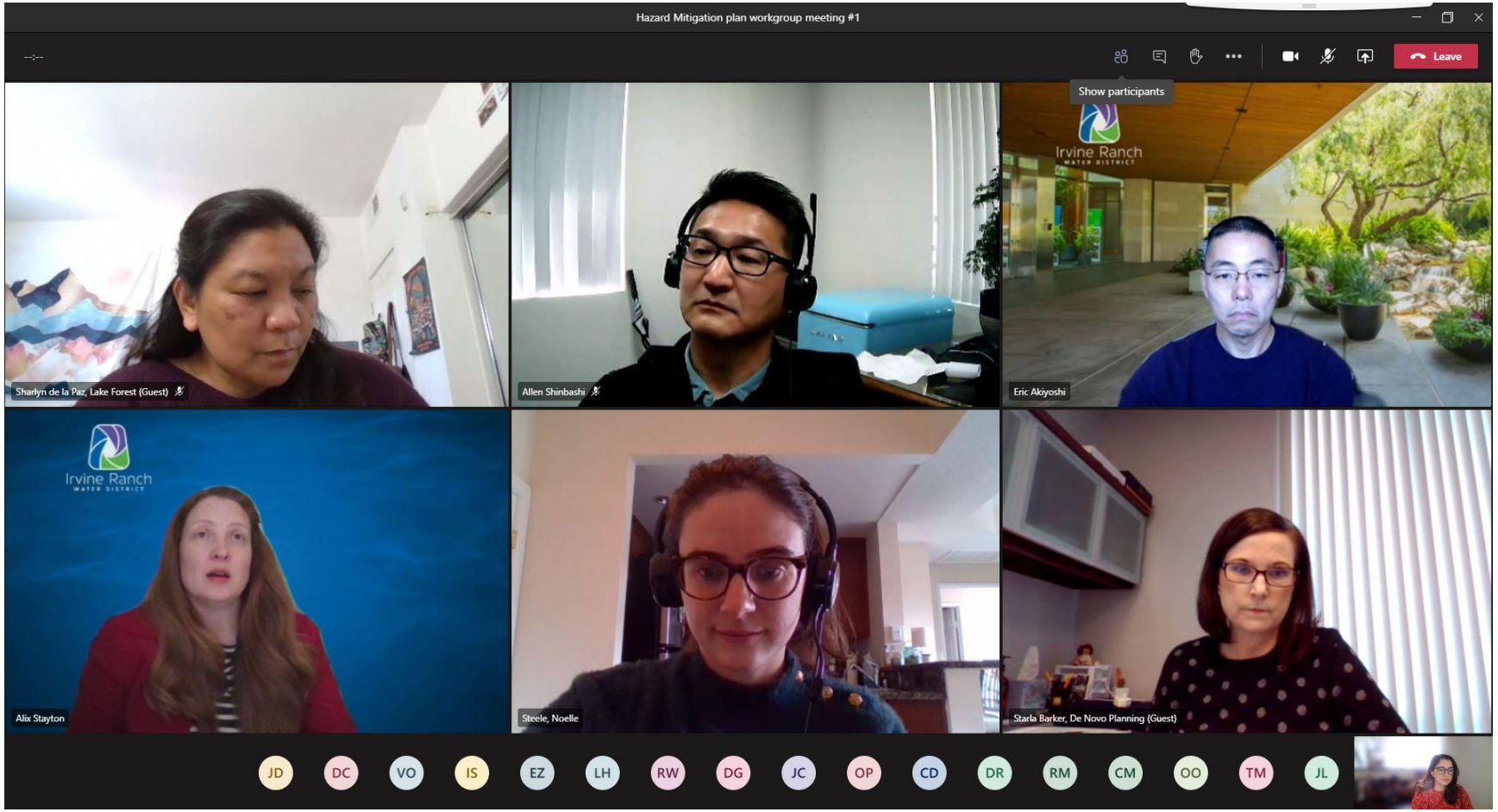
Secondary Impacts	Importance
large	0.5
Impact	Score
Negligible - no loss of function, downtime, and/or evacuations	1
Limited - minimal loss of function, downtime, and/or evacuations	2
Moderate - some loss of function, downtime, and/or evacuations	3
High - major loss of function, downtime, and/or	4

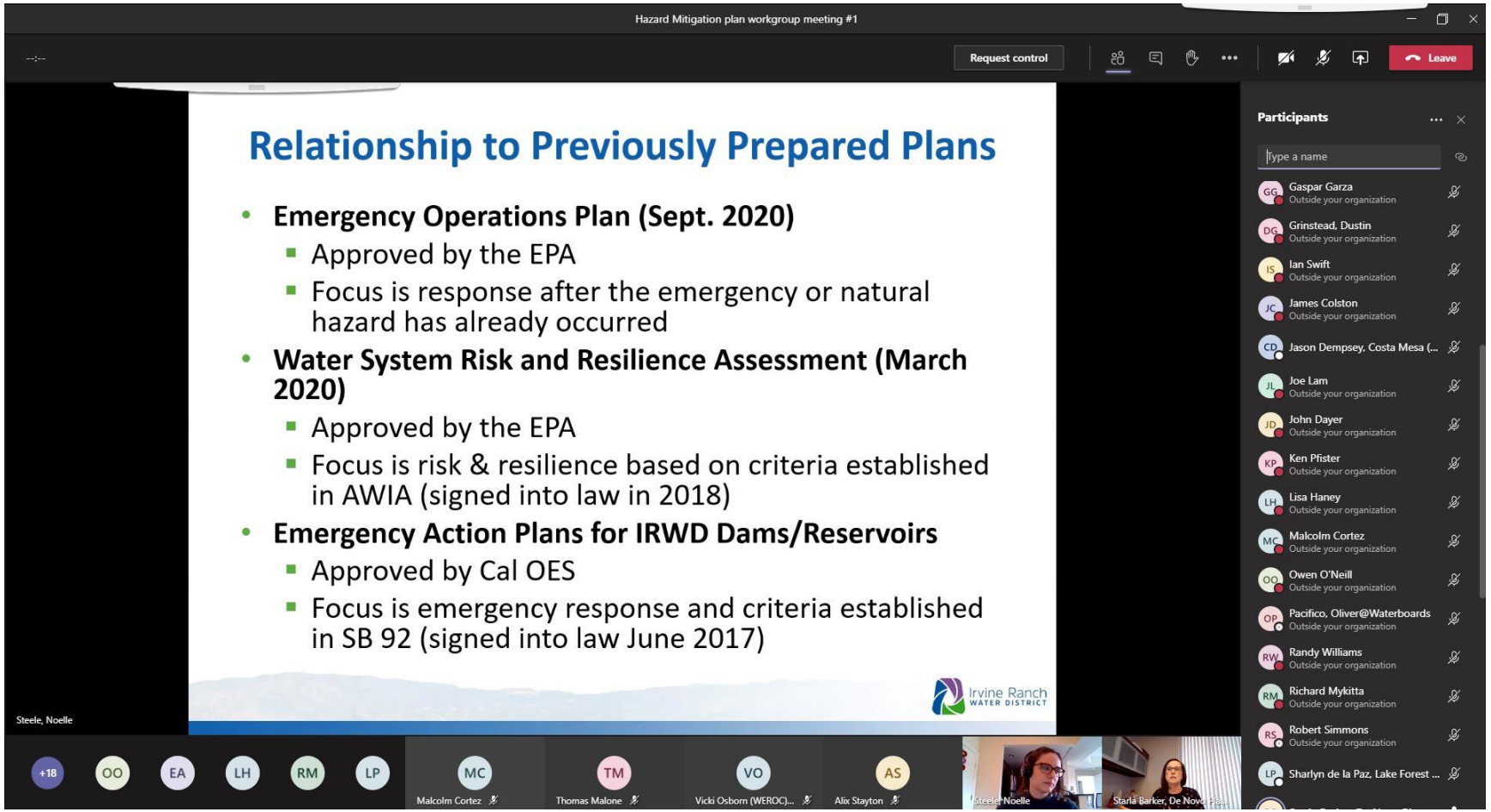
Total Score = Probability x Impact, where:
Probability = (Probability Score x Importance)
Impact = (Affected Area + Primary Impact + Secondary Impacts), where:
Affected Area = Affected Area Score x Importance
Primary Impact = Primary Impact Score x Importance
Secondary Impacts = Secondary Impacts Score x Importance

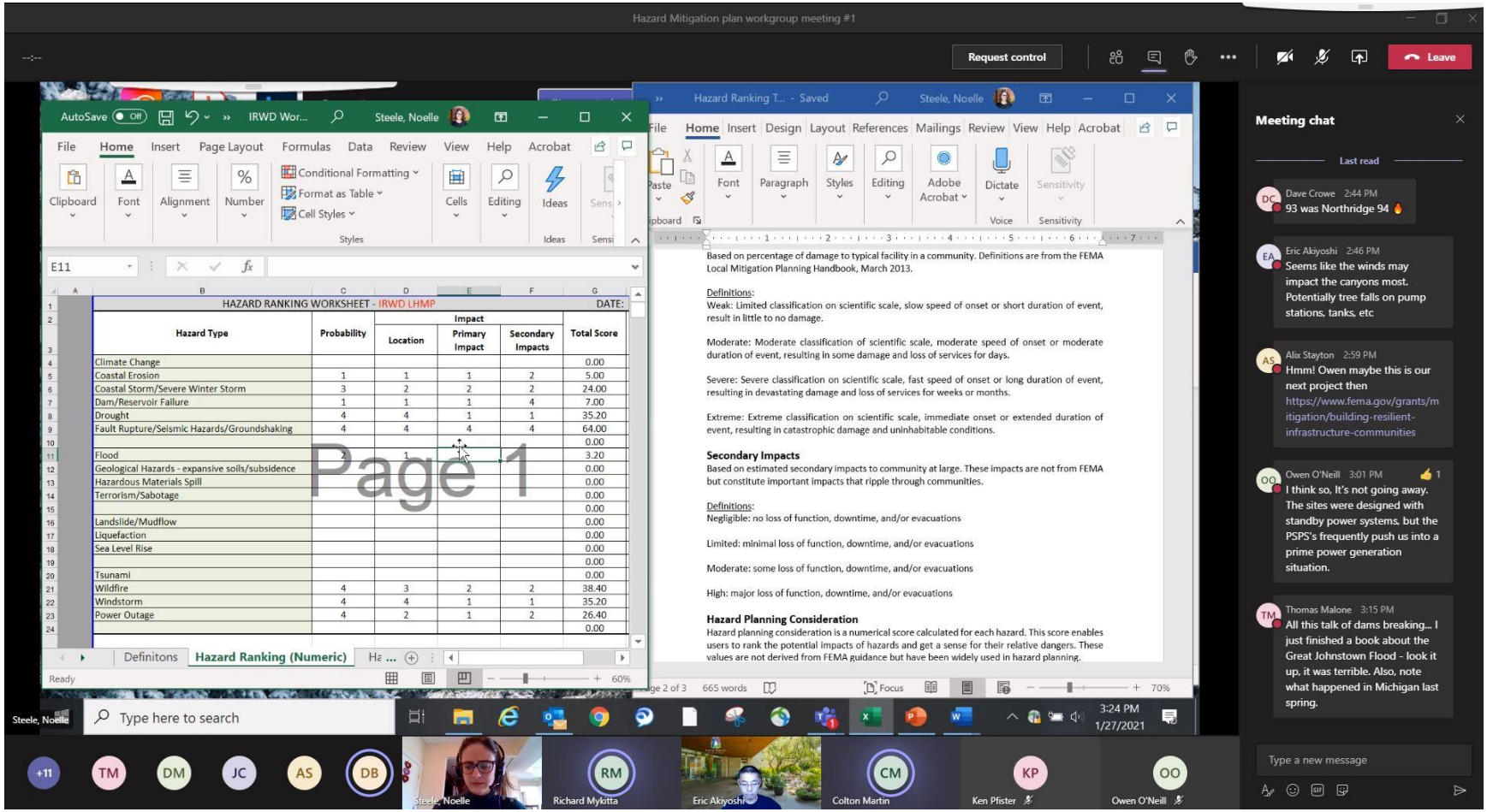
Hazard Planning Consideration

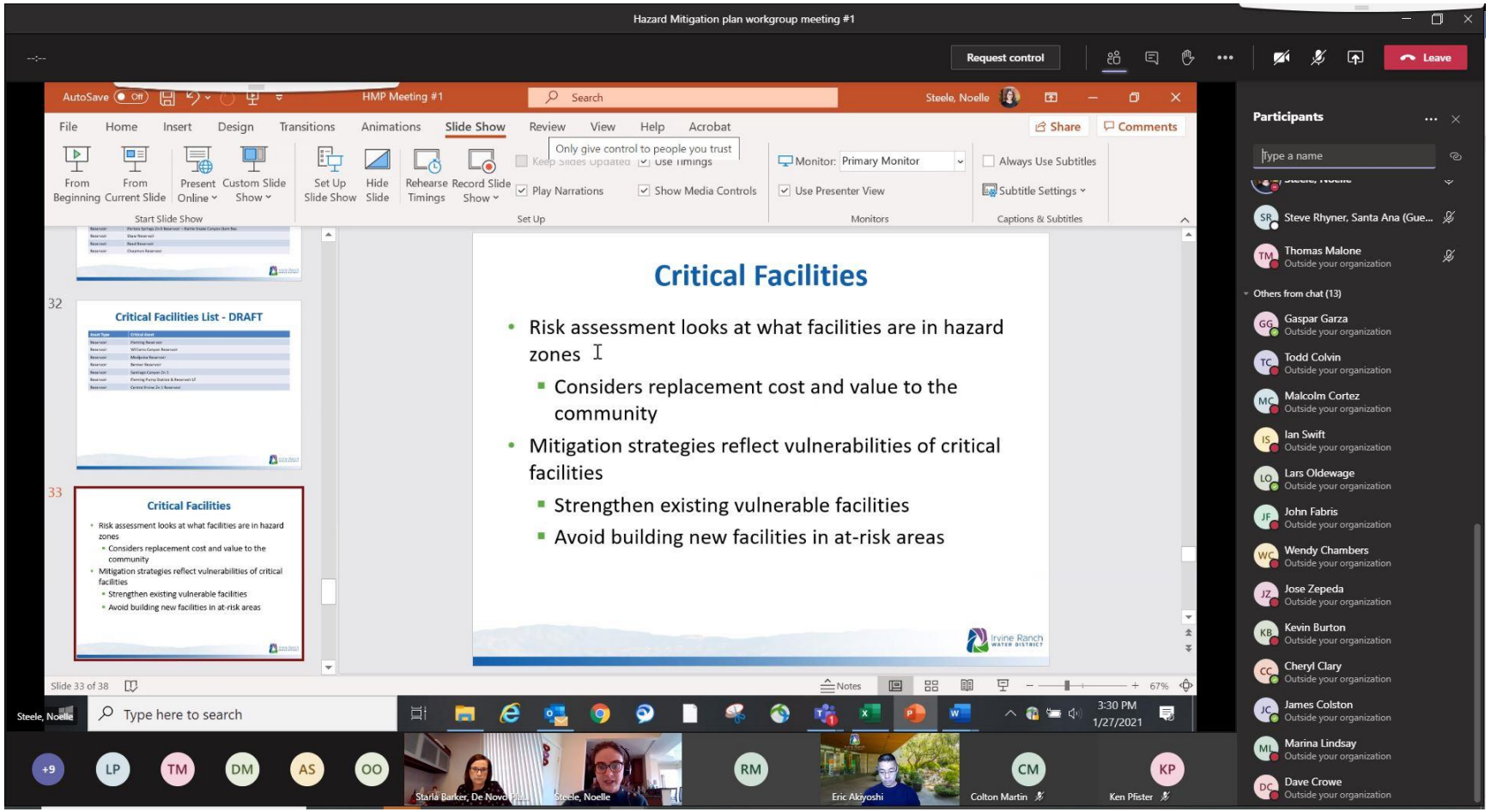
Total Score	Range	Distribution	Hazard Level
0.0	12.0	9	Low
12.1	42.0	9	Medium
42.1	64.0	0	High

The probability of each hazard is determined by assigning a level, from unlikely to highly likely, based on the likelihood of occurrence from historical data. The total impact value includes the affected area, primary impact


Hazard Mitigation plan workgroup meeting #1
--:--
Leave
Show participants
Sharlyn de la Paz, Lake Forest (Guest)
Allen Shinbashi
Eric Akiyoshi
Alix Stayton
Steele, Noelle
Starla Barker, De Novo Planning (Guest)
JD DC VO IS EZ LH RW DG JC OP CD DR RM CM OO TM JL


Hazard Mitigation plan workgroup meeting #1
Request control
Leave
Relationship to Previously Prepared Plans
Emergency Operations Plan (Sept. 2020)
Approved by the EPA
Focus is response after the emergency or natural hazard has already occurred
Water System Risk and Resilience Assessment (March 2020)
Approved by the EPA
Focus is risk & resilience based on criteria established in AWIA (signed into law in 2018)
Emergency Action Plans for IRWD Dams/Reservoirs
Approved by Cal OES
Focus is emergency response and criteria established in SB 92 (signed into law June 2017)
Irvine Ranch WATER DISTRICT
Steele, Noelle
Participants
Type a name
Gaspar Garza
Grinstead, Dustin
Ian Swift
James Colston
Jason Dempsey, Costa Mesa (...
Joe Lam
John Dayer
Ken Pfister
Lisa Haney
Malcolm Cortez
Owen O'Neill
Pacifico, Oliver@Waterboards
Randy Williams
Richard Mykitta
Robert Simmons
Sharlyn de la Paz, Lake Forest ...
Outside your organization
+18
Malcolm Cortez
Thomas Malone
Vicki Osborn (WEROC)...
Alix Stayton
Starla Barker, De Nova Pe...


Hazard Mitigation plan workgroup meeting #1
Request control
Leave
IRWD Wor...
Steele, Noelle
HAZARD RANKING WORKSHEET - IRWD LHMP
DATE:
Hazard Type
Probability
Impact
Location
Primary Impact
Secondary Impacts
Total Score
Climate Change 0.00
Coastal Erosion 1 1 1 2 5.00
Coastal Storm/Severe Winter Storm 3 2 2 2 24.00
Dam/Reservoir Failure 1 1 1 4 7.00
Drought 4 4 1 1 35.20
Fault Rupture/Seismic Hazards/Groundshaking 4 4 4 4 64.00
Flood 2 1 3.20
Geological Hazards - expansive soils/subsidence 0.00
Hazardous Materials Spill 0.00
Terrorism/Sabotage 0.00
Landslide/Mudflow 0.00
Liquefaction 0.00
Sea Level Rise 0.00
Tsunami 0.00
Wildfire 4 3 2 2 38.40
Windstorm 4 4 1 1 35.20
Power Outage 4 2 1 2 26.40
Definitons
Hazard Ranking (Numeric)
Page 1
Hazard Ranking T... - Saved
Based on percentage of damage to typical facility in a community. Definitions are from the FEMA Local Mitigation Planning Handbook, March 2013.
Definitions:
Weak: Limited classification on scientific scale, slow speed of onset or short duration of event, result in little to no damage.
Moderate: Moderate classification of scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days.
Severe: Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months.
Extreme: Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.
Secondary Impacts
Based on estimated secondary impacts to community at large. These impacts are not from FEMA but constitute important impacts that ripple through communities.
Definitions:
Negligible: no loss of function, downtime, and/or evacuations
Limited: minimal loss of function, downtime, and/or evacuations
Moderate: some loss of function, downtime, and/or evacuations
High: major loss of function, downtime, and/or evacuations
Hazard Planning Consideration
Hazard planning consideration is a numerical score calculated for each hazard. This score enables users to rank the potential impacts of hazards and get a sense for their relative dangers. These values are not derived from FEMA guidance but have been widely used in hazard planning.
Meeting chat
Last read
Dave Crowe 2:44 PM
93 was Northridge 94
Eric Akiyoshi 2:46 PM
Seems like the winds may impact the canyons most. Potentially tree falls on pump stations, tanks, etc
Alix Stayton 2:59 PM
Hmm! Owen maybe this is our next project then https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
Owen O'Neill 3:01 PM
I think so, It's not going away. The sites were designed with standby power systems, but the PSPS's frequently push us into a prime power generation situation.
Thomas Malone 3:15 PM
All this talk of dams breaking... I just finished a book about the Great Johnstown Flood - look it up, it was terrible. Also, note what happened in Michigan last spring.
Type a new message
Type here to search
3:24 PM
1/27/2021
Steele, Noelle
Richard Mykitta
Eric Akiyoshi
Colton Martin
Ken Pfister
Owen O'Neill


Hazard Mitigation plan workgroup meeting #1
Request control
Leave
HMP Meeting #1
Search
Steele, Noelle
File Home Insert Design Transitions Animations Slide Show Review View Help Acrobat
Share
Comments
Only give control to people you trust
From Beginning
From Current Slide
Present Online
Custom Slide Show
Set Up Slide Show
Hide Slide
Rehearse Timings
Record Slide Show
Play Narrations
Show Media Controls
Monitor: Primary Monitor
Use Presenter View
Always Use Subtitles
Subtitle Settings
Start Slide Show
Set Up
Monitors
Captions & Subtitles
32
Critical Facilities List - DRAFT
33
Critical Facilities
Risk assessment looks at what facilities are in hazard zones
Considers replacement cost and value to the community
Mitigation strategies reflect vulnerabilities of critical facilities
Strengthen existing vulnerable facilities
Avoid building new facilities in at-risk areas
Critical Facilities
Risk assessment looks at what facilities are in hazard zones
Considers replacement cost and value to the community
Mitigation strategies reflect vulnerabilities of critical facilities
Strengthen existing vulnerable facilities
Avoid building new facilities in at-risk areas
Irvine Ranch Water District
Slide 33 of 38
Notes
67%
Type here to search
3:30 PM
1/27/2021
Participants
Type a name
Steve Rhyner, Santa Ana (Gue...
Thomas Malone
Outside your organization
Others from chat (13)
Gaspar Garza
Todd Colvin
Malcolm Cortez
Ian Swift
Lars Oldewage
John Fabris
Wendy Chambers
Jose Zepeda
Kevin Burton
Cheryl Clary
James Colston
Marina Lindsay
Dave Crowe
Outside your organization
+9
LP
TM
DM
AS
OO
Steele, Noelle
RM
Eric Akyoshi
CM
Colton Martin
KP
Ken Pfister

Steele, Noelle

Subject:	EXTERNAL: Hazard Mitigation plan workgroup meeting #2
Location:	Microsoft Teams Meeting
Start:	Wed 2/24/2021 1:30 PM
End:	Wed 2/24/2021 3:30 PM
Recurrence:	(none)
Meeting Status:	Accepted
Organizer:	Alix Stayton

Meeting agenda and materials will be attached before the call.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Learn More | Meeting options

Steele, Noelle

From: Alix Stayton [redacted]
Sent: Wednesday, February 24, 2021 11:22 AM
To: Emilyn Zuniga; Ken Pfister; Gaspar Garza; Dorien McElroy; Owen O'Neill; Colton Martin; Todd Colvin; Dave Crowe; John Dayer; Malcolm Cortez; Eric Akiyoshi; Ian Swift; Allen Shinbashi; Randy Williams; Joe Lam; Lars Oldewage; Lisa Haney; John Fabris; Steele, Noelle
Cc: Wendy Chambers; Jose Zepeda; Richard Mykitta; Kevin Burton; Thomas Malone; Cheryl Clary; James Colston; Marina [redacted] Stonich, Amy; Levey, Nathan
Subject: EXTERNAL: RE: Hazard Mitigation plan workgroup meeting #2
Attachments: IRWD LHMP_Meeting #2 Agenda.docx

Good morning,

Attached is the agenda for today's LHMP planning meeting. Talk to you all at 1:30pm.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST
[redacted]

-----Original Appointment-----
From: Alix Stayton
Sent: Wednesday, December 30, 2020 4:52 PM
To: Alix Stayton; Emilyn Zuniga; Ken Pfister; Gaspar Garza; Dorien McElroy; Owen O'Neill; Colton Martin; Todd Colvin; Dave Crowe; John Dayer; Malcolm Cortez; Eric Akiyoshi; Ian Swift; Allen Shinbashi; Randy Williams; Joe Lam; Lars Oldewage; Lisa Haney; John Fabris; Noelle Steele
Cc: Wendy Chambers; Jose Zepeda; Richard Mykitta; Kevin Burton; Thomas Malone; Cheryl Clary; James Colston; Marina Lindsay; [redacted] Stonich, Amy; Levey, Nathan
Subject: Hazard Mitigation plan workgroup meeting #2
When: Wednesday, February 24, 2021 1:30 PM-3:30 PM (UTC-08:00) Pacific Time (US & Canada).
Where: Microsoft Teams Meeting

Meeting agenda and materials will be sent prior to the call.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Learn More | Meeting options

Eddy, Clara

From: Alix Stayton [redacted]
Sent: Friday, February 19, 2021 11:25 AM
To: [redacted]
Cc: Steele, Noelle; Emilyn Zuniga
Subject: EXTERNAL: Reminder: IRWD LHMP planning team call Wed Feb 4 at 1:30pm

Good morning partners,

I hope this email finds everyone well. This email will serve as a reminder that we're conducting the second of four planning team calls for our Local Hazard Mitigation Plan (LHMP) next Wednesday, February 4th at 1:30pm. For your convenience, I have added you all to the calendar invite; you'll find the call-in or connection info there. Please accept or decline as appropriate, and feel free to to forward to anyone you feel would be helpful to the planning process. If you cannot attend, you're welcome to send someone to represent you. Please let me know (and thank you to those who have already) if I should replace you on the distribution list with someone more suitable. The third call is scheduled for Wednesday, March 31 at 1:30pm.

I expect to receive a meeting agenda from the consultants before the call and will send along next week. In short, we're going to give the hazard prioritization table overall one more look, then discuss the hazard profiles in more detail and talk about protective measures we're already taking (as a water district, as partners, and within the OA).

Looking forward to speaking with you all then. Have a great weekend.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #2
February 24, 2021

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Alix Stayton	Safety Specialist, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	✓
Allen Shinbashi	Manager of Risk & Contracts, Contracts & Risk Management	Irvine Ranch Water District	[redacted]	[redacted]	✓
Amy Stonich	Assistant Director of Community Development	City of Lake Forest	[redacted]	[redacted]	
Anisha Malik	Planner	Michael Baker International	[redacted]	[redacted]	
Baryic Hunter	Division Chief	Operations District 4, Orange County Fire Authority	[redacted]	[redacted]	✓
Colt Martin	Mechanical Services Manager, Mechanical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Dave Crowe	Construction Manager, Construction Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Denien Rivenburg	Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	
Dorien McElroy	Collections Systems Manager, Collection Systems	Irvine Ranch Water District	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #2
February 24, 2021

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Dustin Grinstead	Admin Captain for Chief Sherwood	Orange County Fire Authority	[redacted]	[redacted]	
Emilyn Zuniga	Safety Manager, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	
Eric Akiyoshi	Engineering Manager, Planning	Irvine Ranch Water District	[redacted]	[redacted]	✓
Gaspar Garza	Operations Manager, MWRP Operations/Biosolids	Irvine Ranch Water District	[redacted]	[redacted]	✓
Ian Swift	Natural Resources Manager, Natural Treatment System Operations	Irvine Ranch Water District	[redacted]	[redacted]	
James Colston	Director Water Quality Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Jason Dempsey	Emergency Services Administrator	City of Costa Mesa	[redacted]	[redacted]	✓
Joe Lam	Automation Manager, Automation	Irvine Ranch Water District	[redacted]	[redacted]	✓
Joe Meyers	Emergency Management Coordinator	Tustin Police Department	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #2
February 24, 2021

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
John Dayer	Facilities/Fleet Manager, Facilities Services & Fleet Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
John Fabris	Public Affairs Manager, Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	✓
Jose Zepeda	Director of Recycling Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Joyce LaPointe	Lieutenant	Office of Emergency Management, Costa Mesa Police Department	[redacted]	[redacted]	
Katie Eing	Disaster Services Coordinator	Newport Beach Police Department	[redacted]	[redacted]	
Ken Pfister	Operations Manager, Water Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Lars Oldewage	Water Quality Manager, Water Quality	Irvine Ranch Water District	[redacted]	[redacted]	
Lisa Haney	Regulatory Compliance Manager, Regulatory Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Malcolm Cortez	Engineering Manager, Engineering – Operations Support	Irvine Ranch Water District	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #2
February 24, 2021

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Marina Lindsay	Water Resources Planner, Planning	Irvine Ranch Water District	[redacted]	[redacted]	✓
Nathan Levey	Assistant Environmental Planner	Michael Baker International	[redacted]	[redacted]	✓
Noelle Steele	Project Manager	Michael Baker International	[redacted]	[redacted]	✓
Oliver Pacifico	Water – South Coast Section	State Water Resources Control Board	[redacted]	[redacted]	✓
Owen O'Neill	Electrical & Instrumentation Manager, Electrical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Randy Williams	Network and Cybersecurity Manager, Information Systems	Irvine Ranch Water District	[redacted]	[redacted]	
Richard (Rick) Mykitta	Director of Maintenance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Robert (Bobby) Simmons	Emergency Management Administrator	Office of Emergency Management, City of Irvine	[redacted]	[redacted]	
Robert Stefano	Deputy Chief of Operations	Emergency Operations Section, Orange City Fire Department	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #2
February 24, 2021

First Name and Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Sarah Fetterling	Sargent	City of Tustin Police Department	[redacted]	[redacted]	✓
Shane Sherwood	Division Chief	Operations District 2, Orange County Fire Authority	[redacted]	[redacted]	
Sharlyn de la Paz	Senior Management Analyst	City of Lake Forest	[redacted]	[redacted]	
Starla Barker	Technical Consultant	De Novo Planning	[redacted]	[redacted]	✓
Steve Rhyner	Emergency Operations Coordinator	Emergency Management, City of Santa Ana	[redacted]	[redacted]	
Thomas Malone	Director for Information Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Todd Colvin	Water Maintenance Supervisor, Field Services	Irvine Ranch Water District	[redacted]	[redacted]	
Vicki Osborn	Director of Emergency Management	Metropolitan Water District of Orange County	[redacted]	[redacted]	✓
Wendy Chambers	Executive Director of Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #2
Wednesday, February 24, 2021
1:30 PM – 3:30 PM

MEETING AGENDA

Attendees: Refer to Sign-in Sheet

Presentation/Discussion:

- Introductions
    - Sign in sheet and group introductions

- Summary of Hazards/Hazard Profiles
    - COASTAL HAZARDS – COASTAL EROSION, SEA LEVEL RISE, TSUNAMI
    - DAM/RESERVOIR FAILURE
    - DROUGHT
    - FLOOD
    - GEOLOGIC HAZARDS – EXPANSIVE SOILS, LAND SUBSIDENCE
    - HUMAN-CAUSED HAZARDS – HAZARDOUS MATERIALS SPILLS, TERRORISM/SABOTAGE
    - LANDSLIDE/MUDFLOW
    - SEISMIC HAZARDS – GROUND SHAKING, FAULT RUPTURE, LIQUEFACTION
    - SEVERE WEATHER – WINTER STORM, SANTA ANA WINDS, POWER OUTAGE
    - WILDFIRE

- Capabilities Assessment
    - Planning & regulatory, admin & tech, financial, education & outreach.
    - FEMA wants to know how hazard mitigation is integrated into your planning mechanisms.

- Hazard Mitigation Goals

- Public Involvement Update
    - Webpage
    - Survey
    - E-newsletter

Next Steps/Action Items:

- Complete capabilities assessment
- Critical facilities values
- Hazard profiles
- Prepare vulnerability/risk assessment
- Preparation for focused meetings
- Meeting 3 – March 31st

    - Risk assessment
    - Hazard mitigation strategies.
- Action items
    - Provide additional information/data through Alix
    - Continue sending out survey on website, social media, etc. Screenshots and documentation to Alix for the plan.

** Denotes a Planning Team Member who indicated they will be sending Alix data/information regarding their facilities or a specific hazard.*

Irvine Ranch
WATER DISTRICT

IRVINE RANCH WATER DISTRICT

HAZARD MITIGATION PLAN

Michael Baker
INTERNATIONAL

Agenda

- Summary of hazards/hazard profiles
- Capabilities assessment
- Hazard mitigation goals
- Public involvement update
- Next steps
- Questions/additional discussion

Meeting #1 Recap

- Project goals, objectives & expectations
- Purpose and requirements of the LHMP
  - Process/regulations differ from previously prepared emergency plans
- Hazard Identification and Prioritization
- Critical Facilities Identification
- Community Outreach Component

Summary of Hazards/ Hazard Profiles

Irvine Ranch WATER DISTRICT

Hazard Identification

Hazard Ranking Worksheet						
Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Location	Primary Impact	Secondary Impacts		
Seismic Hazards (Fault Rupture, Groundshaking)	4	4	4	4	64.00	High
Wildfire	4	3	2	2	38.40	Medium
Drought	4	4	1	1	35.20	Medium
Windstorm	4	4	1	1	35.20	Medium
Landslide/Mudflow	3	2	3	3	31.20	Medium
Power Outage	4	2	1	2	26.40	Medium
Coastal Storm/Severe Winter Storm	3	2	2	2	24.00	Medium
Flood	2	1	3	4	19.60	Medium
Hazardous Materials Spill	2	2	2	3	18.00	Medium
Terrorism	1	3	3	3	12.00	Low
Liquefaction	1	2	3	3	10.40	Low
Coastal Erosion	1	1	1	2	5.00	Low
Sabotage/Vandalism	1	1	1	2	5.00	Low
Geological Hazards (Expansive Soils, Subsidence)	1	1	1	1	4.00	Low
Sea Level Rise	1	1	1	1	4.00	Low
Tsunami	1	1	1	1	4.00	Low

Irvine Ranch WATER DISTRICT

Hazards to be Profiled

- Costal Hazards
  - Coastal Erosion
  - Sea Level Rise
  - Tsunami
- Dam/Reservoir Failure
- Drought
- Flood
- Geologic Hazards
  - Expansive Soils
  - Land Subsidence
- Human Caused Hazards
  - Hazardous Materials
  - Terrorism/Sabotage
- Landslide/Mudflow
- Seismic Hazards
  - Fault Rupture
  - Ground Shaking
  - Liquefaction
- Severe Weather
  - Coastal Storm/Winter Storm
  - Windstorm (Santa Ana winds)
  - Power Outage (secondary impact)
- Wildfire

Irvine Ranch WATER DISTRICT

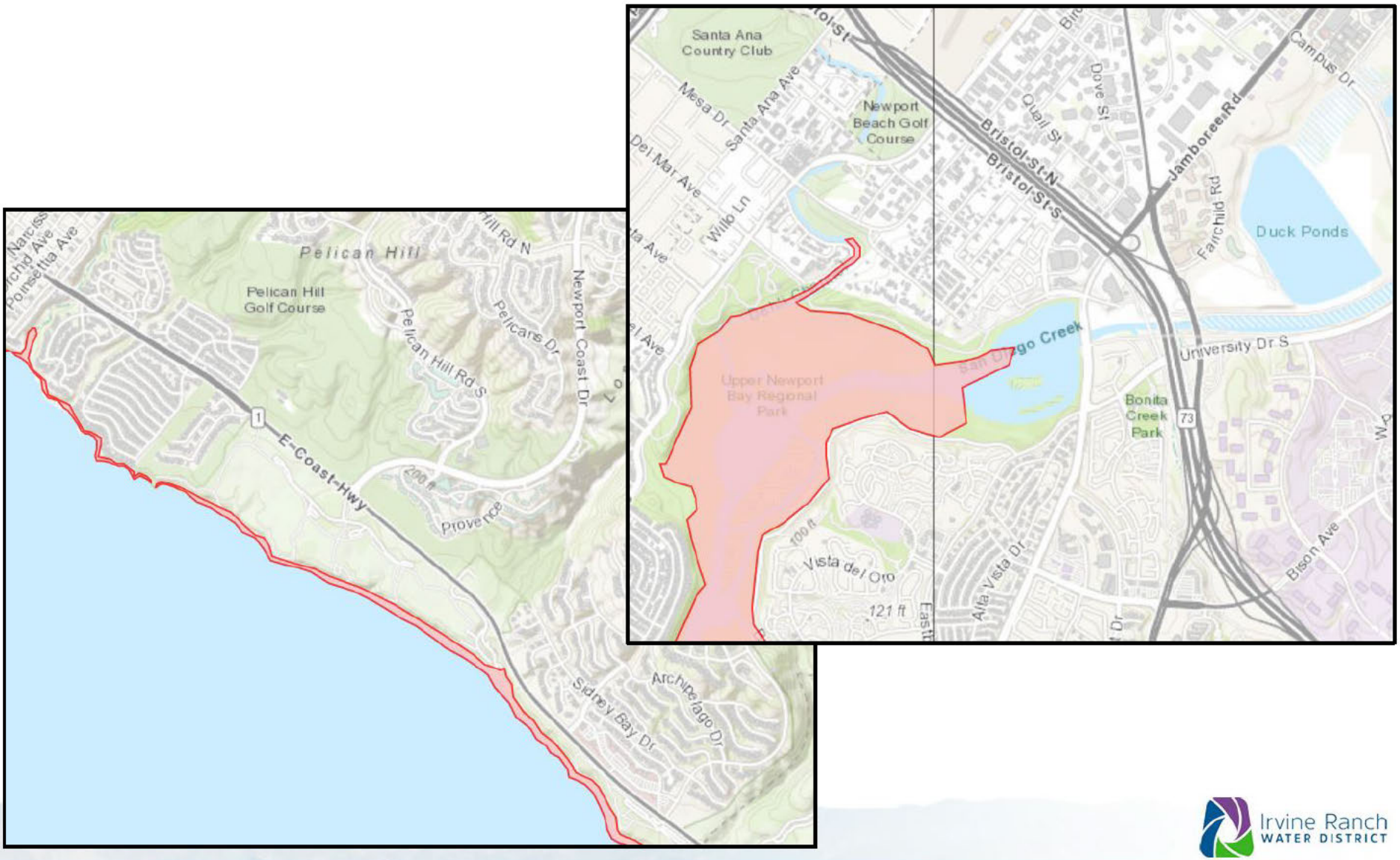
Hazard Profiles

- Description
- Location/Geographic Extent
- Previous Occurrences
- Probability of Future Occurrence

Coastal Hazards

- Description
  - Coastal erosion –weathering of rocks, soils, sands along coast
  - Sea level rise – the gradual rise of global sea level because of thermal expansion from the warming of the ocean and increased melting of land-based ice
  - Tsunami – a series of giant waves triggered by earthquakes, submarine landslide or volcanic eruptions on the ocean floor
- Location/Geographic Extent
  - Newport Coast/Crystal Cove neighborhood, within the City of Newport Beach
  - Minor tsunami run up area identified in Costa Mesa

Tsunami Run-Up



Irvine Ranch WATER DISTRICT

Coastal Hazards

- Previous Occurrences
  - No major coastal erosion or sea level rise within service area
  - Tsunami
    - April 1946; March 1964; March 2011 – major tsunamis in northern and central California resulting in major damage
    - April 2014; September 2015 – tsunami events generated local emergency response within Orange County
- Probability of Future Occurrence
  - Coastal erosion – Medium
  - Sea level rise – Medium
  - Tsunami – Low

Costal Hazards

- Climate Change
  - Continued rising sea levels
  - Costal erosion exacerbated by the impact of high tides and waves as a result of rising sea levels
  - Increase the frequency and severity of storms

Dam/Reservoir Failure

- Description
  - Catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water
- Location/Geographic Extent
  - Major Dams: Rattlesnake Canyon, Syphon Canyon, San Joaquin, Santiago Creek, and Sand Canyon
    - All classified as “extremely high” hazard
  - Smaller water reservoirs/storage tanks across the service area – including some critical facilities

Dam/Reservoir Failure

- Previous Occurrences
  - No major dam failure experienced by Orange County – Two incidents within LA
    - St. Francis Dam (1928) – Santa Clara Valley
    - Baldwin Hills Dam (1963) – Los Angeles
  - Water tank failure in Westminster (1998)
    - 5-million-gallon water storage tank ruptured – corrosion and construction defects
- Probability of Future Occurrence – Low
  - 2015 County of Orange & Orange County Fire Authority LHMP also classifies dam failure as unlikely

Drought

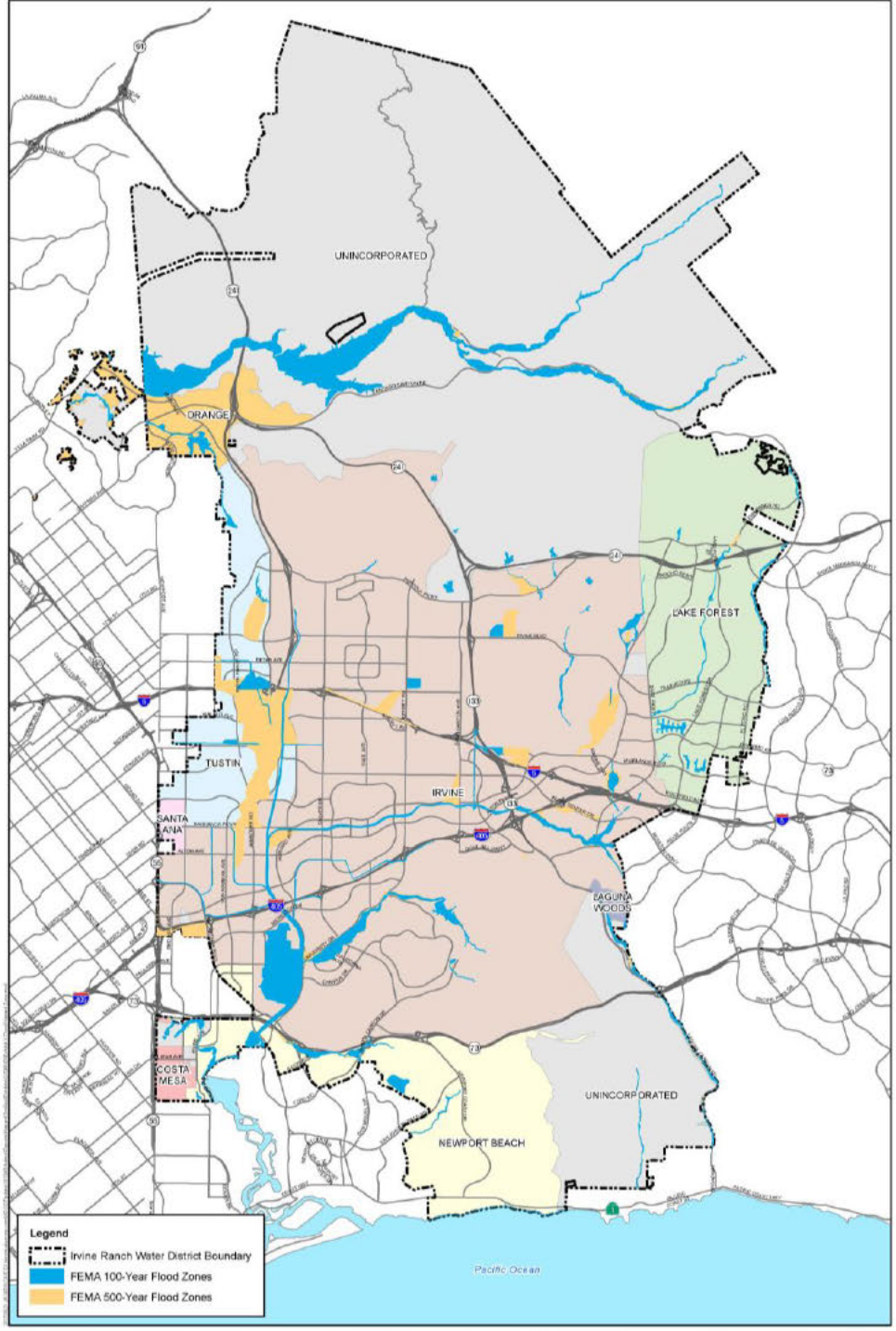
- Description
  - Period of drier than normal conditions resulting in water-related issues
    - Agricultural – soil moisture deficiencies
    - Hydrological – precipitation shortfalls on stream flows, reservoir, lake and groundwater levels
    - Meteorological – defined on degree of dryness compared to expected average
    - Socioeconomic – demand for water exceeds supply as a result of weather-related shortfall
- Location/Geographic Extent
  - Across entire IRWD service area

Drought

- Previous Occurrences
  - FEMA declared drought emergency – January 1977
  - State declared drought emergency – 8x between 1972 and 2009
  - Persistent & historical drought - December 2011 to March 2017
    - January 17, 2014 – CA Governor proclaimed State of Emergency
    - April 1, 2015 – imposed restrictions to achieve a 25% reduction in potable water usage by February 28, 2016
- Probability of Future Occurrence – High
  - Function of precipitation and intensity of current drought conditions
  - Higher probability based on drought history
- Climate change
  - Higher temperatures and prolonged durations – reduced precipitation and reduced water supplies

Flood

- Description
  - Water level exceeds capacity of waterway or failure of drainage infrastructure
- Location/Geographic Extent
  - FEMA Flood maps
  - Areas around creeks/drainages located within the 100-year flood plain
    - Silverado Creek & Lake Irvine
    - San Diego Creek (including tributaries & drainage channels)
    - Other isolated basins & drainages
    - 100-year; 1% chance of flood event in any given year



Irvine Ranch WATER DISTRICT

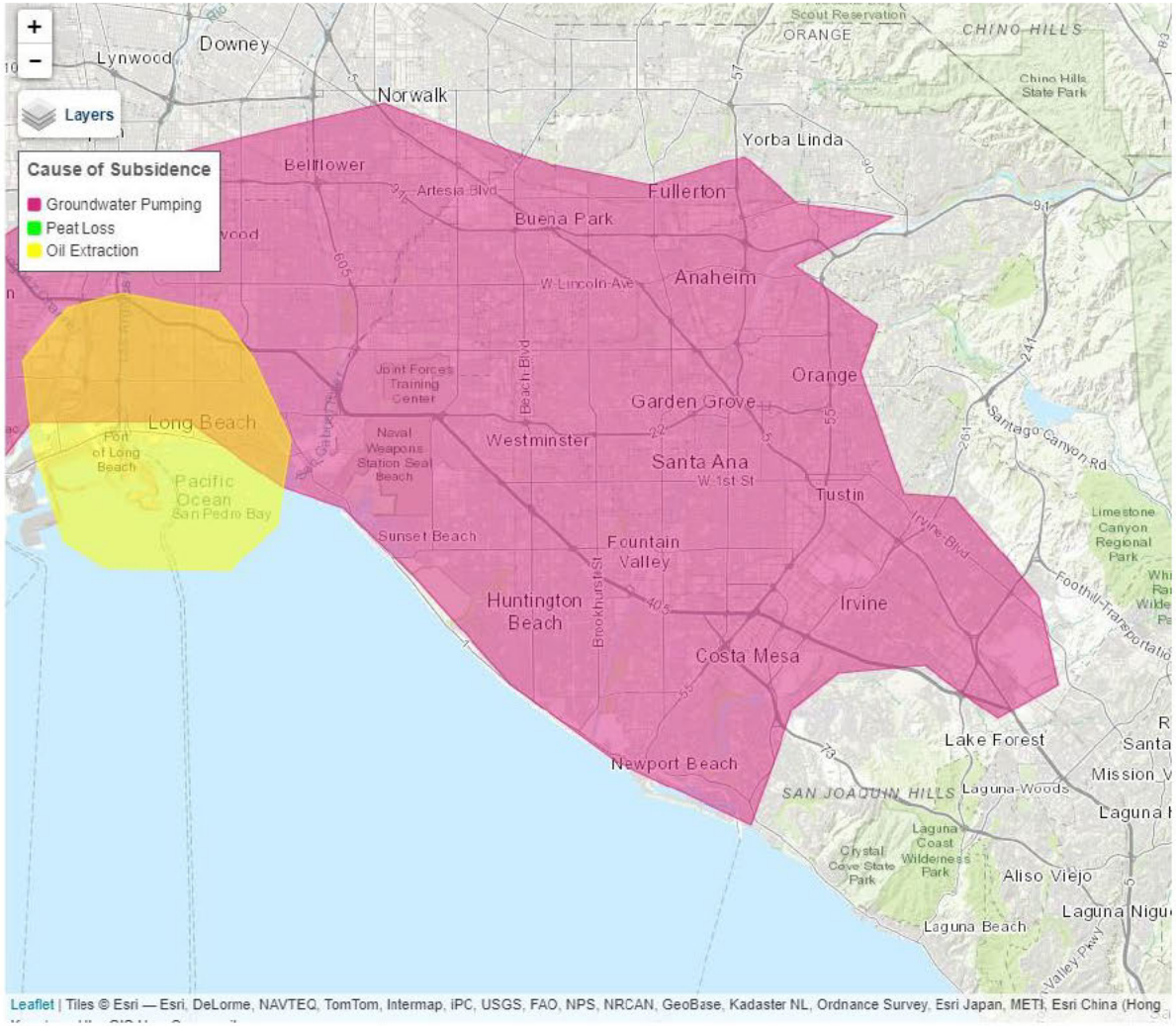
Flood

- Previous Occurrences
  - Flooding/mudflow, Silverado Canyon Jan. 2021
  - December 1997, December 2010, February 2014 – flooding within Orange County
- Probability of Future Occurrence – Medium
  - FEMA
    - *100-year; 1% chance of a flood event in any given year*
    - *500-year; 0.2% chance of a flood event in any given year*
- Climate Change
  - Extreme wet and dry seasons
  - Increased and prolonged rain events

Geologic Hazards

- Description
  - Expansive Soils – soils that can expand or contract, changing in volume based on their moisture content
  - Land subsidence – a gradual settling or sudden sinking of the Earth's surface due to removal or displacement of earth materials
- Location/Geographic Extent
  - Expansive soils underly the majority of Orange County
  - Land subsidence occurring in western Orange County/IRWD service area

Geologic Hazards – Land Subsidence



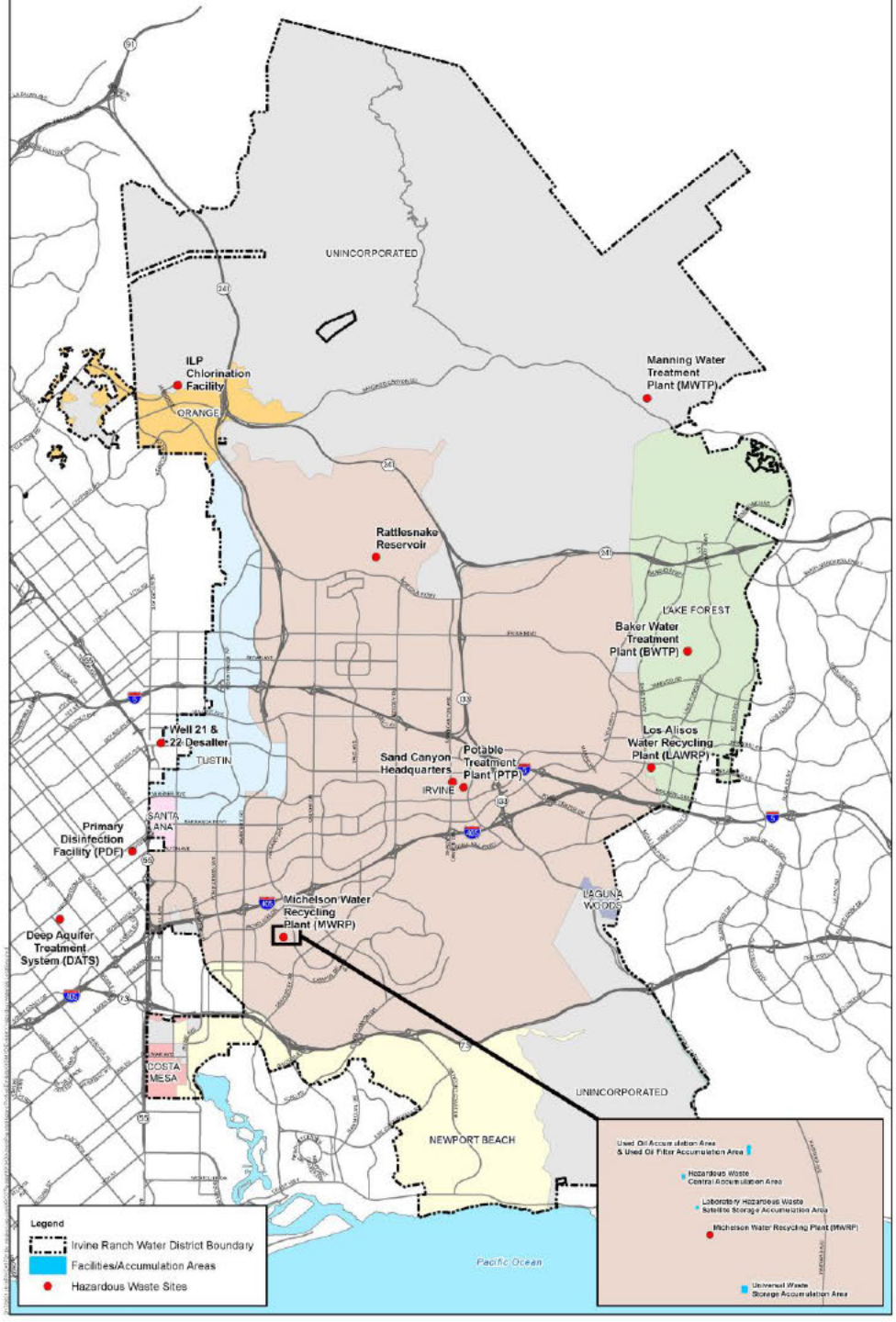
Irvine Ranch WATER DISTRICT

Geologic Hazards

- Previous Occurrences
  - No major historical incidents in IRWD service area
- Probability of Future Occurrence: Low
- Climate Change
  - Drought conditions could introduce groundwater over-drafting incidents
  - Heavy rains/storms could trigger shrink/swell cycles with expansive soils

Human Caused Hazards

- Description
  - Hazardous Materials – release, spill or contamination of materials posing a hazard to human health and safety or to the environment
  - Terrorism/Sabotage – individuals and/or groups inspired by or associated with a movement that espouses extremist ideologies of a political, religious, social, racial, or environmental nature
- Location/Geographic Extent
  - Hazardous Materials – stored within defined area
  - Terrorism/Sabotage – service areawide – property and infrastructure downstream of a dam/reservoir and water or wastewater treatment facilities



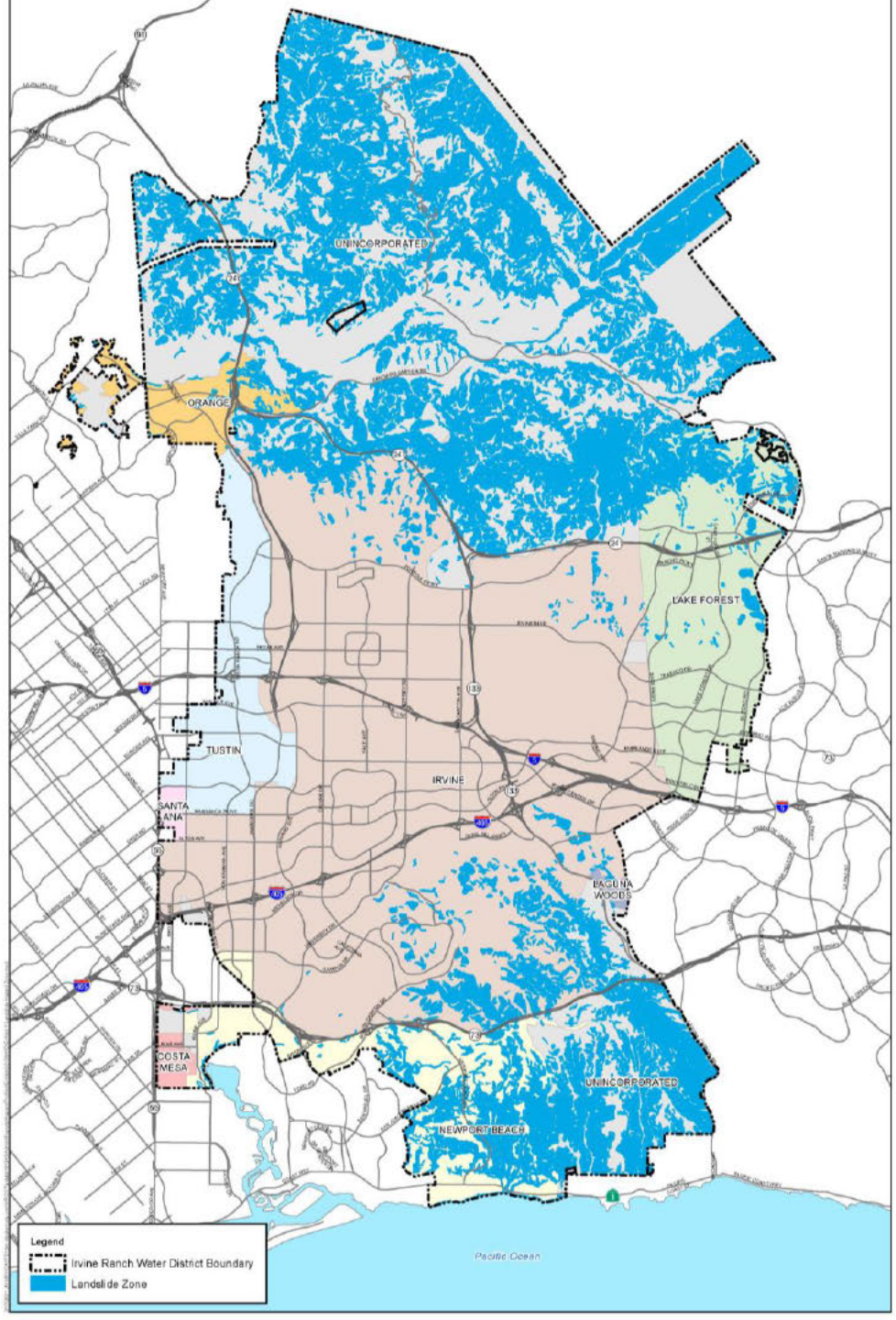
Irvine Ranch WATER DISTRICT

Human Caused Hazards

- Previous Occurrences
  - Hazardous Materials – IRWD has reported minor spills of sewage, saline water/brine, petroleum or chemical
  - Terrorism/Sabotage – none
- Probability of Future Occurrence
  - Hazardous Materials – medium
  - Terrorism/Sabotage – low

Landslide/Mudflow

- Description
  - Landslide – down slope movement of soil and rock under direct influence of gravity
  - Mudflow – river of rock, earth, and other debris, including vegetation that is saturated with water
- Location/Geographic Extent
  - Landslide/Mudflow
    - Earthquake-induced – defined area
    - Areas of steep slopes and creeks
    - High wildfire hazard areas



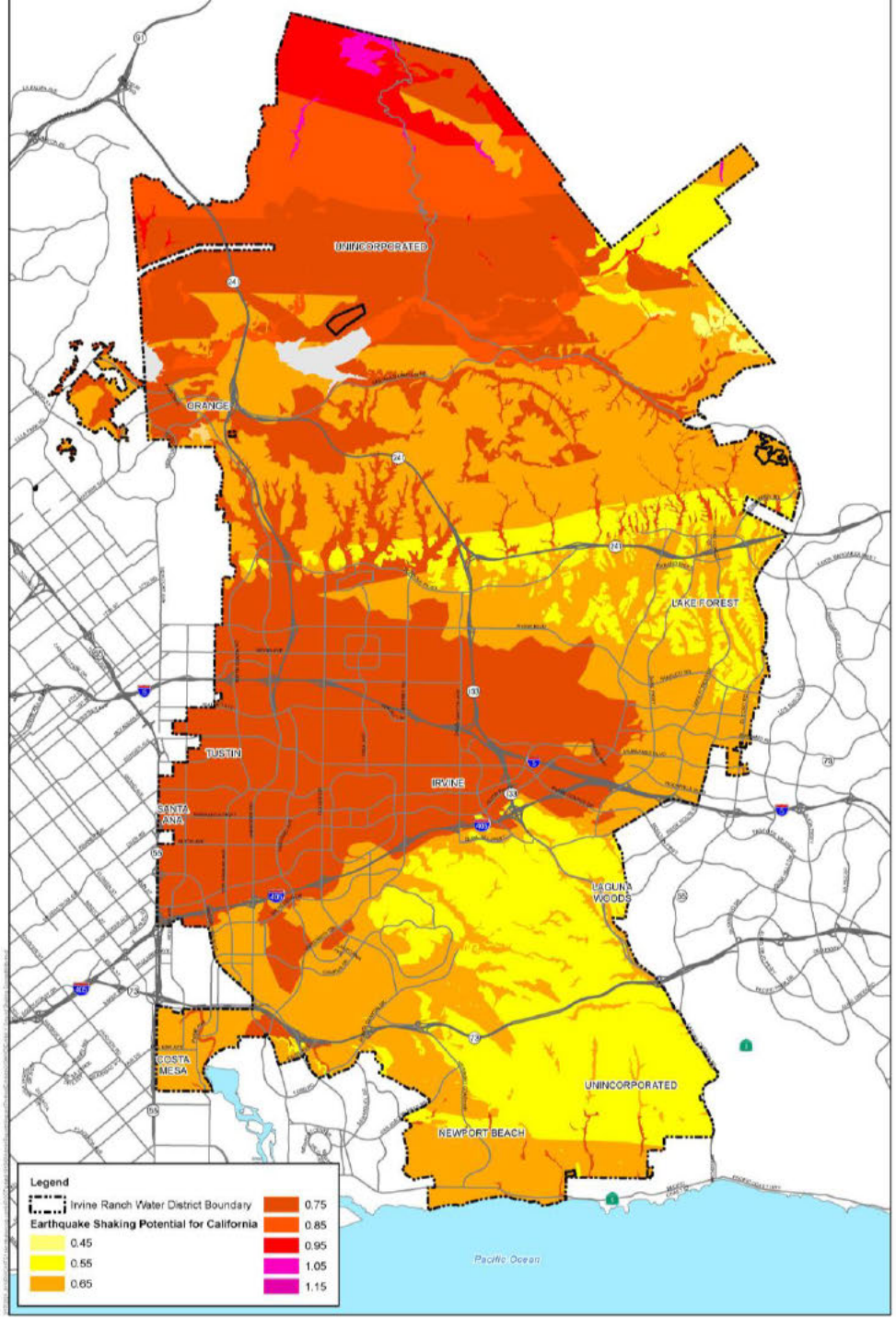
Irvine Ranch WATER DISTRICT

Landslide/Mudflow

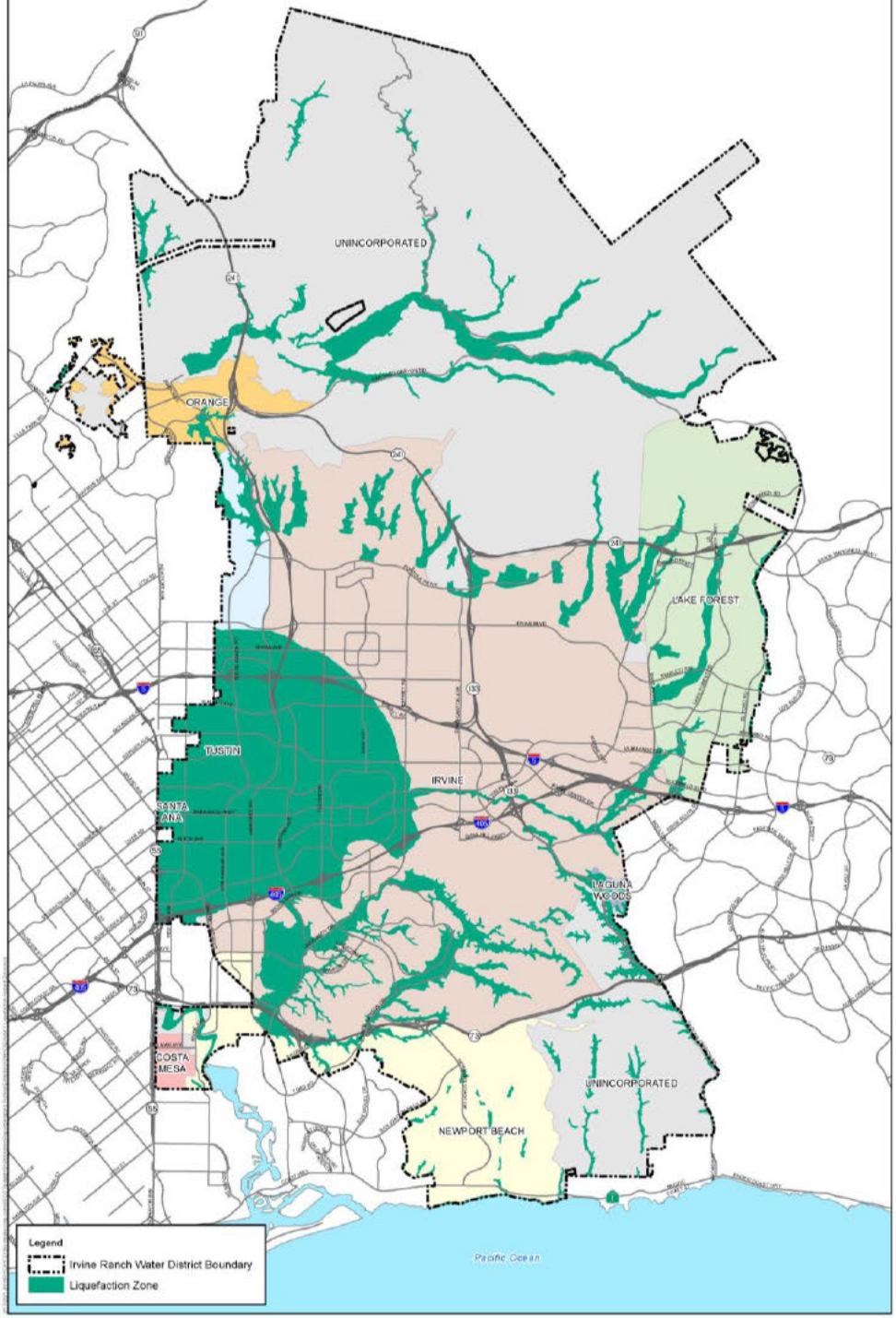
- Previous Occurrences
  - Landslide – 1978 and 2005 Blue Bird Canyon Landslides (Laguna Beach); 2005 SCWD Landslide (Laguna Niguel); 2018 Cannon Cliff Landslide (Dana Point)
  - Mudflow – Silverado Canyon January 2021 within the IRWD service area
- Probability of Future Occurrence – Medium
  - Earthquake-induced landslides – High
- Climate Change
  - Increased precipitation
  - Drought followed by period of increased precipitation
  - Increase in frequency, severity of wildfires

Seismic Hazards

- Description
  - Primary = ground shaking & fault rupture
  - Secondary = Liquefaction – results from ground shaking causing soils to act like liquid
- Location/Geographic Extent
  - Fault rupture – occurs on fault lines
  - Ground shaking – service areawide
  - Liquefaction – within defined area (mapped by California Geological Survey)



Irvine Ranch WATER DISTRICT



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Seismic Hazards

- Previous Occurrences
  - Chino Hills; 2008 – 5.4, La Habra; 2014 – 5.1, Borrego Springs; 2016 – 5.2, Ridgecrest Sequence; 2019 – 6.4 and 7.1
- Probability of Future Occurrence
  - Fault rupture & ground shaking – High
  - Liquefaction – Medium

Magnitude	Fault				
	Elsinore	Newport-Inglewood	Southern San Andreas	San Jacinto	San Joaquin
M ≥ 6.7	3.66%	0.70%	19.21%	5.41%	0.42%
M ≥ 7.0	1.82%	0.63%	12.86%	5.39%	0.40%
M ≥ 7.5	0.90%	0.20%	10.21%	5.28%	0.24%
M ≥ 8.0	<0.01%	--	3.24%	2.75%	--

Notes:
1. M≥6.7 means magnitude greater than or equal to 6.7, and likewise for the other magnitude thresholds.
2. The 30-year period measured by this report is 2014 to 2044; a 30-year period is the typical duration of a homeowner mortgage.
3. Percentages for fault sections closest to IRWD jurisdiction.

Source: US Department of the Interior and the US Geological Survey, *The Third California Earthquake Rupture Forecast (UCERF3)*, Google Earth file with fault probabilities, March 2015.

Severe Weather

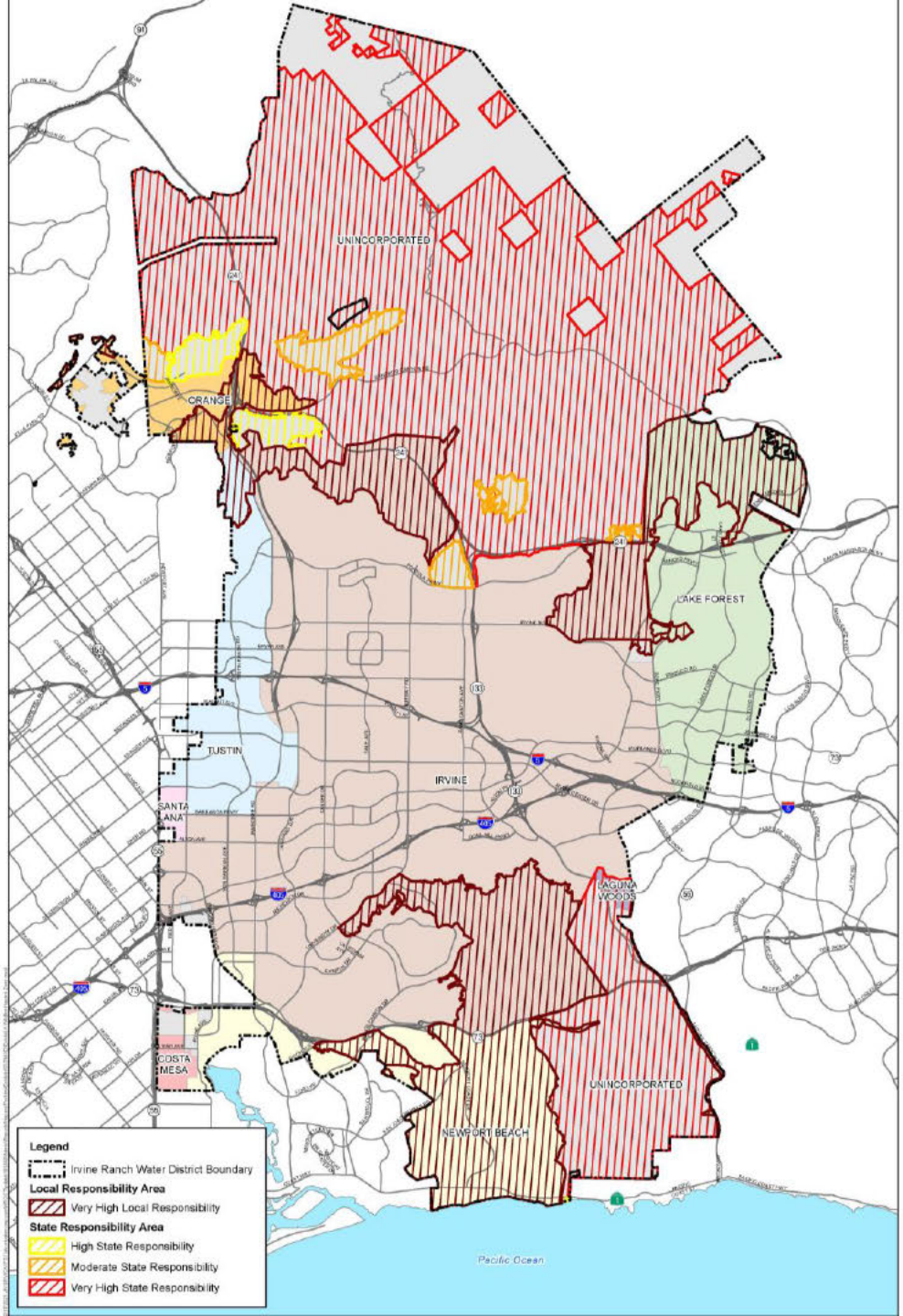
- Description
  - Coastal/Winter Storm – hail that is one inch in diameter or larger; or winds of 58 miles per hour or greater
  - Santa Ana Winds – winds that last longer than one hour at greater than 39 mph or for any length of time at greater than 57 mph
  - Power Outage (secondary) – severe weather such as strong Santa Ana winds, high temperatures, and low humidity could trigger a Public Safety Power Shutoff event
- Location/Geographic Extent
  - Service Areawide

Severe Weather

- Previous Occurrences
  - Coastal/Winter Storm – outlined in Flood section
  - Santa Ana Winds – winds are regularly experienced; no major significant damage has been incurred by IRWD
  - Power Outage (secondary) – none
- Probability of Future Occurrence
  - Coastal/Winter Storm – Medium
  - Santa Ana Winds – High
  - Power Outage (secondary) – High
- Climate Change
  - Affect the frequency and intensity of heavy rain events
  - increase the severity and frequency of Santa Ana wind occurrences
  - increased power outages
  - storm events and Santa Ana winds occurring outside of traditional seasons of the year

Wildfire

- Description
  - Uncontrolled fire spreading through vegetative fuels
    - Wildland urban interface – urban and suburban development adjacent to wildland areas
    - Mixed wildland urban interface – isolated communities/structures in wildland settings
    - Occluded wildland urban interface – island of wildland vegetation in urbanized area
- Location/Geographic Extent
  - Large portion of the IRWD service area located within or adjacent to a mapped Fire Hazard Severity Zone



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Wildfire

- Previous Occurrences
  - Silverado Fire; 2014
  - Canyon and Canyon 2 Fire; 2017
  - Blue Ridge Fire & Silverado Fire; 2020
  - Bond Fire; 2020
- Probability of Future Occurrence – High
- Climate change
  - Increased temperatures and drought can increase frequency, extent, and severity
  - Drier conditions, more vegetative fuel, longer fire season

Capabilities Assessment

Irvine Ranch WATER DISTRICT

Capabilities Assessment

- Two components
  - Inventory of existing resources and tools to accomplish mitigation and reduce long-term vulnerability, and understanding of ability to use them effectively
  - Identification of gaps, conflicts, and/or weaknesses that may need to be addressed through mitigation
- Types of capabilities
  - Planning and regulatory
  - Administrative and technical
  - Financial
  - Education and outreach

Capabilities Identification Worksheets

- Planning and regulatory
  - Ordinances
  - Policies
  - Local laws and state statutes
  - Plans and program that guide and manage growth
- Questions to consider:
  - Does the plan address hazards?
  - Does the plan identify projects to include in the mitigation strategy?
  - Can the plan be used to implement mitigation actions?
  - How can the capabilities be expanded and improved to reduce risk?

Capabilities Identification Worksheets

- Administrative and technical
  - City staff – skills/tools and capacity
  - Public and private resources
  - Ability to access and coordinate resources effectively
- Questions to consider:
  - Is coordination effective?
  - Is staffing adequate to enforce regulations?
  - Is staff trained on hazards and mitigation?
  - Is coordination between agencies and staff effective?
  - Has the capability been used to assess/mitigate risk in the past?
  - How can the capabilities be expanded and improved to reduce risk?

Capabilities Identification Worksheets

- Financial
  - Resources have or eligible to use to fund mitigation
    - Staff time, existing operating budgets, impact fees
    - Local, state and federal funding sources
- Questions to consider:
  - Has the funding resource been used in the past and for what types of activities?
  - Could the resource be used to fund future mitigation actions?
  - How can the capabilities be expanded and improved to reduce risk?

Capabilities Identification Worksheets

- Education and outreach
  - Programs and methods in place to implement mitigation actions and communicate hazard-related information
    - Fire safety programs, education programs
    - Public information or communication activities
- Questions to consider:
  - Could the program/organization help to implement future mitigation activities?
  - How can the capabilities be expanded and improved to reduce risk?

Hazard Mitigation Goals

Irvine Ranch WATER DISTRICT

Hazard Mitigation Goals

- Goal 1: Minimize vulnerabilities of critical facilities to minimize damage from hazards
- Goal 2: Minimize security risks to water and wastewater infrastructure
- Goal 3: Minimize interruption to water and wastewater utilities
- Goal 4: Improve public outreach, awareness, education and preparedness for hazards to increase community resilience
- Goal 5: Eliminate or minimize wastewater spills and overflows
- Goal 6: Protect water quality and supply, critical aquatic resources and habitat to ensure safe water supply
- Goal 7: Strengthen Emergency Response Services to insure preparedness, response and recovery during any major or multi-hazard event.

Public Involvement Update

Irvine Ranch WATER DISTRICT

Public Involvement Update

- Survey link & webpage is live
  - IRWD.com/lhmp
  - Please share with your constituents and jurisdictions via social media, newsletters, etc.
  - Screenshot all instances the survey link was shared for inclusion into the LHMP Appendix

Next Steps

Irvine Ranch WATER DISTRICT

Next Steps

- Complete capabilities assessment worksheets
- Finalize hazard profiles
- Critical facilities list finalization and hazard mapping
- Prepare vulnerability/risk assessment
- Attend Meeting #3
  - March 31 at 1:30 PM

Questions/Additional Discussion?

RANCHO SANTA MARGARITA
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #2
Wednesday, February 24, 2021
1:30 PM – 3:30 PM

MEETING SUMMARY

Attendees: Refer to Sign-in Sheet

Presentation/Discussion:

- Introductions
    - Sign in sheet and brief introductions

- Meeting #1 Recap
    - Project goals, objectives & expectations
    - Purpose & requirements of LHMP
    - Hazard identification and prioritization
    - Critical facilities identification
    - Community outreach component

- Summary of Hazards/Hazard Profiles
    - COASTAL HAZARDS – COASTAL EROSION, SEA LEVEL RISE, TSUNAMI
        - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – are coastal hazards considered significant or of high importance for IRWD?*
            - *Answer from Colton Martin (Mechanical Services Manager, IRWD), Ken Pfister (Operations Manager, IRWD) and Eric Akiyoshi (Engineering Manager, IRWD) – don't think this is of high concern, would not have significant water impact*
        - *Question from Dave Crowe (Construction Manager, IRWD) – How is the map presented, is there a significant change in elevation on Newport Coast? If looking at the tsunami run-up map correctly, then it shouldn't impact IRWD infrastructure.*
            - *Answer from Dorien McElroy (Collections Systems Manager, IRWD) – There is a sewer lift station within the vicinity of the run up maps.*
        - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – is there any other IRWD infrastructure of concern in this area?*
            - *Answer from Dorien McElroy (Collections Systems Manager, IRWD) – there are two urban runoff stations of the PCH*
                - *Response from Dave Crowe (Construction Manager, IRWD) – these will not be impacted, though*
                - *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – yeah, they are higher (elevations)*

        - *Follow-up question from Gaspar Garza (Operations Manager, IRWD) – Couldn't we look at the elevation markup as well?*
        - *Answer from Noelle Steele (Project Manager, Michael Baker Intl) – we can do further research*
    - *Answer from Richard Mykitta (Director of Maintenance, IRWD) – neither one of our lift stations would be impacted according to the map*
        - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – these maps are the best information we have from USGS. If the infrastructure is up top [of the cliff] it wouldn't be as big of a concern*
    - *Answer from Richard Mykitta (Director of Maintenance, IRWD) – we do have a flooding area that is a concern on the creek, but that flooding is from above, it is not from below as would be caused by tsunami inundation*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Are there coastal erosion concerns in that area of infrastructure or around Back Bay?*
    - *Answer from Dave Crowe (Construction Manager, IRWD) – Newport Coast, state park (Crystal Cove State Park?), has about 50- to 70-foot cliffs so influx of ocean water would have to be higher than that cliff. For Back Bay it would have to make it in quite a ways before sea rise would be an issue.*
- *Comment from Starla Barker (Technical Consultant, De Novo Planning) – we are working with Alix to recognize critical infrastructure which will all be confirmed with IRWD staff. If you have a hazard identified as something of concern, you have to have a mitigation for it.*
    - *Further comment from Alix Stayton (Safety Specialist, IRWD) – Do we need to have a new mitigation action? Can we use existing ones?*

- DAM/RESERVOIR FAILURE
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Are there any concerns about upstream dams or reservoirs that are not IRWD owned or operated?*
        - *Answer from Ken Pfister (Operations Manager, IRWD) – The closest one is Oso Reservoir, all the ones in the local area are owned by IRWD.*
    - *Follow up from Noelle Steele (Project Manager, Michael Baker Intl) – Additional information on reservoirs and tanks would be good.*
        - *Answer from Ken Pfister (Operations Manager, IRWD) – There is also Prado Dam, but that is divided by hills from IRWD service area, so should be a concern*
        - *Reply from Richard Mykitta (Director of Maintenance, IRWD) – it doesn't hit much, but it does hit the IRWD area, it goes right down the Santa Ana River. Also, the one [dam] above Prado Dam is also a concern.*
    - *Follow up from Noelle Steele (Project Manager, Michael Baker Intl) – we are looking for a comprehensive list of all reservoirs and storage tanks.**

- DROUGHT

- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – we would like to understand the impacts of the latest drought. Are there any plans or strategies that are still in place? The likely future incidence of drought is high.*
    - *Written comment from Eric Akiyoshi (Engineering Manager, IRWD) – The WSA and UWMP have adequate water supply even in multiple dry years; DWR is asking for a 5-year analysis; OCWD and Metro WD results also support this.*
    - *Response from Richard Mykitta (Director of Maintenance, IRWD) – the biggest struggle was to get customers to cut back, but for statewide purposes, meeting water usage reductions was not necessarily due to water shortage in IRWD.*
    - *Reply from Eric Akiyoshi (Engineering Manager, IRWD) – we achieved our mandated reduction and have communications and documentation to show method and other information.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Are there any conservation measures that were implemented that have been kept as a conservation method?*
    - *Reply from Eric Akiyoshi (Engineering Manager, IRWD) – Amy McNolty and Fiona Sanchez should have some info on this.*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – I will talk to them about this.*
    - *Reply from Starla Baker (Technical Consultant, De Novo Planning) – If we have anything – programs, incentives, etc. – then documenting this will be helpful.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Any other thoughts on drought?*

- FLOOD
    - *Comments from Noelle Steele (Project Manager, Michael Baker Intl) – This was discussed in depth last meeting as a hazard of concern. There are several areas of concern in Silverado Creek, Lake Irvine, and San Diego Creek. Does any localized and/or repetitive flooding occur outside of the marked areas for the 100- and 500-year flood plain?*
        - *Reply from Eric Akiyoshi (Engineering Manager, IRWD) – the map might be outdated, the Michaelson Water Plant is shown in the map as in the flood zone (South of 405 in the bottom left corner). That would historically have contained the Michaelson plant, which was placed in the flood zone in the early 2000s. However, a Letter of Map Revision was filed with FEMA to get the Michaelson Plant removed from the flood plain because flood walls were constructed around the entire plant. So the map in the presentation should be updated or at least noted. I can get in touch with Rich Morey and see if he can get Alix the Letter of Map Revision.**
            - ***Followed up-post meeting and it was determined the presented floodplain mapping was correct and Michelson Water Treatment Plant is excluded from the 100-year flood zone.***

        - *Reply from Richard Mykitta (Director of Maintenance, IRWD) – I would like to know about the 500-year flood plain around the Michaelson Plant – we know that the 100-year flood plain should be removed, but not sure on the 500-year.*
    - *Question from Starla Baker (Technical Consultant, De Novo Planning) – In terms of more localized flooding is there anything? Areas where, because of drainage or other situations that cause flooding? Have you had situations where your facilities have been impacted due to local issues? Every time there is a storm event, are there areas that flood or things that need to be looked at? Even if not in IRWD control.*
        - *Follow up from Noelle Steele (Project Manager, Michael Baker Intl) – was there a pipe that was surfaced due to severe flooding?*
        - *Reply from Richard Mykitta (Director of Maintenance, IRWD) – it was in the Canyons. Dave should have more information about this.**
        - *Follow up – with the flooding in Silverado Canyon, were there any IRWD impacts? Was there mud flow?*
        - *Reply from Dave Crowe (Construction Manager, IRWD) – there was minimal mud flow that impacted IRWD in Silverado and Williams Canyons. We are working to obtain permits to protect the pipeline, but there is a lot of length in the Williams Canyon Creek, so this is taking longer.*
        - *Follow up from Alix Stayton (Safety Specialist, IRWD) – what year did the Williams Canyon incident happen?*
        - *Reply from Dave Crowe (Construction Manager, IRWD) – about 10 years ago, but just over time there has been some failure due to slope. Over the last 18-24 months this has become worse and after the fires the issues became more apparent. Hopefully this year repairs will happen to prevent damage to this from mud flow.*
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – any concerns from other jurisdictions or groups in IRWD areas?*
        - *No comment*

- GEOLOGIC HAZARDS – EXPANSIVE SOILS, LAND SUBSIDENCE
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – are there any previous incidences of subsidence causing damage to infrastructure?*
        - *Answer from Dave Crowe (Construction Manager, IRWD) – In West Irvine around Barranca to Jamboree and Jamboree to Red Hills, issues due to high water level and liquefaction when construction roads and structures.*
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – with issues like groundwater overdraft, what programs is IRWD involved in to manage aquifers? What steps are being taken to reduce overdraft?*
        - *Answer from Eric Akiyoshi (Engineering Manager, IRWD) – OCWD and Producers manage the aquifer to avoid subsidence due to overdraft. The Groundwater basin is managed and doesn't seem to be an issue, at least that I am aware of because of the ongoing management of the*

groundwater basin. There should be an Engineers Report that should didscuss this from OCWD.

- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – if expansive soils or land subsidence doesn't have a significant risk, then it can be reevaluated for inclusion of hazards.*

- HUMAN-CAUSED HAZARDS – HAZARDOUS MATERIALS SPILLS, TERRORISM/SABOTAGE
  - *Comments and question from Noelle Steele (Project Manager, Michael Baker Intl) – FEMA doesn't evaluate human caused hazards the same way as other hazards, they are not as prioritized as natural hazards. When FEMA evaluates the LHMP, their focus will be on natural hazards, but they don't discourage the inclusion of human induced hazards. Have there been any hazardous materials spills that have interrupted or impacted IRWD activities – whether IRWD or outside party?*
    - *Reply from Emilyn Zuniga (Safety Manager, IRWD) – I am not aware of anything*
    - *Reply from Ken Pfister (Operations Manager, IRWD) – I am not aware of anything, even if someone was able to get in and make a change to the system, there are other devices that would block that, other mechanisms stop that.*
  - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – are there any evaluations that occur for cyberterrorism? [Brief discussion of incident in Florida]*
    - *Answer from Richard Mykitta (Director of Maintenance, IRWD) – Yes, quite a bit of work has been done on cyberterrorism. We have done a couple exercises and mitigated some vulnerabilities for the past year. More specific information can be found from Tome Malone or Joe Lam*
    - *Reply from Tom Malone (Director for Info Services, IRWD) – Cyber security is an area of increasing concern. We have run table-top exercises. The Automation group, with Joe Lam, would be where the attack in Florida happened, but it is something we are concerned about.**
    - *Reply from Joe Lam (Automation Manager, IRWD) – maybe a year ago, we had a cyber security assessment and filled out a cybersecurity questionnaire as well.**

- LANDSLIDE/MUDFLOW
  - *Comments and question from Noelle Steele (Project Manager, Michael Baker Intl) – there is a nexus between flooding hazards and seismic hazards and this topic. For convenience, we discuss these as their own hazard. There is a California DoC map for landslides. We have already discussed the Silverado Canyon and Williams Canyon previously, are there any other localized slope failures potentially affecting IRWD Infrastructure? Mud flows, landslides outside what was previously discussed?*
    - *No Comment*

- SEISMIC HAZARDS – GROUND SHAKING, FAULT RUPTURE, LIQUEFACTION

- *Comments and questions from Noelle Steele (Project Manager, Michael Baker Intl) – This is the highest ranked hazard. There are no listed previous incidences of liquefaction in the area, but the potential is mapped in the western portion of IRWD's service area. Are there any historic or recent CA earthquakes that caused damage?*
    - *Reply from Ken Pfister (Operations Manager, IRWD) – not as far as I can remember, there's been no damage.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Has there been a seismic evaluation?*
    - *Reply from Ken Pfister (Operations Manager, IRWD) – we did a few years ago at reservoirs and did retrofitting on pipes going into them.*
    - *Reply from Eric Akiyoshi (Engineering Manager, IRWD) – As facilities are designed and constructed, they undergo geologic explorations and structural engineer design that take into consideration seismic hazards – all facilities are designed to meet the codes and design requirements at the time they are built.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Are there any infrastructure of concern? Such as things that haven't been retrofitted recently?*
    - *Richard Mykitta (Director of Maintenance, IRWD) – A lot of the concerns can't have much done to them. There is a lot of underground piping in liquefaction areas. There are older pipes in the liquefaction areas.*
    - *Follow up from Eric Akiyoshi (Engineering Manager, IRWD) – what is the best way to articulate this? We do routine maintenance, preventative maintenance, build them to spec. Within the confines of this study we can say this.*
    - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – we would discuss meeting standards, recent events, but the purpose of this section is to think of those more extreme events or concerns. If we get this documentation certified, it can assist with applying for grant funding. We are trying to understand what's been done, and articulate the best way forward.*
    - *Reply from Richard Mykitta (Director of Maintenance, IRWD) – Liquefaction would cause pipes to sink.*

- SEVERE WEATHER – WINTER STORM, SANTA ANA WINDS, POWER OUTAGE
    - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – we are interested if there have been any major interferences due to severe weather or if there has been any research into at risk facilities.*
        - *Reply from Dave Crowe (Construction Manager, IRWD) – Should equipment failure be on the slide? About a year ago a substation near Michaelson Plant went down and affected all businesses in the area. This was caused by old infrastructure that took a few days for Edison to repair.*
        - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – the only reason for this incident was due to failing infrastructure?*

        - *Reply from Gaspar Garza (Operations Manager, IRWD) – that is correct.*
    - *Comment from Ken Pfister (Operations Manager, IRWD) – we have adequate generation at facilities for power outages caused by wind, we just need to get fuel out there.*
    - *Follow up form Noelle Steele (Project Manager, Michael Baker Intl) – how long would the outage need to be to trigger difficulties?*
    - *Reply from Ken Pfister (Operations Manager, IRWD) – as is it causes difficulties, but mostly because of other issues that occur due to lack of power, like the cell towers.*
    - *Reply from Colton Martin (Mechanical Services Manager, IRWD) – some facilities aren't able to completely be powered by back-up generators.*
    - *Reply from Owen O'Neill (Electrical and Instrumentation Manager, IRWD) – the chief concern is that the generators are not prime service generators, they are back-up generators. The permits list them at 200 hours per year. We usually lose San Diego 5 at least once a year due to drunk driving. But now we are getting more outages due to fires and power infrastructure issues.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – is there any interest in increasing generator capacity?*
    - *Reply from Owen O'Neill (Electrical and Instrumentation Manager, IRWD) – We would need to verify generator capacity. We run into issues where the backup generator fails, we have difficulties getting the portable generators up to sites. But some generators can only run partial facilities, but we have been able to manage with this, so not likely to need to invest too much.**

- WILDFIRE
    - *Comments from Noelle Steele (Project Manager, Michael Baker Intl) – fairly significant portions of IRWD service area are in some area of fire hazard severity. We know that there have been several major fires, including one occurring outside the traditional fire season and the likelihood of more fires is high. Have there been any service interruptions or impacts to IRWD infrastructure?*
        - *Reply from Owen O'Neill (Electrical and Instrumentation Manager, IRWD) – Long duration service interruptions in the regions that the maps outline, extending a week or maybe longer requiring the replacement of 50 to 100 power poles. Edison did look at improving construction and materials to increase reliability.*
        - *Reply from Ken Pfister (Operations Manager, IRWD) – only issue was with Lowman 3 Reservoir, but that was redundant so no impact to service. Where we have had power outages, we have had back-up generators. In 2007 fire burnt down Station 9, and had to have a replacement station built and we lost the aboveground line and fencing in recent fires.*
        - *Reply from Dave Crowe (Construction Manager, IRWD) – fire season is year-round now, do we need to restructure to reflect that?*

        - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – likelihood of fires to occur beyond what we have traditionally thought of as fire season is what was intended. We are only speaking of the Bond Fire occurring outside the season as an example of severity, not as part of an analysis that limits risk being high to specific time of year. Was the pump station rebuilt in the same location and in same way?*
        - *Reply from Ken Pfister (Operations Manager, IRWD) – the original structure had a wooden roof, it was an old facility that was inherited. There was fire damage at the Portola 9 Pump Station.*
        - *Reply from John _ (__, IRWD) – we removed all vegetation and put in fire resistant vegetation and material and the new design is less susceptible to fire.*
        - *Reply from Owen O'Neill (Electrical and Instrumentation Manager, IRWD) – wasn't phos-chek enacted during Canyon 2?*
        - *Reply from Ken Pfister (Operations Manager, IRWD) – yes, I called that in and they were dropping phos-chek on our facilities.*
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – are there any wildfire mitigation plans or any solidified planning documents associated with wildfire?*
        - *Reply from Alix Stayton (Safety Specialist, IRWD) – there is an annex in the response plan.*
        - *Reply from Dave Crowe (Construction Manager, IRWD) – another water agency local to IRWD installed a helicopter quick-filling station. Is that something that should be talked about? Yorba Linda just installed this.*
        - *Reply from Ken Pfister (Operations Manager, IRWD) – during the 2010 fire, they put in one in an IRWD reservoir, he would recommend putting a hold on incorporating this idea without further discussion.*

- Critical Facilities
    - Discuss as a group which facilities listed are in hazard zones and differentiate between which ones are critical and which ones are facilities of concern. Critical facility functions for the community should be considered if there was an event/hazard in the future.

- Risk Assessment Methodology
    - Geographic area (hazard location), population, critical facilities and potential loss.
    - Talking about costs associated with damage and potential loss – also talking about loss of the facility and associated activities.

- Capabilities Assessment
    - Planning & regulatory, admin & tech, financial, education & outreach.
    - FEMA wants to know how hazard mitigation is integrated into your planning mechanisms.

- Hazard Mitigation Goals
    - Previous plan goals presented, are these still relevant? Overarching framework for the LHMP.
    - No comments; goals are still relevant and adequately portray the goals for the plan.

- Public Involvement Update

- Webpage
- Survey
- E-newsletter

Next Steps/Action Items:

- Complete capabilities assessment
- Critical facilities values
- Hazard profiles
- Prepare vulnerability/risk assessment
- Preparation for focused meetings
- Meeting 3 – March 31st
  - Risk assessment
  - Hazard mitigation strategies.
- Action items
  - Provide additional information/data through Alix
  - Continue sending out survey on website, social media, etc. Screenshots and documentation to Alix for the plan.

** Denotes a Planning Team Member who indicated they will be sending Alix data/information regarding their facilities or a specific hazard.*

A. CRITICAL FACILITIES – DRAFT (FEBRUARY 22, 2021)

1. Wells

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

3. Treatment Plants

PLANT NAME	LOCATION	CAPACITY	TREATMENT TRAIN

4. Storage and Distribution System – Reservoirs, Primary Mains and Pumping Stations

ASSET TYPE	ASSET NAME	LOCATION	AREA SERVED

ASSET TYPE	ASSET NAME	LOCATION	AREA SERVED
[redacted]	[redacted]	[redacted]	[redacted]
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ASSET TYPE	ASSET NAME	LOCATION	AREA SERVED
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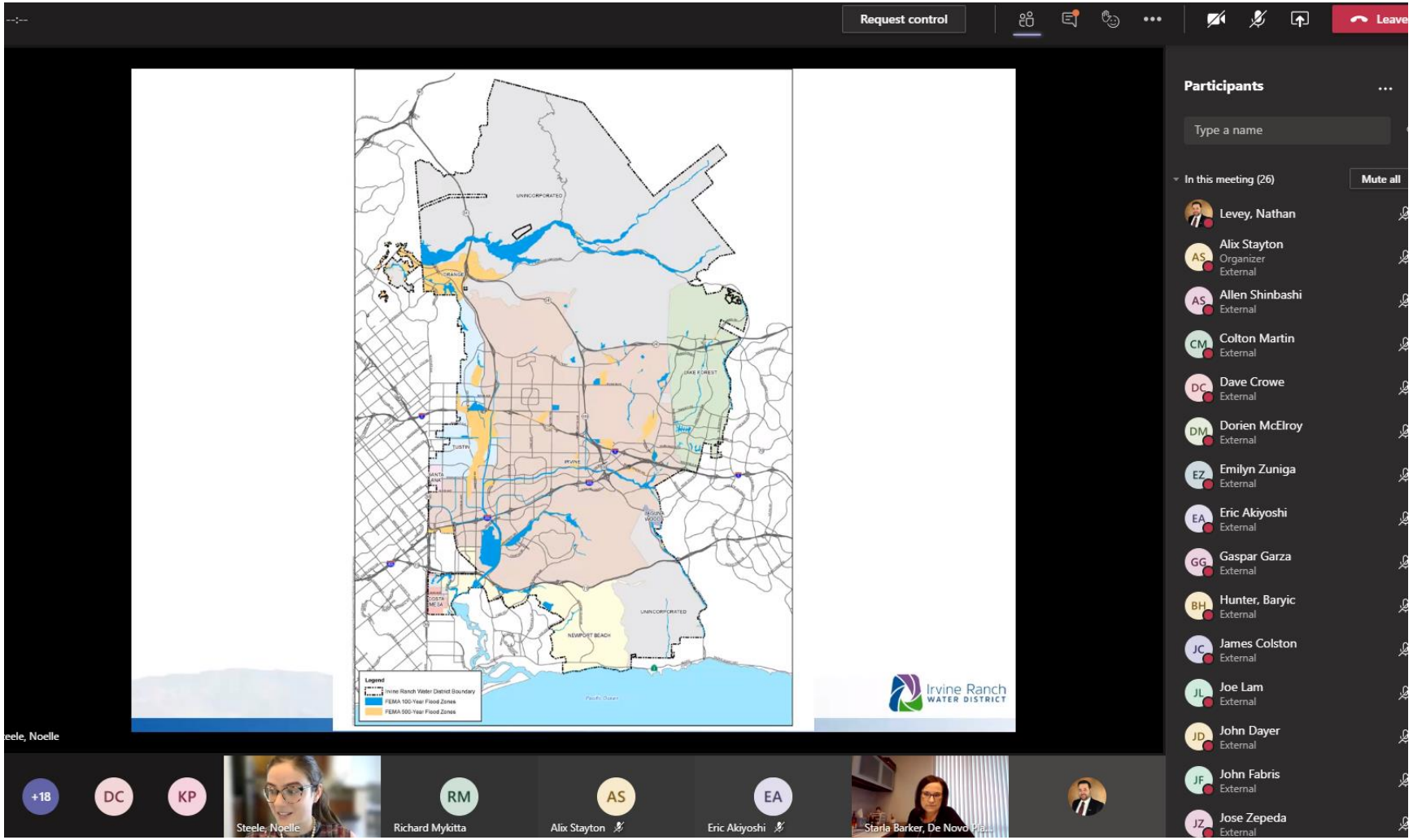
5. Other Key Facilities

ASSET NAME	FUNCTION	LOCATION
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

6. Other Assets Listed in worksheet

ASSET NAME	FUNCTION	LOCATION
[redacted]	[redacted]	


Agenda
Summary of hazards/hazard profiles
Capabilities assessment
Hazard mitigation goals
Public involvement update
Next steps
Questions/additional discussion
Irvine Ranch
WATER DISTRICT
eele, Noelle
+12
GG
TM
Thomas Malone
DC
Dave Crowe
Starla Barker, DeNovo...
CM
Colton Martin
DM
Dorien McElroy
Alix Stayton
Steele, Noelle


Request control
Leave
Participants
Type a name
In this meeting (26)
Mute all
Levey, Nathan
Alix Stayton
Organizer
External
Allen Shinbashi
External
Colton Martin
External
Dave Crowe
External
Dorien McElroy
External
Emilyn Zuniga
External
Eric Akiyoshi
External
Gaspar Garza
External
Hunter, Baryic
External
James Colston
External
Joe Lam
External
John Dayer
External
John Fabris
External
Jose Zepeda
External
UNINCORPORATED
ORANGE
LAKE FOREST
TUSTIN
IRVINE
SANTA ANA
LAGUNA WOODS
COSTA MESA
NEWPORT BEACH
UNINCORPORATED
Legend
Irvine Ranch Water District Boundary
FEMA 100-Year Flood Zones
FEMA 500-Year Flood Zones
Irvine Ranch
WATER DISTRICT
eele, Noelle
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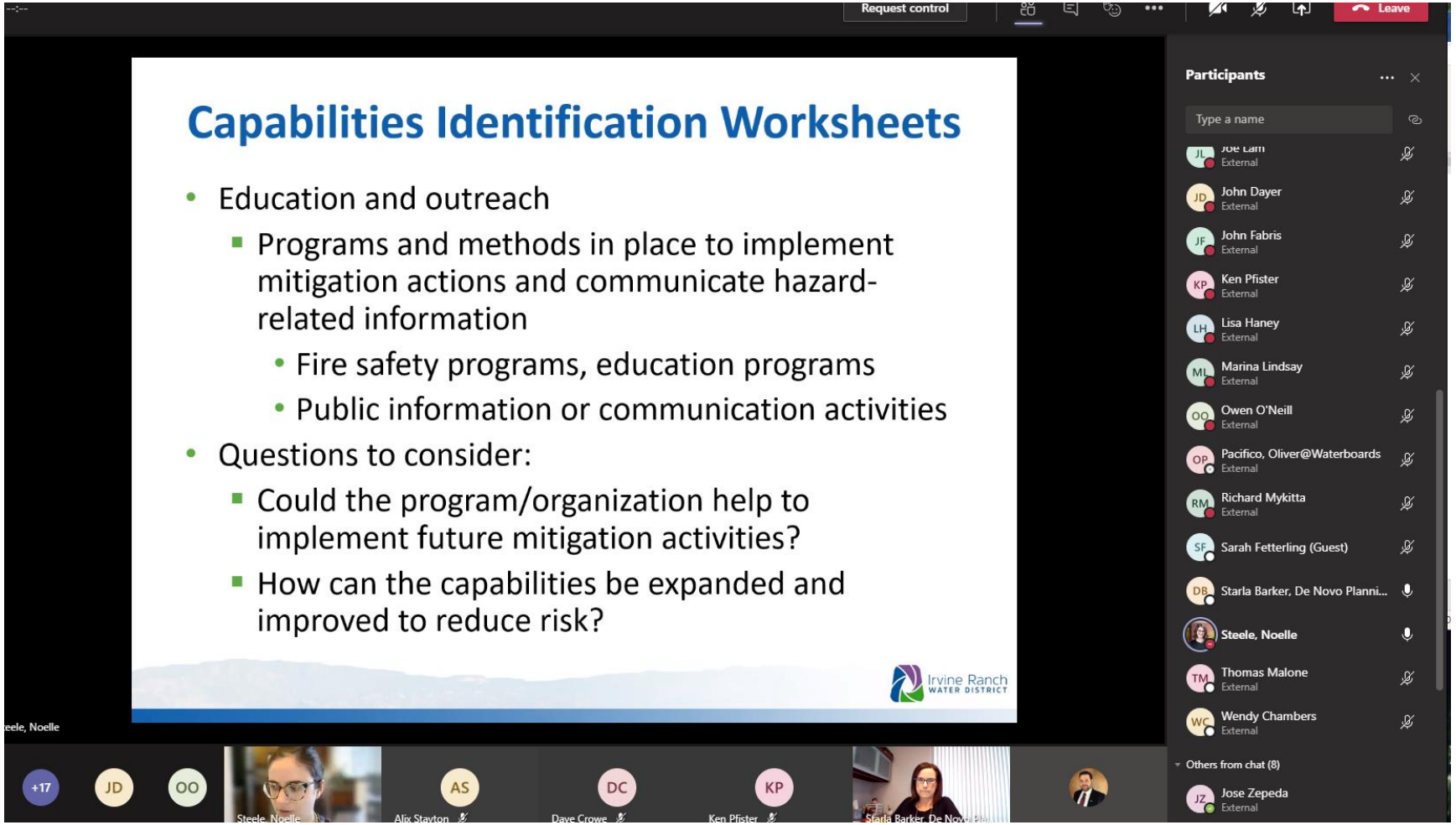
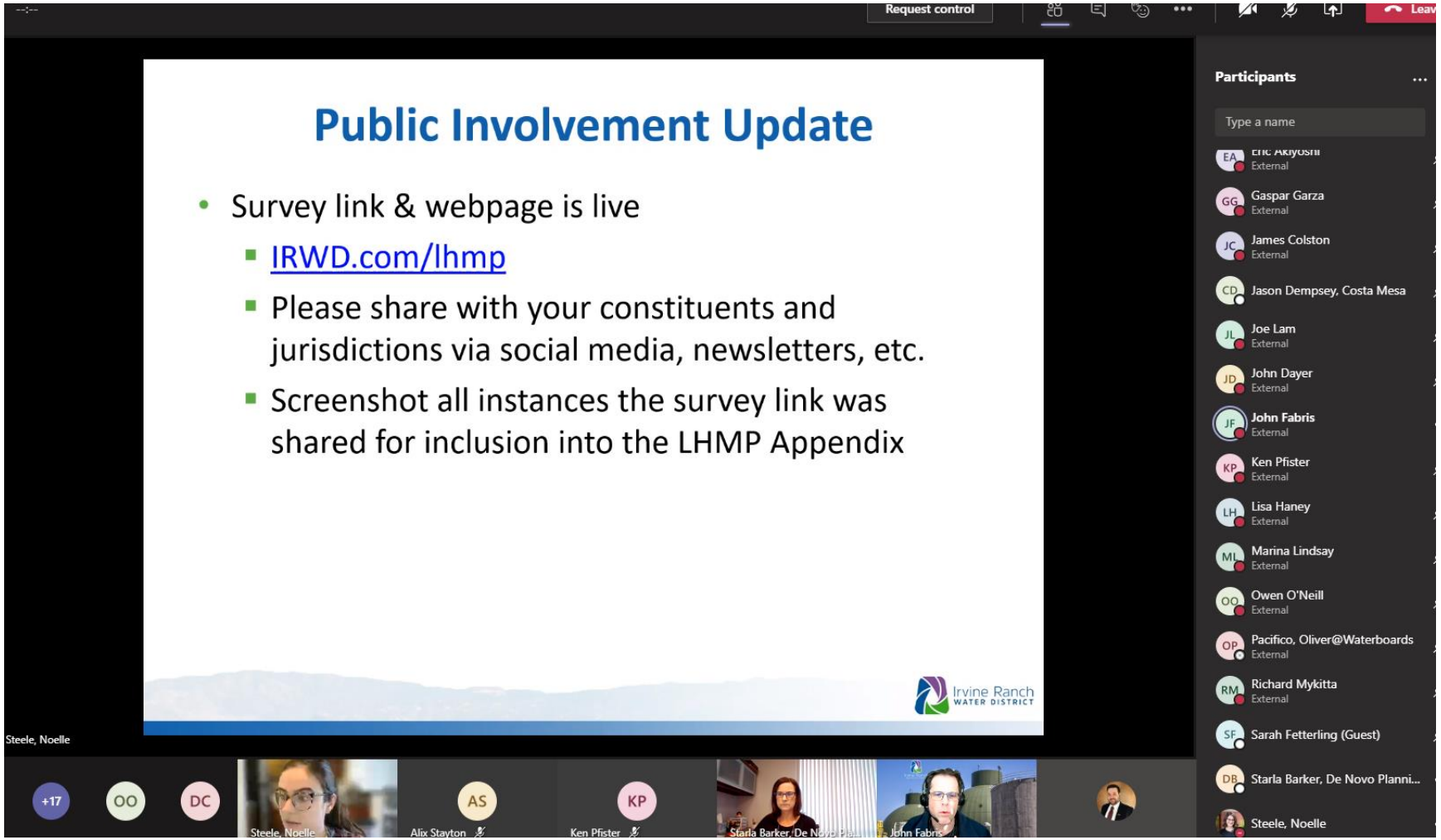
DC
KP
Steele, Noelle
RM
Richard Mylkitta
AS
Alix Stayton
EA
Eric Akiyoshi
Starla Barker, De Novo Pla...


Request control
Leave
Capabilities Identification Worksheets
Education and outreach
Programs and methods in place to implement mitigation actions and communicate hazard-related information
Fire safety programs, education programs
Public information or communication activities
Questions to consider:
Could the program/organization help to implement future mitigation activities?
How can the capabilities be expanded and improved to reduce risk?
Irvine Ranch WATER DISTRICT
Participants
Type a name
John Dayer External
John Fabris External
Ken Pfister External
Lisa Haney External
Marina Lindsay External
Owen O'Neill External
Pacifico, Oliver@Waterboards External
Richard Mykitta External
Sarah Fetterling (Guest)
Starla Barker, De Novo Planni...
Steele, Noelle
Thomas Malone External
Wendy Chambers External
Others from chat (8)
Jose Zepeda External
Alix Stayton
Dave Crowe
Ken Pfister


Request control
Public Involvement Update
Survey link & webpage is live
IRWD.com/lhmp
Please share with your constituents and jurisdictions via social media, newsletters, etc.
Screenshot all instances the survey link was shared for inclusion into the LHMP Appendix
Irvine Ranch WATER DISTRICT
Steele, Noelle
Participants
Type a name
Gaspar Garza External
James Colston External
Jason Dempsey, Costa Mesa
Joe Lam External
John Dayer External
John Fabris External
Ken Pfister External
Lisa Haney External
Marina Lindsay External
Owen O'Neill External
Pacifico, Oliver@Waterboards External
Richard Mykitta External
Sarah Fetterling (Guest)
Starla Barker, De Novo Planni...
Steele, Noelle
Alix Stayton
Ken Pfister

Steele, Noelle

Subject:	EXTERNAL: Hazard Mitigation Plan workgroup meeting #3
Location:	Microsoft Teams Meeting
Start:	Wed 3/31/2021 1:30 PM
End:	Wed 3/31/2021 3:30 PM
Recurrence:	(none)
Meeting Status:	Accepted
Organizer:	Alix Stayton

Meeting agenda and materials will be attached before the call.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Learn More | Meeting options

Eddy, Clara

From: Alix Stayton [redacted]
Sent: Monday, March 22, 2021 9:20 PM
To: Emilyn Zuniga; Ken Pfister; Gaspar Garza; Dorien McElroy; Owen O'Neill; Colton Martin; Todd Colvin; Dave Crowe; John Dayer; Malcolm Cortez; Eric Akiyoshi; Ian Swift; Allen Shinbashi; Randy Williams; Joe Lam; Lars Oldewage; Lisa Haney; John Fabris
Cc: Wendy Chambers; Jose Zepeda; Richard Mykitta; Kevin Burton; Thomas Malone; Cheryl Clary; James Colston
Subject: EXTERNAL: LHMP Planning Meeting #3
Attachments: Planning Team Meeting #3 Agenda final.docx; Capability Assessment Worksheets_Copy for Alix_March 2021 Update.docx

Good evening,

Attached you will find the agenda for next week's Local Hazard Mitigation Planning Meeting #3. Please do the following to get ready for the meeting:

1. Expect to hear from me regarding hazard mitigation projects you have done, are doing, or will do. Thanks to the departments who have already been working on this list with me. We will also use this information to inform the Capabilities Assessment (attached, in case you'd like to see).
2. Go to pre-register for an IdeaFlip account using https://ideaflip.com/. It only asks for an email address, and doesn't send any spam emails to your account. This will allow us to do a collaborative post-it note activity and identify mitigation actions during the meeting.
3. Do your best to answer questions or respond to requests for information as quickly as you are able.

Please feel free to call or email if you need more information or have questions. As we build this list of hazard mitigation projects, it will likely become obvious who should attend the meeting for each team. I will discuss with teams that need more direction. This way, we can develop the needed information in a timely manner with the correct subject matter experts. Everyone has been so helpful with this initial heavy lift of getting the foundational data together, I appreciate your help. Looking forward to talking with all of you about your hazard mitigation work.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ra
WATER DIST
[redacted]

Eddy, Clara

From: Alix Stayton [redacted]
Sent: Tuesday, April 20, 2021 12:09 PM
To: Emilyn Zuniga; pfister; garza; mcelroy; Owen O'Neill; martinc; colvin; crowe; John Dayer; Malcolm Cortez; akiyoshi; swift; shinbash; williams; lam; oldewage; haney; John Fabris; Steele, Noelle; Marina Lindsay; moeder; toland; moreno
Cc: chambersw; zepeda; Richard Mykitta; burton; malone; clary; colston; [redacted] Stonich, Amy; Levey, Nathan; Daniel Harrison; palacio; Matthew Barba
Subject: EXTERNAL: RE: Hazard Mitigation Plan workgroup meeting #3
Attachments: Meeting 3 Worksheet.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon,

Thanks to all who were able to attend Planning Meeting #3. If you have not yet already, please send your completed worksheet (attached again for your convenience) as soon as possible, for inclusion in the plan documentation. Please let me know if you have questions or need more information.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST
[redacted]

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Alix Stayton	Safety Specialist, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	✓
Allen Shinbashi	Manager of Risk & Contracts, Contracts & Risk Management	Irvine Ranch Water District	[redacted]	[redacted]	✓
Amy Stonich	Assistant Director of Community Development	City of Lake Forest	[redacted]	[redacted]	
Andy Lauridsen	Vice President	Orange City Firefighters, Executive Board	[redacted]	[redacted]	✓
Anisha Malik	Planner	Michael Baker International	[redacted]	[redacted]	
Ashley Melchor	Management Assistant	City of Lake Forest	[redacted]	[redacted]	✓
Baryic Hunter	Division Chief	Operations District 4, Orange County Fire Authority	[redacted]	[redacted]	
Cheryl Clary	Executive Director, Finance and Administration	Irvine Ranch Water District	[redacted]	[redacted]	✓
Colt Martin	Mechanical Services Manager, Mechanical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Dave Crowe	Construction Manager, Construction Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Denien Rivenburg	Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	
Derek Moreno	Asset Systems Analyst	Irvine Ranch Water District	[redacted]	[redacted]	✓
Dorien McElroy	Collections Systems Manager, Collection Systems	Irvine Ranch Water District	[redacted]	[redacted]	✓
Dustin Grinstead	Admin Captain for Chief Sherwood	OC Fire	[redacted]	[redacted]	
Emilyn Zuniga	Safety Manager, Safety Department	Irvine Ranch Water District	[redacted]	[redacted]	✓
Eric Akiyoshi	Engineering Manager, Planning	Irvine Ranch Water District	[redacted]	[redacted]	✓
Gaspar Garza	Operations Manager, MWRP Operations/Biosolids	Irvine Ranch Water District	[redacted]	[redacted]	✓
Ian Swift	Natural Resources Manager, Natural Treatment System Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Jacob Moeder	Capital Projects Senior Engineer	Irvine Ranch Water District	[redacted]	[redacted]	✓
James Colston	Director Water Quality Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Jason Dempsey	Emergency Services Administrator	City of Costa Mesa	[redacted]	[redacted]	
Joe Lam	Automation Manager, Automation	Irvine Ranch Water District	[redacted]	[redacted]	✓
Joe Meyers	Emergency Management Coordinator	Tustin Police Department	[redacted]	[redacted]	
John Dayer	Facilities/Fleet Manager, Facilities Services & Fleet Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
John Fabris	Public Affairs Manager, Public Affairs	Irvine Ranch Water District	[redacted]	[redacted]	✓
Jose Zepeda	Director of Recycling Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Joyce LaPointe	Lieutenant	Office of Emergency Management, Costa Mesa Police Department	[redacted]	[redacted]	

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Katie Eing	Disaster Services Coordinator	Newport Beach Police Department	[redacted]	[redacted]	
Ken Pfister	Operations Manager, Water Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Lars Oldewage	Water Quality Manager, Water Quality	Irvine Ranch Water District	[redacted]	[redacted]	✓
Lisa Haney	Regulatory Compliance Manager, Regulatory Compliance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Malcolm Cortez	Engineering Manager, Engineering – Operations Support	Irvine Ranch Water District	[redacted]	[redacted]	✓
Marina Lindsay	Water Resources Planner, Planning	Irvine Ranch Water District	[redacted]	[redacted]	✓
Matthew Barba	Director	Orange City Firefighters, Board of Directors	[redacted]	[redacted]	✓
Natalie Palacio	Water Resources Specialist	Irvine Ranch Water District	[redacted]	[redacted]	✓
Nathan Levey	Assistant Environmental Planner	Michael Baker International	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Noelle Steele	Project Manager	Michael Baker International	[redacted]	[redacted]	✓
Oliver Pacifico	Water – South Coast Section	State Water Resources Control Board	[redacted]	[redacted]	
Owen O'Neill	Electrical & Instrumentation Manager, Electrical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓
Randy Williams	Network and Cybersecurity Manager, Information Systems	Irvine Ranch Water District	[redacted]	[redacted]	✓
Richard (Rick) Mykitta	Director of Maintenance	Irvine Ranch Water District	[redacted]	[redacted]	✓
Robert (Bobby) Simmons	Emergency Management Administrator	Office of Emergency Management, City of Irvine	1[redacted]	[redacted]	
Robert Stefano	Deputy Chief of Operations	Emergency Operations Section, Orange City Fire Department	[redacted]	[redacted]	
Sarah Fetterling	Sargent	City of Tustin Police Department	[redacted]	[redacted]	
Scott Toland	Senior Engineer	Irvine Ranch Water District	[redacted]	[redacted]	✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #3
March 31, 2021

First Name Last Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Shane Sherwood	Division Chief	Operations District 2, Orange County Fire Authority	[redacted]	[redacted]	
Sharlyn de la Paz	Senior Management Analyst	City of Lake Forest	[redacted]	[redacted]	
Starla Barker	Technical Consultant	De Novo Planning	[redacted]	[redacted]	✓
Stephen Foster	Emergency Management Coordinator	City of Tustin	[redacted]	[redacted]	✓
Steve Rhyner	Emergency Operations Coordinator	Emergency Management, City of Santa Ana	[redacted]	[redacted]	
Thomas Malone	Director for Information Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Todd Colvin	Water Maintenance Supervisor, Field Services	Irvine Ranch Water District	[redacted]	[redacted]	✓
Vicki Osborn	Director of Emergency Management	Metropolitan Water District of Orange County	[redacted]	[redacted]	
Wendy Chambers	Executive Director of Operations	Irvine Ranch Water District	[redacted]	[redacted]	✓

Michael Baker
INTERNATIONAL

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #3
Wednesday, March 31, 2021
1:30 PM – 3:30 PM – via Microsoft Teams

AGENDA

---

1) **Risk Assessment/Vulnerability Overview**
   - Hazards Profiled
     a. Mapped Hazards: Coastal Hazards, Dam/Reservoir Failure, Flood, Geologic Hazards, Human Caused Hazards, Landslide/Mudflow, Seismic Hazards, Wildfire
     b. Non-Mapped Hazards: Drought, Severe Weather
   - Coastal Hazards
   - Dam/Reservoir Failure
   - Flood
   - Geologic Hazards
   - Human Caused Hazards
   - Landslide/Mudflow
   - Seismic Hazards
   - Wildfire
   - Summary of Vulnerability
     a. Table showing any overlaps in hazard vulnerability for all mapped/non-mapped hazard

2) **Mitigation Strategy Discussion – using IdeaFlip.com**
   - For each hazard:
     - Identify 2-3 issues or concerns specific to each hazard
     - Write 1 issue/concern on each post-it
     - Place post-its on hazard sheet grouping like ideas
   - Select 1-2 issues or concerns:
     - Identify a potential mitigation action
     - Write the issue/concern on the post-it with the mitigation action
     - Place post-its when done

3) **Capabilities Assessment**
   - Review of capabilities that we received
   - Are there opportunities to improve upon the capabilities?
     - Can a plan be used to identify hazards and implement mitigation actions?
     - How can the capabilities be expanded and improved to reduce risk?

- Is there a missing capability that needs to be considered?
- Is additional staff/community training needed?
- What financial resources can be used?
- How can partner agencies/organizations work together to inform/educate the community?

4) Public Involvement Update

- Webpage
- Survey

5) Next Steps

- Summarize survey results
- Complete vulnerability assessment
- Mitigation actions and prioritization
- Prepare draft plan components
- Meeting 4

Irvine Ranch
WATER DISTRICT

IRVINE RANCH WATER DISTRICT

HAZARD MITIGATION PLAN

March 31, 2021

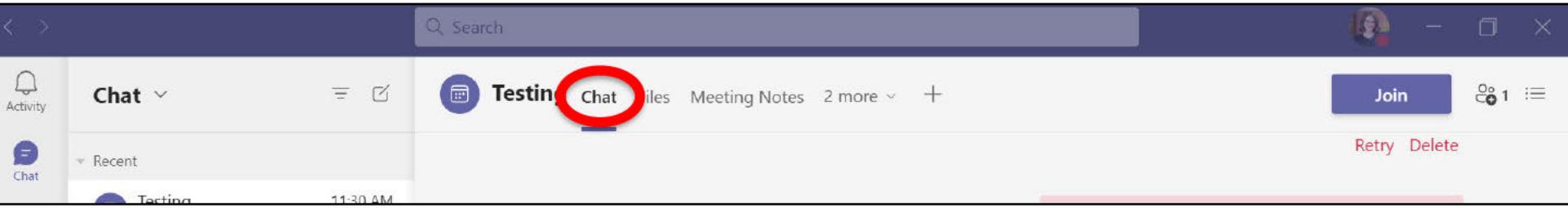
Michael Baker
INTERNATIONAL

Agenda

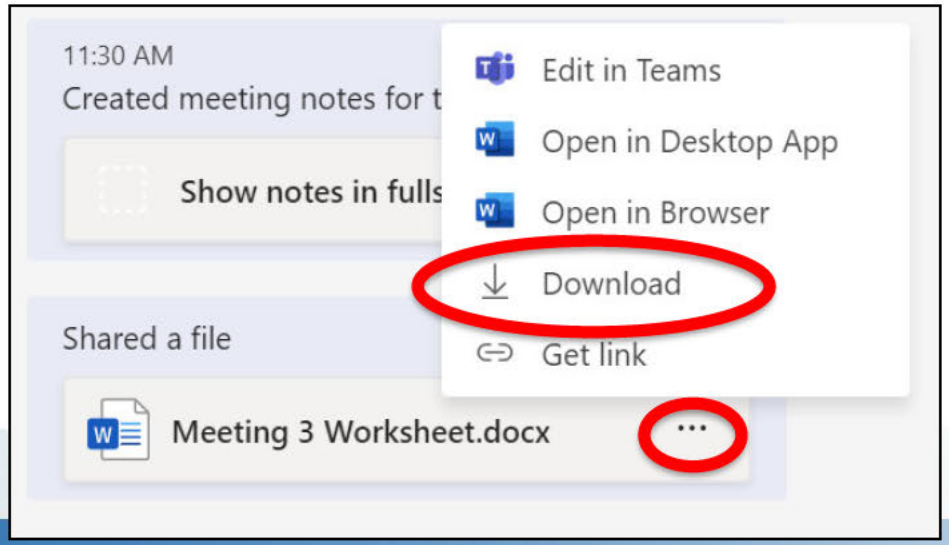
- Risk Assessment/Vulnerability Overview
- Mitigation Strategy Discussion
- Capabilities Assessment
- Public Involvement Update
- Next Steps
- Questions/Additional Discussion

Worksheet Instructions

- Download your HMP Meeting #3 Worksheet in our Microsoft Teams meeting channel



- Click the “chat” function, and download



1. Click Dots
2. Click Download

Irvine Ranch WATER DISTRICT

Worksheet Instructions

Participant Information:
Name:
Title:
Agency:

*** Important**

INSTRUCTIONS:

- Identify 2 – 3 issues or concerns specific to each hazard
- Use one bullet point per issue/concern on the "Concerns" column
- Identify potential mitigation measures/actions based on your concern
- Use one bullet point per mitigation action on the "Potential Mitigation" column
- NOTE: Hazards are included in the order of our presentation discussion. This worksheet is designed to accompany our discussion and is NOT intended to be post-meeting "homework"
- Post Meeting: Please upload this worksheet back into our Microsoft Teams Channel, using the instructions at the end of the document

MAPPED HAZARDS

COASTAL HAZARDS – Concerns (Coastal Erosion, Sea Level Rise, Tsunami)	**COASTAL HAZARDS – Potential Mitigation** (Coastal Erosion, Sea Level Rise, Tsunami)
• (XX insert coastal hazard concerns here)	• (XX insert coastal hazard concerns here)
•	•
•	•

Irvine Ranch WATER DISTRICT

Risk Assessment/Vulnerability Overview

Irvine Ranch WATER DISTRICT

Hazards Profiled

- Costal Hazards
  - Coastal Erosion
  - Sea Level Rise
  - Tsunami
- Dam/Reservoir Failure
- Drought
- Flood
- Geologic Hazards
  - Expansive Soils
  - Land Subsidence
- Human Caused Hazards
  - Hazardous Materials
  - Terrorism/Sabotage (cyberattacks)
- Landslide/Mudflow
- Seismic Hazards
  - Fault Rupture
  - Ground Shaking
  - Liquefaction
- Severe Weather
  - Coastal Storm/Winter Storm
  - Windstorm (Santa Ana winds)
  - Power Outage (secondary impact)
- Wildfire

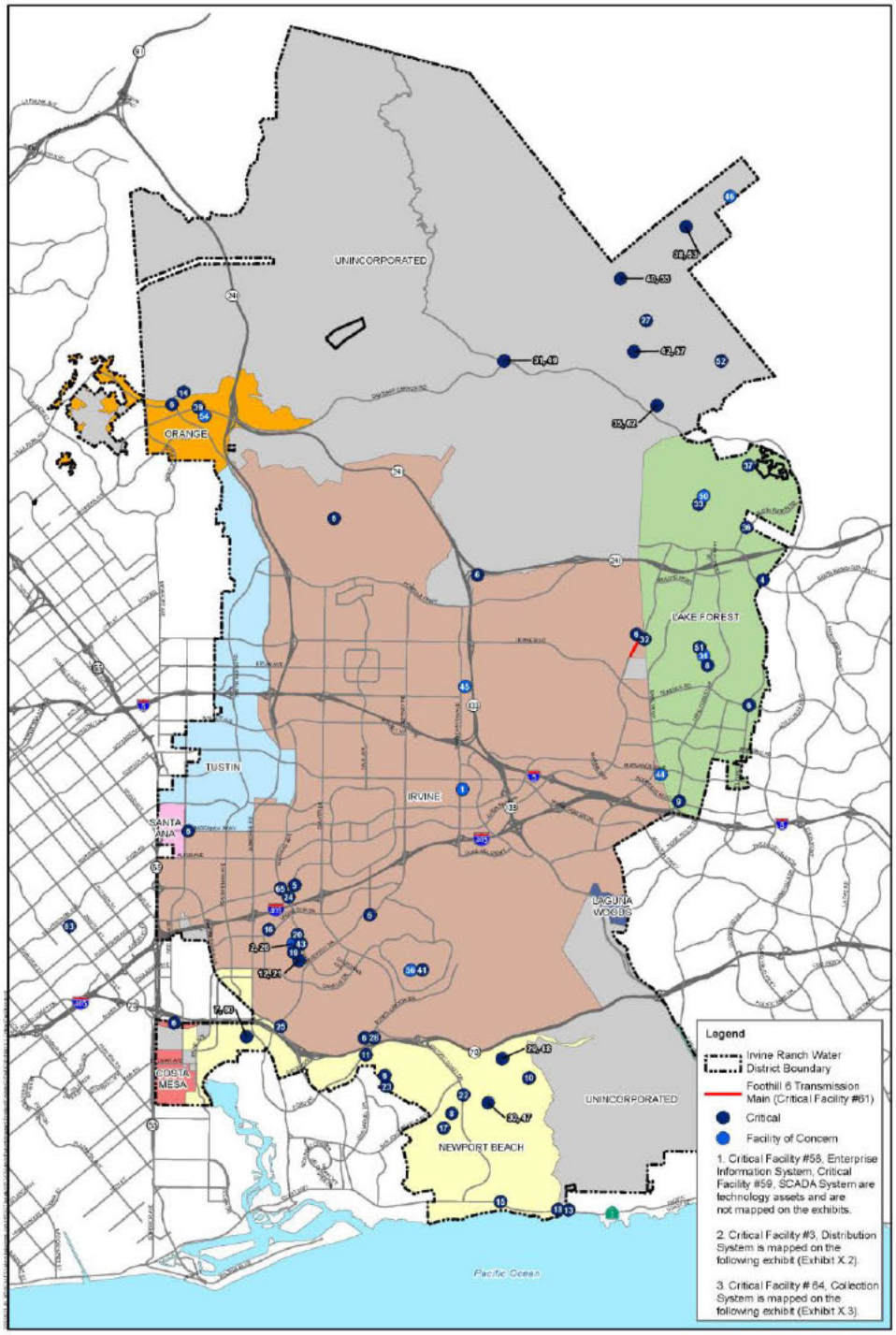
Irvine Ranch WATER DISTRICT

Critical Facilities

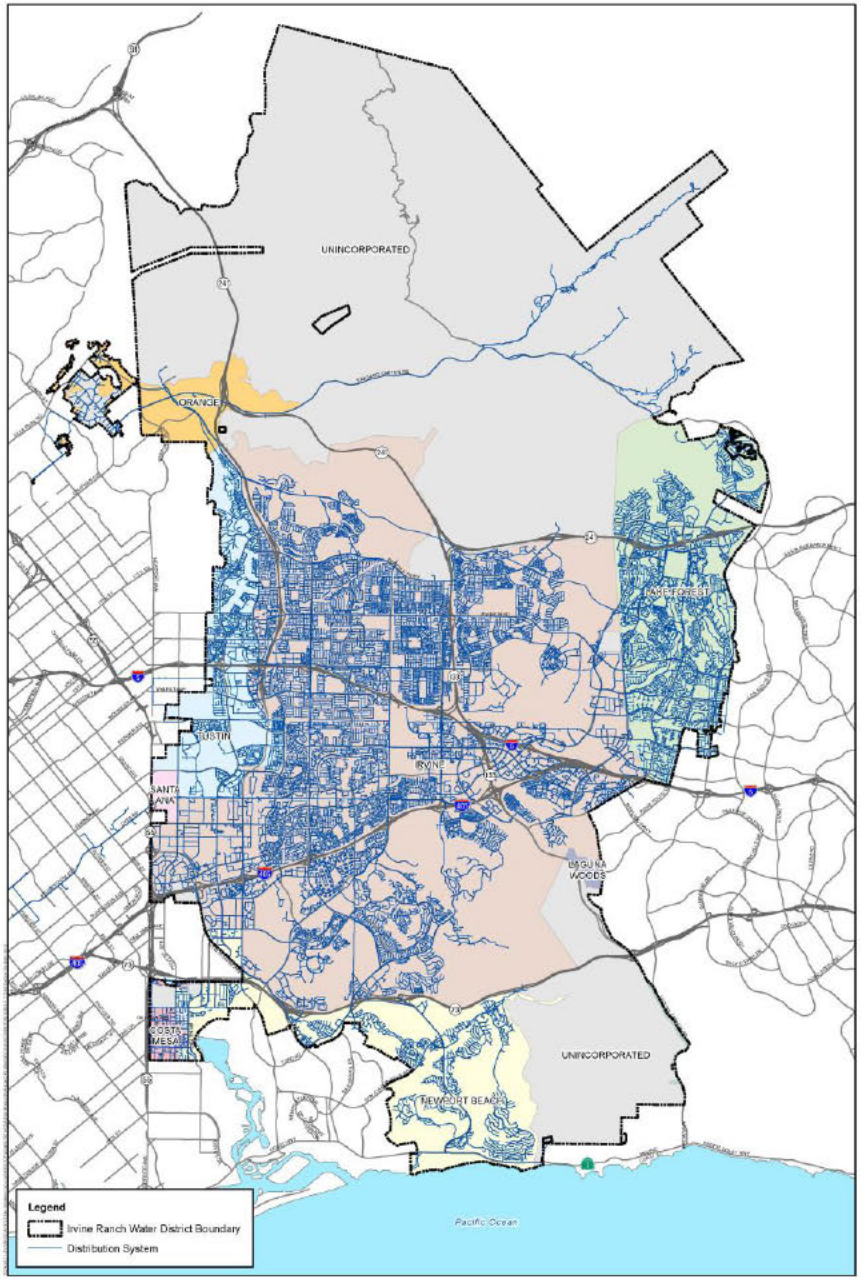
- Utilized the AWIA RR&A critical assets as a basis for developing Critical Facilities List
- Coordinated with Collections & Engineering Departments to tailor list to the HMP
  - Focused on incorporating wastewater facilities, which were excluded from AWIA process but are critical to providing services to IRWD customers
- Siphon critical facilities to be mapped early next week based on on-going discussions with Collections

Facility Types

- **Critical Facilities**
  - Facilities that are **critical** to provide potable and wastewater services to IRWD customers
  - Failure of critical facilities would result in significant issues in maintaining service
  - Many critical facilities are the sole source of water at their location, do not have a backup, or provide service to areas with known hazards/risk
- **Facilities of Concern**
  - Facilities that are **important** to provide potable and wastewater services to IRWD customers
  - Failure of a facility of concern would create slow downs/challenges, but ultimately IRWD could maintain service in the short term



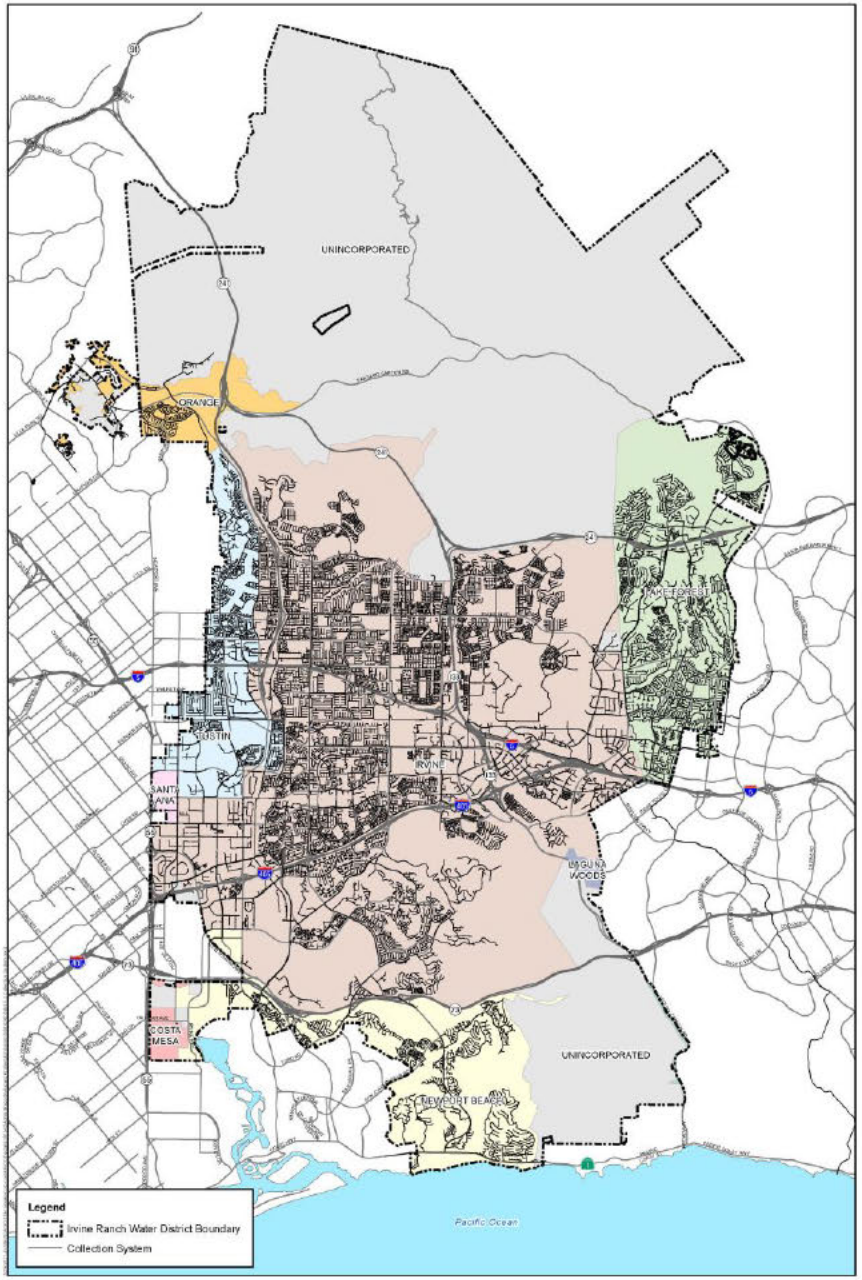
Irvine Ranch WATER DISTRICT



0 4,250 8,500 Feet

Source: IRWD, 2021, FEMA, 2009

Irvine Ranch Water District Local Hazard Mitigation Plan
Distribution System
Exhibit 4.X.2



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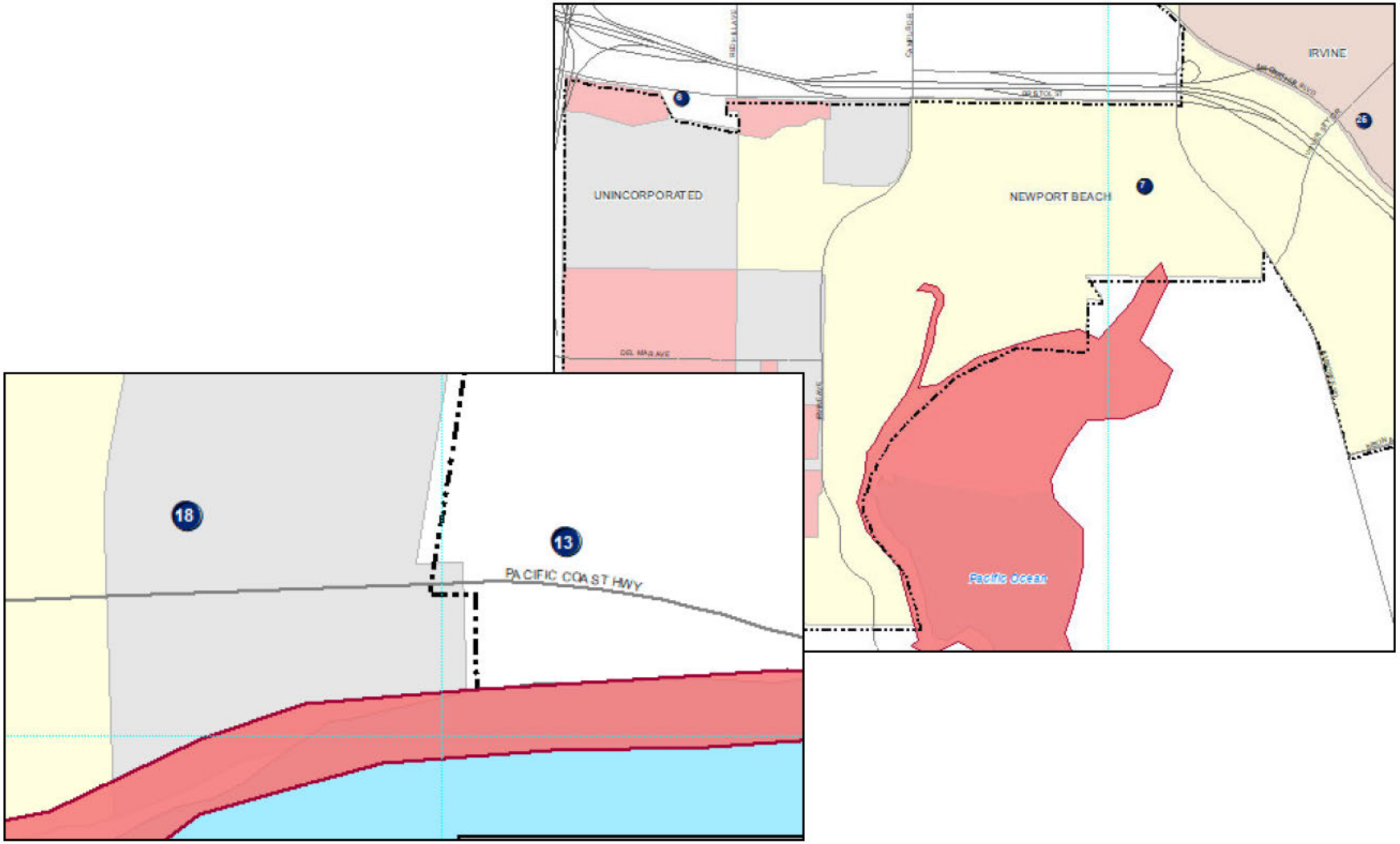
Source: IRWD, 2021, FEMA, 2009

Irvine Ranch Water District Local Hazard Mitigation Plan
Collection System
Exhibit X.3

COASTAL HAZARDS

Irvine Ranch WATER DISTRICT

Coastal Hazards - Tsunami



Irvine Ranch WATER DISTRICT

DAM/RESERVOIR INUNDATION

Irvine Ranch WATER DISTRICT

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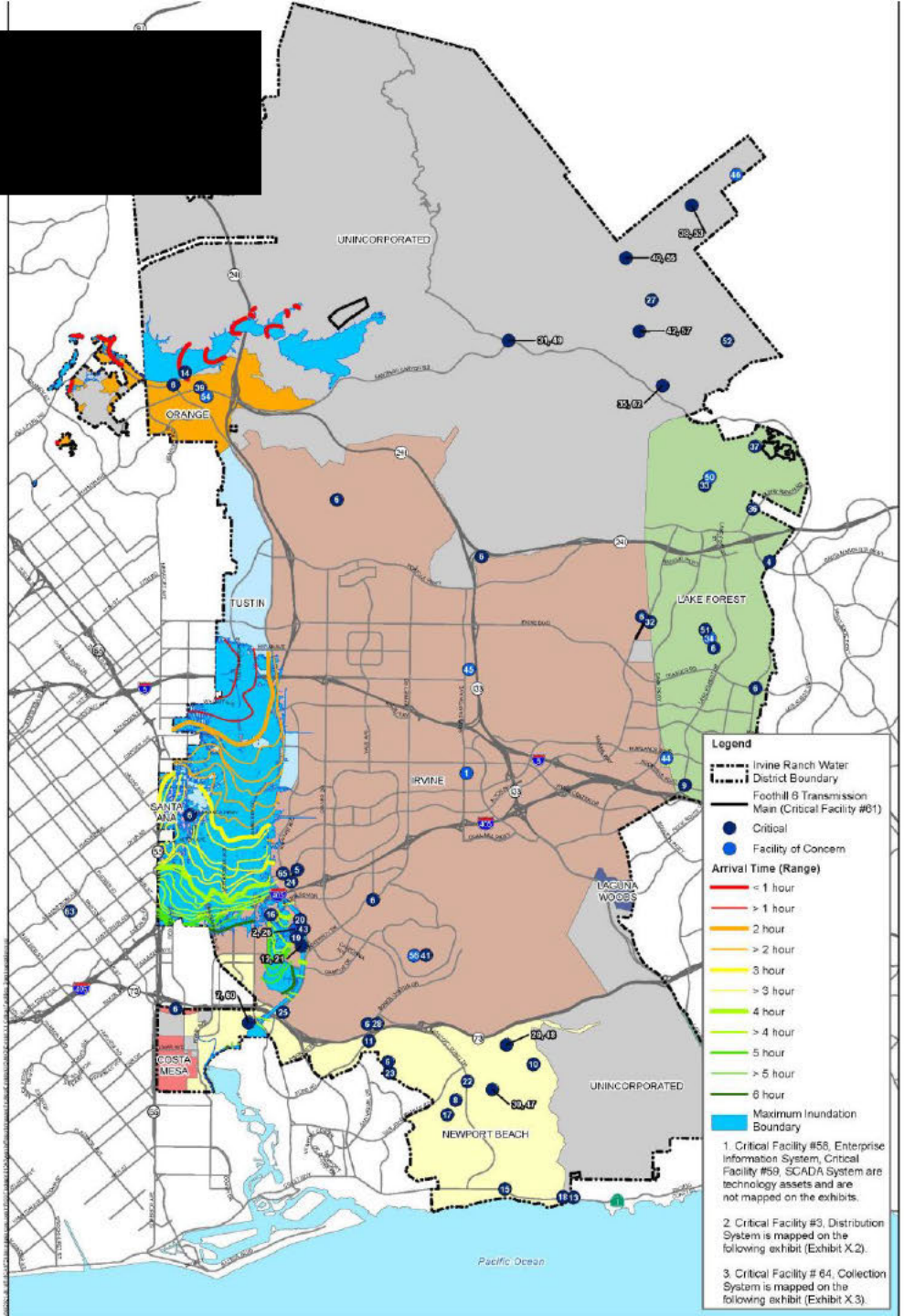


Santiago Dam Only

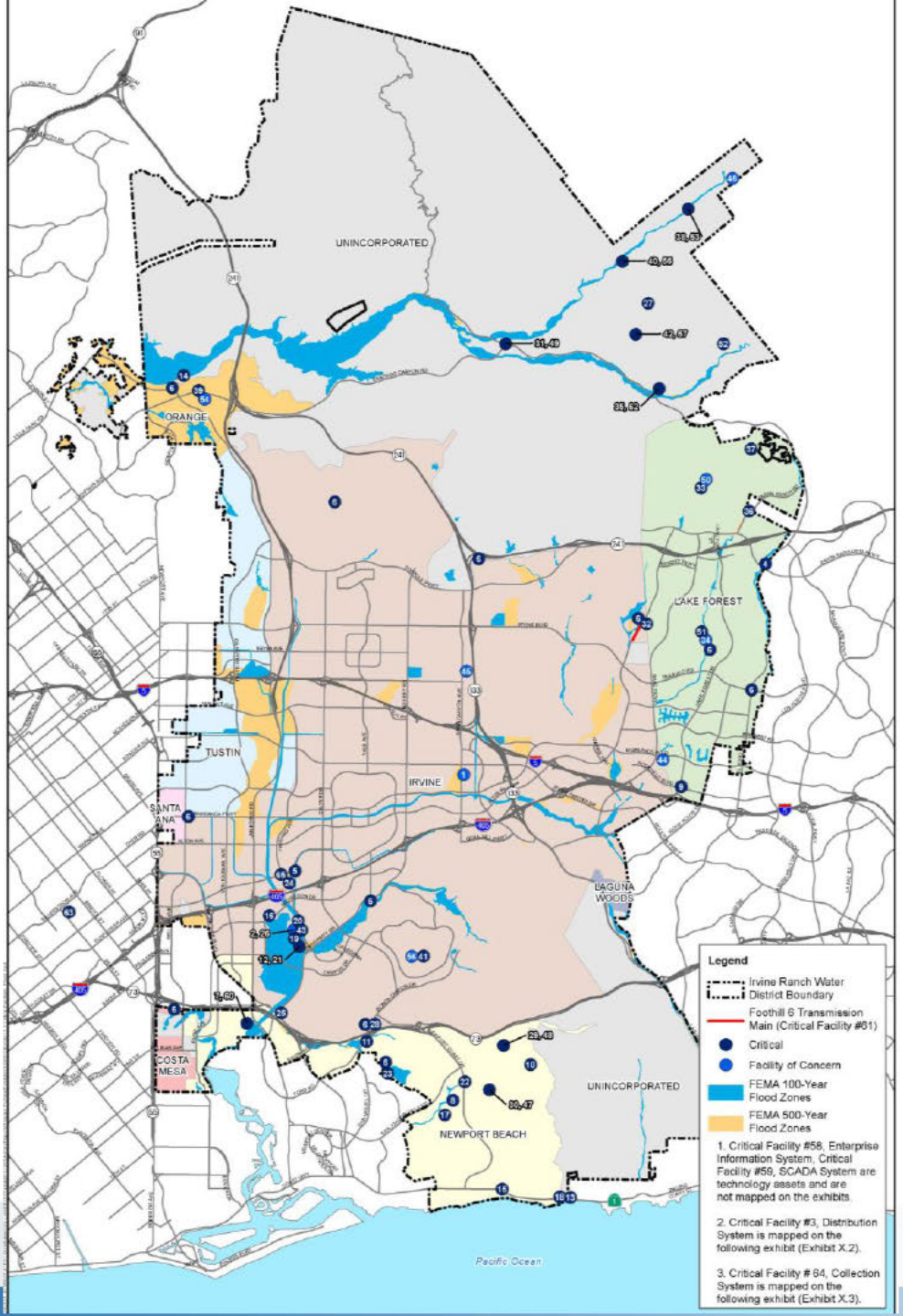
Irvine Ranch WATER DISTRICT

Dam Inundation – Santiago Dam

Map ID	Name	Asset Type	Status	Location	Arrival Time
14	Irvine Park	Lift Station	Critical	1 Irvine Park Road, Irvine	Between 9 and 12 min
2	Michelson Biosolids	Biosolids Treatment	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612	Between 4 hr and 4 hr 10 min
19	MWRP MPS-3	Lift Station	Critical	3512 Michelson Drive, Irvine	Between 4 hr and 4 hr 10 min
26	Michelson Operations Center	Operations Staff Offices	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612	Between 4 hr and 4 hr 10 min
43	Michelson MWRP	Recycled Water	Critical	3512 Michelson Drive, Irvine, CA 92612	Between 4 hr and 4 hr 10 min
63	Deep Aquifer Treatment System (DATS)	Treatment System	Critical	1704 W. Segerstrom, Santa Ana	Between 4 hr and 4 hr 10 min

FLOOD HAZARDS

Irvine Ranch WATER DISTRICT



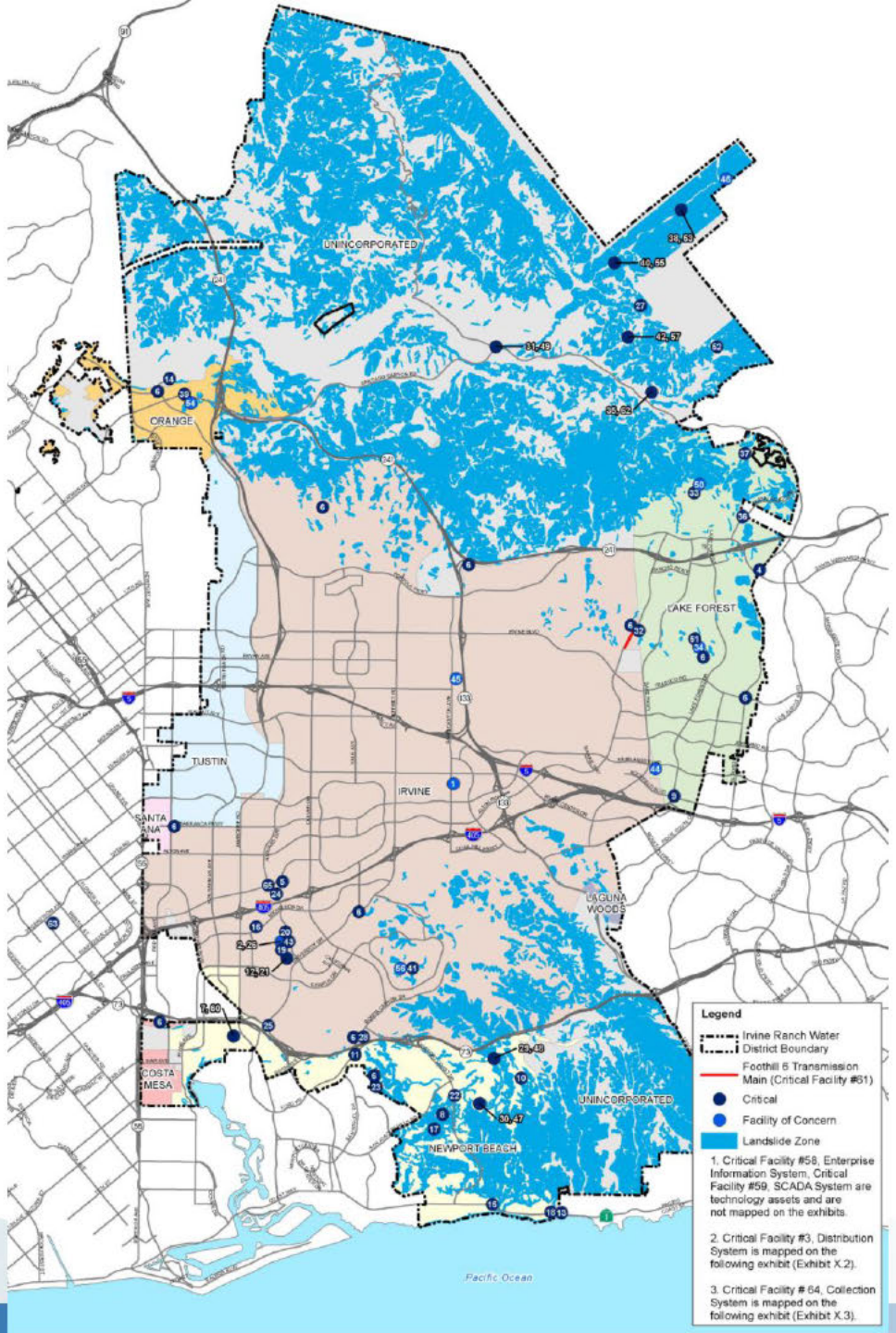
Irvine Ranch WATER DISTRICT

Flood

Map ID	Name	Asset Type	Status	Location
3	Distribution System	Distribution System	Critical	***75.31 miles***
6	Met Source Water	Intake	Critical	NA
12	Duck Club	Lift Station	Critical	3512 Michelson Drive, Irvine
14	Irvine Park	Lift Station	Critical	1 Irvine Park Road, Irvine
21	MWRP Caretaker Housing	Lift Station	Critical	3512 Michelson Drive, Irvine
40	Shaw Pump Station	Pump Station	Critical	28934 Silverado Canyon Road
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd
64	Collection System – 53 miles	Wastewater Collection System	Critical	***53 miles***

LANDSLIDE HAZARDS

Irvine Ranch WATER DISTRICT



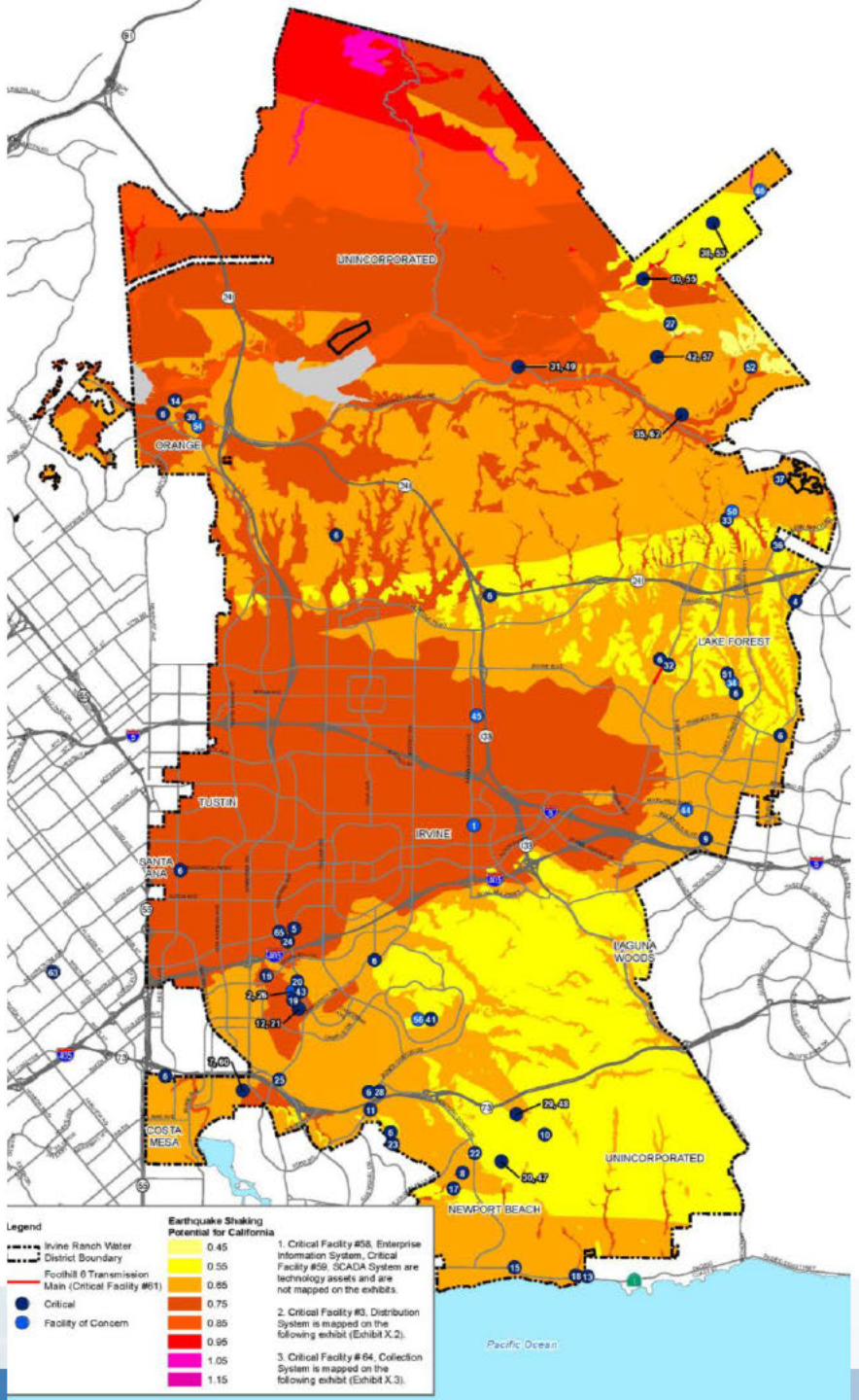
Irvine Ranch WATER DISTRICT

Landslide

Map ID	Name	Asset Type	Status	Location
3	Distribution System	Distribution System	Critical	***40.65 miles***
8	Buck Gully	Lift Station	Critical	21594 White Pine, Newport Beach
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	Critical	3262 University Drive, Irvine
27	Benner Reservoir	Pump Station	Critical	28741 Williams Canyon Rd
46	Chapman Reservoir	Reservoir	Facility of Concern	14909 Mill Rd
52	Modjeska Reservoir	Reservoir	Critical	29265 Modjeska Canyon Rd
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd
57	Williams Canyon Reservoir	Reservoir	Critical	27600 Williams Canyon Rd
64	Collection System	Wastewater Collection System	Critical	***31.68 miles***

SEISMIC HAZARDS – GROUND SHAKING

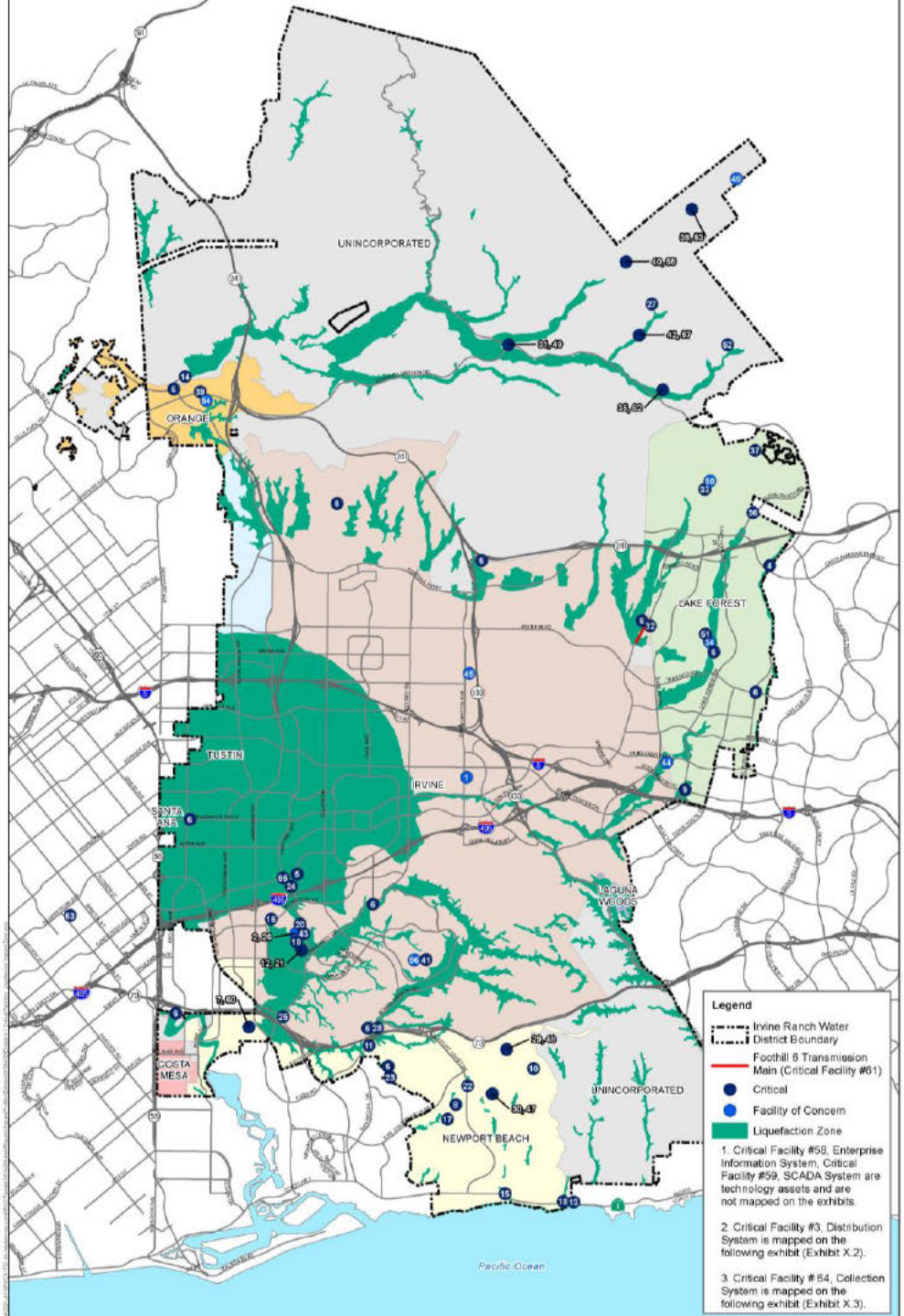
Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

SEISMIC HAZARDS - LIQUEFACTION

Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

Liquefaction

Map ID	Name	Asset Type	Status	Location
2	Michelson Biosolids	Biosolids Treatment	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612
3	Distribution System	Distribution System	Critical	***475.14 miles***
4	El Toro Diversion Structure	Diversion Structure	Critical	NA
5	San Mateo Diversion	Diversion Structure	Critical	103 San Mateo, Irvine
6	Met Source Water	Intake	Critical	NA
9	Canada	Lift Station	Critical	22952 Lake Forest Drive, Lake Forest
12	Duck Club	Lift Station	Critical	3512 Michelson Drive, Irvine
15	Los Trancos Low Flow	Lift Station	Critical	7303 Pacific Coast Highway, Newport Beach
18	Muddy Canyon Low Flow	Lift Station	Critical	8333 Pacific Coast Highway, Newport Beach
19	MWRP MPS-3	Lift Station	Critical	3512 Michelson Drive, Irvine
21	MWRP Caretaker Housing	Lift Station	Critical	3512 Michelson Drive, Irvine
22	Newport Coast	Lift Station	Critical	21244 Newport Coast Drive, Newport Beach
24	Harvard	Lift Station	Critical	17675.25 Harvard Avenue, Irvine

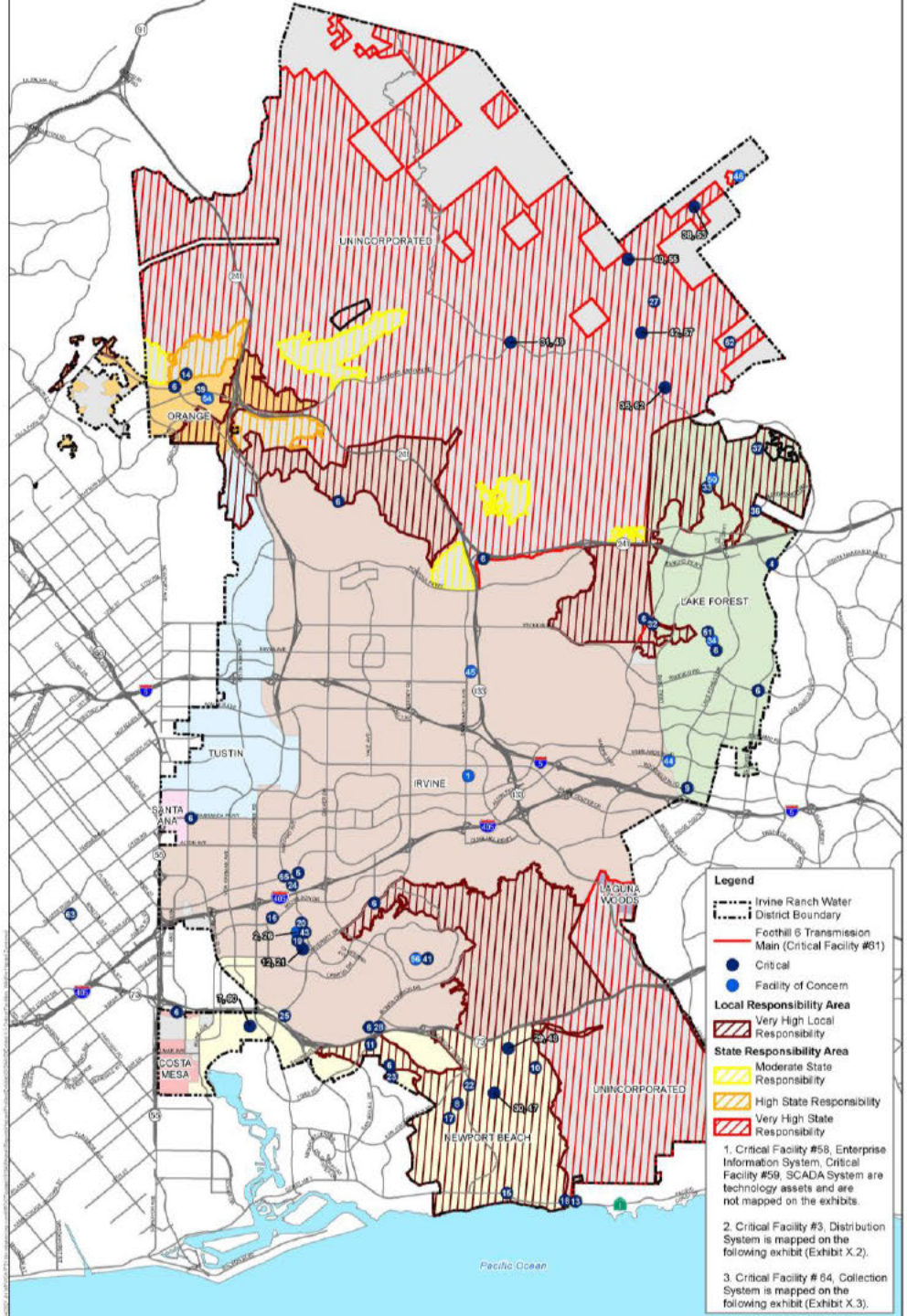
Liquefaction

Map ID	Name	Asset Type	Status	Location
26	Michelson Operations Center	Operations Staff Offices	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612
28	Coastal OC 63-Zn.4 Pump Station	Pump Station	Critical	4925 1/2 Bonita Canyon Dr, Irvine 92603
42	Williams Canyon Pump Station (Benner)	Pump Station	Critical	27600 Williams Canyon Road
43	Michelson MWRP	Recycled Water	Critical	3512 Michelson Drive, Irvine, CA 92612
44	Los Alisos Water Recycling Plant (LAWRP)	Recycling Plant	Facility of Concern	22312 Muirlands Boulevard, Lake Forest
61	Foothill 6 Transmission Main	Transmission Main	Critical	
64	Collection System	Wastewater Collection System	Critical	***387.35 miles***
65	Harvard Area Trunk Diversion Structure (HATS)	Diversion Structure	Critical	NA

Irvine Ranch WATER DISTRICT

WILDFIRE

Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

Wildfire

Map ID	Name	Asset Type	Status	Location
3	Distribution System	Distribution System	Critical	***221.58 miles***
6	Met Source Water	Intake	Critical	NA
8	Buck Gully	Lift Station	Critical	21594 White Pine, Newport Beach
10	Coastal Ridge	Lift Station	Critical	22322 Pacific Mist, Newport Beach
11	Coyote Canyon	Lift Station	Critical	3000 ½ Bonita Canyon Road, Irvine
14	Irvine Park	Lift Station	Critical	1 Irvine Park Road, Irvine
15	Los Trancos Low Flow	Lift Station	Critical	7303 Pacific Coast Highway, Newport Beach
17	Montecito	Lift Station	Critical	21 Via Burrone, Newport Beach
18	Muddy Canyon Low Flow	Lift Station	Critical	8333 Pacific Coast Highway, Newport Beach
22	Newport Coast	Lift Station	Critical	21244 Newport Coast Drive, Newport Beach
23	San Joaquin Housing	Lift Station	Critical	32 Ridgeline Drive, Newport Beach
27	Benner Reservoir	Pump Station	Critical	28741 Williams Canyon Rd
29	Coastal Zn 6-7 Pump Station	Pump Station	Critical	20783 Vista Ridge Rd, Newport Beach 92657

Wildfire

Map ID	Name	Asset Type	Status	Location
30	Coastal Zn. 4-6 Pump Station	Pump Station	Critical	21474 Vista Ridge Rd, Newport Coast 92657
31	Fleming Pump Station	Pump Station	Critical	7431 Silverado Canyon Road
32	Foothill Zn 4-6 Pump Station	Pump Station	Critical	21515 Magazine Rd, Irvine 92618/12848 1/2 Alton
33	Foothill Zn 6-6A Pump Station	Pump Station	Critical	2 Touraine Pl, Foothill Ranch 92610
35	Manning Pump Station	Pump Station	Critical	29265 Modjeska Canyon Road
36	Portola Hills Zn 6-8	Pump Station	Critical	27841 Glenn Ranch Rd, Portola hills 92610
37	Portola Hills Zn 8-9 Pump Station	Pump Station	Critical	18967 Saddleback, Trabuco 92679
38	Read Pump Station	Pump Station	Critical	30500 Silverado Canyon Road
40	Shaw Pump Station	Pump Station	Critical	28934 Silverado Canyon Road
42	Williams Canyon Pump Station (Benner)	Pump Station	Critical	27600 Williams Canyon Road
46	Chapman Reservoir	Reservoir	Facility of Concern	14909 Mill Rd
47	Coastal Zn 4 Reservoir	Reservoir	Critical	21474 Vista Ridge, Newport Beach 92657
48	Coastal Zn 6 Reservoir	Reservoir	Critical	20783 Vista Ridge Rd, Newport Beach 92657

Wildfire

Map ID	Name	Asset Type	Status	Location
49	Fleming Reservoir	Reservoir	Critical	7431 Silverado Canyon Road
50	Foothill Zn 6 Reservoir	Reservoir	Facility of Concern	2 Touraine Pl, Foothll Ranch 92610
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd
55	Shaw Reservoir	Reservoir	Critical	28914 Olive Drive
57	Williams Canyon Reservoir	Reservoir	Critical	27600 Williams Canyon Rd
61	Foothill 6 Transmission Line		Critical	
62	Manning Treatment Plant	Treatment Plant	Critical	NA
64	Collection System	Wastewater Collection System	Critical	151.26 miles

Not Mapped Hazards

- Drought
- Human Induced Hazards
  - Hazardous Materials
  - Terrorism/Sabotage (cyberattacks)
- Geologic Hazards
  - Land Subsidence
  - Expansive Soils
- Severe Weather
  - Coastal Storms/Winter Storms
  - Windstorm
  - Power Outage

Summary of Vulnerability

Map ID	Name	Coastal Hazards	Dam Failure	Drought	Flood	Geo-logic	Human-Caused	Land slide	Lique-faction	Seismic	Severe Weather	Wildfire
2	Michelson Biosolids	N	Y	Y	N	Y	Y	N	Y	Y	Y	N
3	Distribution System	N	Pending	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	El Toro Diversion Structure	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
5	San Mateo Diversion	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
6	Met Source Water	N	Pending	Y	Y	Y	Y	N	Y	Y	Y	Y
8	Buck Gully	N	Pending	Y	N	Y	Y	Y	N	Y	Y	Y
9	Canada	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
10	Coastal Ridge	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
11	Coyote Canyon	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
12	Duck Club	N	Pending	Y	Y	Y	Y	N	Y	Y	Y	N
14	Irvine Park	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
15	Los Trancos Low Flow	N	Pending	Y	N	Y	Y	N	Y	Y	Y	Y

Summary of Vulnerability

Map ID	Name	Coastal Hazards	Dam Failure	Drought	Flood	Geo-logic	Human-Caused	Land slide	Lique-faction	Seismic	Severe Weather	Wildfire
17	Montecito	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
18	Muddy Canyon Low Flow	N	Pending	Y	N	Y	Y	N	Y	Y	Y	Y
19	MWRP MPS-3	N	Y	Y	N	Y	Y	N	Y	Y	Y	N
21	MWRP Caretaker Housing	N	Pending	Y	Y	Y	Y	N	Y	Y	Y	N
22	Newport Coast	N	Pending	Y	N	Y	Y	N	Y	Y	Y	Y
23	San Joaquin Housing	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
24	Harvard	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
25	University	N	Pending	Y	N	Y	Y	Y	N	Y	Y	N
26	Michelson Operations Center	N	Y	Y	N	Y	Y	N	Y	Y	Y	N
27	Benner Reservoir	N	Pending	Y	N	Y	Y	Y	N	Y	Y	Y
28	Coastal OC 63-Zn.4 Pump Station	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
29	Coastal Zn 6-7 Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y

Summary of Vulnerability

Map ID	Name	Coastal Hazards	Dam Failure	Drought	Flood	Geo-logic	Human-Caused	Land slide	Lique-faction	Seismic	Severe Weather	Wildfire
30	Coastal Zn. 4-6 Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
31	Fleming Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
32	Foothill Zn 4-6 Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
33	Foothill Zn 6-6A Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
35	Manning Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
36	Portola Hills Zn 6-8	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
37	Portola Hills Zn 8-9 Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
38	Read Pump Station	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
40	Shaw Pump Station	N	Pending	Y	Y	Y	Y	N	N	Y	Y	Y
42	Williams Canyon Pump Station (Benner)	N	Pending	Y	N	Y	Y	N	Y	Y	Y	Y
43	Michelson MWRP	N	Pending	Y	N	Y	Y	N	Y	Y	Y	N
44	Los Alisos Water Recycling Plant (LAWRP)	N	Y	Y	N	Y	Y	N	Y	Y	Y	N

Summary of Vulnerability

Map ID	Name	Coastal Hazards	Dam Failure	Drought	Flood	Geo-logic	Human-Caused	Land slide	Lique-faction	Seismic	Severe Weather	Wildfire
46	Chapman Reservoir	N	Pending	Y	N	Y	Y	Y	N	Y	Y	Y
47	Coastal Zn 4 Reservoir	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
48	Coastal Zn 6 Reservoir	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
49	Fleming Reservoir	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
50	Foothill Zn 6 Reservoir	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
52	Modjeska Reservoir	N	Pending	Y	N	Y	Y	Y	N	Y	Y	N
53	Read Reservoir	N	Pending	Y	Y	Y	Y	Y	N	Y	Y	Y
55	Shaw Reservoir	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y
57	Williams Canyon Reservoir	N	Pending	Y	N	Y	Y	Y	N	Y	Y	Y
61	Foothill 6 Transmission Line	N	Pending	Y	N	Y	Y	N	Y	Y	Y	Y
62	Manning Treatment Plant	N	Pending	Y	N	Y	Y	N	N	Y	Y	Y

Irvine Ranch WATER DISTRICT

Summary of Vulnerability

Map ID	Name	Coastal Hazards	Dam Failure	Drought	Flood	Geo-logic	Human-Caused	Land slide	Lique-faction	Seismic	Severe Weather	Wildfire
63	Deep Aquifer Treatment System (DATS)	Y	N	N	N	N	N	N	N	N	N	N
64	Collection System	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
65	Harvard Area Trunk Diversion Structure (HATS)	N	Y	Y	N	Y	Y	N	Y	Y	Y	N

Irvine Ranch WATER DISTRICT

Mitigation Strategy Discussion

Irvine Ranch WATER DISTRICT

Mitigation Strategy Discussion

- Costal Hazards
  - Coastal Erosion
  - Sea Level Rise
  - Tsunami
- Dam/Reservoir Failure
- Drought
- Flood
- Geologic Hazards
  - Expansive Soils
  - Land Subsidence
- Human Caused Hazards
  - Hazardous Materials
  - Terrorism/Sabotage (cyberattacks)
- Landslide/Mudflow
- Seismic Hazards
  - Fault Rupture
  - Ground Shaking
  - Liquefaction
- Severe Weather
  - Coastal Storm/Winter Storm
  - Windstorm (Santa Ana winds)
  - Power Outage (secondary impact)
- Wildfire

Irvine Ranch WATER DISTRICT

Capabilities Assessment

Irvine Ranch WATER DISTRICT

Capabilities Assessment

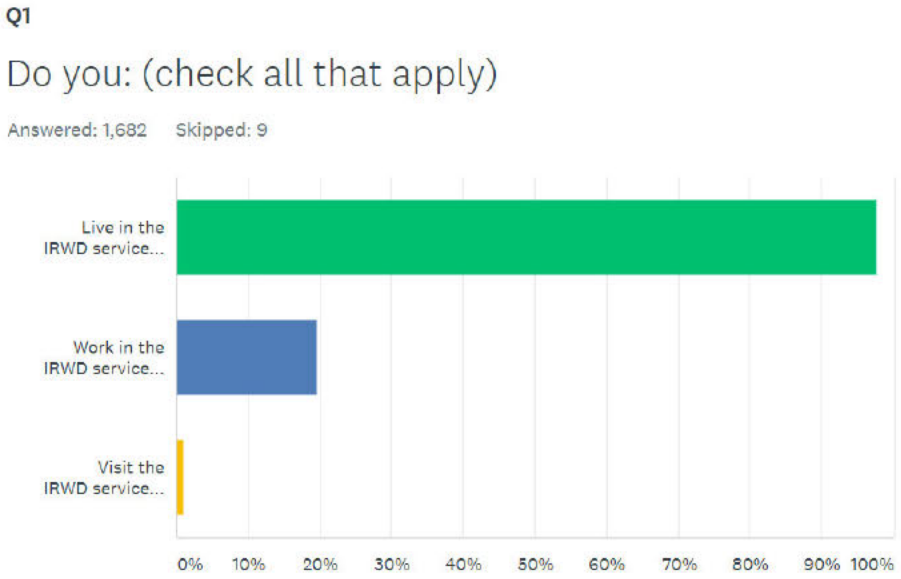
- Are there opportunities to improve upon the capabilities?
  - Can a plan be used to identify hazards and implement mitigation actions?
  - How can the capabilities be expanded and improved to reduce risk?
  - Is there a missing capability that needs to be considered?
  - Is additional staff/community training needed?
  - What financial resources can be used?
  - How can partner agencies/organizations work together to inform/educate the community?

Public Involvement Update

Irvine Ranch WATER DISTRICT

Public Involvement Update

- Survey Update
  - Over 1,700 responses!
  - Survey to close March 31, 2021 (today) COB
- Survey results – to be included as part of Meeting #4



Irvine Ranch WATER DISTRICT

Next Steps

Irvine Ranch WATER DISTRICT

Upload Your Worksheet to Meeting Channel

- Close and save your worksheet on your desktop (making sure your name is included under the "Participant Information" section)
- Select chat function on our Meeting Channel
- Using "Type a new message" function, select the paperclip logo to upload your worksheet

Irvine Ranch WATER DISTRICT

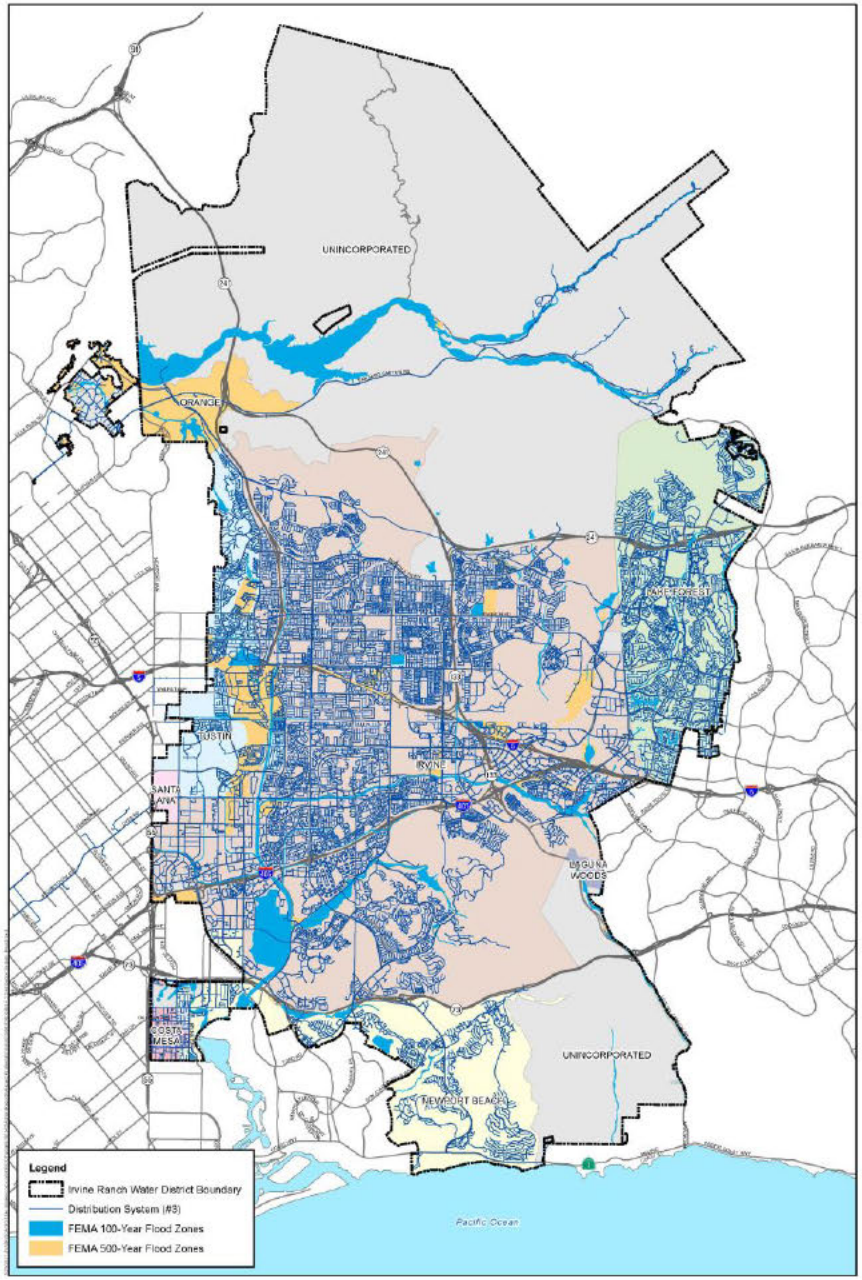
Next Steps

- Summarize survey results
- Complete vulnerability assessment
- Mitigation actions and prioritization
- Prepare draft plan components
- Attend Meeting #4
  - Date TBD, 1:30 – 3:30 PM

Questions/Additional Discussion?

Coastal Hazards – Sea Level Rise

Irvine Ranch WATER DISTRICT



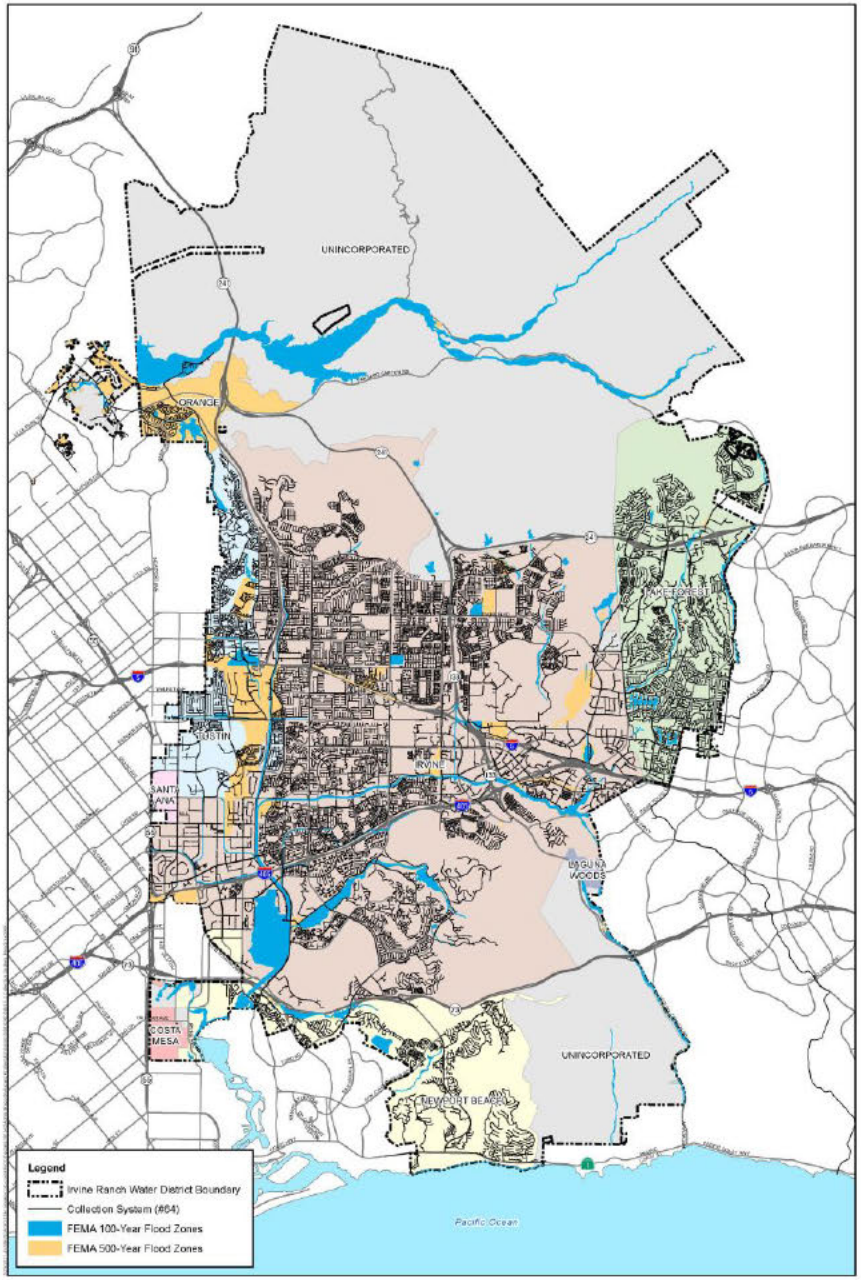
0 4,250 8,500 Feet

Source: IRWD, 2021, FEMA, 2009

Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Distribution System

Exhibit X.2



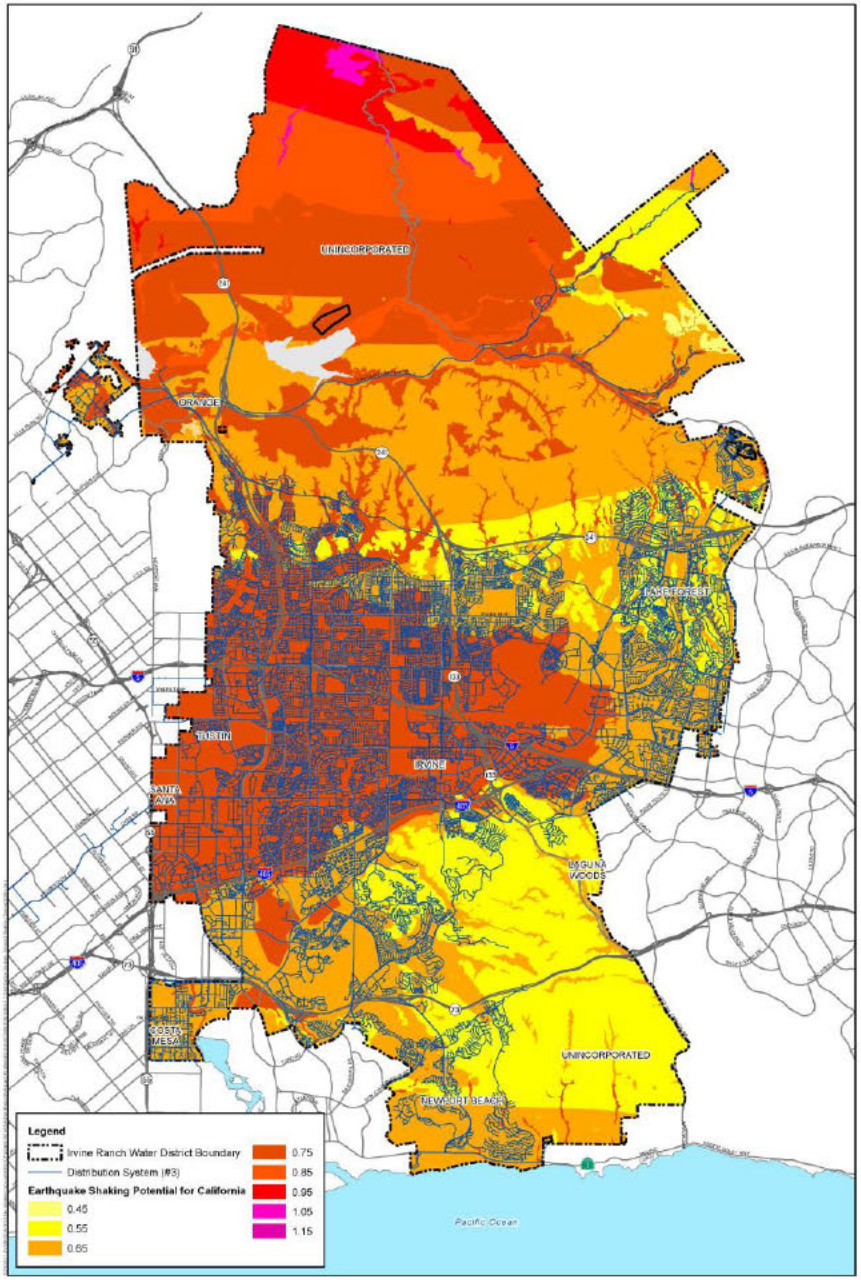
0 4,250 8,500 Feet

Source: IRWD, 2021, FEMA, 2009

Irvine Ranch Water District Local Hazard Mitigation Plan

Flood Hazard Zone - Collection System

Exhibit X.3



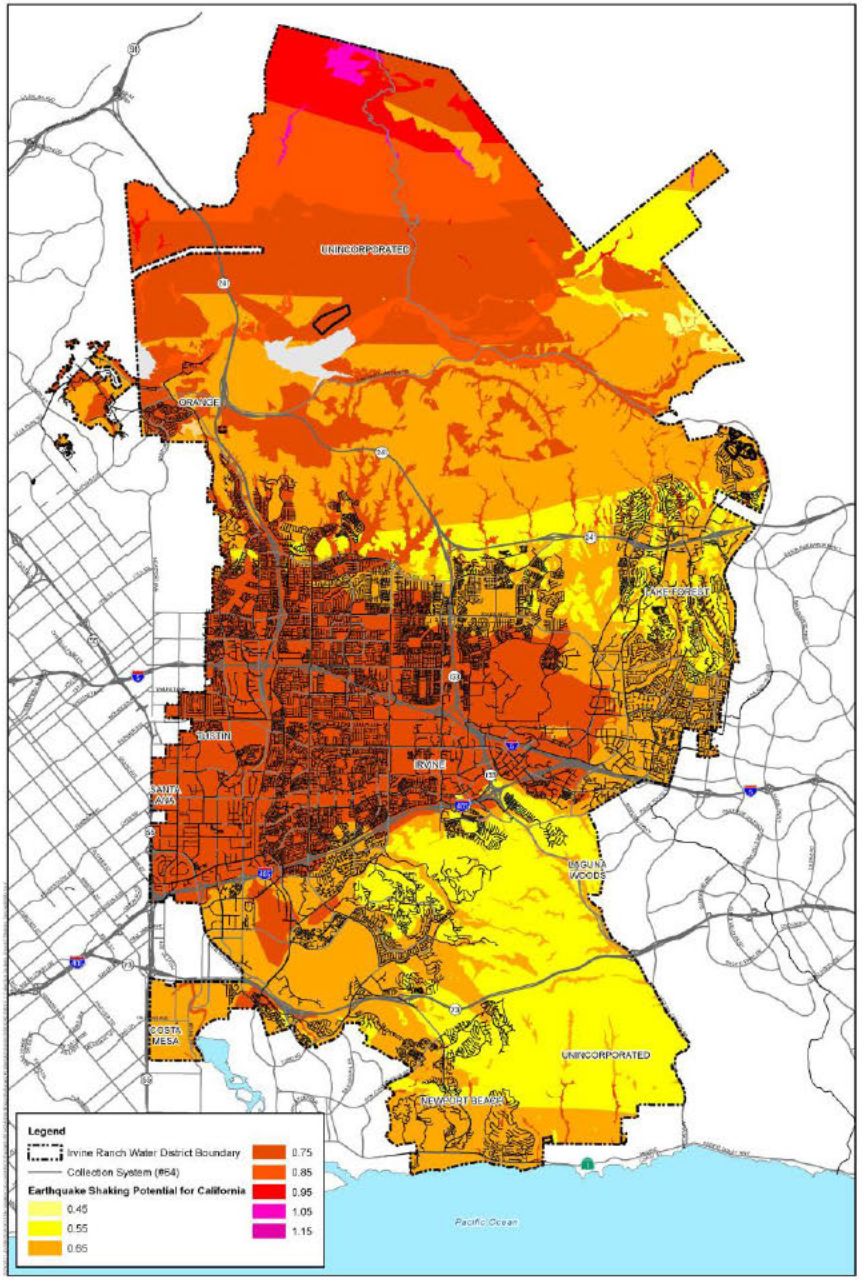
0 4,250 8,500 Feet

Source: IRWD, 2021; CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Distribution System

Exhibit X.2



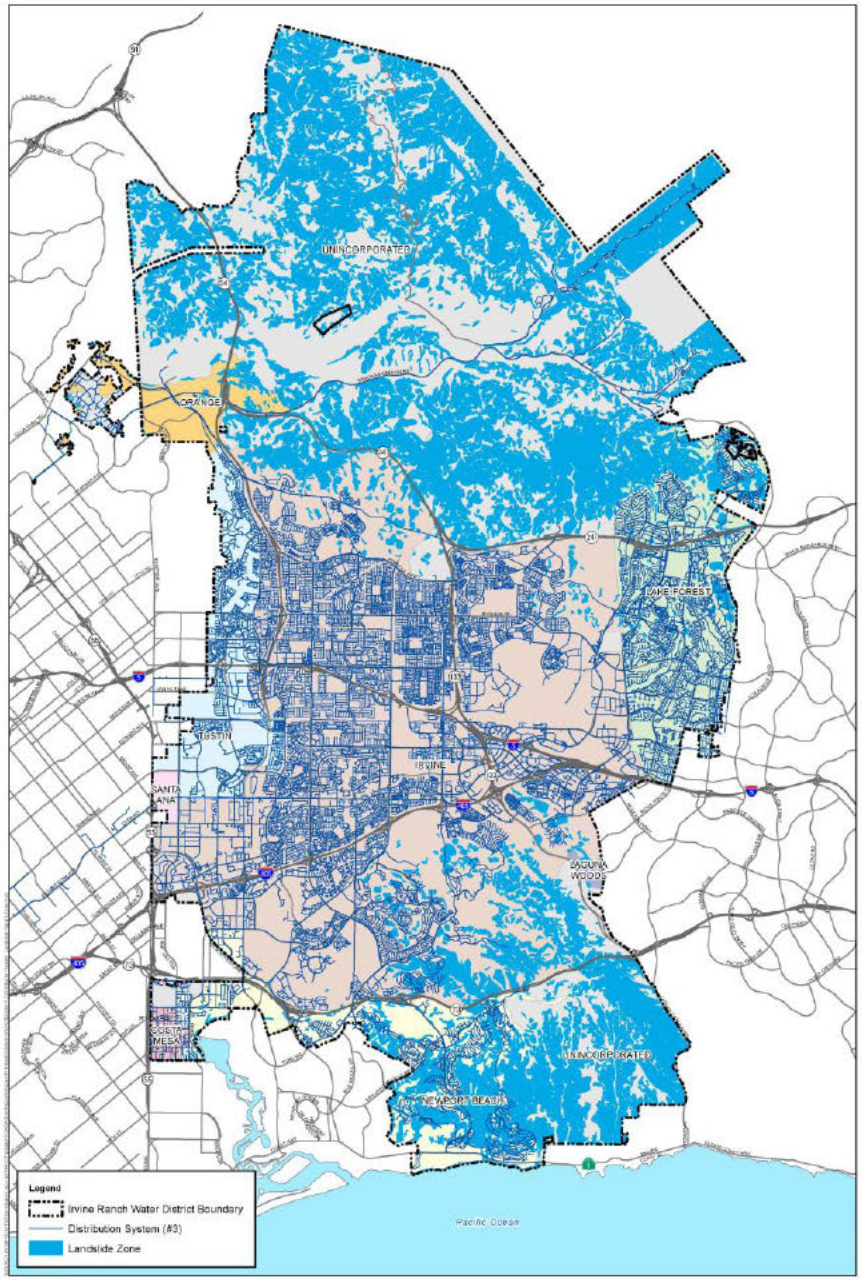
0 4,250 8,500 Feet

Source: IRWD, 2021; CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Collection System

Exhibit X.3



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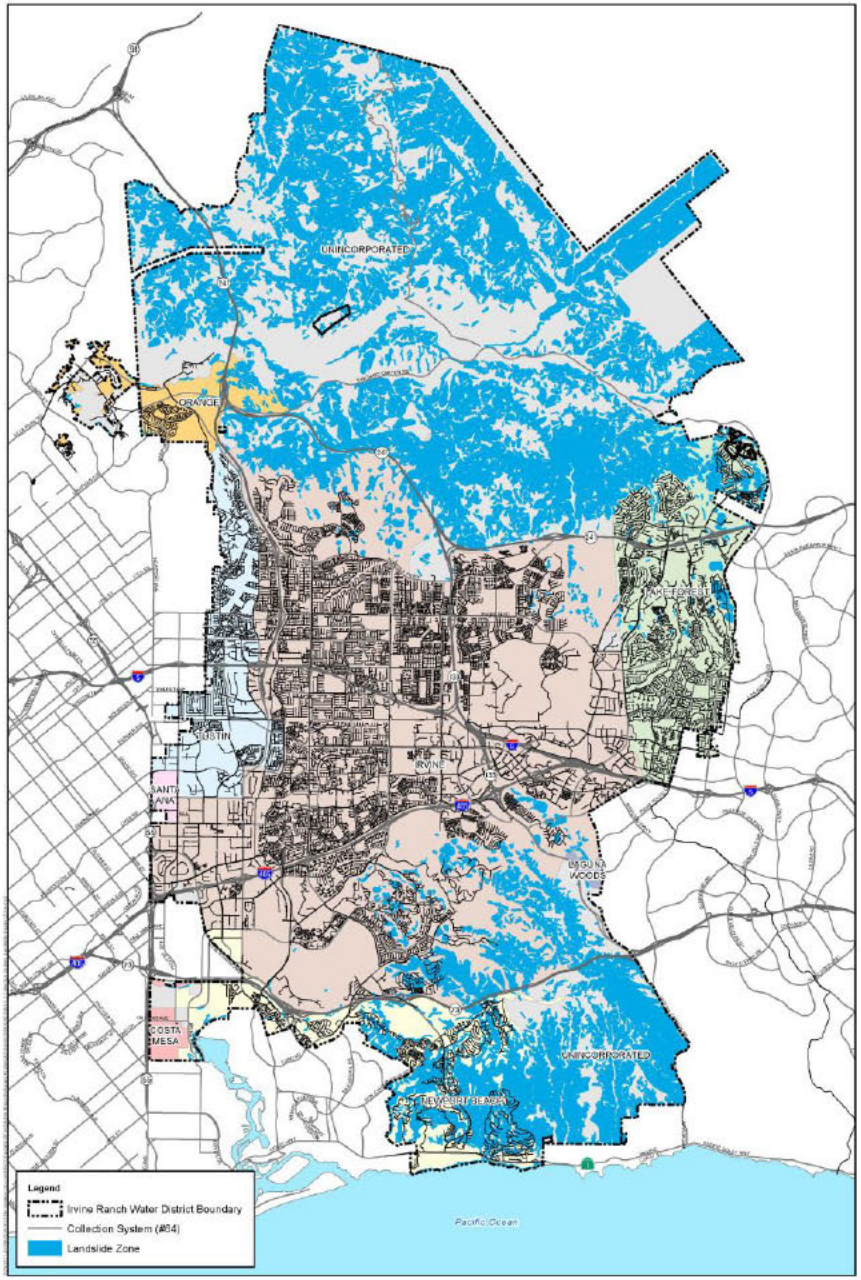
Source: IRWD, 2021, CGS, 2015

Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Distribution System

Exhibit X.2



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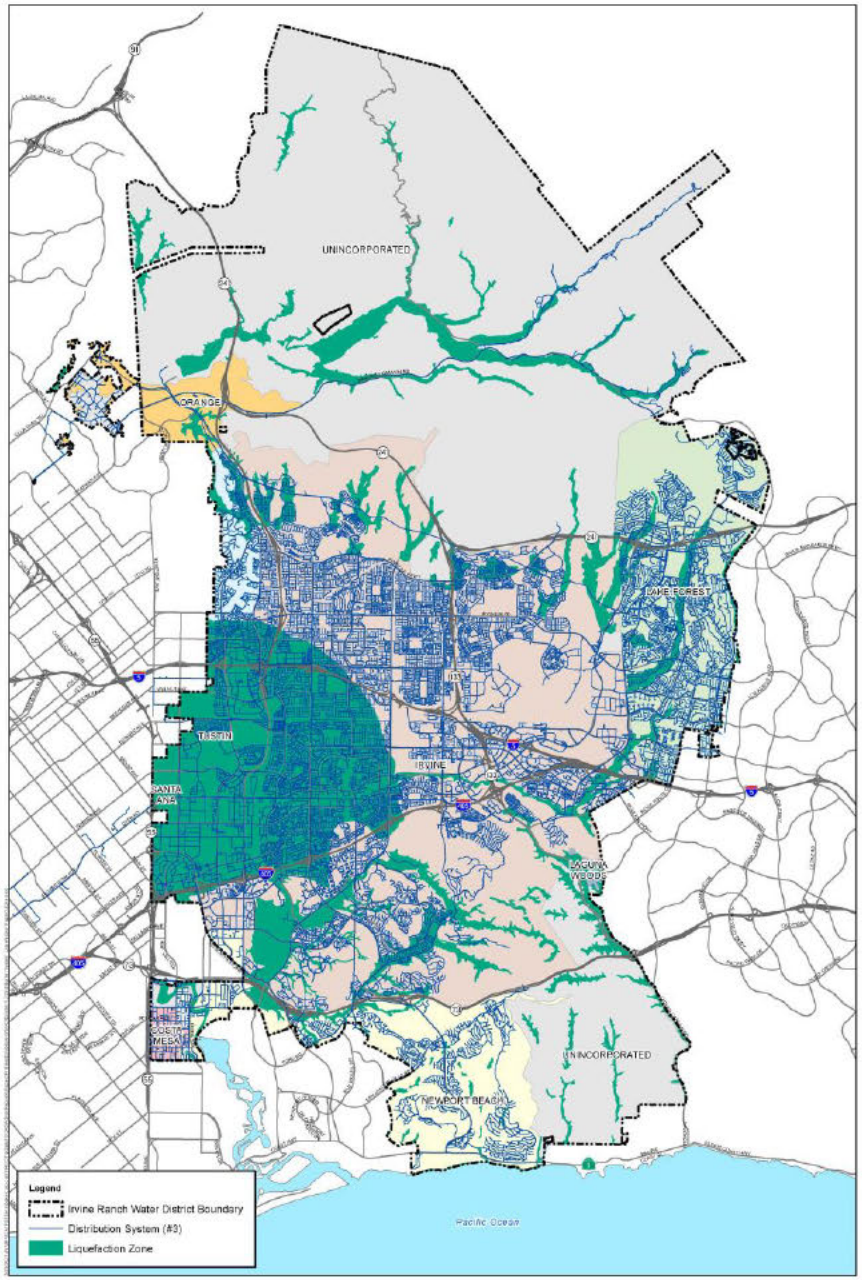
Source: IRWD, 2021, CGS, 2015

Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Collection System

Exhibit X.3



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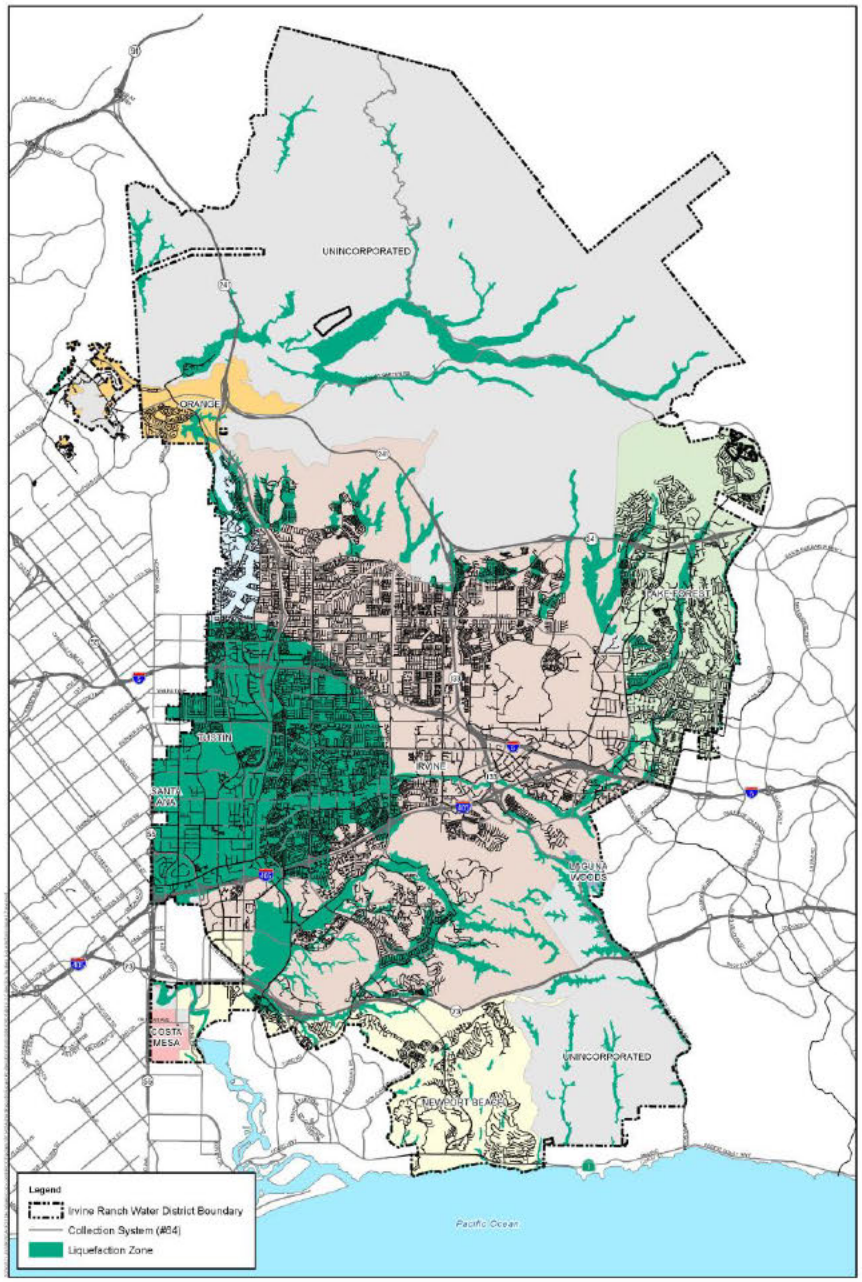
Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Distribution System

Exhibit X.2

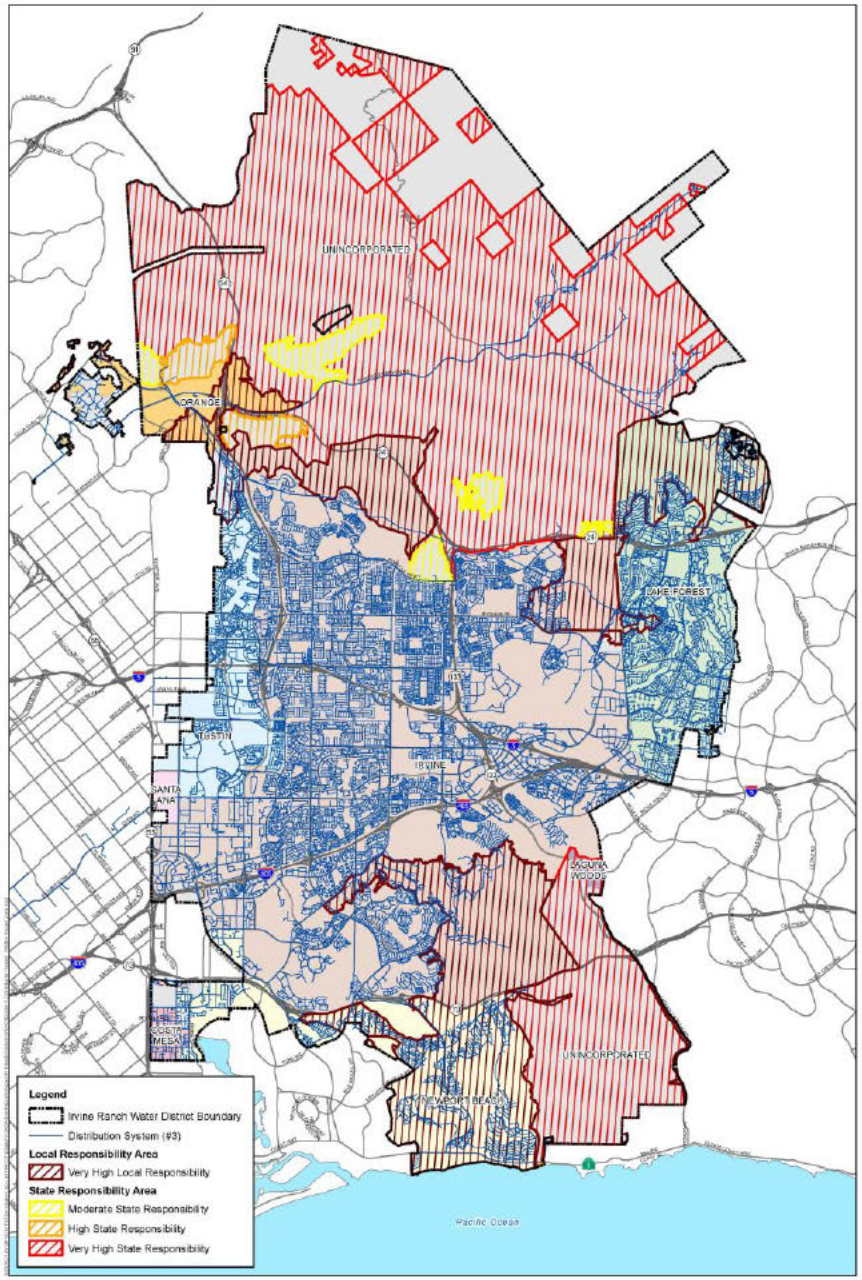


0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Collection System

Exhibit X.3



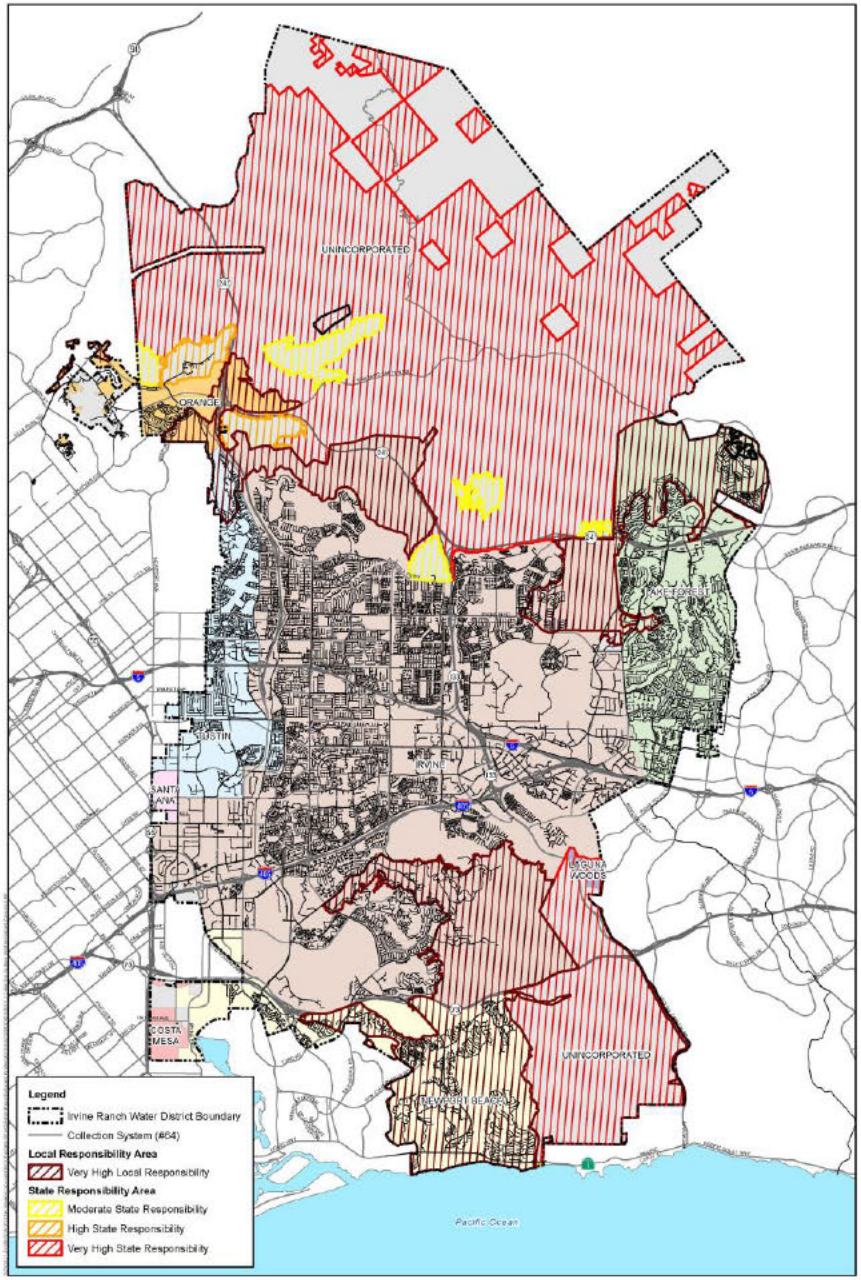
0 4,250 8,500 Feet

Source: IRWD, 2021, CALFIRE, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Distribution System

Exhibit X.2



0 4,250 8,500 Feet

Source: IRWD, 2021, CALFIRE, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Collection System

Exhibit X.3

Michael Baker
INTERNATIONAL

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #3
Wednesday, March 31, 2021
1:30 PM – 3:30 PM – via Microsoft Teams

MEETING SUMMARY

Attendees: Refer to Sign-in Sheet

- **Introduction, brief recap**
  - *Clarification from Noelle Steele (Project Manager, Michael Baker Intl) – Dam/Reservoir Failure can also be human-caused, and there is a note in this section cross-referencing, where appropriate.*
  - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Are there any questions on Cyberterrorism?*
    - *None provided*
- **Risk Assessment/Vulnerability Overview**
  - Participation outline & request
    - Meeting #3 Worksheet, not designed to be homework
  - Critical Facilities
    - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – The building list was coordinated with Alix, engineering, and collections departments. We are currently working to incorporate siphons into the critical facilities list, with issues concerning these to be resolved by next week.*
    - *Question from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – should potential for liquefaction, especially under our dams, be included as a geologic hazard?*
      - *Answer from Noelle Steele (Project Manager, Michael Baker Intl) – Liquefaction is often instigated by a seismic event, so that is why it is located there and not in geologic hazards.*
  - Facility Types – Critical Facilities vs. Facilities of Concern
  - Hazards Profiled
    - Mapped Hazards: Coastal Hazards, Flood, Geologic Hazards, Landslide/Mudflow, Seismic Hazards, Wildfire
    - Non-Mapped Hazards: Dam/Reservoir Failure, Human-Caused Hazards, Drought, Severe Weather
  - Coastal Hazards
    - Tsunami

        - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Now, I would like to open up discussion to chat about whether mitigation actions should be developed [for Tsunamis] or should it be eliminated because it is not a significant impact to IRWD.*
            - *Response from Alix Stayton (Safety Specialist, IRWD) – I almost feel that its not a topic for concern.*
            - *Response from John Dayer (Facilities/Fleet Manager, IRWD) – If it is not a topic of concern, then its not worth dealing with.*
    - Dam/Reservoir Inundation
        - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – We are having data sharing issues, so we currently only have Santiago Dam inundation info. There are 6 facilities that would be inundated by Santiago Dam, with the most severe at Irvine Park, which has 9 to 12 minutes before inundation.*
        - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – I know there are people who have mentioned projects in the pipeline and projects to improve the spillway. Thinking on hazards and potential ways to mitigate these hazards would be very important to include on the worksheets.*
            - *Reply from Alix Stayton (Safety Specialist, IRWD) – Yes, the Santiago Spillway improvement is important and is in progress.*
            - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – The spillway and outlet power are being improved. We are also kind of proactive in doing things before physical improvements. We implemented an interim program to cap the max water surface elevation to reduce the likelihood of using that spillway because we recognized that the spillway needs to be improved.*
        - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – are there any improvements or wish list items for improvements to the other 4?*
            - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – We anticipate there will be, so implement Dam Safety Program, look at potential failure modes, and trying to estimate what the risks would be and estimate the probability of the different failure modes. We anticipate the spillway at Sand Canyon will need improvement, but the evaluation is not complete.*
        - *Comment (unknown) – on this slide, in particular, there are other things that would be impacted, but it looks like this is focused on IRWD.*
            - *Response from Noelle Steele (Project Manager, Michael Baker Intl) – We are only considering within the IRWD service area, but we can potentially document that a power outage could occur in result of dam failure due to SCE infrastructure.*
        - *Question from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – I thought there was sewer infrastructure along the coast, so wouldn't tsunamis cause potential problems?*
            - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – we mapped it and because the collection system is located primarily above*

PCH, there weren't any issues due to tsunami, but we can confirm before eliminating tsunami.

- *Comment from Alix Stayton (Safety Specialist, IRWD) – I have sent all documents via email and uploaded to chat [on Teams].*
- *Question form Noelle Steele (Project Manager, Michael Baker Intl) – Did I cover everything on Dam Inundation Starla?*
  - *Reply from Starla Baker (Technical Consultant, De Novo Planning) – Yes.*

- Flood
  - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Last time, we discussed that the Michaelson Plant should not be in the floodplain due to the upgrades and this has been confirmed as correct.*
    - *Question from Alix Stayton (Safety Specialist, IRWD) – can you go back and zoom in on the plant?*
    - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – Yes, there is a portion that is now no longer in the flood zone, but facilities located nearby are still within the flood zone.*
    - *Question from Alix Stayton (Safety Specialist, IRWD) – So we have floodgates that protect the plant and biosolids?*
    - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – Correct, and that has been reflected in the Facilities List in the Flood Section.*
  - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Do some of these [listed] facilities experience regular flooding? Hopefully this can trigger mitigations or if there is interest in doing similar to Michaelson.*
    - *Response from Gaspar Garza (Operations Manager, IRWD) – There are 50 miles that could be potentially flooded, that could result in an extreme amount of flow going into Michaelson that we may not be able to handle.*
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – So even if the plant is not in the flood zone, there could still be a significant effect?*
    - *Reply from Gaspar Garza (Operations Manager, IRWD) – Yes.*
    - *Dorien McElroy (Collections Systems Manager, IRWD) – Good point that if 53 miles get flooded, we are getting more than we can handle.*
    - *Gaspar Garza (Operations Manager, IRWD) – This can also mean that Collections could have problems with surcharging and flow onto the streets.*
    - *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – Yeah and sometimes during street flooding, police and safety officers will lift manhole covers to relieve flooding.*
    - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Is there some sort of communication that can be done to stop this?*
    - *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – There is some sort of communication going on already.*

- *Comment from Alix Stayton (Safety Specialist, IRWD) – That is something that we can do.*
- *Comment from John Dayer (Facilities/Fleet Manager, IRWD) – Yeah, but it's the 200 manholes that are under water that are causing the issue, not the one that will be lifted.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – What can be done?*
- *Reply from Gaspar Garza (Operations Manager, IRWD) – Rely on Dorien to reroute?*
- *Comment from John Dayer (Facilities/Fleet Manager, IRWD) – It's hard to mitigate because we don't control the storm drains.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Is there anything that can be done Dorien?*
- *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – Not really.*
- *Question from John Dayer (Facilities/Fleet Manager, IRWD) – What happens in successive flow if we just shut down lift station?*
- *Comment from Dorien McElroy (Collections Systems Manager, IRWD) – Yeah, but it will eventually flow to the lowest manhole and come out.*
- *Question from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – We wouldn't even have the ability to divert to a nearby creek? If we have a flood event and more coming into the plant than we can handle, can we divert to OC San and if that is not enough then to the creek?*
- *Reply from Gaspar Garza (Operations Manager, IRWD) – Yeah, we have one side that can handle 18 and another that can possibly handle 10, but in a flood event then we are receiving way more than that and we can only divert treated water.*
- *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – Yes, because the creek diversion is only for tertiary treated water.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Can we discuss with other agencies or set up something to release into storm drains?*
- *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – No.*
- *Question from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – If we have sewage spill, is that a hazard? Is that a part of this [the HMP]?*
- *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – No, it's a consequence of something else.*
- *Follow-up from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – So then it is not something that is part of this [HMP]?*
- *Comment from Alix Stayton (Safety Specialist, IRWD) – We can discuss some of this offline, but this is a worst case scenario. Is there anything around Flood that is a new thing that needs to be brought up or is this our big problem?*
- *Comment from Scott Toland (Senior Engineer, IRWD) – A possible mitigation, but probably a discussion for offline, is that we can have*

gasketed manholes to prevent flow from coming out of the manholes. Or is it dealing with the infrastructure itself that is the issue?

- *Comment from Starla Baker (Technical Consultant, De Novo Planning) – As part of the risk assessment, we do want to discuss some of the consequences of what could happen. What does having 50 miles of distribution backing up mean? Important to note the specific secondary impacts/consequences of what can happen. If this or that happens, what could that mean? If a whole community or neighborhood that is impacted by sewage coming out onto the street, then I am sure there are protocols to address this. If this comes to your mind, bring it to us so that we can note it and incorporated it into the plan.*

- Landslide/Mudflow
  - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Understanding the impacts and discussing mitigation and potential impacts for Landslides and mudflows would be good.*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – I know there are specific things in Codes, but Ken, is there anything that can be done to reduce effect of earth moving around your facilities?*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – This map on the screen is for landslides. All of our facilities have been built to code, but is there anything that we can be doing to protect from landslides?*
  - *Reply from Ken Pfister (Operations Manager, IRWD) – The only ones would be the ones in the canyons, nothing else really needs it.*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Is there anything in the canyons that can be done?*
  - *Reply from Ken Pfister (Operations Manager, IRWD) – Put up a wall around it, which is what we are doing at one of the stations.*
  - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Can we get a list of facilities that could have some sort of protective measure (armor, retaining walls) installed?*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Is Benner [spelling?] already on the list?*
  - *Reply from Ken Pfister (Operations Manager, IRWD) – the biggest one is the Manning [spelling?]. Is that on there?*
  - *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – the maps are based on state data, but if there are facilities outside of these specific areas, then that would be good to note.*
  - *Reply from Colton Martin (Mechanical Services Manager, IRWD) – The reservoirs are all up pretty high, where I would that they would be unaffected.*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Dorien there is one lift station in the list, Buck Gully. Is there anything in the works?*
  - *Reply from Dorien McElroy (Collections Systems Manager, IRWD) – Nothing that I know of that is in the works for Buck Gully.*
  - *Comment from Alix Stayton (Safety Specialist, IRWD) – This should be another side conversation. I can talk more to Ken and Jacob.*

- *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – From an engineering perspective, they would look at the geologic features of the locations. I think what is on the map, a lot of the landslide potential would be off the site.*
- *Comment from Alix Stayton (Safety Specialist, IRWD) – An offline discussion can help us get a better idea, because we have a much more detailed knowledge of the ground.*
- *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – What is not showing on here is that there was a landslide at San Joaquin Reservoir and that changed our operation of that reservoir.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Did we do something that removed the risk for that reservoir?*
- *Reply from Ken Pfister (Operations Manager, IRWD) – We fill it in the winter and when we draw it down, we have hold days at certain levels, so that we don't have saturated land that is exposed.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Does that need some sort of wall or protection?*
- *Reply from Ken Pfister (Operations Manager, IRWD) – No, that would cause more damage.*
- *Reply from Alix Stayton (Safety Specialist, IRWD) – Okay, we can have an offline call and dive a little deeper.*

o Seismic Hazards

- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – The exhibit is showing earthquake potential for the entire service area. We are happy to discuss any facilities that are older, or haven't been retrofitted recently. If there are any facilities, maybe some that are in the higher shake potential areas, that would be very helpful [to the discussion].*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – In the Canyons, there is Fleming Reservoir. That is being replaced from metal to a prestressed concrete. The impetus for the replacement is not for seismic reasons, but that is a side benefit.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Any other reservoirs that could have, what was it again?*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – It is a prestressed concrete tank where they wrap it in wires. There's a few cases where we've installed this throughout the district.*
- *Question from Noelle Steele (Project Manager, Michael Baker Intl) – We are trying to identify ones that haven't been improved in a while. Is there anything that can be improved for seismic security?*
- *Question from Alix Stayton (Safety Specialist, IRWD) – How do you decide, Jacob, on when it gets that prestressed concrete tank?*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – There is a tipping point at around 1,000,000 gallons where it becomes cheaper in the life cycle sense, that it becomes cheaper than steel tanks. There are other steel tanks in the district.*

- *Question from Alix Stayton (Safety Specialist, IRWD) – Is there an understanding of how much steel resists damage?*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Steel tanks are commonly used, and there is probably some tipping point where the size of the steel tank makes it more of a risk for damage due to seismic activity.*
- *Comment from Alix Stayton (Safety Specialist, IRWD) – I don't think we are sitting on a list of reservoirs that are at risk due to seismic activity.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – The LHMP requires mitigation for any profiled hazard.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Can we develop a narrative on how we develop projects considering seismic activity?*
- *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – Yes, we can mention compliance and considerations, but by having seismic activity in the profile, this means we have to include some mitigation.*
- *Question from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Can we include protocols on how to mitigate if something happens?*
- *Reply from Starla Baker (Technical Consultant, De Novo Planning) – We can mention the steps taken in the event of damage. But we are looking for more situations like the one mentioned before where the tank had to be replaced and it had the side benefit of helping with seismic reliability. So maybe a mitigation is that if changes need to be made, we will consider seismic issues in making decisions. Maybe do seismic assessment on facilities that were built before a certain date. You can identify studies as part of a mitigation action.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Malcolm, anything come to mind?*
- *Reply from Malcolm Cortez (Engineering Manager, IRWD) – No.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – I know we do all kinds of things that are routine and we are always taking seismic stability into account. Is it possible that seismic isn't something that needs to be included?*
- *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – I would caution against that, because it would prevent you from obtaining Seismic FEMA funding. I suggest we do a sidebar and Starla and I can pull some mitigation measures form the MWDOC so that you can see.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – I can ask around about seismic studies or investigations that people might want to do in the future. Anything else from my folks?*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – When we do something at a facility, we often do seismic evaluations, especially if doing significant improvements.*
- *Reply from Alix Stayton (Safety Specialist, IRWD) – Right, I'll talk more about statements we can make and talk to MBI and see some examples they have from MWDOC.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Right. And as an improvement of a facility, we can mention that we will evaluate for the potential of improving seismic reliability.*

- Liquefaction
  - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Perhaps a mitigation approach similar to landslide and groundshaking is evaluating liquefaction mitigation improvements when facilities are otherwise being improved. From previous discussions it doesn't seem like there was much concern about liquefaction. Let's open up discussion on these facilities and any mitigation. Or, if everyone wants to write it down on the worksheets, that is fine too.*
  - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – In this same area, we do have nonpotable wells that are part of the base cleanup, so if we are unable to operate some of the wells, that is impacting control of the VOC plume.*
  - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – We talked about this with Alix a while ago. Who was the point person on why the wells don't need to be considered?*
  - *Reply from Alix Stayton (Safety Specialist, IRWD) – Ken would have been the person. Can we talk about why they aren't critical?*
  - *Reply from Ken Pfister (Operations Manager, IRWD) – You brought up sites that I didn't really think were critical. If we were to lose PDF or IDF. As far as the El Toro wells, they'd have to be down for 6 months to a year before we have these impacts.*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Does that make sense Jacob?*
  - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Yeah that makes sense, but it does take longer than 6 months to drill a well in some situations.*
  - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – A lot of Geotech Studies and mitigations for seismic can have overlaps with liquefaction.*
  - *Question from Starla Baker (Technical Consultant, De Novo Planning) – Is there anything that can be potential issues in the future? We can definitely have overlap with seismic.*
  - *Comment from Alix Stayton (Safety Specialist, IRWD) – We can discuss this then with the seismic and I can have a discussion with my people on more specifics.*
- Wildfire
  - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – I know that we were told that a facility had burned down and been rebuilt to be more resistant to fire. One thing to do is list out what you have already done, which Alix has helped us with. But things that can be mentioned would be improving all stations located int eh fire hazard zones to be more fire resistant.*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Does anybody already know that they have a facility that is ancient and behind and next time we do something to it we have to do something to harden it to fire hazards?*
  - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Anything in the Canyons I think.*

- *Question from Alix Stayton (Safety Specialist, IRWD) – does engineering have an understanding of what should be improved for fire?*
- *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Malcolm would be better probably, but for Fleming we have hardened it and have undergrounded the wires.*
- *Reply from Malcolm Cortez (Engineering Manager, IRWD) – The other improvements on the stations recently, like Harry's project, it was done for fire hardening.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – I'm wondering if walls can serve a double purpose of protecting from landslides and hardening against fire.*
- *Reply from Malcolm Cortez (Engineering Manager, IRWD) – I'm pretty sure they are not designed to withstand landslides, but they are designed to withstand earthquakes.*
- *Comment from Colton Martin (Mechanical Services Manager, IRWD) – The fires have gone right up to the walls, but they didn't enter the facility, though it helps that they were covered in PhosCheck.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Owen, is there anything we can do to protect your equipment from wildfires?*
- *Reply from Colton Martin (Mechanical Services Manager, IRWD) – Owen had to step away.*
- *Comment from Richard Mykitta (Director of Maintenance, IRWD) – Most of the electrical is inside the walls. The only thing that is going to be underground is the feed lines, which are outside the walls. If you have a facility without a wall, the electrical is going to be at risk, just like the rest of it.*
- *Comment from John Dayer (Facilities/Fleet Manager, IRWD) – Another thing about clearing brush and making a defensible space is that these facilities in this area are also part of the NCCP. So the vast majority of the open space in this area is part of the preserve. We can't even remove vegetation inside our property line without mitigating that vegetation. Probably cheaper to build a cinder block wall than creating a defensible space. We are tunnel visioned on the canyons, and remove the vegetation that we can, but it is still not what anyone would say is a good defensible space.*
- *Question from Alix Stayton (Safety Specialist, IRWD) – Should we include that?*
- *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – I have worked in the coastal side of things where there has been collaboration between fire department and regulatory agencies to establish a defensible space that is acceptable to everyone. So potential mitigation could be cooperation with interested parties to establish a defensible space.*
- *Comment from Alix Stayton (Safety Specialist, IRWD) – We have walls, undergrounding wires outside of the walls, etc. Is there any kind of project or assessment that we need to do or have done to keep our facilities safe form wildfires?*
- *Reply from Ken Pfister (Operations Manager, IRWD) – The only one we've done is Portola 9, where we got rid of the wood roofs.*

        - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – A study was done by [RRM], which was after a fire at one of our pump stations.*
        - *Interjection from Ken Pfister (Operations Manager, IRWD) – Yeah at the Portola 9.*
        - *Comment form Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Right, right, there was a study done there by RRM.*
        - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – And if there are fire studies or plans that would be helpful, then we can include this.*
    - Non-Mapped Hazards
        - Drought
            - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – I wanted to give everybody a few minutes to work through the worksheet and their own thoughts. Before that, we can spend the next 15 minutes discussing the list of not-mapped hazards. We know that IRWD is doing a lot to mitigate and handle drought conditions. Is there anything else that can be put into place? Something to protect the water supply?*
            - *Reply from Ken Pfister (Operations Manager, IRWD) – That would be something to have water policy involved in. They would be the ones to talk to. Our system is already built for the drought scenario.*
            - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Last time we talked, it was mentioned that there were policies that were put into place during the last severe drought that were continued after the drought ended and we can include these in the HMP.*
            - *Comment from Alix Stayton (Safety Specialist, IRWD) – Let me get people started thinking about wish lists and ideas of what people are wanting for this.*
            - *Comment from Richard Mykitta (Director of Maintenance, IRWD) – a lot of what water policy deals with is water supply, not as much drought though.*
            - *Comment from Ken Pfister (Operations Manager, IRWD) – What they're doing is making sure we have a set quantity. What we don't think about is when we don't have drought, we still can purchase in-lieu of where we can purchase water for recharge, so we can recharge the basin.*
            - *Question from Noelle Steele (Project Manager, Michael Baker Intl) – Would you like to seek FEMA funding to increase recharge?*
            - *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Part of the Sewage Master Plan is seeking potable reuse. We have laid out a long-term vision, but it would require a lot of capital investment.*
            - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Those sort of big ticket items where capital investment is enormous are the sorts of things we want to encapsulate.*
        - Power Outages
            - *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Something your constituents are concerned about are power outages. I know we have discussed this, but in terms of power outages, perhaps*

identifying those facilities that don't have backup generators at the capacity IRWD would like, or if there are facilities with a temporary backup generator that you would like to be permanent…

- *Comment from Alix Stayton (Safety Specialist, IRWD) – I think if Owen was here, he'd have a lot to say.*
- *Comment from Richard Mykitta (Director of Maintenance, IRWD) – The question I would ask is that we don't necessarily need new generators, but we are slowly starting to see aged generators that need to be rehabbed.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – Yes, we can set up a program to seek funding for generator improvements. Not sure what those improvements would be.*
- *Reply from Richard Mykitta (Director of Maintenance, IRWD) – Well it would be replacement. The fleet will have to be replaced over the next 10 to 15 years. And Ken would probably have a few sites to add.*
- *Comment from Ken Pfister (Operations Manager, IRWD) – Yeah, all the sites have generators, but they are aging.*
- *Comment from Gaspar Garza (Operations Manager, IRWD) – At Michaelson, we have generators for a reduced capacity. But if it is a long-term outage, then we need to look into better generators.*
- *Comment from Ken Pfister (Operations Manager, IRWD) – And those generators there are natural gas.*
- *Comment from Colton Martin (Mechanical Services Manager, IRWD) – And like at Rattlesnake, there is no generation to pump water into the reservoir.*
- *Reply from Ken Pfister (Operations Manager, IRWD) – We're going through a whole pump station change there, so once it's done there will be a generator there.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – I'm guessing there are issues associated with an aging generator.*
- *Reply from Richard Mykitta (Director of Maintenance, IRWD) – It is mostly on the electronics side that we have issues.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – It sounds like there are going to be more of these that will require replacement over the long-term and there might be issues at Michaelson requiring generation improvement.*
- *Comment from Richard Mykitta (Director of Maintenance, IRWD) – Michaelson is the only one that needs more generation.*
- *Comment from John Dayer (Facilities/Fleet Manager, IRWD) – Is seeking replacement of a generator really in the spirit of this HMP?*
- *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – We are identifying that this is a current hazard, happening now. And the power outages we are dealing with, and in terms of wildfire and severe windstorms, are unprecedented. So this would be a matter of relating these generators and other mitigation measures to the actual hazards.*

- *Comment from Starla Baker (Technical Consultant, De Novo Planning) – Some of the grant programs they do identify generators specifically, especially when located at a critical facility. They do look at cost-benefit and if its going to be mitigating that hazard and that issue. It is still required to show the cost-benefit, but generators are something that are considered emergency equipment and are eligible for certain funding.*
- *Comment from Noelle Steele (Project Manager, Michael Baker Intl) – SCE has made it clear that planned shutoffs are going to be the norm until some of these issues are resolved. And there are new grant programs and old programs evolve all the time. So as these situations continue to evolve, I find it hard to think that these grants won't become more common in the future.*
- *Written comment submitted by Stephen Foster (no information given) – "Less costly to go through State and Federal agencies with mitigation efforts then the tail end of reimbursement which is more costly."*
- *Comment from Alix Stayton (Safety Specialist, IRWD) – I don't know about windstorms being significant, because it is more the power outages that are associated with the windstorms than the windstorms themselves.*
- *Reply from Noelle Steele (Project Manager, Michael Baker Intl) – We incorporated power outages as a secondary to the windstorms. So power outage-associated mitigation measures would fall under the umbrella of windstorm.*
- *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – That makes sense, because SCE shuts off the power to the canyons whenever there are windstorms.*

  - Summary of Vulnerability
    - Table showing any overlaps in hazard vulnerability for all mapped/non-mapped hazard

- **Mitigation Strategy Discussion**

- **Capabilities Assessment**
  - Review of capabilities that we received
  - Are there opportunities to improve upon the capabilities?
  - Can a plan be used to identify hazards and implement mitigation actions?
  - How can the capabilities be expanded and improved to reduce risk?
  - Is there a missing capability that needs to be considered?
  - Is additional staff/community training needed?
  - What financial resources can be used?
  - How can partner agencies/organizations work together to inform/educate the community?

- **Public Involvement Update**
- Webpage

- Survey

- **Next Steps**
- Summarize survey results
- Complete vulnerability assessment
- Mitigation actions and prioritization
- Prepare draft plan components
- Meeting #4 - Date TBD

Participant Information:
Name:
Title:
Agency:

INSTRUCTIONS:

- Identify 2 – 3 issues or concerns specific to each hazard
- Use one bullet point per issue/concern on the "Concerns" column
- Identify potential mitigation measures/actions based on your concern
- Use one bullet point per mitigation action on the "Potential Mitigation" column
- NOTE: Hazards are included in the order of our presentation discussion. This worksheet is designed to accompany our discussion and is NOT intended to be post-meeting "homework"
- Post Meeting: Please upload this worksheet back into our Microsoft Teams Channel, using the instructions at the end of the document

MAPPED HAZARDS

COASTAL HAZARDS – Concerns (Coastal Erosion, Sea Level Rise, Tsunami) • (XX insert coastal hazard concerns here) • •	**COASTAL HAZARDS – Potential Mitigation** (Coastal Erosion, Sea Level Rise, Tsunami) • (XX insert coastal hazard concerns here) • •
DAM/RESERVOIR HAZARDS - Concerns • • •	**DAM/RESERVOIR HAZARDS – Potential Mitigation** • • •
FLOOD HAZARDS – Concerns • • •	**FLOOD HAZARDS – Potential Mitigation** • • •
LANDSLIDE/MUDSLIDE HAZARDS – Concerns • • •	**LANDSLIDE/MUDSLIDE HAZARDS – Potential Mitigation** • • •
SEISMIC HAZARDS - Concerns (Fault Rupture, Ground Shaking, Liquefaction) • • •	**SEISMIC HAZARDS – Potential Mitigation** (Fault Rupture, Ground Shaking, Liquefaction) • • •
WILDFIRE HAZARDS – Concerns • • •	**WILDFIRE HAZARDS – Potential Mitigation** • • •

NON-MAPPED HAZARDS

DROUGHT – Concerns • • •	**DROUGHT – Potential Mitigation** • • •
HUMAN INDUCED HAZARDS - Concerns (Hazardous Materials, Terrorism/Sabotage, Cyber Attacks) • • •	**HUMAN INDUCED HAZARDS – Potential Mitigation** (Hazardous Materials, Terrorism/Sabotage, Cyber Attacks) • • •
GEOLOGIC HAZARDS – Concerns (Expansive Soils, Land Subsidence) • • •	**GEOLOGIC HAZARDS – Potential Mitigation** (Expansive Soils, Land Subsidence) • • •
SEVERE WEATHER – Concerns (Coastal Storm/Winter Storm, Windstorm, Power Outage) • • •	**SEVERE WEATHER – Potential Mitigation** (Coastal Storm/Winter Storm, Windstorm, Power Outage) • • •

Upload Instructions:

- At the end of the meeting, please close and save your worksheet (making sure your name is included under the "Participant Information" section above)
- Select the "Chat" function on our Meeting Channel
- Using the "Type a new message" function, select the paperclip logo and upload your worksheet for our facilitators to download
- NOTE: Please upload to the channel at the end of the meeting. Again, this worksheet is meant to document your thoughts during the meeting – not to be post-meeting "homework"

	completed	current	Name
1		X	MWRP Compressed Natural Gas and Diesel/Gasoline Fueling Station
2		X	Generator Fuel Storage Upgrades
3		X	Santiago Canyon Pump Station Improvements
4	X		Ladd Canyon Road DW Improvements
5	X		Ops Center Permanent Back-up Generator
6		X	Santiago Canyon Fleming Zone 8 Tank and Zone 8-9 BPS
7		X	Syphon Reservoir Improvements
8		X	Capital Improvement Program (CIP) Asset Management Phase 1 (Facilities)
9		X	Capital Improvement Program (CIP) Asset Management Phase 2 (Linear)
10	X		Wells 21 & 22 Treatment Plant
11	X		Baker Water Treatment Plant
12		x	Water Haulers (2,000 gal) maintained and made available due to FEMA funding
13		x	EOP - Assess permanently raising elevating watersensitive equipment and anchoring fuel tanks in flood-prone locations.
14		x	EOP - Perform checks on portable generators and auxiliary pumps.
15		x	EOP - Designate alternate area(s) for dumping residual dirt apart from Michelson yard.
16		x	Water Shortage Contingency Plan (potable)
17	x		Water Supply Reliability Study
19		x	Water Banking Program in Kern Co.
20	x		Urban Water Management Plan
22		x	Develop and maintain Specific Hazard Response Plans (SHRPs) as vulnerabilities become apparent. Include SHRPs in regular training and exercise program.
25		x	Maintain WEROC membership for communication and collaboration with other water districts and the Operational Area
26		X	EOP - Perform monthly checks on permanent, and portable backup generators. Check fuel supply.
27		X	EOP - Review periodically defensible space and weed abatement needs of all canyon water facilities. (annual)
28		X	EOP - Check and maintain radar flood level gauges located in San Diego Creek.
29		X	Large, old trees at LAWRP evaluated by arborist and questionable ones removed to prevent damage to LAWRP
30		X	Server room air conditioners are served by backup generators to protect against heat, smoke and ash
31	X		Sand Canyon spillway channel debris clearing

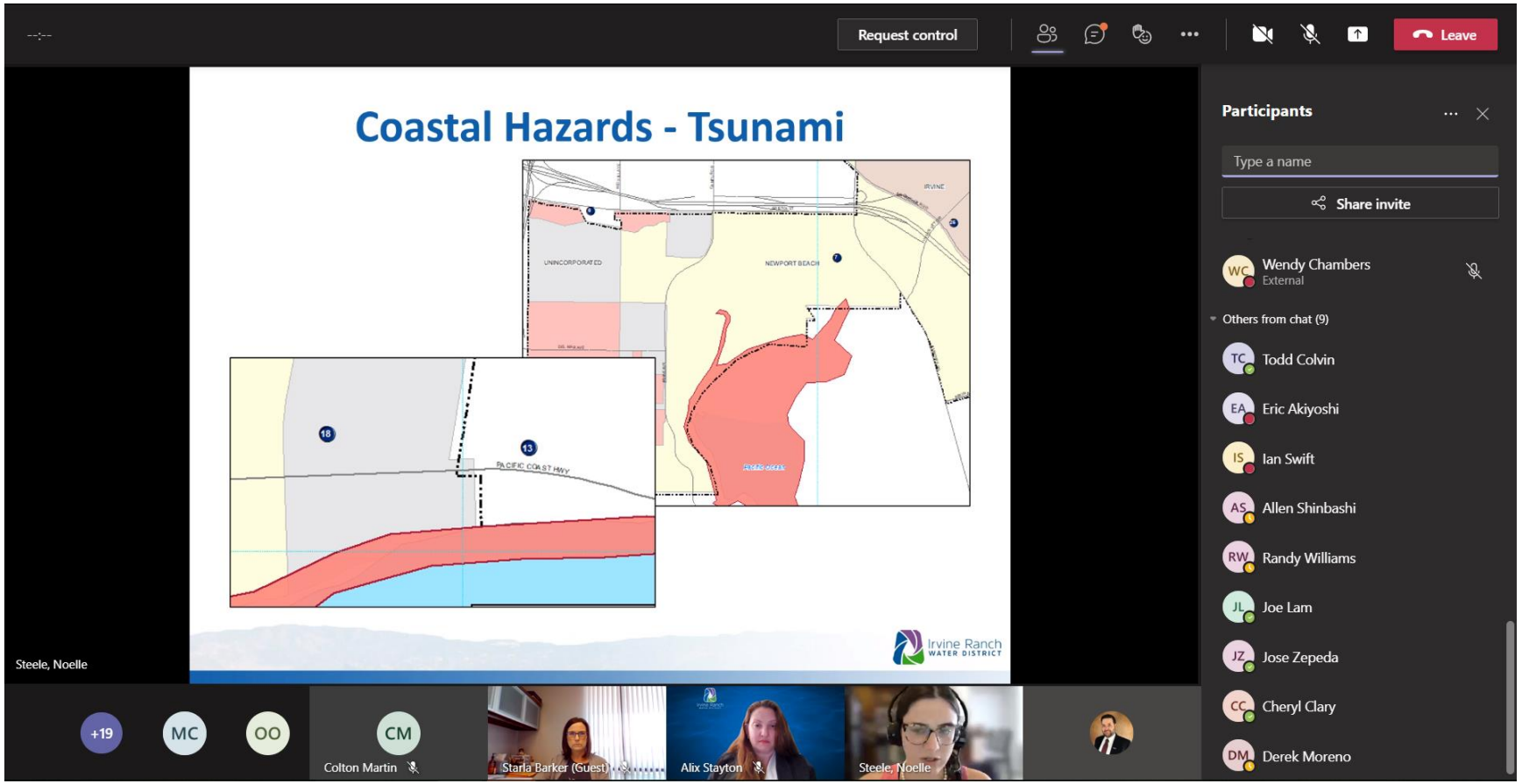
Type - click arrow to choose	Coastal Storm /Severe Winter Storm	Drought	Flood	Wildfire	Windstorm	Power Outage	Earthquake
project						X	
project						X	
project				X			
project				X			
project						X	
project				X			
project		X					
project	X	X	X	X	X	X	X
project	X	X	X	X	X	X	X
project		X					
project		X					
procedure		X		X		X	X
procedure			X				
procedure			X				
procedure			X				
plan		X					X
other		X					X
other		X					X
plan				x			
procedure		water interruption	X	X		X	X
other	X	X	X	X	X	X	X
procedure				X		X	X
procedure				X			
procedure			X				
project					X		
procedure				X			
project			X				

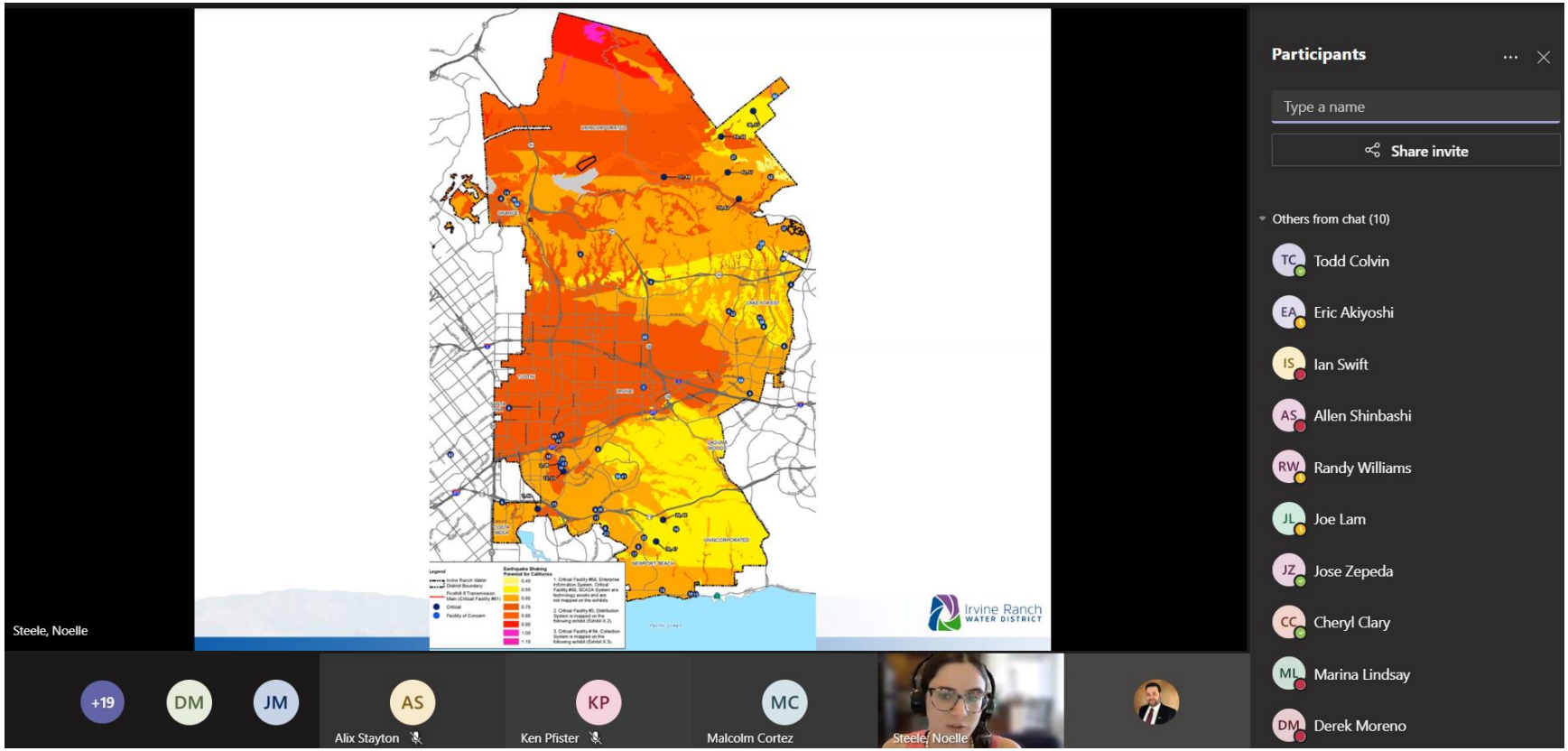
32	X		Moved offsite backups and redundant servers to cloudbased services, email servers on the cloud
33	X		Servers on UPS backup, and generator backup (SC and Michelson)
34		X	Server rooms in Sand Canyon and Michelson are powered by backup generators to protect against heat, smoke and ash
35		X	Cybersecurity Plan in process with consultant - Will include an IS/Network focused BCP
36		X	Increased flexibility and connectivity for alternate work sites with more mobile equipment and robust VPN capability
37		X	Oracle systems moving to cloud
38		X	MWRP and BioSolids has flood gates with annual training & exercise
39		X	Permanent generators for short-term power at Water Treatment Plants
40		X	SCADA equipment on UPS
42		X	SCADA cybersecurity projects and increased staffing underway
43		X	Lab equipment on UPS
44		X	Stage culture media and incubator at LAWRP (will be Baker soon)
48		X	Upon notification of potential generator needs, check with Michele to ensure IRWD has

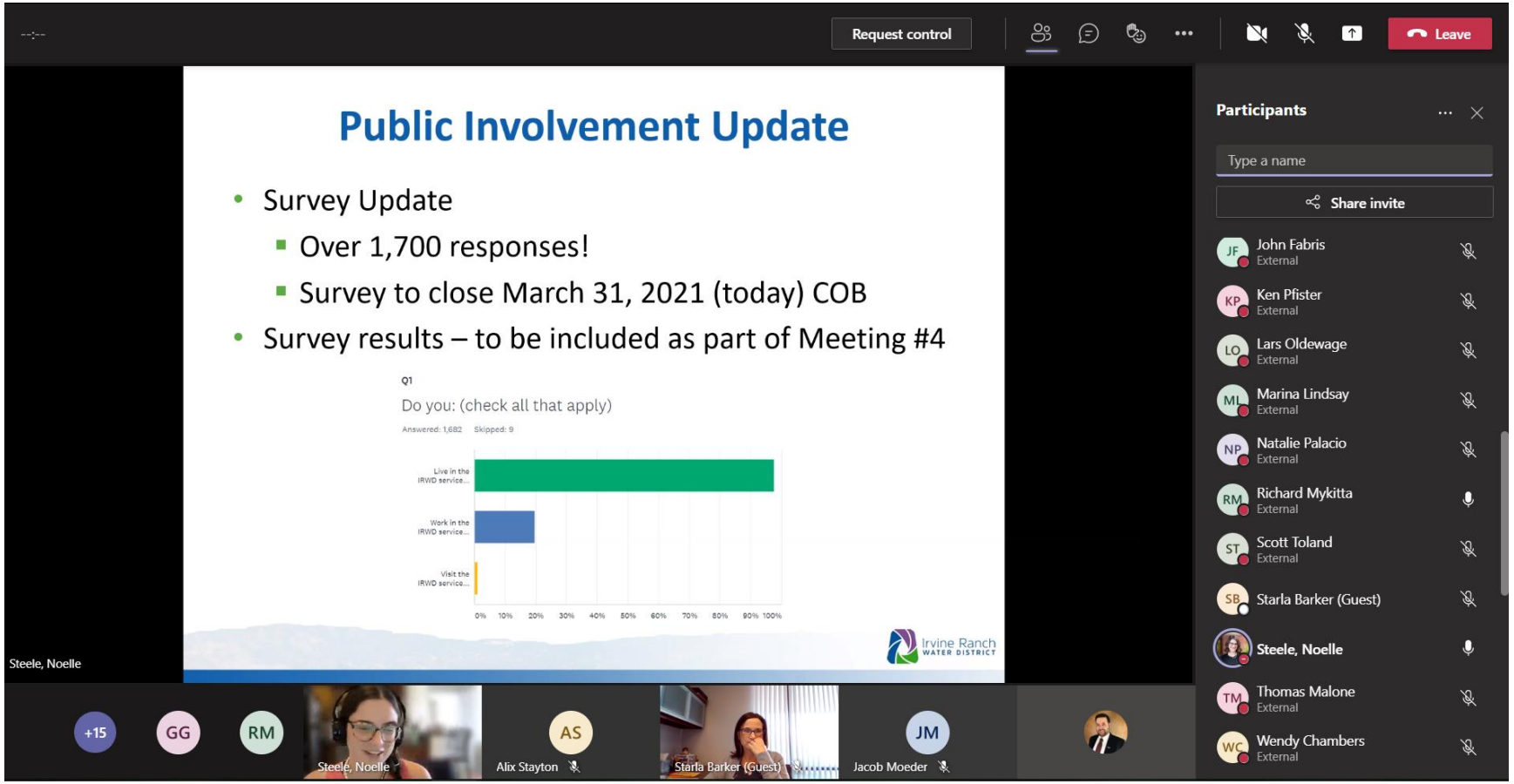
project							X
project				X	X	X	
project				X			
plan							
project			X	X		X	X
project				X		X	X
other			X				
other						X	
other				X		X	X
project	X	X	X	X	X	X	X
other						X	X
procedure			X			X	X
procedure				X		X	X

	pipeline	future	Name
18		x	Recycled Water Shortage Contingency Plan
21	x		EOP - Consider implementing backup communication systems such as satellite phones and amateur radio.
23	x		Implement and maintain internal and external alert & warning systems to communicate threats quickly and effectively to staff and customers. Include this in regular training & exercise program.
24	x		Implement and maintain information sharing mechanisms for involved departments to view during disaster response. Ensure that these can be viewed on network devices and mobile devices, while maintaining data security.
41	X		Extend battery life for SCADA system UPS
45		X	Re-evaluate practicality of alternate regulatory lab reporting site certification
46		X	Consider staging Regulatory Compliance sampling materials and equipment at alternate site with Lab
47		X	Past procedure during heavy rains has been to stage Regulatory Compliance vehicles at althernate work locations. Consider including in future plan/procedure.
49		X	Consider mapping alternate routes to main facilities that avoid bridges

Type - click arrow to choose	Coastal Storm /Severe Winter Storm	Drought	Flood	Wildfire	Windstorm	Power Outage	Earthquake
plan		X		X			
procedure		X		X		X	X
procedure	X	X	X	X	X	X	X
procedure	X	X	X	X	X	X	X
project				X		X	X
project							X
procedure			X				
plan			X				
plan							X


Request control
Leave
Coastal Hazards - Tsunami
UNINCORPORATED
NEWPORT BEACH
IRVINE
PACIFIC COAST HWY
Irvine Ranch WATER DISTRICT
Steele, Noelle
Participants
Type a name
Share invite
Wendy Chambers
External
Others from chat (9)
Todd Colvin
Eric Akiyoshi
Ian Swift
Allen Shinbashi
Randy Williams
Joe Lam
Jose Zepeda
Cheryl Clary
Derek Moreno
+19
MC
OO
CM
Colton Martin
Starla Barker (Guest)
Alix Stayton
Steele, Noelle


Steele, Noelle
Irvine Ranch WATER DISTRICT
+19
DM
JM
AS
Alix Stayton
KP
Ken Pfister
MC
Malcolm Cortez
Steele, Noelle
Participants
Type a name
Share invite
Others from chat (10)
TC Todd Colvin
EA Eric Akiyoshi
IS Ian Swift
AS Allen Shinbashi
RW Randy Williams
JL Joe Lam
JZ Jose Zepeda
CC Cheryl Clary
ML Marina Lindsay
DM Derek Moreno


Request control
Leave
Public Involvement Update
Survey Update
Over 1,700 responses!
Survey to close March 31, 2021 (today) COB
Survey results – to be included as part of Meeting #4
Q1
Do you: (check all that apply)
Answered: 1,682 Skipped: 9
Live in the IRWD service...
Work in the IRWD service...
Visit the IRWD service...
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Irvine Ranch WATER DISTRICT
Steele, Noelle
Participants
Type a name
Share invite
John Fabris External
Ken Pfister External
Lars Oldewage External
Marina Lindsay External
Natalie Palacio External
Richard Mykitta External
Scott Toland External
Starla Barker (Guest)
Steele, Noelle
Thomas Malone External
Wendy Chambers External
+15
GG
RM
Steele, Noelle
AS
Alix Stayton
Starla Barker (Guest)
JM
Jacob Moeder

Steele, Noelle

Subject:	EXTERNAL: IRWD Local Hazard Mitigation Planning meeting #4
Location:	Microsoft Teams Meeting
Start:	Wed 5/5/2021 1:30 PM
End:	Wed 5/5/2021 3:30 PM
Recurrence:	(none)
Meeting Status:	Accepted
Organizer:	Alix Stayton

Fourth and final planning group call; additional data development needs will be handled through sidebar meetings or focus groups. This meeting will zero in on IRWD's mitigation overarching mitigation strategy, how the projects/actions discussed in Meeting #3 relate to the strategy, and include an analysis of identified potential future mitigation actions, among other things. An agenda will be sent before the meeting.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Learn More | Meeting options

Steele, Noelle

From: Alix Stayton [redacted]
Sent: Thursday, April 8, 2021 12:23 PM
To: Emilyn Zuniga; pfister; garza; mcelroy; Owen O'Neill; martinc; colvin; crowe; John Dayer; Malcolm Cortez; akiyoshi; swift; shinbash; williams; lam; oldewage; haney; John Fabris; Steele, Noelle; s[redacted]Marina Lindsay; moeder; toland
Cc: chambersw; zepeda; Richard Mykitta; burton; malone; clary; colston; [redacted] Stonich, Amy; Levey, Nathan; Daniel Harrison
Subject: EXTERNAL: RE: IRWD Local Hazard Mitigation Planning meeting #4

Good afternoon,

I hope this email finds everyone well. In order to accommodate our updated schedule, we need to move this meeting to Wednesday, May 5 (at the same time – 1:30p-3:30p). I apologize for the inconvenience. As previously mentioned, the meeting will focus on IRWD's overarching mitigation strategy, how the projects/actions discussed in Meeting #3 relate to the strategy, and include an analysis of identified potential future mitigation actions, among other things. Please feel free to call or email with questions or if you need more information.

As always, we appreciate your support of this project and the resultant plan. We hope to speak with you in May. I will send the formal agenda when it is available.

Best,

Alix

ALIX STAYTON
SAFETY [redacted]

-----Original Appointment-----
From: Alix Stayton
Sent: Monday, March 22, 2021 9:52 PM
Subject: IRWD Local Hazard Mitigation Planning meeting #4
When: Wednesday, April 21, 2021 1:30 PM-2:30 PM (UTC-08:00) Pacific Time (US & Canada).
Where: Microsoft Teams Meeting

Fourth and final planning group call; additional data development needs will be handled through sidebar meetings or focus groups. This meeting will zero in on IRWD's mitigation overarching mitigation strategy, how the projects/actions discussed in Meeting #3 relate to the strategy, and include an analysis of identified potential future mitigation actions, among other things. An agenda will be sent before the meeting.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Learn More | Meeting options

Steele, Noelle

From: Alix Stayton [redacted]
Sent: Tuesday, May 4, 2021 9:30 PM
To: Emilyn Zuniga; pfister; garza; mcelroy; Owen O'Neill; martinc; colvin; crowe; John Dayer; Malcolm Cortez; akiyoshi; swift; shinbash; williams; lam; oldewage; haney; John Fabris; Steele, Noelle; [redacted] Marina Lindsay; moeder; toland
Cc: chambersw; zepeda; Richard Mykitta; burton; malone; clary; colston; [redacted] Stonich, Amy; Levey, Nathan; Daniel Harrison
Subject: EXTERNAL: RE: IRWD Local Hazard Mitigation Planning meeting #4
Attachments: Planning Team Meeting #4 Agenda.docx

Sorry, here's the agenda.

ALIX STAYTON
SAFETY SPECIALIST
[redacted]

From: Alix Stayton
Sent: Tuesday, May 4, 2021 9:00 PM

Subject: IRWD Local Hazard Mitigation Planning meeting #4

Good evening,

In anticipation of our call tomorrow, I've attached the meeting agenda, and have uploaded the documents to the Teams shared files. Looking forward to speaking with everyone who can attend.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Alix Stayton	Safety Specialist, Safety Department	Irvine Ranch Water District	[redacted]		✓
Allen Shinbashi	Manager of Risk & Contracts, Contracts & Risk Management	Irvine Ranch Water District	[redacted]		
Amy Stonich	Assistant Director of Community Development	City of Lake Forest	[redacted]		
Anisha Malik	Planner	Michael Baker International	[redacted]		
Ashley Melchor	Management Assistant	City of Lake Forest	[redacted]		
Baryic Hunter	Division Chief	Operations District 4, Orange County Fire Authority	[redacted]		
Colt Martin	Mechanical Services Manager, Mechanical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]		✓
Daniel Harrison	WEROC Specialist	Metropolitan Water District of Orange County	[redacted]		✓
Dave Crowe	Construction Manager, Construction Services	Irvine Ranch Water District	[redacted]		✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Denien Rivenburg	Public Affairs	Irvine Ranch Water District	[redacted]		
Dorien McElroy	Collections Systems Manager, Collection Systems	Irvine Ranch Water District	[redacted]		✓
Dustin Grinstead	Admin Captain for Chief Sherwood	OC Fire	[redacted]		
Emilyn Zuniga	Safety Manager, Safety Department	Irvine Ranch Water District	[redacted]		✓
Eric Akiyoshi	Engineering Manager, Planning	Irvine Ranch Water District	[redacted]		
Gaspar Garza	Operations Manager, MWRP Operations/Biosolids	Irvine Ranch Water District	[redacted]		✓
Ian Swift	Natural Resources Manager, Natural Treatment System Operations	Irvine Ranch Water District	[redacted]		
Jacob Moeder	Capital Projects Senior Engineer	Irvine Ranch Water District	[redacted]		✓
James Colston	Director Water Quality Compliance	Irvine Ranch Water District	[redacted]		

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Jason Dempsey	Emergency Services Administrator	City of Costa Mesa	[redacted]		✓
Joe Lam	Automation Manager, Automation	Irvine Ranch Water District	[redacted]		✓
Joe Meyers	Emergency Management Coordinator	Tustin Police Department	[redacted]		
John Dayer	Facilities/Fleet Manager, Facilities Services & Fleet Services – Maintenance Operations	Irvine Ranch Water District	[redacted]		✓
John Fabris	Public Affairs Manager, Public Affairs	Irvine Ranch Water District	[redacted]		✓
Jose Zepeda	Director of Recycling Operations	Irvine Ranch Water District	[redacted]		
Joyce LaPointe	Lieutenant	Office of Emergency Management, Costa Mesa Police Department	[redacted]		
Katie Eing	Disaster Services Coordinator	Newport Beach Police Department	[redacted]		
Ken Pfister	Operations Manager, Water Operations	Irvine Ranch Water District	[redacted]		✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Kevin Burton	Executive Director, Technical Services	Irvine Ranch Water District	[redacted]		✓
Lars Oldewage	Water Quality Manager, Water Quality	Irvine Ranch Water District	[redacted]		
Lisa Haney	Regulatory Compliance Manager, Regulatory Compliance	Irvine Ranch Water District	[redacted]		✓
Malcolm Cortez	Engineering Manager, Engineering – Operations Support	Irvine Ranch Water District	[redacted]		✓
Marina Lindsay	Water Resources Planner, Planning	Irvine Ranch Water District	[redacted]		✓
Natalie Palacio	Water Resources Specialist	Irvine Ranch Water District	[redacted]		
Nathan Levey	Assistant Environmental Planner	Michael Baker International	[redacted]		✓
Noelle Steele	Project Manager	Michael Baker International	[redacted]		✓
Oliver Pacifico	Water – South Coast Section	State Water Resources Control Board	[redacted]		✓

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Owen O'Neill	Electrical & Instrumentation Manager, Electrical Services – Maintenance Operations	Irvine Ranch Water District	[redacted]		✓
Randy Williams	Network and Cybersecurity Manager, Information Systems	Irvine Ranch Water District	[redacted]		
Richard (Rick) Mykitta	Director of Maintenance	Irvine Ranch Water District	[redacted]		
Robert (Bobby) Simmons	Emergency Management Administrator	Office of Emergency Management, City of Irvine	[redacted]		
Robert Stefano	Deputy Chief of Operations	Emergency Operations Section, Orange City Fire Department	[redacted]		
Sarah Fetterling	Sargent	City of Tustin Police Department	[redacted]		
Scott Toland	Senior Engineer	Irvine Ranch Water District	[redacted]		✓
Shane Sherwood	Division Chief	Operations District 2, Orange County Fire Authority	[redacted]		
Sharlyn de la Paz	Senior Management Analyst	City of Lake Forest	[redacted]		

Irvine Ranch Water District
Local Hazard Mitigation Plan
Planning Team Meeting #4
May 5, 2021

Last and First Name	Title	Organization/Department	Mailing Address	E-Mail Address	Present?
Starla Barker	Technical Consultant	De Novo Planning	[redacted]		✓
Stephen Foster	Emergency Management Coordinator	City of Tustin	[redacted]		✓
Steve Rhyner	Emergency Operations Coordinator	Emergency Management, City of Santa Ana	[redacted]		
Thomas Malone	Director for Information Services	Irvine Ranch Water District	[redacted]		✓
Todd Colvin	Water Maintenance Supervisor, Field Services	Irvine Ranch Water District	[redacted]		
Vicki Osborn	Director of Emergency Management	Metropolitan Water District of Orange County	[redacted]		
Wendy Chambers	Executive Director of Operations	Irvine Ranch Water District	[redacted]		✓

Michael Baker
INTERNATIONAL

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #4
Wednesday, May 5, 2021
1:30 PM – 3:30 PM, Microsoft Teams

AGENDA

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1) **Risk Assessment/Vulnerability - Updates from Meeting #3**
   - Mapped Hazards: Dam inundation, Flood, Landslide, Seismic (Fault Rupture, Liquefaction), and Wildfire
   - Not Mapped Hazards: Drought, Geologic Hazards, Human-Caused Hazards, Severe Weather

2) **Survey Summary/Community Outreach Summary**
   - Summarize responses, including:
     a) High concern/low concern hazards
     b) Preparedness
     c) Access
     d) Outreach

3) **Mitigation Strategy**
   - Mitigation Goals
   - Mitigation actions
     a) Mitigation actions – reduce or eliminate long-term risk
     b) Different from actions to prepare or respond to an event
     c) Mitigation activities lessen or eliminate the need for preparedness or response resources
     d) Emphasis on the impact or vulnerabilities – not on the hazard itself
   - Staple/e review & selection criteria
     a) Social
     b) Technical
     c) Administrative
     d) Political
     e) Legal
     f) Economic
     g) Environmental
   - Mitigation Prioritization & Timeframe

4) **Capabilities Assessment**
   - Are there opportunities to improve upon the capabilities?

Michael Baker
INTERNATIONAL

5) Next Steps

- Complete Draft LHMP for Planning Team Review
  - May 5 – June 18, 2021
- Planning Team Review of LHMP
  - June 21 – July 2, 2021
- Revise LHMP for Public Review
- Public Review
  - July 20 – August 3, 2021

Irvine Ranch
WATER DISTRICT

IRVINE RANCH WATER DISTRICT

HAZARD MITIGATION PLAN

Michael Baker
INTERNATIONAL

Agenda

- Risk assessment/vulnerability overview
  - Updates from Meeting #3
- Survey summary
- Mitigation strategy
- Capabilities assessment
- Next steps
- Questions/additional discussion

Risk Assessment/ Vulnerability Overview

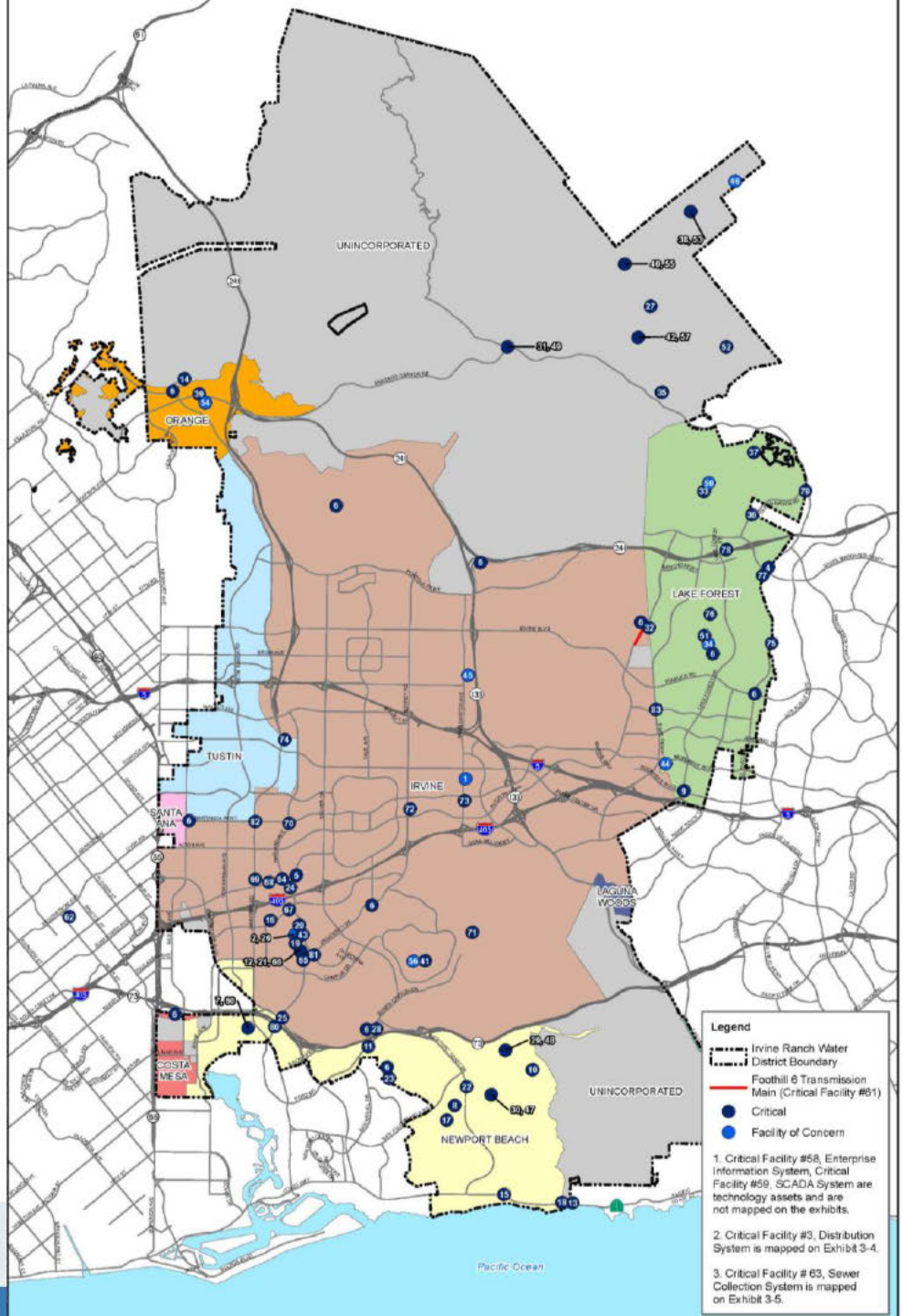
Hazards Profiled

- Dam/Reservoir Failure
- Drought
- Flood
- Geologic Hazards
  - Expansive Soils
  - Land Subsidence
- Human Caused Hazards
  - Hazardous Materials
  - Terrorism/Sabotage (cyberattacks)
- Landslide/Mudflow
- Seismic Hazards
  - Fault Rupture
  - Ground Shaking
  - Liquefaction
- Severe Weather
  - Coastal Storm/Winter Storm
  - Windstorm (Santa Ana winds)
  - Power Outage (secondary impact)
- Wildfire

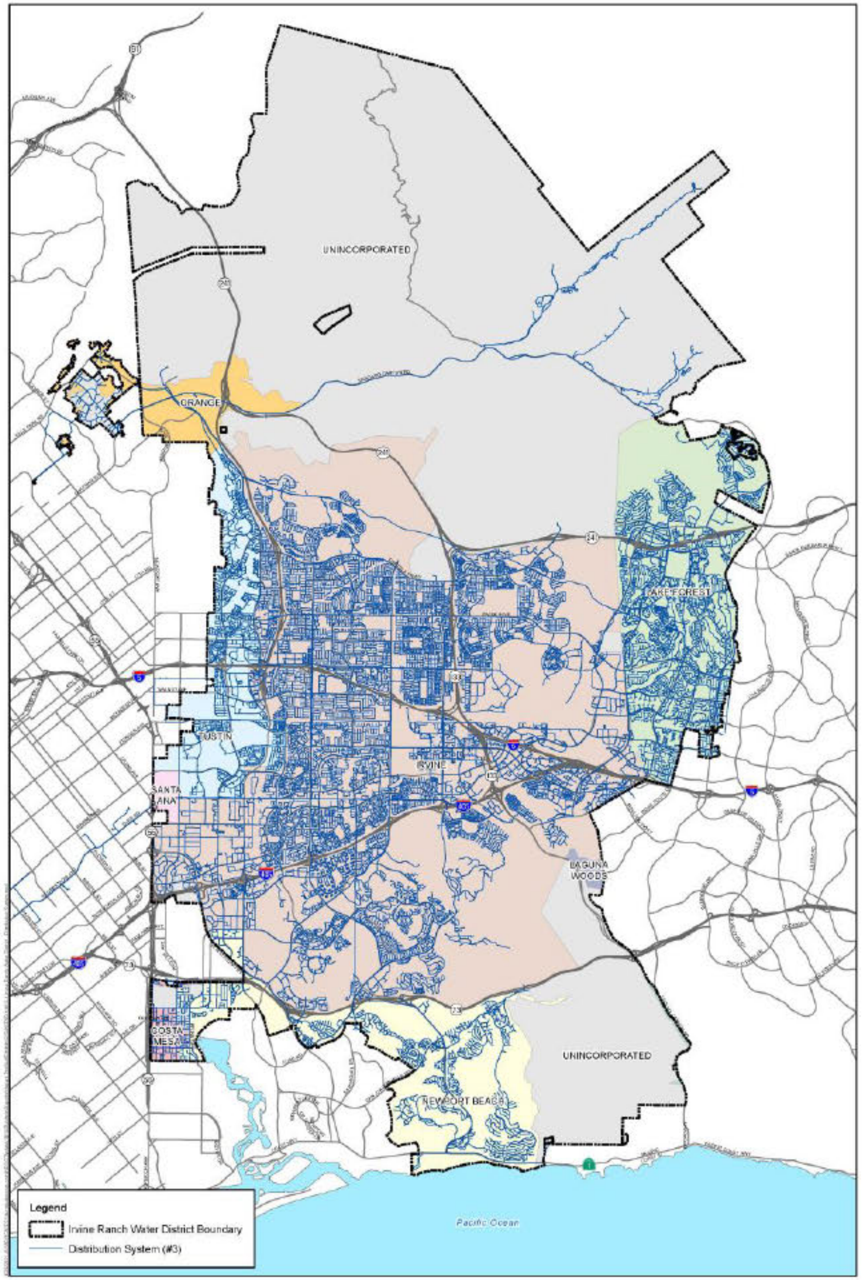
Irvine Ranch WATER DISTRICT

Facility Types

- **Critical Facilities**
  - Facilities that are **critical** to provide potable and wastewater services to IRWD customers
  - Failure of critical facilities would result in significant issues in maintaining service
  - Many critical facilities are the sole source of water at their location, do not have a backup, or provide service to areas with known hazards/risk
- **Facilities of Concern**
  - Facilities that are **important** to provide potable and wastewater services to IRWD customers
  - Failure of a facility of concern would create slow downs/challenges, but ultimately IRWD could maintain service in the short term



Irvine Ranch WATER DISTRICT

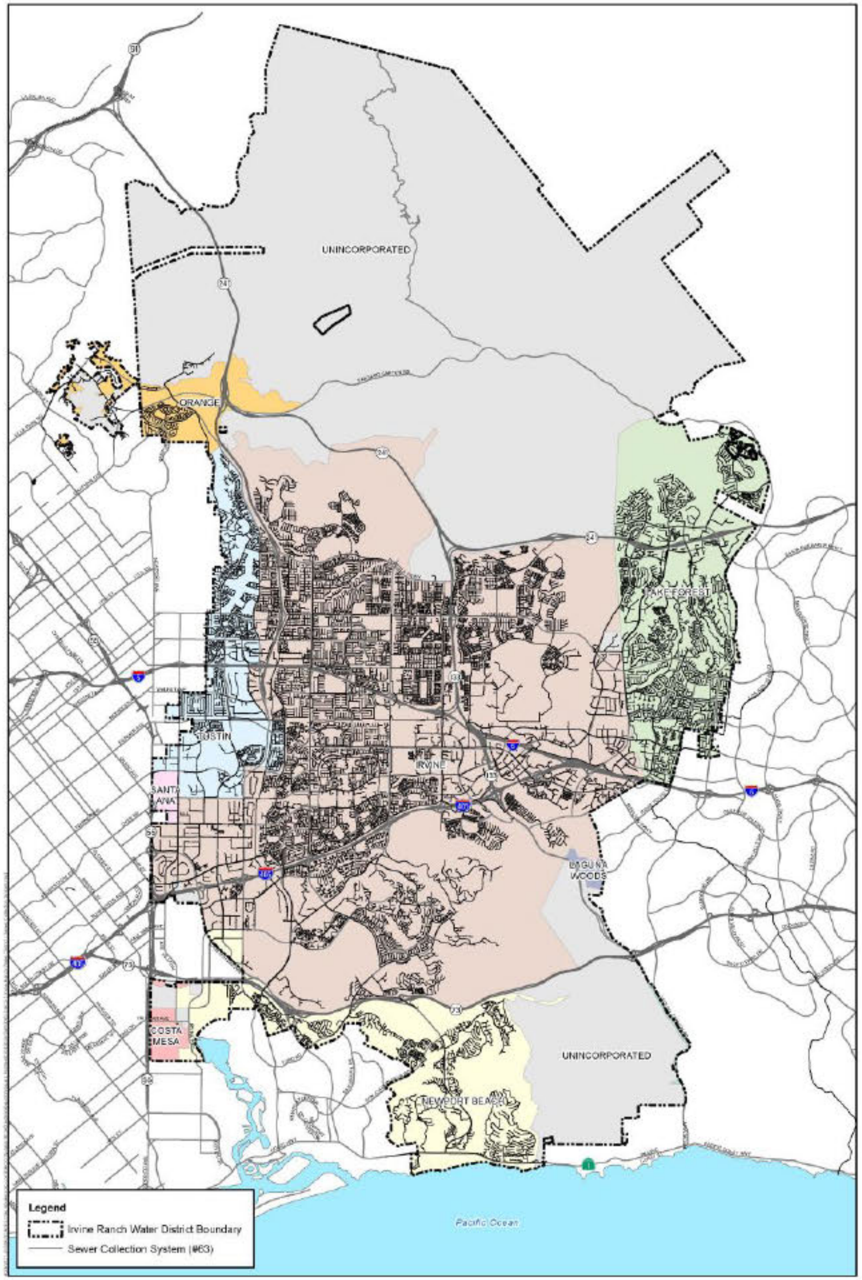


Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District - Distribution System

Source: IRWD, 2021

Exhibit 3-4



Irvine Ranch Water District Local Hazard Mitigation Plan

Irvine Ranch Water District - Sewer Collection System

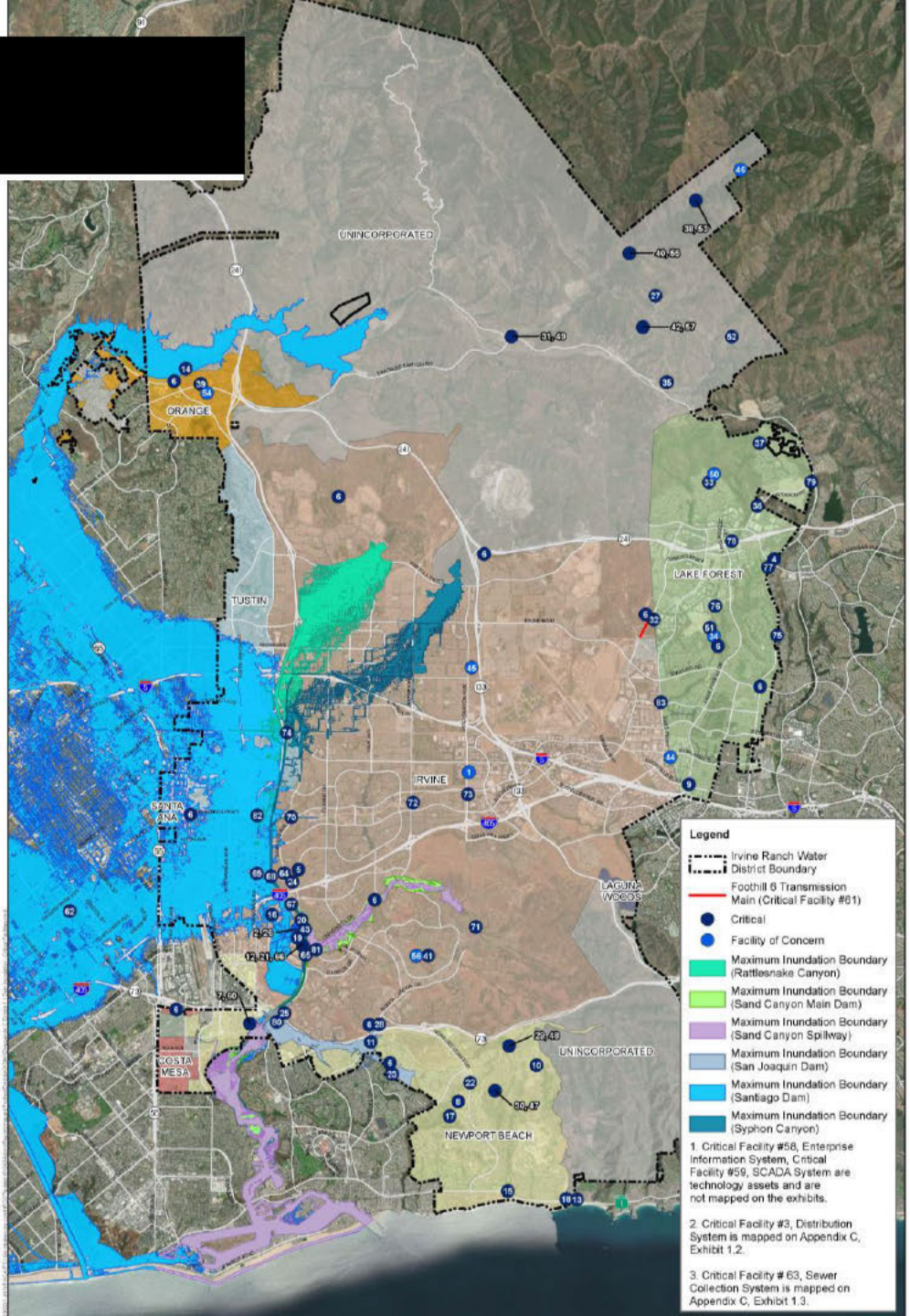
Source: IRWD, 2021

Exhibit 3-5

DAM/RESERVOIR INUNDATION

Irvine Ranch WATER DISTRICT

[redacted]



Irvine Ranch WATER DISTRICT

Dam Inundation – Vulnerability Matrix

Map ID	Name	Asset Type	Santiago Dam	Sand Canyon (Spillway)	Sand Canyon (Dam)	Syphon Canyon Dam	Rattle-snake Canyon Dam	San Joaquin Dam
2	Michelson Biosolids	Biosolids Treatment	Y	N	N	N	N	N
3	Distribution System	Distribution System	Y	Y	Y	Y	Y	Y
6	Met Source Water	Intake	N	Y	Y	N	N	Y
11	Coyote Canyon	Lift Station	N	N	N	N	N	Y
14	Irvine Park	Lift Station	Y	N	N	N	N	N
19	MWRP MPS-3	Non-Potable Booster Station	Y	N	N	N	N	N
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	N	N	N	N	N	Y
26	Michelson Operations Center	Operations Staff Offices	Y	N	N	N	N	N
43	Michelson MWRP	Recycled Water	Y	N	N	N	N	N
62	Deep Aquifer Treatment System (DATS)	Treatment System	Y	N	N	N	N	N
63	Collection System	Wastewater Collection System	Y	Y	Y	Y	Y	Y

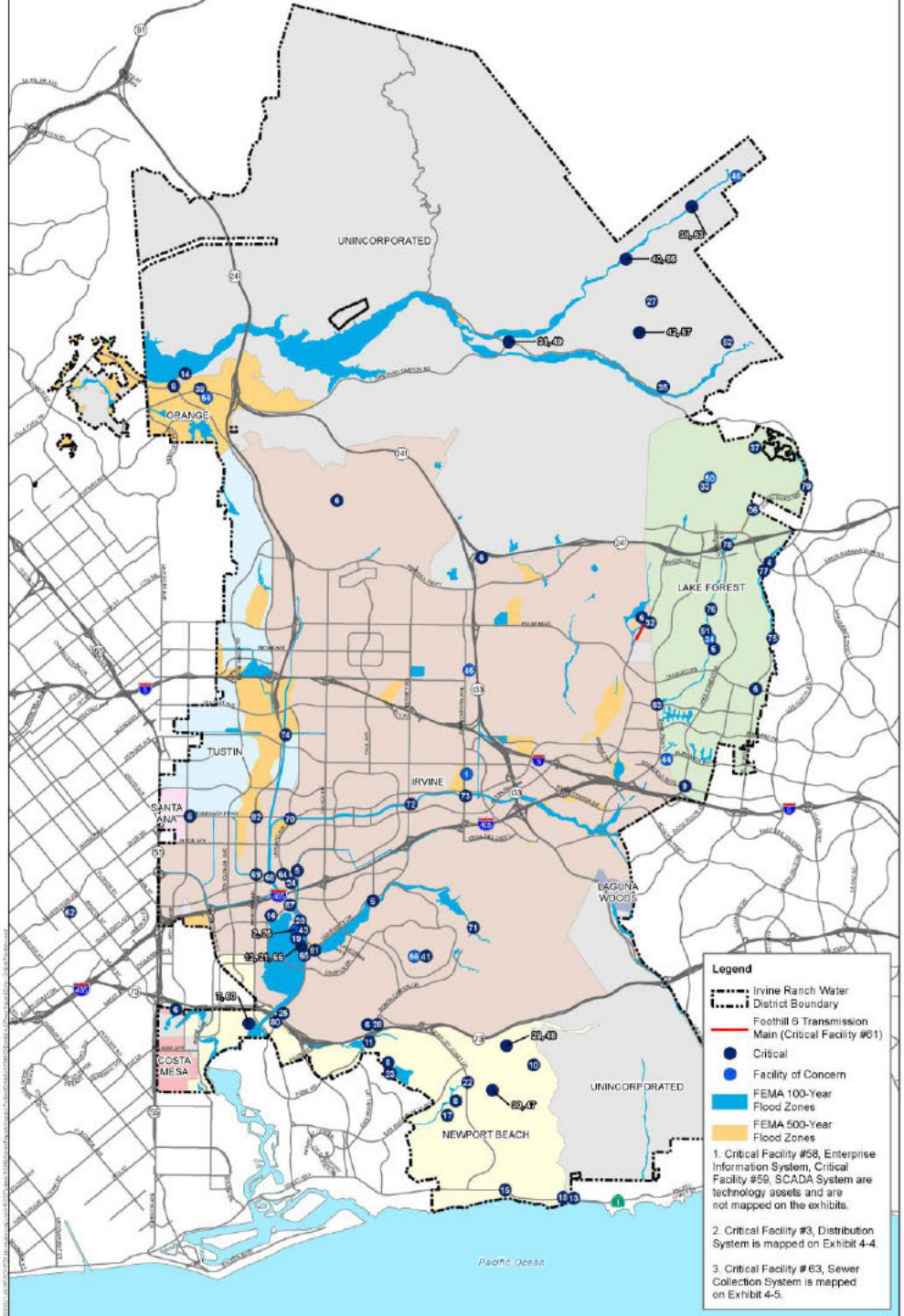
Dam Inundation – Vulnerability Matrix

Map ID	Name	Asset Type	Santiago Dam	Sand Canyon (Spillway)	Sand Canyon (Dam)	Syphon Canyon Dam	Rattle-snake Canyon Dam	San Joaquin Dam
65	S1	Siphon	Y	Y	Y	N	Y	Y
66	S2	Siphon	Y	Y	Y	Y	Y	Y
67	S3	Siphon	Y	N	Y	Y	Y	N
68	S4	Siphon	Y	Y	Y	Y	Y	N
69	S5	Siphon	Y	N	N	N	N	N
70	S6	Siphon	Y	N	N	N	Y	N
74	S10	Siphon	Y	N	N	Y	Y	N
80	S16	Siphon	N	N	N	N	N	Y
81	S18	Siphon	N	Y	Y	N	N	N
82	S19	Siphon	Y	N	N	N	N	N

Irvine Ranch WATER DISTRICT

FLOOD HAZARDS

Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

Flood

Map ID	Name	Asset Type	Status	Location	Replacement Value
3	Distribution System	Distribution System	Critical	***75.31 miles***	$790,000,000.00
6	Met Source Water	Intake	Critical	NA	NA
12	Duck Club	Lift Station	Critical	3512 Michelson Drive, Irvine	$300,000.00
14	Irvine Park	Lift Station	Critical	1 Irvine Park Road, Irvine	$2,605,484.00
21	MWRP Caretaker Housing	Lift Station	Critical	3512 Michelson Drive, Irvine	$300,000.00
40	Shaw Pump Station	Pump Station	Critical	28934 Silverado Canyon Road	$1,649,200.00
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd	$3,306,300.00
63	Collection System	Wastewater Collection System	Critical	***53 miles***	
65	S1	Siphon	Critical	San Diego Creek Channel/University	$585,000.00
66	S2	Siphon	Critical	Harvard/San Diego Creek Channel	$1,266,000.00
67	S3	Siphon	Critical	Michelson/Riparian	$1,302,000.00
68	S4	Siphon	Critical	Main/Veneto	$1,365,000.00
69	S5	Siphon	Critical	Jamboree/N of Main	$222,000.00

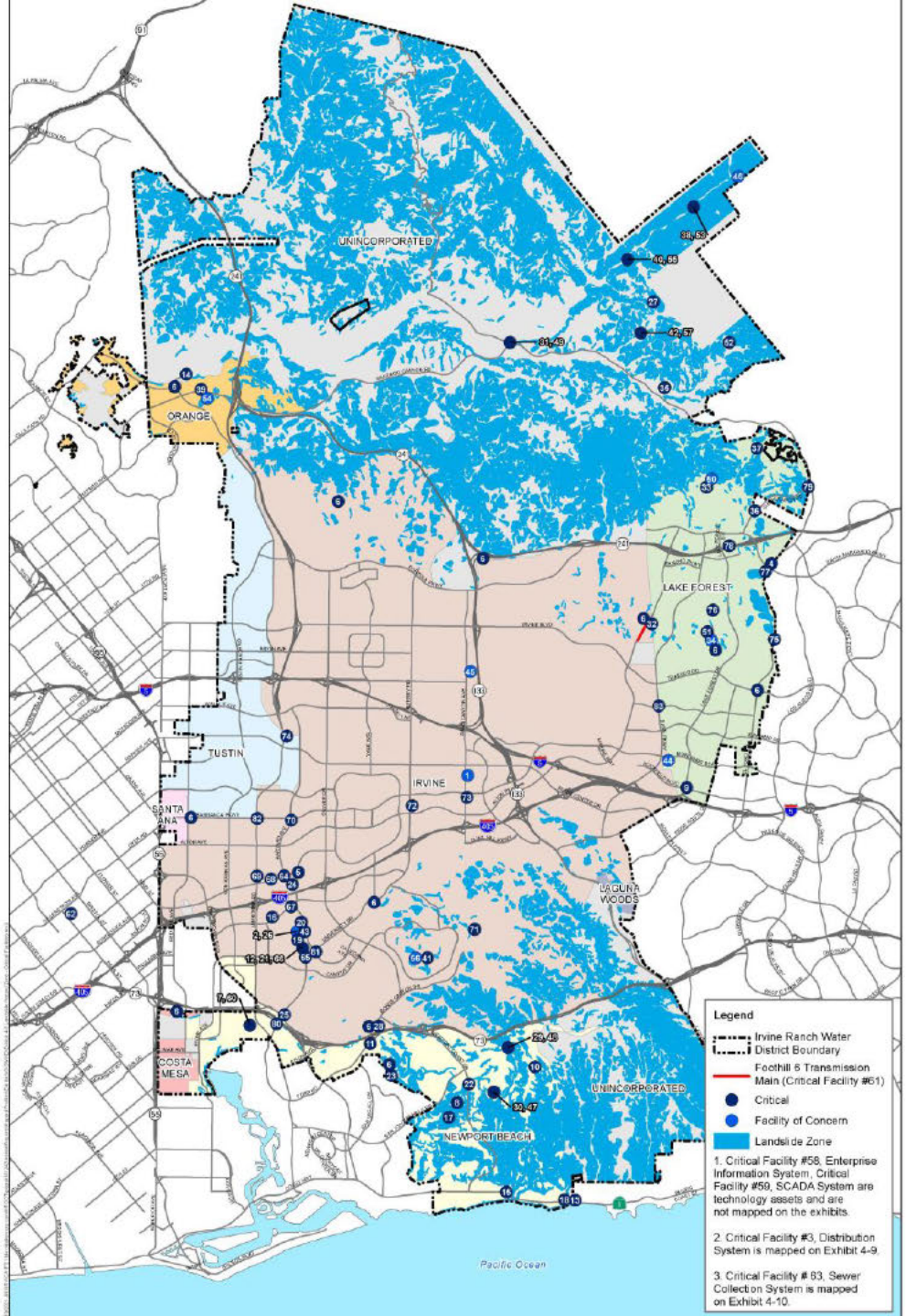
Irvine Ranch WATER DISTRICT

Flood

Map ID	Name	Asset Type	Status	Location	Replacement Value
70	S6	Siphon	Critical	Harvard/Barranca	$444,000.00
72	S8	Siphon	Critical	Jeffrey/Alton	$807,000.00
73	S9	Siphon	Critical	Sand Canyon/Barranca	$870,000.00
74	S10	Siphon	Critical	OCTA Metrolink/Jamboree	$549,000.00
75	S11	Siphon	Critical	El Toro/Raintree	$948,000.00
77	S13	Siphon	Critical	Portola/El Toro	$1,122,000.00
78	S14	Siphon	Critical	241/Lake Forest	$432,000.00
81	S18	Siphon	Critical	Harvard/University	$807,000.00
83	S17	Siphon	Critical	Bake/Toledo	$324,000.00

LANDSLIDE HAZARDS

Irvine Ranch WATER DISTRICT



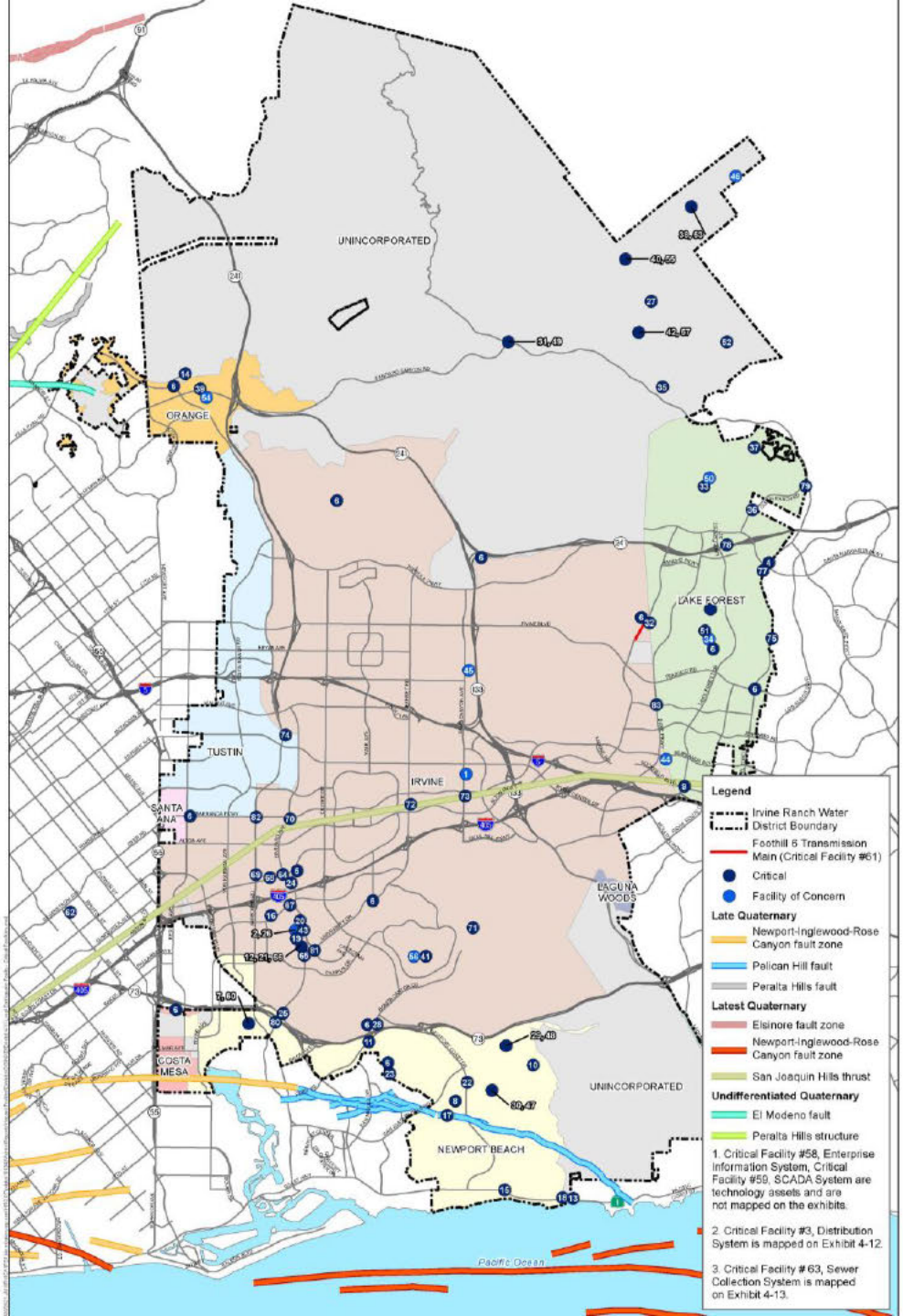
Irvine Ranch WATER DISTRICT

Landslide

Map ID	Name	Asset Type	Status	Location	Replacement Value
3	Distribution System	Distribution System	Critical	***40.65 miles***	$790,000,000.00
8	Buck Gully	Lift Station	Critical	21594 White Pine, Newport Beach	$1,935,024.00
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	Critical	3262 University Drive, Irvine	$6,999,844.00
27	Benner Reservoir	Pump Station	Critical	28741 Williams Canyon Rd	$1,138,600.00
46	Chapman Reservoir	Reservoir	Facility of Concern	14909 Mill Rd	$1,510,400.00
52	Modjeska Reservoir	Reservoir	Critical	29265 Modjeska Canyon Rd	$4,478,500.00
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd	$3,306,300.00
57	Williams Canyon Reservoir	Reservoir	Critical	27600 Williams Canyon Rd	$2,653,400.00
63	Collection System	Wastewater Collection System	Critical	***31.68 miles***	

SEISMIC HAZARDS – FAULT RUPTURE

Irvine Ranch WATER DISTRICT



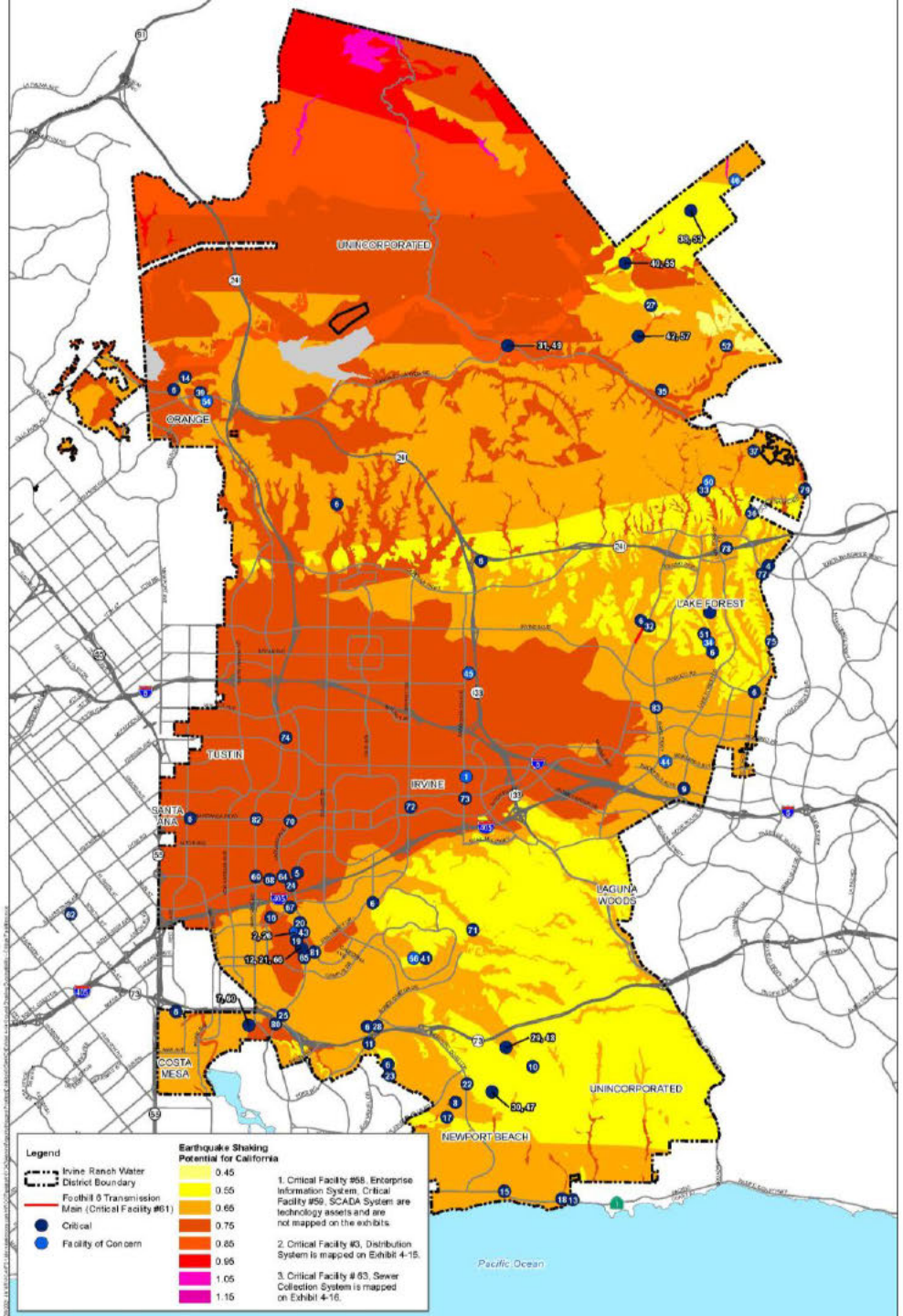
Irvine Ranch WATER DISTRICT

Seismic Hazards – Fault Rupture

Map ID	Name	Asset Type	Status	Location	Replacement Value
3	Distribution System	Distribution System	Critical	N/A	$790,000,000.00
17	Montecito	Lift Station	Critical	21 Via Burrone, Newport Beach	$1,935,024.00
63	Collection System	Sewer Collection System	Critical	N/A	

SEISMIC HAZARDS – GROUND SHAKING

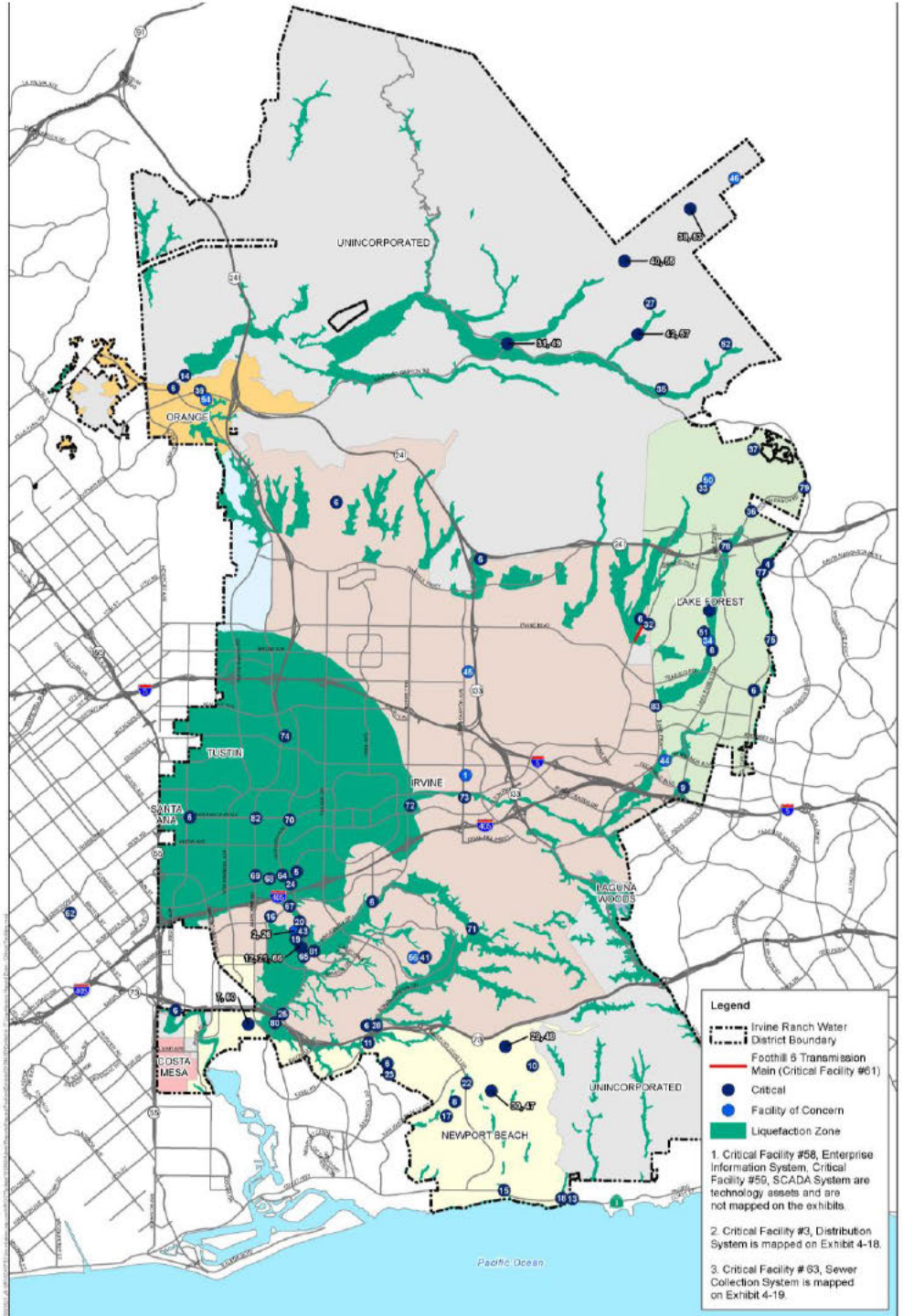
Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

SEISMIC HAZARDS - LIQUEFACTION

Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

Liquefaction

Map ID	Name	Asset Type	Status	Location	Replacement Value
2	Michelson Biosolids	Biosolids Treatment	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612	$250,000,000.00
3	Distribution System	Distribution System	Critical	***475.14 miles***	$790,000,000.00
4	El Toro Diversion Structure	Diversion Structure	Critical	NA	$500,000.00
5	San Mateo Diversion	Diversion Structure	Critical	103 San Mateo, Irvine	$500,000.00
6	Met Source Water	Intake	Critical	NA	NA
9	Canada	Lift Station	Critical	22952 Lake Forest Drive, Lake Forest	$3,508,247.00
12	Duck Club	Lift Station	Critical	3512 Michelson Drive, Irvine	$300,000.00
15	Los Trancos Low Flow	Lift Station	Critical	7303 Pacific Coast Highway, Newport Beach	$1,935,024.00
18	Muddy Canyon Low Flow	Lift Station	Critical	8333 Pacific Coast Highway, Newport Beach	$1,935,024.00
19	MWRP MPS-3	Non-Potable Booster Station	Critical	3512 Michelson Drive, Irvine	$4,226,529.00
21	MWRP Caretaker Housing	Lift Station	Critical	3512 Michelson Drive, Irvine	$300,000.00
22	Newport Coast	Lift Station	Critical	21244 Newport Coast Drive, Newport Beach	$6,999,844.00
24	Harvard	Lift Station	Critical	17675.25 Harvard Avenue, Irvine	$5,115,644.00

Liquefaction

Map ID	Name	Asset Type	Status	Location	Replacement Value
26	Michelson Operations Center	Operations Staff Offices	Facility of Concern	3512 Michelson Drive, Irvine, CA 92612	$20,900,000.00
28	Coastal OC 63-Zn.4 Pump Station	Pump Station	Critical	4925 1/2 Bonita Canyon Dr, Irvine 92603	$3,076,700.00
42	Williams Canyon Pump Station (Benner)	Pump Station	Critical	27600 Williams Canyon Road	$1,649,200.00
43	Michelson MWRP	Recycled Water	Critical	3512 Michelson Drive, Irvine, CA 92612	$500,000,000.00
44	Los Alisos Water Recycling Plant (LAWRP)	Recycling Plant	Facility of Concern	22312 Muirlands Boulevard, Lake Forest	$10,185,000.00
61	Foothill 6 Transmission Main	Transmission Main	Critical	NA	$504,104.32
63	Collection System	Sewer Collection System	Critical	***387.35 miles***	
65	S1	Siphon	Critical	San Diego Creek Channel/University	$585,000.00
66	S2	Siphon	Critical	Harvard/San Diego Creek Channel	$1,266,000.00
67	S3	Siphon	Critical	Michelson/Riparian	$1,302,000.00
68	S4	Siphon	Critical	Main/Veneto	$1,365,000.00
69	S5	Siphon	Critical	Jamboree/N of Main	$222,000.00

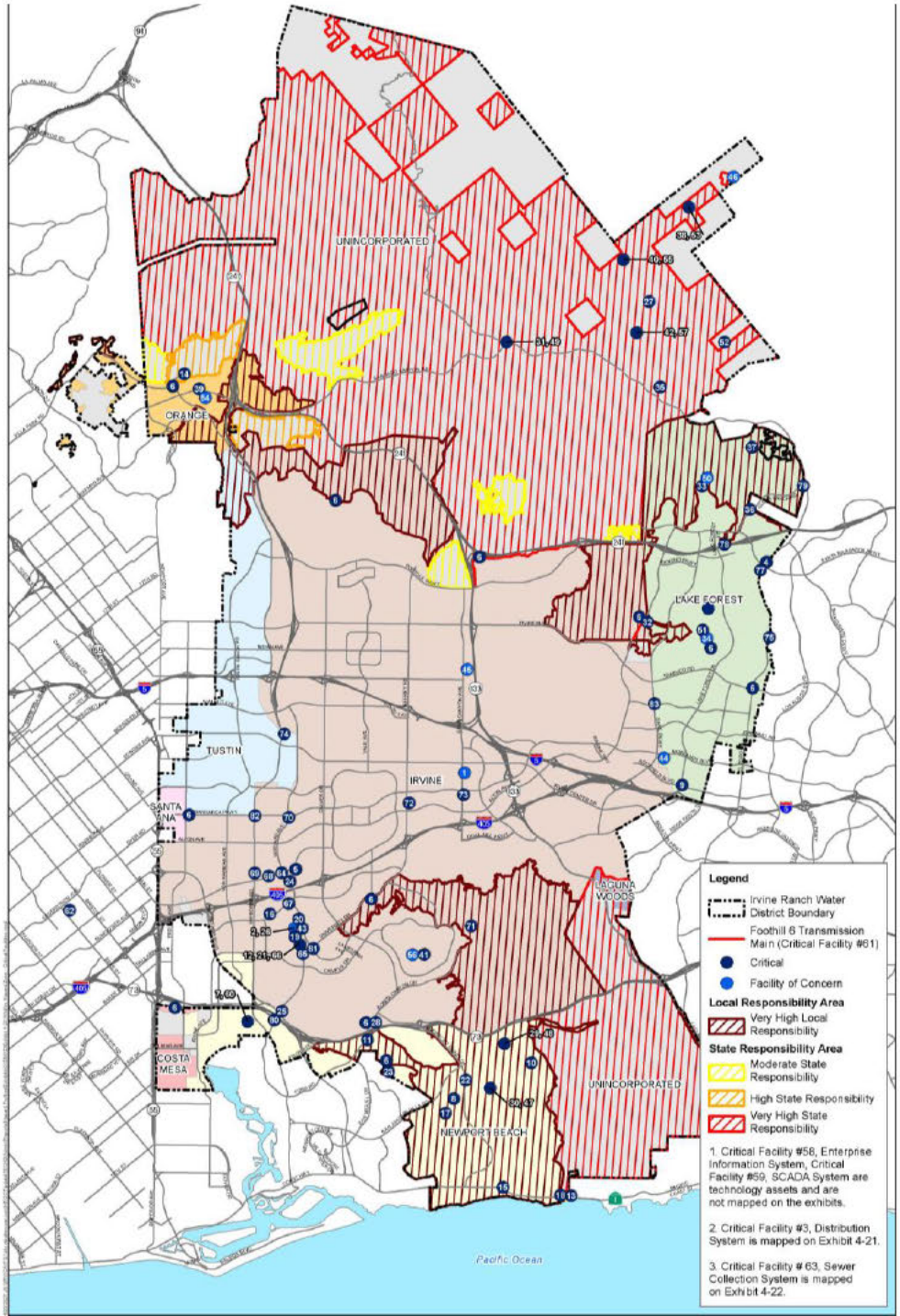
Irvine Ranch WATER DISTRICT

Liquefaction

Map ID	Name	Asset Type	Status	Location	Replacement Value
70	S6	Siphon	Critical	Harvard/Barranca	$444,000.00
71	S7	Siphon	Critical	Shady Canyon/Sage Creek	$1,056,000.00
72	S8	Siphon	Critical	Jeffrey/Alton	$807,000.00
73	S9	Siphon	Critical	Sand Canyon/Barranca	$870,000.00
74	S10	Siphon	Critical	OCTA Metrolink/Jamboree	$549,000.00
75	S11	Siphon	Critical	El Toro/Raintree	$948,000.00
76	S12	Siphon	Critical	Prism/Linear	$738,000.00
77	S13	Siphon	Critical	Portola/El Toro	$1,122,000.00
78	S14	Siphon	Critical	241/Lake Forest	$432,000.00
81	S18	Siphon	Critical	Harvard/University	$807,000.00
82	S19	Siphon	Critical	Jamboree/Barranca	$180,000.00

WILDFIRE

Irvine Ranch WATER DISTRICT



Irvine Ranch WATER DISTRICT

Wildfire

Map ID	Name	Asset Type	Status	Location	Replacement Value
3	Distribution System	Distribution System	Critical	***221.58 miles***	$790,000,000.00
6	Met Source Water	Intake	Critical	NA	NA
8	Buck Gully	Lift Station	Critical	21594 White Pine, Newport Beach	$1,935,024.00
10	Coastal Ridge	Lift Station	Critical	22322 Pacific Mist, Newport Beach	$2,605,484.00
11	Coyote Canyon	Lift Station	Critical	3000 ½ Bonita Canyon Road, Irvine	$2,605,484.00
14	Irvine Park	Lift Station	Critical	1 Irvine Park Road, Irvine	$2,605,484.00
15	Los Trancos Low Flow	Lift Station	Critical	7303 Pacific Coast Highway, Newport Beach	$1,935,024.00
17	Montecito	Lift Station	Critical	21 Via Burrone, Newport Beach	$1,935,024.00
18	Muddy Canyon Low Flow	Lift Station	Critical	8333 Pacific Coast Highway, Newport Beach	$1,935,024.00
22	Newport Coast	Lift Station	Critical	21244 Newport Coast Drive, Newport Beach	$6,999,844.00
23	San Joaquin Housing	Lift Station	Critical	32 Ridgeline Drive, Newport Beach	$300,000.00
27	Benner Reservoir	Pump Station	Critical	28741 Williams Canyon Rd	$1,138,600.00
29	Coastal Zn 6-7 Pump Station	Pump Station	Critical	20783 Vista Ridge Rd, Newport Beach 92657	$2,671,800.00

Wildfire

Map ID	Name	Asset Type	Status	Location	Replacement Value
30	Coastal Zn. 4-6 Pump Station	Pump Station	Critical	21474 Vista Ridge Rd, Newport Coast 92657	$2,268,700.00
31	Fleming Pump Station	Pump Station	Critical	7431 Silverado Canyon Road	$2,268,700.00
32	Foothill Zn 4-6 Pump Station	Pump Station	Critical	21515 Magazine Rd, Irvine 92618/12848 1/2 Alton	$3,076,700.00
33	Foothill Zn 6-6A Pump Station	Pump Station	Critical	2 Touraine Pl, Foothill Ranch 92610	$2,671,800.00
35	Manning Pump Station	Pump Station	Critical	29265 Modjeska Canyon Road	$1,649,200.00
36	Portola Hills Zn 6-8	Pump Station	Critical	27841 Glenn Ranch Rd, Portola hills 92610	$3,076,700.00
37	Portola Hills Zn 8-9 Pump Station	Pump Station	Critical	18967 Saddleback, Trabuco 92679	$3,076,700.00
38	Read Pump Station	Pump Station	Critical	30500 Silverado Canyon Road	$1,649,200.00
40	Shaw Pump Station	Pump Station	Critical	28934 Silverado Canyon Road	$1,649,200.00
42	Williams Canyon Pump Station	Pump Station	Critical	27600 Williams Canyon Road	$1,649,200.00
46	Chapman Reservoir	Reservoir	Facility of Concern	14909 Mill Rd	$1,510,400.00
47	Coastal Zn 4 Reservoir	Reservoir	Critical	21474 Vista Ridge, Newport Beach 92657	$8,813,300.00
48	Coastal Zn 6 Reservoir	Reservoir	Critical	20783 Vista Ridge Rd, Newport Beach 92657	$1,230,590.00

Wildfire

Map ID	Name	Asset Type	Status	Location	Replacement Value
49	Fleming Reservoir	Reservoir	Critical	7431 Silverado Canyon Road	$1,556,800.00
50	Foothill Zn 6 Reservoir	Reservoir	Facility of Concern	2 Touraine Pl, Foothll Ranch 92610	$7,794,900.00
53	Read Reservoir	Reservoir	Critical	30500 Silverado Canyon Rd	$3,306,300.00
55	Shaw Reservoir	Reservoir	Critical	28914 Olive Drive	$1,728,100.00
57	Williams Canyon Reservoir	Reservoir	Critical	27600 Williams Canyon Rd	$2,653,400.00
61	Foothill 6 Transmission Line	Transmission Main	Critical	Foothill 4-6 to Foothill 6 Reservoir	$504,104.32
63	Collection System	Sewer Collection System	Critical	***151.26 miles***	
71	S7	Siphon	Critical	NA	$1,056,000.00
78	S14	Siphon	Critical	NA	$432,000.00
79	S15	Siphon	Critical	NA	$915,000.00

Irvine Ranch WATER DISTRICT

Not Mapped Hazards

- Drought
- Human Induced Hazards
  - Hazardous Materials
  - Terrorism/Sabotage (cyberattacks)
- Geologic Hazards
  - Land Subsidence
  - Expansive Soils
- Severe Weather
  - Coastal Storms/Winter Storms
  - Windstorm
  - Power Outage

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
2	Michelson Biosolids	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
3	Distribution System	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	El Toro Diversion Structure	N	Y	N	Y	Y	N	Y	Y	N	Y	N
5	San Mateo Diversion	N	Y	N	Y	Y	N	Y	Y	N	Y	N
6	Met Source Water	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
8	Buck Gully	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
9	Canada	N	Y	N	Y	Y	N	Y	Y	N	Y	N
10	Coastal Ridge	N	Y	N	Y	Y	N	N	Y	N	Y	Y
11	Coyote Canyon	Y	Y	N	Y	Y	N	N	Y	N	Y	Y

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
12	Duck Club	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
14	Irvine Park	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
15	Los Trancos Low Flow	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
17	Montecito	N	Y	N	Y	Y	N	N	Y	Y	Y	Y
18	Muddy Canyon Low Flow	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
19	MWRP MPS-3	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
21	MWRP Caretaker Housing	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
22	Newport Coast	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
23	San Joaquin Housing	N	Y	N	Y	Y	N	N	Y	N	Y	Y

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
24	Harvard	N	Y	N	Y	Y	N	Y	Y	N	Y	N
25	University	Y	Y	N	Y	Y	Y	N	Y	N	Y	N
26	Michelson Operations Center	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
27	Benner Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
28	Coastal OC 63-Zn.4 Pump Station	N	Y	N	Y	Y	N	Y	Y	N	Y	N
29	Coastal Zn 6-7 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
30	Coastal Zn. 4-6 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
31	Fleming Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
32	Foothill Zn 4-6 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
33	Foothill Zn 6-6A Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
35	Manning Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
36	Portola Hills Zn 6-8	N	Y	N	Y	Y	N	N	Y	N	Y	Y
37	Portola Hills Zn 8-9 Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
38	Read Pump Station	N	Y	N	Y	Y	N	N	Y	N	Y	Y
40	Shaw Pump Station	N	Y	Y	Y	Y	N	N	Y	N	Y	Y
42	Williams Canyon Pump Station (Benner)	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
43	Michelson MWRP	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
44	Los Alisos Water Recycling Plant (LAWRP)	N	Y	N	Y	Y	N	Y	Y	N	Y	N

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
46	Chapman Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y
47	Coastal Zn 4 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
48	Coastal Zn 6 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
49	Fleming Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
50	Foothill Zn 6 Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
52	Modjeska Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	N
53	Read Reservoir	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y
55	Shaw Reservoir	N	Y	N	Y	Y	N	N	Y	N	Y	Y
57	Williams Canyon Reservoir	N	Y	N	Y	Y	Y	N	Y	N	Y	Y

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
61	Foothill 6 Transmission Line	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
62	Deep Aquifer Treatment System (DATS)	Y	Y	N	Y	Y	N	N	Y	N	Y	N
63	Collection System	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
64	Harvard Area Trunk Diversion Structure (HATS)	N	Y	N	Y	Y	N	Y	Y	N	Y	N
65	S1	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
66	S2	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
67	S3	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
68	S4	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N

Irvine Ranch WATER DISTRICT

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
69	S5	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
70	S6	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
71	S7	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
72	S8	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
73	S9	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
74	S10	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
75	S11	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
76	S12	N	Y	N	Y	Y	N	Y	Y	N	Y	N
77	S13	N	Y	Y	Y	Y	N	Y	Y	N	Y	N

Summary of Vulnerability

Map ID	Name	Dam Failure	Drought	Flood	Geologic	Human-Caused	Land slide	Lique-faction	Ground-Shaking	Fault Rupture	Severe Weather	Wildfire
78	S14	N	Y	N	Y	Y	N	N	Y	N	Y	Y
79	S15	N	Y	N	Y	Y	N	N	Y	N	Y	Y
80	S16	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
81	S18	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N
82	S19	Y	Y	N	Y	Y	N	Y	Y	N	Y	N
83	S17	N	Y	Y	Y	Y	N	N	Y	N	Y	N

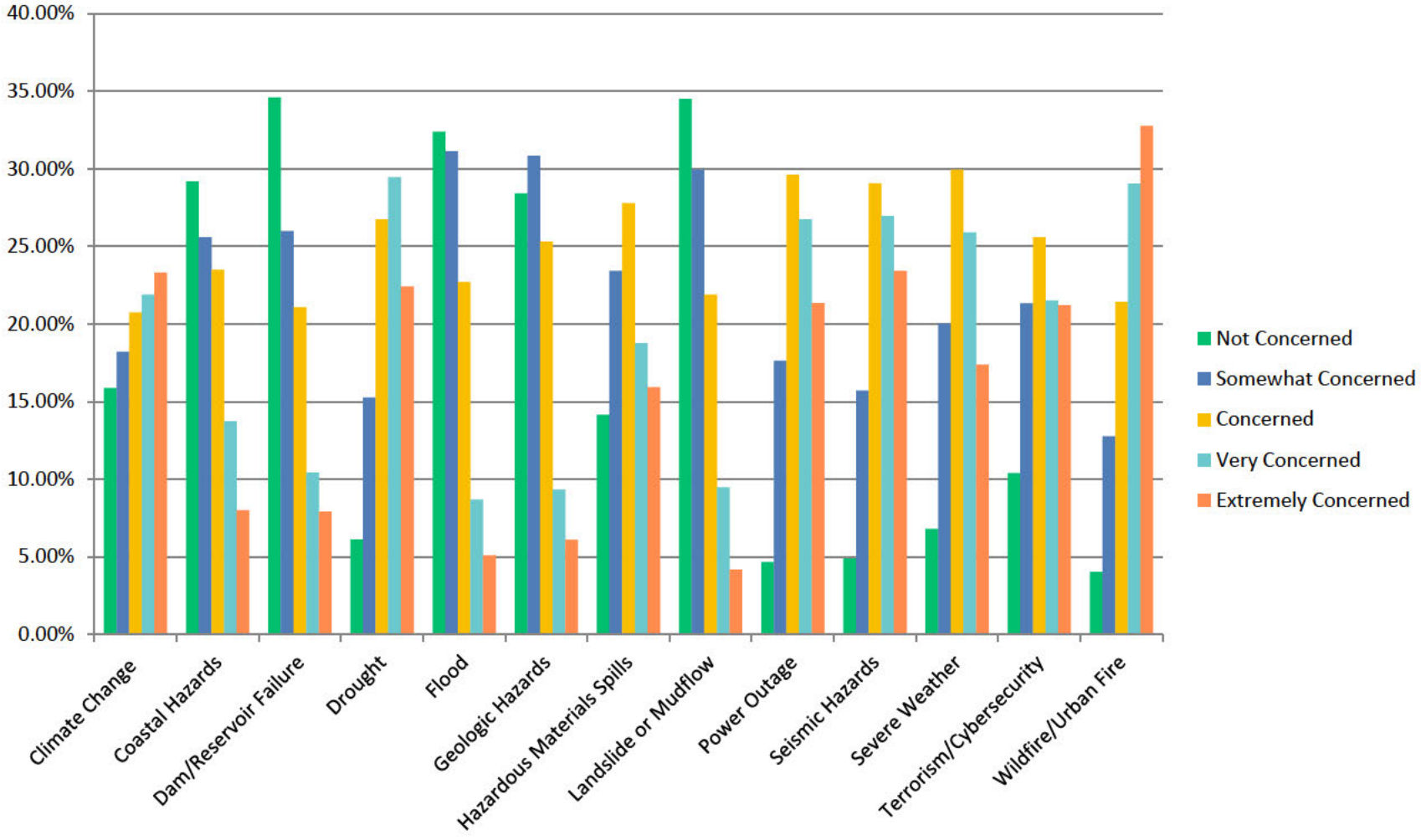
Irvine Ranch WATER DISTRICT

Survey Summary

Survey Summary

- 1,750 responses; 98% live & 20% work in service area
- Preparedness
  - Feel somewhat prepared: 52%
    - *Common preventative actions taken: smoke/carbon monoxide detectors, anchored furniture/utilities, landscape maintenance & drought tolerant plants, ready to go kits/supplies.*
- Outreach
  - Most effective ways of receiving information:
    - *Email, direct mail, city/agency newsletters, auto-dial information, social media, TV-based media*

Survey Summary



Irvine Ranch WATER DISTRICT

Mitigation Strategy

Mitigation Strategy

- Mitigation goals: **general guidelines** that explain what the **community wants to achieve**
- Mitigation actions: **specific projects** and activities that help to **achieve the goals**.
- Action plan: describes **how** the actions will be **implemented** – how prioritized, administered, incorporated into existing planning mechanisms

Mitigation Goals

- **Reduce the Potential for Damage** – Reduce damage to IRWD critical assets from natural and man-made hazards;
- **Create a Decision Tool for Management** – To provide information so that IRWD may act to address vulnerabilities; and
- **Promote Compliance with State and Federal Program Requirements** – To ensure that IRWD can take full advantage of state and federal grant programs, policies, and regulations.

Mitigation Actions

- Mitigation actions – reduce or eliminate long-term risk
  - **Different from actions to prepare or respond to an event**
- Mitigation activities lessen or eliminate the need for preparedness or response resources
- Emphasis on the impact or vulnerabilities – not on the hazard itself

STAPLE/E Review and Selection Criteria

Social
• Is the proposed action socially acceptable to the jurisdiction and surrounding community? • Are there equity issues involved that would mean that one segment of the jurisdiction and/or community is treated unfairly? • Will the action cause social disruption?
Technical
• Will the proposed action work? • Will it create more problems than it solves? • Does it solve a problem or only a symptom? • Is it the most useful action in light of other jurisdiction goals?
Administrative
• Can the jurisdiction implement the action? • Is there someone to coordinate and lead the effort? • Is there sufficient funding, staff, and technical support available? • Are there ongoing administrative requirements that need to be met?
Political
• Is the action politically acceptable? • Is there public support both to implement and to maintain the project?

STAPLE/E Review and Selection Criteria

Legal
• Is the jurisdiction authorized to implement the proposed action? • Are there legal side effects? Could the activity be construed as a taking? • Will the jurisdiction be liable for action or lack of action? • Will the activity be challenged?
Economic
• What are the costs and benefits of this action? • Do the benefits exceed the costs? • Are initial, maintenance, and administrative costs taken into account? • Has funding been secured for the proposed action? If not, what are the potential funding sources (public, nonprofit, and private)? • How will this action affect the fiscal capability of the jurisdiction? • What burden will this action place on the tax base or local economy? • What are the budget and revenue effects of this activity? • Does the action contribute to other jurisdiction goals? • What benefits will the action provide?
Environmental
• How will the action affect the environment? • Will the action need environmental regulatory approvals? • Will it meet local and state regulatory requirements? • Are endangered or threatened species likely to be affected?

Irvine Ranch WATER DISTRICT

Mitigation Prioritization & Timeframe

Category	Comments
High	Top organizational priority and is generally a well-detailed project idea. Protects population, resource or property at high risk, Uses feasible methods, techniques or technology.
Medium	A good idea that needs more information or is an action that addresses a moderate hazard.
Low	An idea that needs a lot more information or will take a lot of preliminary action to build support.

Category	Timeframe
Short-term	1-2 years
Mid-term	3-4 years
Long-term	5+ years
Ongoing	1-2 years and ongoing thereafter

Irvine Ranch WATER DISTRICT

Mitigation Measure Development

- Internal IRWD focus groups and discussions with specific departments to develop desired actions
- Turned feedback received in Meeting #3 into formal mitigation actions
- Michael Baker incorporated recommendations based on HMP trends and other best practices in the region

Capabilities Assessment

Irvine Ranch WATER DISTRICT

Capabilities Assessment

- Are there opportunities to improve upon the capabilities?
  - Can a plan be used to identify hazards and implement mitigation actions?
  - How can the capabilities be expanded and improved to reduce risk?
  - Is there a missing capability that needs to be considered?
  - Is additional staff/community training needed?
  - What financial resources can be used?
  - How can partner agencies/organizations work together to inform/educate the community?

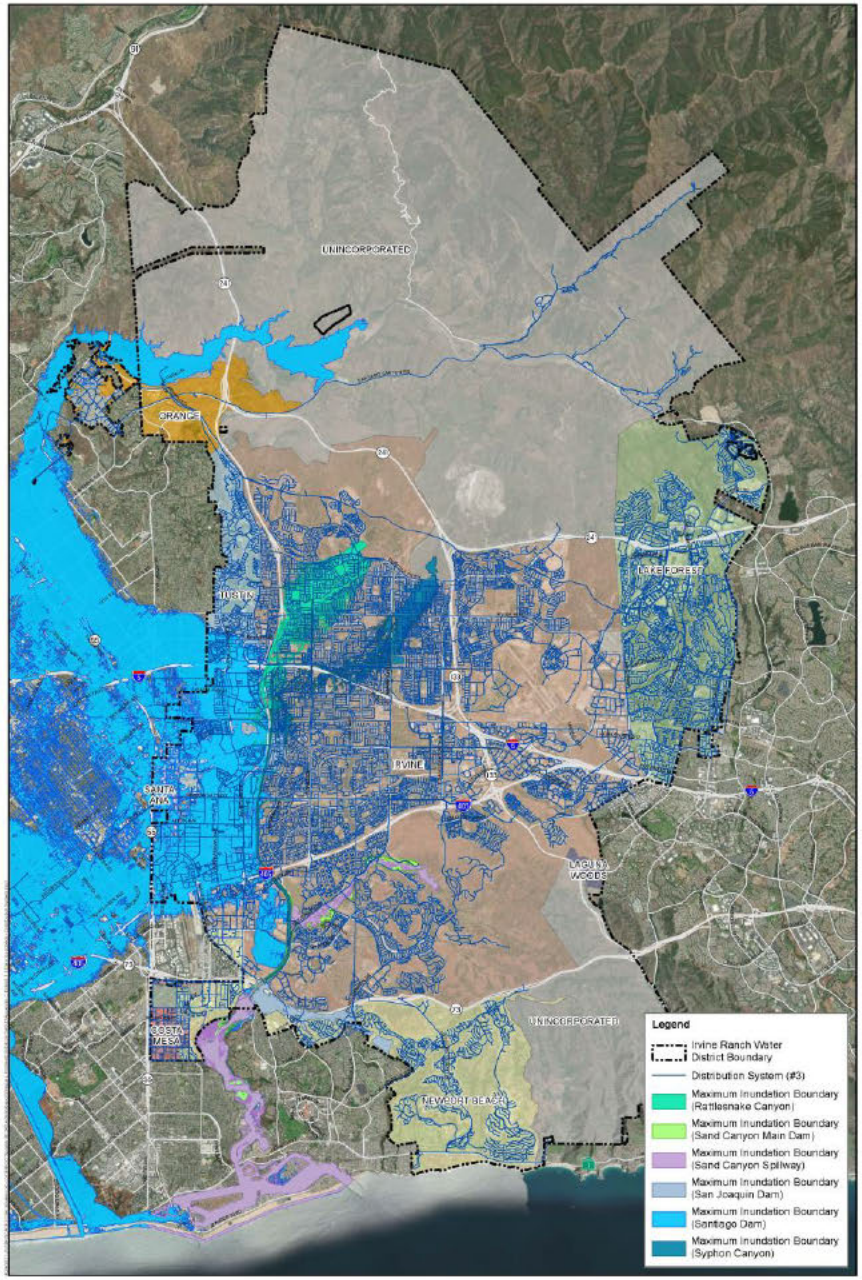
Next Steps

Irvine Ranch WATER DISTRICT

Next Steps

- **Complete Draft LHMP for Planning Team Review**
  - May 5 – June 18, 2021
- **Planning Team Review of LHMP**
  - June 21 – July 2, 2021
- **Revise LHMP for Public Review**
- **Public Review**
  - July 20 – August 3, 2021

Questions/Additional Discussion?

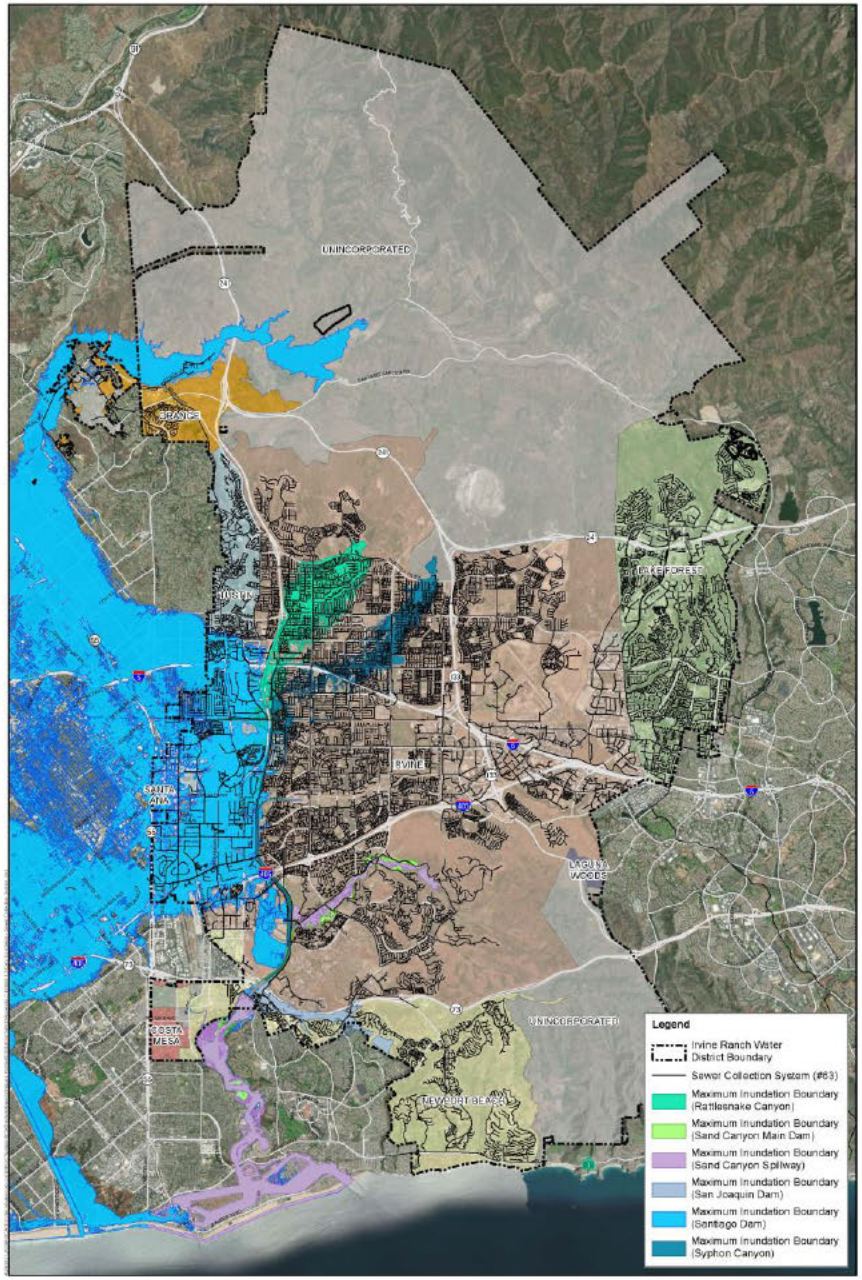


0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Dam Inundation Map - Distribution System

Appendix C, Exhibit 1.2



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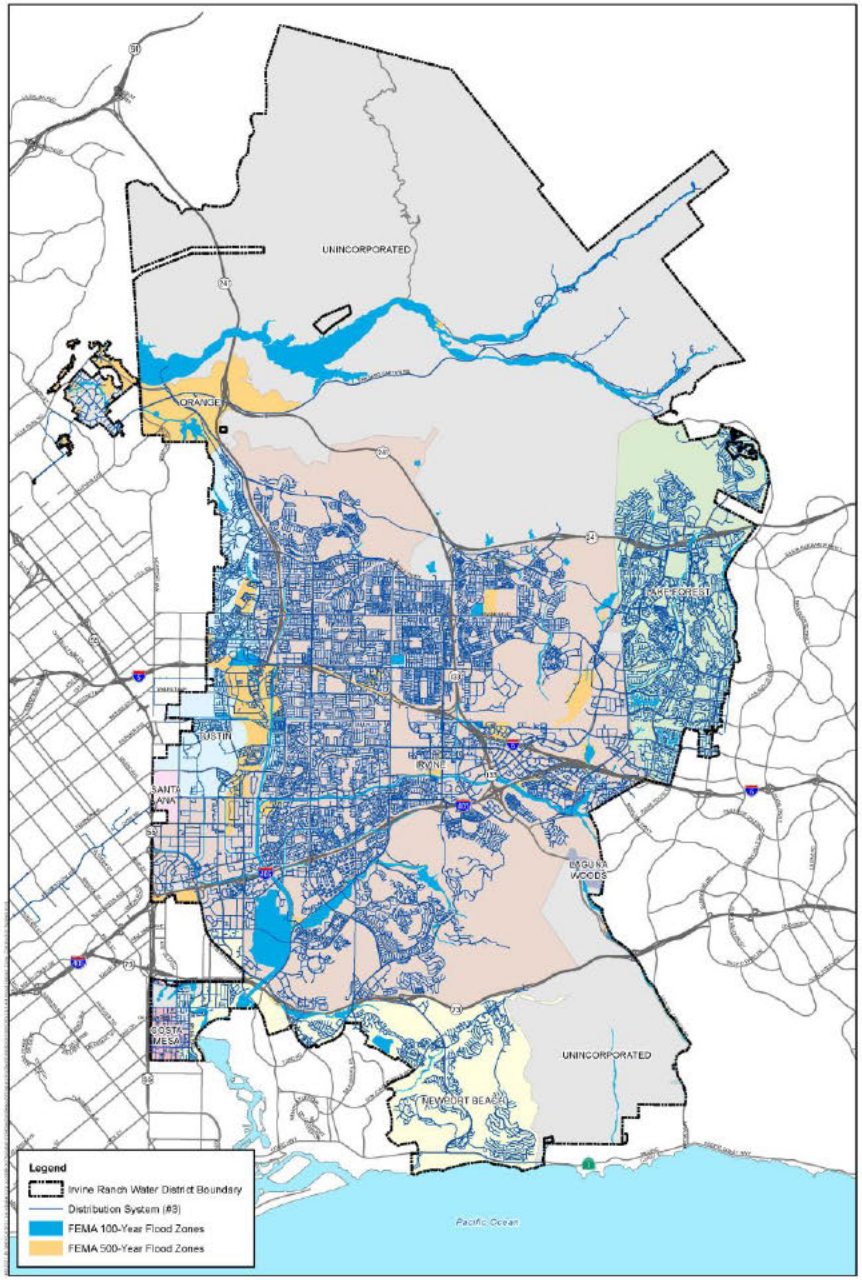
Irvine Ranch Water District Local Hazard Mitigation Plan

Dam Inundation Map - Sewer Collection System

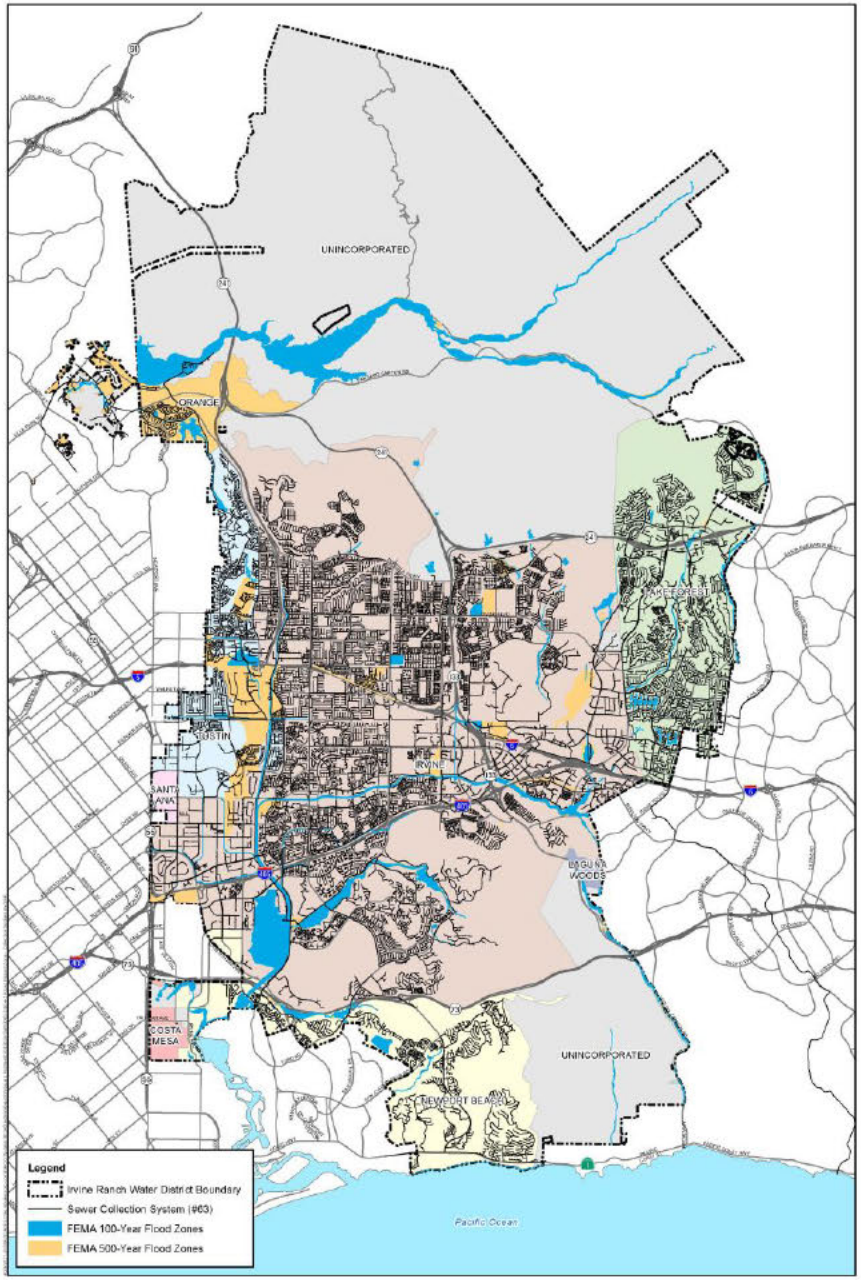
Appendix C, Exhibit 1.3



0 4,250 8,500 Feet

Source: IRWD, 2021, FEMA, 2009

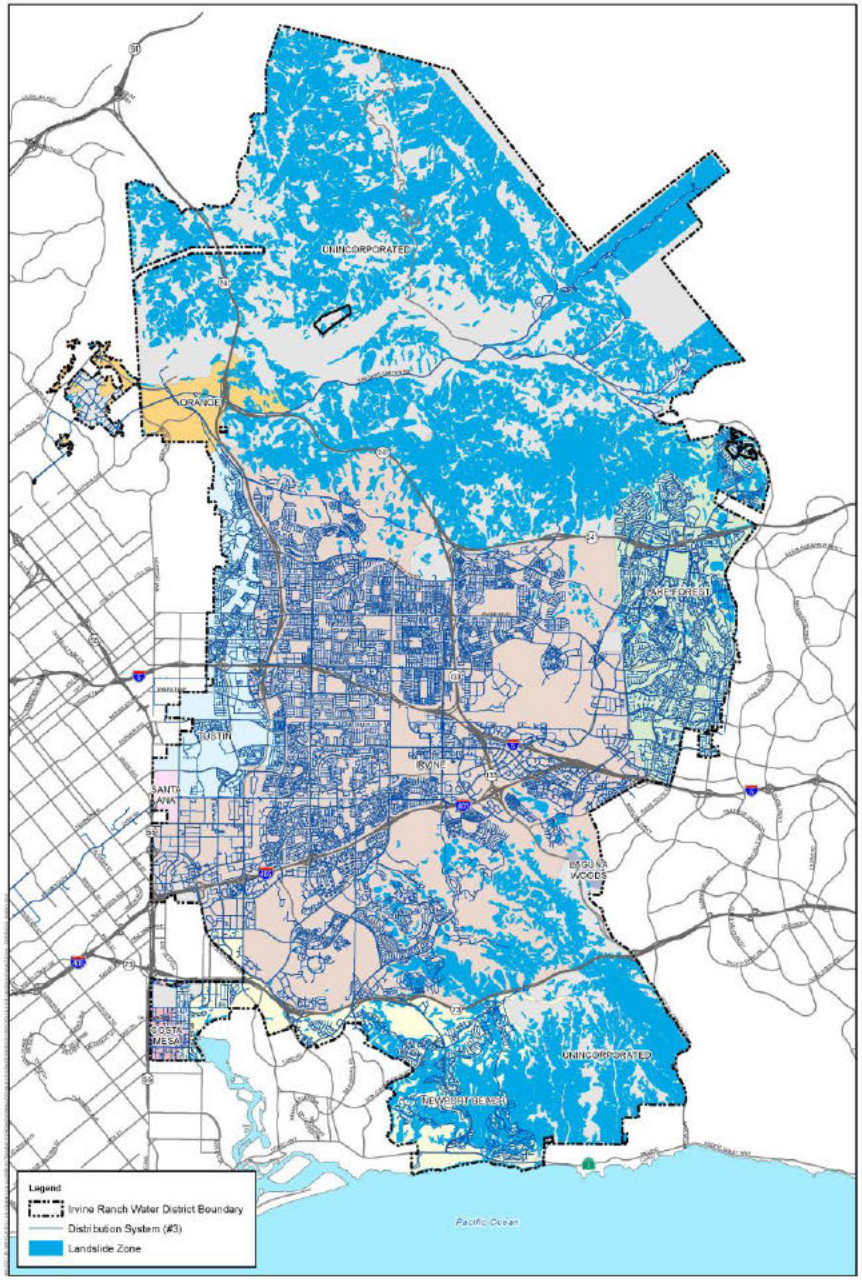
Irvine Ranch Water District Local Hazard Mitigation Plan
Flood Hazard Zone - Distribution System
Exhibit 4-4



0 4,250 8,500 Feet

Source: IRWD, 2021, FEMA, 2009

Irvine Ranch Water District Local Hazard Mitigation Plan
Flood Hazard Zone - Sewer Collection System
Exhibit 4-5



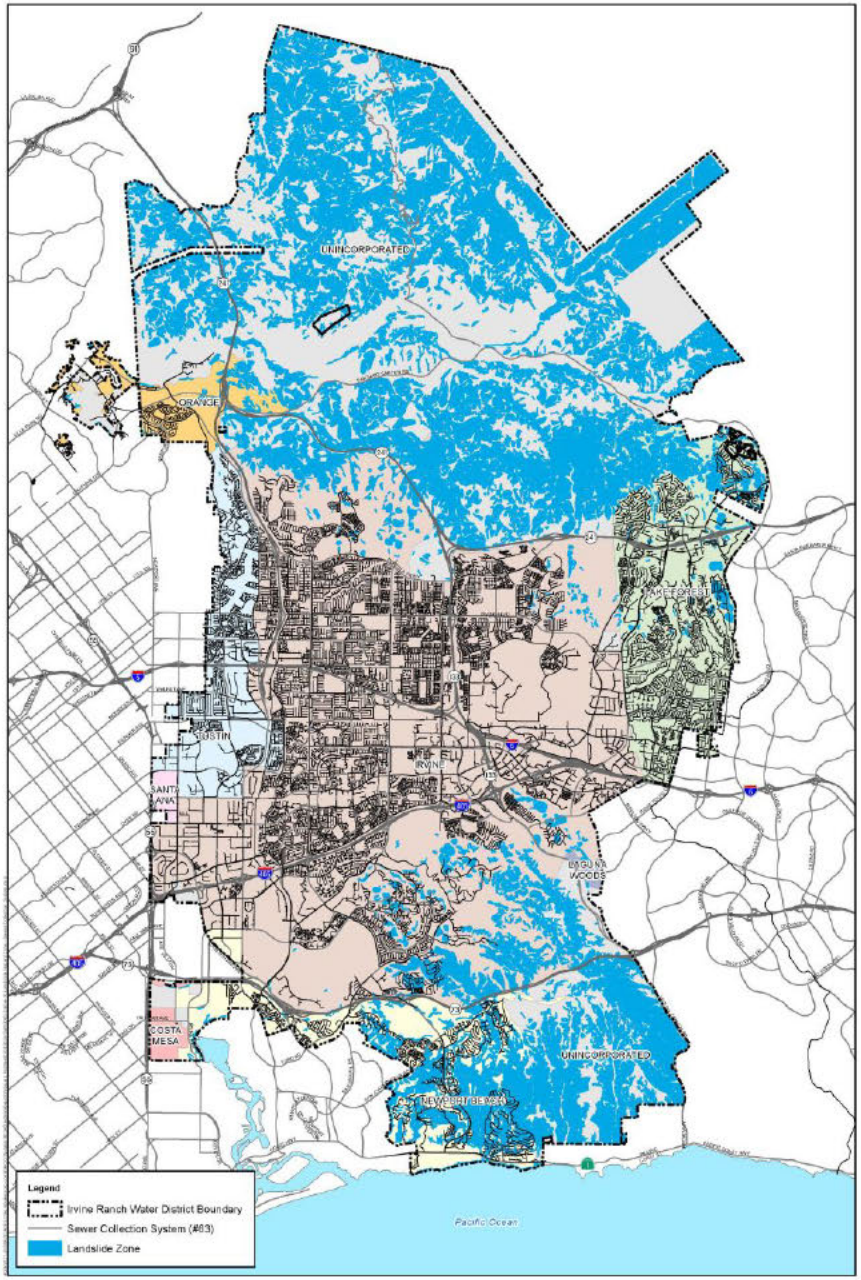
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Distribution System

Exhibit 4-9



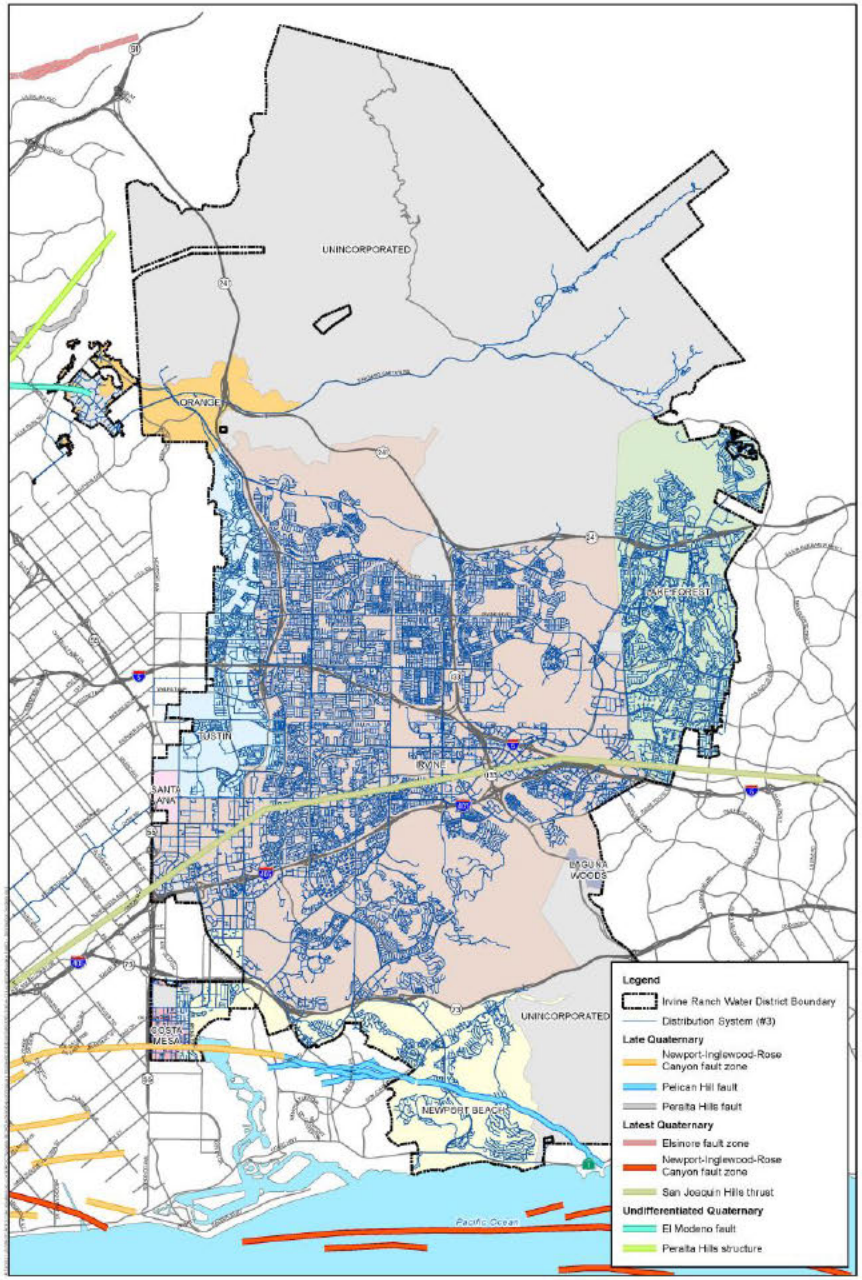
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Landslide Hazard Zone - Sewer Collection System

Exhibit 4-10



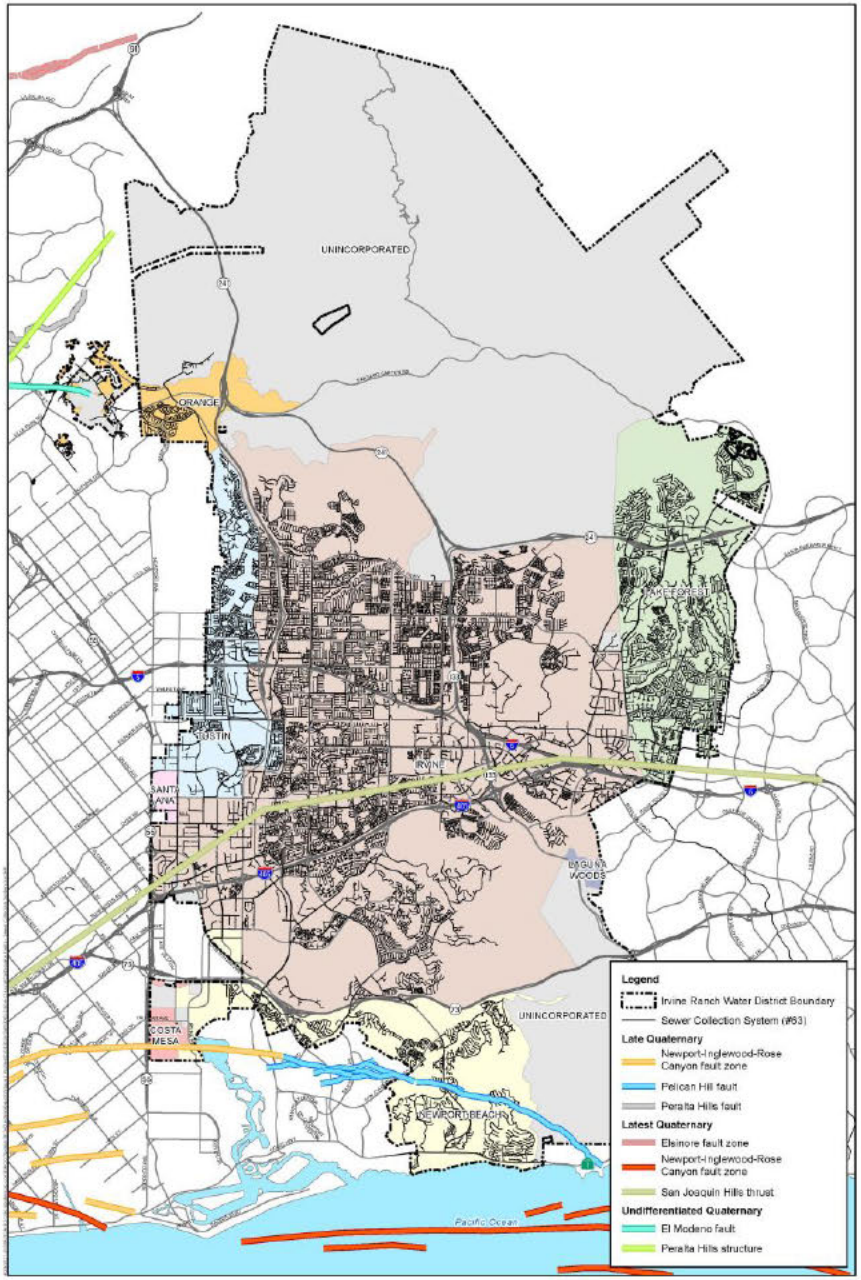
0 4,250 8,500 Feet

Source: IRWD, 2021, USGS, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Local Earthquake Faults - Distribution System

Exhibit 4-12



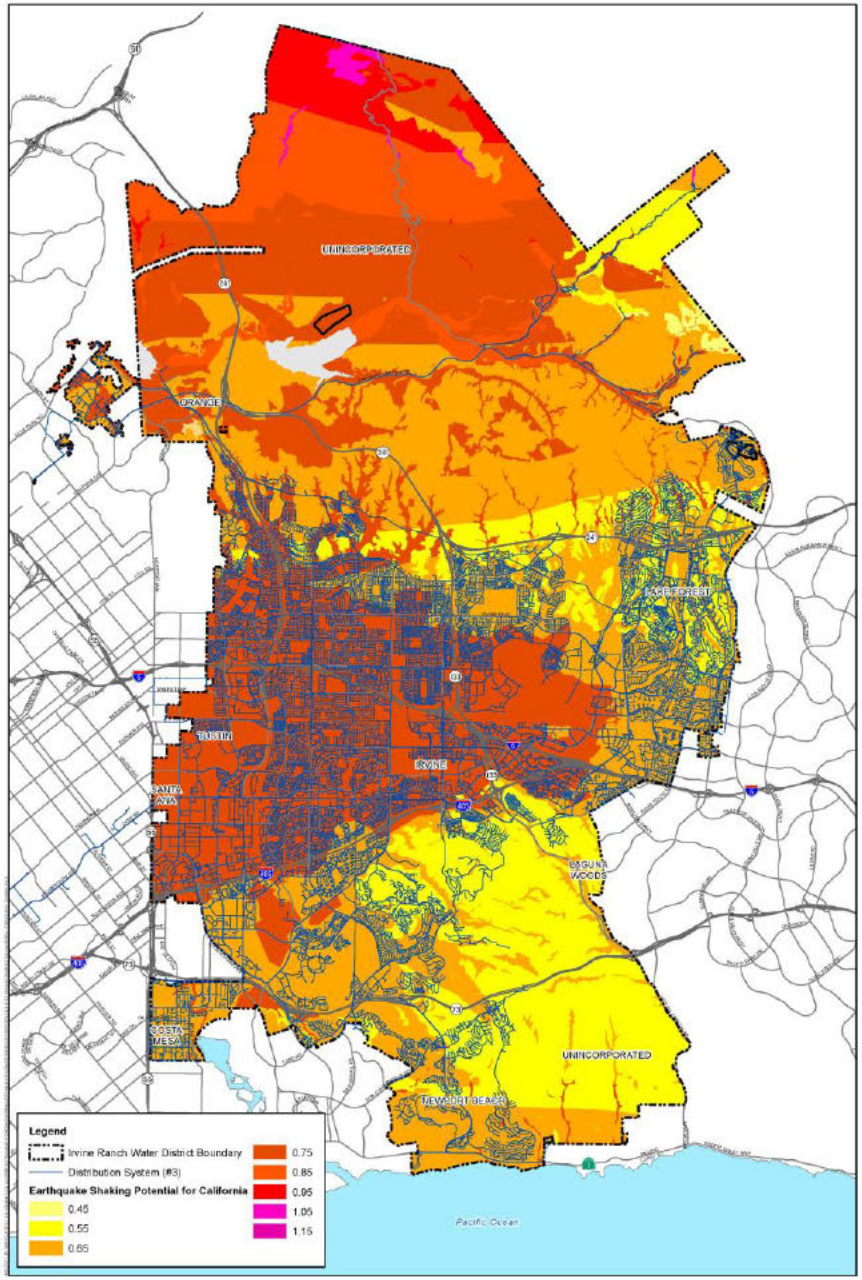
0 4,250 8,500 Feet

Source: IRWD, 2021, USGS, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Local Earthquake Faults - Sewer Collection System

Exhibit 4-13



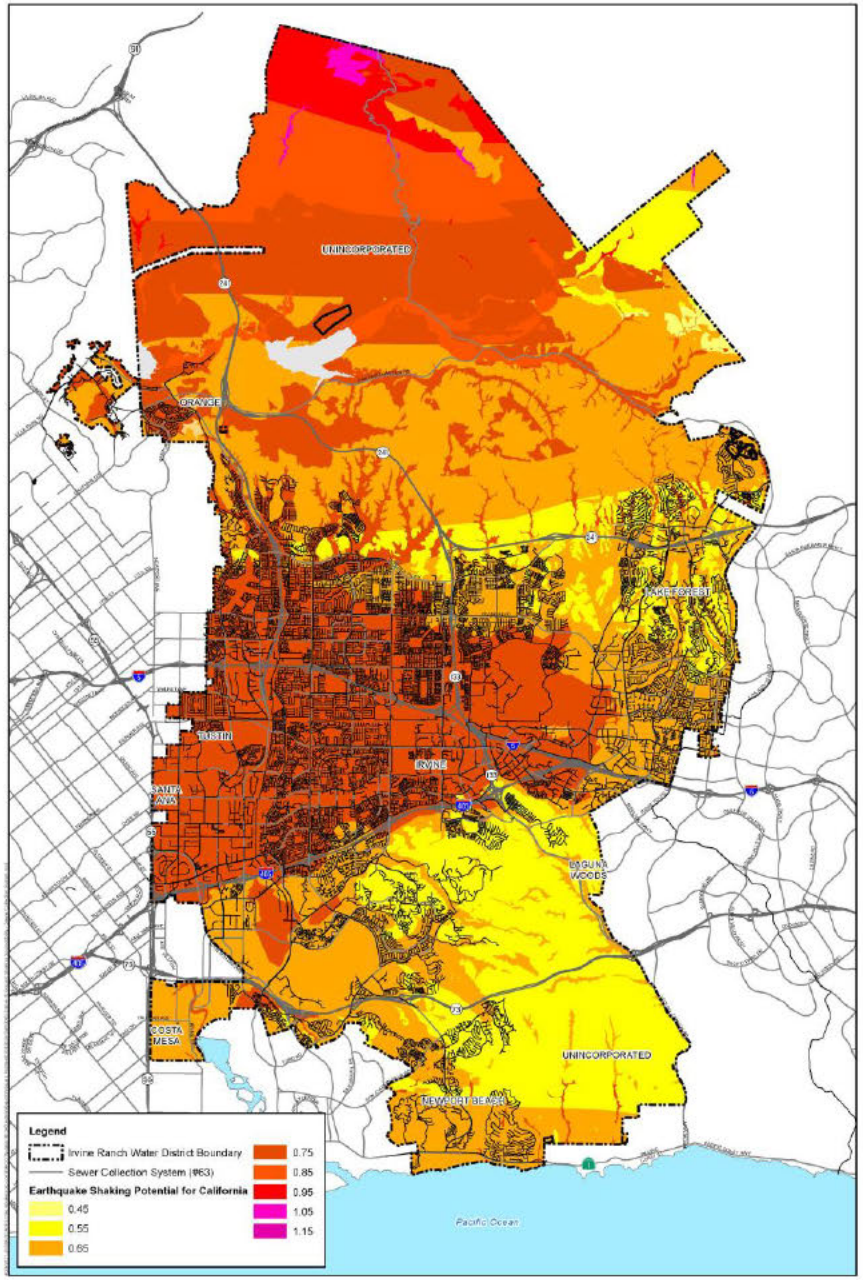
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Distribution System

Exhibit 4-15



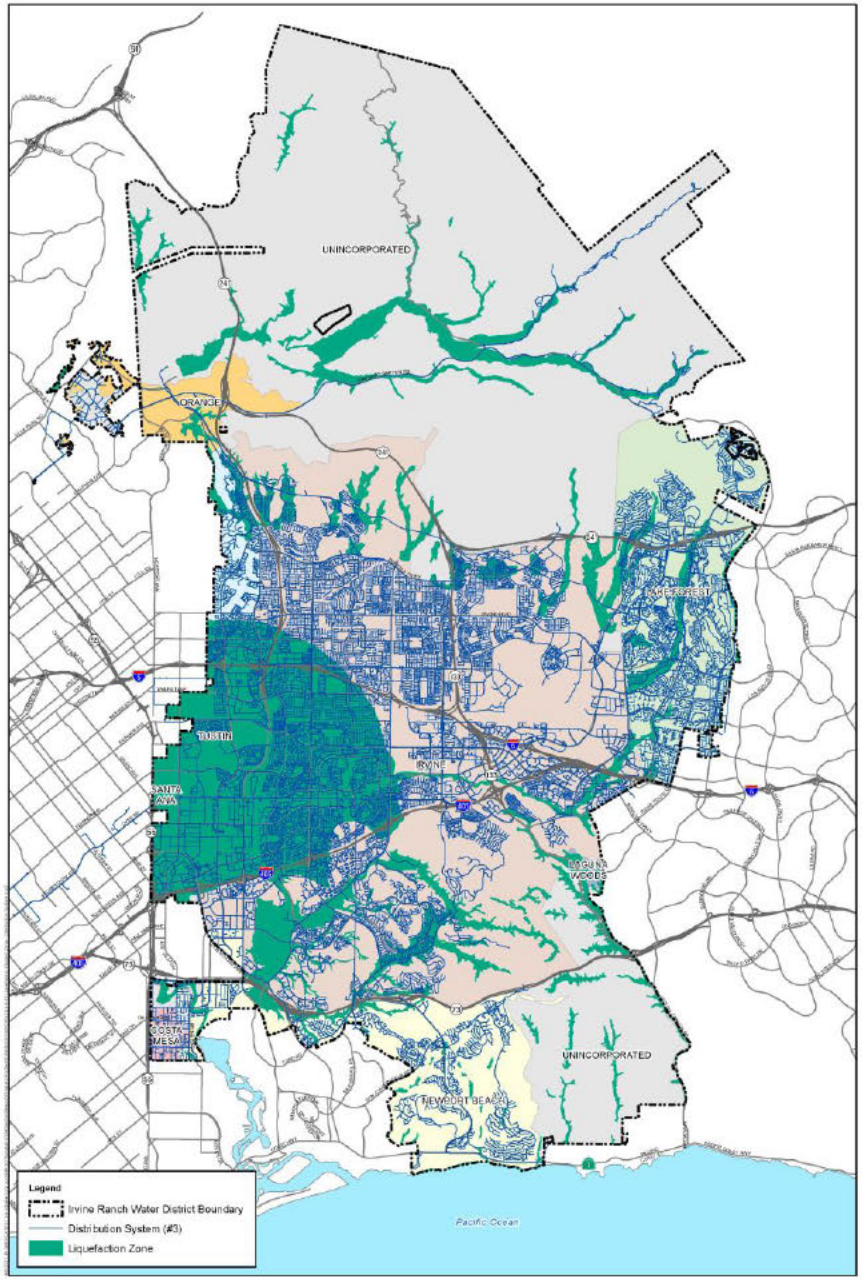
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 2016

Irvine Ranch Water District Local Hazard Mitigation Plan

Ground Shaking Susceptibility - Sewer Collection System

Exhibit 4-16



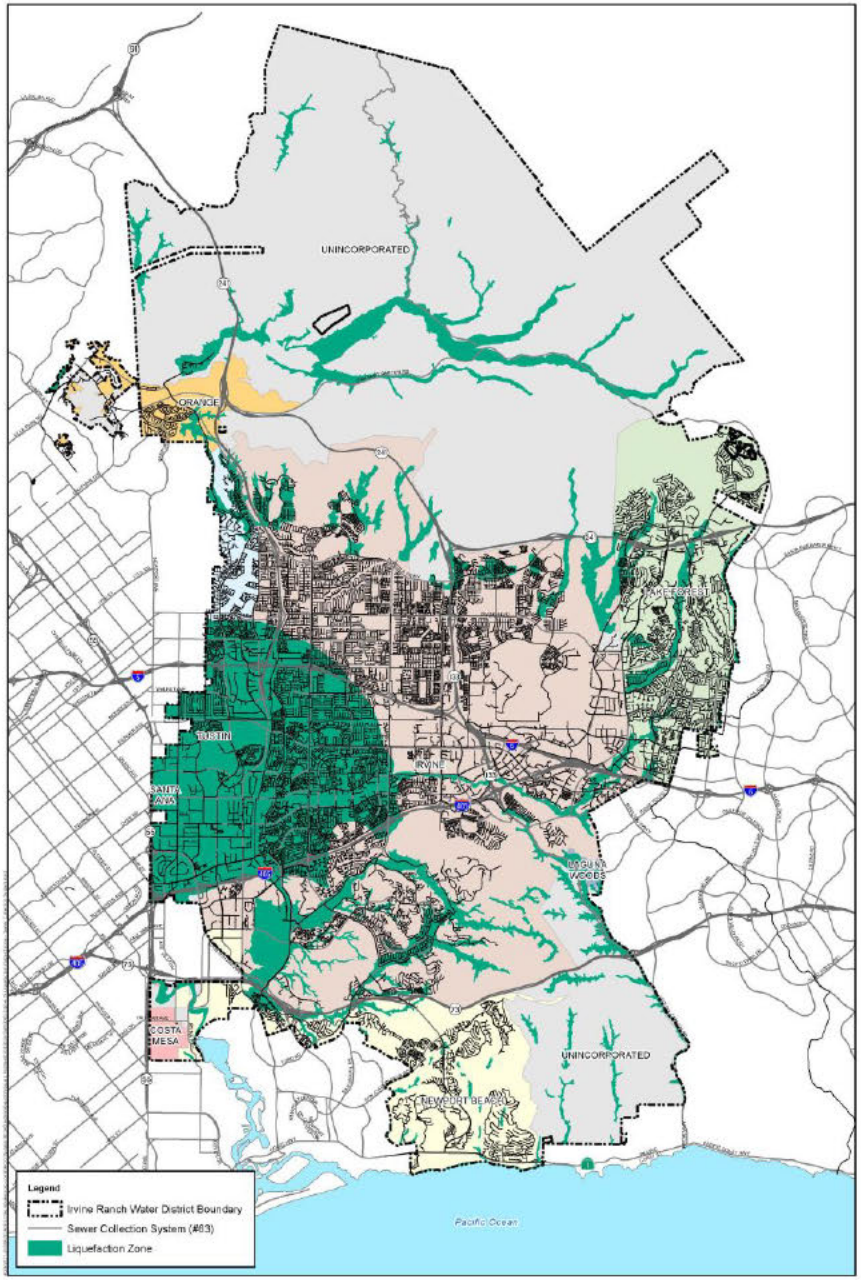
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 1998, 2001, 2002

Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Distribution System

Exhibit 4-18



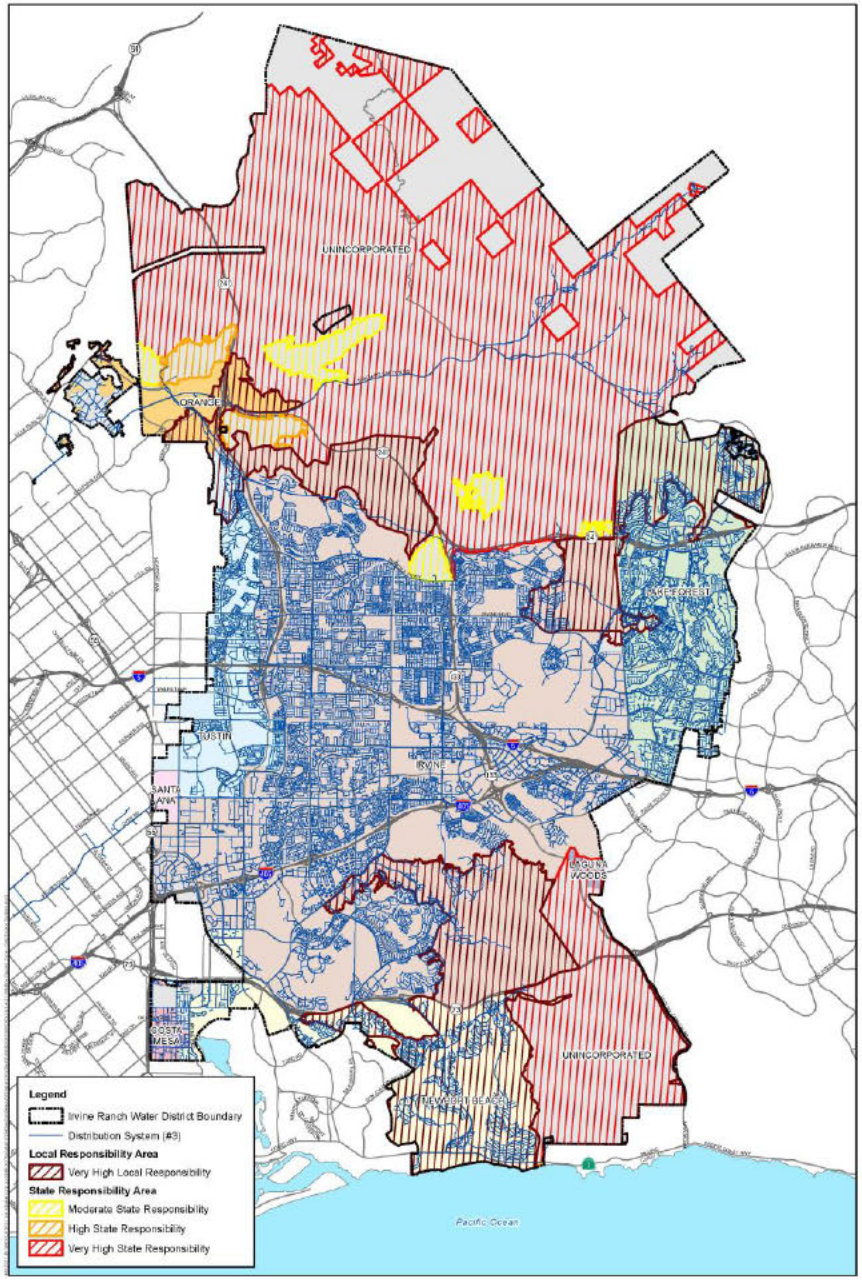
0 4,250 8,500 Feet

Source: IRWD, 2021, CGS, 1998, 2001, 2002

Irvine Ranch Water District Local Hazard Mitigation Plan

Liquefaction Hazard Zone - Sewer Collection System

Exhibit 4-19



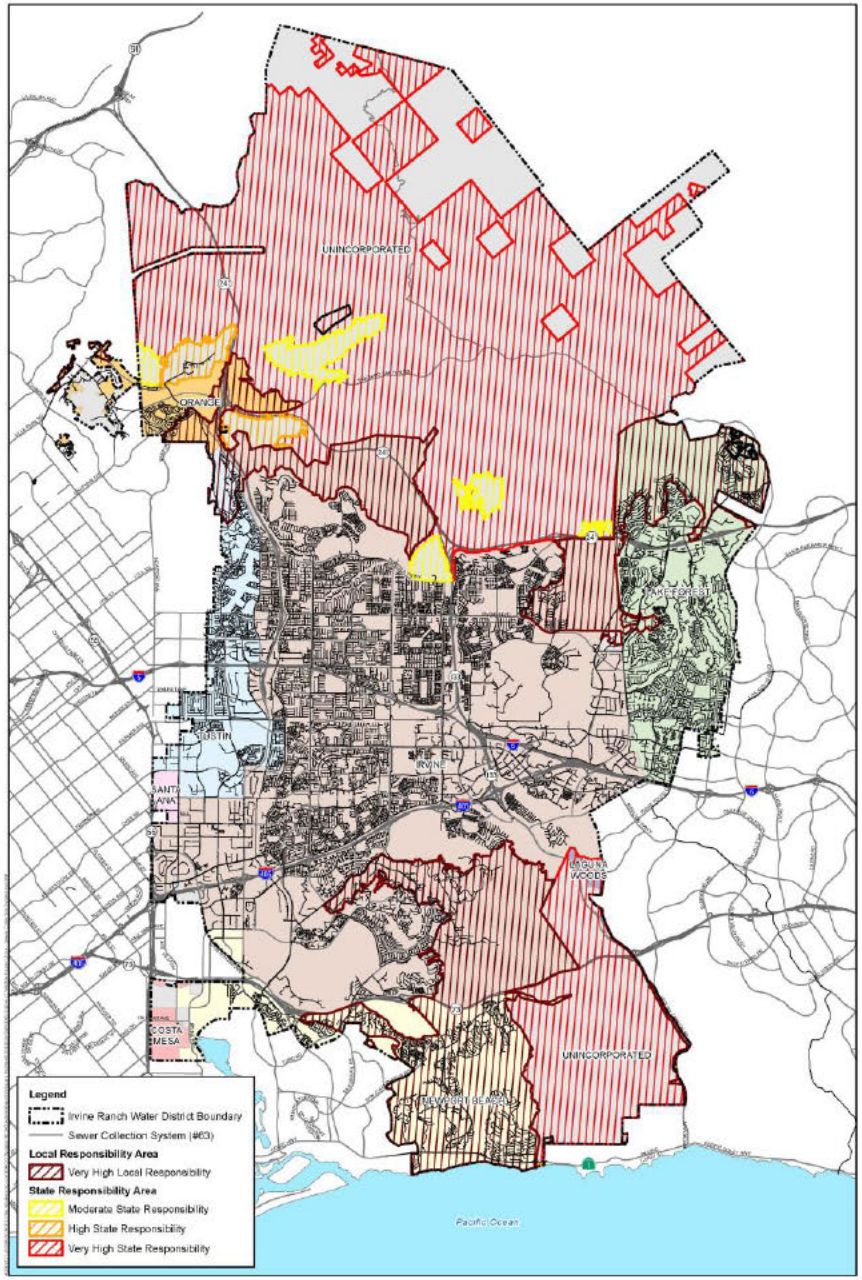
0 4,250 8,500 Feet

Source: IRWD, 2021, CALFIRE, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Distribution System

Exhibit 4-21



0 4,250 8,500 Feet

Source: IRWD, 2021, CALFIRE, 2018

Irvine Ranch Water District Local Hazard Mitigation Plan

Wildfire Hazard Zone - Sewer Collection System

Exhibit 4-22

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

PLANNING TEAM MEETING #4
Wednesday, May 5, 2021
1:30 PM – 3:30 PM, Microsoft Teams

MEETING SUMMARY

Attendees: Refer to Sign-in Sheet

- **Introduction, Recap**
  - *Update from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Based on the discussions in Meeting #3, tsunami is being removed.*
- **Risk Assessment/Vulnerability - Updates from Meeting #3**
  - Facility Types
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We have our facilities list, as discussed last meeting. The critical facilities are called this because a failure at one of these facilities would cause significant issues in maintaining service. Also note that we have separated the distribution system and the collection system into separate graphics for clarity.*
  - Dam Inundation
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – I know that there was interest shown in showing the inundation areas for dams outside of IRWD, but for this LHMP we are only concerned with the impacts within the IRWD jurisdiction.*
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Siphons have now been added to the graphics and lists. I'd like to open up the floor for any mitigation actions that haven't been brought up in terms of dam inundation.*
      - *Ken Pfister (Operations Manager, IRWD) – don't have any from our group.*
      - *Jacob Moeder (Capital Projects Senior Engineer, IRWD) – There is an item, all the way down* [the list]*, is that too far down to talk about now?*
      - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We will be addressing that later unless you want to talk about it now.*
      - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – No, I can wait until later.*
    - *Written comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – "Quick comment. Syphon Reservoir is spelled with a "y"."*
  - Flood Hazards
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – I want to open up the floor for any discussion on flood hazards.*
    - *No comment*

- Landslides
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – I want to open up the floor for any discussion on landslides.*
    - *No comment.*
- Faults
    - *Comments from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We have multiple faults in Southern California. One of the faults in IRWD is the San Joaquin Thrust Fault. There is some debate among scientists whether this is active or not. With all of the faults in IRWD, there are very few intersections with critical facilities. I don't think, from earlier meetings, that there were any concerns with fault rupture, but if that has changed, I'm more than happy to discuss that now… If not, that's fine as we know this is something that is evaluated at the time of project initiation.*
- Groundshaking
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – This hasn't changed.*
- Liquefaction
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – The graphics have been updated as a lot of the siphons were located in the liquefaction zone. This is something we will consider in the mitigation action phase.*
    - *Comment from Dorien McElroy (Collections Systems Manager, IRWD) – We had a few discussions with this – Alix and Jose and I – I think we are good with this.*
- Wildfire
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – No significant updates from the last time we presented this. There are a few siphons here, but they are underground and if there were any siphon failures, they would be constructed differently anyways. If there's any comments on the graphics or vulnerability tables, I'm happy to discuss this now, before we jump into the next portion of our presentation.*
- Non-Mapped Hazards
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We chose to keep Geologic Hazards as a service area wide hazard as the soils across the service area are susceptible to the same hazards*.

- **Survey Summary/Community Outreach Summary**
    - *Summary from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We received over 1,750 responses. This is the biggest survey response I've seen in a long time. The majority of survey responders live within the service area. We did have a good amount from people who work in the area. One portion of the survey asked how prepared people feel in case of an emergency situation. The response was about average for what we see in these surveys. A lot of people said that email and direct mail were the most favored ways of receiving information. A lot of people stated their concern regarding power outages.*
        - *Comment from John Fabris (Public Affairs Manager, IRWD) – This is fascinating that with all of the outreach and the perception of negative public opinion that dam/reservoir failure is not a big concern.*

        - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Yes, only 7 percent of people who responded said they were extremely concerned.*
    - *Summary from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – A good amount of people expressed concern about climate change as well. This is something that is incorporated into every LHMP as well. Over 800 of the survey respondents asked to be notified when the LHMP is ready for public review. We are excited for this response and for what we'll see in terms of public involvement once we release it for public review.*

- **Mitigation Strategy**
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We will briefly go over the strategy of what we do for mitigations: mitigation goals, mitigation actions, then the action plan.*
    - Review and Discussion of mitigation goals
        - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – I know that Alix met and discussed mitigation goals with several of you. Is there anything that we want to add or take away? I'm happy to facilitate this discussion.*
        - *Reply from John Fabris (Public Affairs Manager, IRWD) – This is more about outreach of the project again. I talked with Alix about this and we are planning to do this more in July through social media and the web.*
            - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Thanks John. The promotion of the survey really helped us get a great response.*
            - *Reply from Alix Stayton (Safety Specialist, IRWD) – Yeah, I've never seen a response this strong.*
            - *Comment from John Fabris (Public Affairs Manager, IRWD) – And we didn't see much panic in the responses either.*
            - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Usually with these, we don't see much panic, because we are taking proactive steps to avoid or mitigation.*
        - *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Alix, were there any further discussions you wanted to host internally or did we as a group think that these three goals are good for the rest of the plan?*
            - *Reply from Alix Stayton (Safety Specialist, IRWD) – If nobody has any comments, you know, we can set up a meeting, but we have had several meetings about this.*
    - Mitigation actions
        - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Mitigation actions are different from actions to prepare or respond to an event, which would be more in line with an EOP. This is the formal review that FEMA will use [STAPLE/E Review and Selection Criteria].*
    - Mitigation Prioritization and Timeframe
        - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Alix will be hosting some side meetings about establishing categories of prioritization and the timeframe, so we don't need to get too far into the weeds on this, but just so everyone knows that this is what is on the horizon.*

- *Comment from Alix Stayton (Safety Specialist, IRWD) – I was able to share the document, so the list I shared is what Noelle is about to go over.*
- *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – For the Dam Safety Plan, we have something similar, but it is more focused on what could occur, identifying specific items, where this is more high-level. Does the Dam Safety Plan need to be coordinated with what you're preparing or are they completely separate?*
- *Reply from Alix Stayton (Safety Specialist, IRWD) – They are completely separate. This is more about us making an internal assessment on what we should tackle first. There are no dependencies on anything in the plan. It is not connected in that way.*
- *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – remember that the mitigation actions are high level and we don't need to get too specific. But at the same time, we want to be clear and specific enough to give people clarity down the line. It sounded like maybe we were talking about deleting dame safety from this Plan?*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – No, I don't think so.*
    - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – I don't know about that, but our assessment of the dam extends beyond just the dam itself. Item 12 seemed pretty specific and I didn't know if it should be broader.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We can delete the "potential spillway and outlet" portion.*
    - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – and just leave the "extremely high" since that is the only category we use for these.*
- *Comment from Colton Martin (Mechanical Services Manager, IRWD) – Number 17, the responsible department for that is Electrical and Instrumentation, not Mechanical. Thank you.*
- *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We know that Alix has held several meetings before Meeting 3 and before this meeting. Michael Baker then added in suggestions to make sure ach area is covered and to add in best practices and incorporate items that we know are applicable. Item 14 is a good example of this.*
- *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Do we have any comments or suggestions on the mitigation actions in the terms of the ones that are addressed to all hazards?*
    - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Alix, I know we had some questions on the Regulatory Lab.*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – Lars is in an audit, Randy is in a meeting so I'll talk to him later today. Also, this isn't your only chance to look at this list. But we are getting close to it. Noelle, what kind of timeline would you give for when people can get this back to me?*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – I sent you an email with a timeline that had the final for you to get it to me is May 12, so maybe May 11 for them to get it to you.*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – Okay, I'm learning that the earlier the better as often we need input from multiple departments.*
    - *Written comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – "Alix – Joe Lam might be another good resource for the two modes of communication question."*

- *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Should we have a review of the Dam Safety Program every year?*
  - *Written reply from Thomas Malone (Director for Information Services, IRWD) – "I don't think so. They should send a SOW, I think. It can be simple."*
  - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – if we are saying having this broad description that covers these future studies, I don't think we need to add anything else.*
  - *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Starla, should we do something else to bolster this?*
    - *Reply from Starla – I'm wondering if we incorporate something that is connecting the two together. I know we have evaluate dams improvements, but maybe something specific to review of the Dam Safety Program. Make sure that the studies and things like that gets wrapped back into the HMP for potential funding. Maybe we can work on a mitigation that allows for that.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Okay, so bolster what we have.*
- Drought Mitigation
  - *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – We do have other studies that discuss potable reuse other than the Sewage Treatment Master Plan.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Do we delete the specific reference and make it general or list out each study?*
    - *Reply from Starla – I think we keep it general.*
  - *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Any other drought actions? Like maybe in terms of public awareness, education opportunities, anything in terms of a mitigation action for that hazard?*
    - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Maybe John wants to chime in on that, but the last drought there was a lot of outreach, but maybe John wants to contribute on that.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – John, if you're still with us, campaign strategies, outreach strategies, etc. are all important, even though they are not part of the infrastructure.*
- Flood Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We do have a good amount of hazard mitigation actions addressing flood. A question I had for the group, I know there was a lot of work getting the Michelson out of the flood area. My question in terms of mitigation actions, are there any other facilities where something similar would be good or helpful? If not, that's okay, we've got the focus group meeting, and interested agencies meeting that all contributed.*
  - *Comment from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – On item 17, is this something we are already doing or proposing to do? Because we are already doing this.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Yes, this is something that we know you are already doing and this is for ongoing action.*
    - *Reply from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – Okay, thank you.*

- *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – and if there are other things that you are actively doing for mitigation, let us know because we can incorporate them here.*

- Geologic Hazards Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We only have one mitigation action for this hazard. Are there any other actions that are either ongoing or wishlist items to protect against subsidence and/or expansive soil?*
    - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – That's kind of project by project, not a global study.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Yeah and from our research it doesn't seem like there is any ongoing or lingering concerns.*
- Human-Caused Hazards Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We received one developed by Alix's focus group for developing a cybersecurity plan. Our team has identified two additional mitigation actions. I know that IRWD does a lot in understanding and maintaining your certifications and best practices. Is there anything else we want to add?*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – I guess in terms of terrorism and vandalism, I can go back to Alan and see if there is anything we want to add. Because we have security and of course they do a lot to prevent vandalism.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Good, and we'd be happy to bolster with HazMat mitigations.*
- Landslide and Mudflow Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We've got four actions outlined here. One of them is tied to wildfire events. Are there any location specific actions we want to incorporate for this known hazard? If so, we are happy to do so now.*
    - *Reply from Malcolm Cortez (Engineering Manager, IRWD) – No others.*
- Multiple Hazards Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – A lot of these relate to communications and communications processes, location of storing generators. Power outage is a big concern from the responses we received to the survey and we can see in the mitigation actions that this is reflected here with a lot of these addressing power outage issues. Anything we should add? Should we be more specific or more general?*
    - *Reply from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – Looks fine to me, but could you scroll down a little bit?*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – to Item 32?*
    - *Reply from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – So would they be portable generators instead of permanent?*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – this is something from Alix's meeting, but maybe something got lost in translation*
    - *Reply from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – and we want to make Responsible Department Mechanical as well as Electrical.*
    - *Comment from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – Do we want to not say portable or permanent so we can decide later?*

  - *Reply from Owen O'Neill (Electrical & Instrumentation Manager, IRWD) – Yeah, that's good.*
- *Comment from Colton Martin (Mechanical Services Manager, IRWD) – Item 31, should be Mechanical as well there.*
  - *Reply from Alix Stayton (Safety Specialist, IRWD) – That was designed specifically for Reg Comp, so do we want to broaden the language?*
  - *Reply from Colton Martin (Mechanical Services Manager, IRWD) – This would be for FEMA trailers and things like that?*
  - *Reply from Alix Stayton (Safety Specialist, IRWD) – let's change it to District instead of Reg Compliance.*
  - *Comment from Dave Crowe (Construction Manager, IRWD) – And we should say equipment instead of vehicles because there's a lot more than just vehicles.*
  - *Comment from Alix Stayton (Safety Specialist, IRWD) – I learned that its really important for the Reg Compliance vehicles to be staged where they can still move, so we might want to leave the word vehicle.*
- *Jacob Moeder (Capital Projects Senior Engineer, IRWD) – We talked about hazards, we are talking about replacing the entire Sewage Treatment Plant at Los Alisos. As part of that project, we might replace the fuel station there. I don't know if tehre's value in identifying something in relation to a fueling station.*
  - *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – is that the LARP facility?*
  - *Question from Alix Stayton (Safety Specialist, IRWD) – Should we be saying something about fueling? We have more than one fueling location.*
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Now that I'm thinking about it, we have these generators, especially the portable ones, we can add something about it. Are you feeling that the fueling stations are adequately spaced out?*
    - *Reply from John Dayer (Facilities/Fleet Manager, IRWD)– they are pretty spaced out, but we did identify a vulnerability and that was a sufficient amount of fuel. We ran some studies and we have a capital project in the works to increase the fuel capacity.*
    - *Written comment from Lisa Haney (Regulatory Compliance Manager, IRWD) – "Thanks for bringing this up John. CNG and different fuel types also."*
  - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We can fold this in as a multiple hazard into this section right here.*
  - *Comment from Alix Stayton (Safety Specialist, IRWD) – Speaking of fuel, I don't think fuel is mentioned as a hazardous material at all. I can look more into that to see if it is worth adding it in here.*
  - *Comment from John Dayer (Facilities/Fleet Manager, IRWD)– we have mitigation actions that depend on generators. So if we have these generators then it wouldn't be good to have them all empty. So this fuel mitigation would be in support of other mitigation actions.*
  - *Written comment from Lisa Haney (Regulatory Compliance Manager, IRWD) – "There are regulations to move fleet towards electric, so this will be an increasing need in a hazard situation for the future. Access to charging vehicles during an emergency. We have plenty of time on the horizon for this, just wanted to put it on the radar."*

  - *Question from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Is there any expansion or anything that needs to be added in terms of access to your facilities in terms of wildfire or any other hazards?*
    - *Reply from John Dayer (Facilities/Fleet Manager, IRWD)– We talked about this at a meeting with Colt and Alix*
    - *Reply from Alix Stayton (Safety Specialist, IRWD) – Yes, that's why Noelle brought it up. We know this surfaced for Mechanical and Electrical. Are there any other groups that have access issues? If there are, let us know.*
    - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – or like we were talking about earlier, getting the vehicles out of Michelson before the flood gates close, things like that are good to note.*
- Seismic Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – We have a lot of generalized actions for this one. Unless there's any other earthquake, seismic thoughts, I think we can leave it.*
  - *Comment from Alix Stayton (Safety Specialist, IRWD) – No, I don't have anything additional.*
- Wildfire Mitigation
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Our last one in terms of addressing hazard is wildfire. We have some good ones we developed during meeting 3. We've got a study to assess canyon facilities. We have another that circles back to that access issue. Are there any others to add?*
- *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Like we were saying earlier, Alix is going to be meeting with some of the focus groups. Just a reminder we will be coordinating with you in defining the categories for prioritization and timeframe. It is acceptable to include actions and studies that will be in the long-term, even though these HMPs last 5 years. So keep that in mind.*
  - *Reply from Jacob Moeder (Capital Projects Senior Engineer, IRWD) – for the drought, was there any discussion with water resources about our water banking? Or is that not included?*
  - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – that would be something good to add.*
  - *Reply from Alix Stayton (Safety Specialist, IRWD) – Yeah, let me circle back to Kelly because that would be something good.*
  - *Reply from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Yeah and that would help bolster the drought mitigations as well.*

- **Capabilities Assessment**
  - *Comment from Noelle Steele (PROJECT MANAGER, MICHAEL BAKER INTL) – Alix has been coordinating and we will incorporate this. We will be contacting some of you for details.*

- **Next Steps**
  - Complete Draft LHMP for Planning Team Review
    - May 5 – June 18, 2021
  - Planning Team Review of LHMP
    - June 21 – July 2, 2021

- Revise LHMP for Public Review
- Public Review
    - July 20 – August 3, 2021

Irvine Ranch Water District LHMP – Draft Mitigation Actions
Planning Team Meeting – May 5, 2021

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
1	Provide redundant underground communication systems for critical facilities to insure reliability of operating systems.	All Hazards	Automation, Information Systems, Facilities	*From Alix focus group prior to Meeting #4*
2	Build redundancy into the wastewater collection, treatment, disposal and non-potable distribution system to mitigate major structural defects.	All Hazards	Recycling Operations, Engineering	*From Alix focus group prior to Meeting #4*
3	Identify additional back-up communication systems (such as satellite phones or radio) for purchase, to utilize if primary communication systems become unavailable. Ensure that coverage includes the entirety of the IRWD service area. Include annual training opportunities.	All Hazards	Safety, Information Services, Facilities/Fleet	*From Alix's Focus Group prior to Meeting #3*
4	Develop a technical communications plan to build redundancy and evaluate the cost/benefit and feasibility of different communications systems .	All Hazards	Safety, Information Services, Facilities/Fleet	*Discussion with Alix prior to Meeting #4*
5	Implement and maintain both internal and external alert/warning systems to effectively communicate hazard threats to staff and customers. Include alert/warning system in a regular training program.	All Hazards	Customer Service, Safety, Public Affairs	*From Alix's Focus Group prior to Meeting #3*
6	Implement and maintain information sharing mechanisms/platforms for involved departments to utilize during a disaster response. Ensure the platform can be viewed on network devices and mobile devices, while maintaining data security.	All Hazards	Safety, Information Services	*From Alix's Focus Group prior to Meeting #3*
7	Evaluate and study the practicality of alternate regulatory lab reporting site certification, in the case of failure at Michelson. Consider the feasibility of locating and certifying an alternative regulatory lab reporting site at LARP.	All Hazards	Water Quality	*From Alix's Focus Group prior to Meeting #3*
8	Develop and maintain Specific Hazard Response Plans (SHRPs) as vulnerabilities become apparent. Include SHRPS in regular training and exercise programs.	All Hazards	Safety, related departments	*From Alix's Focus Group prior to Meeting #3*
9	Maintain Water Emergency Response Organization of Orange County (WEROC) membership for communication and collaboration opportunities with regional water districts, including identification and implementation of mitigation actions with shared benefits.	All Hazards	Safety	*From Alix's Focus Group prior to Meeting #3*
10	Enhance flexibility and connectivity for alternative work on-campus sites, with more mobile cell phone equipment and robust VPN capability.	All Hazards	Information Services	*From Alix's Focus Group prior to Meeting #3*
11	Establish alternate route mapping for critical facilities that avoid bridges, and fold into the IRWD EOP once complete.	All Hazards	Engineering, Water Operations, Recycling Operations, Safety	*From Alix's Focus Group prior to Meeting #3*

Commented [SN1]: Add in additional coms capabilities project – coordinating with County of Orange to see if communication space on tower could be given to IRWD. Would need same brand of equipment, same radio frequency. Would allow for SCADA radio communications only.

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
12	Evaluate dams ~~potential spillway and outlet~~ improvements for "extremely high" and ~~"high"~~ hazard dam/reservoirs to increase resiliency, in coordination~~accordance~~ with the Dam Safety Program.	Dam/Reservoir Failure	Engineering	*Developed during Meeting #3*
13	Seek funding opportunities to further study, plan and implement the IRWD potable reuse program~~, as identified in the Sewage Treatment Master Plan (January 2021)~~.	Drought	Water Resources	*Developed during Meeting #3*
14	Continue to proactively monitor drought conditions or water conservation warnings issued by state agencies or regional water authorities.	Drought	Water Resources	*MBI suggested action*
15	Prepare a Recycled Water Shortage Contingency Plan. Consider seeking funding to prepare.	Drought	Water Resources	*From Alix's Focus Group prior to Meeting #3*
16	Assess permanently elevating water-sensitive equipment and anchoring fuel tanks in flood-prone locations. Consider seeking funding to assess and/or implementation.	Flood	Engineering	*From Alix's Focus Group prior to Meeting #3*
17	Regularly check and maintain radar flood level gauges located in San Diego Creek.	Flood	Electrical and Instrumentation~~Mechanical~~	*From Alix's Focus Group prior to Meeting #3*
18	Designate alternative locations for residual dirt and fill storage, away from the Michelson Yard.	Flood	Construction, Facilities	*From Alix's Focus Group prior to Meeting #3*
19	Continue coordination with police and public safety agencies for IRWD-preferred response actions during localized flooding incidents, to prevent increased flood waters impacting IRWD facilities associated with the lifting of manhole covers.	Flood	Safety, WEROC, Recycling Operations	*Developed during Meeting #3*
20	Continue to coordinate with customer cities and the County to ensure proper storm drain maintenance, to prevent against localized flooding due to sediment or debris in the drainage system.	Flood	Safety, WEROC, Recycling Operations	*Developed during Meeting #3*
21	Conduct inflow & infiltration study to determine where 50 year and 100 year flood waters would collect. Study outcomes should include the following: • What assets, including the collections conveyance system, would be affected? • What facilities or equipment would need rehabilitation or replacement after a 50 year or 100 year flood? How should that work be prioritized? • What would be the cost of the necessary temporary equipment to get the service area up and running, during the replacement/rehabilitation project? • How would these impacts on the wastewater affect potable water operations? Will they contaminate storage wells? • How would this affect IRWD's recycled water business?	Flood	Engineering, Recycling Operations	*From Alix focus group prior to Meeting #4*

Commented [SN2]: Double check as a capability.

Commented [SN3R2]: Dam Safety implementation plan.

Commented [SN4]: Additional capabilities.

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
	• What measures could IRWD take to prevent or mitigate any of the identified damage? Consider seeking funding for plan preparation.			
22	Continue to conduct geotechnical studies for geologic hazards on new construction projects when appropriate, to evaluate vulnerabilities for land subsidence and expansive soils.	Geologic Hazards (Land Subsidence, Expansive Soil)	Engineering	MBI suggested action
23	Continue to support customer cities and the County in community outreach actions regarding the proper handling, storage and disposal of hazardous materials.	Human-Caused Hazards (Hazardous Materials)	Safety, Public Affairs	*MBI suggested action*
24	Continue to monitor and track regulatory requirements and updates as they relate to hazardous materials storage and response actions.	Human-Caused Hazards (Hazardous Materials)	Safety	*MBI suggested action*
25	Develop a Cybersecurity Plan in coordination with a consultant and include an IS/Network focused Business Continuity Plan (BCP). Consider seeking funding to prepare plan.	Human-Caused Hazards (Terrorism/Sabotage, Cyberattacks)	Information Services	*From Alix's Focus Group prior to Meeting #3*
26	Evaluate and study critical facilities and facilities of concern that could benefit from protective retaining wall installation.	Landslide/Mudflow	Engineering	*Developed during Meeting #3*
27	Following wildfire events, continue to partner with Cal Fire, Orange County Office of Emergency Preparedness, Orange County Fire Authority, and Orange County Sheriff's Department, to identify the potential and location for landslide and/or mudflow events associated with heavy rainfall.	Landslide/Mudflow	Engineering, Safety, WEROC	*MBI suggested action*
28	Consider development of a project utilizing the recent hyper-local landslide study and resulting report (2021 WERT report) in combination with assessment of canyon facilities to determine potential for additional mitigation projects protecting against debris flow.	Landslide/Mudflow	Operational Area partners, WEROC, Water Operations, Recycling Operations, Facilities, Engineering	*From Alix focus group prior to Meeting #4*
29	Continue to conduct geotechnical studies for onsite landslide on any new construction project.	Landslide/Mudflow	Engineering	*From Alix focus group prior to Meeting #4*
30	Assess the communications resilience in canyon areas; address capacity of canyon facilities to communicate with each other (some are linked and dependent), as well as sending communications back to IRWD staff in other locations monitoring facility status.	Multiple Hazards – Flood, Landslide/Mudflow, Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Automation, Information Systems, Facilities	*From Alix focus group prior to Meeting #4*
31	Establish procedures for staging District ~~Regulatory Compliance~~ vehicles, materials, and equipment at alternative work locations prior to significant storm events.	Multiple Hazards – Flood, Severe Weather (Coastal Storm/Winter Storm)	Regulatory Compliance and Mechanical	*From Alix's Focus Group prior to Meeting #3*

Commented [SN5]: Hazmat plan

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
32	Continue to locate ~~permanent~~ electrical generators at Water Treatment Plants for short-term power solutions.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical and Mechanical	*From Alix's Focus Group prior to Meeting #3*
33	Perform monthly maintenance checks on permanent and portable back-up generators, and check fuel supply.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Mechanical	*From Alix's Focus Group prior to Meeting #3*
34	Seek funding opportunities to rehabilitate or replace aging generators in order to maintain critical water and wastewater operations during power outages.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Engineering, Safety	*Developed during Meeting #3*
35	Coordinate with Southern California Edison prior to any planned power outage to ensure generator capacity and provide time to pre-position supplies as applicable.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Safety, WEROC	*MBI suggested action*
36	Establish a communication plan with Southern California Edison for use during an unplanned power outage to assess the potential duration and extent of the power outage, and associated need for generators and supplies.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Electrical, Safety, WEROC	*MBI suggested action*
37	Utilize data from ongoing generator replacement project to develop further wildfire and power outage mitigation projects, once above study results become available.	Multiple Hazards – Severe Weather (Coastal Storm/Winter Storm, Windstorm/Santa Ana Winds, Power Outage), Wildfire	Engineering, Water Operations, Recycling Operations, Maintenance	*From Alix focus group prior to Meeting #4*

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
38	The necessity for fire agency escorts into fire-affected areas has complicated physical access to facilities for refueling. Increase the capacity of current portable fueling equipment to allow better access to affected facilities with fewer trips during active fire activity. This project will also increase efficiency during power outages that do not involve wildfires.	Multiple Hazards – Severe Weather (Windstorm/Santa Ana Winds, Power Outage), Wildfire	Fleet, Maintenance	*From Alix focus group prior to Meeting #4*
39	Extend battery life for the Supervisory Control and Data Acquisition (SCADA) system by purchasing uninterruptible power supply (UPS) to prevent outages in canyon facilities. Evaluate which locations would benefit from the additional UPS.	Multiple Hazards - Wildfire, Windstorm (Power Outage)	Automation	*From Alix's Focus Group prior to Meeting #3*
40	Monitor changes/updates to building codes and seismic regulations to determine if IRWD-owned critical facilities may need seismic retrofits as they age and building codes are updated.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	*MBI suggested action*
41	If any IRWD-owned critical facility is determined to be seismically vulnerable, identify a plan to conduct structural retrofitting, including funding sources.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	*MBI suggested action*
42	As repair and rehabilitation needs are identified in vertical structural facilities, consider options that increase seismic stability and resiliency as needed. Make improvements in accordance with current codes.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	*From Alix focus group prior to Meeting #4*
43	Consider developing and seeking funding for an evaluation program to determine the seismic vulnerability of critical assets.	Seismic Hazards (Fault Rupture, Ground Shaking, Liquefaction)	Engineering	*From Alix focus group prior to Meeting #4*
44	Include assessment and mitigation of potential liquefaction conditions in the scope of any new building or infrastructure project.	Seismic Hazards (Liquefaction)	Engineering	*From Alix focus group prior to Meeting #4*
45	Annually review defensible space, brush clearing and weed abatement needs for all canyon water facilities.	Wildfire	Facilities	*From Alix's Focus Group prior to Meeting #3*
46	Collaborate with the California Department of Fish and Wildlife (CDFW), CalFIRE, and local firefighting agencies to establish a defensible space strategy in compliance with existing plans and policies that provides IRWD the ability to maintain/remove vegetation around critical facilities in the wildfire hazard zone.	Wildfire	Facilities, Safety, WEROC	*Developed during Meeting #3*
47	Evaluate opportunities to enhance infrastructure hardscape (including protective walls) and undergrounding utility lines as appropriate.	Wildfire	Engineering	*Developed during Meeting #3*
48	Conduct a study to assess canyon facilities: • Which are in the fire field historically? With increased fire activity, is that area growing? • Which could be further fire hardened or have protective retaining walls added?	Wildfire	Engineering, Water Operations, Recycling Operations, Maintenance	*From Alix focus group prior to Meeting #4*

#	Mitigation Action	Hazard(s) Addressed	Responsible Department(s)	*Internal Notes*
	• How should IRWD prioritize any mitigation measures planned? Consider seeking funding for assessment.			
49	Develop measures to improve access to canyon facilities for fueling and maintenance during wildfires. Collaboration with fire agencies and pre-planning with WEROC are two possibilities.	Wildfire	Safety, Water Operations, Recycling Operations, Maintenance	*From Alix focus group prior to Meeting #4*

B.2
Community Outreach

IRVINE RANCH WATER DISTRICT
LOCAL HAZARD MITIGATION PLAN

Survey Summary

April 14, 2021

As part of the outreach for the Local Hazard Mitigation Plan (LHMP), the Irvine Ranch Water District (IRWD) administered a survey to community members to help gauge the level of knowledge the community has about natural disaster issues and to obtain input about areas in IRWD's Service Area that may be vulnerable to various types of natural disasters. The information gained from the survey will help IRWD identify and coordinate projects focused on reducing the risk of injury or damage to property from future hazard events (e.g., earthquakes, heavy rains, drought).

The survey was available from February 9 to March 30, 2021 and received 1,750 responses. It included multiple choice questions with the opportunity to provide comments, and covered demographic information, types of disasters and threats the community might anticipate, how community members would respond, how governing agencies should respond, and community members' readiness in the event of a disaster. The results of the survey are summarized below. Detailed graphs and on each question can be found in Appendix A. Raw data from the survey questions is located within Appendix B.

Summary of Input

Key issues:

Approximately 98 percent of survey respondents live within the IRWD service area, and approximately 20 percent of respondents work within the IRWD service area. Severe weather, power outage, wildfire and drought were noted as key concerns for survey participants. Many IRWD customers reported previously experiencing these hazard events. Seismic hazards and climate change were also noted as key hazards of concern. Items of lesser concern include flood, landslide/mudflow, and dam/reservoir failure.

Preparedness:

In terms of preparedness, respondents indicated that they feel somewhat prepared for a natural hazard. Preparedness actions primarily focused on the following: smoke/carbon monoxide detectors, anchored furniture/utilities, landscape maintenance, earthquake kits, and security measures.

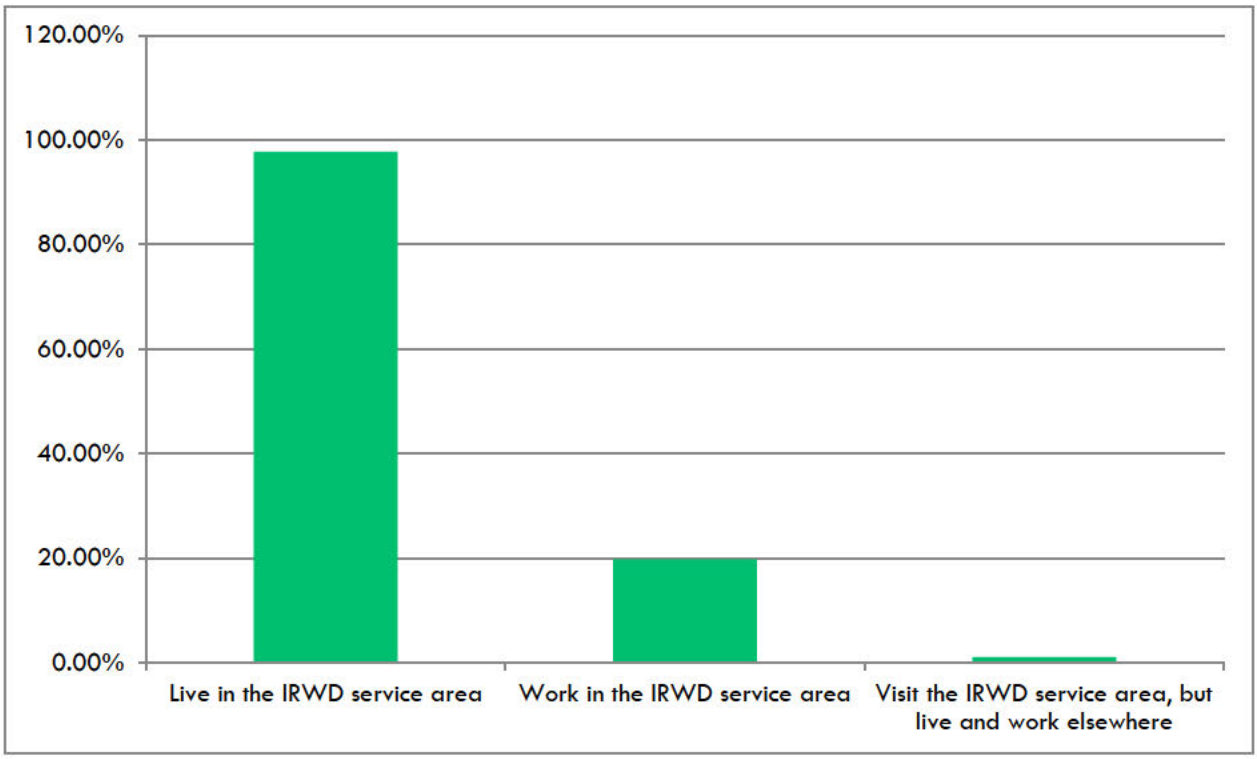
Outreach:

Responses to the most effective ways that respondents would like to receive information was fairly dispersed between the options provided, with Email being the most preferred option. The following are the ten most highly ranked options:

1. Email
2. Direct mail
3. City/Agency newsletters
4. Emergency hotline
5. Social media
6. TV-based media
7. Community Emergency Response Training (CERT)
8. National Weather Service website
9. Fire department
10. Public awareness campaigns

Question 1: Do you – Check all that apply

Almost 98 percent of respondents live in IRWD service area, and almost 20 percent work within the service area. Only 1.09 percent of respondents visit the IRWD Service Area, but live and work elsewhere.



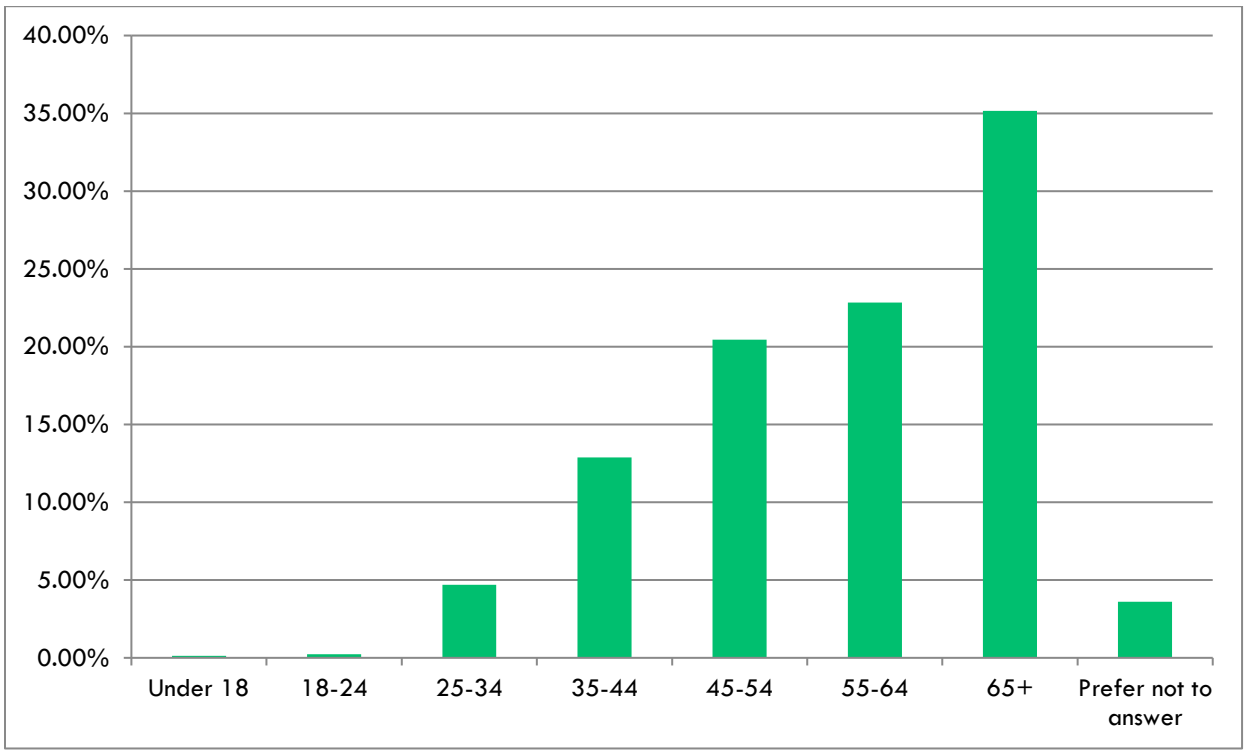
Question 2: What is your Zip Code?

The majority of survey respondents live in the following zip codes: 92630 (Lake Forest), 92620 (Irvine), 92604 (Irvine), 92618 (Irvine), 92614 (Irvine) and 92603 (Irvine/Newport Beach). Additional zip codes are listed in the table below.

Zip Code	Total Respondents	Zip Code	Total Respondents	Zip Code	Total Respondents
92630	243	92780	18	92625	1
92620	210	92869	15	92617	1
92604	173	92677	3	92551	1
92618	151	96825	1	92530	1
92614	130	95620	1	92503	1
92603	116	94614	1	92404	1
92606	98	93630	1	92360	1
92782	96	92865	1	90755	1
92602	93	92833	1	90631	1
92612	89	92705	1	90505	1
92610	82	92704	1	90403	1
92657	55	92692	1	90010	1
92679	31	92688	1	85204	1
92627	30	92663	1	75229	1
92676	29	92656	1	40509	1
92660	26	92626	1		

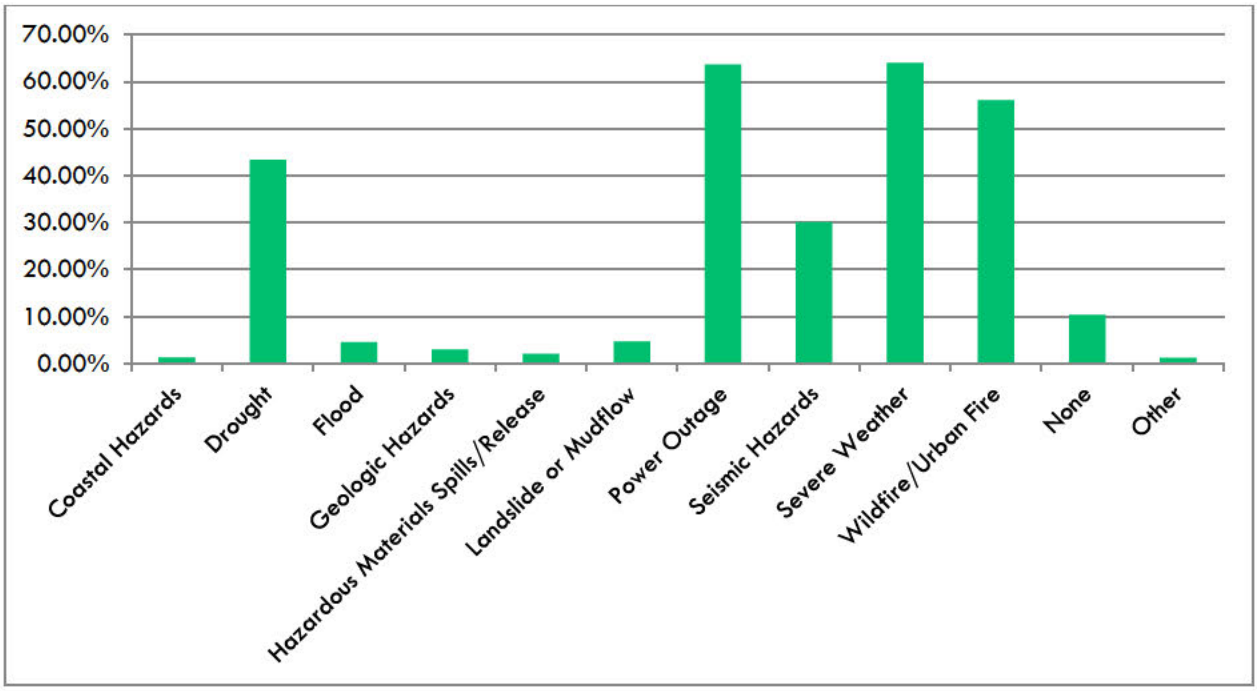
Question 3: What is your Age?

Over half of survey respondents were between the ages of 55 – 64 and 65+ (57.99 percent). Only two respondents were under the age of 18, and four respondents were between the ages 18 – 24.



Question 4: Which of the following types of natural disasters have you or someone in your household experienced while residing and/or working within the IRWD service area?

Most survey respondents have experienced severe weather (i.e., winter storms and high winds) and power outages. Over half of the survey respondents have also experienced wildfire/urban fire hazards, and approximately 43 percent have experienced drought.



Additional Comments[1]

- Access wrong in back of property is serious fire hazard IRWD access road!
- Breaks in main water lines under the streets.
- Earthquake.
- Edison Power Shutoffs due to their lack of maintenance for >20 years.
- El Toro Air Base, Tustin Air base Contamination.
- La Nina.
- Mosquitoes*
- One time stay out of the house in 2020 for fire, it is ok.
- Pipes burst requiring rerouting water pipes.
- There is a large landslide above our neighborhood, that could come down the hill and damage many homes.
- Superfund site for toxic waste disposal.
- Windstorms.

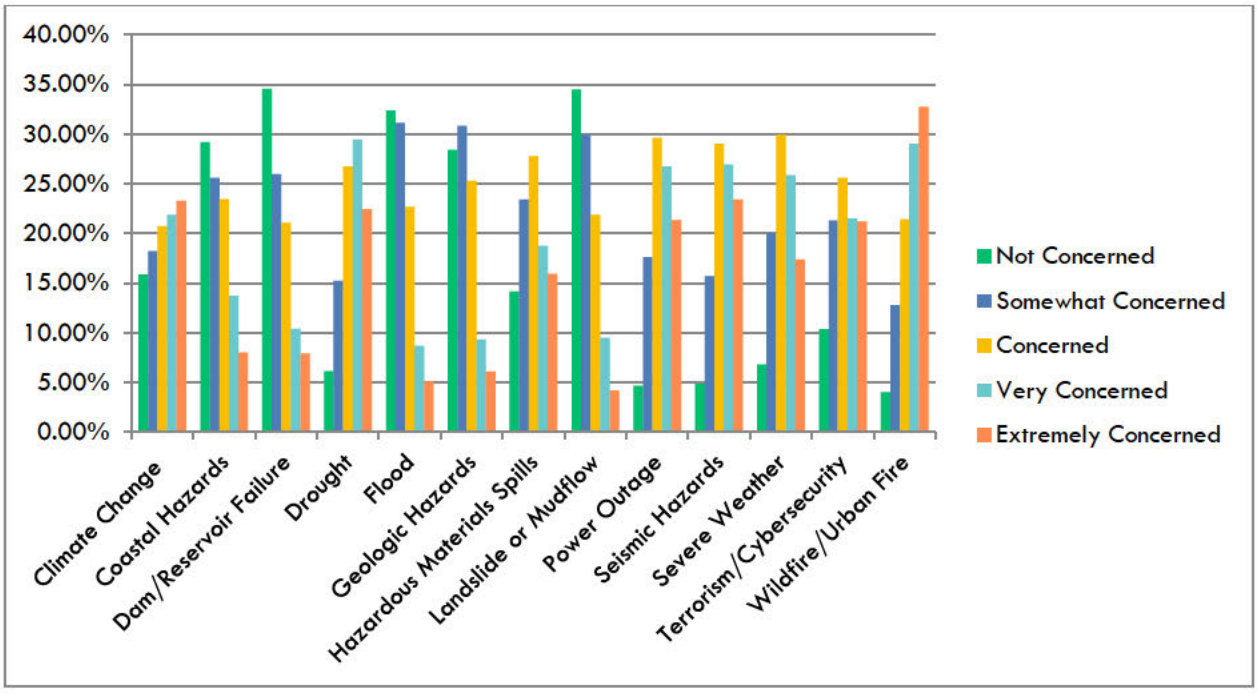
[1] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- 125 Degrees Heat Wave.

**repetitive comments were consolidated*

Question 5: The following hazards could potentially impact IRWD and may be addressed in the Local Hazard Mitigation Plan. Please indicate the level of concern you perceive for each hazard that may affect you and IRWD's critical water and wastewater facilities and infrastructure. (Please check ONE response for each hazard)

Question 5 determines which hazards that could potentially impact IRWD are considered to be primary concerns for residents within the IRWD service area. Wildfire/urban fire, climate change, and seismic hazards were ranked as most concern ("Extremely Concerned") for respondents. Hazards that are of least concern ("Not Concerned") include dam/reservoir failure, landslide incidents, and flooding.



Additional Comments[2]

- Access road weeds and wild growth not cleared is a big concern during fire season
- Disruption and/or damage to safe drinking water delivery
- El Toro Contamination
- EMP natural or man made
- Failure of infrastructure due to aging (rusting pipes, etc.)
- Fire during Santa Ana winds and July 4th Holiday FIREWORKS

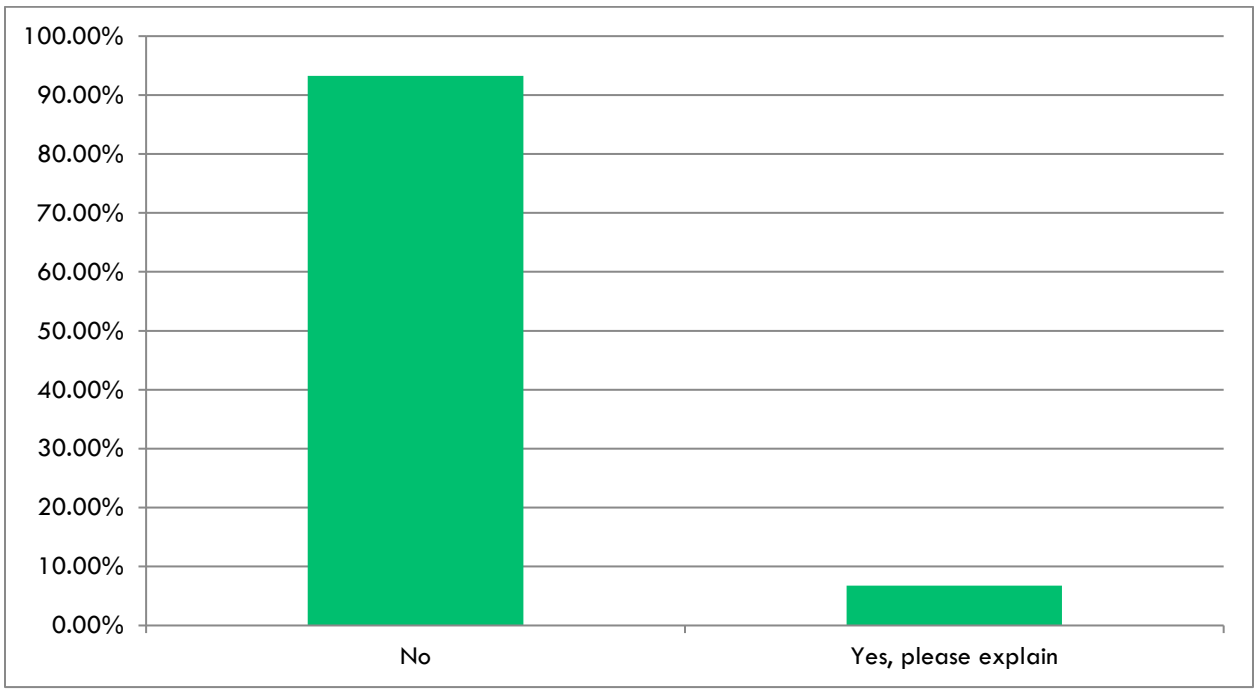
[2] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- I think everyone should worry about terrorism and cybersecurity. This is a universal problem potentially. It housed be made so safe that no one will attempt anything damaging. Thanks.
- Infrastructure and contamination (like Flint)
- Lack of an area desalinization plant in case of drought
- Most of these are normal in Southern California, just a fact of life
- None*
- Other*
- Potable water supply ongoing.
- Safety and integrity of city water pipes or IRWD water system over time.
- Sheriffs denying access to home: biggest concern.
- storage capacity, Alternate water supply
- water purification chemicals used by IRWD that corrode cooper, and implementation of water pressure gauges to control water pressure.
- Water quality safety re: el toro

**repetitive comments were consolidated*

Question 6: Do you have information on specific hazard issues or problem areas (localized flooding, power outages) that the planning committee should be aware of (please provide as much detail as possible, including location and type of hazard)?

The majority of respondents answered "No" to having information on specific hazard issues or problem areas.



Appendix A: Survey Responses Summary

Additional Comments[3]

- 1) A major earthquake is inevitably going to hit along the southern San Andreas fault, 2) cyberterrorism threats and risks to the electric grid and other utility infrastructures.
- All of the new houses built at the new Civic Center has drainage directed into Serrano creek. We live at 20945 Sharmila backing up to the creek which has had excessive erosion in the past 10 years, now more erosion will occur due to the runoff of 300 + houses being directed to this creek
- Being denied access to home during emergencies
- Buck Gully used to have low brush and now has dead wood trees etc. that should be removed
- Canyon communities have unique needs/hazards for OC.
- Chemicals used for water purification that lessen life copper piping and use of water gauges to prevent pressure breaking pipes.
- concerned about safety of strawberry farms earth dam
- concerned about supply system risks (aqueducts, wells, open storage lakes) vulnerable to terrorist activity (poison, bomb, etc.): general concern, no specific knowledge
- Different agencies need to communicate.
- Dry areas along 241 and 131 may catch wildfire
- During heavy rains, street drainage does not seem adequate.
- Education to the public to prevent wildfire from happening.
- Electrical poles are major hazard when it comes to wildfires and should be underground instead, especially along the Silverado Road.
- Existing pipeline capacity during fire and disruption
- Failure of underground water storage tanks on Signal Peak directly above my home presents a flood and mudslide risk
- Fires around Orchard Hills
- Flooding now that Irvine has lost a lot of open ground to soak up water.. land is now all asphalt and concrete. Run off will be bad now
- Flow of traffic if evacuated.
- Fluoride in the water
- Foothills area with mud and flood due to wildfire.
- future readiness for wildfires, possible power outages and evacuations
- Handy Creek
- Has there been mitigation completed to improve the flood control capacity of San Diego Creek that over-flowed between Culver and Jeffrey (adjacent to Barranca Pkwy.) during the 1980's?
- Have seen several fires and floods over a 40 year span
- I have heard Woodbridge has subsidence. I believe this to be true. Every now and then you step into spaces on grass that have sunk a bit.

[3] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- I have read Irvine is a superfund site and that cleaning chemicals for the airplanes have seeped into our water.
- I know SCE shuts off our power for high winds. We've also had two fires (Silverado, Bond) and the recent mudslides in Silverado with mandatory evacuations in Silverado and Modjeska
- I see (when traveling throughout Lake Forest and other southern California cities hillsides, valleys etc. that are covered with 3 ft. high dried brush/grass. This is such a fire hazard and I see it in a lot of places. I think there should be a plan put in place to remove that kind of dry kindle before it turns into a major fire starter. Thank you
- It seems that Syphon Canyon Dam is constructed on liquefiable alluvium. As a result of a strong earthquake on the San Joaquin Hills blind thrust, Elsinore fault or others the dam could breach, resulting in flooding of downstream Crean Lutheran school children and Irvine residents.
- July 4 Holiday extreme illegal use of fireworks & potential fires
- Lack of irrigation in areas subject to high winds and heat
- Lack of unified communication during incidents like the recent wildfires. It was difficult to get accurate information because there was no single source of truth. Extremely concerned about aging dam and likelihood of impending failure. Flood path includes my neighborhood
- Landslide
- Liquefaction
- Mountain lion, coyotes, eating our pets (potentiality us!)
- My backyard has flooded and "emptied" into my garage once in 26 years
- My residence was evacuated Twice from the local wildfires just last year alone, this year after having much less rain greatly concerns me that wilder & dangerous animals will be exploring the nearby Whiting Ranch trails and of course more wildfires will be happening!!!
- No off-grid power alternatives permitted.
- Nuclear accident at San Onofre
- Periodic power outages*
- Please think about people who are not good at English.
- Power Transformer in the driveway side.
- Reduction of Colorado River allocation
- Reservoir whose failure could destroy my house
- Same access road gets flooded out during heavy rains. Washing out sections of road
- San Diego Creek has sewage lines going along the creek. Water flow is causing erosion. Potential for sewage spills or damage.
- Santa Ana wind
- Seems we are in dire need of modernizing infrastructure
- Seniors are dependent on power and need to have companies use backup generators.
- Silverado canyon road has had multiple 2ft+ mudflows since the Bond Fire
- Some evenings I could smell organic solvent/fume in the backyard
- Syphon Reservoir Improvement Project. Prefer to improve the safety of the infrastructure for the current water capacity, not to increase the water capacity at this location.

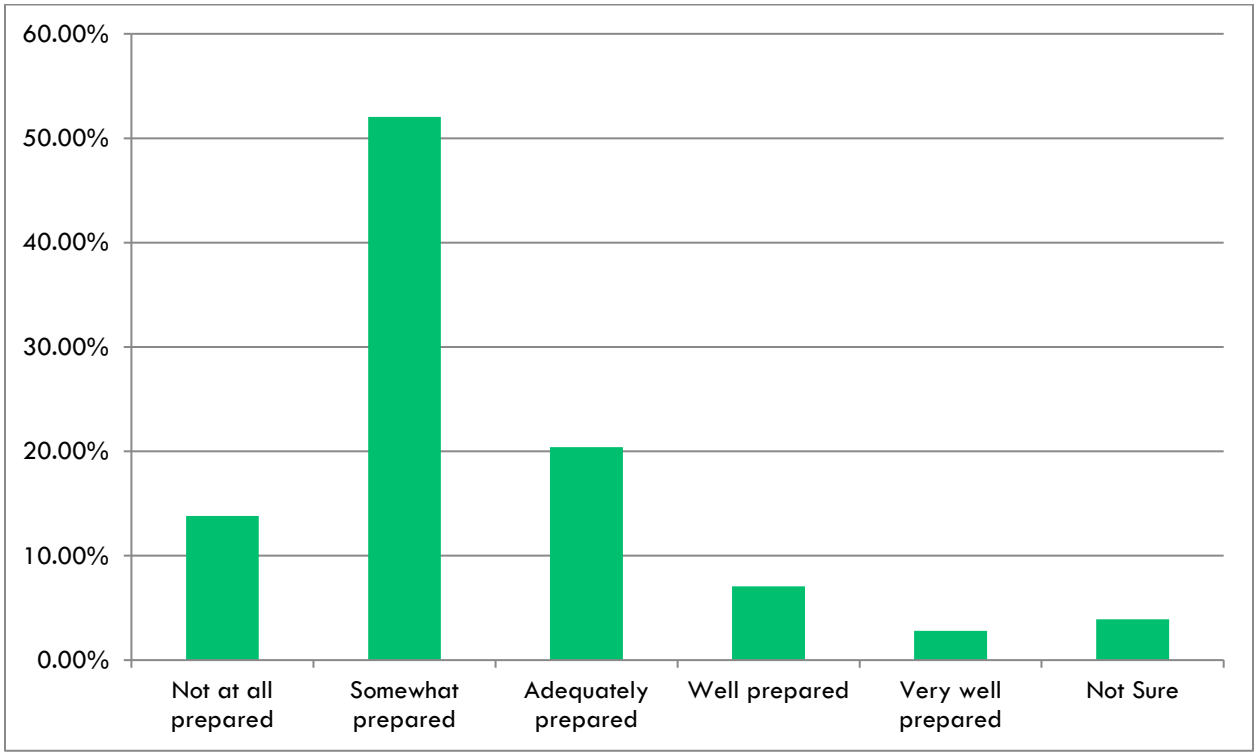
- The burn area of the late 2020 fires in and around Silverado Canyon and the mudslides in the area due to heavy rains
- The canyon areas seem to be the primary location where fires start
- The localized extended power outages caused a lot of neighbors to get generators.
- The low end of my street floods every time we experience heavy rain
- The neutron fusion pile in the basement needs constant attention.
- The trees touch the electrical wires along Santa Ana avenue and Mesa drive. The poles need to be put underground in the Santa Ana heights neighborhood! They are a hazard.
- The underground plume of trichloroethane under Woodbridge in Irvine from the El Toro Superfund site.
- The water duct alongside the 133 toll road needs severe improvements and could cause damage to the toll road which may impact housing alongside Portola Springs.
- There are areas where the drainage is insufficient and it causes the road to be made impassable by mudflow
- There is a partial landslide above the neighborhood, just above our neighborhood. The back side of the hill has slid into the canyon, creating a very large mound, which could be triggered as a slide if we get a substantial amount of rain. The slide is up above the northern end of Calle Cabrillo. I don't think most people know of this, but I've hiked there, and the slide could cause major damage.
- Toxic soil and potential aquifer toxification hazard at decommissioned El Toro Marine Base
- Turtle Rock has a lot of dry brush mid-summer. We had a fire near Concordia and at Quail Hill area that could have been major fires.
- Unsecured power and communication lines during high wind
- use solar panels with home batteries to prevent power outages
- Water bug infestations
- water quality
- We are in general, long-term drought.
- We had wildfire last year, very close to our community
- We have experienced earthquakes as well as having to move out of our home because of wildfire. We participate in summer power conservation where the Edison cuts off power for limited intervals.
- We have regular alerts from SCE regarding possible power outages during Santa Ana wind events and summertime
- We live next to the Serrano Creek. We are very concerned about the dead trees being a fire hazard.
- When SCE shuts off power to canyon areas; we have no way to get help. No cell phones, no land lines. During the Bond Fire, the homeowner had to drive to the nearest Fire Station (unmanned) and wait for help to arrive. It took 45 minutes for help to arrive at Bond Way. By that time, their home was gone.
- Why are there serious mosquito problems?

- Wildfire, Santa Ana winds seasonal & power outages because of wind*
- Wildfire burn areas subject to mud and debris flow during rain

**repetitive comments were consolidated*

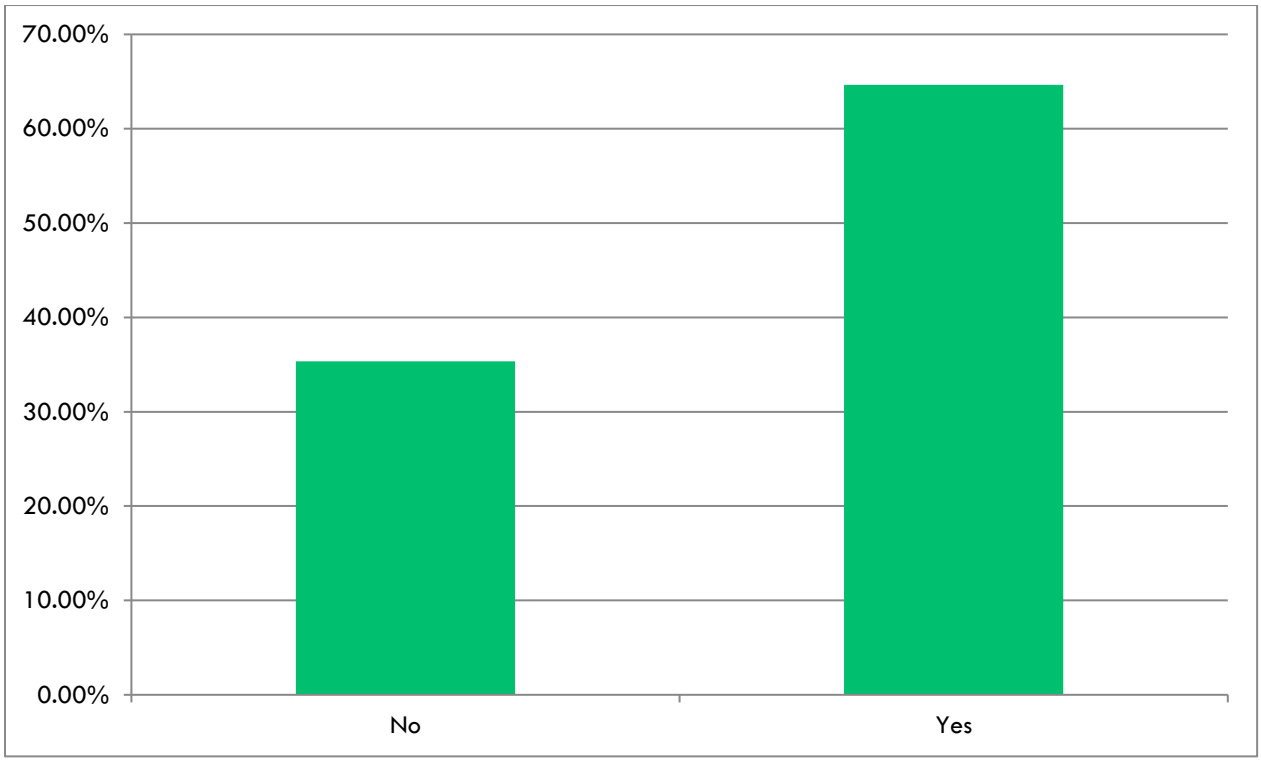
Question 7: How prepared is your household to deal with a natural hazard event likely to occur in the IRWD service area and/or the surrounding area??

Approximately 2.8 percent of survey respondents stated that they felt "Very well prepared" for natural hazard event likely to occur in the IRWD service area and/or the surrounding area. Approximately 13.8 percent of respondent stated that they felt "Not at all prepared", and the majority of respondents stated that they felt "Somewhat prepared".



Question 8: Have you taken actions to make your home, business, or neighborhood more resistant to hazards (such as anchored furniture and service utilities, functioning smoke detectors, regularly trimmed trees, etc.)?

A majority of respondents indicated that they had taken actions to make their home, business, or neighborhood more resistant to hazards.



Additional Comments[4]

- Additional beam supports, gasometer auto shut off valve
- Air Purifier
- All of the above*
- Anchored furniture*
- Carbon monoxide detectors
- CERT Training
- Drought-tolerant landscaping*
- Earthquake kit
- Evacuation Plan
- Emergency supplies*
- Emergency shutoff valves
- Fire and CO^2 Sensors

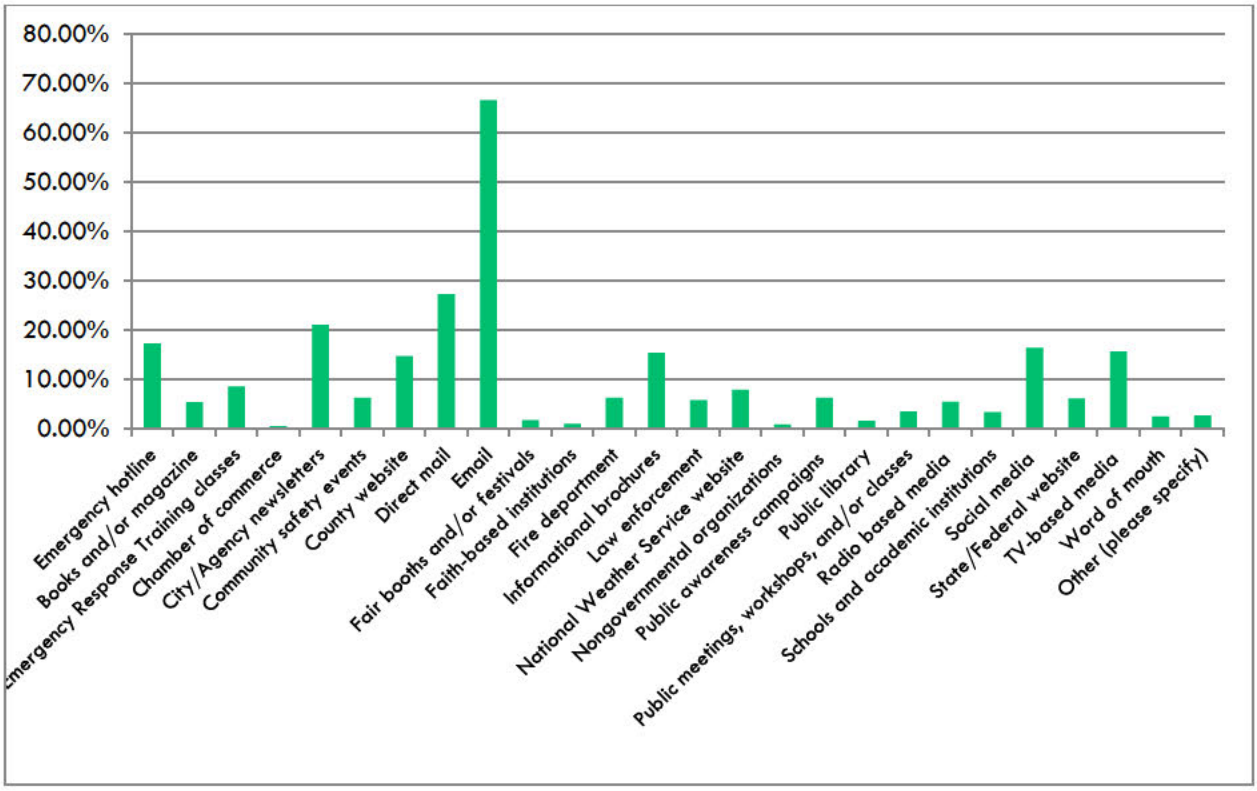
[4] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- Fire Extinguishers
- Fire fuel modification, generator, some hardening of structure
- Flood and erosion control measures
- HOA keeping up with main items*
- Home sprinkler system
- Maintain fire distance at 100 feet
- Oil lanterns, propane cooking stove
- Precautions to minimize fire risk and high winds
- Prune Trees*
- Ready-to-go kits/bags
- Removal of excess water
- Residential Solar Battery
- Smoke Detectors*
- Solar Lights and power*
- Store food/water supplies
- Store potable water
- Strapping water heater*
- Supply of food and water for a disaster*
- Water heater anchored*
- Yard Maintenance*

**repetitive comments were consolidated*

Question 9: Choose the top 3 ways you prefer to receive information about how to make your home and neighborhood more resistant to hazards? (Select a maximum of 3)

Approximately 66 percent of respondents listed Emailing as one of their top three ways to receive information on making their homes safe.



Additional Comments[5]

- Agency website (ex. Water)*
- An app that provides natural hazard events warning, status, and data
- Irvine Disaster Emergency Communications group affiliated with Irvine Police Department
- Fire Safe Councils
- Homeowner's and Neighborhood Associations
- Mobile phone notifications*
- Newspapers
- Not sure which is most effective.
- Notify by text directly to cell phone.
- Opt-in text links.
- Social media notifications*
- Specific Information available 24/7 via video

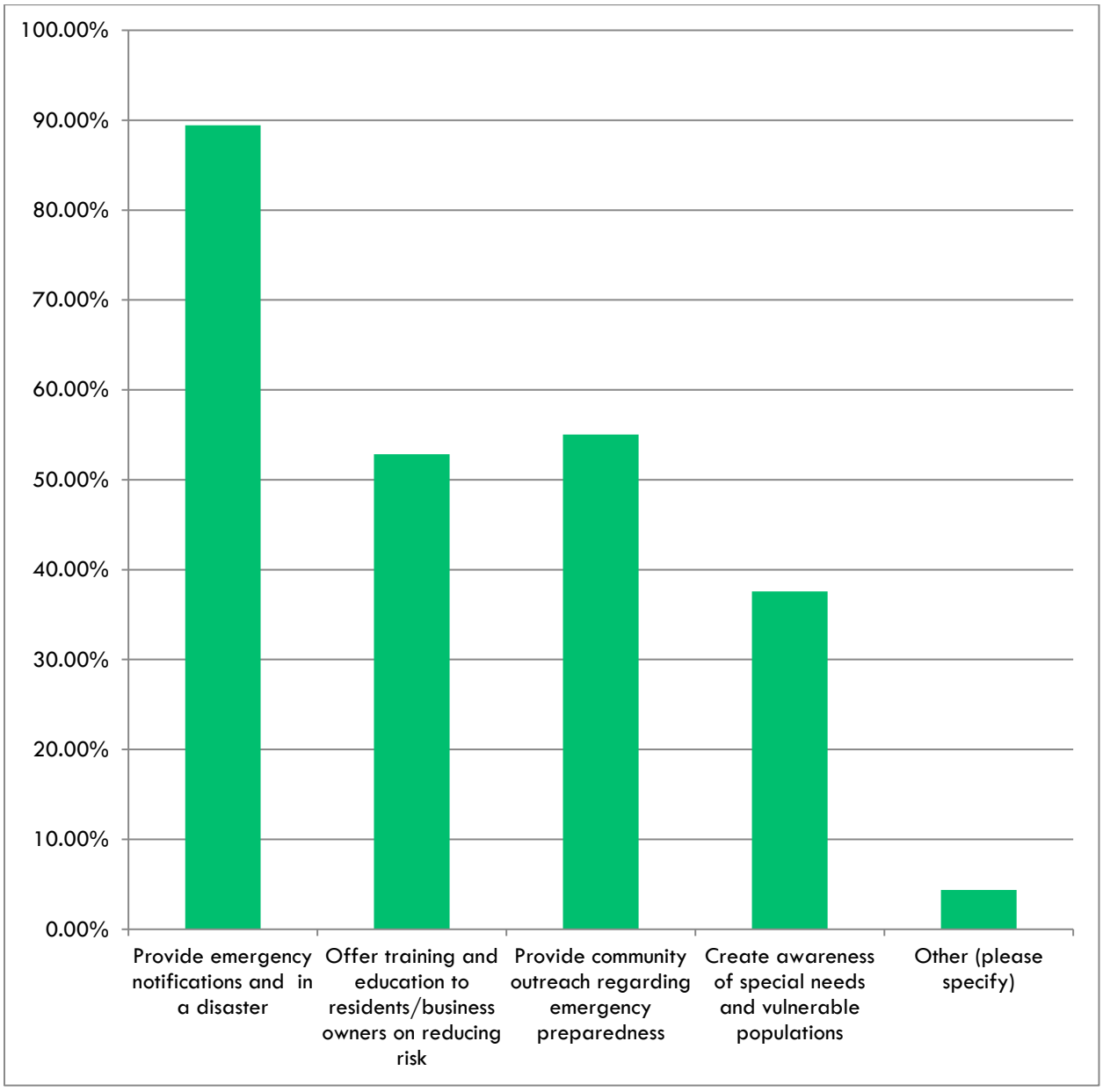
[5] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- Snail Mail*
- Talk radio
- Text notifications*
- Utility websites
- YouTube city channel

**repetitive comments were consolidated*

Question 10: How can IRWD and its partners help you become better prepared for a disaster? Choose all that apply.?

Almost 90 percent of respondents indicated that providing emergency notifications in a disaster would be the best way for IRWD and its partners to prepare residents for a natural disaster.



Additional Comments[6]

- Coordination with FEMA
- Create user-friendly web-based data and information that residents can access with questions.

[6] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

- Early (timely) warning system
- Each Community provide a contact to get information out.
- Education for natural disasters preparedness*
- Effective evacuation planning for each neighborhood
- Emergency preventative notifications prior to a disastrous event.
- Fortify the water delivery infrastructure against seismic events.
- Give first aid kits to households as school children. Mail people fillable emergency contact info cards w their city services pre-printed.
- Improvements to solar energy generation
- Indicate liquefaction possibility by zip code
- Info about flood zones around Dam by Peters Canyon on flyer with bill.
- Keep IRWD facilities, equipment and lines in top condition and repair.
- Lower the cost of the water.
- Maintain clean and efficient potable water
- Notifications via Nixel? There are so many false notifications and emails - it needs to be SHORT with a link to read more. Like contaminated water at local beach - good to know I won't go there. But if the hill above me is slipping I can read more for just my area.
- Offer cost effective options to prepare for disaster.
- Partner with community's CERT program.*
- Prepare for an event and manage expectations in advance.
- Aid elderly homeowners with the tree pruning.
- Provide free or subsidized safety tools or kits.
- Providing first-aid kits to members of the community.
- Prudent back-ups across for system wide resiliency. Tankless water heaters are in bad idea if there's ever a water main disaster
- Public outreach to children in schools as well, and have kids share information with their household and extended family.
- Transparency from the agency.*
- Send equipment to clean up the creek to prevent further disasters.
- SMS text messages
- Stop turning off the power to canyon communities.
- US Mail

**repetitive comments were consolidated*

Question 11: Please utilize the space below to provide any additional comments regarding local natural hazards, disasters, and preparedness.

Comments received on Question 12 are provided in their entirety, below: [7]

- Access road is shared with Metropolitan water district and Serrano Creek association but none of the 3 agencies take responsibility. Please assist weed abatement and road continued maintenance
- Adequate back up water supplies in case of main supply disruption, Backup generators to run main and distribution pumps. Back up IRWD personnel to inspect & repair damaged supply lines
- Alarm system
- Alert systems, quick updates, good communication system for public to access. emergency ham radio broadcast channel for use to let public get latest hazard updates/broadcasts
- All of our current problems go back to Edison turning off the power for days at a time. Now Edison refuses to do anything to remedy what they started. They stopped turning off our power in high winds and there are no bad consequences which means they never should have done this
- All programs that are in operation need to be put into public awareness for everyone to take the responsibility of the outcomes. The geoengineering programs need to be brought further into our discussion in view of droughts and water management.
- Always be ready
- An analysis of the hazards and risks facing IRWD and the areas it serves. Would like to see the issues addressed at schools as well. So many students seem to have no concern about preparedness and how important this topic is.
- An emergency packet for residents that is either mailed or download format to new residents and updated every 5 years online for emergency planning.
- Answer phone calls
- Be reasonable and honest about problems and solutions*
- Because emergencies can come up at any time, I would definitely need we provided information from governmental entities regarding local natural hazards, disasters, and preparedness.
- Better communication
- Better dissemination of flood and other hazards to residents. Most people do not know how to search for these on the internet and use it when choosing a place to purchase or make improvements to their property.
- Better information by App, mail, or email
- Better information where to seek shelter, better communication needed
- Better outlets to access freeways duration evacuation*
- Build more Dams and Power plants
- Can use app like nextdoor to fill the information blackholes during emergency
- Centers to find loved ones. First Aid centers to provide care and medical supplies.
- CERT training is very good, local community events such as National night out where PD and Fire come to local parks it would benefit IRWD to be there for Emergency Preparedness.*
- Clear booklet with checklists for emergency events would be great. For example, "In the event of an earthquake, follow these steps (1) if you hear or smell gas leaking from anywhere in or

[7] Comments unrelated to the survey topic were not included in this summary, but can be viewed in Appendix B.

around the house, use the gas shutoff wrench to shut the gas off at the meter (see illustration) ... Follow these steps to check around the house and up and down the streets for evidence of water leaking () broken water pipes inside the house () clothes washer hoses ()check your swimming pool for cracks or leaks () if your house is on a terraced lot lower than another lot that has a swimming pool, check for cracks and leaks cover fires, hailstorm, power outage, main water leak or break, home leak, gas leak, sewer rupture, include 911 and emergency local or regional numbers Be Prepared lists of items to have on hand, such as 5 gallons of distilled water for each resident, etc.,.

- Collect and remove the dry weeds nearby a community neighborhood.
- Communication is the most important aspect of knowing there is a disaster and we often lose power or cell phone coverage, leaving us literally in the dark.
- Community website.
- Concerned about the use “round up” that Baldwin bros use on. New development in Portola Hill-groundwater contamination.
- Concerned regarding water and gas supply outages. Also concerned regarding contamination of fresh water supply and emergency water supply availability. Frequent power outages is pending concern due to political machinations of the single source supply power to Irvine.
- Coordinate with local (very local) organizations: OCFA, Firesafe Council, Intercanyon League. All are involved in the same issues.
- Costs of what it would take to considered properly “prepared”, checklist, rotation schedule for preparation materials, etc. would be great.
- Create emergency awareness and provide community outreach regarding emergency preparedness.
- Direct communication to each resident is the most important factor in a disaster - rather than getting information from the media which one can no longer believe is providing true facts.
- Disaster preparedness.
- Divert/Involve community to clear the brush. Work/partner with local NGOs to adopt and clear the wild brush in certain sensitive areas. Provide volunteer hours for high schools and engage them in helping them involved with communities.
- Do not use this survey to increase the price.
- doing a great job
- Drought among other climate change impacts are manmade and we can and should do a better job mitigating.
- During last year's wildfires, we had no evacuation route and there was quite a bit of chaos within the Great Park community trying to exit the area. We need more information before it gets to be fire weather again.
- During the pandemic, zoom presentation is one of the useful ways to inform and educate public.
- Earthquake and flood preparedness are important.
- Educate people about reducing their carbon, CO2 and methane footprint so that Mother Earth can slowly but surely recover from global warming effects. Global warming is to blame for natural disasters, excluding earthquakes. Promote the concept of "Reduce, reuse, recycle" and overall make people to reduce their consumerist mentality because America is the top resource consuming nation per capita.
- Effective emergency notifications and helps before, during and after the disaster are greatly appreciated.
- Email and phone notification.

- Emergency response plans and chemical inventory audits on an annual basis to ensure regulated business' compliance with the community right-to-know rules and regulations.
- Evacuation Resources are a concern.
- Extended loss of electric grid and its dependent utility services are a major concern.
- Fire Authority and Sheriffs have to allow residents in to secure their homes. I'll sign a waiver absolving them of any responsibility. They are more of a nuisance than help.
- Fire department local branch has email notifications in emergency matters, in addition to road and weather concerns.
- Fires and earthquakes are the biggest risks.
- Fires are my most concern.
- Fluoride is hazardous material and doesn't belong in our water. Bring awareness to safely disposing pharmaceuticals.
- For each hazard, it would be nice to have a simple checklist that covers the most important points and is easy to remember. Periodically sending out the checklists would help keep people informed. Having access to additional resources on the checklist makes it easy for people to follow up if they have additional questions.
- For the good communication, use more SNS and message.
- For us, it is the prospect of earthquake and also wildfire. I have lived here 45 years and been evacuated four times, three of those times last year. Climate change is making things worse.
- forecast by email
- Have a standard training for average citizens to help in specific areas coordinated by fire/police departments. Can't be done just by emergency crews.
- Have list of things need to be prepared to provide to community.
- Having been evacuated a couple times last year, one thing that was very disturbing to me was that when you get an evacuation notice and you start calling hotels to book a room (because we have no family close) the hotels give you a much higher price than what is listed online. When I asked the hotel manager why we were charged so much, she admitted that when there is high demand they raise their prices. I understand that in a normal busy season (spring break etc..) BUT to do that to people who don't have anywhere to go is terrible. We should pass legislation or something to prevent hotels from being able to do this to people who are homeless due to natural disasters.
- Help homeowners understand how far away from their homes combustible organic material such as leaves, dry bushes and trees must be cut back so that wildfire will not burn their house.
- Hope we can prepare for any disaster.
- Hope we do not have any serious problems!
- Houses with most vulnerable should be listed, such as families with infants or elder people who cannot react fast to emergency.
- How to prepare better for high winds.
- I am appalled that there is still a plan to develop a reservoir in a spot that if it failed would destroy my house.
- I am concerned about Fire hazards
- I am concerned that there may be shortage of water. So, converting sea water into usable water should be the approach.
- I appreciate IRWD's pioneering accomplishments in recycled water. Rather than sending excess into the sea, can it be injected into the ground or allowed to infiltrate in old gravel pits or the rivers?

- I feel safe but it would be helpful for our whole community to know what safety measures are best to take.
- I feel that information is provided to our community already
- I have lived in this area for over 10 years and truly wonder if our city is truly ready for an emergency???
- I have no idea how vulnerable we are to tsunami; I see the signs but have no idea other than that. Have no idea what a best estimation of rising sea level in our area, have no idea what is being done and what we should be doing ..... EDUCATION, EDUCATION, EDUCATION, EDUCATE please !
- I have no specific knowledge of how we are to protect ourselves in the situations you mention.
- I have no suggestions
- I just have some worry about the wildfire. why should we take some pre-action to avoid the wildfire?
- I live near a flood control channel. During heavy rain it is flowing with lots of water. Can that water be captured, recycled, and reused? Or does it just drain to the ocean as it states on the storm drains? Seems like lots of free water available if it can be treated properly.
- I never seem to have enough time and money to be fully prepared like I read I should be. I don't know if I could shut off gas/power/water in a major earthquake. I don't know how to communicate with others in a big disaster if power/internet/cell phones are down. I wanted to keep a plain old copper wired analog home line with phone line powered equipment, but AT&T makes that near impossible to afford anymore/going all digital, and most all home phones need AC power. Both Cox and AT&T have AC powered equipment to have a home phone line now, and how many homeowners want or can afford battery backup systems always humming and buzzing in the background? They really let the ball drop on the public good in an earthquake-prone and wildfire-prone area, by dropping support for analog, phone line powered systems.
- I selected our house location based on disaster avoidance: 1. Flat, level ground with reduced risk of liquefaction and mudslide. 2. Ground elevated enough above sea-level so as to minimize tsunami risk. 3. Away from the underground El Toro hazardous plume that is encroaching on Woodbridge. 4. South enough of Long Beach to avoid an accidental release of airborne hazardous chemicals. 5. Not in the flood plain subject to Prado Dam flooding. 6. In a city that takes disaster planning seriously and can afford it. 7. Not at the edge of city/wilderness boundaries so as to reduce wildfire risk. 8. CERT trained 9. I try to stay informed of local issues and problems.
- I think Irvine is well prepared for a natural disaster and making sure we will have clean water is top of the list for surviving a natural disaster.
- I think my answers suffice.
- I think the city should trim resident's trees that are over 30 feet tall.
- I think we have covered it all....
- I walk in Newport Coast every day. The amount of trash (clothing, empty cases of glass liquor bottles and food containers) shows me homeless, teens or whatever take over at night. My biggest concern is a careless fire starting in the hills above my home.
- I will bet most people in Irvine are not prepared any kind of an emergency as well of most of Southern California. All people wait till after the problem to do anything Too Late
- I wish to receive information about emergency hotline contact numbers.
- I wish you could've used some examples of these types of disasters so I can imagine what it would be like to prepare for it.

- I worry about storm drains becoming clogged with debris and flooding my neighborhood. I would like to see some information / awareness about this potential issue.
- I worry about the people on the Newport peninsula in the event of a local earthquake that would generate a tsunami for which there would be no warning time. There would be a traffic jam, I'm afraid with results similar to the one in the South Pacific in 1998 (I can't remember which country but there was a long peninsula where many died.) I don't know what the answer is except for each resident to perhaps build something well anchored in the ground in which they could climb upward. Also, in all coastal areas, people need to the educated about tsunamis. I like the signs for tsunami evacuation although the ones I've seen are placed in areas that are already safe. They need to show directions out of areas not safe, especially Corona Del Mar Beach. People there need to know that you don't wait for a warning. The ground shaking is your warning to run up the cliff immediately! Places like Laguna and Huntington, you'll just have to run inland fast, and people should know to do that if the ground shakes. Also, education is important re: the water receding prior to a tsunami as many often go out to look, not realizing that is a sign they should be going the other way. They should also know to observe their animals as animals know it makes sense to be distressed in such a situation.
- I would like information on charging cell phones during extended power outages and on storage batteries for our 16-panel solar power array. Also, for all-electric vehicles if that is currently possible; we have a BOLT.
- I would like to know how the revenue of the IRWD are spent for the natural hazards, disasters, and preparedness if applicable to ask.
- I would like to see fire abatement in the form of pre-fire application of retardant on red flag warning periods in foothills near residential communities!
- I would like to see what plans are made if all electronics devices fail (phones, internet, vehicles and etc.) how will emergency services make notifications and how will they respond.
- I would love a "checklist" for each type of disaster.
- I've lived in this area for over 15 years and it's been a wonderful experience so far. Keep doing what you do!!
- I'd recommend visual scenarios in the hands of residents, both email and physical mail, that people could identify themselves... like a family in a house staring at dark smartphones "What would you do you?" or a shaking house with gas and/or power disruption "What would you do? ... Most don't *think* about it... so for them to see it and think "OH! I don't know! What would I do?" .. this would be the win.
- If not already, maximize use and development of local water reservoirs for water storage.
- If this program is serious, then training sessions at local schools or local library would be a good place to get started.
- I'm grateful that you are working on this. Climate change seems to be affecting our area greatly. Winds and rising temperatures are more frequent, and we never seem to have enough rain.
- I'm more concerned for industrial/government pollution of our water. Natural hazards/disasters don't cover the whole 'picture'.
- I'm new to the Canyons and have heard that floods typically come after fires, and that there's a certain cycle to these things. It would be in the best interest of Canyon residents if we can be informed of the natural hazards that are most pertinent to the current season and provide some sort of training/class to help us be prepared.
- Immediate concern is fire
- Information on a county website dedicated to disaster & preparedness.
- Links to Emergency phone centers & updates during events

- Information regarding natural hazards, disasters and preparedness can be provided along with water conservation tips.
- Irvine did a great job contacting us during the recent fires. Made us think of being prepared
- I sure hope that your secure from Cyber-attacks and other types of attacks.
- IRWD communication on Fire danger is important
- IRWD has done a great job of hardening their system in my area.
- IRWD is doing a good job*
- Is anything being done about the El Toro plume?
- Is it best to have a regular water heater rather than tankless in our residence should there be a water disruption?
- It would be great to have a check off sheet with a list of things you can do to be prepared for a disaster.
- It would be helpful to receive step by step guideline on specific items (the bare minimum) that a family should have on hand for different disasters
- It's nice to have a list of items/recommendations to keep handy in case of different disasters
- Join CERT Volunteer program
- Just as neighborhoods once had "Block Parents" who were screened and trained, it would be good to have something akin to "Prepared Persons" for the neighborhoods who could be a close by contact for information and guidance in case of a natural hazard, disaster or needed preparedness guidance for neighbors in times of need.
- Just follow-up on evacuation zones and could someone please address seasonal flooding issues on my street?
- Just give us as much forewarning as possible.
- Keep residents informed the disaster relief plan.
- Keep the hills and forests free of dry brush, maintained, safe for residents.
- Keeping everyone in the loop is awesome
- Kids education activities can help our community and IRWD Keep the water flowing please.
- Less confusing information
- limited cell phone service in my neighborhood constrains rapid communication of information - evacuation notices and similar alerts.
- Liquefaction
- List (map) areas of possible impact in case of dam failure
- Living in canyon means being prepared and living through disasters. Especially important that water pressure/delivery systems are resilient.
- Looking forward to hearing back on what steps she will take moving forward. Appreciate your proactivity in these regards to keep us safe.
- Looking forward to your information
- Lots of wildfire. I was forced to evacuate due to it this year.
- Lower the cost of the water
- Mail a brochure with emergency kit list and important phone numbers
- Maintain currency on local, state, and federal guidelines
- Make information easier to access.
- Make sure dry weeds are addressed
- Make sure people moving to Irvine know about the El Toro Superfund site and how it affects
- Make sure the IRWD has sufficient capacity and contract for more water.
- Make sure you have solar and battery backup to counter power outage.

- Many very old people still live in their homes. They should be identified so they can be checked on if there is an emergency.
- Maybe IRWD can sell disaster kits
- Maybe the county EOC provide input to your newsletter about wildfire & landslide prone areas.
- Monthly forecasts.
- Most concerns for Irvine are wildfire hazards & water contamination.
- My area is not prone to flooding, but we all must be prepared for earthquakes.
- Need earlier detection of wildfires and quicker response
- Need more reservoirs to provide back-up water supplies for periods of extended droughts.
- Need to know how much danger we are really in given our location.
- New homeowners/ renters new to CA should be notified by HOA about the natural hazards, disasters, and preparedness
- No additional comments at this time.*
- No additional comments. I appreciate the consistent communications I receive from IRWD.
- Notification by text
- Offer extension courses for CERT members.
- Offer More information to us.*
- Offer training and education to residents and business owners to learn how to reduce risk.
- Our biggest concern is wildfires (having evacuated twice last year within two weeks). The second concern would be earthquakes which could disrupt water, electricity and natural gas services as well as make roads impassable.
- Our city and or county should be proactive regarding wildfires, protecting residential areas, and creating barriers between the brush and houses. Fires have burned right up to Irvine's housing developments numerous times. These are wake up calls. Something needs to be done.
- Our density is increasing, and our issues appear to be more frequent. The best we can do right now is education and planning for the short-term while policy changes to address the long-term solutions.
- Pamphlets distributed to homeowners.
- People moving into this area forget that this is a semi-arid area with little natural water yet build where the land will slide when it does rain and plant as if there is abundant water. City of Irvine boasts of 1,000,000 trees s if that is an accomplishment. Makes it tough to avoid disasters.
- People must be prepared and must be aware what they have to do in case of hazard. It must be practiced frequently in order to be an automatic reaction when hazard happens.
- Perhaps send Email or Text to let us know?
- Please cut public trees and brushes regularly. Please keep adequate amount of water at slopes.
- Please have the information available in multiple languages. Perhaps working with local cultural groups to disseminate the information.
- Please keep us informed and train us periodically.
- Please keep working on prevention education through all media channels necessary. Our society always reacts to disasters but we are never prepared and prevent.
- Please patrol mountain safety near residential areas.
- Please release water contaminant measurements in an easy to see place and replace responsible infrastructure
- Please think about senior people more. It is hard for them to deal with the natural hazards.
- Please, be aware that we likely do not have power during an emergency. No power = no cell = no internet.

- Power and water availability likely to be the two greatest risks in a serious natural disaster.
- Pre-COVID-19 I taught an in-person ESL class and we had presentations from the IPD about safety. I also had annual info for earthquake preparedness... having a speaker or appropriate (easy to understand) info available for disaster preparedness for our language learners would be GREAT. There are many other ESL classes locally.
- Pre-packed emergency belongings
- Prepare areas by clearing overgrown brush and trees at the appropriate timing to help prevent or mitigate potential fire areas and flooding.
- Prevent Wildfires, avoid wasteful water
- Primarily concerned about wildfires and windstorms
- Provide any information on seismic proofing the water systems such as water lines and treatment plants.
- Provide emergency phone number to IRWD for water related problems.
- Provide information and knowledge focusing on preparedness for drought and wildfire hazards.
- Provide information on the kind of effects some of the hazards will have on the Services offered by IRWD.
- Provide information to areas with higher risk.
- Provide list and resources to develop household rations for food, water, first aide, in case of an emergency.
- Provide on-line, cloud-based tutorial for emergency situations
- Provide procedures to connect emergency power to residential housing.
- Provide regular updates at least once a year on how to best prepare for disasters over the internet allowing people to log on at their own convenience to access the information Push notification through OC Alert is very helpful.
- Providing the checklist for residents do regular inspection on natural hazard disasters around the community.
- Really concerned about earthquake safety and fire hazards in our community. Would like to know what steps are being taken to avoid wildfire spread.
- Recommend a survey of home-bound seniors or invalids to reference if a catastrophic disaster strikes.
- Regular mailing to neighborhood to educate resident would be good too.
- Residence is in Orangetree neighborhood of Irvine. Day to day vehicle access is via only one point (Orangetree) with one locked emergency exit on Bright Hollow without dissemination of how the emergency exit will be opened.
- Recycled water and make sure the water delivered to residents is safe.
- Residence should involve in this planning by offering their help and work with you.
- SCE shutting off power in high winds leaves us without any ability to call 911 in the event of an emergency.
- Send info with bill
- Send text message in an emergency event. Should decide evacuation sites according the city population size. Shortage and route. I think you can avoid congestion if you decide on them in advance. This opinion is in my experience when Silverado fire in November 2020. Evacuation sites were not enough, and we got caught in a traffic jam.
- Simply offer website information availability and periodic notices to update personal preparation

- Since our area is prone to more fires now, need to make people (school kids also) aware of dangers of starting fires (bonfires, etc.) e.g. during summer months and why. People (kid included) need to be educated and responsible. Climate is different now and we have more dry months. Schools need to include these in their curriculum.
- Since the district is a high population density, relocation of people from hazard-affected areas should be considered (e.g., signage for tsunami evacuation; identified alternative traffic routes for fire areas -- especially those with limited ingress/egress).
- Sirens maybe.
- Start verifying backflow protection.
- Starting at the top, we need to address climate change. Republicans need to help Biden.
- Steps should be taken to learn from the December 2020 fires in Silverado- namely the breakdowns in communications between fire officials and residents of the canyons. During the fires, residents found that they were not being communicated with.
- Storm drains contamination.
- Street water runoff should be captured for reuse instead of going to ocean.
- Suggest you focus on how we prepare for water or sewer interruptions.
- Text messages alerts regarding local disasters would be helpful*
- Text messages. How do I apply to CERT
- The ability of IRWD to continue operations during an emergency is critically important. Please carefully consider and implement redundant systems to enhance facility reliability
- The city should turn on the sprinklers when/where there are fires.
- The emergency response system is very effective
- The hill erosion on Canada near Birendra is a concern, the hill is constantly falling off into the street, the hill is not maintained and has wild vegetation unkempt and fire prone
- The Irvine Water District is, by far, the most responsible of all the agencies we have to deal with.
- The IRWD newsletter (the one that comes with the bill) is very informative and I enjoy reading it. Hopefully for people who pay online, they have easy access to it.
- The OC County FD and city emergency preparedness team should conduct random business
- The text messages and robot calls during the recent fires were very effective and reassuring
- The utilities like SCE shutting down the power grid during wildfires is more of a health and safety hazard than the wildfires themselves. Had SCE paid more attention to cutting down or replacing overgrown trees with cactus plants and the like, the likelihood a Santa Ana Wind condition would "ignite a fire" by knocking down a powerline unto dry trees would be mitigated against and risk reduced.
- There is a major fault under us - what are the projections?
- To inform in advance the Local natural hazards using advanced Techni also to Cell Phones.
- To received text message on regard matter.
- Too many people you run into problems no food no water no supplies.
- Training and education on continuous basis
- Tustin Ranch, having been developed recently, is better prepared for most hazards than other areas. My wife works for the County and is assisting in improving security against flooding. That doesn't happen often but there have been a few serious episodes over the past decades.
- Two evacuations within a few months in 2020. We need more announcements by officials as to where we can go with our pets quickly even if it's just parking in our car but, have safety measures implemented.

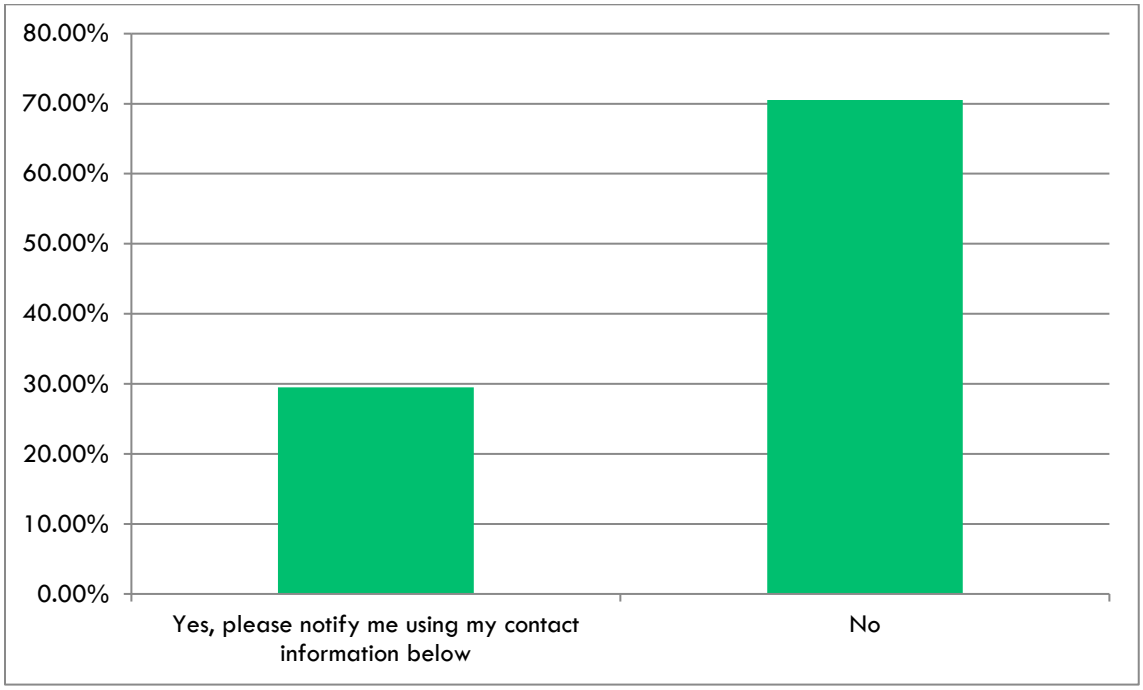
- Update storage and distribution capacity and increase availability of reclaimed water for use during disruptions or fire
- Utilize monetary/gift/raffle incentives for members to actually read through material.
- Very concerned about drought/fire. Would like to get the hillside behind my home planted in succulents.
- Very concerned about groundwater contamination. What is being done about the toxic plume under Woodbridge. How did it get there? If it traveled from the great park area then which other areas of Irvine are contaminated?
- Very concerned about the contamination of our water due to industrial pollutants, i.e. upstream flame-retardant manufacturer, asphalt factory, and the like.
- Water district needs to build more water storage facilities including lakes, reservoirs, water tanks. Also, more hydroelectric dams are needed for s growing number of electric vehicles. All electric wires to undergrounded, even long distance, high voltage, transmission lines.
- Water districts should test for all potential toxins, including MBTA, Perchlorate, and include it in their water quality reports.
- Water is life, if we face weeks of failed infrastructure after a major quake IRWD should be at the forefront of helping their customers acquire safe water and or purifying methods.
- Water security is going to be a bigger and bigger issue in the West due to global warming. IRWD should be on the forefront of efforts to mitigate the impact on its members and also offer training on water conservation, water catchment and storage.
- We applaud FEMA and IRWD for giving attention to VERY IMPORTANT SECURITY concerns that at present may not seem urgent.
- We appreciate the attention placed on this subject. Earthquake is our biggest concern.
- We appreciate the free or low price services offered by IRWD and other utilities, such as the irrigation controller and thermostat. We would probably respond quickly to similar offers of emergency preparedness items.
- We are a rural canyon area with needs quite different than most of suburban Orange County
- We are in a condo, so we are both more protected and less able to impact our surroundings
- We are woefully unprepared.
- We can never be prepared enough in these times. This must be an ongoing effort by the city of Irvine and public utilities such as IRWD and other important offices keeping the public informed and urging the public and homeowners to become involved. Disasters are becoming worse all over the USA and here in California. Everyone should become more involved and careful and alert.
- We do what we can to be prepared.
- We have drought resistant landscaping, so just make sure the water quality is excellent and the water keeps running.
- We have excellent notifications that are sent out during natural hazards, disasters, and preparedness for the same. Hope it will continue the same way.
- We live in the Forest part of lake forest and our concern is fire and what would be in place to stop the eucalyptus from fire and possible explosion?
- We must prevent wildfires. No one is prepared for earthquakes.
- We need better escape routes from the Portola Springs area. This was proven during the last fire evacuation. Opening the gate at the south end of Native Springs will help.
- We need better water and stable internet

- We need to Have water ready for after a super Earthquake! We need More emergency Wells with pumping equipment and fuel on standby!! Because we can't survive without water and we can't escape Southern California!! This is the only Security risk IRWD should be worried about or after an earthquake we'll all be dead. I repeat we'll all be dead!! We can't walk out of here.
- We own a second home in the area addressed and can use information about the natural hazards of the area and what to expect.
- We should have a dedicated helicopter to respond to fires with water drops on short notice. I saw the Bond fire start, and it didn't spread off the property for at least 20 minutes. It could have been contained with one or two water drops.
- We should have Communication centers for local loved ones, hospitals, and emergency room
- We use solar during the day but need better info on battery availability in our area to mitigate power outages
- Webinar, workshop
- What channel on the emergency radio should we use to hear about our local emergency updates?
- When providing information, please also include a sense of the likelihood and severity of any given disaster occurring.
- When the fires occurred, we turned to the city website for information and updates. The site is useless There needs to be a program in place on trimming tree/landscapes and it needs to be enforced. Same with creating and enforcing laws against illegal fireworks; with notices and warnings going out months prior to holidays. Each year, firework use gets worse and last year it was a war zone...houses will burn during the dry and windy days and yet, we have no programs in place to educate the public (as we do about conserving water, water irrigation, conserving energy). Nothing will matter when 1 of our communities goes up in flames and yet we've experienced 2-3 evacuations already. When will the fire commissioner put something in place for preventive matters vs. after the fact?
- Where to purchase viable products to put into a home "Go Bag" in case of an earthquake, fire, or flood.
- Wildfires seem to be getting closer and more frequent. What steps are we taking to reduce the impact?
- Will need a fast responsive monitoring system to monitor the natural hazards, like wildfire, in early stage, so we can either be good prepared or contain it before it spreads out.
- Wind and fire concern are high on my list. I would like to see trees and vegetation maintained to prepare for natural hazards.
- With so many people living in community associations, is there outreach efforts for these institutions?
- With the vaccine, perhaps reaching out to hold workshops at the L.F. Community center for seniors.
- Without these services communication with the outside world would not be possible.
- Work with HOAs to incentivize emergency preparedness in their communities. They already work as a team and in the best interest of their communities.
- Work with other authorities to form a unified communication plan for disasters.
- workshop or checklist would be nice.
- Would like to know state of waste dump and water storage facilities this area.
- Would like to know what possible natural hazards are in my area other than earthquakes & high winds. Would we be subject to a tsunami in my area?

- Would like to receive notification on emergencies and how to prepare for it.
- Would love to be more involved in disaster response planning and community outreach, but I haven't found the effective entry point into that sort of community service yet.

**repetitive comments were consolidated*

Question 12: Would you like to review and comment on the draft of the IRWD Local Hazard Mitigation Plan?



Question 13: If you would like to be notified of future opportunities to participate in hazard mitigation and resiliency planning, please provide your name and contact info

Names and contact information of responses are included under a separate cover.

Irvine Ranch Water District

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Irvine Ranch Water District
February 18 ·

Local governments, including water districts, are required to have an approved local hazard mitigation plan to be eligible for FEMA hazard mitigation funds. Please take 10 minutes to submit answers to a survey on what is important to you and how you would like to see the District become more resilient. Visit IRWD.com/lhmp.

1

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March 4 at 9:26 AM ·

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March 24 at 10:27 AM ·

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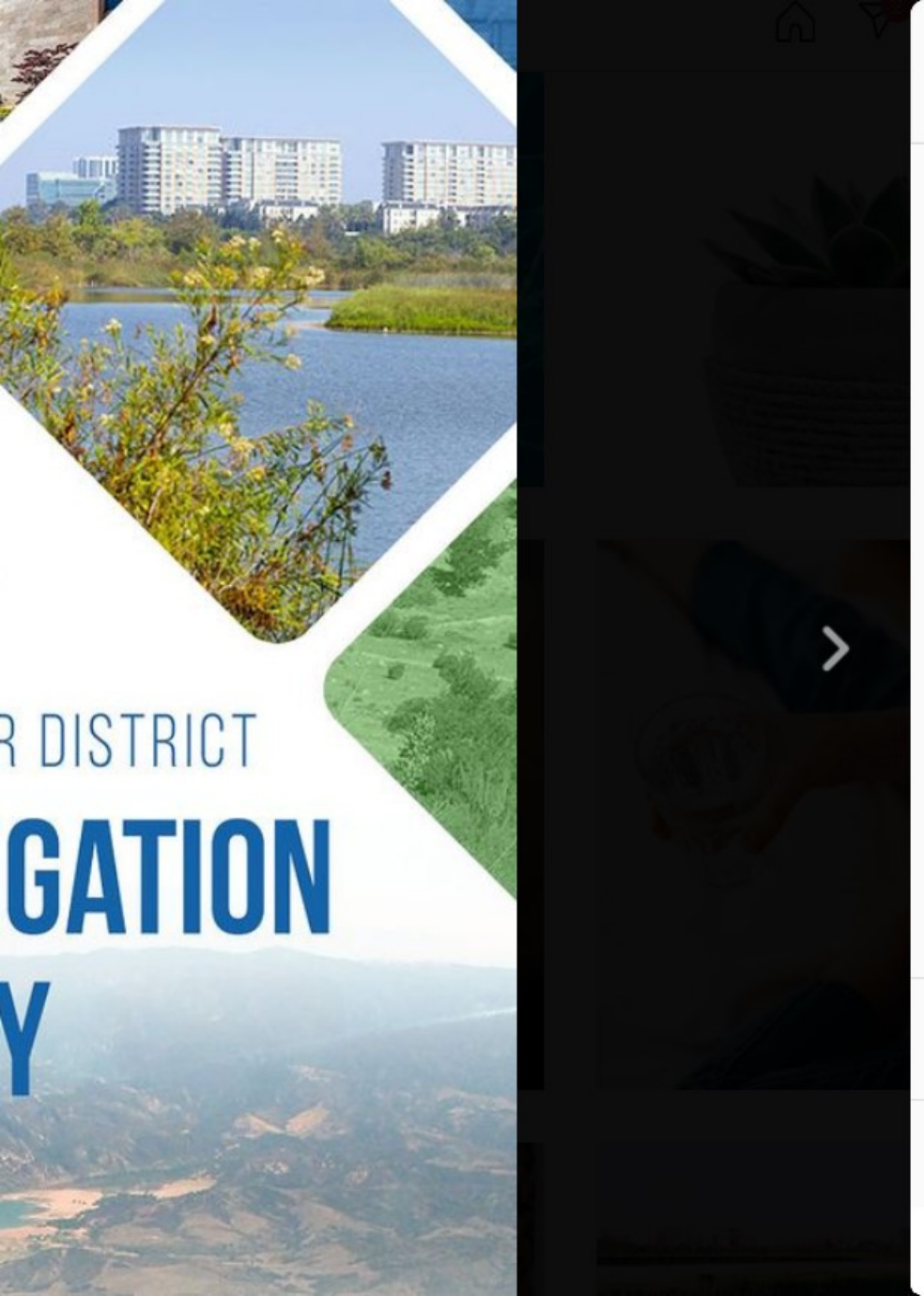

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March 10

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(https://www.irwd.com/)

MAY 24, 2021 | 10:33AM

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PUBLISHED: FEB 02, 2021 | 17:05 PM

Customers, take our hazard mitigation survey

Local governments, including water districts, are required to have an approved hazard mitigation plan to be eligible for FEMA hazard mitigation funds. Please take 10 minutes to submit answers to a survey on what is important to you and how you would like to see the District become more resilient. Visit IRWD.com/lhmp (http://irwd.com/lhmp).

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Finance and Personnel Committee Meeting - June 1, 20 (/component/jevents/eventdetail/19144/60|61|69/finance personnel-committee-meeting-june-1-2021?Itemid=1&filter_reset=1)

JUN 01, 2021 | 11:30am -

Water Resources Policy and Communications Committe Meeting - June 3, 2021 (/component/jevents/eventdetail/19145/60|61|69/water-resources-policy-and-communications-committee-meeti june-3-2021?Itemid=1&filter_reset=1)

JUN 03, 2021 | 03:00pm -

Engineering and Operations Committee Meeting - June 2021 (/component/jevents/eventdetail/19146/60|61|69/engine and-operations-committee-meeting-june-15-2021?Itemid=1&filter_reset=1)

JUN 15, 2021 | 01:30pm -

Irvine Ranch Water District

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City of Lake Forest - Government - The Irvine Ranch Water District Local Hazard Mitigat…

City of Lake Forest - Government
The Irvine Ranch Water District Local Hazard Mitigation Plan needs your input! Please take a moment to fill out this survey IRWD.com/lhmp to provide input for the Local Hazard Mitigation Plan. #irvineranchwaterdistrict

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Top Fan
Rich Parker
Don't even get me started with IRWD crap. How I wish the Los Alisos WD was still in control. Thumbs down

1 mo **Like** **Reply** **More**

Steele, Noelle

From: [redacted]
Sent: Monday, March 15, 2021 5:57 PM
To: [redacted]
Cc: Emilyn Zuniga; Steele, Noelle
Subject: EXTERNAL: IRWD Local Hazard Mitigation Plan community survey request

Good afternoon community partners,

Thank you for your continued support of our Local Hazard Mitigation Planning process. We are seeking public participation in a pre-planning disaster survey, and we would like to ask for your help in getting the word out. The survey can be found here: IRWD.com/lhmp

If you are able and willing to post to your website, social media, or other outreach channels, we'll have the survey open through the end of March. I'll be sending out the next planning meeting agenda shortly, so you can preview the discussion topics and bring any of your own hazard mitigation project information to the meeting that you would like to share. We appreciate your help and remain available for questions if you have them.

Best regards,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
[redacted]00, Irvine, California 92619-7000
[redacted]

Steele, Noelle

From: Alix Stayton [redacted]
[redacted]
To: Emilyn Zuniga; Ken Pfister; Gaspar Garza; Dorien McElroy; Owen O'Neill; Colton Martin; Todd Colvin; Dave Crowe; John Dayer; Malcolm Cortez; Eric Akiyoshi; Ian Swift; Allen Shinbashi; Randy Williams; Joe Lam; Lars Oldewage; Lisa Haney; John Fabris
Cc: Wendy Chambers; Jose Zepeda; Richard Mykitta; Kevin Burton; Thomas Malone; Cheryl Clary; James Colston; Marina Lindsay; Deniene Rivenburg; Steele, Noelle
Subject: EXTERNAL: Hazard Mitigation Plan update
Attachments: HMP Meeting #1.pdf

Good afternoon,

Please find attached the slide deck that was presented during the first Hazard Mitigation Plan working group meeting. Since then, the Public Affairs department has facilitated distribution of the public engagement survey, and a small group of us got together and finished the hazard prioritization chart that we worked on in the first call. You can view the survey here: IRWD.com/lhmp.

Next steps will be to continue to gather information for inclusion in the plan such as our list of critical assets and GIS data. If anyone has data, analyses, reports or plans that can give the consulting team more perspective on our experience of disasters, send them along and I will forward. Thank you to everybody who has already been helping with these tasks.

Our next call will focus on ensuring our initial prioritization work makes sense as a whole; today we talked about how, even though we scored the individual hazards fairly, the list doesn't yet reflect our District disaster priorities (too many "medium-impact" hazards). The consultants will facilitate the process of shaping the list to show what's important to us, and help us work on a couple of the hazards that seemed difficult to score. We will also be talking about the hazard profiles, which comprise a large portion of the Plan that FEMA will be reviewing. We'll discuss historical incidents and the programs, procedures, and other protective measures we already have in place to minimize disaster impacts. Meetings will continue to include community partners like the City of Irvine, WEROC and the State Water Resources Control Board.

As a reminder, the Hazard Mitigation Plan is a FEMA process for gaining grant eligibility and may differ from our very recent AWIA experience, which was an EPA process for ensuring compliance. We provided the MBI team with a lot of background material on IRWD, including the AWIA plan, and they take it into account whenever they are able to reduce the amount of duplicate work we have to do. Thanks to everyone for their patience and participation with this process.

As always, if you have questions or need more information, I'm happy to help or go find answers. Call, text or email anytime.

Best,

Alix

ALIX STAYTON
SAFETY SPECIALIST

Irvine Ranch
WATER DISTRICT
3512 Michelson Drive, Irvine, California 92612
Mailing: PO Box 57000, Irvine, California 92619-7000
[redacted]
[redacted]

APPENDIX C

Dam/Reservoir Vulnerability Assessment

APPENDIX C: DAM/RESERVOIR FAILURE VULNERABILITY ASSESSMENT

C.1 DAM/RESERVOIR FAILURE VULNERABILITY OVERVIEW

IRWD owns and operates five dams classified by the Division of Safety of Dams as "extremely high hazard" within the IRWD service area: Rattlesnake Canyon Dam, Syphon Canyon Dam, San Joaquin Dam, Santiago Dam, and Sand Canyon Dam. DSOD is responsible for assigning each jurisdictional dam a downstream hazard classification. This classification is based only on potential downstream impacts to life and property, in the unlikely event that the dam should fail when operating with a full reservoir. This hazard status is not related to the condition of the dam or the likelihood of the dam to fail in either the short or long-term future. Inundation mapping and Emergency Action Plans (EAPs) have been prepared and approved by FEMA and DSOD and are included in this Appendix for reference.

Critical facilities and facilities of concern were mapped against each inundation zone. As all five dam inundation zones ultimately reach San Diego Creek and Upper Newport Bay, there is some overlap of the dam inundation zones. Table C-1, *Dam/Reservoir Failure Vulnerability*, below, summarizes the critical facilities and facilities of concern that are located within at least one dam inundation zone. Tables C-2, *Facilities in the Santiago Dam Inundation Zone* to C-7, *Facilities in the San Joaquin Dam Inundation Zone*, identify the specific inundation vulnerabilities associated with each "extremely high hazard" dam. Refer to Appendix C, Exhibit 1.1, *Dam Inundation Map – Critical Facilities*, Appendix C Exhibit 1.2, *Dam Inundation Map – Distribution Map*, and Appendix C Exhibit 1.3, *Dam Inundation Map, Sewer Collection System*, for illustrations of all five inundation zones.

Table C-1
Dam/Reservoir Failure Vulnerability

Map ID	Name	Asset Type	Santiago Dam	Sand Canyon (Spillway)	Sand Canyon (Dam)	Syphon Canyon Dam	Rattlesnake Canyon Dam	San Joaquin Dam	Total Loss Potential
2	Michelson Biosolids	Biosolids Treatment	Y	N	N	N	N	N	$250,000,000.00
3	Distribution System	Distribution System	Y	Y	Y	Y	Y	Y	$790,000,000.00
6	Met Source Water	Intake	N	Y	Y	N	N	Y	N/A
11	Coyote Canyon	Lift Station	N	N	N	N	N	Y	$2,605,484.00
14	Irvine Park	Lift Station	Y	N	N	N	N	N	$2,605,484.00
19	MWRP MPS-3	Lift Station	Y	N	N	N	N	N	$4,226,529.00
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	N	N	N	N	N	Y	$6,999,844.00
26	Michelson Operations Center	Operations Staff Offices	Y	N	N	N	N	N	$20,900,000.00
43	Michelson MWRP	Recycled Water	Y	N	N	N	N	N	$500,000,000.00
62	Deep Aquifer Treatment System (DATS)	Treatment System	Y	N	N	N	N	N	$20,000,000.00
63	Collection System	Wastewater Collection System	Y	Y	Y	Y	Y	Y	$781,131,700.00
65	S1	Siphon	Y	Y	Y	N	Y	Y	$585,000.00
66	S2	Siphon	Y	Y	Y	Y	Y	Y	$1,266,000.00
67	S3	Siphon	Y	N	Y	Y	Y	N	$1,302,000.00
68	S4	Siphon	Y	Y	Y	Y	Y	N	$1,365,000.00
69	S5	Siphon	Y	N	N	N	N	N	$222,000.00
70	S6	Siphon	Y	N	N	N	Y	N	$444,000.00
74	S10	Siphon	Y	N	N	Y	Y	N	$549,000.00
80	S16	Siphon	N	N	N	N	N	Y	$951,000.00
81	S18	Siphon	N	Y	Y	N	N	N	$807,000.00
82	S19	Siphon	Y	N	N	N	N	N	$180,000.00

C.1.1 Santiago Dam

Santiago Dam (Irvine Lake, also known as Santiago Creek Reservoir), located in Santiago Canyon, stores water for non-drinking uses and operates as a source water for the Baker Water Treatment Plant. Capacity for Santiago Dam is 25,000 acre-feet. Failure of Santiago Creek Reservoir would result in inundation for low-lying portions of south Orange, Villa Park, Santa Ana, North Tustin, Tustin, Fountain Valley, Garden Grove, Costa Mesa, Irvine, Huntington Beach, and Newport Beach. Portions of the state highway system could be inundated, including Interstate 5 (I-5), I-405, State Route (SR) 22, SR-55, SR-57, and SR-261 (toll road). Many surface streets would also be inundated. High flows and flooding are expected in Santiago Creek, Santa Ana River, Peters Canyon Wash, San Diego Creek, and Upper Newport Bay.

As this is the largest dam in the IRWD service area, inundation from dam failure would be the most significant. Several critical facilities and one facility of concern would potentially be inundated; refer to Table C-2, *Facilities in the Santiago Dam Inundation Zone*.

Table C-2
Facilities in the Santiago Dam Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
Critical Facilities				
2	Michelson Biosolids	Biosolids Treatment	Between 4 hr and 4 hr 10 min	$250,000,000.00
3	Distribution System	Distribution System	Between 12 min and 15 min	$790,000,000.00[1]
14	Irvine Park	Lift Station	Between 9 and 12 min	$2,605,484.00
19	MWRP MPS-3	Lift Station	Between 4 hr and 4 hr 10 min	$4,226,529.00
43	Michelson MWRP	Recycled Water	Between 4 hr and 4 hr 10 min	$500,000,000.00
62	Deep Aquifer Treatment System (DATS)	Treatment System	Between 4 hr and 4 hr 10 min	$20,000,000.00
63	Collection System	Wastewater Collection System	Between 6 min and 9 min	$781,131,700.00[2]
65	S1	Siphon	Between 3 hr 50 min and 4 hr	$585,000.00
66	S2	Siphon	Between 3 hr 40 min and 3 hr 50 min	$1,266,000.00
67	S3	Siphon	Between 3 hr 20 min and 3 hr 30 min	$1,302,000.00
68	S4	Siphon	Between 3 hr 40 min and 3 hr 50 min	$1,365,000.00
69	S5	Siphon	Between 3 hr 40 min and 3 hr 50 min	$222,000.00
70	S6	Siphon	Between 3 hr and 3 hr 10 min	$444,000.00
74	S10	Siphon	Between 2 hr 10 min and 2 hr 20 min	$549,000.00
82	S19	Siphon	Between 2 hr 40 min and 2 hr 50 min	$180,000.00
Facilities of Concern				
26	Michelson Operations Center	Operations Staff Offices	Between 4 hr and 4 hr 10 min	$20,900,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

C.1.2 Sand Canyon Dam

Sand Canyon Dam is located in the City of Irvine and serves as recycled water storage for IRWD. Capacity for Sand Canyon Dam is 768 acre-feet. Failure of Sand Canyon Dam would result in the inundation of Strawberry Farms Golf Course, along with low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, the University Drive and Michelson Drive intersection, and adjacent areas. University Drive from I-405 to Campus Drive would likely be unusable in the event of inundation. High flows could be expected in San Diego Creek to Newport Bay. The flood wave caused by a failure of Sand Canyon Dam could take approximately 8 hours to subside.

Failure of the Sand Canyon Dam Spillway (designated critical appurtenant structure) would result in a less significant inundation footprint when compared to Sand Canyon Dam. The Sand Canyon

Dam Spillway failure would result in partial inundation of the Strawberry Farms Gold club, but would mostly be confined to Sand Canyon Wash. The flood waves would continue to Sand Canyon Creek. The flood wave would take approximately 10 hours to subside.

As the inundation footprint for Sand Canyon Dam Failure and Spillway Failure are slightly different, the vulnerabilities for each scenario vary. Critical facilities within the inundation zone for spillway failure are outlined below in Table C-3, *Facilities in the Sand Canyon (Spillway) Inundation Zone*. Critical facilities within the inundation zone for dam failure are outlined in Table C-4, *Facilities in the Sand Canyon (Dam) Inundation Zone*. No facilities of concern are located within either inundation zone.

Table C-3
Facilities in the Sand Canyon (Spillway) Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
3	Distribution System	Distribution System	3 min	$790,000,000.00[1]
6	Met Source Water	Intake	Between 48 min and 54 min	N/A
63	Collection System	Wastewater Collection System	3 min	$781,131,700.00[2]
65	S1	Siphon	Between 2 hr 6 min and 2 hr 12 min	$585,000.00
66	S2	Siphon	no arrival contour	$1,266,000.00
68	S4	Siphon	no arrival contour	$1,365,000.00
81	S18	Siphon	Between 2 hr 12 min and 2 hr 18 min	$807,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

Table C-4
Facilities in the Sand Canyon (Dam) Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
3	Distribution System	Distribution System	3 min	$790,000,000.00[1]
6	Met Source Water	Intake	Between 15 min and 18 min	N/A
63	Collection System	Wastewater Collection System	3 min	$781,131,700.00[2]
65	S1	Siphon	Between 48 min and 54 min	$585,000.00
66	S2	Siphon	Between 48 min and 54 min	$1,266,000.00
67	S3	Siphon	Between 1 hr 6 min and 1 hr 12 min	$1,302,000.00
68	S4	Siphon	Between 1 hr 48 min and 1 hr 54 min	$1,365,000.00
81	S18	Siphon	Between 36 min and 42 min	$807,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

C.1.3 Syphon Canyon Dam

Syphon Canyon is located in the City of Irvine and serves as recycled water storage for IRWD. Capacity for Syphon Canyon Dam is 535 acre-feet. Failure of Syphon Canyon Dam could result in low-lying areas of the Stonegate/Woodbury neighborhoods, Irvine Boulevard, Jeffery Road below Boulevard, and Jeffery Open Space to be inundated. Portions of I-5 between Culver Drive and Jeffery Road could be impacted by inundation at Syphon Canyon Dam. Portions of Portola Road, Irvine Boulevard, Jeffery Road, Trabuco Road, Walnut Road, Harvard Road, and Edinger Avenue would potentially be closed due to partial inundation.

Critical facilities within the Syphon Canyon Dam inundation zone are identified in Table C-5, *Facilities in the Syphon Canyon Dam Inundation Zone*. No facilities of concern are located within the Syphon Canyon Dam inundation zone.

Table C-5
Facilities in the Syphon Canyon Dam Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
3	Distribution System	Distribution System	3 min	$790,000,000.00[1]
63	Collection System	Wastewater Collection System	3 min	$781,131,700.00[2]
66	S2	Siphon	4 hr	$1,266,000.00
67	S3	Siphon	4 hr	$1,302,000.00
68	S4	Siphon	Between 3 hr 54 min and 4 hr	$1,365,000.00
74	S10	Siphon	Between 2 hr and 2 hr 6 min	$549,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

C.1.4 Rattlesnake Canyon Dam

Rattlesnake Canyon Dam is located in the City of Irvine and serves as recycled water storage for IRWD. Capacity for Rattlesnake Canyon Dam is 1,480 acre-feet. Failure of Rattlesnake Canyon Dam would inundate the low-lying portions of the Northwood neighborhood (Irvine), Portola Parkway, Culver Drive, and adjacent surface streets. Portions of I-5 between Jamboree Road/261 and Culver Drive could be impacted as well. However, I-405 would not be impacted, as the flood would be confined to San Diego Creek.

Critical facilities within the Rattlesnake Canyon Dam inundation zone are listed within Table C-6, below. No facilities of concern are located within the Rattlesnake Canyon Dam inundation zone.

Table C-6
Facilities in the Rattlesnake Canyon Dam Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
3	Distribution System	Distribution System	Between 3 min and 6 min	$790,000,000.00[1]
63	Collection System	Wastewater Collection System	Between 3 min hr and 6 min	$781,131,700.00[2]
65	S1	Siphon	Between 2 hr 6 min and 2 hr 12 min	$585,000.00
66	S2	Siphon	Between 2 hr and 2 hr 6 min	$1,266,000.00
67	S3	Siphon	Between 1 hr 30 min and 1 hr 36 min	$1,302,000.00
68	S4	Siphon	Between 1 hr 18 min and 1 hr 24 min	$1,365,000.00
70	S6	Siphon	1 hr 12 min	$444,000.00
74	S10	Siphon	Between 30 min and 36 min	$549,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a "significant portion" of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a "significant portion" of the system.

C.1.5 San Joaquin Dam

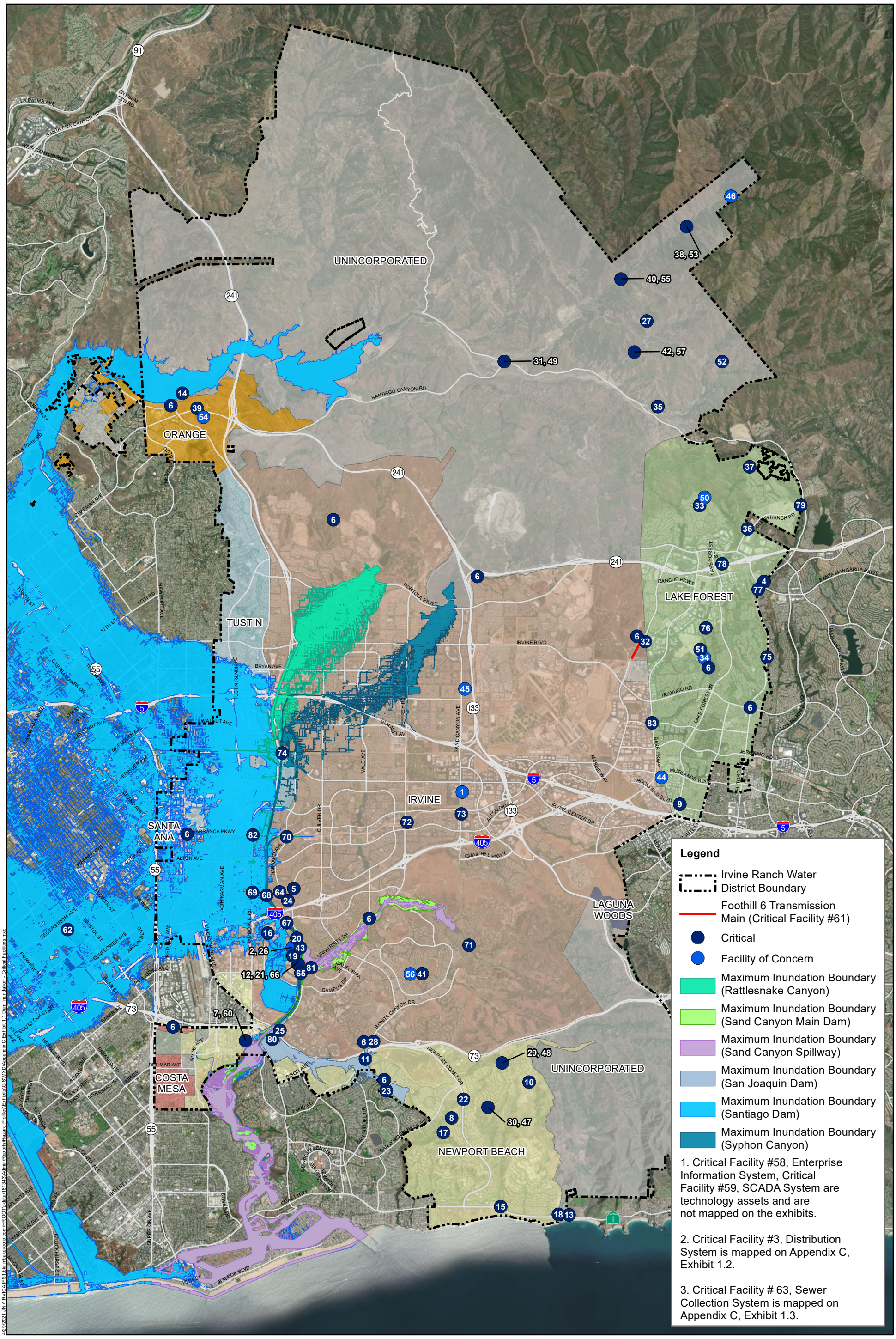
San Joaquin Dam is located in the City of Newport Beach and serves as recycled water storage for IRWD. Capacity for San Joaquin Dam is 3,080 acre-feet. Failure of San Joaquin Dam would result in inundation of the Newport North, Newport Canyon, and Baypoint neighborhoods (Newport Beach). Bonita Canyon Drive, Jamboree Road, University Drive, and State Route 73 near Bison Avenue would be inundated and could be closed. I-405 would not be impacted, as the flood would be confined to San Diego Creek.

Critical facilities within the San Joaquin Dam inundation zone are listed in Table C-7, *Facilities in the San Joaquin Dam Inundation Zone*. No facilities of concern are located within the San Joaquin Dam inundation zone.

Table C-7
Facilities in the San Joaquin Dam Inundation Zone

Map ID	Name	Asset Type	Arrival Time	Total Loss Potential
3	Distribution System	Distribution System	3 min	$790,000,000.00[1]
6	Met Source Water	Intake	3 min	N/A
11	Coyote Canyon	Lift Station	Between 3 min and 6 min	$2,605,484.00
25	University	Multi-Purpose: Lift Station, Telemetry Site, Pump Station	Between 15 min and 18 min	$6,999,844.00
63	Collection System	Wastewater Collection System	Between 3 min and 6 min	$781,131,700.00[2]
65	S1	Siphon	Between 36 min and 42 min	$585,000.00
66	S2	Siphon	Between 36 min and 42 min	$1,266,000.00
80	S16	Siphon	Between 12 min and 15 min	$951,000.00

1. Replacement cost for Critical Facility #3, Distribution System, is labeled as replacement for a “significant portion” of the system.
2. Replacement cost for Critical Facility #63, Sewer Collection System, is labeled as replacement for a “significant portion” of the system.



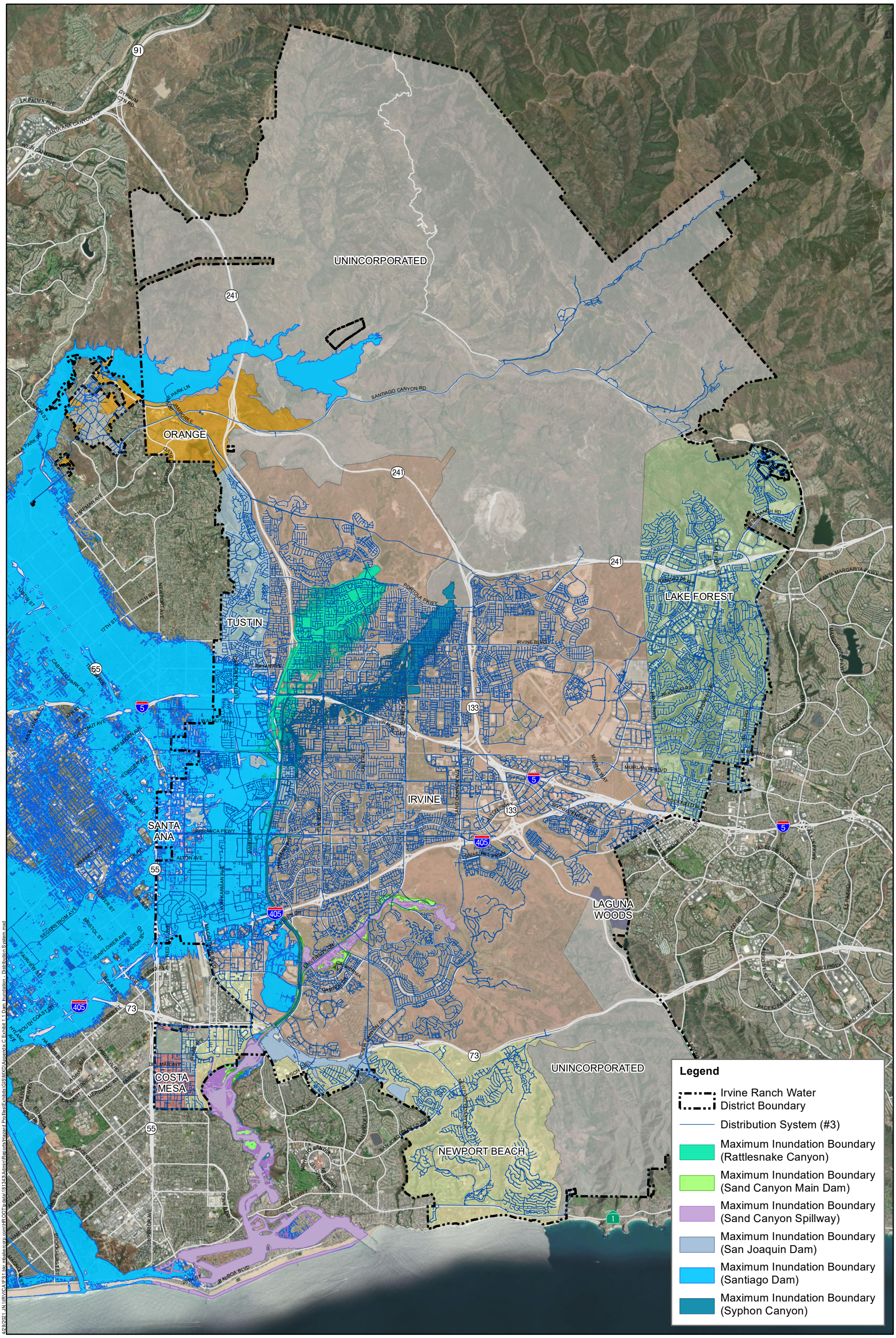
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Dam Inundation Map - Critical Facilities

Data Source: ESRI, 2020, IRWD, 2021, Stetson Engineering, Inc., 2018

Appendix C, Exhibit 1.1



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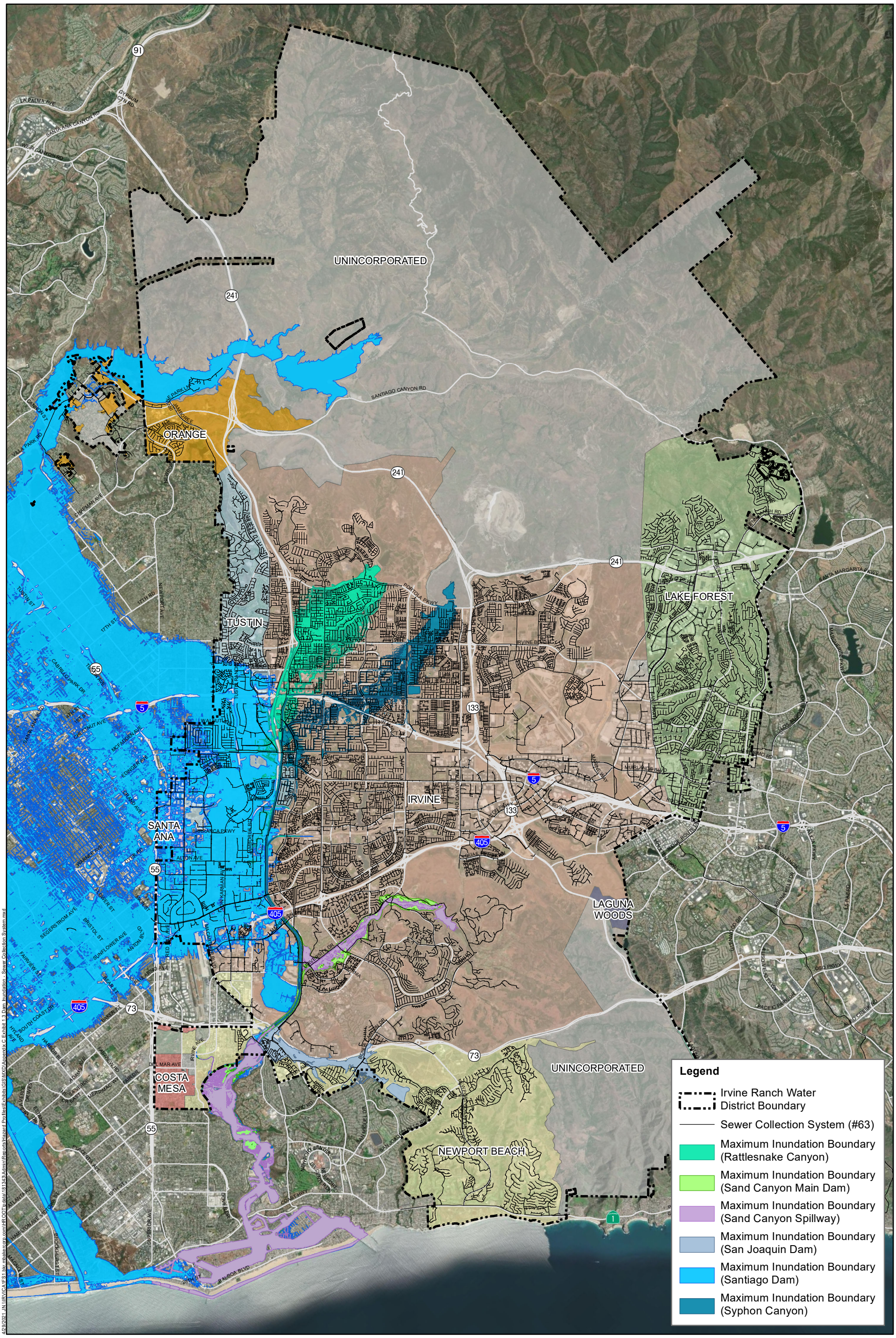
0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Dam Inundation Map - Distribution System

Data Source: ESRI, 2020, IRWD, 2021, Stetson Engineering, Inc., 2018

Appendix C, Exhibit 1.2



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0 4,250 8,500 Feet

Irvine Ranch Water District Local Hazard Mitigation Plan

Dam Inundation Map - Sewer Collection System

Data Source: ESRI, 2020, IRWD, 2021, Stetson Engineering, Inc., 2018

Appendix C, Exhibit 1.3