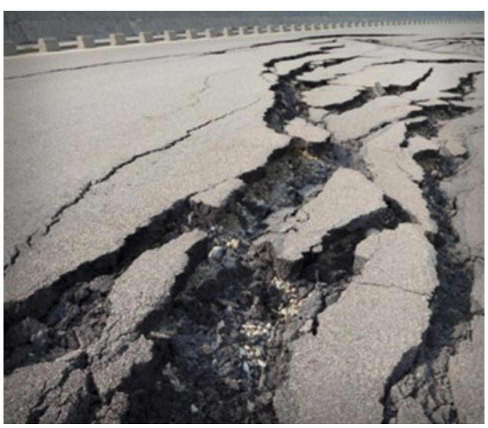
Attachment B

July 13, 2022 | All-Hazards Mitigation Plan



Metro

Credits

Q&A | ELEMENT A: PLANNING PROCESS | A1c.
Q: Does the plan identify who represented each jurisdiction? (At a minimum, it must identify the jurisdiction represented and the person's position or title and agency within the jurisdiction.) (Requirement §201.6(c)(1))
A: See **Hazard Mitigation Planning Team** below.

Hazard Mitigation Planning Team:

Name	*Department*	*Position Title*
Metro		
Albert Escarcega	Information Technology	Systems Maintenance Supervisor
Aldon Bordenave, Co-Chair	Emergency Management	Manager
Andrina Dominguez	Environmental Compliance and Sustainability	Senior Environmental Specialist
Androush Danielians	Projects Engineering	Executive Officer
Anthony Chua	Information Technology	Senior Software Engineer
Ashad Hamideh	Countywide Planning and Development	Senior Director
Aspet Davidian	Program Management	Deputy Executive Officer
Bob Spadafora	Rail Fleet Services	Senior Executive Officer
Brady Branstetter	Facilities Maintenance	Deputy Executive Officer
Brian Balderrama	Regional Rail	Deputy Executive Officer
Brian Boudreau	Program Control	Senior Director
Chirag Rabari	Transportation Planning	Manager
Chris Limon	Facilities Management	Deputy Executive Officer (Interim)
Craig Reiter	Environmental Compliance and Sustainability	Senior Director
Dana De Vera	Project Management	Senior Director
Denise Longley	Asset Management	Deputy Executive Officer
Donell Harris	Bus Maintenance	Division Maintenance Superintendent
Eddie Boghossian	Corporate Safety	Senior Director
Edna Stanley	Rail Operations	Service Operations Superintendent
Errol Taylor	Maintenance & Engineering	Executive Officer
Gelito Ocdamia	Project Engineering – Facilities – Systems	Director
Heather Severin	Environmental Compliance and Sustainability	Senior Manager
James Jimenez	Quality Assurance	Senior Manager
James Pachan	Bus Maintenance	Division Maintenance Superintendent
James D. Andrew	Transportation Planning	Manager
Janice Lim	Cyber Security	Deputy Executive Officer
Jeanet Owens	Regional Rail	Senior Executive Officer

Name	*Department*	*Position Title*
Metro		
Jerry Whelan	Wayside SCADA	Senior Engineer
John Slay	General Services	Facilities Maintenance Supervisor
Jonathan Hofert	Project Management - Engineering	Director
Karen Parks	Systems Security & Law Enforcement	Manager
Kate Amissah	Regional Rail	Senior Engineer
Mario Del Rosario	Project Engineering: Facilities – Systems	Senior Director
Marshall Epler	Maintenance and Engineering	Deputy Executive Officer
Moniek Pointer, Chair	Emergency Management	Manager
Mike Ornelas	Rail Fleet Services	Senior Director
Nadine Triche-Williams	Bus Operations	Director
Patrick Soto	Information Technology	Senior Programmer
Raymond Lopez	Corporate Safety	Deputy Executive Officer
Robert Castanon	Rail Operations	Service Operations Superintendent
Ron Tien	Project Engineering	Senior Director
Roger Largaespada	Information Technology	Senior Director
Romerica Eller	Finance / Accounting	Director
Stephen Toms	Asset Management	Project Manager
Steve Jaffe	General Services	Deputy Executive Officer
Thinh Dinh	Project Engineering: Facilities – Systems	Senior Director
Timothy Lindholm	Construction Management	Senior Executive Officer
Ty Henderson	Transit Security	Lieutenant

Acknowledgements

LA Metro Board of Directors

- ✓ **Ara Najarian, Chair, Appointee of Los Angeles County City Selection Committee, Council Member, City of Glendale**
- ✓ **Jacquelyn Dupont-Walker, First Vice Chair, Board Member, Appointee of Mayor of the City of Los Angeles**
- ✓ **Janice Hahn, Second Vice Chair, Los Angeles County Board Supervisor, Fourth Supervisorial District**
- ✓ **Kathryn Barger, Board Member, Los Angeles County Board Supervisor, Fifth Supervisorial District**
- ✓ **Mike Bonin, Board Member, Appointee of Mayor of the City of Los Angeles, Council Member, City of Los Angeles**
- ✓ **James Butts, Board Member, Appointee of Los Angeles County City Selection Committee, Southeast Long Beach sector**

- ✓ **Fernando Dutra, Board Member, Appointee of Los Angeles County City Selection Committee, Southwest Corridor sector**
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- ✓ **Holly Mitchell, Board Member, Los Angeles County Board Supervisor, Second Supervisorial District**
- ✓ **Tim Sandoval, Board Member, Appointee of Los Angeles County City Selection Committee, Council Member, San Gabriel Valley sector**
- ✓ **Hilda L. Solis, Board Member, Los Angeles County Board Supervisor, First Supervisorial District**
- ✓ **Gloria Roberts, Nonvoting Board Member, District 7 Director (Interim), California Department of Transportation (Caltrans), Appointee of the Governor of California**

Point of Contact

To request information or provide comments regarding this mitigation plan, please contact:

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Telephone Number	213-617-6227
Name & Position Title	Aldon P. Bordenave, Jr., MEP, Hazard Mitigation Programs Advisor Emergency & Homeland Security Preparedness
Email	bordenavea@metro.net
Mailing Address	One Gateway Plaza, Los Angeles 90012
Telephone Number	213-617-6223

Consulting Services

General Technologies and Solutions

- ✓ Project Manager and Critical Assets Mapping: Rawad Hani, PE, TE, Principal

Emergency Planning Consultants

- ✓ Principal Planner: Carolyn J. Harshman, CEM, President
- ✓ Planning Assistant: Megan R. Fritzler, BA

Mapping

The maps in this plan were provided by the Los Angeles County Metropolitan Transportation Authority, County of Los Angeles, Federal Emergency Management Agency (FEMA), or were acquired from public Internet sources. Care was taken in the creation of the maps contained in this Plan, however they are provided "as is". The Los Angeles County Metropolitan Transportation

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Mandated Content

In an effort to assist the readers and reviewers of this document, the jurisdiction has inserted "markers" emphasizing mandated content as identified in the Disaster Mitigation Act of 2000 (Public Law – 390). Following is a sample marker:

EXAMPLE

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:**

Table of Contents

Part I: PLANNING PROCESS

Introduction

Q&A | ELEMENT A: PLANNING PROCESS | A1b.
Q: Does the plan list the jurisdiction(s) participating in the plan that are seeking approval? (Requirement §201.6(c)(1)) **A:** See **Introduction** below.

The Hazard Mitigation Plan (Mitigation Plan) was prepared in response to the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 (also known as Public Law 106-390) requires state and local governments (including special districts and joint powers authorities) to prepare mitigation plans to document their mitigation planning process, and identify hazards, potential losses, mitigation needs, goals, and strategies. This type of planning supplements The Los Angeles County Metropolitan Transportation Authority's emergency management planning programs. This is the agency's first hazard mitigation plan.

The Los Angeles County Metropolitan Transportation Authority will be referred to as Metro from this point forward.

Planning Approach

The four-step planning approach outlined in the FEMA publication, *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (FEMA 386-3) was used to develop this plan:

- ✓ **Develop mitigation goals and objectives -** The risk assessment (hazard characteristics, inventory, and findings), along with municipal policy documents, were utilized to develop mitigation goals and objectives.
- ✓ **Identify and prioritize mitigation actions -** Based on the risk assessment, goals and objectives, existing literature/resources, and input from participating entities, mitigation activities were identified for each hazard.
- ✓ **Prepare implementation strategy -** Generally, high priority activities are recommended for implementation first. However, based on organizational needs and goals, project costs, and available funding, some medium or low priority activities may be implemented before some high priority items.
- ✓ **Document mitigation planning process -** The mitigation planning process is documented throughout this plan.

Q&A | ELEMENT A: PLANNING PROCESS | A3
Q: Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) **A:** See **Stakeholders** below.

Stakeholders

A Hazard Mitigation Planning Team (Planning Team) consisting of Metro staff working with General Technologies and Solutions and Emergency Planning Consultants to create the hazard mitigation plan. **The Planning Team served as the primary stakeholders throughout the planning process.**

Following input from the Planning Team on the First Draft Plan, the Second Draft Plan was shared with Metro's Executive Team. Their input was incorporated into the Third Draft Plan and details included in **Attachments**. Additionally, as required by DMA 2000, the Planning Team involved "the public". The general public and external agencies were invited to contribute to the mitigation plan during the plan writing phase. The Third Draft Plan was announced and posted on Metro's website on September 15 – October 18, 2021. External agencies were emailed information about the Plan's availability on September 15, 2021.

Metro's Executive Team, the general public, and external agencies served as secondary stakeholders with opportunity to contribute to the plan during the Plan Writing Phase of the planning process.

Q&A | ELEMENT C. MITIGATION STRATEGY | C2
Q: Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii)) **A:** See **NFIP Participation** below.

National Flood Insurance Program

Established in 1968, the NFIP provides federally backed flood insurance to homeowners, renters, and businesses in communities that adopt and enforce floodplain management ordinances to reduce future flood damage. Metro does not control land use so has no floodplain management ordinance" or a floodplain administrator. Furthermore, the Metro service area and its facilities rely on infrastructure (roads, bridges, etc.) throughout an expansive area included in many Flood Insurance Rate Maps (FIRM) that show floodways, 100-year flood zones, and 500-year flood zones.

NFIP Participation

Metro facilities are located in Los Angeles County, who participates in NFIP. The FEMA FIRM maps for the project area were last updated December 21, 2018. It's important to note that FEMA flood maps are not entirely accurate. The studies and maps represent flood risk at the point in time when FEMA completed the studies and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. See **Flood Hazards** for information on flood hazards impacting the service area.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B4
Q: Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii)) **A:** See **Repetitive Loss Properties** below.

Repetitive Loss Properties

According to FEMA resources, none of the Metro facility locations are designated as a Repetitive Loss Property (RLPs).

Repetitive Loss Properties (RLPs) are most susceptible to flood damages; therefore, they have been the focus of flood hazard mitigation programs. Unlike a Countywide program, the Floodplain Management Plan (FMP) for repetitive loss properties involves highly diversified property profiles, drainage issues, and property owner's interest. It also requires public involvement processes unique to each RLP area. The objective of an FMP is to provide specific potential mitigation measures and activities to best address the problems and needs of communities with repetitive loss properties. A repetitive loss property is one for which two or more claims of $1,000 or more have been paid by the National Flood Insurance Program (NFIP) within any given ten-year period.

Planning Process

Throughout the project, the Planning Team served as the primary stakeholders while also making a concerted effort to gather information from the general public, external agencies (joint powers authority jurisdictions, utility providers and special districts). In addition, the Planning Team solicited information from agencies and people with specific knowledge of hazards and past historical events, as well as building codes and facilities maintenance planning. The hazard mitigation strategies contained in this plan were developed through an extensive planning process involving Metro staff, general public, and external agencies.

Following review and input by the Planning Team to the First Draft Plan, next (still during the Plan Writing Phase), the Second Draft Plan was shared with Metro's Executive Team. Their input was incorporated into a Third Draft Plan that will be shared with the general public and external agencies (joint powers authority jurisdictions, utility providers, special districts, etc.). The general public and external agencies will serve as the secondary stakeholders. Next, the comments gathered from the secondary stakeholders will be incorporated into a Fourth Draft Plan which will be submitted to Cal OES and FEMA along with a request for a determination of "approval pending adoption."

Next, the Planning Team will complete amendments to the Plan to reflect mandated input by Cal OES and FEMA. The Final Draft Plan will then be posted in advance of Metro's Board of Directors public meeting. Any comments gathered will be included in the staff report to the Metro Board of Directors. Following adoption by the Board of Directors, proof of adoption will be forwarded to FEMA with a request for approval. The FEMA Letter of Approval will be included in the Final Plan. The planning process described above is portrayed below in a timeline:

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q: Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:** See **Plan Methodology and Planning Phases Progression** below.
Q&A | ELEMENT A: PLANNING PROCESS | A3
Q: Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) **A:** See **Planning Phases Progression** below.

Figure: Planning Phases Progression

PLANNING PHASES PROGRESSION				
Plan Writing Phase (First, Second, Third Draft Plan)	**Plan Review Phase (Fourth Draft Plan)**	**Plan Adoption Phase (Final Draft Plan)**	**Plan Approval Phase (Final Plan)**	**Plan Implementation Phase**
• Planning Team input – research, meetings, writing, review of First Draft Plan • Incorporate input from the Planning Team into Second Draft Plan • Invite Metro Executive Team to provide input. Information gathered reflected in Third Draft Plan. • Public and external agencies via email and web posting to review, comment, and contribute to the Third Draft Plan • Incorporate input into the Fourth Draft Plan	• Fourth Draft Plan sent to Cal OES and FEMA for conditional approval • Address any mandated revisions identified by Cal OES and FEMA into Final Draft Plan	• Post public notice of Board of Directors meeting along with the Final Draft Plan • Final Draft Plan distributed to Board of Directors in advance of meeting • Present Final Draft Plan to the Board of Directors for adoption • Board of Directors adopt Plan	• Submit Proof of Adoption to FEMA with request for final approval • Receive FEMA Letter of Approval • Incorporate FEMA approval and Board of Directors resolution into the Final Plan	• Conduct bi-annual Planning Team meetings • Integrate mitigation action items into budget and other funding and strategic documents

Q&A | ELEMENT E: PLAN ADOPTION | E1
Q: Does the plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5)) **A:** See **Plan Adoption Process** below.

Plan Adoption Process

Adoption of the plan by the local governing body demonstrates Metro's commitment to meeting mitigation goals and objectives. Governing body approval legitimizes the plan and authorizes responsible agencies to execute their responsibilities.

The Third Draft Plan was submitted to Cal OES and FEMA for review and approval. FEMA issued an Approval Pending Adoption on _____ (TBD) requiring the adoption of the Plan by the Metro Board of Directors. The adoption resolution was submitted to FEMA along with a request for a FEMA Letter of Approval.

In preparation for the public meeting with the Board of Directors, the Planning Team prepared a Staff Report including an overview of the Planning Process, Risk Assessment, Mitigation Goals, and Mitigation Actions. The staff presentation concluded with a summary of the input received during the public review of the document. The meeting participants were encouraged to present their views and make suggestions on possible mitigation actions.

The FEMA Approval Pending Adoption was received on July 13, 2022. The Board of Directors is scheduled to review and adopt the plan ion _________. The Board voted _______ (example: to adopt) the hazard mitigation plan. The Resolution of adoption is in the **Attachment: Board Resolution**.

Plan Approval

FEMA approved the Plan on ___ (date). A copy of the FEMA Letter of Approval is in the **Attachment: FEMA Letter of Approval**.

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q: Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:** See **Planning Team Involvement** below.

Planning Team Involvement

The Planning Team, with assistance from Emergency Planning Consultants, identified and profiled hazards; determined hazard rankings; estimated potential exposure or losses; evaluated development trends and specific risks; and developed mitigation goals and action items.

The Planning Team consisted of representatives from different Metro departments with a role in hazard mitigation processes. The Planning Team served as the primary stakeholders throughout the planning process. The general public and external agencies served as secondary stakeholders in the planning process. The Planning Team was responsible for the following tasks:

- ✓ Develop planning goals
- ✓ Prepare timeline
- ✓ Ensure plan meets DMA 2000 requirements
- ✓ Organize and solicit involvement of public and external agencies
- ✓ Analyze existing data and reports
- ✓ Review hazard information and HAZUS loss projection estimates
- ✓ Examine Hazard-Specific Critical Assets Maps
- ✓ Develop Mitigation Action Items
- ✓ Participate in Planning Team meetings and Board of Directors public meeting
- ✓ Share existing resources including maps and data
- ✓ Research strategic documents identifying future construction and maintenance projects
- ✓ Examine known vulnerabilities to critical assets

Table: Planning Team Level of Participation

Name	Research, Data Collection and Plan Writing	Contract Project Management Kick-Off Meeting: May 14, 2019	Planning Team Meeting 1: June 28, 2019	Planning Team Meeting 2: August 28, 2019	Planning Team Meeting 3: October 17, 2019	Planning Team Meeting 4: February 3, 2020	Contract Project Management Meeting: June 11, 2020	Planning Team Comment on First Draft Plan	Distribute Second Draft Plan to General Public and External Agencies	Review Input from Public, and External Agencies of the Second Draft Plan	Submit Third Draft Plan to Cal OES/FEMA for Approval Pending Adoption	Post Final Draft Plan in Advance of Board of Directors Meeting	Present Final Draft Plan to Board of Directors at Public Meeting for Plan Adoption	Submit Proof of Adoption to FEMA for Final Approval	Incorporate FEMA Approval into Final Plan
LA Metro Planning Team															
Albert Escarcega			X												
Aldon Bordenave, Co-Chair	X	X	X	X	X	X	X	X	X	X					
Andrina Dominguez			X	X	X	X		X							
Androush Danielians			X												
Anthony Chua			X												
Aspet Davidian			X	X		X		X							
Bob Spadafora			X	X		X		X							
Brady Branstetter			X			X		X							
Brian Balderrama			X	X											
Chirag Rabari			X												
Chris Limon				X	X	X		X							
Craig Reiter			X	X	X	X		X							
Dana De Vera			X	X	X										
Denise Longley			X	X	X	X		X							

Name	Research, Data Collection and Plan Writing	Contract Project Management Kick-Off Meeting: May 14, 2019	Planning Team Meeting 1: June 28, 2019	Planning Team Meeting 2: August 28, 2019	Planning Team Meeting 3: October 17, 2019	Planning Team Meeting 4: February 3, 2020	Contract Project Management Meeting: June 11, 2020	Planning Team Comment on First Draft Plan	Distribute Second Draft Plan to General Public and External Agencies	Review Input from Public, and External Agencies of the Second Draft Plan	Submit Third Draft Plan to Cal OES/FEMA for Approval Pending Adoption	Post Final Draft Plan in Advance of Board of Directors Meeting	Present Final Draft Plan to Board of Directors at Public Meeting for Plan Adoption	Submit Proof of Adoption to FEMA for Final Approval	Incorporate FEMA Approval into Final Plan
Edna Stanley			X	X	X	X		X							
Errol Taylor			X												
Gelito Ocdamia			X			X		X							
Heather Severin			X												
James D. Andrew				X	X	X									
James Jimenez			X												
James Pachan			X												
Jeanet Owens			X												
Jerry Whelan						X		X							
John Slay				X	X	X		X							
Jonathan Hofert			X												
Karen Parks			X	X		X		X							
Kate Amissah			X												
Mario Del Rosario			X	X											
Marshall Epler				X	X	X		X							
Mike Ornelas					X										

Name	Research, Data Collection and Plan Writing	Contract Project Management Kick-Off Meeting: May 14, 2019	Planning Team Meeting 1: June 28, 2019	Planning Team Meeting 2: August 28, 2019	Planning Team Meeting 3: October 17, 2019	Planning Team Meeting 4: February 3, 2020	Contract Project Management Meeting: June 11, 2020	Planning Team Comment on First Draft Plan	Distribute Second Draft Plan to General Public and External Agencies	Review Input from Public, and External Agencies of the Second Draft Plan	Submit Third Draft Plan to Cal OES/FEMA for Approval Pending Adoption	Post Final Draft Plan in Advance of Board of Directors Meeting	Present Final Draft Plan to Board of Directors at Public Meeting for Plan Adoption	Submit Proof of Adoption to FEMA for Final Approval	Incorporate FEMA Approval into Final Plan
Moniek Pointer, Chair	X	X	X	X	X	X	X	X	X	X					
Nadine Triche-Williams			X	X	X										
Raymond Lopez			X	X		X		X							
Roger Largaespada				X	X										
Romerica Eller				X											
Ron Tien			X												
Stephen Toms			X		X	X		X							
Steve Jaffe			X												
Steve Rank						X		X							
Thinh Dinh			X			X		X							
Ty Henderson				X											
General Technologies and Solutions															
Rawad Hani	X	X	X	X	X	X	X								
Emergency Planning Consultants															
Carolyn Harshman	X	X	X	X	X	X	X				X				
Megan Fritzler	X		X												

Table: Planning Team Timeline

Task	May 2019	June 2019	July 2019	August 2019	September 2019	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020-June 2022	July 2022	August 2022	September 2022	October 2022	November 2022	December 2022
Research, Data Collection and Plan Writing																										
Research for Hazard, Risk, Vulnerability Assessment, and Capability Assessment	X	X																								
Prepare First Draft Plan	X	X	X	X	X	X	X	X	X	X																
Planning Team Comments on First Draft Plan										X	X	X	X	X	X	X										
Prepare Second Draft Plan											X	X	X	X	X	X	X	X								
Meetings																										
Project Management Kick-Off Meeting	X																									
Planning Team Meeting #1 - HMP Overview, Initial Hazard Briefing, Discuss Plan Goals, & Outreach Strategy		X																								
Planning Team Meeting #2 HAZUS and Discuss Existing Mitigation Action Items				X																						
Planning Team Meeting #3 Develop						X																				

Task	May 2019	June 2019	July 2019	August 2019	September 2019	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020-June 2022	July 2022	August 2022	September 2022	October 2022	November 2022	December 2022
New Mitigation Action Items																										
Planning Team Meeting #4 Input to First Draft Plan										X																
Project Management Meeting														X												
Outreach Strategy																										
Provide Opportunities for the Public, & Metro Internal / External Partners to Provide Input to the 2nd Draft Plan																	X	X								
Plan Review, Adoption, Approval, and Implementation																										
Submit 3rd Draft Plan to Cal OES																			X							
Work with Cal OES and FEMA on DMA 2000-Mandated Revisions																			X	X						
Receive FEMA Approval Pending Adoption																					X					
Present Final Draft Plan to Metro Board of Directors and Metro Senior Leadership for Adoption																								X		

Task	May 2019	June 2019	July 2019	August 2019	September 2019	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020-June 2022	July 2022	August 2022	September 2022	October 2022	November 2022	December 2022
Submit Proof of Adoption to FEMA																										
Receive FEMA Final Approval																										
Incorporate FEMA Final Approval into Final Plan																										

Q&A | ELEMENT A: PLANNING PROCESS | A2a.
Q: Does the plan document an opportunity for neighboring communities, local, and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, as well as other interested parties to be involved in the planning process? (Requirement §201.6(b)(2)) **A:** See **Secondary Stakeholders** below.
Q&A | ELEMENT A: PLANNING PROCESS | A2b.
Q: Does the plan identify how the stakeholders were invited to participate in the process? (Requirement §201.6(b)(2)) **A:** See **Secondary Stakeholders** below.

Secondary Stakeholders

In addition to the Planning Team, the secondary stakeholders also provided information, expertise, and other resources during plan writing phase. The secondary stakeholders included the Metro staff, general public (including riders), and external agencies. All gathered input was incorporated into the Third Draft Plan prior to submittal to Cal OES and FEMA. For a specific accounting of the date, source, information gathered, and use of information during the Plan Writing Phase, please see Attachments: **Secondary Stakeholder Input**.

In advance of the Board of Directors public meeting, Metro staff (via Newsletter), general public (via public noticing) and external agencies (via email invitation) were informed of the Final Draft Plan and encouraged to participate in the public meeting. Any comments gathered were noted in the Planning Team Staff Report and added to the Final Plan.

Q&A | ELEMENT C. MITIGATION STRATEGY | C1a.
Q: Does the plan document each jurisdiction's existing authorities, policies, programs and resources? (Requirement §201.6(c)(3)) **A:** See **Capability Assessment – Existing Processes and Programs** below.

Capability Assessment – Existing Processes and Programs

Metro will incorporate mitigation planning as an integral component of daily operations. This will be accomplished by the Planning Team working with their respective departments to integrate mitigation strategies into the planning documents and Metro's operational guidelines. In addition to the Capability Assessment below, the Planning Team will strive to identify additional policies, programs, practices, and procedures that could be created or modified to address mitigation activities.

Table: Capability Assessment - Existing Processes and Programs

Resource Type	Resource Name	Ability to Support Mitigation
Personnel	Board Administration	*The Board of Directors guide the agency's priorities, projects and activities, and includes 13 members who represent various areas throughout Los Angeles County. The Board will play an important role in providing continuing support for projects and plans key to implementation of the AHMP.*
	Bus Facilities and Property Maintenance	*Safe and reliable operation of the bus transportation infrastructure and equipment. To continually improve the performance of our assets by keeping all facilities, equipment, structures and utilities in good working order and at maximum efficiency. Including implementing the Mitigation Actions Matrix, BFPM has boots on the ground with ability to observe maintenance issues and changes in hazards.*

Resource Type	Resource Name	Ability to Support Mitigation
	Bus Operations	*The service delivery, including directing the availability and assigning of proper operating and supervisory staff resources to ensure that service objectives are achieved to provide safe, clean, reliable, on-time, courteous service to our customers. Including implementing the Mitigation Actions Matrix, BO has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Community Relations	*Community Relations is committed to transforming communities, building a constituency for transportation in Los Angeles County and leading the conversation with stakeholder groups now and for future generations through public engagement. The department will lead the effort for community outreach as the Second Draft Plan is distributed for input by the public and external agencies during the plan writing phase. Additionally, they will play a critical role is providing updated information and future outreach opportunities during the plan's implementation.*
	Emergency Management	*Emergency Management Department provides leadership and support to our internal and external partners relating to creating, guiding, and maintaining a robust resilience capability in response to and preparation for local and regional disasters. Including implementing the Mitigation Actions Matrix, EM has a unique view of Metro as the gatherers of information on incidents and events impacting the transportation system. This collection wisdom will be instrumental in the implementation meetings and the evaluation process. Additionally, EM is the recipient of grant and other funding opportunities relevant to the Mitigation Actions Matrix.*
	Environmental Compliance & Sustainability	*Environmental Compliance and Sustainability Department (ECSD) provides general support services to LA Metro's Planning, Construction, Operations, and Procurement Business units. The department's three core functions include environmental services; sustainability services (including policy implementation, Environmental Management System, and carbon credits administration); and project management of sustainability related projects/infrastructure. ECS has its eye at all times on the region's environment – the very source of many hazards. They will be instrumental in keeping the Risk Assessment of the AHMP up-to-date and will also be an excellent source of grant and other funding opportunities.*
	Finance & Accounting	*Finance and Accounting will provide the professional management and operational support that ensures the policies, priorities, and programs approved by the Board of Directors are delivered in the most efficient and cost effective manner possible. Their access to grant and other funding opportunities will be invaluable to the implementation process.*
	General Services	*General Services provides facility and administrative services, including building management and maintenance, mail services, travel office and copy services. Including implementing the Mitigation Actions Matrix, GS has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Information Technology	*Provides technical support and protection for Metro's technological systems, including hardware, software, data and devices. IT will assist with implementing the Mitigation Actions Matrix.*
	Maintenance of Way Engineering	*The Maintenance of Way Engineering team is responsible for the day-to-day maintenance of Metro's rail track and equipment, passenger bus and rail stations, and facilities. Including implementing the Mitigation Actions Matrix, MWG has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Program Management	*The Program Management Department is focused on the successful delivery of capital projects, including transit, highway, and regional rail projects. Safety, quality, and on-time/on-budget delivery while mitigating stakeholder's issues are major goals. Including implementing the Mitigation Actions Matrix, PM will play a pivotal role in pulling together the status of Metro's capital projects with updates to*

Resource Type	Resource Name	Ability to Support Mitigation
		the AHMP. Also, they can provide information on grants and other funding opportunities.
	Rail Facilities Maintenance	*Metro Maintenance is responsible for maintaining all elevators, escalators, signs, trains, tracks, traction and power equipment, facilities, stops, and stations. Including implementing the Mitigation Actions Matrix, RFM has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Rail Fleet Services	*Safe and reliable operation of the rail transportation infrastructure and equipment. To continually improve the performance of our assets by keeping all facilities, equipment, structures and utilities in good working order and at maximum efficiency. Including implementing the Mitigation Actions Matrix, RFS has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Rail Operations	*The revenue service delivery for six rail lines and all movements on the rail rights-of-way and the dispatch and control for all train service, maintenance of way and personnel on the rights-of-way. Including implementing the Mitigation Actions Matrix, RO has boots on the ground with ability to observe maintenance issues and changes in hazards.*
	Regional Rail	*The Regional Rail unit provides overall coordination, management, and the programming of funds for Metro's commitment to the Metrolink commuter rail and high-speed rail system in Los Angeles County including Amtrak intercity and long distance trains. Regional Rail is involved with regional and statewide rail providers to coordinate and fund projects throughout Los Angeles County. Including implementing the Mitigation Actions Matrix, RR can play an important role with stakeholder in the region in developing projects that integrate hazard mitigation practices.*
	System Security and Law Enforcement	*To ensure Metro patrons and employees can ride and work safely, without fear, 100% of the time. Leading the transit industry in the development and implementation of innovative security and law enforcement strategies; advancing the use of crime analysis tools, problem-solving methodologies and technology; building and sustaining regional community and law enforcement partnerships. Including implementing the Mitigation Actions Matrix, SSLE has boots on the ground with ability to observe maintenance issues and changes in hazards.*
Plans	*Active Transportation Strategic Plan (2016)*	*The Active Transportation Strategic Plan (Plan) is Metro's county-wide effort to identify strategies to increase walking, bicycling and transit use in Los Angeles County. The Plan's policy and infrastructure recommendations will require collaboration between Metro, local and regional agencies, and other stakeholders to ensure implementation.*
	Metro Climate Action and Adaptation Plan (2019)	*The CAAP is the cornerstone to achieve a more sustainable and resilient Metro and LA County. Metro has worked to embed climate action into systems, assets and operations to create a resilient and forward-thinking Agency prepared for a changing future. This update sets ambitious goals for the near and long term and contributes to broader efforts to ensure Metro's ability to continue providing essential services regardless of future conditions.*
	Comprehensive Annual Financial Report (2018)	*The Comprehensive Annual Financial Report is an audit for Los Angeles Metro fiscal year ending June 30, 2018. State law requires Metro to publish a complete set of audited financial statements within six months of the close of each fiscal year. Metro is required to undergo an annual Single Audit in conformity with the provisions of the Single Audit Act of 1984 and the U.S. Office of Management and Budget Uniform Guidance. Information related to the Single Audit, including the Schedule of Federal and State awards, findings, and recommendations, and auditor's reports on the internal control structure and compliance with applicable laws and regulations are set forth in a separate Single Audit report.*

Q&A | ELEMENT A: PLANNING PROCESS | A4
Q: Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))
A: See **Use of Existing Data** below.

Use of Existing Data

The Planning Team gathered and reviewed existing data and plans during plan writing and specifically noted as "sources". Numerous electronic and hard copy documents were used to support the planning process:

Los Angeles County Metropolitan Transportation Authority (Metro) Website
https://www.metro.net/
Applicable Incorporation: Departments, Ridership Stats.

Active Transportation Strategic Plan (2016)
https://www.metro.net/projects/active-transportation-strategic-plan/
Applicable Incorporation: Population and Demographics, Photos.

Metro Climate Action and Adaptation Plan (2019)
https://media.metro.net/projects_studies/sustainability/images/Climate_Action_Plan.pdf
Applicable Incorporation: Climate Change Chapter, Graphs, Photos.

Comprehensive Annual Financial Report (2018)
https://media.metro.net/about_us/finance/images/fy18_cafr.pdf
Applicable Incorporation: Maps, Photos.

Metro Asset Hazard Maps
Created by General Technologies and Solutions
Applicable Incorporation: Maps of Metro Assets.

Los Angeles County General Plan (2015)
http://planning.lacounty.gov/assets/upl/project/gp_final-general-plan.pdf
Applicable Incorporation: Climate Information, Maps.

County of Los Angeles All-Hazards Mitigation Plan (2019)
http://file.lacounty.gov/SDSInter/lac/1062614_AHMPPublicDraft_Oct1.pdf
Applicable Incorporation: Information about hazards in the County contributed to the hazard-specific sections in the Metro Hazard Mitigation Plan.

County of Los Angeles Fire Department
https://fire.lacounty.gov/bobcat-fire-status/
Applicable Incorporation: Information about Wildfire hazards.

State of California Hazard Mitigation Plan (2018)
https://www.caloes.ca.gov/HazardMitigationSite/Documents/0022018%20SHMP_FINAL_ENTIRE%20PLAN.pdf
Applicable Incorporation: Used to identify hazards posing greatest threat to State.

HAZUS Maps and Reports
Created by Emergency Planning Consultants
Applicable Incorporation: Numerous HAZUS maps and reports have been included for Earthquake and Flooding to determine specific risks and impacts to Metro service area.

FEMA "How To" Mitigation Series (386-1 to 386-9)
www.fema.gov/media
Applicable Incorporation: Mitigation Measures Categories and 4-Step Planning Process are quoted in the Executive Summary.

National Flood Insurance Program
www.fema.gov/national-flood-insurance-program
Applicable Incorporation: Used to confirm there are no repetitive loss properties within the Metro service area.

Local Flood Insurance Rate Maps
https://msc.fema.gov/portal/home
Applicable Incorporation: Provided by FEMA and included in Flood Hazard section.

California Department of Forestry and Fire Protection (CAL FIRE)
www.fire.ca.gov
Applicable Incorporation: Wildland fire hazard mapping.

California Department of Conservation
www.conservation.ca.gov/cgs
Applicable Incorporation: Seismic hazards mapping.

U.S. Geological Survey (USGS)
www.usgs.gov
Applicable Incorporation: Earthquake records and statistics.

Using HAZUS for Mitigation Planning (2018)
https://www.fema.gov/media-library-data/1540479624999-ab1eca852448e271f0de82cf2031a01b/Using_Hazus_in_Mitigation_Planning_20180820_Final_508_Compliant.pdf
Applicable Incorporation: HAZUS Information.

California's Fourth Climate Change Assessment: Los Angeles Region Report (2019)
https://www.energy.ca.gov/sites/default/files/2019-07/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles.pdf
Applicable Incorporation: Climate Information.

NOAA National Centers for Environmental Information, Climate at a Glance (2019)
https://www.ncdc.noaa.gov/cag/county/time-series
Applicable Incorporation: Data Image.

Part II: RISK ASSESSMENT

Service Area Profile

Q&A | ELEMENT B3:
Q: Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(b)(3)) **A:** See **Location and the Environment** below.

Location and the Environment

Los Angeles County Metropolitan Transportation Authority (Metro) is one of the country's largest transportation agencies serving nearly 9.6 million people within Los Angeles County – nearly one-third of California's residents.

With approximately 4,760 square miles, Los Angeles County is geographically one of the largest counties in the country. The county stretches along 75 miles of the Pacific coast of Southern California and is bordered to the east by Orange County and San Bernardino County, to the north by Kern County, and to the west by Ventura County.

Metro provides services to the San Fernando Valley, San Gabriel Valley, South Bay/Gateway, and Westside/Central communities. The jurisdictions included in Metro's service area are identified below in Table: Metro Service Area Jurisdictions.

Table: Metro Service Area Jurisdictions
Source: County of Los Angeles General Plan

City of Agoura Hills	City of Glendora	City of Paramount
City of Alhambra	City of Hawaiian Gardens	City of Pasadena
City of Arcadia	City of Hawthorne	City of Pico Rivera
City of Artesia	City of Hermosa Beach	City of Pomona
City of Azusa	City of Hidden Hills	City of Rancho Palos Verdes
City of Baldwin Park	City of Huntington Park	City of Redondo Beach
City of Bell	City of Industry	City of Rolling Hills
City of Bell Gardens	City of Inglewood	City of Rolling Hills Estates
City of Bellflower	City of Irwindale	City of Rosemead
City of Beverly Hills	City of La Canada Flintridge	City of San Dimas
City of Bradbury	City of La Habra Heights	City of San Fernando
City of Burbank	City of La Mirada	City of San Gabriel
City of Calabasas	City of La Puente	City of San Marino
City of Carson	City of La Verne	City of Santa Fe Springs
City of Cerritos	City of Lakewood	City of Santa Monica
City of Claremont	City of Lawndale	City of Sierra Madre
City of Commerce	City of Lomita	City of Signal Hill
City of Compton	City of Long Beach	City of South El Monte
City of Covina	City of Los Angeles	City of South Gate
City of Cudahy	City of Lynwood	City of South Pasadena
City of Culver City	City of Malibu	City of Temple City
City of Diamond Bar	City of Manhattan Beach	City of Torrance

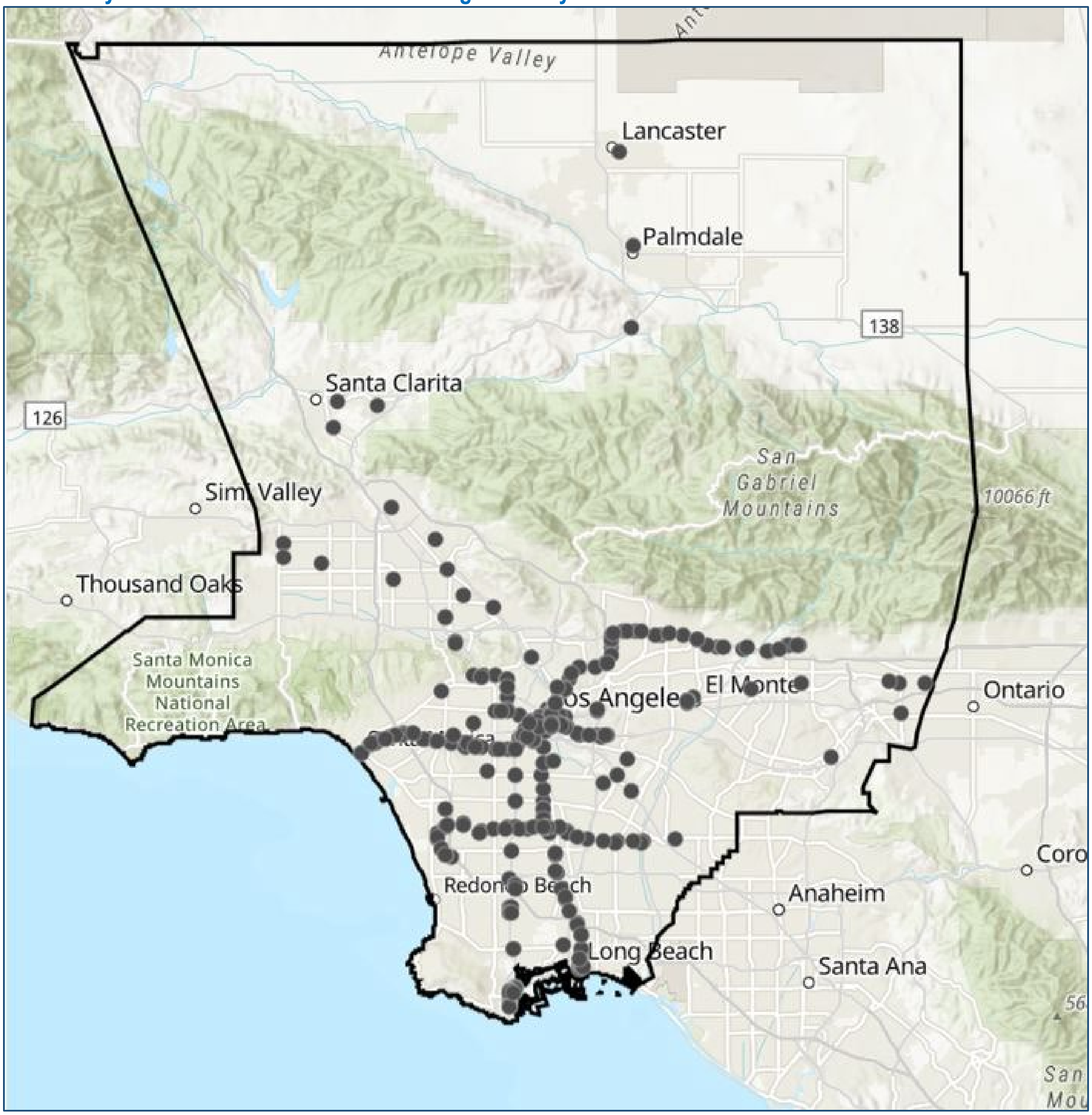
City of Downey City of Duarte City of El Monte City of El Segundo City of Gardena City of Glendale	City of Maywood City of Monrovia City of Montebello City of Monterey Park City of Norwalk City of Palos Verdes Estates	City of Vernon City of Walnut City of West Covina City of West Hollywood City of Westlake Village City of Whittier County of Los Angeles Unincorporated Areas

Metro has locations and assets throughout Los Angeles county as shown on **Map: Metro Critical Assets**.

Photo: Metro Bus in Downtown Los Angeles
Source: Active Transportation Strategic Plan, Volume 1, April 2016

Caption: Metro Bus in Downtown Los Angeles

Map: Metro Critical Assets
(Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility**



Map: Metro Bus and Rail Overview (Source: Metro)

History and Ridership

Photo: Manchester Avenue Metro Station
Source: Comprehensive Annual Financial Report for the Fiscal Year Ended June 30, 2018

Caption: Manchester Avenue Metro Station

According to the American Public Transportation Association, Metro operates the third-largest public transportation agency in the United States, proving services to a County population of approximately 10,105,500. Metro employs approximately 9,800 full-time employees making it one of the region's largest employers.

Under contract with Metro, the Los Angeles Sheriff's Department (LASD), Los Angeles Police Department (LAPD), and Long Beach Police Department (LBPD) provides security along the entire Metro bus and rail network in cooperation with Metro's own Transit Police Force.

A brief history of Metro, transportation routes, and ridership statistics are described in the following tables.

Table: Metro Rail and Busways
(Source: Metro)

Metro Rail and Busways					
Rail Line	**Opened**	**Miles**	**Type**	**Stations**	**Construction Cost**
Metro E Line	2012 Extension to Santa Monica, 2016	13.1	Light Rail	19 (including 2 shared)	$2.4 billion
Metro J Line	2009 South Bay and El Monte via Downtown Los Angeles	n/a	Busway	11 n/a	$587 million
Metro G Line	2005 Extension from Canoga Park to Chatsworth, 2012	18	Busway	18 n/a	$484 million
Metro L Line	2003 Eastside Extension, 2009 Azusa Extension, 2016	29.7	Light Rail	27 (including 1 shared)	$2.8 billion
Metro C Line	1995	19.5	Light Rail	14 (including 1 shared)	$718 million
Metro B/D Lines	1993 MacArthur Park, 1993 Wilshire/ Western, 1996	14.0	Subway	16 (including 6 shared)	$4.5 billion

Metro Rail and Busways					
Rail Line	**Opened**	**Miles**	**Type**	**Stations**	**Construction Cost**
	Hollywood, 1999 North Hollywood, 2000				
Metro A Line	1990	21.3	Light Rail	22 (including 3 shared)	$877 million

Table: Ridership Statistics
(Source: Interactive Estimated Ridership Stats, November 2019)

Systemwide (Bus and Rail)					
Day Type	**Estimated Ridership**	**Average Passenger Miles**	**Day Count**	**Total Estimated Ridership**	**Total Passenger Miles**
Weekday	1,155,119	5,472,562	20	23,102,380	109,451,232
Saturday	729,515	3,519,865	5	3,647,575	17,599,324
Sunday	546,401	2,716,229	5	2,732,005	13,581,146
Total	**N/A**	**N/A**	**30**	**29,481,960**	**140,631,702**
All Bus					
Day Type	**Estimated Ridership**	**Average Passenger Miles**	**Day Count**	**Total Estimated Ridership**	**Total Passenger Miles**
Weekday	854,195	3,537,143	20	17,083,900	70,742,860
Saturday	542,270	2,246,503	5	2,711,350	11,232,515
Sunday	393,086	1,682,653	5	1,965,430	8,413,265
Total	**N/A**	**N/A**	**30**	**21,760,680**	**90,388,640**
Directly Operated (Bus)					
Day Type	**Estimated Ridership**	**Average Passenger Miles**	**Day Count**	**Total Estimated Ridership**	**Total Passenger Miles**
Weekday	813,962	3,349,369	20	16,279,240	66,987,380
Saturday	519,388	2,140,010	5	2,596,940	10,700,050
Sunday	376,387	1,603,865	5	1,881,935	8,019,325
Total	**N/A**	**N/A**	**30**	**20,758,115**	**85,706,755**
Rail					
Day Type	**Estimated Ridership**	**Average Passenger Miles**	**Day Count**	**Total Estimated Ridership**	**Total Passenger Miles**
Weekday	300,924	1,935,419	20	6,018,480	38,708,372

Systemwide (Bus and Rail)					
Day Type	Estimated Ridership	Average Passenger Miles	Day Count	Total Estimated Ridership	Total Passenger Miles
Saturday	187,245	1,273,362	5	936,225	6,366,809
Sunday	153,315	1,033,576	5	766,575	5,167,881
Total	**N/A**	**N/A**	**30**	**7,721,280**	**50,243,062**

Climate

Metro's Climate Action and Adaptation Plan (2019) is the cornerstone to achieve a more sustainable and resilient Metro and Los Angeles County. Metro has worked to embed climate action into systems, assets and operations to create a resilient and forward-thinking Agency prepared for a changing future. The CAAP sets ambitious goals for the near and long term and contributes to broader efforts to ensure Metro's ability to continue providing essential services regardless of future conditions.

Much of Los Angeles County is part of a biodiversity hotspot, designating the area as unique with a fragile ecosystem of endemic plants and animals. According to National Geographic, biodiversity hotspots make up less than 3 percent of Earth's land surface and refer to regions that are both rich with life and at high risk for destruction.

As discussed in the Los Angeles County General Plan 2015, the region is a land of beaches, valleys, mountains, and deserts. Overall, the climate can be characterized as "Mediterranean," with hot, dry summers and mild, wet winters. The diversity of the topography results in localized climate zones that are roughly divided by the Transverse Ranges (Santa Monica Mountains and San Gabriel Mountains). The climate zones are closely tied to geologic landforms and vary based on elevation changes and distance from the ocean. These climate zones can be grouped into three broad categories:

Coastal Plain: The coastal plain includes the beaches, valleys, and canyons that occupy the Los Angeles Basin and terminate at the Transverse Ranges. During the dry season, the determining factor in coastal plain weather is the proximity to the Pacific Ocean and the resultant marine layer. The marine layer acts as a buffer, which is evidenced by relatively cool and constant temperatures, low clouds, fog, and haze. The marine layer settles over the Basin during the evening and early morning before being burned off by sunshine midday. Due to the dominance and stability of the high-pressure area in the Basin, precipitation is rare between May and November.

Mountain: Climates in the mountains are characterized by lower average temperatures and heavier rainfall than in the coastal plain. The Transverse Ranges are further removed from the climatic influences of marine wind patterns and experience the additional influence of altitude.

High Desert: The high desert includes the Antelope Valley, which is the westernmost portion of the Mojave Desert. The high desert is located more than 50 miles inland and is removed from marine influences and experiences a more extreme type of climate. The Transverse Ranges act as a barrier to rain bearing clouds moving inland. In addition, the

Antelope Valley is home to several wildlife and wildflower sanctuaries that thrive in the often-inhospitable climate found in the high desert.

Risk Assessment

What is a Risk Assessment?

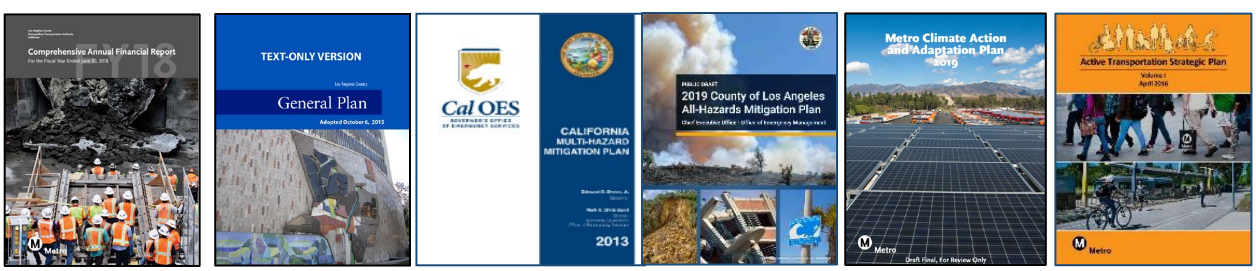
Conducting a risk assessment can provide information regarding: the location of hazards; the value of existing land and property in hazard locations; and an analysis of risk to life, property, and the environment that may result from natural hazard events. Specifically, the five levels of a risk assessment are as follows: Hazard Identification, Profiling Hazard Events, Vulnerability Assessment/Inventory of Existing Assets, Risk Analysis, and Assessing Vulnerability/Analyzing Development Trends.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Hazard Identification** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1b.
Q: Does the plan provide rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area? (Requirement §201.6(c)(2)(i)) **A:** See **Hazard identification** below.

1) Hazard Identification

This section is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. Maps are used in this plan to display hazard identification data. ***Metro utilized the categorization of hazards as identified in California's State Hazard Mitigation Plan, including Earthquakes, Floods, Levee Failures, Wildfires, Landslides and Earth Movements, Tsunami, Climate-Related Hazards, Volcanoes, and Other Hazards***.

Next, the Planning Team reviewed existing documents to determine which of these hazards posed the most significant threat to Metro and its ability to deliver services. In other words, which hazard would likely result in a local declaration of emergency.



The geographic extent of each of the identified hazards was identified by the Planning Team utilizing maps and data contained in the Los Angeles County General Plan 2015. In addition, numerous internet resources and the County of Los Angeles All-Hazards Mitigation Plan (2019) served as valuable resources. Utilizing the Calculated Priority Risk Index (CPRI) ranking technique, the Planning Team concluded the hazards posing a significant threat against Metro including Earthquake, Flood, Wildfire, Landslide, Windstorm, Tsunami, Climate Change (with sub-hazards Drought, Sea-Level Rise, and Extreme Heat), and Epidemic / Pandemic / Vector-Borne Diseases.

The hazard ranking system is described in **Table: Calculated Priority Risk Index**, while the actual ranking is shown in **Table: Calculated Priority Risk Index Ranking for Metro.**

Table: Calculated Priority Risk Index
(Source: Federal Emergency Management Agency)

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 1 in 1,000 years.	1	45%
	Possibly	Rare occurrences. Annual probability of between 1 in 100 years and 1 in 1,000 years.	2	
	Likely	Occasional occurrences with at least 2 or more documented historic events. Annual probability of between 1 in 10 years and 1 in 100 years.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability of greater than 1 every year.	4	
Magnitude/ Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure. Injuries or illnesses are treatable with first aid and there are no deaths. Negligible loss of quality of life. Shut down of critical public facilities for less than 24 hours.	1	30%
	Limited	Slight property damage (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability, and there are no deaths. Moderate loss of quality of life. Shut down of critical public facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damage (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least 1 death. Shut down of critical public facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damage (greater than 50% of critical and non-critical facilities and infrastructure). Injuries and illnesses result in permanent disability and multiple deaths. Shut down of critical public facilities for more than 1 month.	4	
Warning Time	> 24 hours	Population will receive greater than 24 hours of warning.	1	15%
	12–24 hours	Population will receive between 12-24 hours of warning.	2	
	6-12 hours	Population will receive between 6-12 hours of warning.	3	
	< 6 hours	Population will receive less than 6 hours of warning.	4	
Duration	< 6 hours	Disaster event will last less than 6 hours	1	10%
	< 24 hours	Disaster event will last less than 6-24 hours	2	
	< 1 week	Disaster event will last between 24 hours and 1 week.	3	
	> 1 week	Disaster event will last more than 1 week	4	

Table: Calculated Priority Risk Index Ranking for Metro Service Area (Source: Emergency Planning Consultants)

Hazard	Probability	Weighted 45% (x.45)	Magnitude Severity	Weighted 30% (x.3)	Warning Time	Weighted 15% (x.15)	Duration	Weighted 10% (x.1)	CPRI Total
Earthquake – San Andreas M7.8	3	1.35	3	0.9	4	0.6	1	0.1	**2.95**
Earthquake – Newport Inglewood 7.2	2	0.9	4	1.2	4	0.6	1	0.1	**2.80**
Wildfire	3	1.35	2	0.6	3	0.45	2	0.2	**2.60**
Earthquake – Sierra Madre 7.2	2	0.9	3	0.9	4	0.6	1	0.1	**2.50**
Windstorm	4	1.8	1	0.3	1	0.15	2	0.2	**2.45**
Flood	3	1.35	2	0.6	2	0.3	2	0.2	**2.45**
Tsunami	2	0.9	2	0.6	3	0.45	3	0.3	**2.25**
Landslide	2	0.9	2	0.6	4	0.6	1	0.1	**2.20**
Climate Change	2	0.9	2	0.6	1	0.15	4	0.4	**2.05**
Drought	2	0.9	2	0.6	1	0.15	4	0.4	**2.05**
Sea-Level Rise	2	0.9	2	0.6	1	0.15	4	0.4	**2.05**
Extreme Heat	2	0.9	2	0.6	1	0.15	4	0.4	**2.05**
Epidemic / Pandemic / Vector-Borne Diseases	2	0.9	2	0.6	1	0.15	4	0.4	**2.05**

2) Profiling Hazard Events

This process describes the causes and characteristics of each hazard and what part of Metro facilities, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in the Metro Specific Hazard Analysis. **Table: Vulnerability: Location, Extent, and Probability for Metro Service Area** indicates a generalized perspective of the community's vulnerability of the various hazards according to extent (or degree), location, and probability.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1c.

Q: Does the plan include a description of the **location** for all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Table: Vulnerability: Location, Extent, and Probability for Metro Service Area** below.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1d.

Q: Does the plan include a description of the **extent** for all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Table: Vulnerability: Location, Extent, and Probability for Metro Service Area** below.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.

Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Table: Vulnerability: Location, Extent, and Probability for Metro Service Area** below.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2b.

Q: Does the plan include information on the **probability** of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Table: Vulnerability: Location, Extent, and Probability for Metro Service Area** below.

Table: Vulnerability: Location, Extent, and Probability for Metro Service Area

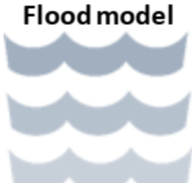
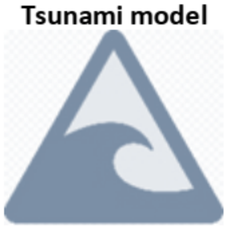
Hazard	Location (Where)	Extent (How Big an Event)	Probability (How Often) *	Previous Occurrences
Earthquake	Entire Service Area	The Southern California Earthquake Center (SCEC) in 2007 concluded that there is a 99.7 % probability that an earthquake of M6.7 or greater will hit California within 30 years. Earthquake would most likely originate from the San Andreas fault.	Likely	2014 – La Habra Earthquake
Wildfire	Metro assets located closest to wildland interface; northern and eastern portions of service area.	Very High Fire Hazard Severity Zone ratings.	Likely	2018 – Woolsey Fire
Landslide	Metro assets located along hillsides and sloped terrain.	Earthquake-induced and rain-induced landslide events possibly impacting dozens of structures.	Likely	2019 – Pacific Coast Highway near Ventura
Flood	Entire Service Area, low lying areas with poor drainage	Urban and localized flooding from severe weather (100-yr floodplain).	Likely	2017 – severe winter storms
Windstorm	Entire Service Area	35-50 mile per hour or greater wind gusts.	Likely	2015-2019 - El Nino
Tsunami	Coastal Regions of Service Area	Maximum Run-Up 12 meters	Possible	2011 – Redondo Beach
Climate Change	Entire Project Area	Impacts would range from mild to severe throughout the project area.	Likely	Statewide Drought 2011-2015
Drought	Entire Project Area	Impacts would range from mild to severe throughout the project area.	Likely	Statewide Drought 2011-2015
Sea-Level Rise	Coastal Regions of Service Area	Impacts would range from mild to severe throughout the project area.	Likely	No History
Extreme Heat	Entire Project Area	Impacts would range from mild to severe throughout the project area.	Likely	Los Angeles County Heat Event September 2021
Epidemic / Pandemic / Vector-Borne Diseases	Entire Project Area	Impacts would range from mild to severe throughout the project area.	Possible	COVID 19 2019-present
* Probability is defined as: Unlikely = 1:1,000 years, Possibly = 1:100-1:1,000 years, Likely = 1:10-1:100 years, Highly Likely = 1:1 year				
[1] Uniform California Earthquake Rupture Forecast				

HAZUS-MH

The HAZUS maps in the Mitigation Plan were generated by Emergency Planning Consultants using FEMA's Hazards United States – Multi Hazard (HAZUS-MH) software program. Please see **Attachments – HAZUS** for complete reports. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the amount of damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up. It's important to note that the "project area" is based on Census Tracts not jurisdictional boundaries.

As per FEMA's HAZUS Guidebook, HAZUS is a GIS-based software that can be used to estimate potential damage, economic loss, and social impacts from earthquake, flood, tsunami and hurricane wind hazards. The HAZUS software includes nationwide general GIS datasets, and a model for the four natural disasters below. The model results can support the risk assessment piece of mitigation planning.

Graphic: Model Results to Support Risk Assessment for Mitigation Planning
(Source: Using HAZUS for Mitigation Planning, Federal Emergency Management Agency, 2018)

Earthquake model 	Estimates damages and losses to buildings, essential facilities, transportation, and utility lifelines from a single scenario or probabilistic earthquake analysis. There are also tools that allow the user to integrate earthquake hazard data generated outside of Hazus into the earthquake model. This model estimates debris generation, shelter requirements, casualties, and fire following an earthquake disaster.
Flood model 	Generates flood hazard data using nationwide hydrological datasets. There are also tools that allow the user to integrate flood hazard data generated outside of Hazus software into the flood model. This model estimates the expected levels of damage to infrastructure and buildings. Debris generation and shelter requirements, as well as agricultural losses, can be calculated with this model.
Tsunami model 	Can produce analyses that have several pre-tsunami and/or post-tsunami applications. Use of the methodology will generate an estimate of the consequences to a county or region of a "scenario tsunami," i.e., a tsunami with a specified inundation depth, velocity, and location. The resulting "loss estimate" generally will describe the scale and extent of damage and disruption that may result from the scenario tsunami.
Hurricane wind model 	Can create the wind hazard data from a historical or real-time event, probabilistic event, or from a user-defined scenario. Estimates of potential damage and economic loss to buildings can then be calculated. The storm surge analysis combines the wind and coastal flood model to simulate storm surge for historical, and manual hurricanes. The model combines the wind and flood losses.

HAZUS is packaged with datasets that include building inventories and infrastructure for the entire United States. Because HAZUS is currently built on GIS technology, the inventory and infrastructure datasets can be mapped and intersected with the hazard information created from the four models.

Following the intersection, HAZUS determines the effects of wind, ground shaking, and water depths on buildings and infrastructure to calculate losses and damages. The outputs and estimates can be used in hazard mitigation planning, emergency response, and planning for recovery and reconstruction.

Losses estimated in HAZUS are based on the accuracy of input data. Basic analysis can be developed using the default data and parameter data provided within HAZUS. Users can conduct more advanced analysis using more accurate data that is specific to the region, hazard, population, etc. User-supplied data improves the accuracy of inventories and/or parameters.

Advanced-level analyses may also incorporate data from third-party studies. The user must determine the appropriate level of analysis to meet the user's needs and resources.
HAZUS analysis can be performed at three different levels:

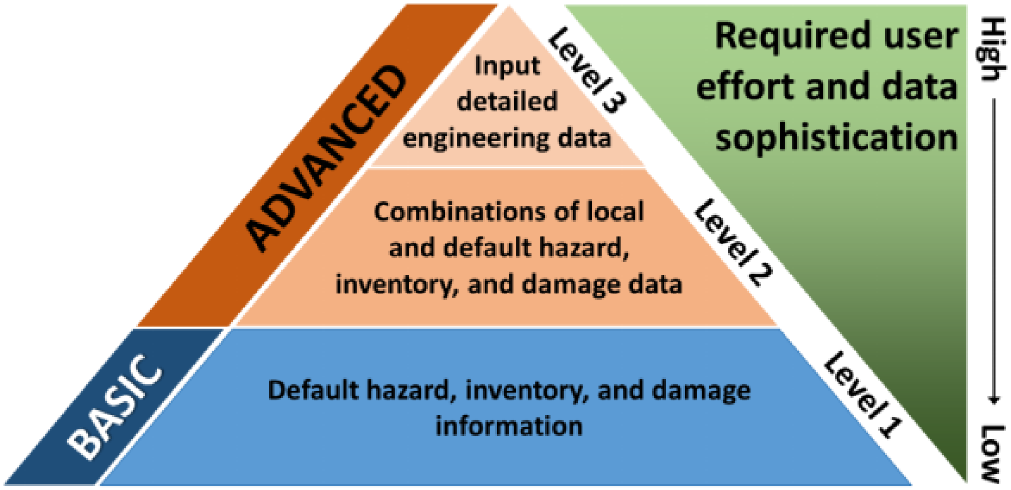
- A Level 1 basic analysis can be performed simply using the default data provided. This level of analysis is very coarse, and because the results will be subject to a much higher level of uncertainty, this should serve primarily as a baseline for further study. The user will still be able to produce basic maps and results. Limited additional data will be required to complete the flood analysis. Site specific input data produces more accuracy in vulnerability identification and loss estimation amounts. If the data is available, it is highly recommended that a user integrate site specific data to reduce uncertainty associated with the results of default data. Using a user defined depth grid, in the flood model, against default state data is classified as a level 1 analysis and is the recommendation of HAZUS Program.

- A Level 2 advanced analysis increases the accuracy and precision of an analysis by incorporating user-supplied data relevant to a given hazard. While the data included with the HAZUS software can be utilized to run a basic level one analysis, level two inputs are supplied by local sources and contain a higher level of detail. This can include datasets that model the hazards in more detail, or datasets that increase the accuracy of the inventory information. Incorporating more detailed data will improve the quality of the results. Level 2 is broadly defined as the incorporation of user-defined hazard and updated general building stock (GBS) or site-specific data. *Level 2 HAZUS maps and reports were prepared by Emergency Planning Consultants for the Mitigation Plan.*

- A Level 3 advanced analysis achieves the highest degree of precision and involves modifying or substituting the model parameters and/or equations, relevant to a given hazard. Users can modify inputs depending on the time and resources available. Keeping track of the data used is suggested so that any relationships between input and results is documented. It is usually done by advanced users experienced with both the hazard and the HAZUS software.

FEMA's Natural Hazard Risk Assessment Program (NHRAP) encourages users to conduct Level 2 or 3 analyses to improve the accuracy of results and recommends the use of user defined data (e.g., depth grids for all flood analysis) for mitigation planning.

Graphic: HAZUS Analysis Levels
(Source: Using HAZUS for Mitigation Planning, Federal Emergency Management Agency, 2018)



HAZUS creates credible estimates for losses and damages; datasets created on the local level typically provide greater detail than the datasets that are packaged with HAZUS (Level 1). Incorporating local datasets into the analysis will improve the results.

HAZUS Outputs

The user plays a major role in selecting the scope and nature of the output of a HAZUS analysis. A variety of maps can be generated for visualizing the extent of the losses. Numerical results may be examined at the level of the census block or tract or may be aggregated by county or region. There are three main categories of HAZUS outputs: direct physical damage, induced damage, and direct losses. Direct physical damage includes general building stock (GBS), essential facilities, high potential loss facilities, transportation systems, utility systems, and user defined facilities. Induced damage includes building debris, tree debris generation and fire following disaster occurrence. Direct losses include losses for buildings, contents, inventory, income, crop damage, vehicle loss, injuries, casualties, sheltering needs and displaced households.

3) Vulnerability Assessment/Inventory of Existing Assets

A Vulnerability Assessment in its simplest form is a simultaneous look at the geographical location of hazards and an inventory of the underlying land uses (populations, structures, etc.). Facilities that provide critical and essential services following a major emergency are of particular concern because these locations house staff and equipment necessary to provide important public safety, emergency response, and/or disaster recovery functions.

Critical Facilities

FEMA separates critical buildings and facilities into the five categories shown below based on their loss potential. All of the following elements are considered critical facilities:

Essential Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Essential facilities include hospitals and other medical facilities, police and fire stations, emergency operations centers and evacuation shelters, and schools.

Transportation Systems include airways – airports, heliports; highways – bridges, tunnels, roadbeds, overpasses, transfer centers; railways – trackage, tunnels, bridges, rail yards, depots; and waterways – canals, locks, seaports, ferries, harbors, drydocks, piers.

Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power and communication systems.

High Potential Loss Facilities are facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

Hazardous Material Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Table: Critical Facilities Vulnerable to Hazards below illustrates the hazards with potential to impact critical facilities owned by or providing services to Metro.

Table: Critical Facilities Vulnerable to Hazards
(Source: General Technologies and Solutions and Emergency Planning Consultants)

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
1	TPSS	Lorena 114 North Lorena Street, Los Angeles	X					X	X	X	X		X
2	TPSS	Soto 2310 East 1st Street, Los Angeles	X					X	X	X	X		X
3	TPSS	Union 401 Bauchet Street, Los Angeles	X					X	X	X	X		X
4	TPSS	Division 21 (Baker) 1802 Baker Street, Los Angeles	X		X			X	X	X	X		X
5	TPSS	98 East Green Street 98 East Green Street, Pasadena	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
6	TPSS	Division 24 (Monrovia) 1600 South California Avenue, Monrovia	X					X	X	X	X		X
7	TPSS	Arizona 322 Arizona Avenue, Los Angeles	X					X	X	X	X		X
8	TPSS	Mariachi Plaza 1831 East 1st Street, Los Angeles	X					X	X	X	X		X
9	TPSS	French 3541 Pasadena Avenue, Los Angeles	X					X	X	X	X		X
10	TPSS	Monterrey 300 Monterey Road, South Pasadena	X					X	X	X	X		X
11	TPSS	Glenarm 57 East State Street, Pasadena	X					X	X	X	X		X
12	TPSS	Corson 309 North Michigan Avenue, Pasadena	X					X	X	X	X		X
13	TPSS	Titley 3055 East Walnut Street, Pasadena	X					X	X	X	X		X
14	TPSS	Baldwin 500 Colorado Street, Arcadia	X					X	X	X	X		X
15	TPSS	Los Robles 1405 Los Robles Avenue, Monrovia	X					X	X	X	X		X
16	TPSS	Irwindale 15996 Avenuenida Padilla, Irwindale	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
17	TPSS	Soldano 825 North Dalton Avenue, Azusa	X					X	X	X	X		X
18	TPSS	Atlantic 5100 Pomona Boulevard, East Los Angeles	X					X	X	X	X		X
19	TPSS	Sunol 4025 East 3rd Street, Los Angeles	X		X			X	X	X	X		X
20	TPSS	Center Street 1302 1/2 East 1st Street, Los Angeles	X					X	X	X	X		X
21	TPSS	Baker 1802 Baker Street, Los Angeles	X					X	X	X	X		X
22	TPSS	Avenue 50 4970 Marmion Way, Los Angeles	X	X				X	X	X	X		X
23	TPSS	Fairview 715 Fairview Avenue, South Pasadena	X					X	X	X	X		X
24	TPSS	Walnut 167 East Walnut Street, Pasadena	X					X	X	X	X		X
25	TPSS	Craig 2152 East Maple Street, Pasadena	X					X	X	X	X		X
26	TPSS	Michilinda 3865 Arboleda Street, Pasadena	X					X	X	X	X		X
27	TPSS	Joseph 23 East St. Joseph Street, Arcadia	X					X	X	X	X		X
28	TPSS	Business Center 1846 Flower Avenue, Duarte	X					X	X	X	X		X

			Hazards										
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
29	TPSS	Virginia 841 West 6th Street, Azusa	X					X	X	X	X		X
30	TPSS	Citrus 902 North Palm Drive, Azusa	X					X	X	X	X		X
31	TPSS	Division 13 Yard/Stewart 1805 Stewart Street, Santa Monica	X					X	X	X	X		X
32	TPSS	Pico 1234 South Flower Street, Los Angeles	X					X	X	X	X		X
33	TPSS	18th St Junction 421 West 18th Street, Los Angeles	X					X	X	X	X		X
34	TPSS	TPSS03 Normandie 1401 Exposition Boulevard, Los Angeles	X			X		X	X	X	X		X
35	TPSS	TPSS 05 9th Ave 2827 Exposition Place, Los Angeles	X			X		X	X	X	X		X
36	TPSS	TPSS 07 Clyde 5614 West Jefferson Boulevard, Los Angeles	X					X	X	X	X		X
37	TPSS	Claring 10100 National Boulevard, Los Angeles	X		X			X	X	X	X		X
38	TPSS	Sepulveda 11297 Exposition Boulevard, Los Angeles	X					X	X	X	X		X
39	TPSS	Cloverfield 2202 Olympic Boulevard, Santa Monica	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
40	TPSS	5th Street 402 Colorado Avenue, Santa Monica	X					X	X	X	X		X
41	TPSS	TPS02 Flower 3584 South Figueroa Street, Los Angeles	X					X	X	X	X		X
42	TPSS	TPS04 Van Ness 1865 West Rodeo Road, Los Angeles	X					X	X	X	X		X
43	TPSS	TPS06 Farmdale 4601 Exposition Boulevard, Los Angeles	X			X		X	X	X	X		X
44	TPSS	National 8808 West Washington Boulevard, Culver City	X					X	X	X	X		X
45	TPSS	Overland 11620 Northvale Road, Los Angeles	X			X		X	X	X	X		X
46	TPSS	Barrington 11631 Exposition Boulevard, Los Angeles	X					X	X	X	X		X
47	TPSS	17th Street 1726 Colorado Avenue, Santa Monica	X					X	X	X	X		X
48	TPSS	Division 11 Carson Yard 2083 Santa Fe Avenue, Long Beach	X			X		X	X	X	X		X
49	TPSS	Pico 1234 South Flower Street, Los Angeles	X					X	X	X	X		X
50	TPSS	18th Street Junction 421 West 18th Street, Los Angeles	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
51	TPSS	Washington 1945 Long Beach Avenue, Los Angeles	X					X	X	X	X		X
52	TPSS	Slauson 5865 Randolph Street, Huntington Park	X					X	X	X	X		X
53	TPSS	Firestone 7501 Graham Avenue, Los Angeles	X					X	X	X	X		X
54	TPSS	Imperial 11650 Willowbrook Avenue, Los Angeles	X					X	X	X	X		X
55	TPSS	Compton 507 North Willowbrook Avenue, Compton	X			X		X	X	X	X		X
56	TPSS	Dominguez 18919 South Santa Fe Avenue, Compton	X			X		X	X	X	X		X
57	TPSS	Wardlow 3376 Pacific Place, Long Beach	X					X	X	X	X		X
58	TPSS	PCH 333 East Esther Street, Long Beach	X					X	X	X	X		X
59	TPSS	1st Street 150 Elm Avenue, Long Beach	X					X	X	X	X		X
60	TPSS	San Pedro 1917 Stanford Avenue, Los Angeles	X					X	X	X	X		X
61	TPSS	Vernon 4415 Long Beach Avenue, Los Angeles	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
62	TPSS	Florence 7501 Graham Avenue, Los Angeles	X					X	X	X	X		X
63	TPSS	103rd 1681 East 108th Street, Los Angeles	X					X	X	X	X		X
64	TPSS	Piru 13504 Willowbrook Avenue, Los Angeles	X					X	X	X	X		X
65	TPSS	Artesia 1810 South Acacia Avenue, Compton	X					X	X	X	X		X
66	TPSS	Del Amo 20340 South Santa Fe Avenue, Compton	X			X		X	X	X	X		X
67	TPSS	Willow 2750 West American Avenue, Long Beach	X			X		X	X	X	X		X
68	TPSS	Anaheim 906 Pacific Avenue, Long Beach	X					X	X	X	X		X
69	TPSS	Hawthorne/Division 22 14724 Aviation Boulevard, Hawthorne	X					X	X	X	X		X
70	TPSS	El Segundo 151 North Nash Street, El Segundo	X					X	X	X	X		X
71	TPSS	Hawthorne 11230 Acacia Avenue, Inglewood	X					X	X	X	X		X
72	TPSS	Western 11725 South Manhattan Place, Los Angeles	X		X			X	X	X	X		X

Hazards														
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
73	TPSS	105110 139 West 117th Street, Los Angeles	X					X	X	X	X		X
74	TPSS	Imperial 11650 Willowbrook Avenue, Los Angeles	X					X	X	X	X		X
75	TPSS	Long Beach 11500 Long Beach Boulevard, Lynwood	X					X	X	X	X		X
76	TPSS	Wright 11750 Wright Road, Lynwood	X			X		X	X	X	X		X
77	TPSS	Lakewood 12939 Lakewood Boulevard, Downey	X					X	X	X	X		X
78	TPSS	Norwalk 13026 Flatbush, Norwalk	X			X		X	X	X	X		X
79	TPSS	Douglas 700 South Douglas Street, El Segundo	X					X	X	X	X		X
80	TPSS	Aviation 5380 West Imperial Highway, Los Angeles	X					X	X	X	X		X
81	TPSS	Crenshaw 3301 West 120th Street, Hawthorne	X					X	X	X	X		X
82	TPSS	Vermont 11530 New Hampshire Avenue, Los Angeles	X		X			X	X	X	X		X
83	TPSS	Central 11700 Belhaven Avenue, Los Angeles	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
84	TPSS	Santa Fe 4160 Fernwood Avenue, Lynwood	X			X		X	X	X	X		X
85	TPSS	Marsh 2901 Fernwood Avenue, Lynwood	X					X	X	X	X		X
86	TPSS	Paramount 6170 Florence Avenue, South Gate	X			X		X	X	X	X		X
87	TPSS	Bellflower 9733 Angell, Downey	X			X		X	X	X	X		X
88	TPSS	Division 20 Yard 300 South Santa Fe Avenue, Los Angeles	X					X	X	X	X		X
89	TPSS	Union 800 Alameda Street, Los Angeles	X					X	X	X	X		X
90	TPSS	7th & Metro 660 South Figueroa Street, Los Angeles	X					X	X	X	X		X
91	TPSS	Wilshire/Vermont 3191 Wilshire Boulevard, Los Angeles	X					X	X	X	X		X
92	TPSS	Vermont/Sunset 1500 North Vermont Avenue, Los Angeles	X					X	X	X	X		X
93	TPSS	Hollywood/Vine 6250 Hollywood Boulevard, Los Angeles	X					X	X	X	X		X
94	TPSS	Universal 3881 Lankershim Boulevard, North Hollywood	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
95	TPSS	North Hollywood 5420 Lankershim Boulevard, North Hollywood	X					X	X	X	X		X
96	TPSS	Civic Center 100 North Hill Street, Los Angeles	X					X	X	X	X		X
97	TPSS	Pershing Square 400 South Hill Street, Los Angeles	X					X	X	X	X		X
98	TPSS	Wilshire/Normandie 3510 Wilshire Boulevard, Los Angeles	X		X			X	X	X	X		X
99	TPSS	Vermont/Santa Monica 1015 North Vermont Avenue, Los Angeles	X					X	X	X	X		X
100	Administrative Office (EOC)	Main Office (99) 1 Gateway Plaza, Los Angeles	X					X	X	X	X		X
101	Control Center	Rail Operations Control (60) 2000 East Imperial Highway, Los Angeles	X					X	X	X	X		X
102	Maintenance Facility	CMF Central Maintenance Facility (30) 470 Bauchet Street, Los Angeles	X					X	X	X	X		X
103	Bus Division	Downtown Los Angeles Division 1 1130 East 6th Street, Los Angeles	X					X	X	X	X		X
104	Bus Division	Downtown Los Angeles Division 2 720 East 15th Street, Los Angeles	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
105	Bus Division	Cypress Park Division 3 630 West Avenue 28, Los Angeles	X					X	X	X	X		X
106	Bus Division	Arthur Winston Division 5 5425 Van Ness Avenue, Los Angeles	X			X		X	X	X	X		X
107	Bus Division	West Hollywood Division 7 8800 Santa Monica Boulevard, West Hollywood	X					X	X	X	X		X
108	Bus Division	Chatsworth Division 8 9201 Canoga Avenue, Chatsworth	X					X	X	X	X		X
109	Bus Division	El Monte Division 9 3449 Santa Anita Avenue, El Monte	X					X	X	X	X		X
110	Bus Division	Los Angeles Division 10 742 North Mission Road, Los Angeles	X					X	X	X	X		X
111	Rail Division	Metro A Line Division 11 4350 East 208th Street, Long Beach	X			X		X	X	X	X		X
112	Bus Division	Downtown Los Angeles 13 920 North Vignes Street, Los Angeles	X					X	X	X	X		X
113	Rail Division	Metro E Line Division 14 1955 South Centinela Avenue, Santa Monica	X					X	X	X	X		X
114	Bus Division	Sun Valley Division 15 11900 Branford Street, Los Angeles	X					X	X	X	X		X
115	Bus Division	South Bay Division 18 450 West Griffith Street, Carson	X					X	X	X	X		X

Hazards														
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
116	Rail Division	Metro B/D Line Division 20 320 South Santa Fe Avenue, Los Angeles	X					X	X	X	X		X
117	Rail Division	Metro L Line Division 21 (Elysian Park) 1800 Baker Street, Los Angeles	X					X	X	X	X		X
118	Rail Division	Metro C Line Division 22 14724 Aviation Boulevard, Lawndale	X					X	X	X	X		X
119	Rail Division	Metro L Line Division 24 (Monrovia) 1600 South California Avenue, Monrovia	X					X	X	X	X		X
120	Maintenance Facility	Division 4 Non-Revenue Vehicles 7878 Telegraph Road, Downey	X			X		X	X	X	X		X
121	Bus Terminal	Maple Avenue Terminal 632 Maple Avenue, Los Angeles	X					X	X	X	X		X
122	Bus Terminal	El Monte Terminal 3501 Santa Anita Avenue, El Monte	X					X	X	X	X		X
123	Bus Stop	West Los Angeles Transit Center 5702 Apple Street, Los Angeles	X					X	X	X	X		X
124	Bus Terminal	LAX City Bus Terminal 6111 West 96th Street, Los Angeles	X					X	X	X	X		X
125	Bus Terminal	Terminal 28 111 West 18th Street, Los Angeles	X					X	X	X	X		X
126	Bus Terminal	Terminal 31: Center/Jackson Terminal 410 Center Street, Los Angeles	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
127	Maintenance Facility	Vernon Yards (34) 4462 Pacific Boulevard, Vernon	X					X	X	X	X		X
128	Bus Terminal	Pico Rimpau Bus Terminal 4646 Pico Boulevard, Los Angeles	X			X		X	X	X	X		X
129	Maintenance Facility	Heavy Rail Maintenance of Way Facility (64) 590 South Santa Fe Avenue, Los Angeles	X					X	X	X	X		X
130	Administrative Office	Operations & Training (One Santa Fe) (63) 100 South Santa Fe Avenue, Los Angeles	X					X	X	X	X		X
131	Maintenance Facility	Light Rail Maintenance of Way Facility (66) 1680 East Imperial Highway, Willowbrook	X					X	X	X	X		X
132	Administrative Office	Crenshaw Light Rail 3695-3699 Crenshaw Boulevard, Los Angeles	X			X		X	X	X	X		X
133	Administrative Office	WSRC Westside Subway and Regional Connector 777 South Figueroa Street, Los Angeles	X		X			X	X	X	X		X
134	Rail Station	A Line 801/Stop # 80101 Downtown Long Beach Station	X					X	X	X	X		X
135	Rail Station	A Line 801 Stop # 80102 Pacific Avenue Station	X					X	X	X	X		X
136	Rail Station	A Line 801 Stop # 80105 Anaheim Street Station	X					X	X	X	X		X
137	Rail Station	A Line 801 Stop # 80106 Pacific Coast Highway Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
138	Rail Station	A Line 801 Stop # 80107 Willow Street Station	X			X		X	X	X	X		X
139	Rail Station	A Line 801 Stop # 80108 Wardlow Station	X					X	X	X	X		X
140	Rail Station	A Line 801 Stop # 80109 Del Amo Station	X			X		X	X	X	X		X
141	Rail Station	A Line 801 Stop # 80110 Artesia Station	X					X	X	X	X		X
142	Rail Station	A Line 801 Stop # 80111 Compton Station	X			X		X	X	X	X		X
143	Rail Station	A Line 801 Stop # 80112 Willowbrook - Rosa Parks Station - Metro Blue Line	X					X	X	X	X		X
144	Rail Station	A Line 801 Stop # 80113 103rd Street / Watts Towers Station	X					X	X	X	X		X
145	Rail Station	A Line 801 Stop # 80114 Firestone Station	X					X	X	X	X		X
146	Rail Station	A Line 801 Stop # 80115 Florence Station	X					X	X	X	X		X
147	Rail Station	A Line 801 Stop # 80116 Slauson Station	X					X	X	X	X		X
148	Rail Station	A Line 801 Stop # 80117 Vernon Station	X					X	X	X	X		X
149	Rail Station	A Line 801 Stop # 80118 Washington Station	X					X	X	X	X		X
150	Rail Station	A Line 801 Stop # 80119 San Pedro Street Station	X					X	X	X	X		X
151	Rail Station	A Line 801/Stop # 80120 Grand / LATTC Station	X					X	X	X	X		X
152	Rail Station	A/E Line 801 Stop # 80121 Pico Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
153	Rail Station	A/E Line 801 Stop # 80122 7th Street / Metro Center - Metro Blue & Expo Lines	X					X	X	X	X		X
154	Rail Station	E Line 806 Stop # 80123 LATTC / Ortho Institute Station	X					X	X	X	X		X
155	Rail Station	E Line 806 Stop # 80124 Jefferson / USC Station	X					X	X	X	X		X
156	Rail Station	E Line 806 Stop # 80125 Expo Park / USC Station	X					X	X	X	X		X
157	Rail Station	E Line 806 Stop # 80126 Expo / Vermont Station	X					X	X	X	X		X
158	Rail Station	E Line 806 Stop # 80127 Expo / Western Station	X			X		X	X	X	X		X
159	Rail Station	E Line 806 Stop # 80128 Expo / Crenshaw Station	X			X		X	X	X	X		X
160	Rail Station	E Line 806 Stop # 80129 Farmdale Station	X			X		X	X	X	X		X
161	Rail Station	E Line 806 Stop # 80130 Expo / La Brea Station	X			X		X	X	X	X		X
162	Rail Station	E Line 806 Stop # 80131 La Cienega / Jefferson Station	X					X	X	X	X		X
163	Rail Station	E Line 806 Stop # 80132 Culver City Station	X					X	X	X	X		X
164	Rail Station	E Line 806 Stop # 80133 Palms Station	X		X			X	X	X	X		X
165	Rail Station	E Line 806 Stop # 80134 Westwood / Rancho Park Station	X			X		X	X	X	X		X
166	Rail Station	E Line 806 Stop # 80135 Expo / Sepulveda Station	X					X	X	X	X		X
167	Rail Station	E Line 806 Stop # 80136 Expo / Bundy Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
168	Rail Station	E Line 806 Stop # 80137 26th Street / Bergamot Station	X					X	X	X	X		X
169	Rail Station	E Line 806 Stop # 80138 17th Street / SMC Station	X					X	X	X	X		X
170	Rail Station	E Line 806 Stop # 80139 Downtown Santa Monica Station	X					X	X	X	X		X
171	Rail Station	A Line 801 Stop # 80153 1st Street Station	X					X	X	X	X		X
172	Rail Station	A Line 801 Stop # 80154 5th Street Station	X					X	X	X	X		X
173	Rail Station	B Line 802 Stop # 80201 North Hollywood Station	X					X	X	X	X		X
174	Rail Station	B Line 802 Stop # 80202 Universal / Studio City Station	X					X	X	X	X		X
175	Rail Station	B Line 802 Stop # 80203 Hollywood / Highland Station	X					X	X	X	X		X
176	Rail Station	B Line 802 Stop # 80204 Hollywood / Vine Station	X			X		X	X	X	X		X
177	Rail Station	B Line 802 Stop # 80205 Hollywood / Western Station	X					X	X	X	X		X
178	Rail Station	B Line 802 Stop # 80206 Vermont / Sunset Station	X					X	X	X	X		X
179	Rail Station	B Line 802 Stop # 80207 Vermont / Santa Monica Station	X					X	X	X	X		X
180	Rail Station	B Line 802 Stop # 80208 Vermont / Beverly Station	X		X			X	X	X	X		X
181	Rail Station	B/D Lines 802 Stop # 80209 Wilshire / Vermont Station	X					X	X	X	X		X
182	Rail Station	B/D Lines 802 Stop # 80210 Westlake / Macarthur Park Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
183	Rail Station	B/D Lines 802 Stop # 80211 7th Street / Metro Center - Metro Red/Purple Lines	X					X	X	X	X		X
184	Rail Station	B/D Lines 802 Stop # 80212 Pershing Square Station	X					X	X	X	X		X
185	Rail Station	Red/Purple Lines 802 Stop # 80213 Civic Center / Grand Park Station	X					X	X	X	X		X
186	Rail Station	B/D Lines 802 Stop # 80214 Union Station - Metro Red & Purple Lines	X					X	X	X	X		X
187	Rail Station	D Line 805 Stop # 80215 Wilshire / Normandie Station	X		X			X	X	X	X		X
188	Rail Station	D Line 805 Stop # 80216 Wilshire / Western Station	X					X	X	X	X		X
189	Rail Station	C Line 803 Stop # 80301 Redondo Beach Station	X					X	X	X	X		X
190	Rail Station	C Line 803 Stop # 80302 Douglas Station	X					X	X	X	X		X
191	Rail Station	C Line 803 Stop # 80303 El Segundo Station	X					X	X	X	X		X
192	Rail Station	C Line 803 Stop # 80304 Mariposa Station	X					X	X	X	X		X
193	Rail Station	C Line 803 Stop # 80305 Aviation / Lax Station	X					X	X	X	X		X
194	Rail Station	C Line 803 Stop # 80306 Hawthorne / Lennox Station	X					X	X	X	X		X
195	Rail Station	C Line 803 Stop # 80307 Crenshaw Station	X					X	X	X	X		X
196	Rail Station	C Line 803 Stop # 80308 Vermont / Athens Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
197	Rail Station	C Line 803 Stop # 80309 Harbor Freeway Station	X					X	X	X	X		X
198	Rail Station	C Line 803 Stop # 80310 Avalon Station	X					X	X	X	X		X
199	Rail Station	C Line 803 Stop # 80311 Willowbrook - Rosa Parks Station - Metro Green Line	X					X	X	X	X		X
200	Rail Station	C Line 803 Stop # 80312 Long Beach Boulevard Station	X					X	X	X	X		X
201	Rail Station	C Line 803 Stop # 80313 Lakewood Boulevard Station	X					X	X	X	X		X
202	Rail Station	C Line 803 Stop # 80314 Norwalk Station	X			X		X	X	X	X		X
203	Rail Station	L Line 804 Stop # 80401 Atlantic Station	X					X	X	X	X		X
204	Rail Station	L Line 804 Stop # 80402 East La Civic Center Station	X					X	X	X	X		X
205	Rail Station	L Line 804 Stop # 80403 Maravilla Station	X					X	X	X	X		X
206	Rail Station	L Line 804 Stop # 80404 Indiana Station	X					X	X	X	X		X
207	Rail Station	L Line 804 Stop # 80405 Soto Station	X					X	X	X	X		X
208	Rail Station	L Line 804 Stop # 80406 Mariachi Plaza / Boyle Heights Station	X					X	X	X	X		X
209	Rail Station	L Line 804 Stop # 80407 Pico / Aliso Station	X					X	X	X	X		X
210	Rail Station	L Line 804 Stop # 80408 Little Tokyo / Arts District Station	X					X	X	X	X		X
211	Rail Station	L Line 804 Stop # 80409 Union Station - Metro Gold Line	X					X	X	X	X		X

		Hazards											
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
212	Rail Station	L Line 804 Stop # 80410 Chinatown Station	X					X	X	X	X		X
213	Rail Station	L Line 804 Stop # 80411 Lincoln Heights / Cypress Park Station	X					X	X	X	X		X
214	Rail Station	L Line 804 Stop # 80412 Heritage Square / Arroyo Station	X					X	X	X	X		X
215	Rail Station	L Line 804 Stop # 80413 Southwest Museum Station	X	X				X	X	X	X		X
216	Rail Station	L Line 804 Stop # 80414 Highland Park Station	X	X				X	X	X	X		X
217	Rail Station	L Line 804 Stop # 80415 South Pasadena Station	X					X	X	X	X		X
218	Rail Station	L Line 804 Stop # 80416 Fillmore Station	X					X	X	X	X		X
219	Rail Station	L Line 804 Stop # 80417 Del Mar Station	X					X	X	X	X		X
220	Rail Station	L Line 804 Stop # 80418 Memorial Park Station	X					X	X	X	X		X
221	Rail Station	L Line 804 Stop # 80419 Lake Station	X					X	X	X	X		X
222	Rail Station	L Line 804 Stop # 80420 Allen Station	X					X	X	X	X		X
223	Rail Station	L Line 804 Stop # 80421 Sierra Madre Villa Station	X					X	X	X	X		X
224	Rail Station	L Line 804 Stop # 80422 Arcadia Station	X					X	X	X	X		X
225	Rail Station	L Line 804 Stop # 80423 Monrovia Station	X					X	X	X	X		X
226	Rail Station	L Line 804 Stop # 80424 Duarte / City of Hope Station	X					X	X	X	X		X

Hazards														
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
227	Rail Station	L Line 804 Stop # 80425 Irwindale Station	X	X				X	X	X	X		X
228	Rail Station	L Line 804 Stop # 80426 Azusa Downtown Station	X					X	X	X	X		X
229	Rail Station	L Line 804 Stop # 80427 Azusa Pacific University/ Citrus College Station	X					X	X	X	X		X
230	Bus Stop	G Line Stop #15312 Pierce College Station	X					X	X	X	X		X
231	Bus Stop	G Line Stop #15313 Pierce College Station	X					X	X	X	X		X
232	Bus Stop	G Line Stop #15415 Reseda Station	X					X	X	X	X		X
233	Bus Stop	G Line Stop #15416 Reseda Station	X					X	X	X	X		X
234	Bus Stop	G Line Stop #15432 Canoga Station	X					X	X	X	X		X
235	Bus Stop	G Line Stop #15435 Tampa Station	X					X	X	X	X		X
236	Bus Stop	G Line Stop #15436 Tampa Station	X					X	X	X	X		X
237	Bus Stop	G Line Stop #15438 De Soto Station	X					X	X	X	X		X
238	Bus Stop	G Line Stop #15444 Canoga Station	X					X	X	X	X		X
239	Bus Stop	G Line Stop #15453 De Soto Station	X					X	X	X	X		X
240	Bus Stop	G Line Stop #15458 Canoga Station	X					X	X	X	X		X
241	Bus Stop	G Line Stop #15458 Canoga Station	X					X	X	X	X		X
242	Bus Stop	G Line Stop #15515 Balboa Station	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
243	Bus Stop	G Line Stop #15516 Balboa Station	X					X	X	X	X		X
244	Bus Stop	G Line Stop #15535 Sepulveda Station	X					X	X	X	X		X
245	Bus Stop	G Line Stop #15539 Sepulveda Station	X					X	X	X	X		X
246	Bus Stop	G Line Stop #15546 Van Nuys Station	X					X	X	X	X		X
247	Bus Stop	G Line Stop #15568 Chatsworth Station	X			X		X	X	X	X		X
248	Bus Stop	G Line Stop #15568 Chatsworth Station	X			X		X	X	X	X		X
249	Bus Stop	G Line Stop #15570 Van Nuys Station	X					X	X	X	X		X
250	Bus Stop	G Line Stop #15575 Nordhoff Station	X					X	X	X	X		X
251	Bus Stop	G Line Stop #15583 Woodman Station	X					X	X	X	X		X
252	Bus Stop	G Line Stop #15584 Woodman Station	X					X	X	X	X		X
253	Bus Stop	G Line Stop #15588 Woodley Station	X					X	X	X	X		X
254	Bus Stop	G Line Stop #15590 Roscoe Station	X					X	X	X	X		X
255	Bus Stop	G Line Stop #15600 Sherman Way Station	X					X	X	X	X		X
256	Bus Stop	G Line Stop #15601 Sherman Way Station	X					X	X	X	X		X
257	Bus Stop	G Line Stop #15606 Woodley Station	X		X			X	X	X	X		X
258	Bus Stop	G Line Stop #15607 Roscoe Station	X					X	X	X	X		X

			Hazards										
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
259	Bus Stop	G Line Stop #15608 Nordhoff Station	X					X	X	X	X		X
260	Bus Stop	G Line Stop #15611 Laurel Canyon Station	X					X	X	X	X		X
261	Bus Stop	G Line Stop #15617 Laurel Canyon Station	X					X	X	X	X		X
262	Bus Stop	G Line Stop #15624 Valley College Station	X					X	X	X	X		X
263	Bus Stop	G Line Stop #15661 Valley College Station	X					X	X	X	X		X
264	Bus Stop	G Line Stop #15684 North Hollywood Station	X					X	X	X	X		X
265	Bus Stop	G Line Stop #15684 North Hollywood Station	X					X	X	X	X		X
266	Bus Stop	J Line Stop #70 El Monte Busway / Alameda - Union Station	X					X	X	X	X		X
267	Bus Stop	J Line Stop #378 Harbor Beacon Park Ride - Sb	X		X			X	X	X	X		X
268	Bus Stop	J Line Stop #931 Cal State La Busway Station	X		X			X	X	X	X		X
269	Bus Stop	J Line Stop #1813 Flower / 23rd	X					X	X	X	X		X
270	Bus Stop	J Line Stop #2315 Harbor Transitway / 37th Street / USC	X					X	X	X	X		X
271	Bus Stop	J Line Stop #2320 Harbor Transitway / Manchester	X		X			X	X	X	X		X
272	Bus Stop	J Line Stop #2321 Harbor Transitway / Rosecrans	X		X			X	X	X	X		X
273	Bus Stop	J Line Stop #2322 Harbor Transitway / Slauson	X		X			X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
274	Bus Stop	J Line Stop #2324 Harbor Transitway / Harbor Freeway Station	X		X			X	X	X	X		X
275	Bus Stop	J Line Stop #2377 Flower / Pico	X					X	X	X	X		X
276	Bus Stop	J Line Stop #2378 Flower / Washington	X					X	X	X	X		X
277	Bus Stop	J Line Stop #2603 Beacon / 1st	X					X	X	X	X		X
278	Bus Stop	J Line Stop #3124 Harbor Beacon Park Ride - Nb	X		X			X	X	X	X		X
279	Bus Stop	J Line Stop #3153 Beacon / 1st	X					X	X	X	X		X
280	Bus Stop	J Line Stop #3258 Harbor Freeway & Transit Way – 110 South Exit 7B	X					X	X	X	X		X
281	Bus Stop	J Line Stop #3559 Harbor Freeway & Transit Way on-ramp	X					X	X	X	X		X
282	Bus Stop	J Line Stop #3674 Flower / 7th	X					X	X	X	X		X
283	Bus Stop	J Line Stop #3821 Pacific / 1st	X			X		X	X	X	X		X
284	Bus Stop	J Line Stop #4994 Figueroa / 23rd	X					X	X	X	X		X
285	Bus Stop	J Line Stop #5040 Figueroa / Olympic	X					X	X	X	X		X
286	Bus Stop	J Line Stop #5041 Figueroa / Pico	X					X	X	X	X		X
287	Bus Stop	J Line Stop #5048 USC Medical Center Busway Station	X					X	X	X	X		X

			Hazards										
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
288	Bus Stop	J Line Stop #5049 Figueroa / Washington	X					X	X	X	X		X
289	Bus Stop	J Line Stop #5377 1st / Hill	X					X	X	X	X		X
290	Bus Stop	J Line Stop #5395 Pacific / 11th	X					X	X	X	X		X
291	Bus Stop	J Line Stop #5396 Pacific / 15th	X					X	X	X	X		X
292	Bus Stop	J Line Stop #5397 Pacific / 17th	X					X	X	X	X		X
293	Bus Stop	J Line Stop #5408 Pacific / 3rd	X			X		X	X	X	X		X
294	Bus Stop	J Line Stop #5410 Pacific / 7th	X					X	X	X	X		X
295	Bus Stop	J Line Stop #5411 Pacific / 7th	X					X	X	X	X		X
296	Bus Stop	J Line Stop #9129 El Monte Busway / Alameda - Union Station	X					X	X	X	X		X
297	Bus Stop	J Line Stop #9480 Cal State La Busway Station	X					X	X	X	X		X
298	Bus Stop	J Line Stop #10846 Harbor Transitway / Rosecrans	X		X			X	X	X	X		X
299	Bus Stop	J Line Stop #10848 Harbor Transitway / 37th St / USC	X					X	X	X	X		X
300	Bus Stop	J Line Stop #10853 Harbor Transitway / Manchester	X		X			X	X	X	X		X
301	Bus Stop	J Line Stop #10855 Harbor Transitway / Harbor Freeway Station	X		X			X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
302	Bus Stop	J Line Stop #10994 Harbor Transitway / Slauson	X		X			X	X	X	X		X
303	Bus Stop	J Line Stop #11917 Spring / 1st - City Hall	X		X			X	X	X	X		X
304	Bus Stop	J Line Stop #12304 Pacific / 1st	X			X		X	X	X	X		X
305	Bus Stop	J Line Stop #12416 Spring / Temple	X		X			X	X	X	X		X
306	Bus Stop	J Line Stop #13460 HOV Roadway / Adams	X					X	X	X	X		X
307	Bus Stop	J Line Stop #13496 Flower / Olympic	X					X	X	X	X		X
308	Bus Stop	J Line Stop #13560 Grand / 3rd	X					X	X	X	X		X
309	Bus Stop	J Line Stop #13561 Grand / 5th	X		X			X	X	X	X		X
310	Bus Stop	J Line Stop #13802 Pacific / 11th	X					X	X	X	X		X
311	Bus Stop	J Line Stop #13803 Pacific / 15th	X					X	X	X	X		X
312	Bus Stop	J Line Stop #13804 Pacific / 17th	X					X	X	X	X		X
313	Bus Stop	J Line Stop #13805 Pacific / 19th	X					X	X	X	X		X
314	Bus Stop	J Line Stop #13817 Pacific / 3rd	X			X		X	X	X	X		X
315	Bus Stop	J Line Stop #14073 Harbor Freeway / Carson	X					X	X	X	X		X
316	Bus Stop	J Line Stop #15029 USC Medical Center Busway Station	X		X			X	X	X	X		X
317	Bus Stop	J Line Stop #15612 1st / Hill	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
318	Bus Stop	J Line Stop #15713 6th / Flower	X					X	X	X	X		X
319	Bus Stop	J Line Stop #15715 Olive / 5th	X					X	X	X	X		X
320	Bus Stop	J Line Stop #15820 Flower / Adams	X					X	X	X	X		X
321	Bus Stop	J Line Stop #30005 Harbor Gateway Transit Center	X					X	X	X	X		X
322	Bus Stop	J Line Stop #30005 Harbor Gateway Transit Center	X					X	X	X	X		X
323	Bus Stop	J Line Stop #30019 El Monte Station - Upper Level	X					X	X	X	X		X
324	Bus Stop	J Line Stop #30019 El Monte Station - Upper Level	X					X	X	X	X		X
325	Bus Stop	J Line Stop #141012 Pacific / 21st Layover	X					X	X	X	X		X
326	Bus Stop	J Line Stop #141012 Pacific / 21st Layover	X					X	X	X	X		X
327	Bus Stop	J Line Stop #141079 Harbor Freeway / Pacific Coast	X					X	X	X	X		X
328	Bus Stop	J Line Stop #141080 Harbor Freeway / Carson	X					X	X	X	X		X
329	Bus Stop	J Line Stop #142216 Harbor Freeway / Pacific Coast	X		X			X	X	X	X		X
330	Bus Stop	J Line Stop #65300038 Figueroa / Victoria	X					X	X	X	X		X
331	Bus Stop	J Line Stop #65300039 Figueroa / 190th	X					X	X	X	X		X
332	Bus Stop	J Line Stop #65300042 Figueroa / 7th	X					X	X	X	X		X
333	Bus Stop	J Line Stop #70500012 Olive / General Thaddeus Kosciuszko	X		X			X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
334	Rail Station	Commerce Metrolink Station 6433 26th Street, Commerce	X					X	X	X	X		X
335	Rail Station	Norwalk/Santa Fe Springs Metrolink Station 12700 Imperial Highway, Norwalk	X		X			X	X	X	X		X
336	Rail Station	Downtown Pomona Metrolink Station 100 East Commercial Street, Pomona	X					X	X	X	X		X
337	Rail Station	Industry Metrolink Station 600 South Brea Canyon Road, Industry	X					X	X	X	X		X
338	Rail Station	Claremont Metrolink Station 200 West 1st Street, Claremont	X					X	X	X	X		X
339	Rail Station	Pomona Metrolink Station 205 Santa Fe Street, Pomona	X					X	X	X	X		X
340	Rail Station	Covina Metrolink Station 600 North Citrus Avenue, Covina	X					X	X	X	X		X
341	Rail Station	Baldwin Park Metrolink Station 3825 Downing Avenue, Baldwin Park	X					X	X	X	X		X
342	Rail Station	El Monte Metrolink Station 10925 Railroad Street, El Monte	X					X	X	X	X		X
343	Rail Station	Cal State La Metrolink Station 5150 State University Drive, Los Angeles	X		X			X	X	X	X		X
344	Rail Station	La County Fairgrounds Metrolink Station Arrow Highway, Pomona	X					X	X	X	X		X

Hazards													
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
345	Rail Station	Lancaster Metrolink Station 44812 Sierra Highway, Lancaster	X			X		X	X	X	X		X
346	Rail Station	Vincent Grade/Acton Metrolink Station 550 West Sierra Highway, County	X	X		X		X	X	X	X		X
347	Rail Station	Santa Clarita Metrolink Station 22122 Soledad Canyon Rd, Santa Clarita	X	X		X		X	X	X	X		X
348	Rail Station	Princessa Metrolink Station 19201 Via Princessa, Santa Clarita	X			X		X	X	X	X		X
349	Rail Station	Sylmar/San Fernando Metrolink Station 12219 Frank Modugno Drive, Los Angeles	X					X	X	X	X		X
350	Rail Station	Glendale Metrolink Station 400 West Cerritos Avenue, Glendale	X					X	X	X	X		X
351	Rail Station	Sun Valley Metrolink Station San Fernando & Olinda, Los Angeles	X					X	X	X	X		X
352	Rail Station	Newhall Metrolink Station Santa Clarita	X			X		X	X	X	X		X
353	Rail Station	Palmdale Metrolink Station 39000 Clock Tower Plaza Drive, Lancaster	X			X		X	X	X	X		X
354	Rail Station	Chatsworth Metrolink Station 21510 Devonshire Blvd, Chatsworth	X			X		X	X	X	X		X

Hazards														
#	Asset Category	Metro Critical Assets	Earthquakes	Wildfires	Landslides	Floods	Tsunamis	Windstorms	Climate Change	Drought	Extreme Heat	Sea Level Rise	Epidemic / Pandemic / Vector-Borne Diseases
355	Rail Station	Northridge Metrolink Station 8775 Wilbur Avenue, Los Angeles	X			X		X	X	X	X		X
356	Rail Station	Van Nuys Metrolink Station 7720 Van Nuys Blvd, Van Nuys	X					X	X	X	X		X
357	Rail Station	Burbank Airport Metrolink Station 3750 Empire Avenue, Burbank	X			X		X	X	X	X		X
358	Railroad Passenger Terminal	Los Angeles Union Station 800 North Alameda Street, Los Angeles	X					X	X	X	X		X
359	Rail Station	Commerce/Montebello Metrolink Station 2000 Flotilla Street, Montebello	X					X	X	X	X		X
360	Rail Station	Downtown Burbank Metrolink Station 201 North Front Street, Burbank	X					X	X	X	X		X

The hazard assessment of Metro's Critical Assets reveals a universal vulnerability to the impacts of earthquakes, windstorms, and climate changes. For many years, Metro has been proactive in fortifying its buildings and facilities against these hazards. The Mitigation Actions Matrix (located in Mitigation Strategies) identifies several actions that can be taken by Metro departments to further minimize the impacts associated with these hazards. Although not as "regional" in nature, wildfires, landslides, floods, and tsunamis also pose a significant threat to Metro. This assessment emphasizes the importance of conducting a site by site review. Knowing a particular location is vulnerable to certain hazards greatly increases the likelihood of proactive measures, alerting, and well informed emergency response.

Earthquake Hazards

Hazard Definition

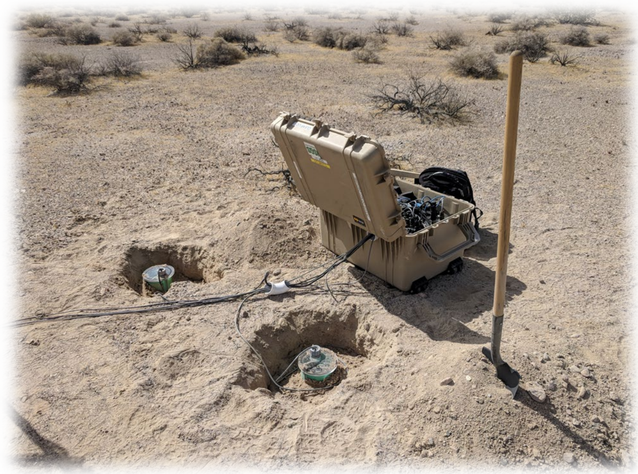
An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. The photo to the below is of a residential complex in Northridge that experienced severe damage from the magnitude 6.7 earthquake on January 17, 1994.

Photo: Soft Story Building Collapse at Northridge, California,
Source: FEMA Photo Library

Caption: Soft Story Building Collapse at Northridge, California.

One tool used to describe earthquake intensity is the Magnitude Scale. The Magnitude Scale is sometimes referred to as the Richter Scale. The two are similar but not exactly the same. The Magnitude Scale was devised as a means of rating earthquake strength and is an indirect measure of seismic energy released. The Scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter scale corresponds to about a 32-fold increase in energy released. Therefore, a Magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy.

Photo: Portable Seismic Station
Source: USGS



Caption: Two portable sensors: a strong motion sensor (to record strong shaking that can be felt) and a broadband sensor (to record weak motion for detecting small earthquakes) buried into the ground to detect earthquakes. These stations can be quickly deployed and send real-time data back to the USGS via cellular telemetry immediately after they are installed.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Previous Occurrences of Earthquakes in the Metro Service Area** below.

Previous Occurrences of Earthquakes in the Metro Service Area

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), significant earthquakes in the county over the past 50 years include the following:

Date	Location	Impact
July 6, 2019	Ridgecrest (M 7.1)	fires reported as a result of gas leaks no reported major injuries, deaths or major building damage
March 28, 2014	La Habra (M 5.1)	few injuries and $10 million dollars in damages
July 29, 2008	Chino Hills (M 5.5)	8 injuries and limited damages
January 17, 1994	Northridge (M 6.7)	57 deaths, 8,700 injuries and up to $40 billion dollars in damages
June 28, 1991	Sierra Madre (M 5.6)	1 death, 100+ injuries and up to $40 million dollars in damages
February 28, 1990	Upland (M 5.7)	30 injuries and $12.7 million dollars in damages
October 1, 1987	Whitter (M 5.9)	8 deaths, 200 injuries and $358 million in damages
February 9, 1971	San Fernando (M 6.6)	58 – 65 deaths, 200 – 2,000 injuries and up to $553 million in damages

Photo: Northern end of rupture resulting from the M7.1 Searles Valley quake
Source: Ryan Gold, USGS

Caption: Fault rupture crosses dirt road, with California Geological Survey vehicles for scale. Displacement at this location is primarily normal (vertical). Photograph taken near the northern end of the rupture resulting from the M7.1 Searles Valley earthquake.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Local Conditions** below.

Local Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), the county is susceptible to 3,041.91 (63.90%) square miles with violent low frequency shaking potential; and 711.01 square miles (14.93%) with extreme low frequency shaking potential. In unincorporated areas of Los Angeles County, there are 1,783.57 (58.65%) square miles with violent low frequency shaking potential; and 527.60 square miles (17.35%) with extreme low frequency shaking potential.

California Building Code (CBC) was substantially revised and updated in the aftermath of the Northridge Earthquake. Various building types (Steel, Concrete, Masonry, Wood or hybrid) designed and constructed after the Northridge EQ would perform much better in a seismic event with less severe damage, in comparison to buildings designed and constructed prior to Northridge EQ.

Violent perceived shaking can produce the potential for heavy damage. According to the USGS, this could mean that well-designed framed structures could be thrown out of plumb and substantial buildings could experience partial building collapse. In extreme shaking, the USGS notes that some well-built wooden structures could be destroyed, and most masonry and frame structures with foundations could be destroyed.

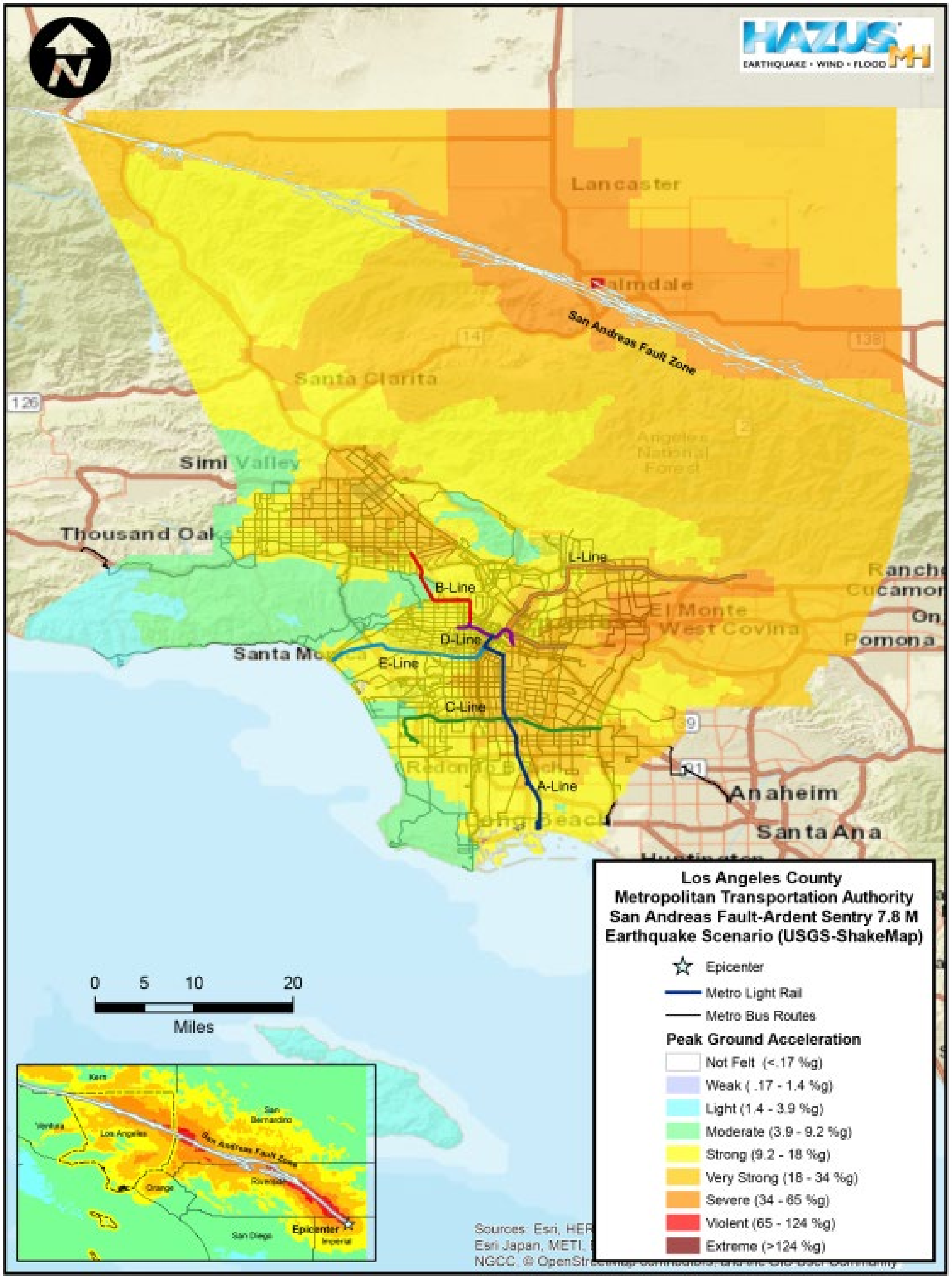
Photo: Metro Gold Line (now L line) to Azusa
Source: Metro Climate Action and Adaptation Plan, 2019

Caption: Metro Gold Line (now L line) to Azusa

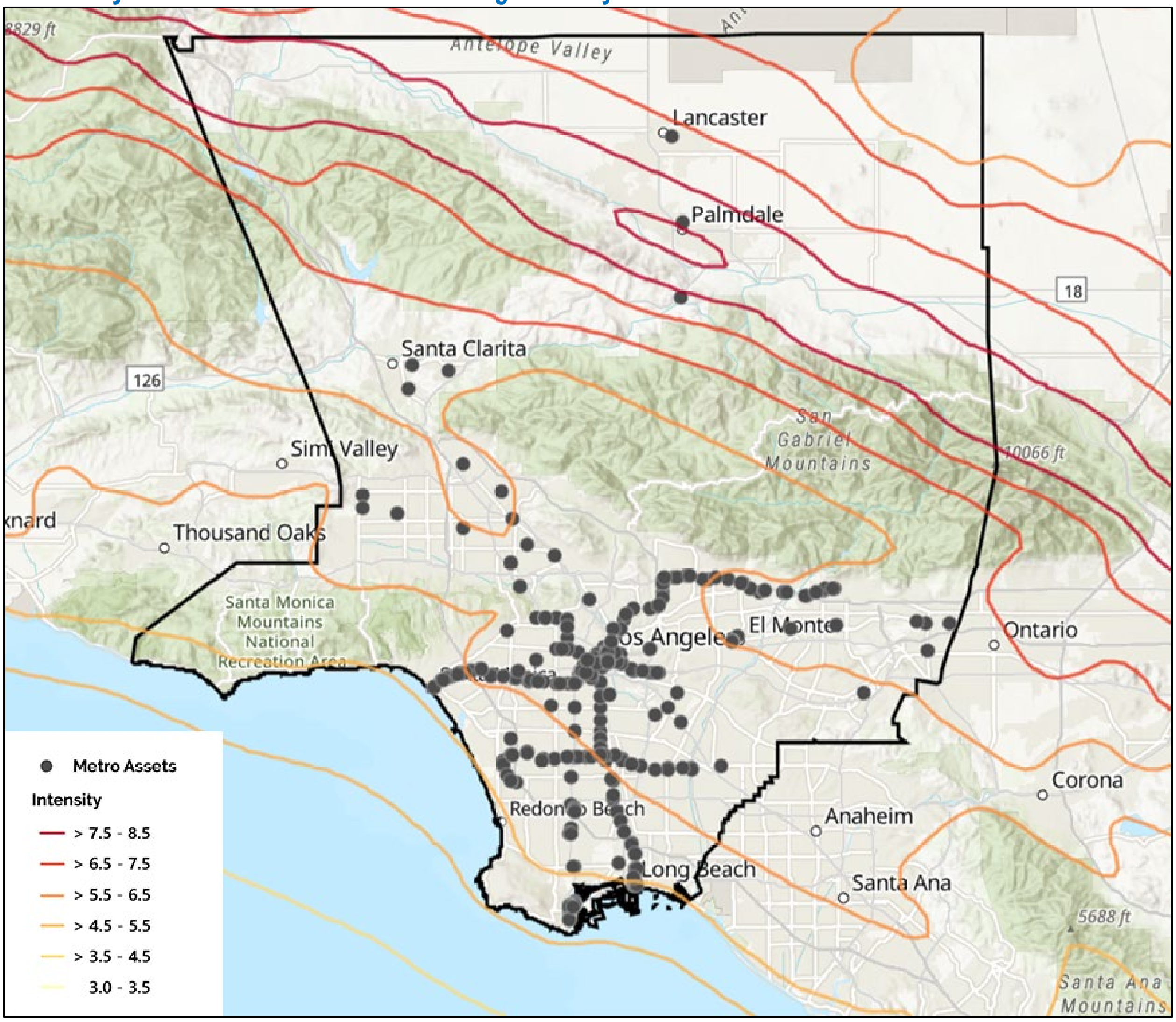
San Andreas Fault Zone

The San Andreas Fault Zone goes directly through the Metro service area. This fault zone extends from the Gulf of California northward to the Cape Mendocino area where it continues northward along the ocean floor. The total length of the San Andreas Fault Zone is approximately 750 miles. The activity of the fault has been recorded during historic events, including the 1906 (M8.0) event in San Francisco and the 1857 (M7.9) event between Cholame and San Bernardino, where at least 250 miles of surface rupture occurred. These seismic events are among the most significant earthquakes in California history. Geologic evidence suggests that the San Andreas Fault has a 50 percent chance of producing a magnitude 7.5 to 8.5 quake (comparable to the great San Francisco earthquake of 1906) within the next 30 years.

Map: Shake Intensity Map - San Andreas Fault M7.8
(Source: Emergency Planning Consultants)



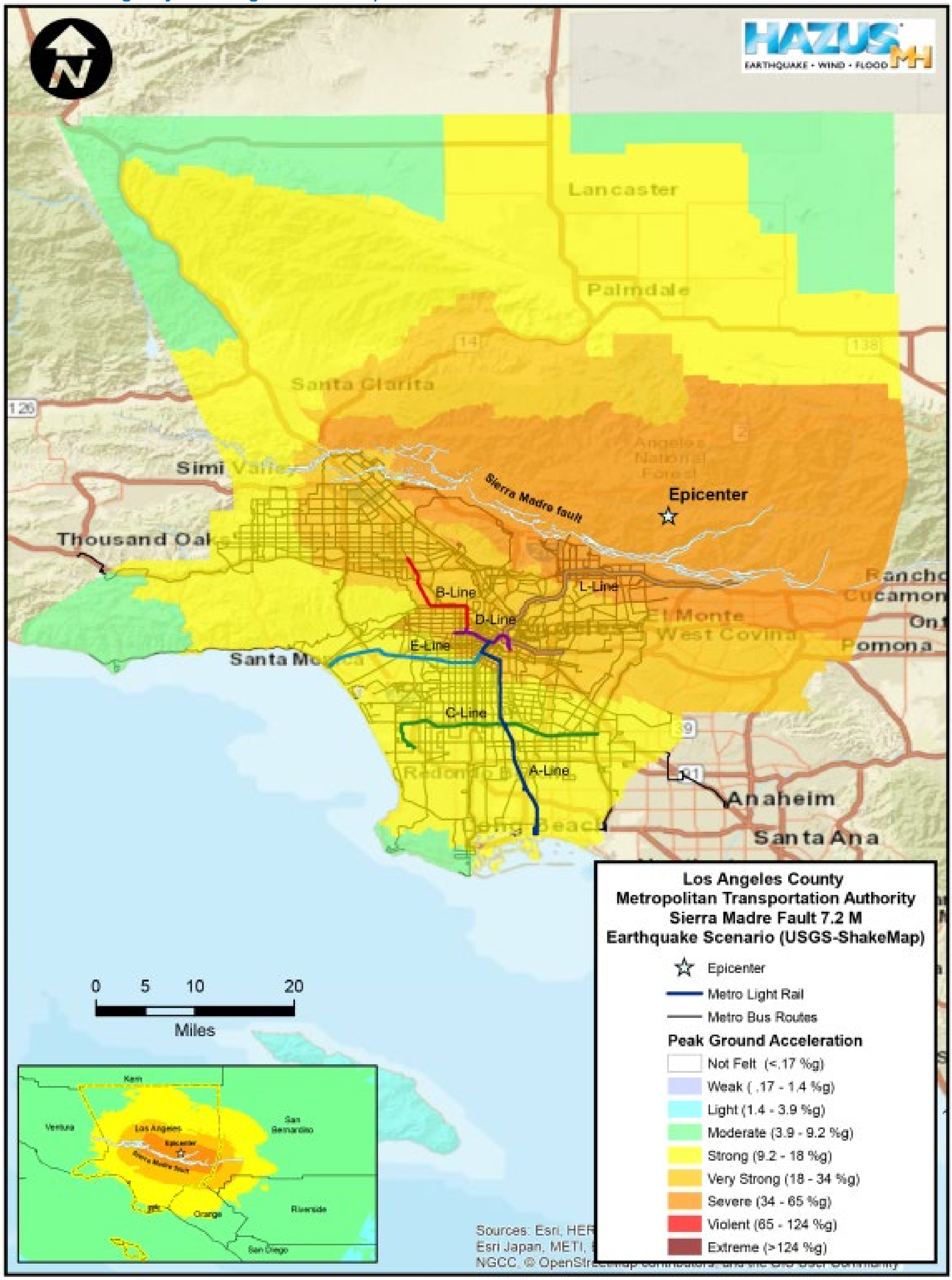
Map: Metro Critical Assets Impacted by Earthquake M7.8 Southern San Andreas Fault (Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



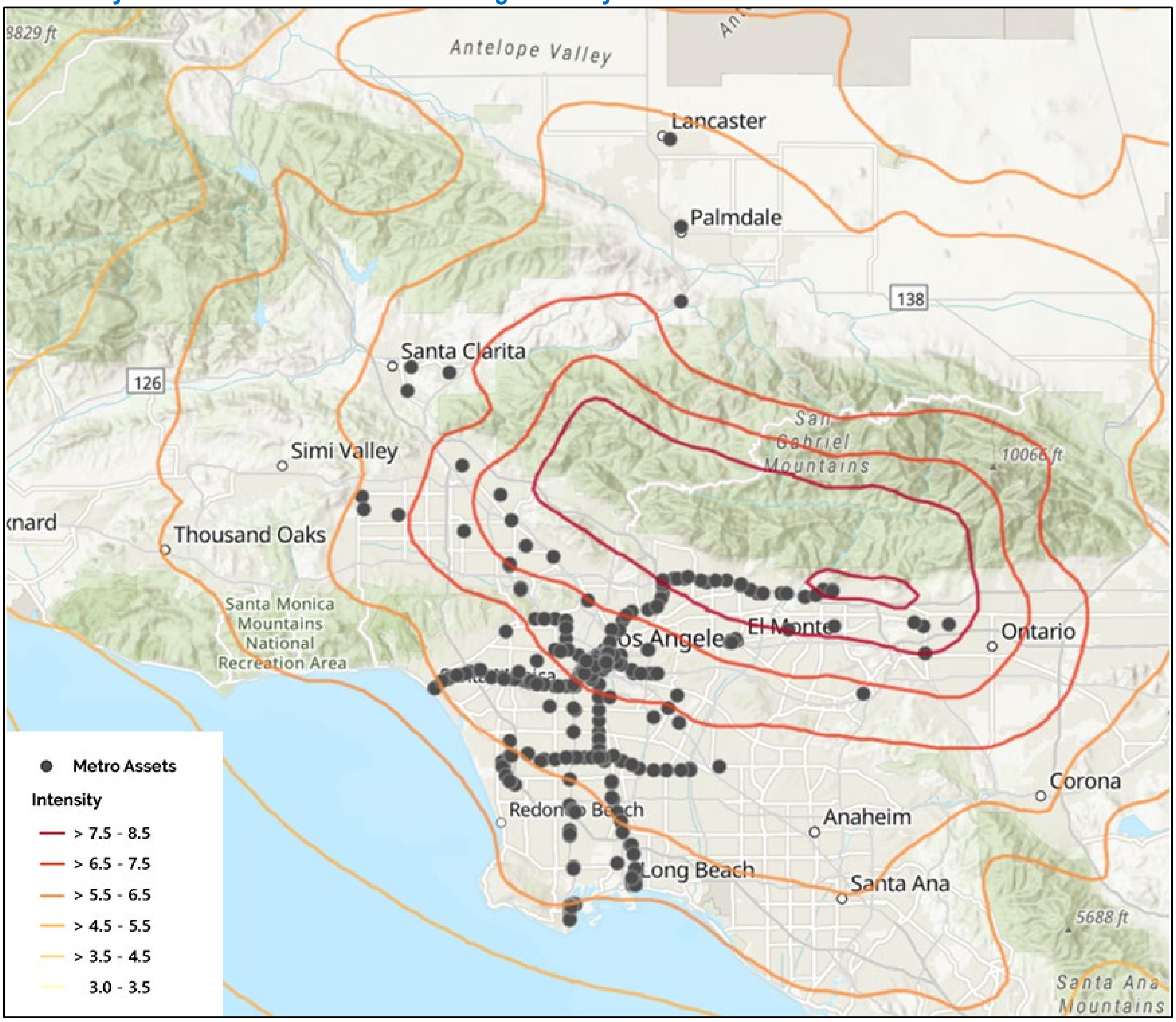
Sierra Madre Fault Zone

The Sierra Madre fault zone is a series of moderate angle, north-dipping, reverse faults (thrust faults). Movement along these frontal faults has resulted in the uplift of the San Gabriel Mountains. According to the Southern California Earthquake Data Center, rupture on the Sierra Madre fault zone (theoretically) could be limited to one segment at a time, it has recently been suggested that a large event on the San Andreas fault to the north (like that of 1857) could cause simultaneous rupture on reverse faults south of the San Gabriel Mountains – the Sierra Madre fault zone being a prime example of such. Whether this could rupture multiple Sierra Madre fault zone segments simultaneously is unknown. Seismic activity on the Sierra Madre Fault is expected to have a maximum magnitude of 7.2.

Map: Shake Intensity Map – Sierra Madre Fault M7.2
(Source: Emergency Planning Consultants)



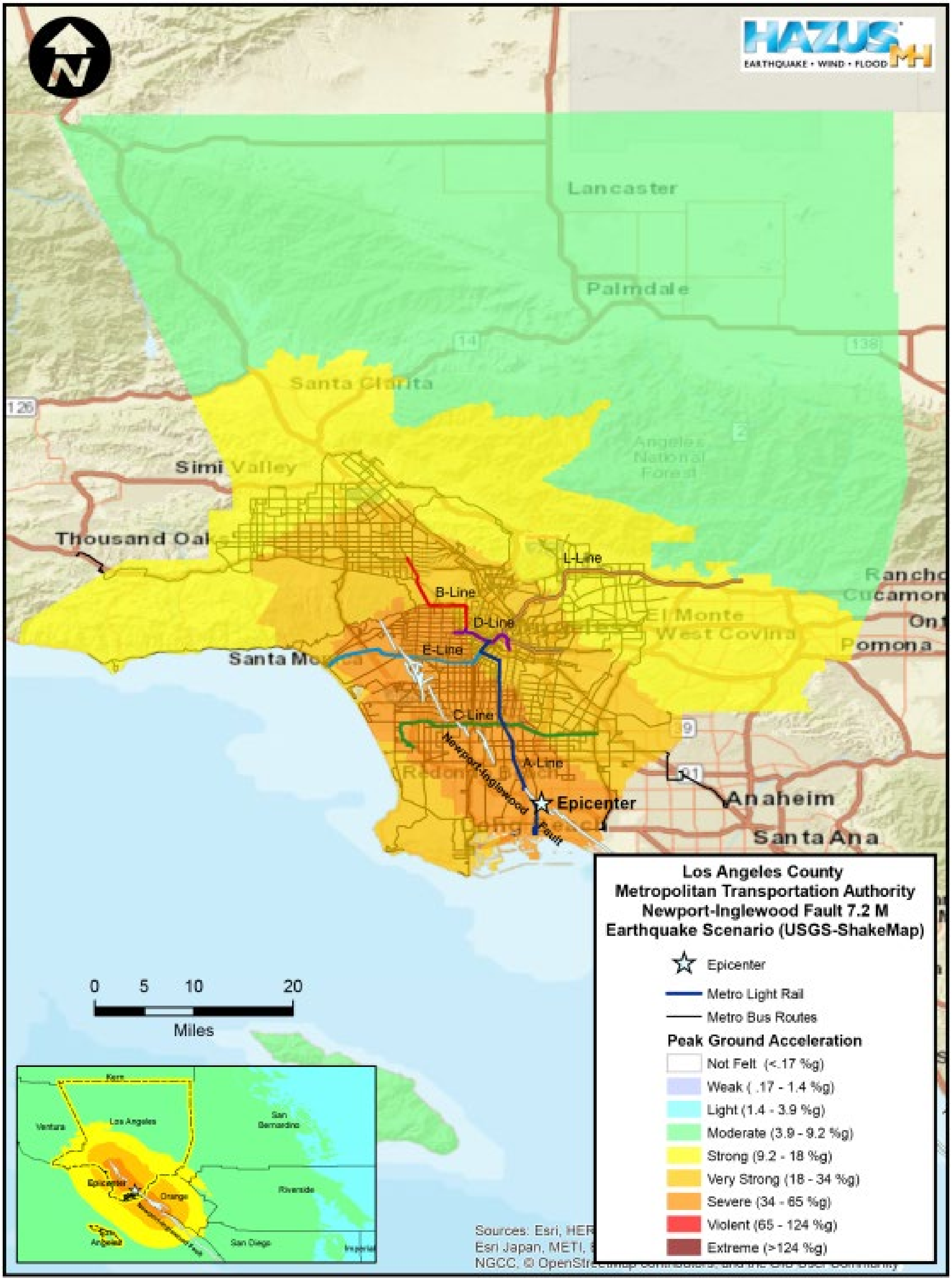
Map: Metro Critical Assets Impacted by Earthquake M7.2 Sierra Madre Fault (Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



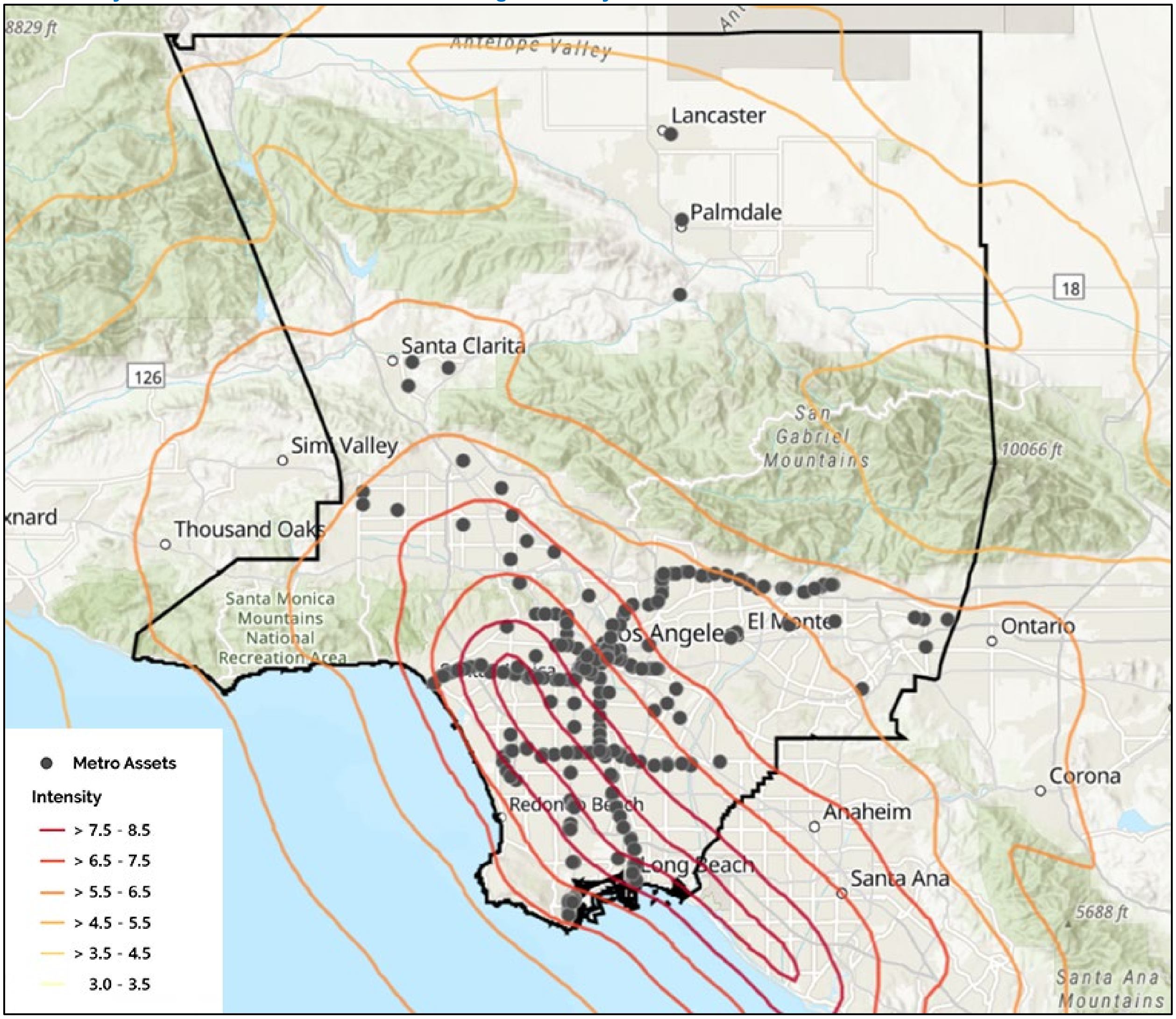
Newport-Inglewood Fault

The Newport-Inglewood Fault is a right-lateral fault with a length of 75 km in the Los Angeles Basin. The fault zone can easily be noted by the existence of a chain of low hills extending from Culver City to Signal Hill. South of Signal Hill, it roughly parallels the coastline until just south of Newport Bay, where it heads offshore, and becomes the Newport-Inglewood – Rose Canyon fault zone. The most recent rupture was on March 10, 1993 (M6.4) but was not a surface rupture.

Map: Shake Intensity Map – Newport-Inglewood Fault M7.2
(Source: Emergency Planning Consultants)



Map: Metro Critical Assets Impacted by Earthquake M7.2 Newport-Inglewood Fault (Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



Earthquake Related Hazards

Ground shaking, landslides, and liquefaction are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

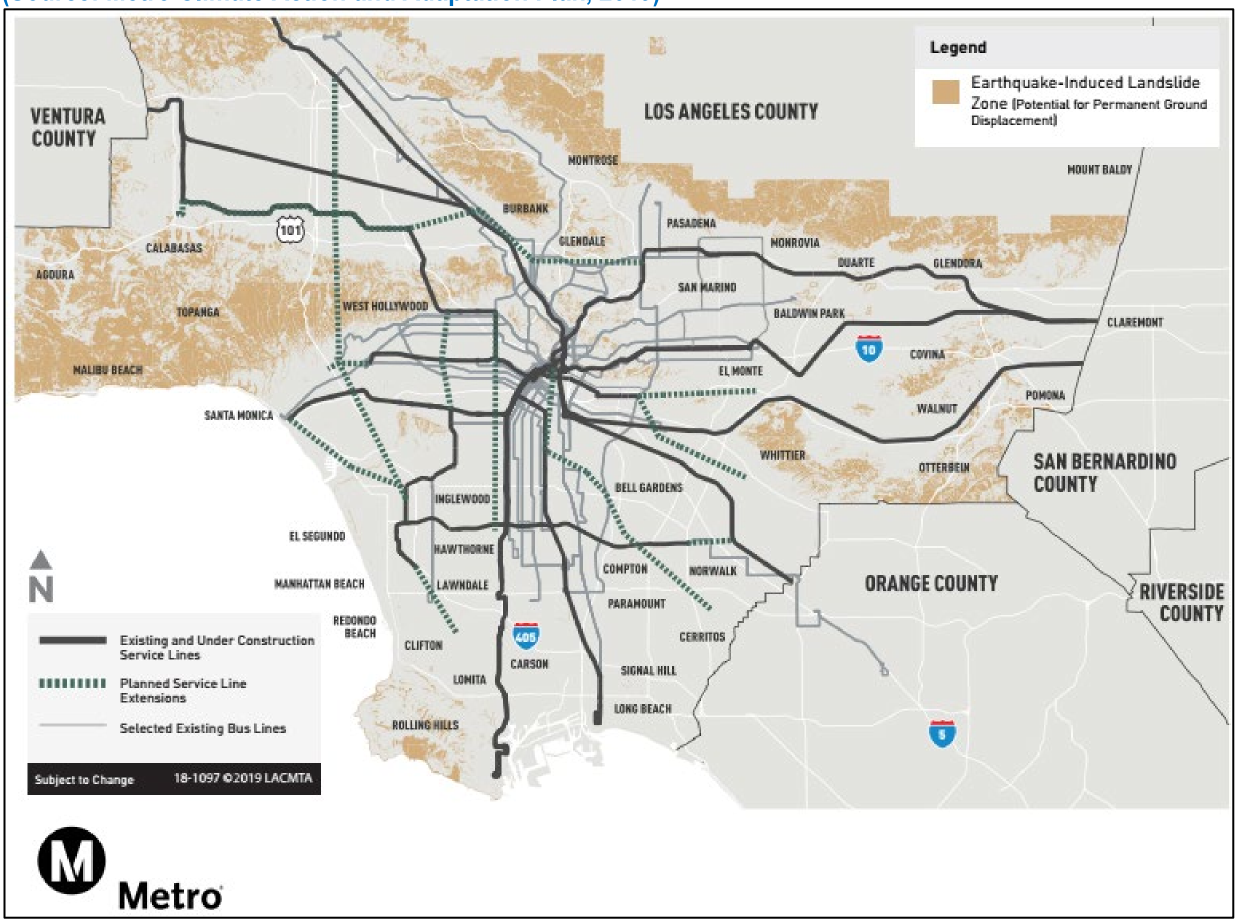
Earthquake-Induced Landslides

Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

Rock falls may happen suddenly and without warning but are more likely to occur in response to earthquake induced ground shaking, during periods of intense rainfall, or as a result of human activities, such as grading and blasting. Ground acceleration of at least 0.10g in steep terrain is necessary to induce earthquake-related rock falls.

Map: Landslide Exposure to Metro Service Lines shows the moderate risk of earthquake-induced landslide risk within the Metro service area.

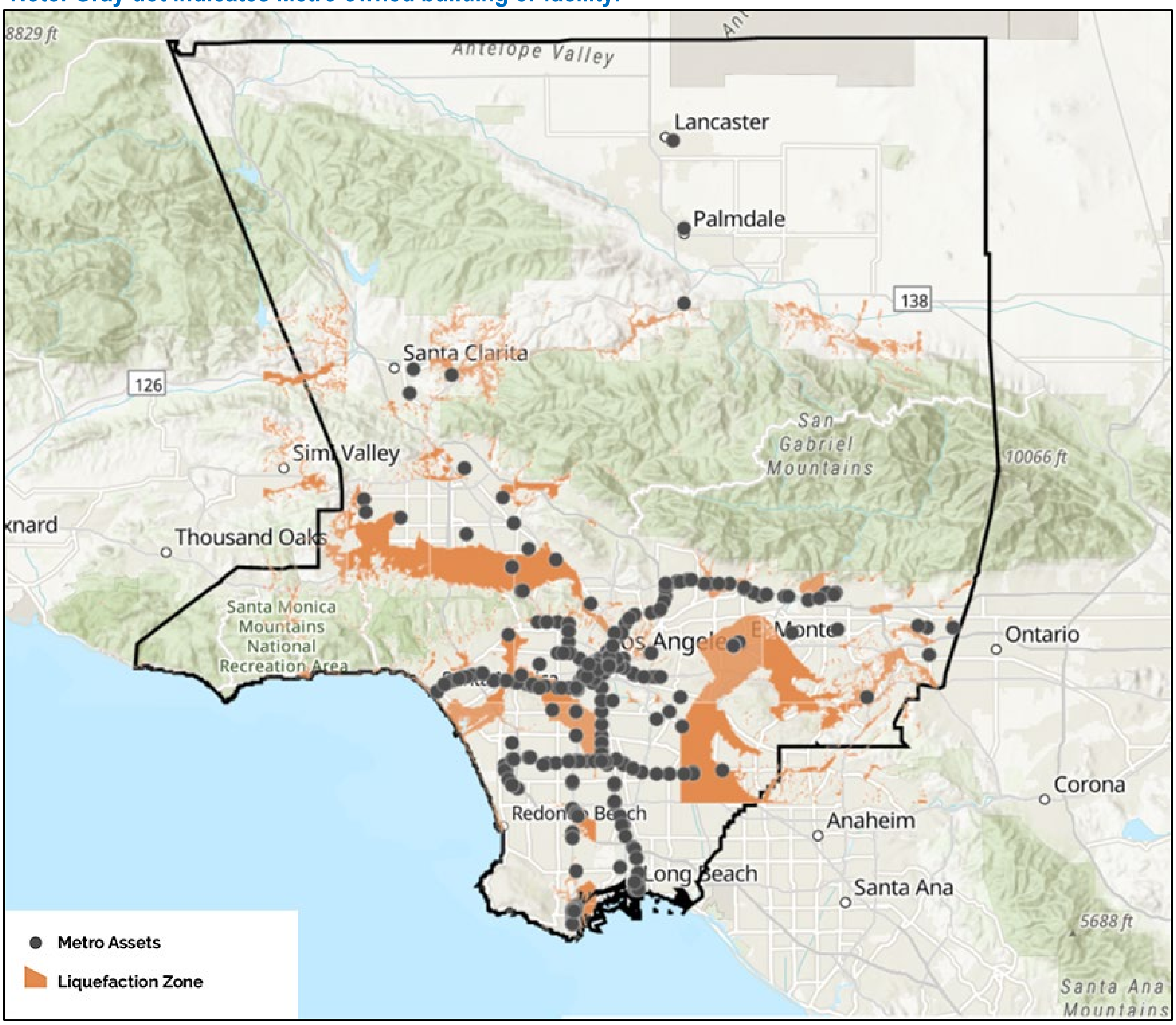
Map: Landslide Exposure to Metro Service Lines
(Source: Metro Climate Action and Adaptation Plan, 2019)



Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other events. Liquefaction occurs in saturated soils, which are soils in which the space between individual soil particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other. Because liquefaction only occurs in saturated soil, its effects are most commonly observed in low lying areas. Typically, liquefaction is associated with shallow groundwater, which is less than 50 feet beneath the earth's surface.

Map: Metro Critical Assets Impacted by Liquefaction
(Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Earthquakes in the Metro Service Area** below.

Impact of Earthquakes in the Metro Service Area

Based on the risk assessment, it is evident that earthquakes will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

Wildfire Hazards

Photo: Modoc July Complex Fire
Source: CAL OES

Hazard Definition

A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. They often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. A wildland/urban interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Caption: Modoc July Complex Fire

Photo: Modoc July Complex Fire
Source: CAL OES

Caption: Modoc July Complex Fire

Wildfire Characteristics

There are three categories of wildland/urban interface fire: The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas; the mixed wildland/urban interface is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings. The occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. 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). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought, and development.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Wildfire in the Metro Service Area** below.

Previous Occurrences of Wildfire in the Metro Service Area

According to the County of Los Angeles Fire Department, the most recent significant wildfire event to impact the County of Los Angeles is the ongoing Bobcat Fire, which began on September 8, 2020 in the Angeles National Forest in Azusa, CA. As of September 25, the fire has burned approximately 114,000 acres and is 55% contained. The fire is located near the Cogswell Dam and West Fork Day Use area. The fire is burning in heavy fuels with a rapid rate of spread.

3-D Map: Bobcat Fire
Source: Wildfire Today/USFS/Google

Caption: 3-D map of the Bobcat Fire. The red dots represent heat detected by a satellite at 3:42 a.m. PDT Sept 16, 2020. The red line was the perimeter as mapped by an aircraft at 10:48 p.m. MDT Sept. 15, 2020. Looking north-northeast.

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), NOAA Storm Events Database, and County of Los Angeles Fire Department, some of the county's most destructive fires have occurred since 2000, including:

Table: County's Most Destructive Fires Since 2000
(Sources: County of Los Angeles AHMP 2019, NOAA Storm Events Database, County of Los Angeles Fire Department)

Date	Fire	Damage
September 6, 2020	The Bobcat Fire	Burned approximately 114,000 acres in the Angeles National Forest, Azusa.
August 12, 2020	The Lake Fire	Burned 31,089 acres in Lake Hughes, an unincorporated area of Los Angeles County. There were 4 injuries and 12 structures destroyed.
July 6, 2020	The Soledad Fire	Burned 1,525 acres in Soledad Canyon. There was one firefighter injury and zero structures destroyed.
October 28, 2019	The Getty Fire	Burned over 700 acres across the Santa Monica Mountains, near the Getty Museum. The fire damaged or destroyed 25 residences.
October 24, 2019	The Tick Fire	Burned over 4600 acres in the Canyon County area of Los Angeles county. The fire destroyed and damaged numerous residences.
October 10, 2019	The Saddleridge Fire	Burned over 8700 acres in the foothills of the San Fernando Valley in Los Angeles county. Over 100 residences were either damaged or destroyed by the fire. Additionally, there was one civilian death was reported due to cardiac arrest.
November 8, 2018	The Woolsey Fire	Burned a total of 96,949 acres in Los Angeles and Ventura counties including Thousand Oaks, Agoura Hills, Calabasas, the Santa Monica Mountains, Malibu, and West Hills. A total of 1,643 structures were destroyed and 3 people were killed.
September 22, 2009	The Station Fire	Burned a total of 160,883 acres in the Angeles National Forest. The Station Fire is the largest recorded fire in Los Angeles County. It destroyed 89 residences and another 120 buildings of significance. Two firefighters were killed. The cause of the fire was arson.
October 20, 2007	The Ranch Fire	Burned a total of 58,410 acres near Townsend Peak in the Angeles National Forest. The cause of the fire was equipment.
October 30, 2006	The Day Fire	Burned a total of 161,816 acres. The fire primarily burned the Los Padres National Forest. The cause of the fire was human ignited debris.
October 25, 2003	The Simi Fire	Burned a total of 107,570 acres between Simi Hills and southeastern Simi Valley, in eastern Ventura County and western Los Angeles County, California. It destroyed 37 homes and 278 buildings. The cause of the fire remains unknown.
October 21, 2003	The Grand Prix Fire	Burned a total of 50,618 acres between Claremont and Lytle Creek. The fire destroyed 136 homes and was ruled "accidental but human-initiated."

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.

Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))

A: See **Local Conditions** below.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.

Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii))

A: See **Local Conditions** below.

Local Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), the climate in Los Angeles County is characterized as Mediterranean, featuring cool, wet winters and warm, dry summers. High moisture levels during the winter rainy season significantly increase the growth of plants. However, the vegetation is dried during the long, hot summers, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. As a result, fire susceptibility increases dramatically, particularly in late summer and early autumn. In addition, the presence of chaparral, a drought-resistant variety of vegetation that is dependent on occasional wildfires, is expected in Mediterranean dry-summer climates.

Photo: Bobcat Fire
Source: InciWeb – Incident Information System

Caption: S-61 conducting bucket drops on the Bobcat Fire on September 14, 2020.

Additionally, a local meteorological phenomenon, known as the Santa Ana winds, contributes to the high incidence of wildfires in Los Angeles County. These winds originate during the autumn months in the hot, dry interior deserts to the north and east of Los Angeles County. They often sweep west into the county, bringing extremely dry air and high wind speeds that further desiccate plant communities during the period of the year when the constituent species have very low moisture content. The effect of these winds on existing fires is particularly dangerous; the winds can greatly increase the rate at which fires spread.

In Los Angeles County, there are 386.06 square miles (8.11%) located in the very high LRA FHSZ, 625.01 square miles (13.13%) in the very high SRA FHSZ, and 132.77 square miles (2.79%) in the high SRA FHSZ. In the Unincorporated Los Angeles County, this includes: 23.53 square miles (0.77%) of very high LRA FHSZ; 610.94 square miles (20.09%) of very high SRA FHSZ; and 132.06 square miles (4.34%) of high SRA FHSZ.

As of September 25, 2020, the Bobcat Fire is affecting the Metro project area in the Angeles National Forest in Azusa. The fire began on September 6 and the cause is under investigation. It is 55% contained and has burned approximately 114,000 acres so far. A significant warming and drying trend will induce record temperatures and extremely low humidity, accompanied by windy conditions

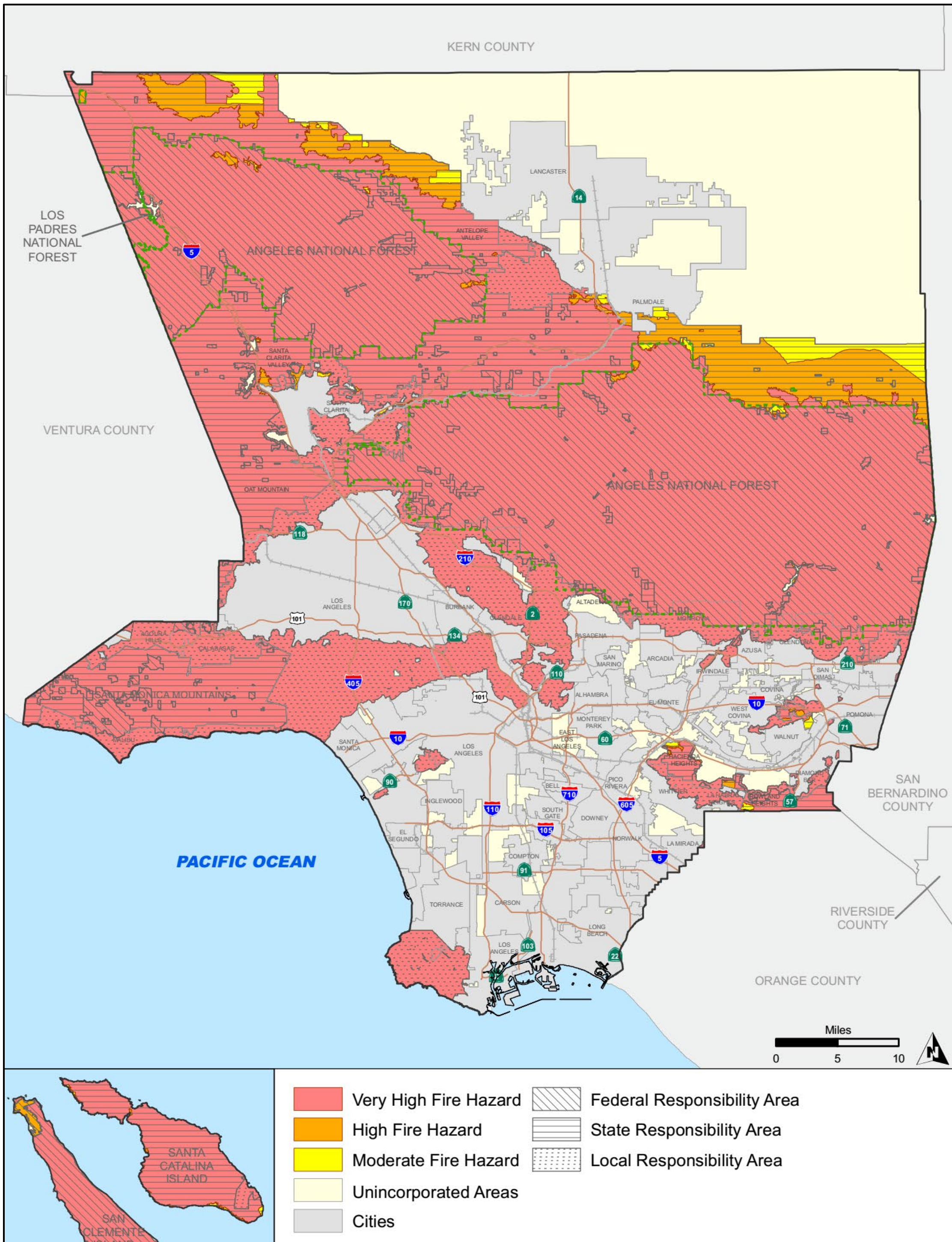
Photo: Bobcat Fire
Source: InciWeb – Incident Information System

Caption: Firefighters conduct firing operation on the Bobcat Fire, Sept. 14, 2020.

Photo: Bobcat Fire
Source: InciWeb – Incident Information System

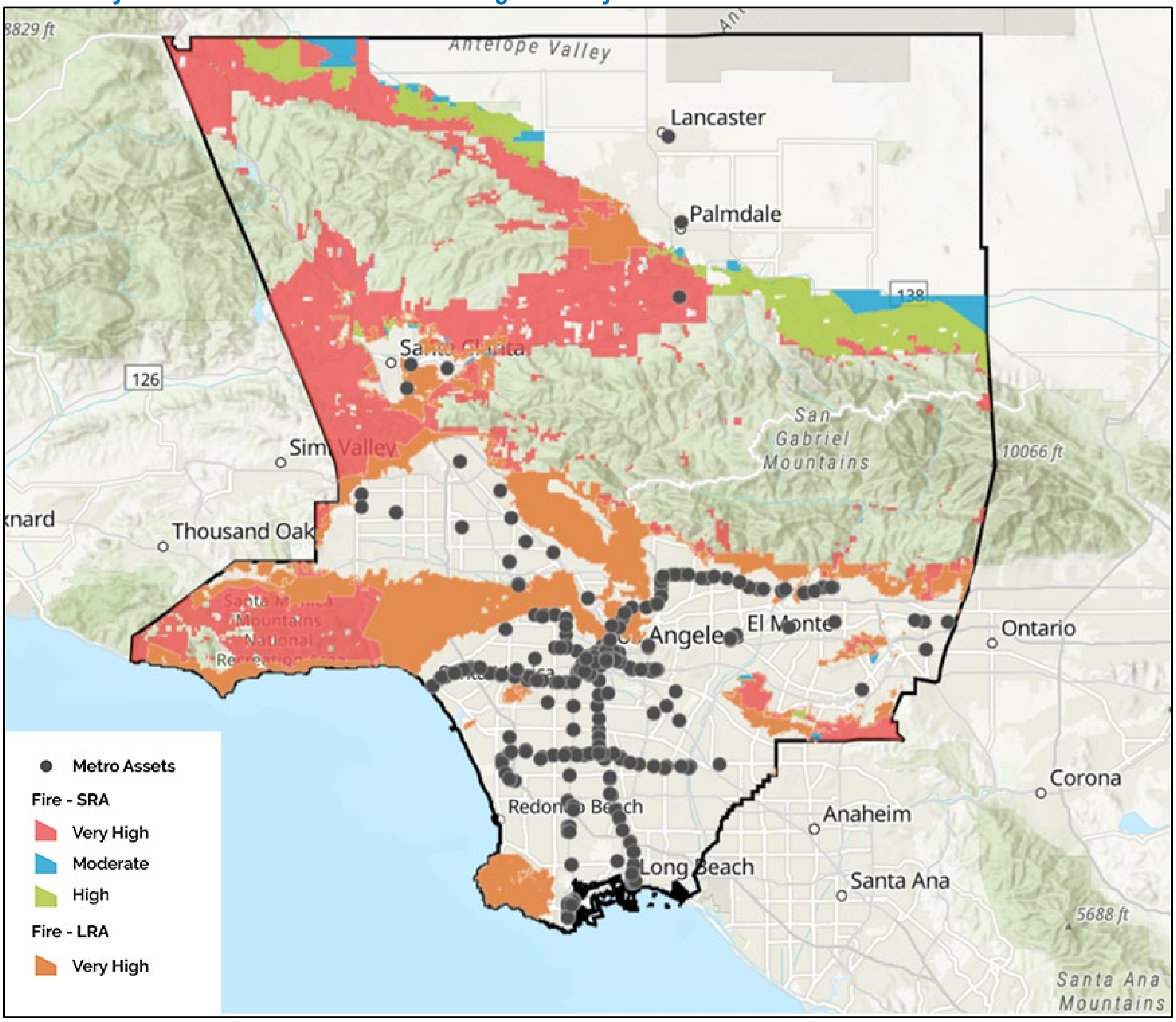
Caption: Strategic Firing Night of September 22, 2020.

Map: Fire Hazard Severity Zones
(Source: Los Angeles County General Plan, 2015)



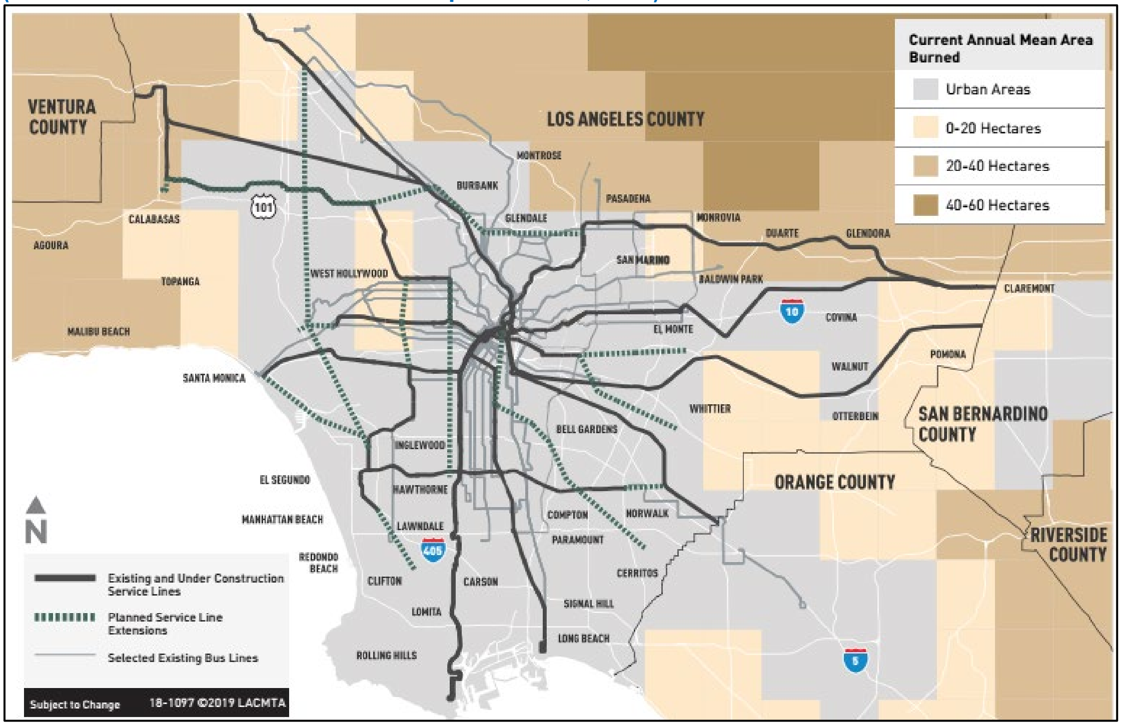
Source: Department of Regional Planning, May 2014. Additional Sources: California Department of Forestry and Fire Protection - Fire and Resource Assessment Program (FRAP), CALFIRE, County of Los Angeles Fire Department. Draft version, Current as of May 2014.

Map: Metro Critical Assets Impacted by Wildfire
(Source: General Technologies and Solutions)
*Note: Gray dot indicates Metro owned building or facility.

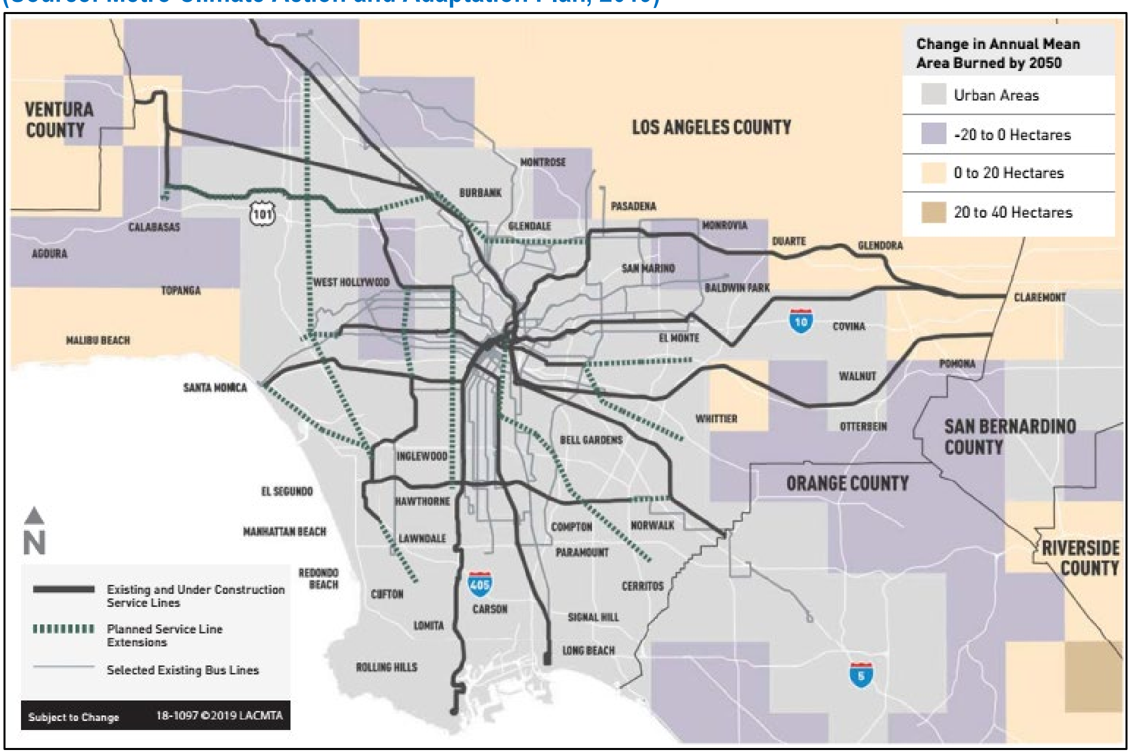


According to the Metro Climate Action and Adaptation Plan (2019), wildfires pose high risks to the northern and eastern parts of the rail system. Wildfires can cause costly damage to light rail infrastructure by melting catenary lines, burning sensitive equipment and damaging trackwork. Most parts of the rail system are not highly exposed to wildfire, but the parts that are exposed are at high risk. Wildfire impacts to bus routes are more limited. Roads might close due to wildfires, forcing buses to reroute, but these disruptions are typically temporary. Wildfires can also damage buildings and impact air quality, creating safety and health hazards for passengers, operators and staff.

Map: Current Wildfire Exposure to Metro Service Lines (Source: Metro Climate Action and Adaptation Plan, 2019)



Map: Projected Wildfire Exposure to Metro Service Lines (Source: Metro Climate Action and Adaptation Plan, 2019)



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii))   **A:** See **Impact of Wildfire in the Metro Service Area** below.

Impact of Wildfire in the Metro Service Area

Wildfires and their impact vary by location and severity of any given wildfire event. Based on the risk assessment, it is evident that wildfires will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but anticipated in future events include:

- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

Landslide Hazards

Hazard Definition

A landslide is defined as the movement of a mass of rock, debris, or earth movement down a slope. Landslides are a type of "mass wasting" which denotes any down slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses events such as rock falls, topples, slides, spreads, and flows. Landslides are initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by human-caused construction activities, or any combination of these factors. Landslides also occur underwater, causing tidal waves and damage to coastal areas. These landslides are called submarine landslides.

Photo: 2007 landslide in La Jolla, California
Source: Pam Irvine, USGS

Caption: This event occurred on October 4, 2007 in La Jolla, California. A landslide, perhaps first indicated in July by cracks appearing in pavement and homes along Soledad Mountain Road, struck suddenly when a massive slab of hillside broke loose, sending tons of dirt cascading toward streets below.

Landslide Characteristics

Landslides are a serious geologic hazard in almost every state in America. Nationally, landslides cause 25 to 50 deaths each year. The best estimate of direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually. As a seismically active region, California has a significant number of locations impacted by landslides. Some landslides result in private property damage, other landslides impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

Landslides can be broken down into two categories: 1) rapidly moving (generally known as debris flows), and 2) slow moving. Rapidly moving landslides or debris flows present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides, are at increased risk of serious injury. Slow moving landslides can cause significant property damage but are less likely to result in serious human injuries.

The primary effects of mudslides/landslides include abrupt depression and lateral displacement of hillside surfaces over distances of up to several hundreds of feet, disruption of surface drainage, blockage of flood control channels and roadways, displacement or destruction of improvements such as roadways, buildings, and water wells.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Previous Occurrences of Landslides in the Metro Service Area** below.

Previous Occurrences of Landslides in the Metro Service Area

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), landslides in Los Angeles are generally trigged by intense and/or prolonged rainfall but can also occur after an earthquake. Notable recent landslides in Los Angeles County include:

Photo: Landslide in Pacific Palisades
Source: USGS

Caption: The 1994 Northridge Earthquake caused the coastal bluff under this home in Pacific Palisades to undergo a landslide, causing half the home to be torn and fall down the slope.

Table: Landslides in Los Angeles County Since 1928
(Source: County of Los Angeles AHMP, 2019)

Date	Description
January 2019	Cost, unknown. Sections of the Pacific Coast Highway near the Ventura County line were closed due to mudslides.
December 2018	Cost, unknown. Heavy rain on the Woolsey Fire burned hillsides created debris flows and mudslides in and around Malibu causing several road closures
January 2018	Cost, unknown. A hillside in Malibu gave way leaving a house uninhabitable.
March 2005	Cost, unknown. A slide near Sunset Mesa caused 20,000 cubic yards of debris to cover the Pacific Coast Highway.
March 1995 Los Angeles and Ventura Counties	Cost, unknown. Above normal rainfall triggered damaging debris flows, deep-seated landslides, and flooding. Several deep-seated landslides were triggered by the storms, the most notable was the La Conchita landslide, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 km west of Ventura. There also was widespread debris-flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire two years before.
1994 Northridge Earthquake Landslides	Cost, unknown. As a result of the M6.7 Northridge Earthquake, more than 11,000 landslides occurred over an area of 10,000 km^2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. Destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. Caused deaths from Coccidioidomycosis (valley fever) the spore of which was released from the soil and blown toward the coastal populated areas. The spore was released from the soil by the landslide activity.
1983 Big Rock Mesa	Cost, $706 million (2000 Dollars) in legal claims, condemnation of 13 houses, and 300 more threatened rockslide caused by rainfall.
1980 Southern California Slides	Cost, $1.1 billion in damage (2000 Dollars). Heavy winter rainfall in 1979-90 caused damage in six Southern California counties. In 1980, the rainstorm started on February 8. A sequence of 5 days of continuous rain and 7 inches of precipitation had occurred by February 14. Slope failures were beginning to develop by February 15 and then very high-intensity rainfall occurred on February 16. As much as eight inches of rain fell in a six-hour period in many locations. Records and personal observations in the field on February 16 and 17 showed that the mountains and slopes literally fell apart on those two days.
1979 Big Rock	Cost, $1.08 billion (2000 Dollars). California Highway 1 rockslide.
1977-1980 Monterey Park, Repetto Hills	Cost, $14.6 million (2000 Dollars). 100 houses damaged in 1980 due to debris flows.
1971 Juvenile Hall, San Fernando	Cost, $266.6 million (2000 Dollars). Landslides caused by the February 9, 1971, San Fernando earthquake. In addition to damaging the San Fernando Juvenile Hall, this 1.2 km-long slide damaged trunk lines of the Southern Pacific Railroad, San Fernando Boulevard, Interstate Highway 5, the Sylmar electrical converter station, and several pipelines and canals.
1971 Upper and Lower Van Norman Dams, San Fernando	Cost, $302.4 million (2000 Dollars). Earthquake-induced landslides. Damage due to the February 9, 1971, M7.5 San Fernando, Earthquake. The earthquake of February 9 severely damaged the Upper and Lower Van Norman Dams.
1970 Princess Park	Cost, $29.1 million (2000 Dollars). California Highway 14, ten miles north of Newhall, near Saugus, northern Los Angeles County.
1969 Glendora	Cost, $26.9 million (2000 Dollars). Los Angeles County, 175 houses damaged, mainly by debris flows.
1969 Seventh Avenue	Cost, $14.6 million (2000 Dollars). California Highway 60.
1963 Baldwin Hills Dam	Cost, $50 million (1963 Dollars). On December 14, the 650-foot-long by 155-foot-high earth fill dam gave way and sent 360 million gallons of water in a fifty-foot-high wall cascading onto the community below, killing five persons.
1961 Mulholland Cut	Cost, $41.5 million (2000 Dollars). On Interstate 405, 11 miles north of Santa Monica, Los Angeles County.
1958-1971 Pacific Palisades	Cost, $29.1 million (2000 Dollars). California Highway 1 and house damaged.

1956 Portuguese Bend	Cost, $14.6 million (2000 Dollars). California Highway 14, Palos Verdes Hills. Land use on the Palos Verdes Peninsula consists mostly of single-family homes built on large lots, many of which have panoramic ocean views. All of the houses were constructed with individual septic systems, generally consisting of septic tanks and seepage pits. Landslides have been active here for thousands of years, but recent landslide activity has been attributed in part to human activity. The Portuguese Bend Landslide began its modern movement in August 1956, when displacement was noticed at its northeast margin. Movement gradually extended down slope so that the entire eastern edge of the slide mass was moving within 6 weeks. By the summer of 1957, the entire slide mass was sliding towards the sea.
1928 St. Francis Dam	Cost, $672.1 million (2000 Dollars). The dam, located in Los Angeles County, gave way on March 12, and its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. Sixty-five miles of valley was devastated, and over 500 people were killed.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Local Conditions** below.

Local Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), there are 750.02 square miles (15.75%) of land in Los Angeles County located in the Classes IX and X. In the unincorporated areas of Los Angeles County, there are 577.63 square miles (18.99%) in this hazard area.

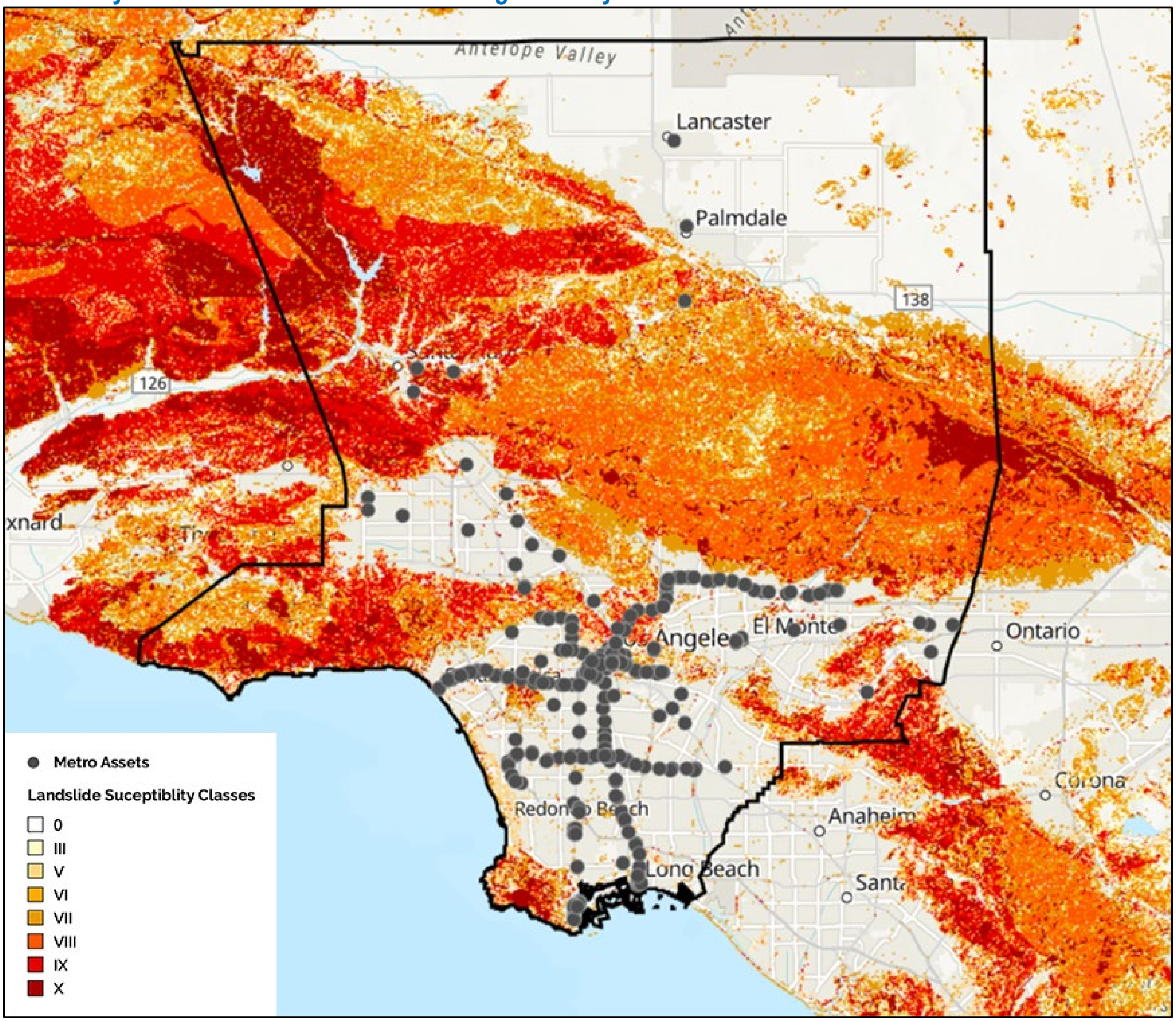
Areas prone to landslide include existing old landslides, base of slopes, base of minor drainage hollows, base or top of an old fill slope, base or top of a steep cut slope, and developed hillsides where leach field septic systems are used. In Los Angeles County, the majority of landslide-prone areas include the Santa Monica Mountains, the San Gabriel Mountains, the Sierra Pelona Mountains, the Baldwin Hills, the Puente Hills, and the Palos Verdes Hills. Landslides may: cause injury or death to those trapped; break utility lines; block/damage roadways; damage foundations, chimneys, or surrounding land; and lead to flash flooding and additional land sliding. In Los Angeles County, landslide risks are mitigated through the Hillside Management Area Ordinance and Hillside Design Guidelines.

According to the Metro Climate Action and Adaptation Plan (2019), landslides and mudslides could occur more often in the future due to increased frequency or severity of wildfires and heavy precipitation events. Almost all aspects of Metro's transportation system are sensitive to landslides, since they can block rails, damage equipment and vehicles and engulf buildings, parking lots and yards. Any of these impacts can cause service delays and require costly and extended repair. Land or mudslides can block roads and disrupt bus routes. Such disruption poses most risk to assets that lie at the foothills of mountains. Catenary lines can be particularly costly to repair or protect from landslide damage.

Photo: 2005 Landslide in Conchita, CA
Source: Mark Reid, USGS

Caption: This landslide occurred at La Conchita, California in 2005. Ten people were killed.

Map: Metro Critical Assets Impacted by Landslides
(Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impacts of Landslides in the Metro Service Area** below.

Impacts of Landslides in the Metro Service Area

Based on the risk assessment, it is evident that landslides will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but can be anticipated in future events, include:

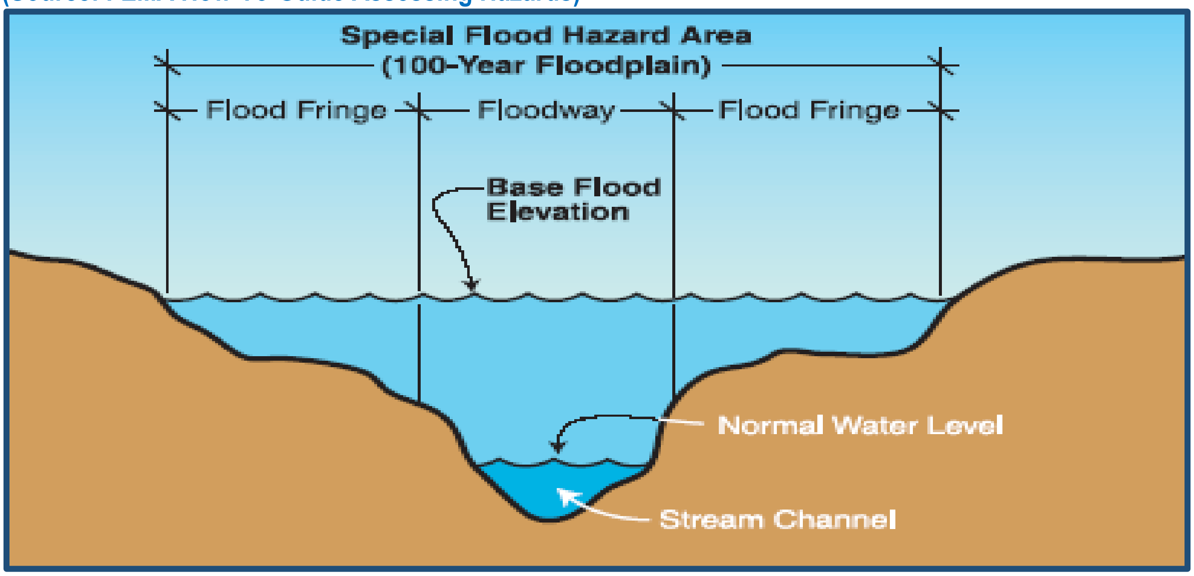
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

Flood Hazards

Hazard Definition

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The floodplain is made up of two sections: the floodway and the flood fringe. The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. **Schematic: Floodplain and Floodway** shows the relationship of the floodplain and the floodway.

Figure: Floodplain and Floodway
(Source: FEMA How-To-Guide Assessing Hazards)



Types of Flooding

Two types of flooding primarily affect the region: slow-rise or flash flooding. Slow-rise floods may be preceded by a warning period of hours or days. Evacuation and sandbagging for slow-rise floods have often effectively lessened flood related damage. Conversely, flash floods are most difficult to prepare for, due to extremely limited, if any, advance warning and preparation time.

Recently, sea level rise has become an increasing concern in coastal areas. See Climate Change Hazards – Sub-Hazard: Sea Level Rise for more information.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Flooding in the Metro Service Area Service Area** below.

Previous Occurrences of Flooding in the Metro Service Area

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), there have been 13 Presidential disaster declarations for flooding emergencies affecting Los Angeles County, including:

Table: Los Angeles County Presidential Declarations - Flooding (Source: County of Los Angeles AHMP, 2019)

Date	Description
January 18, 2017-January 23, 2017	California Severe Winter Storms, Flooding, and Mudslides (DR-4305)
January 7, 1993-February 19, 1993	California Winter Storms (DR-979)
February 12 and 19, 1992	California Winter Storms (DR-935)
December 21, 1988	Coastal Storms (DR-812)
February 7 and 21, 1980	Southern California Winter Storms (DR-615)
February 15, 1978	California Winter Storms Flooding (DR-547)
August 15, 1969	California Flooding (DR-270)
February 25, 1963	California Severe Storms, Heavy Rains, Flooding (DR-145)
October 24, 1962	California Severe Storms, Flooding (DR-138)
March 6, 1962	California Floods (DR-122)
April 4, 1958	California Heavy Rainstorms, Flood (DR-82)
December 23, 1955	California Flooding (DR-47)
February 5, 1954	California Flood and Erosion (Disaster Declaration # [DR]-15)

Photo: Debris flow damage in California
Source: Susan Cannon, USGS

Caption: House damaged by debris flows generated in Mullally Canyon in response to a rainstorm on February 6, 2010. The drainage basin above this home was burned the previous summer by the Station Fire, which was the largest fire in the history of Los Angeles County at the time.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Local Conditions** below.

Local Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), Los Angeles County has a long history of moderate to severe flooding during major storms. In the Los Angeles basin area, an extensive flood control system has eliminated much of this problem. However, in the less densely populated areas where relatively few flood controls have been constructed, flooding remains a problem. In areas with alluvial fans, flood flows discharge from the mountainous canyons in an uncontrolled manner onto the desert floor, thereby resulting in widespread damage to agricultural land, buildings, and infrastructure. In the foothill areas that experience intense rainfall, mudflows pose a risk to those downstream. Finally, along the coast, waves generated by winter storms in combination with high astronomical tides and strong winds can cause a significant wave runup, resulting in erosion and coastal flooding to low-lying portions of the shoreline. Floods can occur at any time but are most common with winter storms packed with subtropical moisture.

Major flood sources in Los Angeles County still include Ballona Creek, Los Angeles River, Malibu Creek, Pacific Ocean, Rio Hondo River, San Gabriel River and its tributaries, Santa Clara River, Topanga Canyon, and the Pacific Ocean. In the unincorporated areas of Los Angeles County, flooding sources include:

• **Little Rock and Big Rock Washes**: Flooding occurs when the flows reach the valley floor where the channels flatten out. This allows the flows to spread over great distances, inundating the surrounding areas.

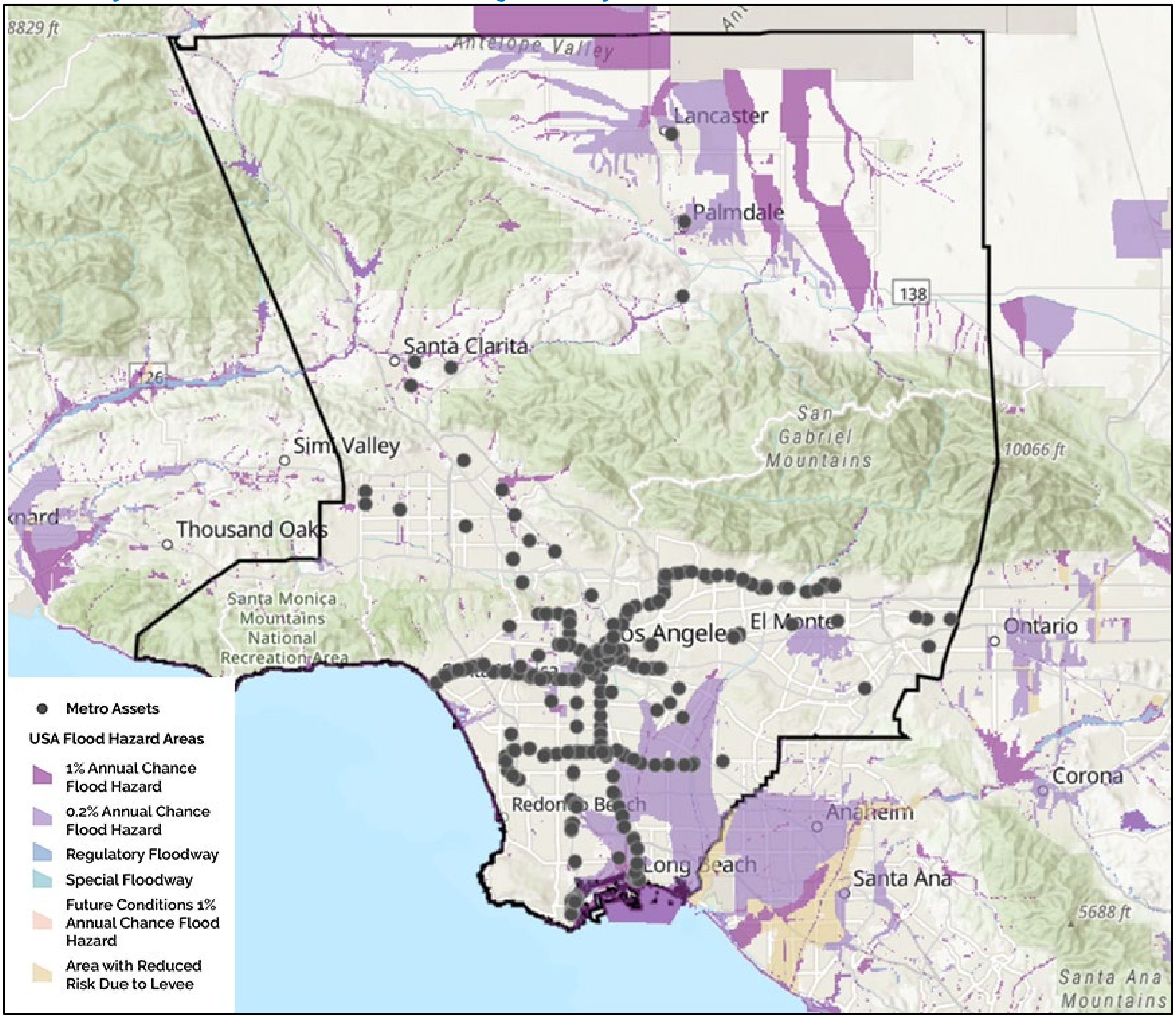
• **Antelope Valley**: Flooding occurs when flows from the mountains reach the broad alluvial plan in the Antelope Valley are northerly from the mountains across the broad alluvial plain. During minor storms, much of the flow percolates into the ground. In major storms, flows reach the lake at the northern county limits, where flood flows pond until evaporated.

• **Foothills of Santa Clarita**: Flooding and mudflows occur in the foothill areas during intense rainfall, usually following fires in the upstream watershed.

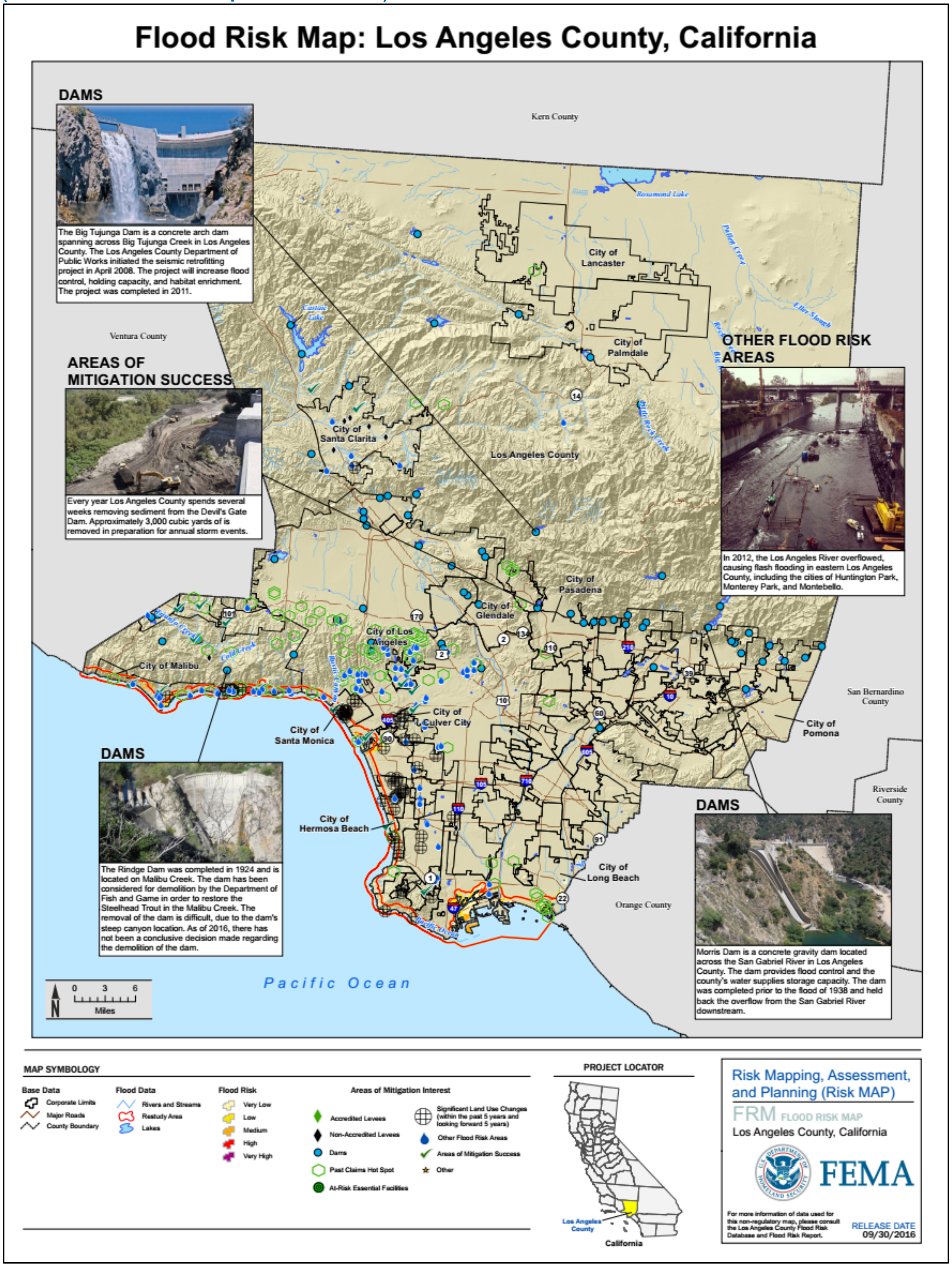
• **Coastline**: Flooding is caused by waves generated by winter storms. The occurrence of such a storm event in combination with high astronomical tides and strong winds can cause a significant wave runup and allow storm waves to reach higher than normal elevations along the coastline.

The Los Angeles County Digital Flood Insurance Rate Map (DFIRM) identifies 4.19 square miles (0.09%) with a 1% annual chance of flooding, and 243.32 square miles (5.11%) with a 0.2% annual chance of flooding. In the unincorporated areas of Los Angeles County, there are 1.23 square miles (0.04%) with a 1% annual chance of flooding, and an additional 64.77 square miles (2.13 %) with a 0.2% annual chance of flooding.

Map: Metro Critical Assets Impacted by Flooding
(Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



Map: Flood Risk Map - Los Angeles County, California
(Source: FEMA Flood Map Service Center)



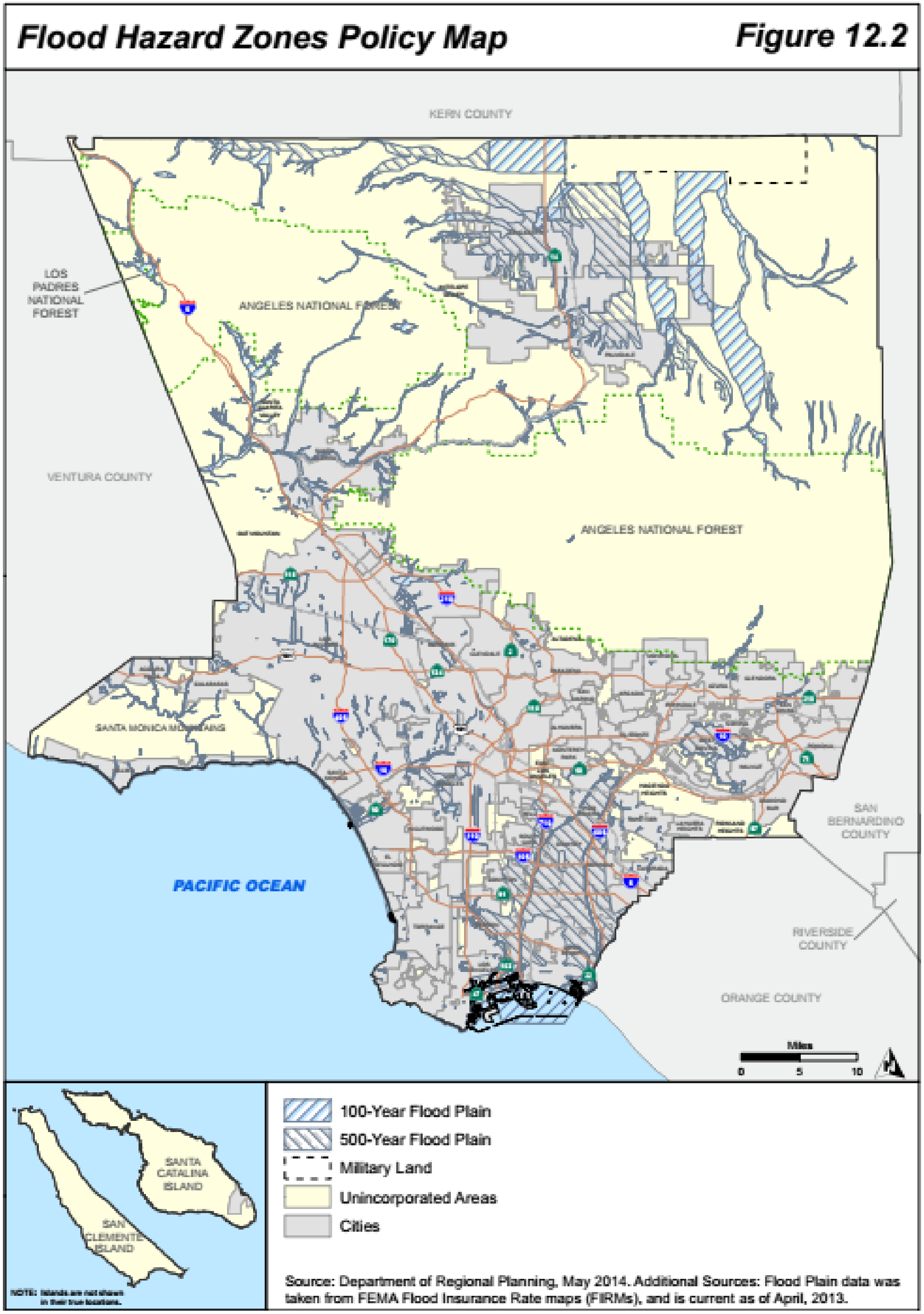
Q&A | ELEMENT C. MITIGATION STRATEGY | C2
Q: Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii)) **A:** See **NFIP Participation** below.

National Flood Insurance Program

The County of Los Angeles participate in the National Flood Insurance Program (NFIP). Created by Congress in 1968, the NFIP makes flood insurance available in communities that enact minimum floodplain management rules consistent with the Code of Federal Regulations §60.3.

According to FEMA, Metro's service area includes a broad range of flood zone designations. The County of Los Angeles All Hazards Mitigation Plan identifies that the Los Angeles County DFIRM identifies 4.19 square miles (0.09%) with a 1% annual chance of flooding (100-year floodplain), and 243.32 square miles (5.11%) with a 0.2% annual chance of flooding (500-year floodplain). These areas are highlighted below in **Map: Flood Hazard Zones** from the Los Angeles County General Plan, 2015.

Map: Flood Hazard Zones
(Source: Los Angeles County General Plan, 2015)



Definitions of FEMA Flood Zone Designations

Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.

Moderate to Low Risk Areas

In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:

ZONE	DESCRIPTION
B and X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
C and X (unshaded)	Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.

High Risk Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.

ZONE	DESCRIPTION
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

Undetermined Risk Areas

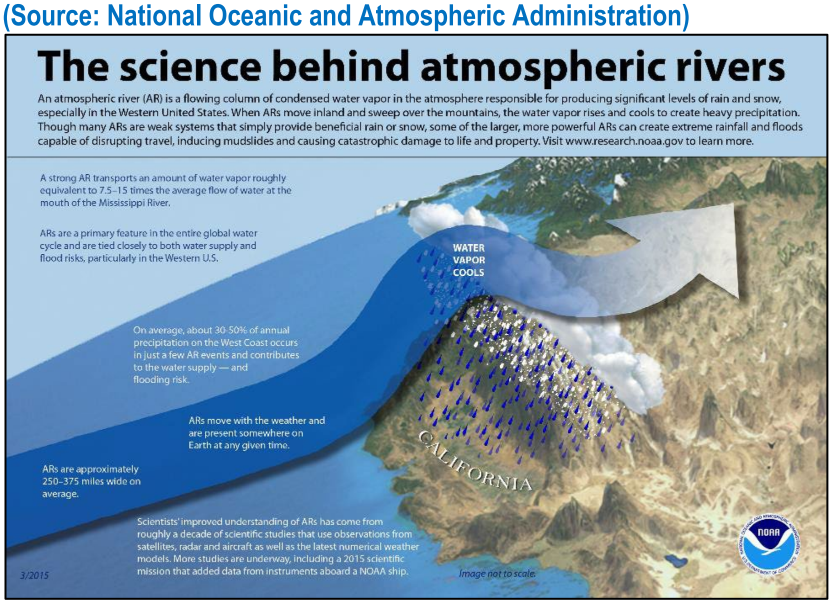
ZONE	DESCRIPTION
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Atmospheric Rivers

According to the National Oceanic and Atmospheric Administration (NOAA), atmospheric rivers are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. These columns of vapor move with the weather, carrying an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow.

Although atmospheric rivers come in many shapes and sizes, those that contain the largest amounts of water vapor and the strongest winds can create extreme rainfall and floods, often by stalling over watersheds vulnerable to flooding. These events can disrupt travel, induce mudslides and cause catastrophic damage to life and property. A well-known example is the "Pineapple Express," a strong atmospheric river that is capable of bringing moisture from the tropics near Hawaii over to the U.S. West Coast.

Graphic: Atmospheric Rivers
(Source: National Oceanic and Atmospheric Administration)



While atmospheric rivers are responsible for great quantities of rain that can produce flooding, they also contribute to beneficial increases in snowpack. A series of atmospheric rivers fueled the strong winter storms that battered the U.S. West Coast from western Washington to southern California from December 10–22, 2010, producing 11 to 25 inches of rain in certain areas. These rivers also contributed to the snowpack in the Sierras, which received 75 percent of its annual snow by December 22, the first full day of winter.

NOAA research (e.g., NOAA Hydrometeorological Testbed and Cal Water) uses satellite, radar, aircraft and other observations, as well as major numerical weather model improvements, to better understand atmospheric rivers and their importance to both weather and climate.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Flooding in the Metro Service Area** below.

Impact of Flooding in the Metro Service Area

Floods and their impacts vary by location and severity of any given flood event, and likely only affect certain areas of the region during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but anticipated in future events include:

- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

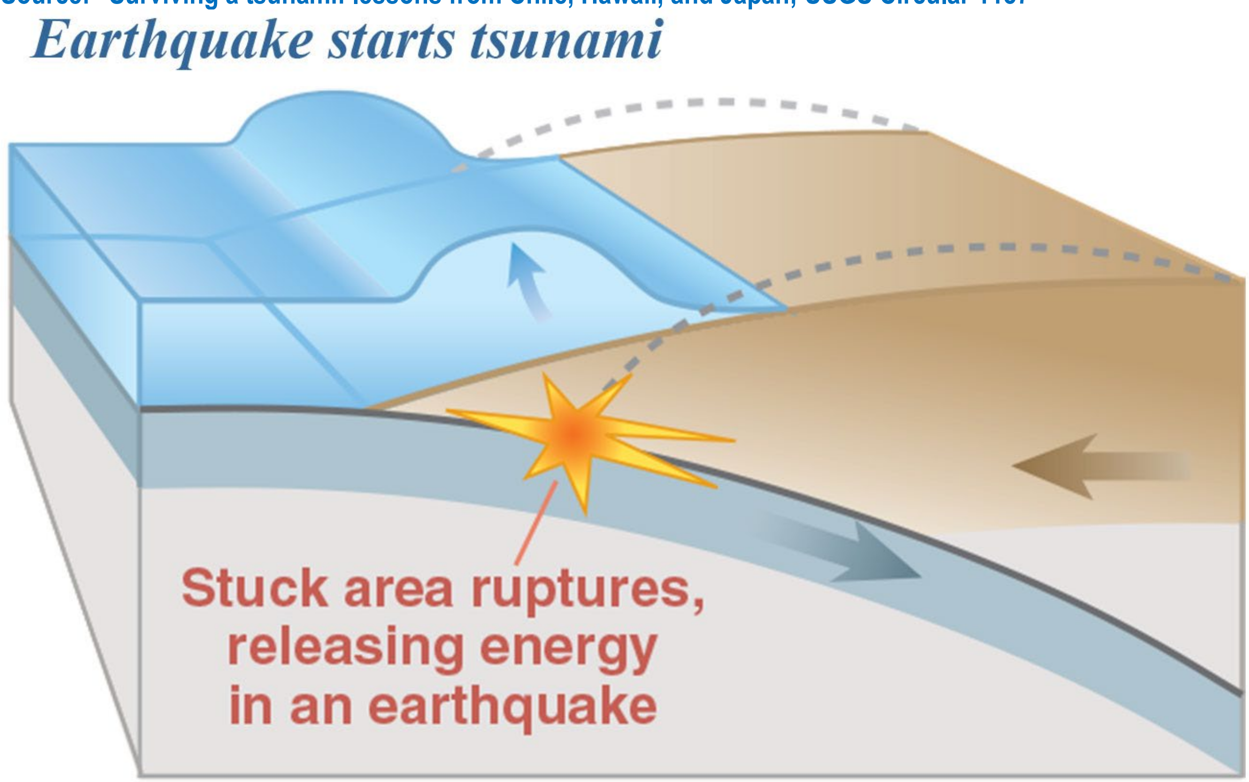
Tsunami Hazards

Hazard Definition

According to the Intergovernmental Oceanographic Commission brochure titled “Tsunami: The Great Waves” (2012), the phenomenon we call “tsunami” (soo-NAH-mee) is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves move with a speed exceeding 500 miles per hour, and a wave height of only a few inches. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction up to 30 feet or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 100 feet. Even a tsunami 1-3 feet high can inflict destructive damage and cause many deaths and injuries.

Infographic: Earthquake Starts Tsunami
Source: “Surviving a tsunami: lessons from Chile, Hawaii, and Japan; USGS Circular 1187”



Caption: An earthquake along a subduction zone happens when the leading edge of the overriding plate breaks free and springs seaward, raising the sea floor and the water above it. This uplift starts a tsunami. Meanwhile, the bulge behind the leading edge collapses, thinning the plate and lowering coastal areas.

Earthquakes and Tsunamis

An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.
Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean and cause vertical movement of the sea floor over a large area, hundreds or thousands of square miles. “By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor.” The amount of vertical and horizontal motion of the sea floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the efficiency with which energy is transferred from the earth’s crust to the ocean water are all part of the tsunami generation mechanism. The sudden vertical displacements over such large areas, disturb the ocean's surface, displace water, and generate destructive tsunami waves.

Photo: Tsunami in Indonesia
Source: Antara Foto, Reuters, The New York Times

Caption: A ship was stranded amid the destruction Monday after an earthquake and tsunami hit Donggala, Indonesia, near the mouth of Palu Bay on the island of Sulawesi.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Tsunami in the Metro Service Area** below.

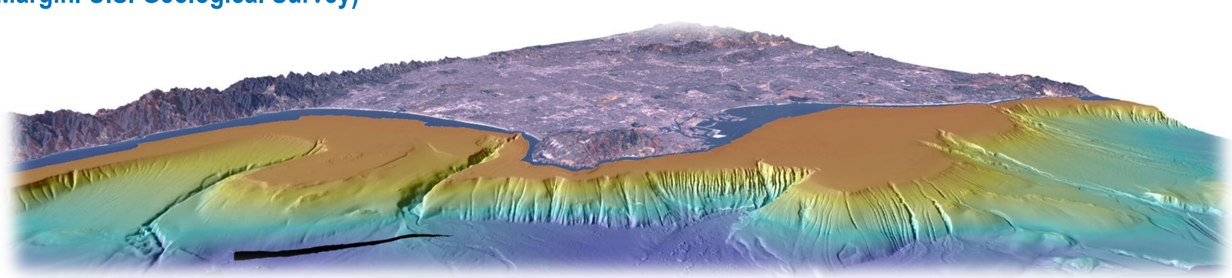
Previous Occurrences of Tsunamis in the Metro Service Area

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), eleven major tsunami events have occurred in Los Angeles County in the last century, including:

Table: Los Angeles County Tsunamis
(Source: County of Los Angeles AHMP, 2019)

Date	Locations	Maximum Run up*(m)	Earthquake Magnitude
April 13, 1923	Kamchatka	Unknown	M 7.2
August 30, 1930	Santa Monica	9 to 10 feet	N/A
April 1, 1946	Earthquake near Aleutian Islands affecting Catalina Island, Los Angeles, and Long Beach	1 to 6 feet	M 8.8
November 4, 1952	Earthquake near Kamchatka affecting Santa Monica, Los Angeles, and Long Beach	1 to 2 feet	M 9.0
March 9, 1957	Earthquake near Aleutian Islands affecting Santa Monica, Los Angeles, and Long Beach	1 to 2 feet	M 8.6
May 22, 1960	Earthquake in Chile affecting Catalina Island, Los Angeles, Long Beach, and Santa Monica	2 to 5 feet	M 9.5
March 28, 1964	Earthquake in Alaska affecting Catalina Island, Los Angeles, Long Beach, and Santa Monica	2 to 3 feet	M 9.2
November 29, 1975	Earthquake in Hawaii affecting Catalina Island	3 to 4 feet	M 8.0
September 29, 2009	Earthquake in Samoa affecting Los Angeles	1 to 2 feet	M 8.0
February 27, 2010	Earthquake in Chile affecting Catalina Island, Los Angeles, Long Beach, and Santa Monica	1 to 3 feet	M 8.8
March 11, 2011	Earthquake in Japan affecting Catalina Island, Los Angeles, Long Beach, Redondo Beach, and Santa Monica	2 to 3 feet	M 9.0

3D Illustration: Los Angeles Margin and Basin
Source: Gardner, James V., and Peter Dartnell, 2002. Multibeam Mapping of the Los Angeles, California Margin. U.S. Geological Survey)



Caption: Overall perspective view of the Los Angeles Margin and Basin looking northeast. The distance across the bottom of the image is about 100 kilometers with a vertical exaggeration of 6 times. The margin is bisected by a series of large underwater canyons, channels, and gullies. Underwater landslides occur along the steep slope off the Palos Verdes Peninsula (far right) depositing large blocks into the deeper basin.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Local Conditions** below.

Local Conditions

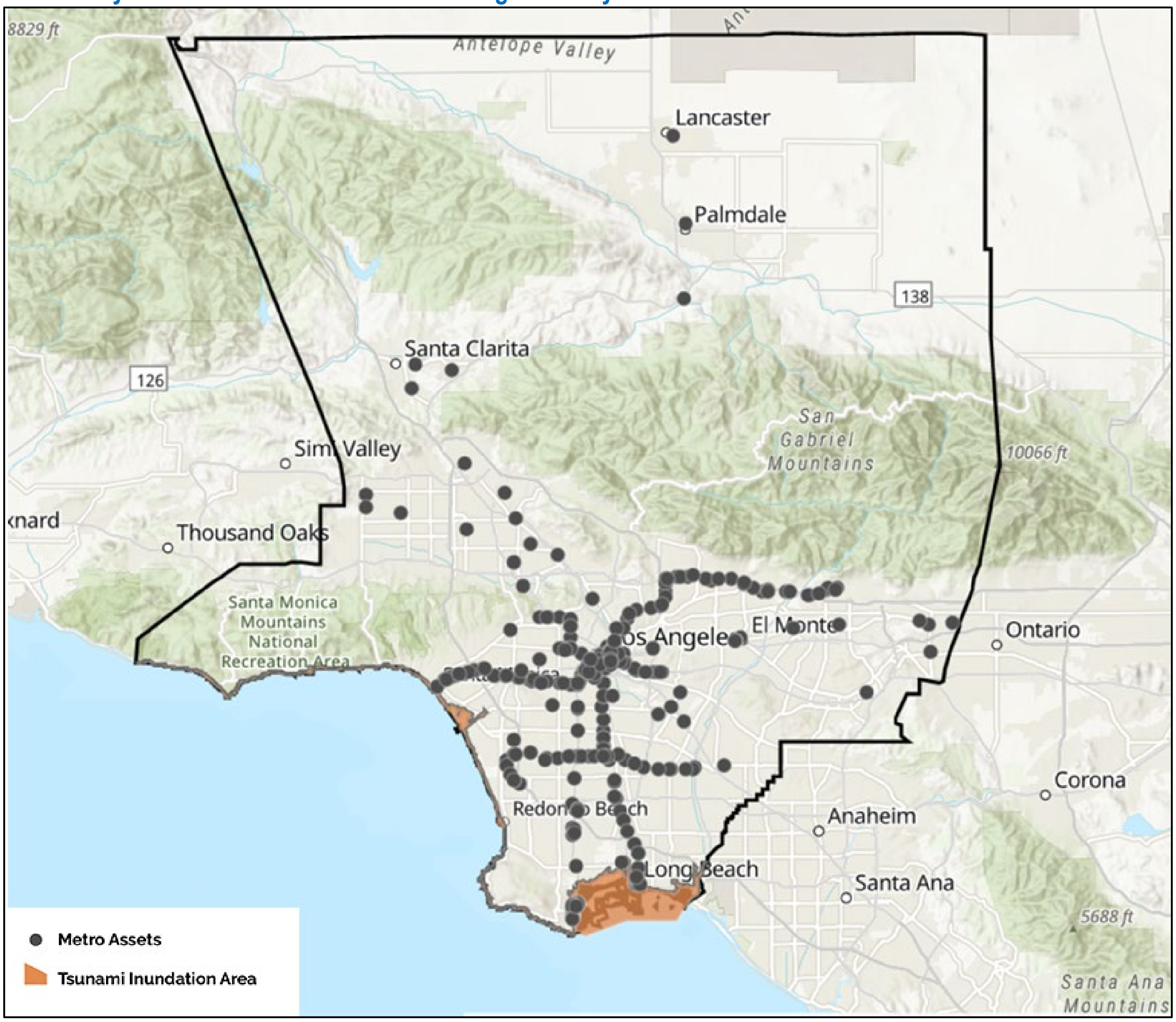
In Los Angeles County, areas at risk of maximum tsunami run up include the ports of Long Beach and Los Angeles, Catalina Island, and areas in the cities of Los Angeles, Long Beach, Manhattan Beach, Redondo Beach, Hermosa Beach, El Segundo, Palos Verdes, Santa Monica, and Malibu. In the unincorporated areas of Los Angeles County, the five coastal zones (i.e., Marin Del Rey, Santa Catalina Island, Santa Monica Mountains, San Clemente Island, and Ballona Wetlands) are subject to inundation.

In Southern California, an earthquake could trigger an underwater avalanche or submarine landslide in the Santa Monica Bay and produce a tsunami that could inundate low-lying areas of Los Angeles County. According to researchers a locally generated tsunami could bring water as high as 5 feet in Marina del Rey, 7 feet in Manhattan Beach and 11 feet in Redondo Beach. Such a tsunami could flood homes and destroy many small boats in nearby harbors, thereby creating dangerous debris.

Based on the history of tsunami run-ups in the region and the history of earthquakes in the Pacific Rim, another tsunami event is likely to occur, although the extent and probability is unknown.

Map: Metro Critical Assets Impacted by Tsunami shows the maximum considered tsunami runup from several extreme tsunami sources. According to the County of Los Angeles All-Hazards Mitigation Plan (2019), there are 43.35 square miles (0.91%) in Los Angeles County located in this hazard area. In the unincorporated areas of Los Angeles County there are 2.07 square miles (0.07%) at risk to a maximum tsunami runup.

Map: Metro Critical Assets Impacted by Tsunami
(Source: General Technologies and Solutions)
***Note: Gray dot indicates Metro owned building or facility.**



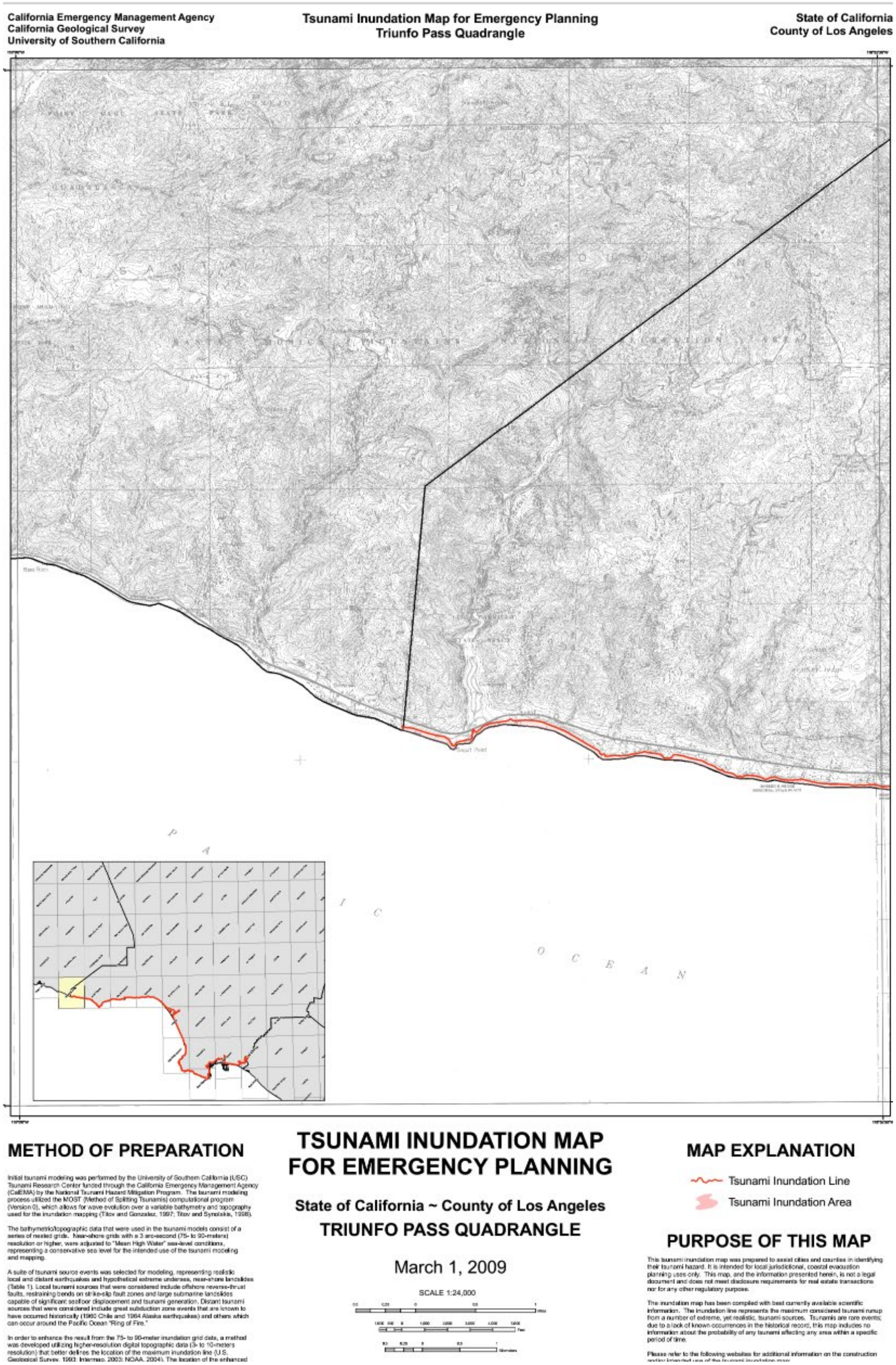
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Tsunamis in the Metro Service Area** below.

Impact of Tsunamis in the Metro Service Area

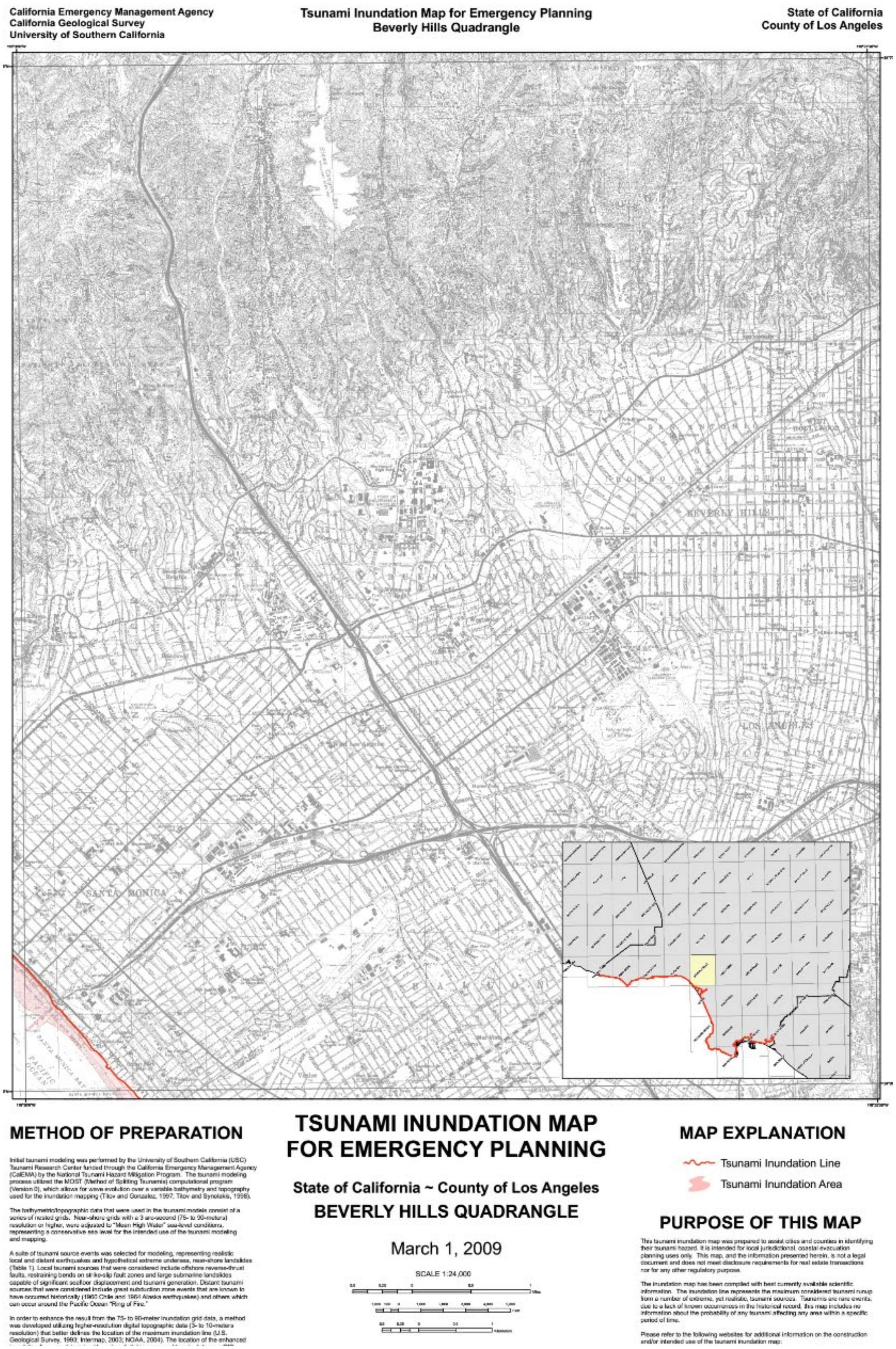
Based on the risk assessment, it is evident that tsunamis will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

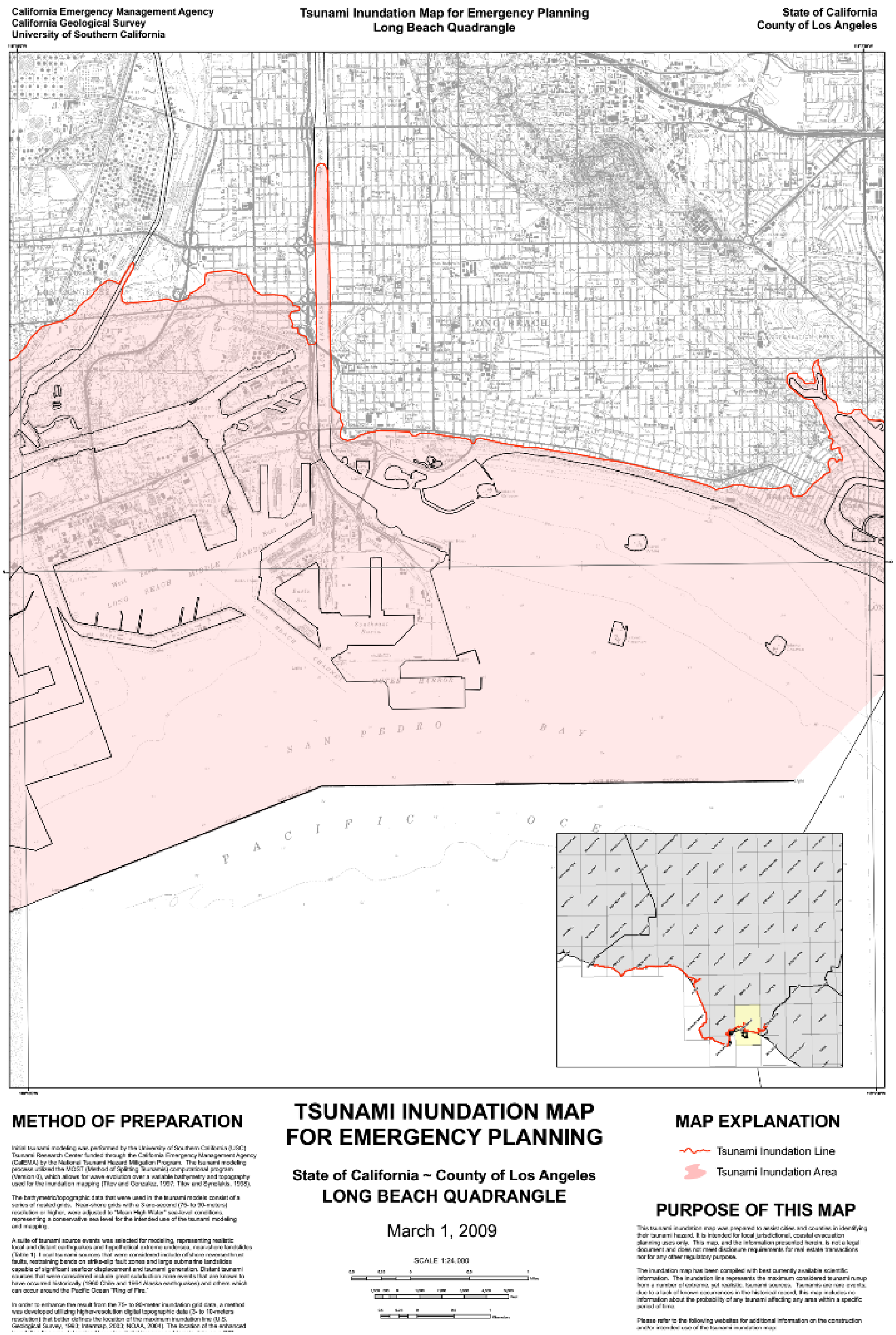
Map: Tsunami Inundation Map – Triunfo Pass Quadrangle (Source: California Department of Conservation)



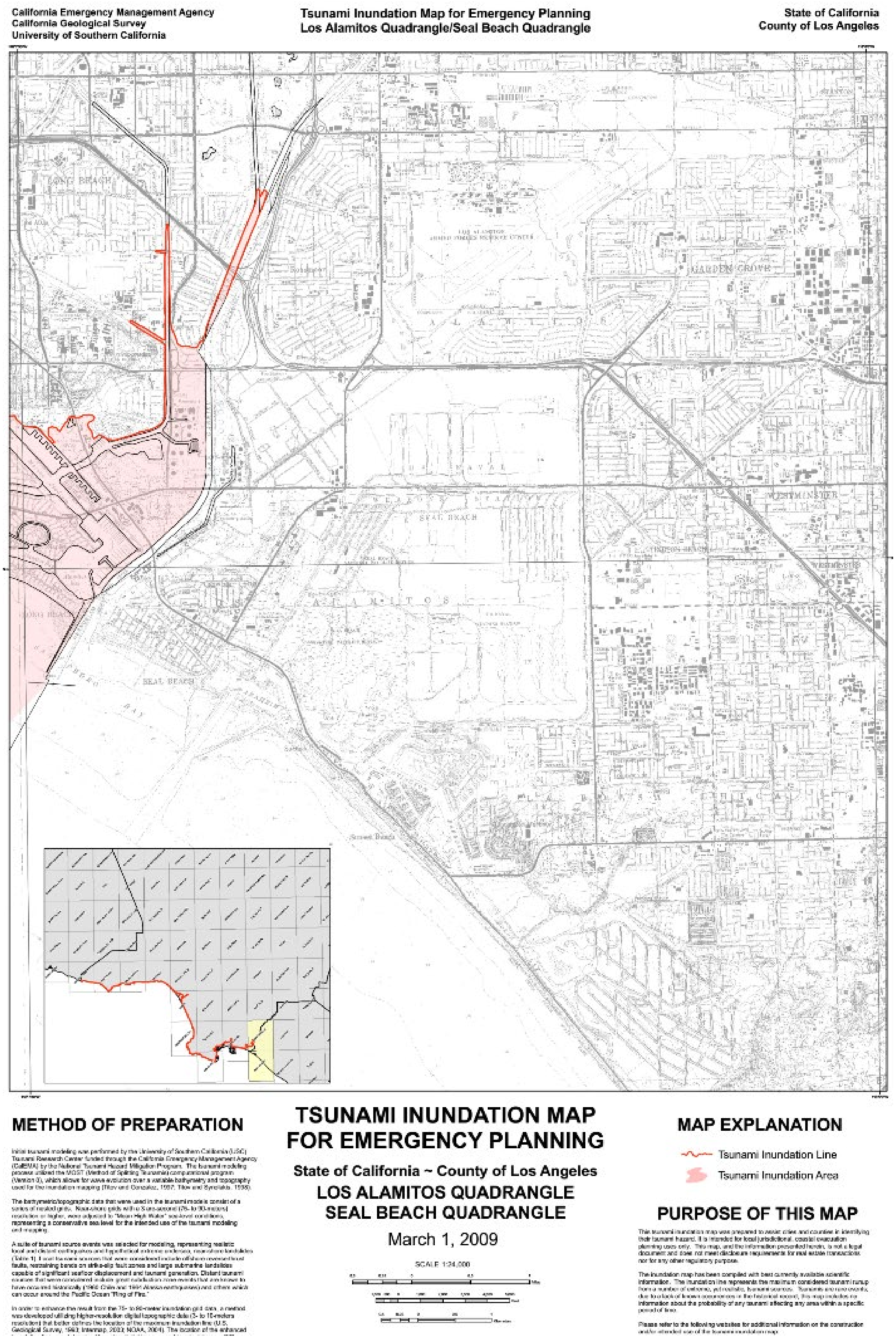
Map: Tsunami Inundation Map – Beverly Hills Quadrangle (Source: California Department of Conservation)



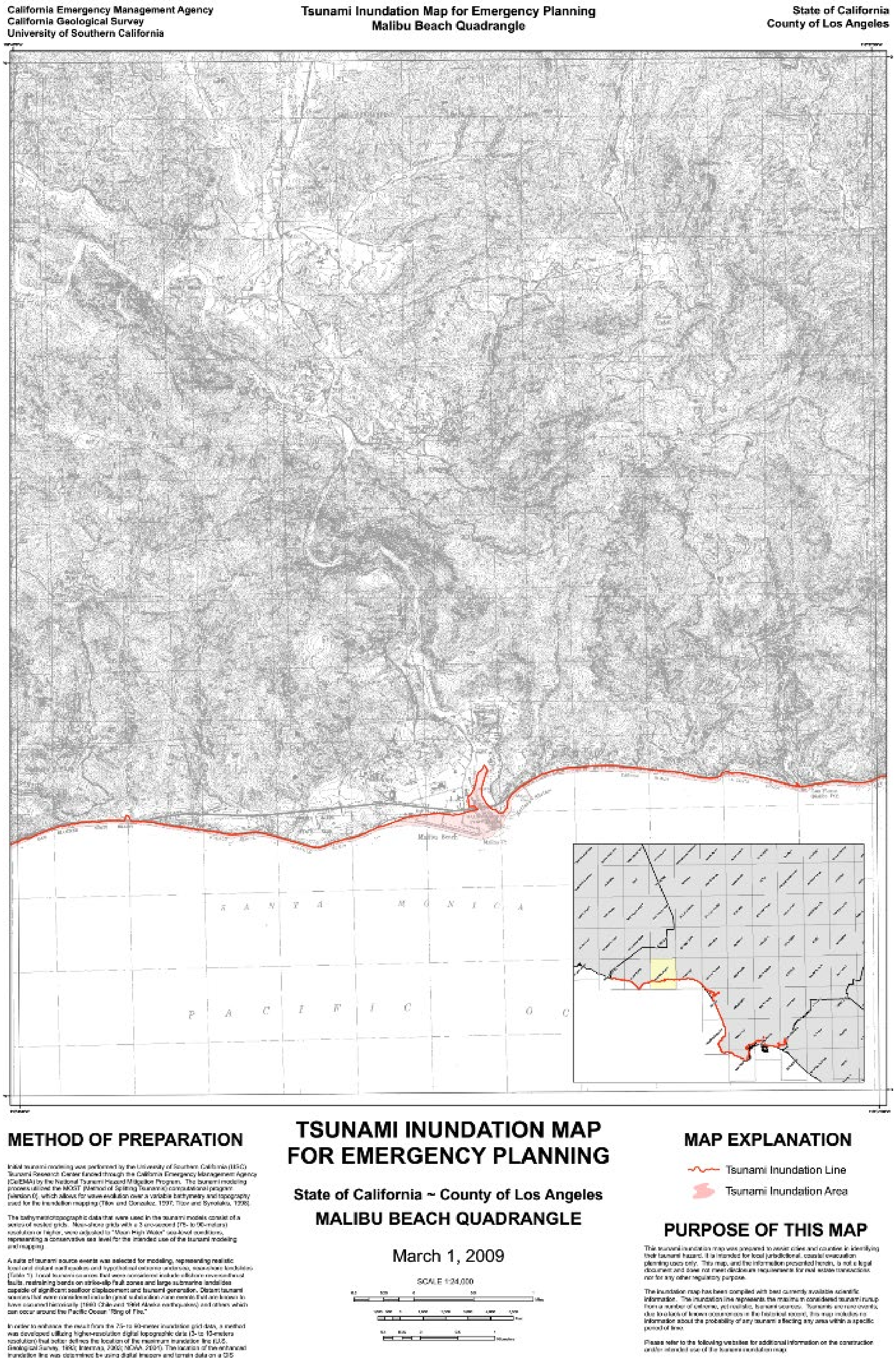
Map: Tsunami Inundation Map – Long Beach Quadrangle (Source: California Department of Conservation)



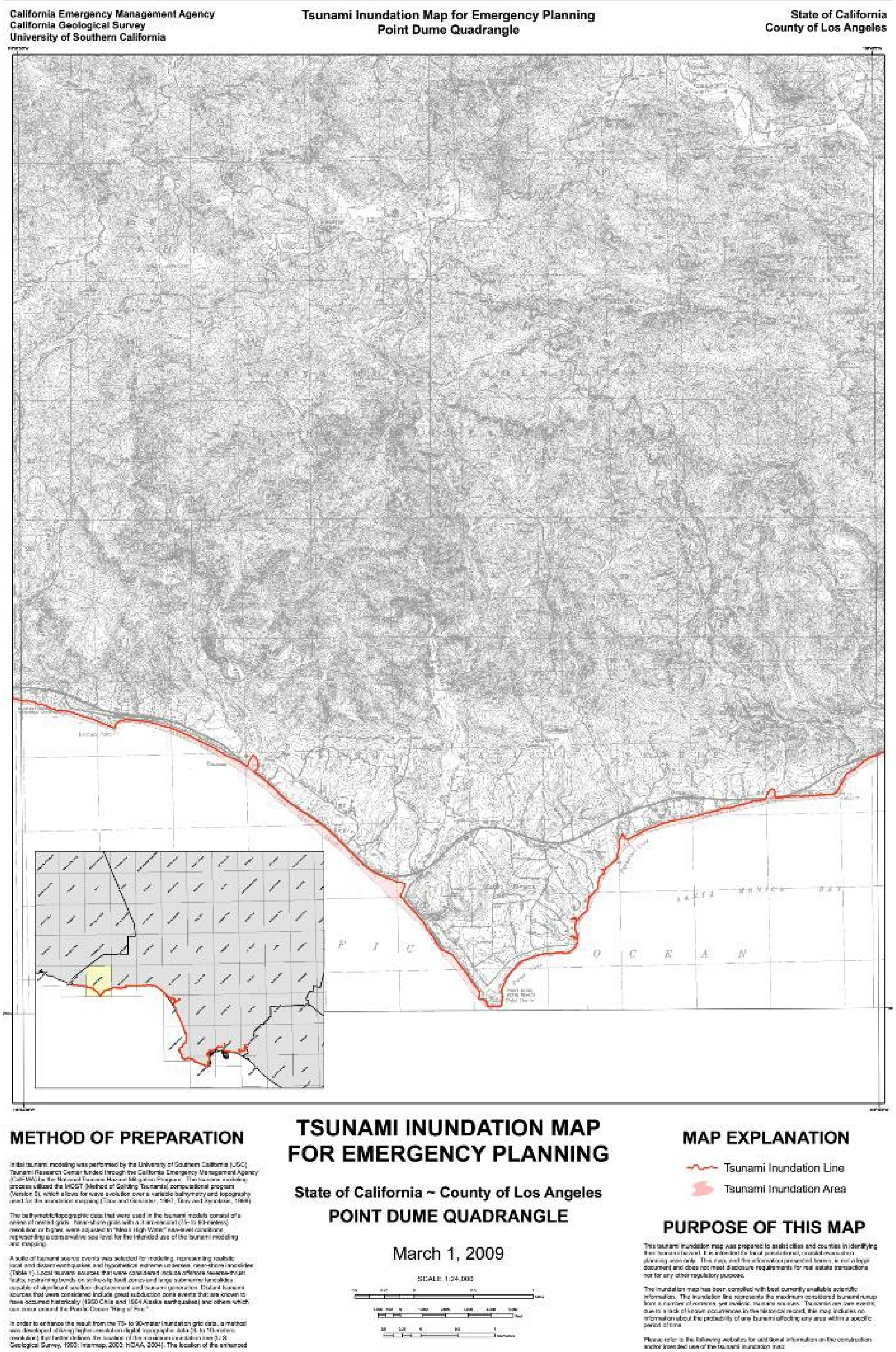
Map: Tsunami Inundation Map – Los Alamitos/Seal Beach Quadrangle (Source: California Department of Conservation)



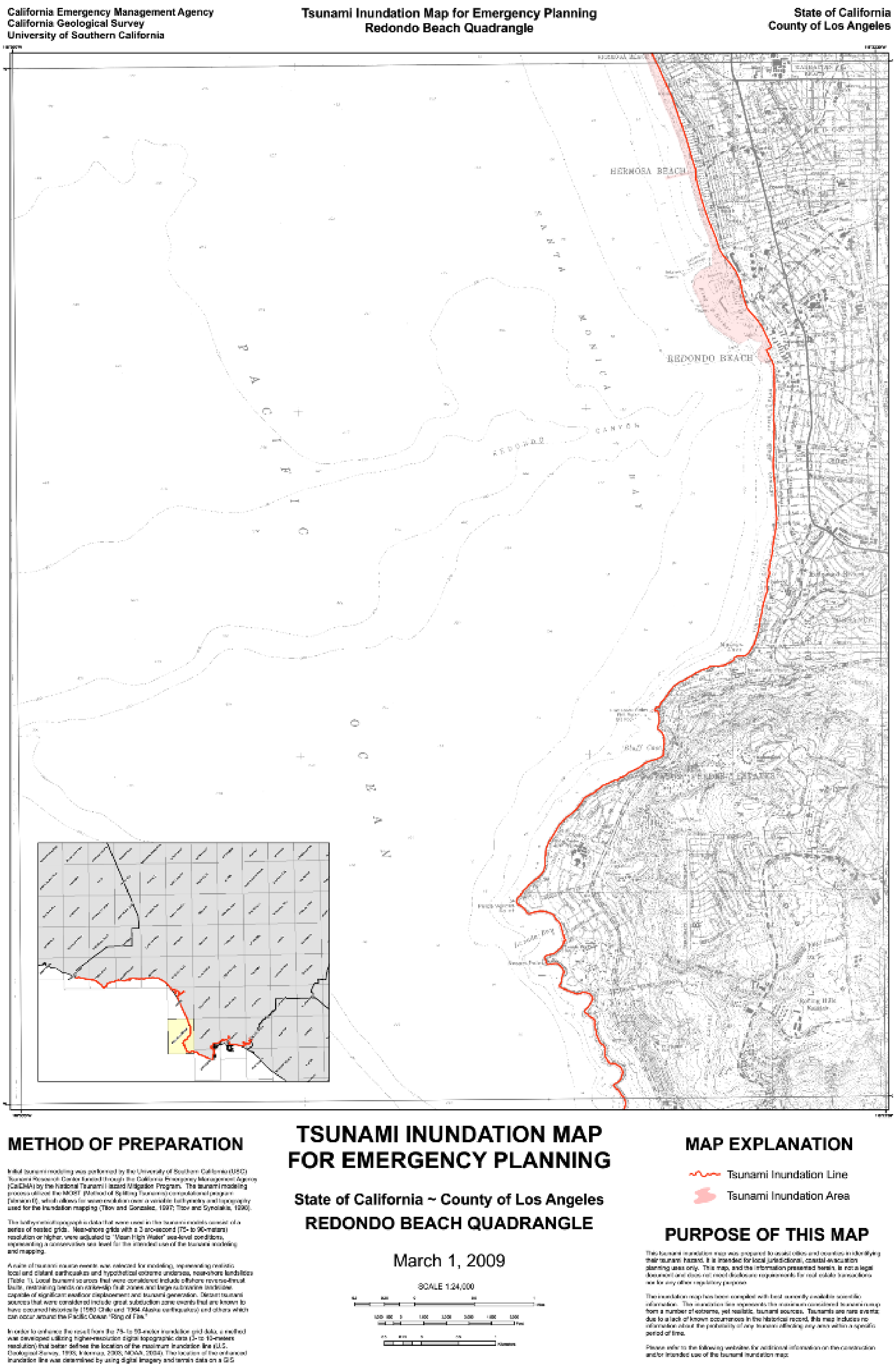
Map: Tsunami Inundation Map – Malibu Beach Quadrangle
(Source: California Department of Conservation)



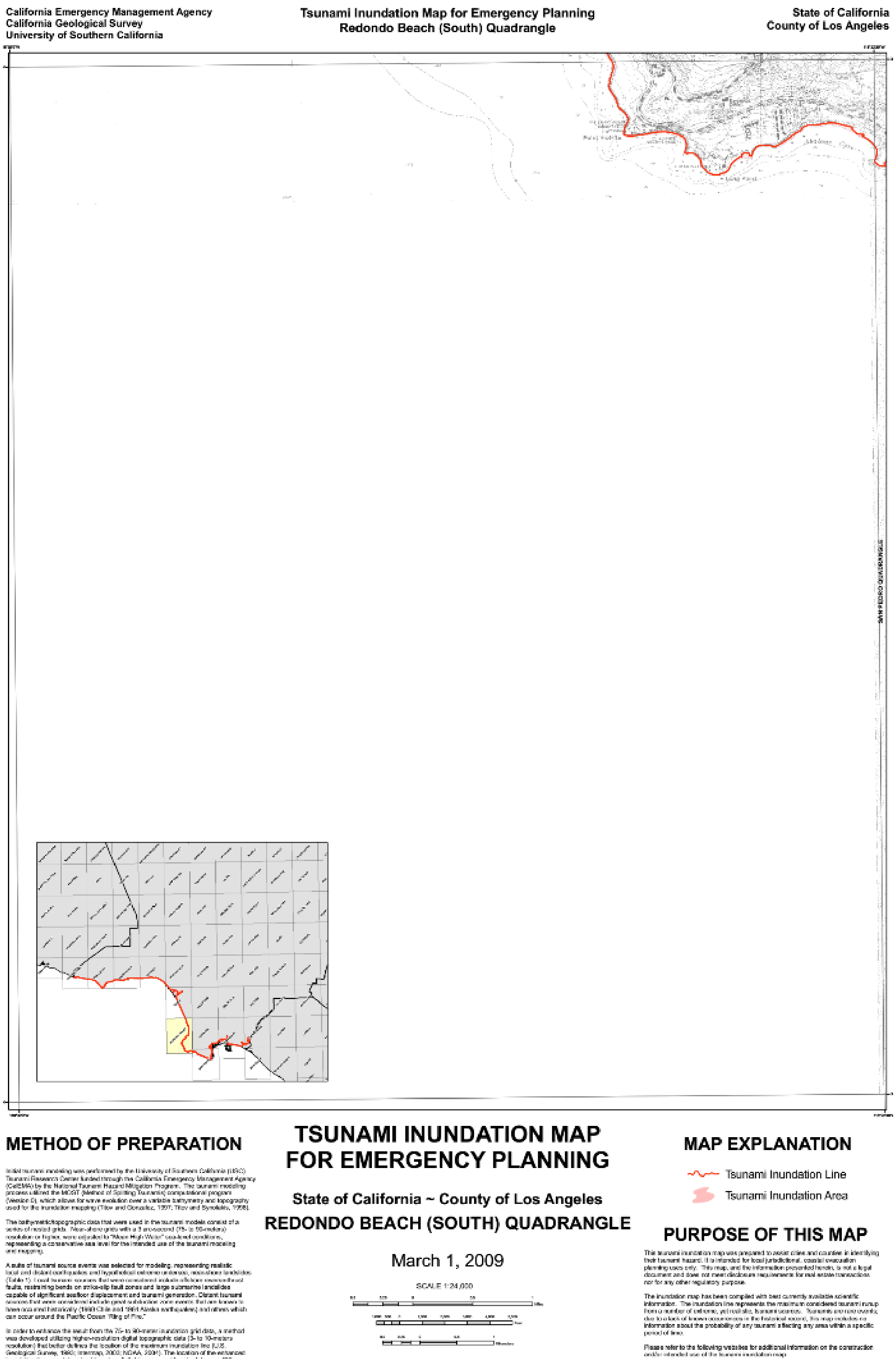
Map: Tsunami Inundation Map – Point Dume Quadrangle
(Source: California Department of Conservation)



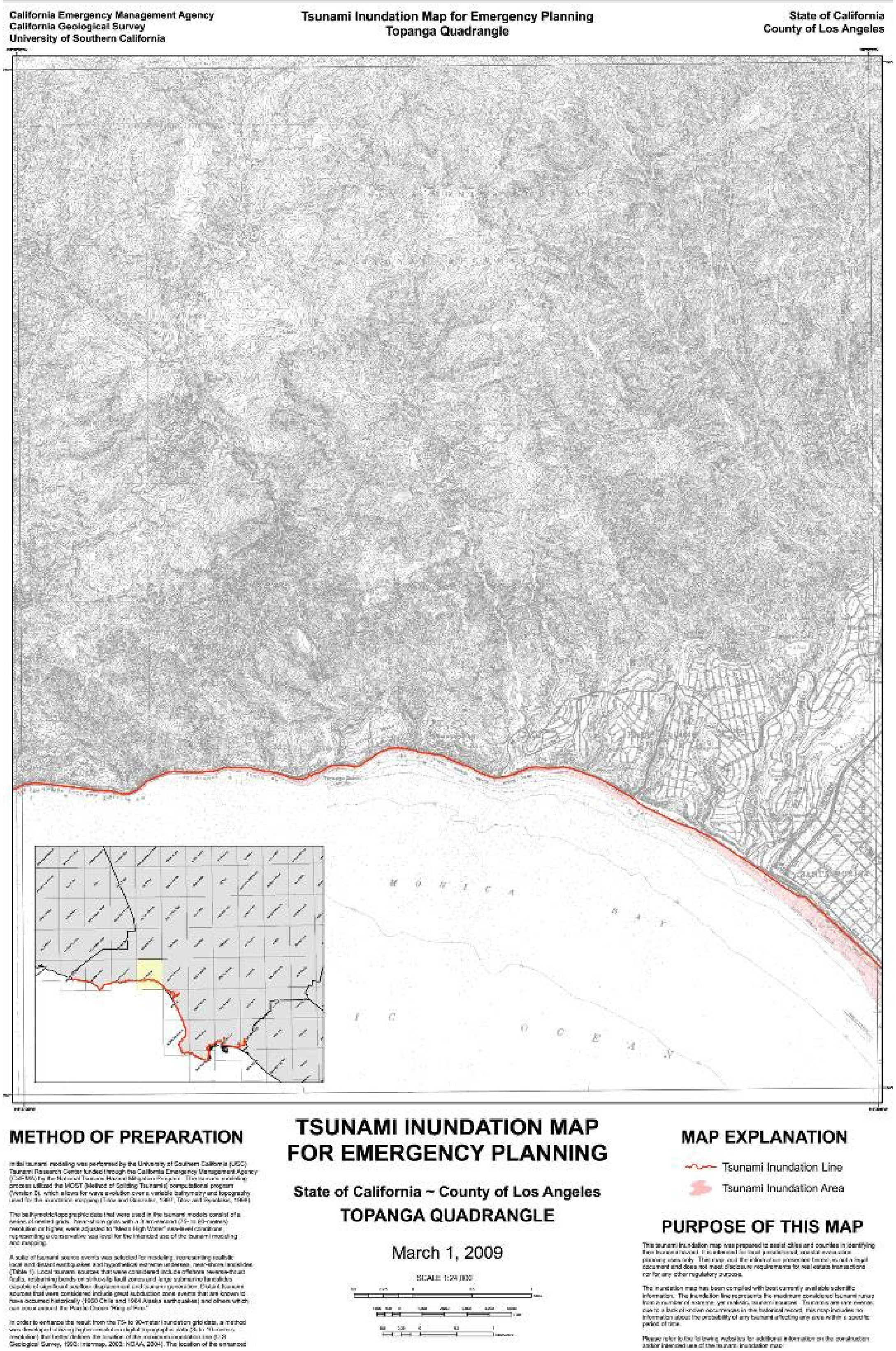
Map: Tsunami Inundation Map – Redondo Beach Quadrangle (Source: California Department of Conservation)



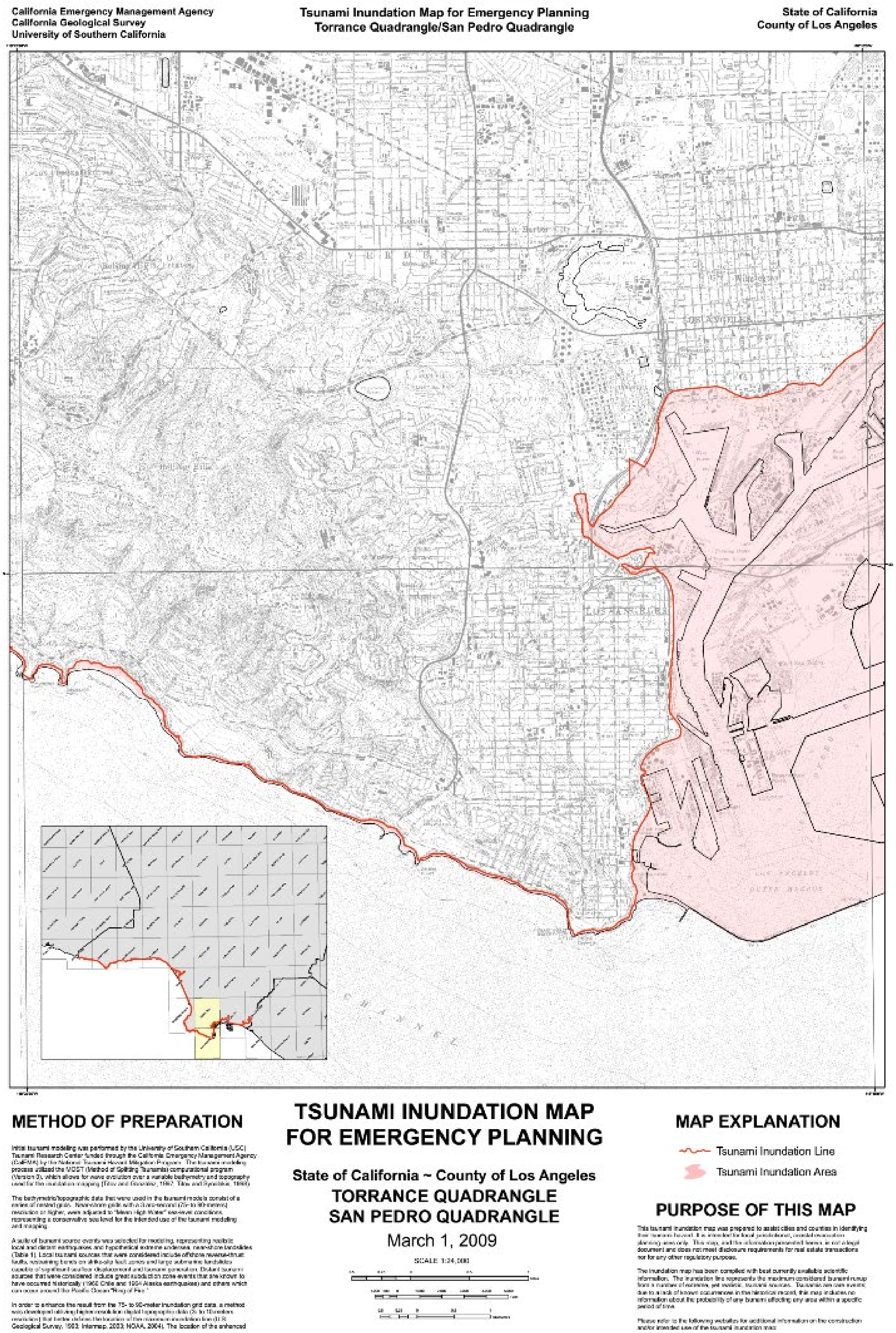
Map: Tsunami Inundation Map – Redondo Beach South Quadrangle (Source: California Department of Conservation)



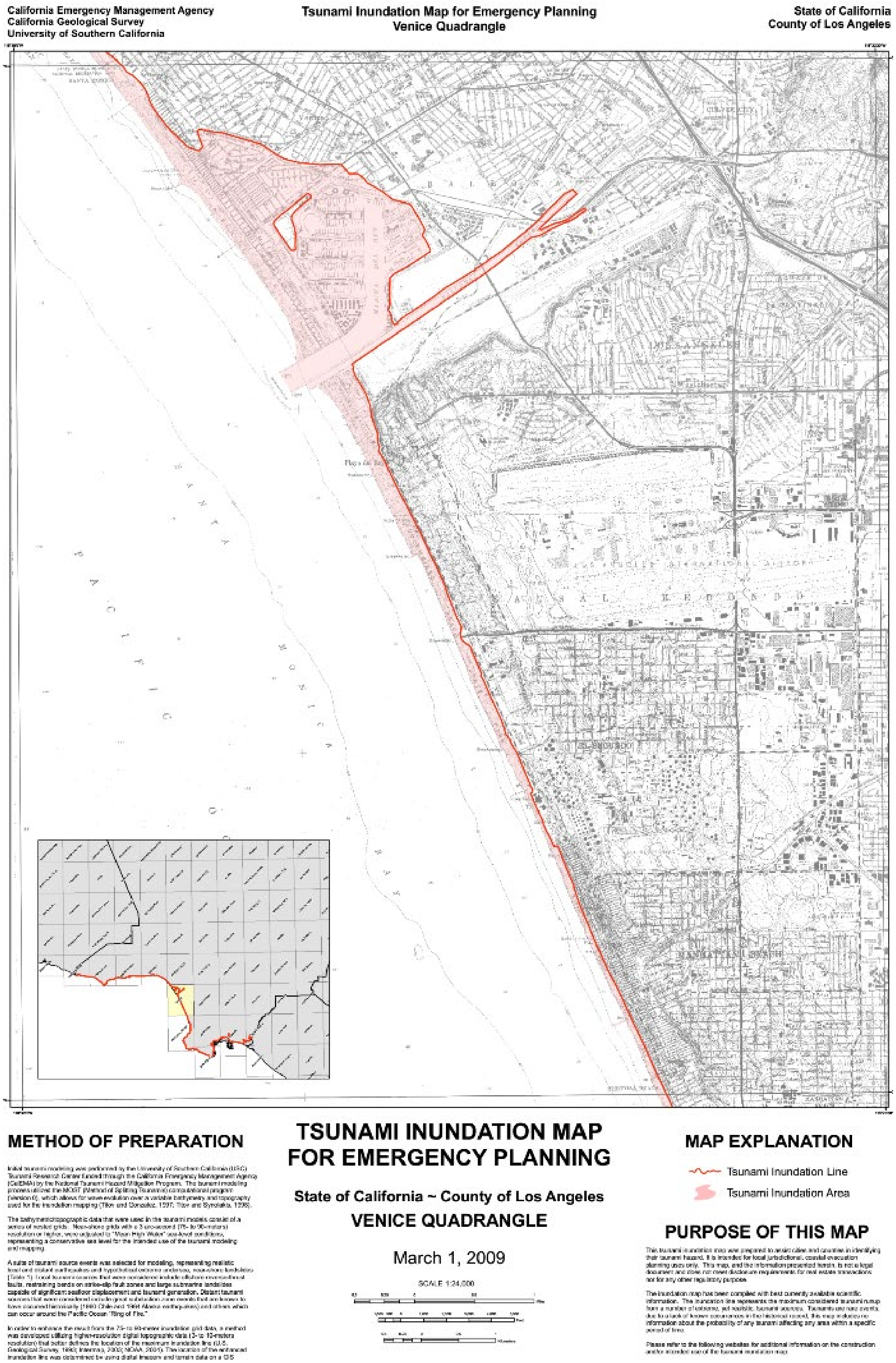
Map: Tsunami Inundation Map – Topanga Quadrangle (Source: California Department of Conservation)



Map: Tsunami Inundation Map – Torrance/San Pedro Quadrangle (Source: California Department of Conservation)



Map: Tsunami Inundation Map – Venice Quadrangle
(Source: California Department of Conservation)

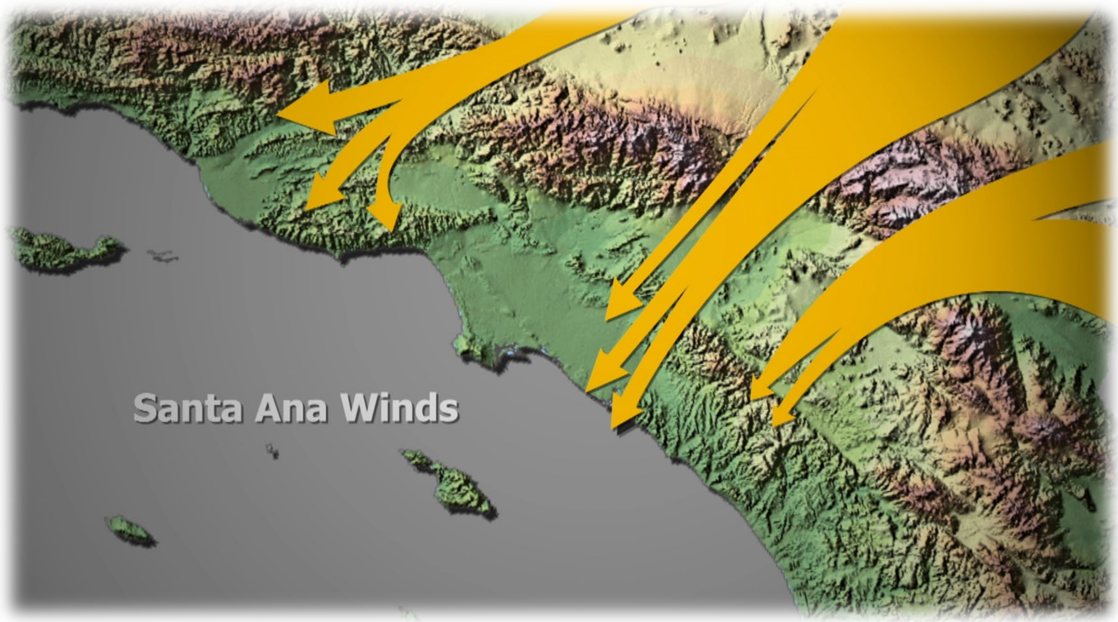


Windstorm Hazards

Hazard Definition

Santa Ana winds are generally defined as warm, dry winds that blow from the east or northeast (offshore). These winds occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles and Orange County basins. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which it derives its name). Forecasters at the National Weather Service offices in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots." These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.

Infographic: Santa Ana Winds
Source: A screenshot from the USGS film "Living with Fire"



Caption: Santa Ana Winds are a natural phenomenon in southern California that contributes to the region's fire ecology. USGS is investigating ways to balance community fire risk management and native habitat conservation as part of the USGS Southern California Wildfire Risk Scenario Project, analyzing both human factors and natural factors.

The complex topography of Southern California combined with various atmospheric conditions create numerous scenarios that may cause widespread or isolated Santa Ana events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra Mountains and west of the Rocky Mountains including most of Nevada and Utah). Clockwise circulation around the center of this high-pressure area forces air downslope from the high plateau. The air warms as it descends toward the California coast at the rate of five degrees F per 1,000 feet due to compressional heating. Thus, compressional heating provides the primary source of warming. The air is dry since it originated in the desert, and it dries out even more as it is heated.

These regional winds typically occur from October to March, and, according to most accounts are named either for the Santa Ana River Valley where they originate, or for the Santa Ana Canyon, southeast of Los Angeles, where they pick up speed.

What is Susceptible to Windstorms?

Life and Property

Windstorm events can be expected, perhaps annually, across widespread areas of the region which can be adversely impacted during a windstorm event. This can result in the involvement of emergency response personnel during a wide-ranging windstorm or microburst tornadic activity. Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure creates a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents creates lift suction forces that pull building components and surfaces outward. With extreme wind forces, the roof or entire building can fail causing considerable damage.

Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike an area, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

Utilities

Historically, falling trees are the major cause of power outages in the project area. Windstorms such as strong microbursts and Santa Ana Wind conditions cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet, overhead power lines are damaged, even in relatively minor windstorm events. Falling trees bring electric power lines down to the pavement, creating the possibility of lethal electric shock.

Infrastructure

Windstorms damage buildings, power lines, and other property, and infrastructure, due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

Increased Fire Threat

Perhaps the greatest danger from windstorm activity in the project area comes from the combination of the Santa Ana winds with the major fires that occur every few years in the urban/wildland interface. With the Santa Ana winds driving the flames, the speed and reach of the flames is even greater than in times of calm wind conditions.

Transportation

Windstorm activity impacts local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong Santa Ana winds, major highways can be temporarily closed to truck and recreational vehicle traffic. However, typically these disruptions are not long lasting, nor do they carry a severe long term economic impact on the region.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Windstorms in the Metro Service Area** below.

Previous Occurrences of Windstorms in the Metro Service Area

Based on local history, most incidents of high wind in the County of Los Angeles are the result of the Santa Ana and El Niño–related wind conditions. While high-impact wind incidents are not frequent in the area, significant wind events and sporadic tornado activity have been known to negatively affect the county. Between 2015-2019, the County of Los Angeles experienced 49 wind related events with gusts reaching 79mph. As an example, on December 22, 2015, 20 big rig trucks were turned over by 80mph winds, shutting down the Antelope Valley 14 Freeway, shutting down routes between northern and southern California. Although the region did not suffer fatalities or serious injuries, the high winds fueled devastating Thomas Fire (2017). Below is a history of wind related events in the County of Los Angeles within the last five years:

Table: High Wind, Strong Wind and Tornado Events in Los Angeles County, 2015-2019 (Source: NOAA, Storm Events Database, 2019)

Location	Date	Time	Time Zone	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Santa Monica Mountains Recreation Area	10/30/2015	00:47	PST-8	High Wind	37 knots MS	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	10/30/2015	02:55	PST-8	High Wind	55 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	11/15/2015	02:55	PST-8	High Wind	63 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	11/15/2015	06:55	PST-8	High Wind	62 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	12/11/2015	20:53	PST-8	High Wind	69 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	12/25/2015	18:53	PST-8	High Wind	66 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	12/26/2015	01:56	PST-8	High Wind	58 knots MG	0	0	0.00K	0.00K
Los Angeles County Coasts Including Downtown Los Angeles	01/31/2016	15:53	PST-8	High Wind	36 knots MS	0	0	0.00K	0.00K
Antelope Valley	01/31/2016	18:00	PST-8	High Wind	50 knots MG	0	0	0.00K	0.00K

Los Angeles County Mountains Excluding the Santa Monica Range	02/07/2016	11:55	PST-8	High Wind	53 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	02/07/2016	11:57	PST-8	High Wind	56 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	02/17/2016	09:53	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	03/22/2016	22:56	PST-8	High Wind	56 knots MG	0	0	0.00K	0.00K
Antelope Valley	03/27/2016	12:55	PST-8	High Wind	55 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	04/14/2016	20:53	PST-8	High Wind	57 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	04/14/2016	21:57	PST-8	High Wind	55 knots MG	0	0	0.00K	0.00K
Antelope Valley	11/27/2016	09:00	PST-8	High Wind	54 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	12/02/2016	03:00	PST-8	High Wind	56 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	12/02/2016	07:00	PST-8	High Wind	59 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	12/02/2016	12:57	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	01/22/2017	09:55	PST-8	High Wind	72 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	01/27/2017	03:53	PST-8	High Wind	66 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	01/27/2017	14:21	PST-8	High Wind	56 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	02/12/2017	07:55	PST-8	High Wind	62 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	02/17/2017	13:56	PST-8	High Wind	57 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	02/17/2017	14:56	PST-8	High Wind	51 knots MG	0	0	0.00K	0.00K
Catalina and Santa Barbara Islands	02/17/2017	15:22	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Antelope Valley	03/27/2017	14:00	PST-8	High Wind	51 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	03/27/2017	22:00	PST-8	High Wind	56 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	03/30/2017	19:47	PST-8	High Wind	51 knots MG	0	0	0.00K	0.00K

Los Angeles County Mountains Excluding the Santa Monica Range	04/27/2017	14:55	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	10/09/2017	03:53	PST-8	High Wind	55 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	10/09/2017	07:19	PST-8	High Wind	65 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	10/09/2017	09:56	PST-8	High Wind	58 knots MG	0	0	0.00K	0.00K
Santa Clarita Valley	12/04/2017	09:56	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	12/04/2017	18:56	PST-8	High Wind	62 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	12/04/2017	23:53	PST-8	High Wind	63 knots MG	0	0	0.00K	0.00K
Los Angeles County San Fernando Valley	12/05/2017	05:54	PST-8	High Wind	57 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	01/28/2018	01:55	PST-8	High Wind	61 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	01/28/2018	04:56	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	04/12/2018	17:53	PST-8	High Wind	60 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	10/15/2018	05:56	PST-8	High Wind	57 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	10/15/2018	07:55	PST-8	High Wind	57 knots MG	0	0	0.00K	0.00K
Santa Monica Mountains Recreation Area	11/08/2018	21:38	PST-8	High Wind	63 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	11/08/2018	23:53	PST-8	High Wind	54 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	11/12/2018	09:53	PST-8	High Wind	52 knots MG	0	0	0.00K	0.00K
Antelope Valley	03/12/2019	23:16	PST-8	High Wind	59 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	03/12/2019	23:53	PST-8	High Wind	61 knots MG	0	0	0.00K	0.00K
Los Angeles County Mountains Excluding the Santa Monica Range	04/09/2019	23:20	PST-8	High Wind	64 knots MG	0	0	0.00K	0.00K
Totals:						0	0	0.00K	0.00K

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii))   **A:** See **Local Conditions** below.

Local Conditions

According to the Metro Climate Action and Adaptation Plan (2019), the Santa Ana winds are a key feature of the Los Angeles climate. These winds vary year to year and, currently, scientists are unsure how climate change could affect them in the future. The best available data suggest there might not be a significant change.

The Southern California climate is generally mild and does not produce enough airflow to generate a windstorm. However, during the Fall, season shifts in weather patterns begin to arise and produce very high and unpredictable winds. These windstorm conditions are known as the Santa Ana winds and often produce events such as trees and power lines falling down. Severe windstorms pose a significant risk to life and property in the project area by creating conditions that disrupt essential systems such as public utilities, telecommunications and transportation routes. High winds can and do occasionally cause tornado-like damage to local homes and businesses. Severe windstorms can present a very destabilizing effect on the dry brush that covers the County of Los Angeles' hillsides and urban wildland interface areas. High winds can have destructive impacts, especially to trees, power lines, and utility services. Perhaps the greatest danger from windstorm activity in the region comes from the combination of the Santa Ana winds and the major fires that occur every few years in the urban/wildland interface.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii))   **A:** See **Impact of Windstorms in the Metro Service Area** below.

Impacts of Windstorms in the Metro Service Area

Based on the risk assessment, it is evident that windstorms will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Minor to major disruption of revenue service on bus and rail

- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Damage to overhead catenary lines resulting from falling trees and limbs
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to citizens as temporary facilities and relocations would likely be needed

Climate Change Hazards

Hazard Definition

Climate Change
According to National Geographic, "climate change" refers to a long-term shift in global or regional climate patterns. It is generally perceived in the emergency management profession that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Changes could include:

- Sea ice and snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- Sea level is projected to rise 7 to 23 inches during the 21st century due to melting snow and ice on land and thermal expansion of ocean waters.
- The risk of drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding; if the world's average temperature warms only an additional 2.7ºF to 4.5ºF above pre-industrial levels, an estimated 20 to 30 percent of known plant and animal species would be at increasingly high risk of extinction.

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and forest fires; more heat-related stress; the spread of existing or new vector-born disease into a community; and increased erosion and inundation of low-lying areas along coastlines. In many cases, communities are already facing these problems to some degree.

According to the 2019 County of Los Angeles All-Hazards Mitigation Plan, the effects of climate change are expected to negatively impact water and electricity demand and supplies in Los Angeles County. Decreasing air quality and extreme heat days will degrade public health, as well as and increase wildfire risk. And low-lying coastal areas may flood or be underwater from sea level rise.

Sub-Hazards: Drought, Sea Level Rise, Extreme Heat
In recognition of the priorities mentioned above, the Planning Team identified drought, sea level rise, and extreme heat as "sub-hazards". As such, hazard profiles have been prepared for each of the three and hazard mitigation action items included in the Mitigation Strategy.

<u>Drought</u>
It's impossible to separate drought from water supply shortages. Drought is defined as a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (e.g., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness of the rains (e.g., rainfall intensity, number of rainfall events).

Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity. Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human beings often exacerbate the impact of drought. Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this natural hazard.

One dry year does not normally constitute a drought in California but serves as a reminder of the need to plan for droughts. California's extensive system of water supply infrastructure — its reservoirs, groundwater basins, and inter-regional conveyance facilities — mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall -- ranchers engaged in dry land grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Criteria used to identify statewide drought conditions do not address these localized impacts. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

There are four different ways that drought can be defined:

o Meteorological - a measure of departure of precipitation from normal. Due to climatic differences what is considered a drought in one location may not be a drought in another location.
o Agricultural - refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
o Hydrological - occurs when surface and subsurface water supplies are below normal.
o Socioeconomic - refers to the situation that occurs when physical water shortage begins to affect people.

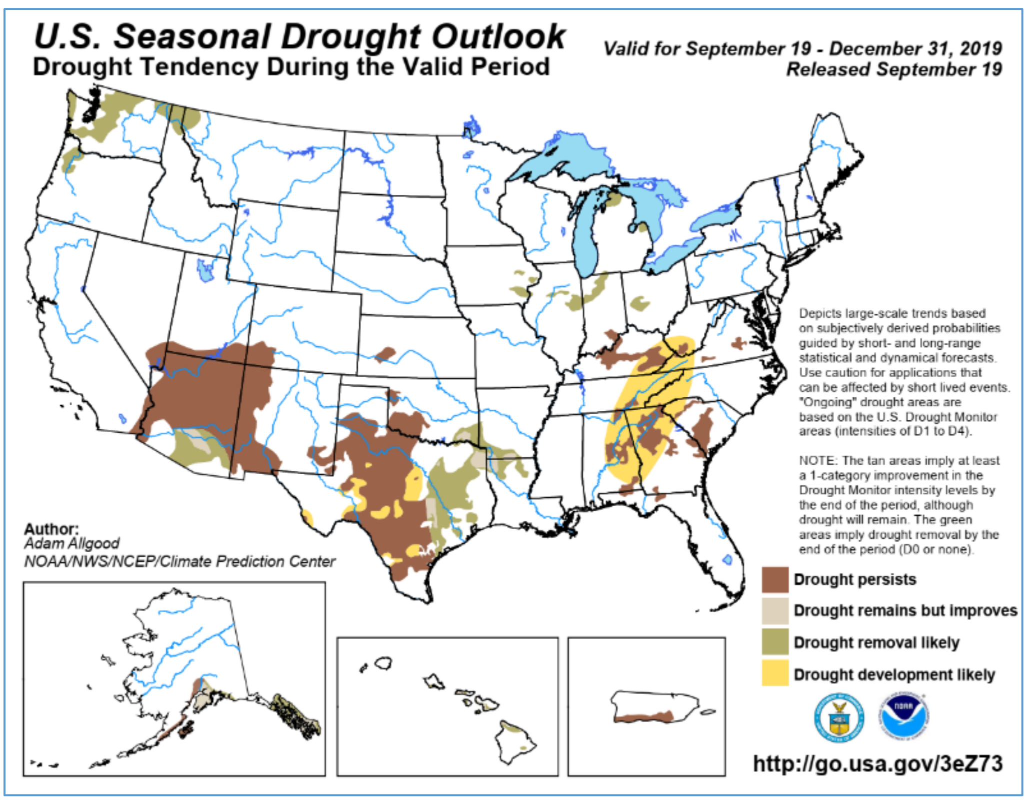
According to the 2019 County of Los Angeles All-Hazards Mitigation Plan, a drought's severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. Due to its multidimensional nature, drought is difficult to define in exact terms and poses difficulties in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering of effects of an event after its apparent end. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

According to the 2019 County of Los Angeles All-Hazards Mitigation Plan, climate scientists predict that Los Angeles County and the rest of southern California will get drier and northern California will get hotter. The resulting loss of snowpack in the Sierra Nevada will mean less water for all Californians – farmers, residents, utilities, and even hatchery fish. However, while drought cannot be controlled, according to the USGS, drought can be managed in two ways: through drought planning and in helping communities make the best day-to-day management decisions while the drought is taking place. During the drafting of this plan update, the Governor of California signed an executive order directing specific State agencies to develop a Water Resilience Portfolio to "ensure safe and dependable water supplies, flood protection and healthy waterways for the state's communities, economy and environment."

The U.S. Seasonal Drought Outlook below shows the Metro Service Area as well as California as a whole is no longer in danger from the impacts of drought:

Figure: U.S. Seasonal Drought Outlook - 2019
(Source: NOAA)



Sea Level Rise

According to National Geographic, sea level rise is the result of an increase in the level of the world's oceans due to the effects of global warming. Burning fossil fuels is one of the causes of global warming because it releases carbon dioxide and other heat-trapping gasses into the atmosphere. The oceans then absorb the majority of this heat. As water becomes warmer, it expands. Furthermore, sea level rise poses a serious threat to coastal life around the world. Consequences include increased intensity of storm surges, flooding, and damage to coastal areas.

Extreme Heat

Extreme heat conditions are defined as weather that is much hotter than average for a particular time and place—and sometimes more humid, too. Extreme heat is not just a nuisance; it kills hundreds of Americans every year and causes many more to become seriously ill. The heat index is a measure of how hot it feels when relative humidity is factored in with the actual air temperature. Relative humidity is the percentage of moisture in the air compared with the maximum amount of moisture the air can hold. Humidity is an important factor in how hot it feels because when humidity is high, water doesn't evaporate as easily, so it's harder for your body to cool off by sweating.

Figure: NOAA's National Weather Service Heat Index
(Source: NOAA National Weather Service, 2016)

Temperature (°F)

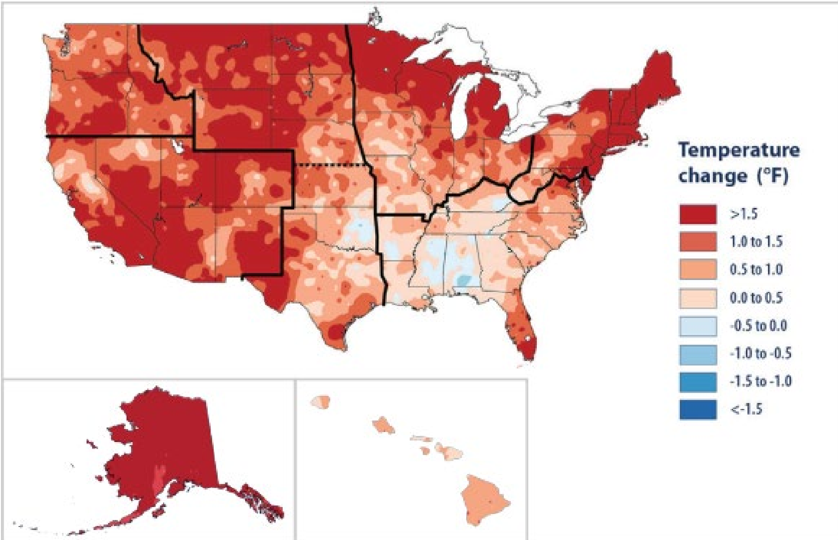
Relative humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of heat disorders with prolonged exposure or strenuous activity

Caution | Extreme caution | Danger | Extreme danger

This chart shows that as the temperature (horizontal axis) and relative humidity (vertical axis) each increase, they combine to create a heat index (colored values) that feels hotter than the actual temperature. For example, when the temperature is 96°F, with 65 percent humidity, it actually feels like 121°F (indicated by the blue lines in the chart above). Source: NOAA National Weather Service, 2016[1]

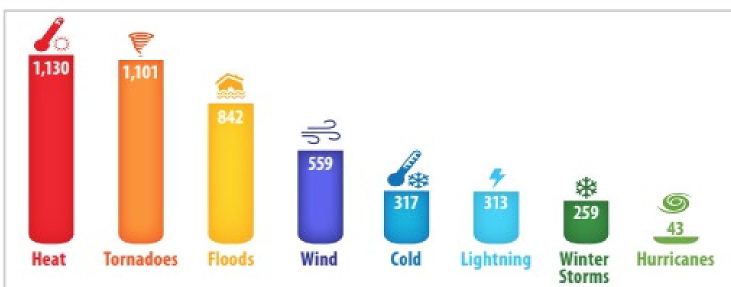
Figure: Observed U.S. Temperature Change
Source: Source: Melillo, et al., 2014



The colors on this map show temperature changes over the past 22 years (1991–2012) compared with the 1901–1960 average for the contiguous United States. Temperature changes for Alaska and Hawaii were compared with the 1951–1980 average for those states.Thick borders represent National Climate Assessment regions. Source: Melillo et al., 2014[3]

According to CDC's Extreme heat causes more deaths than any other weather-related hazard—more than hurricanes, tornadoes, or flooding. In addition, thousands of people who are exposed to extreme heat seek medical treatment each year. In fact, each - summer more than 65,000 Americans on average visit an emergency room for acute heat illness.

Figure: Fatalities by Hazard, 2006–2015
Source: NOAA National Weather Service, 2016



Numbers in each bar represent the total number of fatalities by hazard. Source: NOAA National Weather Service, 2016[12]

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Climate Change in the Metro Service Area** below.

Previous Occurrences of Climate Change and Sub-Hazards in the Metro Service Area

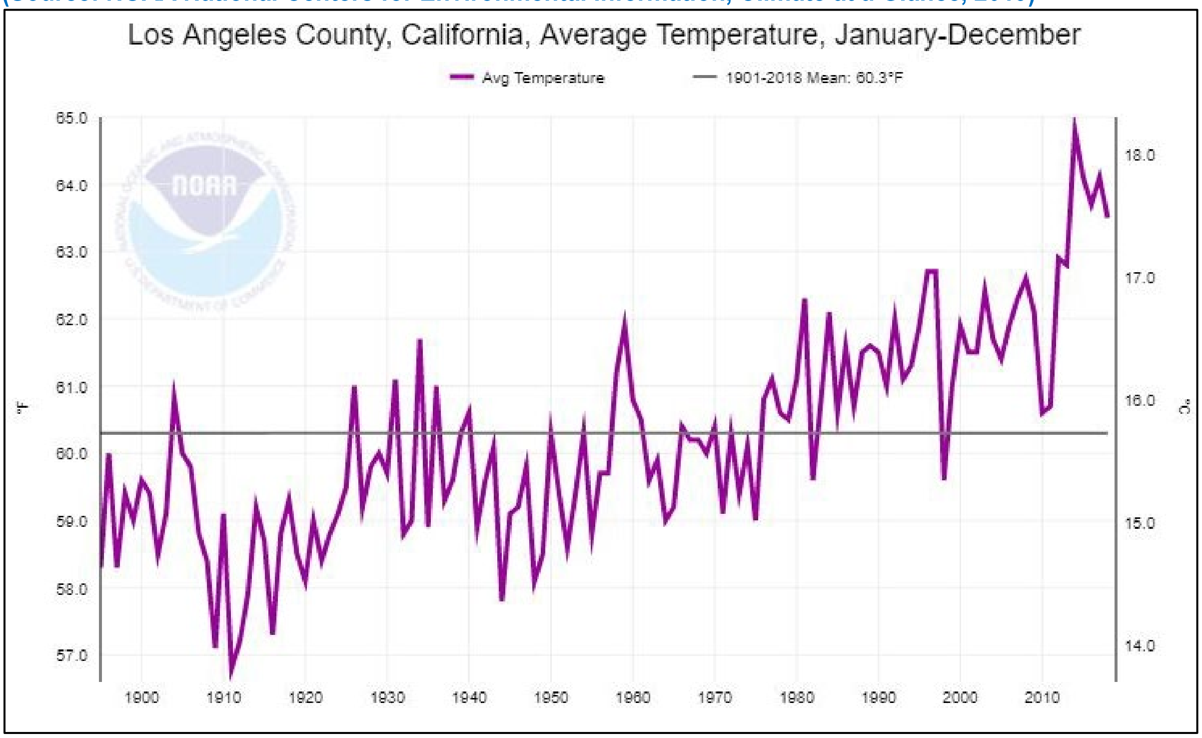
Climate Change

According to the Los Angeles Region Report of California's Fourth Climate Change Assessment 2018, observations over the past century indicate that temperature has increased across southern California. Based on 1896-2015 temperature records for the California South Coast NOAA

Climate Division, which encompasses the LA region, He and Gautam (2016) found significant trends in annual average, maximum, and minimum temperature around 0.16°C per decade. Every month has experienced significant positive trends in monthly average, maximum, and minimum temperature. Monthly average and minimum temperatures have increased the most in September and monthly maximum temperatures have increased the most in January, with each trend exceeding 0.2°C per decade. Recently, the California South Coast Climate Division has experienced sustained record warmth. The top 5 warmest years in terms of annual average temperature have all occurred since 2012: 2014 was the warmest, followed by 2015, 2017, 2016, and 2012.

The NOAA National Centers for Environmental Information published data in December 2019 showing this increase in average temperature:

Table: Average Temperatures in January-December, 1895-2019
(Source: NOAA National Centers for Environmental Information, Climate at a Glance, 2019)



According to the Environmental Protection Agency, since the 1990s, scientific research on climate change has included multiple disciplines and has expanded, significantly increasing our understanding of causal relations, links with historic data, and ability to numerically model climate change. The most recent work has been summarized in the Assessment Reports by the Intergovernmental Panel on Climate Change (IPCC). Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors that include oceanic processes (such as oceanic circulation), biotic processes, variations in solar radiation received by Earth, plate tectonics and volcanic eruptions, and human-induced alterations of the natural world; these latter effects are currently causing global warming, and "climate change" is often used to describe human-specific impacts.

Sub-Hazards: Drought, Sea Level Rise, Extreme Heat

Drought

Drought is a cyclic part of the climate of California, occurring in both summer and winter, with an average recurrence interval between 3 and 10 years. Droughts in California over the past 100 years are listed as follows. The most recent drought from 2011 to 2015 was the driest 4-year period on record in California since recordkeeping began in 1895.

- 1917-1921, Statewide except for central Sierra Nevada and north coast
- 1922-1926, Statewide except for central Sierra Nevada
- 1928-1937, Statewide
- 1943-1951, Statewide
- 1959-1962, Statewide
- 1976-1977, Statewide, except for southwestern deserts
- 1987-1992, Statewide
- 2007-2009, Statewide, particularly the central coast
- 2011-2015, Statewide

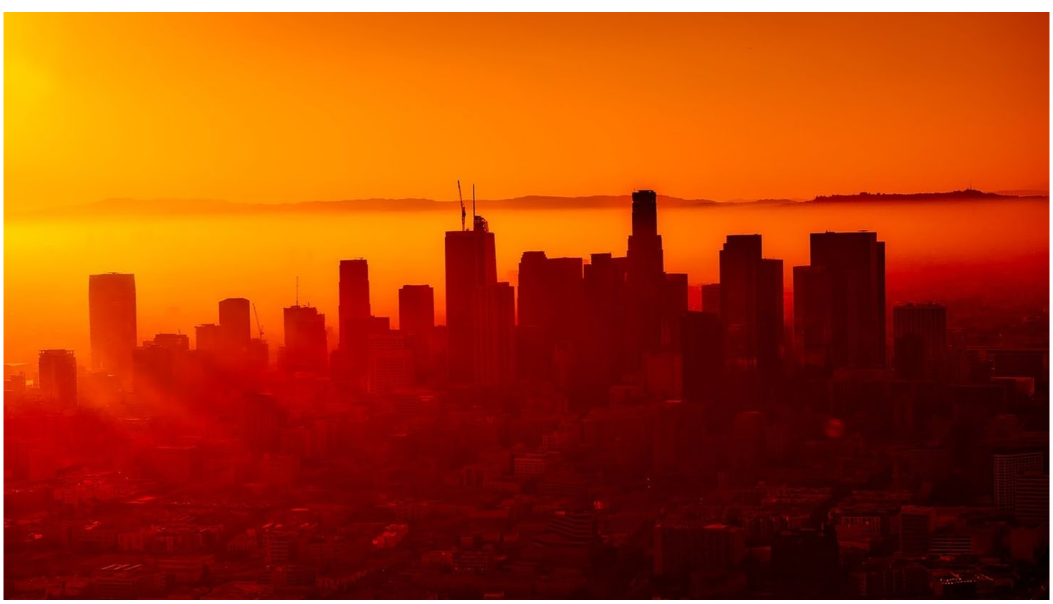
Sea Level Rise

No historical information for the Metro Service Area.

Extreme Heat

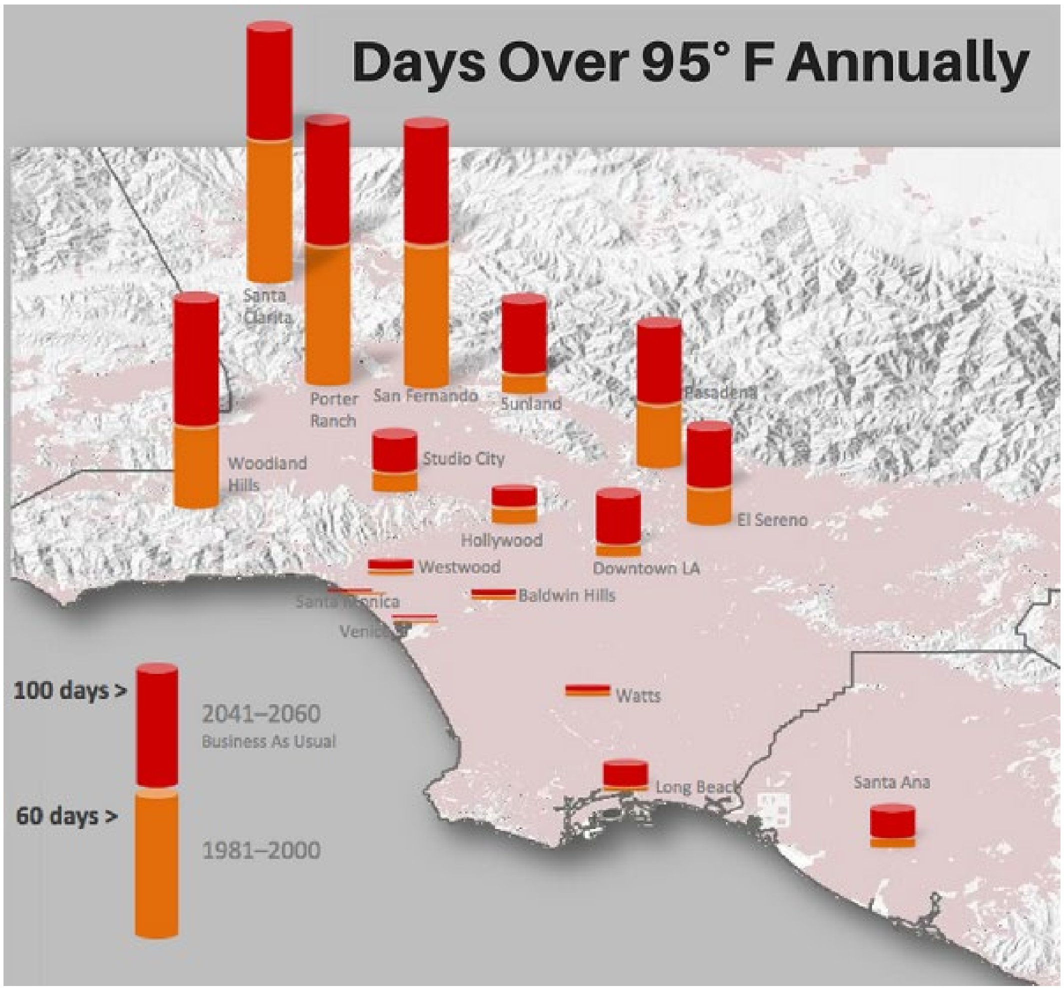
All across Los Angeles, we're feeling the effects of climate change, like more very hot days and heat waves later in the summer. Scientists predict that climate change will continue to cause even more extreme heat in the future. Coastal areas and central Los Angeles will experience three times more days of temperatures over 95°F, and the San Fernando and San Gabriel Valleys will have even more extremely hot weather.

Photo: Los Angeles Heat Wave
Source: Pixabay



The chart below was developed by UCLA showing predictions for the number of days over 95°F in dark orange (as compared to the current number of days in light orange) assuming climate change stays on its present trajectory:

Chart: Days Over 95 F Annually
Source: UCLA Institute of the Environment and Sustainability



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Local Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard’s overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Local Conditions** below.

Local Conditions

Climate Change
According to the Metro Climate Action and Adaptation Plan (2019), Metro assessed impacts from projections of seven categories of climate-related hazards by 2050 including:

- Extreme heat
- Electrical outages
- Wildfires
- Heavy precipitation events
- Riverine flooding
- Landslides and mudslides
- Sea-level rise and coastal flooding

It's important to note that these hazards are expected to occur with more intensity or frequency as the climate changes.

Photo: Metro station
Source: Metro Climate Action and Adaptation Plan 2019

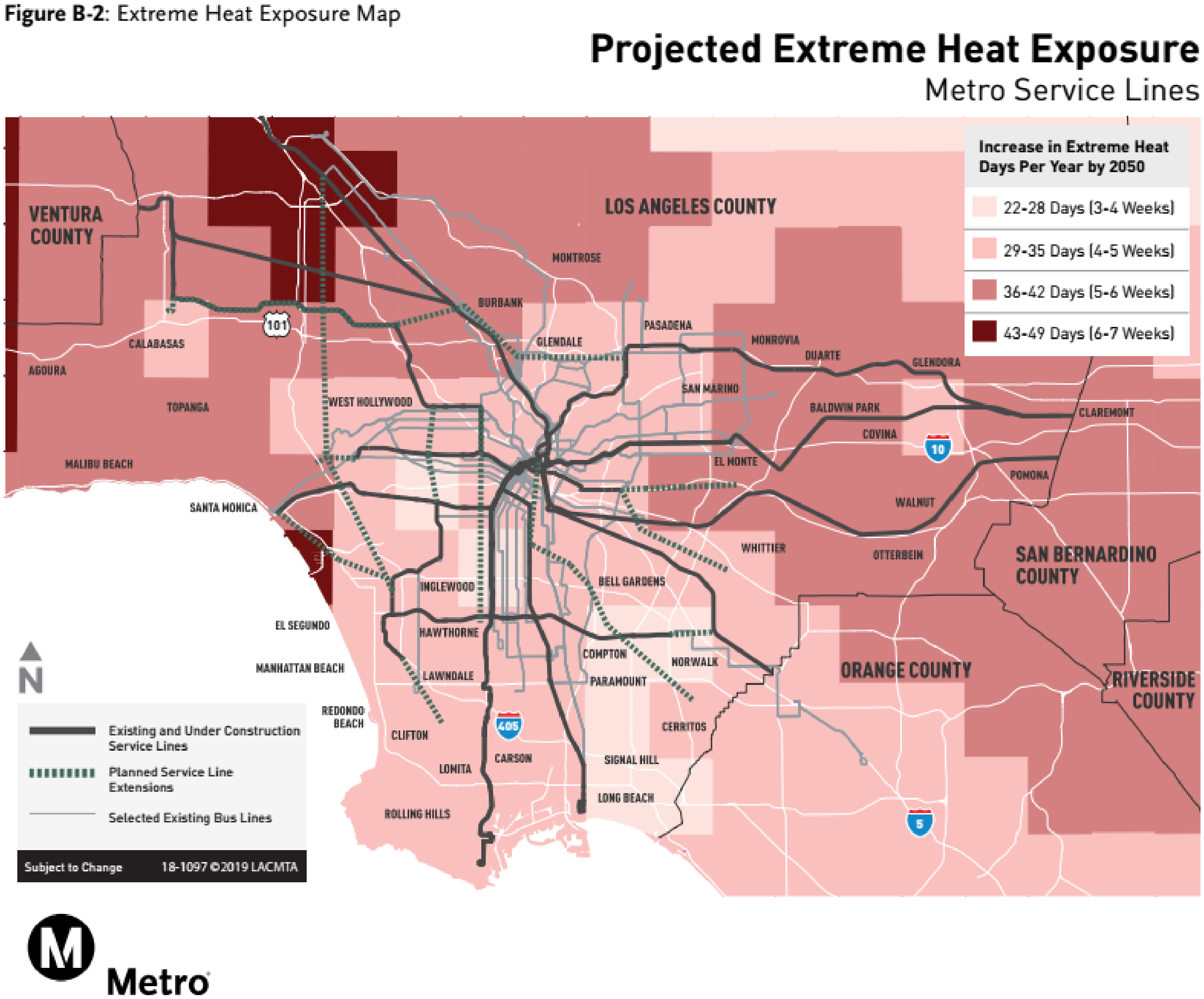
Caption: Metro Bus riders at a Metro Station.

Extreme Heat

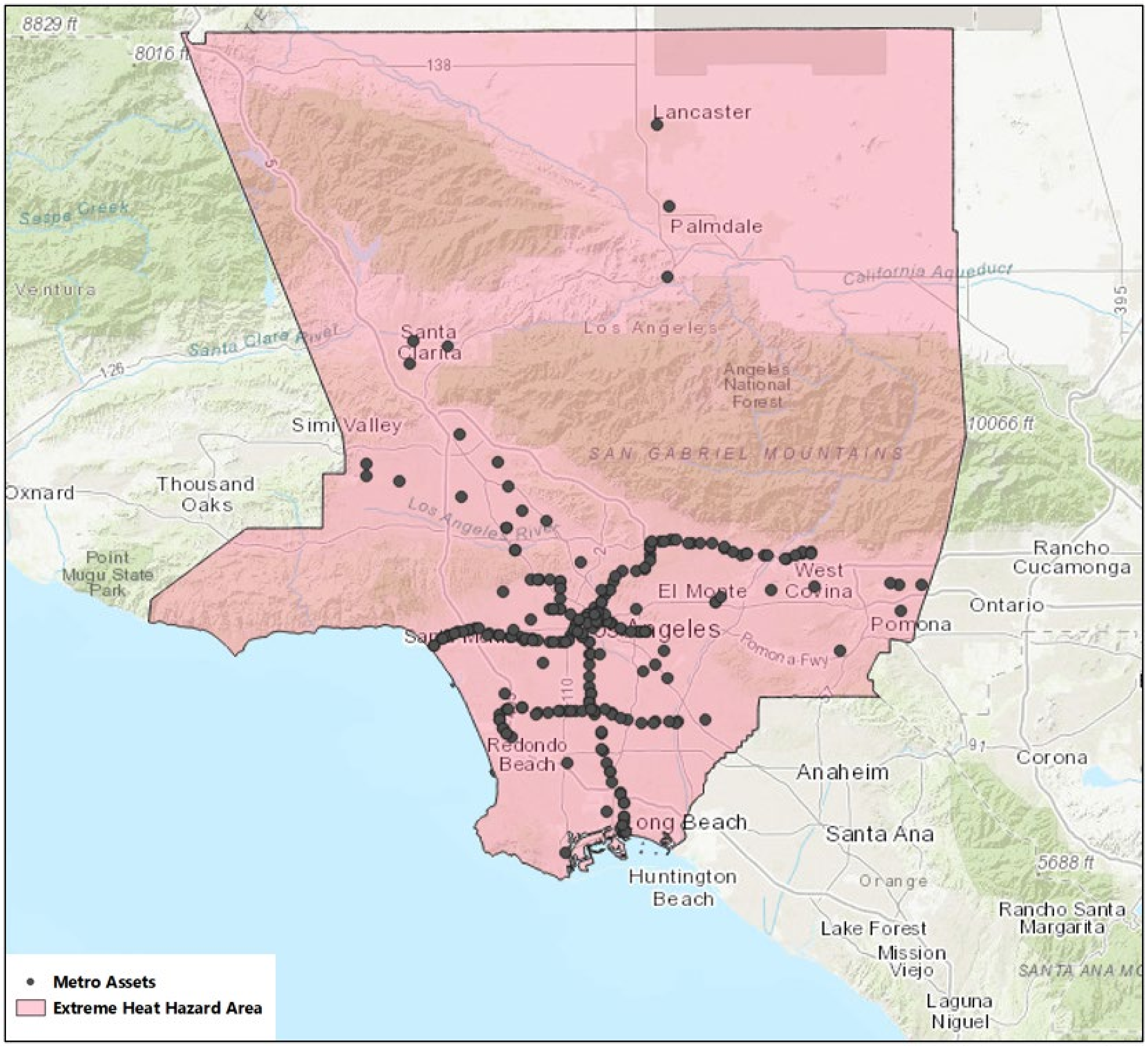
Of the seven climate hazards assessed in the Metro CAAP, extreme heat could affect the greatest number of assets and people. As extreme temperatures become more common, sensitive systems and equipment can overheat and malfunction. Overhead catenary lines can sag, trackwork can buckle, hydraulic lift systems in elevators can overheat and signal switches and communication systems can malfunction. Each situation results in costly repairs and service disruptions. Those rail and bus assets located downtown are most at risk due to their criticality to the overall system. Extreme heat events can also pose health hazards for riders and employees. Air conditioning in buses or in rail stations might be unable to provide enough cooling for passenger comfort. Without shade, riders walking to stations or waiting at bus stops could experience heat-related health impacts. Extreme heat often leads to reduced air quality, which further impacts health.

Map: Projected Extreme Heat Exposure
(Source: Metro Climate Action and Adaptation Plan, 2019)

Figure B-2: Extreme Heat Exposure Map



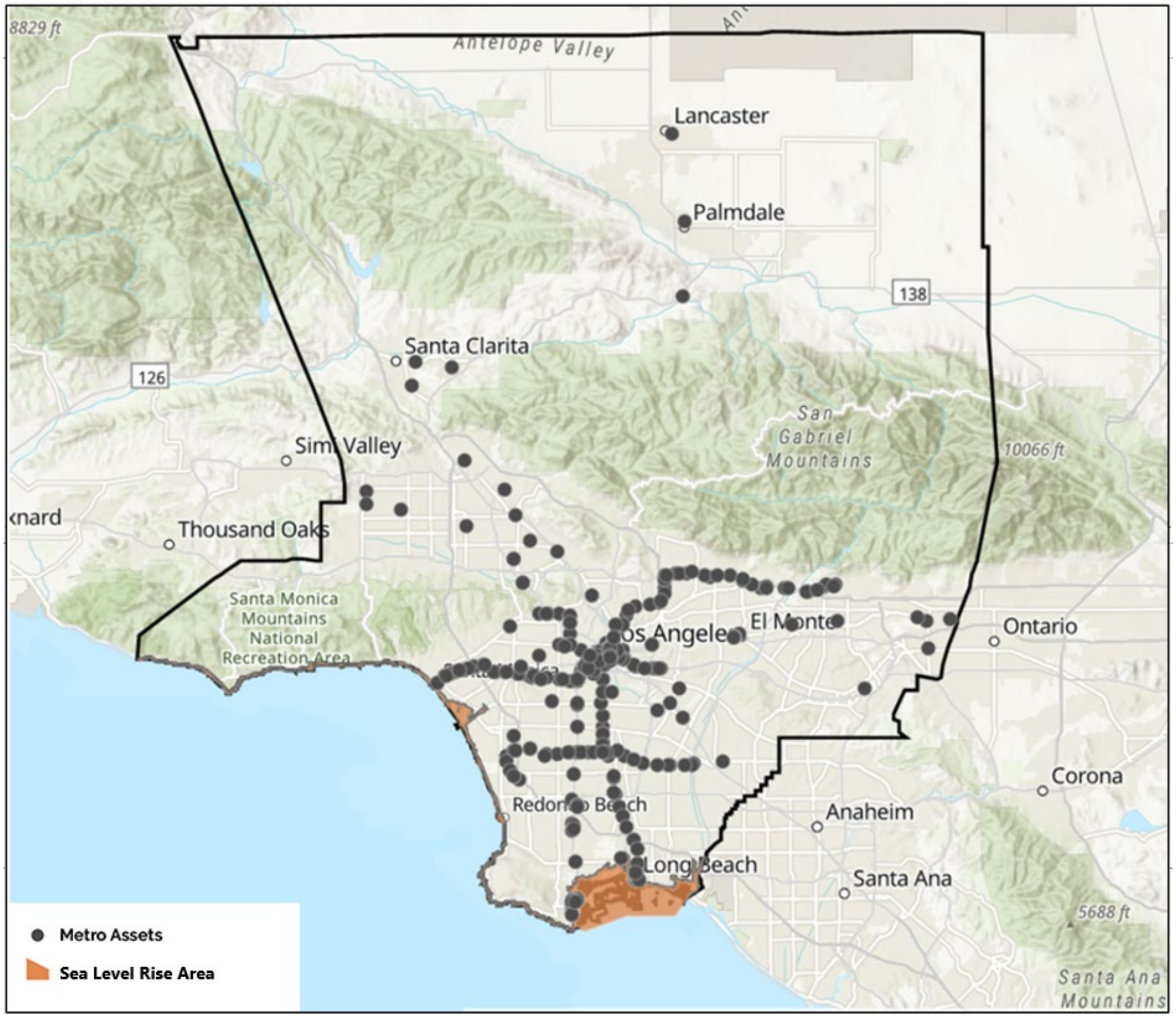
Map: Metro Critical Assets Impacted by Extreme Heat (Source: General Technologies and Solutions)



Sea Level Rise

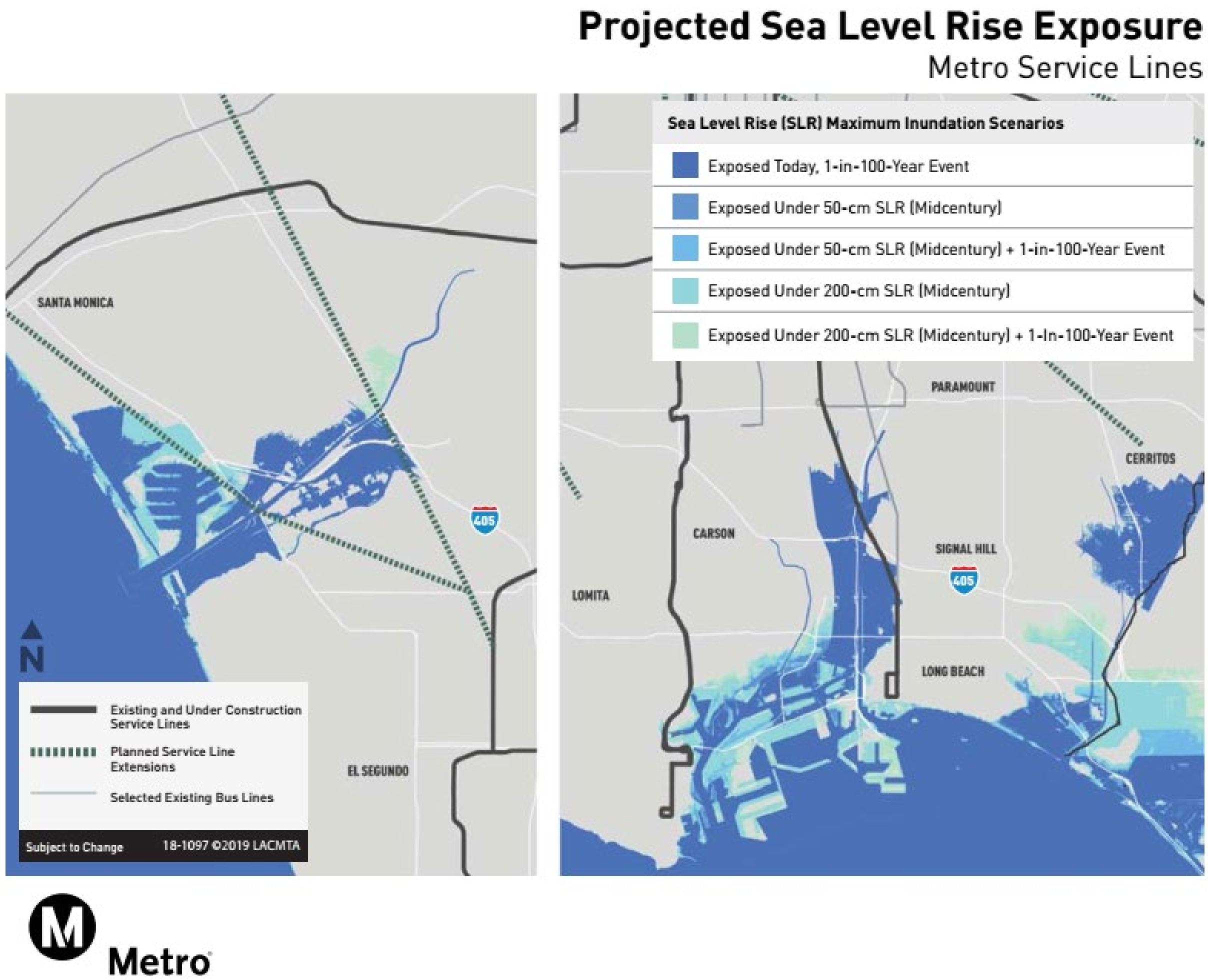
Sea level rise and coastal flooding could have severe long-term impacts on coastal assets. Most of Metro's assets are inland, and therefore not at risk to sea level rise and coastal flooding. However, Metro's 18 coastal assets are exposed to this hazard and are at high or extreme risk. The most at risk are rail assets, bus routes and buildings. Sea level rise and coastal flooding can inundate sensitive equipment or close certain buildings and rail stations, causing problems for the communities that rely on Metro to move.

Map: Metro Critical Assets Impacted by Sea Level Rise (Source: General Technologies and Solutions)



Map: Projected Sea Level Rise Exposure
(Source: Metro Climate Action and Adaptation Plan, 2019)

Figure B-8: Sea Level Rise and Coastal Flooding Exposure Map



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Climate Change in the Metro Service Area** below.

Impact of Climate Change, Drought, Sea Level Rise, and Extreme Heat in the Metro Service Area

Based on the risk assessment, it is evident that climate change will continue to have potentially devastating economic impacts to the Metro service area and Metro facilities. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Minor to major disruption of revenue service on bus and rail

- ✓ Damage to infrastructure
- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards (e.g., mold and mildew)
- ✓ Minor to major disruption of revenue service on bus and rail
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values

Epidemic/Pandemic/Vector-Borne Diseases Hazards

Hazard Definition

According to the California State Hazard Mitigation Plan (2018), the California Department of Public Health has identified epidemics, pandemics, and vector-borne diseases as specific hazards that would have a significant impact throughout the State.

According to the Centers for Disease Control (CDC), an epidemic refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population area. A pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people. Vector-borne diseases are human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors – living organisms that can transmit infectious pathogens between humans, or from animals to humans.

Seasonal Influenza

Seasonal influenza, also known as the flu, is a disease that attacks the respiratory system (nose, throat, and lungs) in humans. Seasonal influenza occurs every year. In the U.S., the influenza season typically occurs from October through May, peaking in January or February with yearly epidemics of varying severity. Although mild cases may be similar to a viral "cold," influenza is typically much more severe. Influenza usually comes on suddenly; may include fever, headache, tiredness (which may be extreme), dry cough, sore throat, nasal congestion, and body aches; and can result in complications such as pneumonia. Persons aged 65 and older, those with chronic health conditions, pregnant women, and young children are at the highest risk for serious complications, including death.

Pandemic Influenza

A pandemic influenza occurs when a new influenza virus, for which there is little or no human immunity, emerges and spreads on a worldwide scale, infecting a large proportion of the human population. The 20th century saw three such pandemics. The most notable pandemic was the 1918 Spanish influenza pandemic that was responsible for 20 million to 40 million deaths throughout the world. There have been two pandemics in the 21st century; H1N1 in 2009, and the most recent COVID outbreak in 2019. As demonstrated historically and currently, pandemic influenza has the potential to cause serious illness and death among people of all age groups and have a major impact on society. These societal impacts include significant economic disruption that can occur due to death, loss of employee work time, and costs of treating or preventing the spread of influenza.

H1N1 Influenza

In 2009 a pandemic of H1N1 influenza, popularly referred to as the swine flu, resulted in many hospitalizations and deaths. Pandemic H1N1 influenza is spread in the same way as seasonal influenza, from person to person through coughing or sneezing by infected people. In April 2009, two kids living more than 100 miles apart in Southern California came down with the flu. By mid-April, their illnesses had been diagnosed as being caused by a new strain of H1N1 influenza. Persons infected with H1N1 experienced fever and mild respiratory symptoms, such as coughing, runny nose, and congestion. In some cases, symptoms were severe and included diarrhea, chills, and vomiting, and in rare cases respiratory failure occurred. The H1N1 virus caused relatively few deaths in humans. In the United States, for example, it caused fewer deaths (between 8,870 and 18,300) than seasonal influenza, which, based on data for the years 2014–2019, causes an average of about 40,000 deaths each year. The H1N1 virus was most lethal in individuals affected by chronic disease or other underlying health conditions.

COVID-19

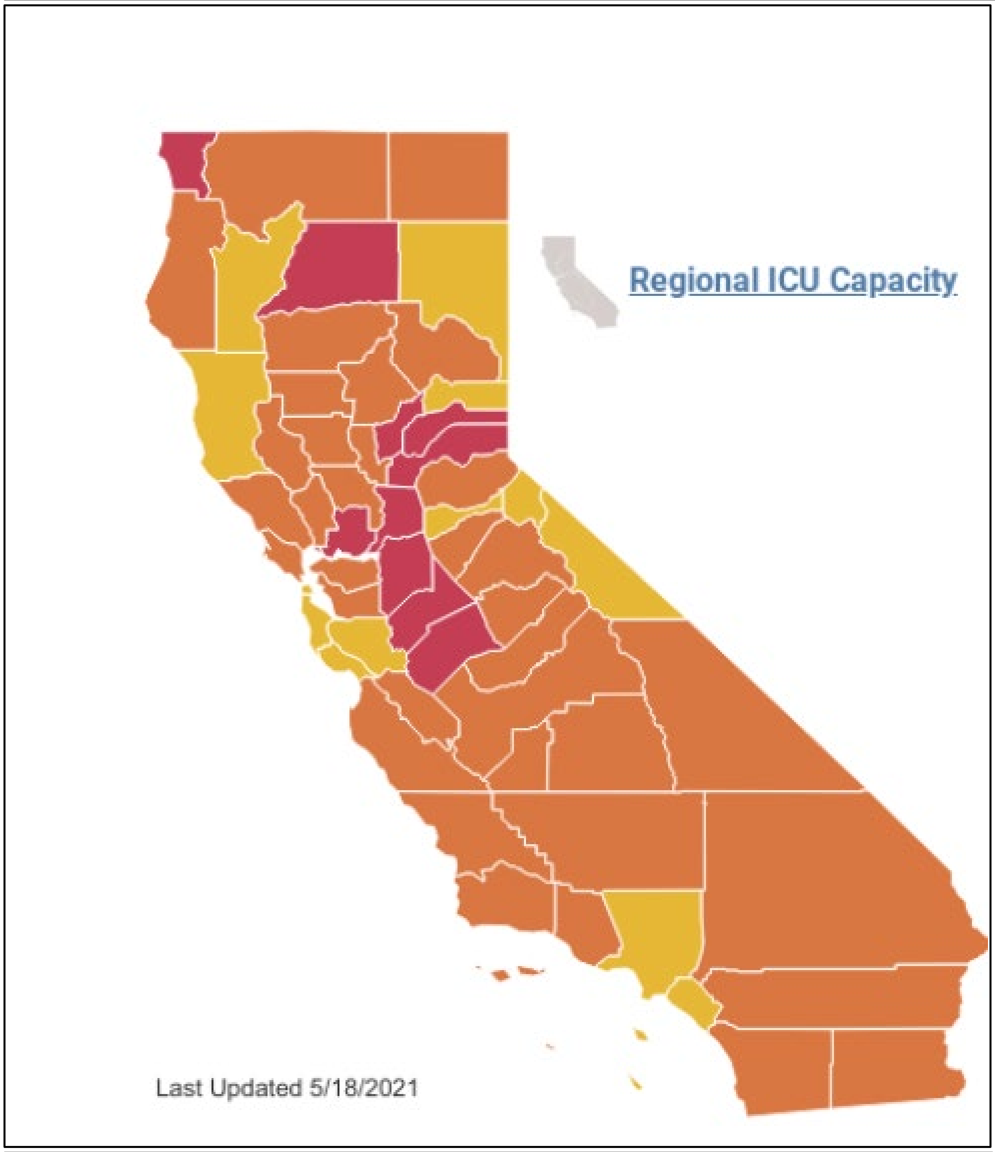
In 2019, the CDC responded to a pandemic of respiratory disease spreading from person to person caused by a novel (new) coronavirus. The disease was named “Coronavirus Disease 2019” (abbreviated “COVID-19”). Coronaviruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people such as with Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

According to the CDC, many of the patients at the epicenter of the outbreak in Wuhan, Hubei Province, China had some link to a large seafood and live animal market, suggesting animal-to-person spread. Later, a growing number of patients reportedly did not have exposure to animal markets, indicating person-to-person spread. Person-to-person spread was subsequently reported outside Hubei and in countries outside China, including in the United States. Most international destinations now have ongoing community spread with the virus that causes COVID-19, as does the United States.

On March 4, 2020, Governor Newsom proclaimed a state of emergency in the California in response to the COVID-19 outbreak. On March 19, 2020, Governor Newsom issued an executive order directing all residents immediately to heed current State public health directives to stay home, except as needed to maintain continuity of operations of essential critical infrastructure sectors. After a fourteen month stay at home order, the counties in California range from minimal to substantial risk levels, and the counties no longer fit the criteria for the widespread designation.

Figure: California's County Risk Levels as of May 18, 2021
(Source: California Department of Public Health)

WIDESPREAD	SUBSTANTIAL	MODERATE	MINIMAL
Many non-essential indoor business operations are closed	Some non-essential indoor business operations are closed	Some indoor business operations are open with modifications	Most indoor business operations are open with modifications



COUNTY RISK LEVELS

	Counties	Population	
Substantial	10	4,428,415	11.0%
Moderate	35	18,114,222	45.1%
Minimal	13	17,586,523	43.8%

Avian Influenza

Avian Influenza, commonly referred to as "Bird Flu," remains a looming pandemic threat. Avian Influenza primarily spreads from birds to birds and rarely to humans. Public health experts continue to be alert to the possibility that an avian virus may mutate or change so that it can be passed from birds to humans, potentially causing a pandemic in humans. Some strains of the Avian Influenza could arise from Asia or other continents where people have very close contact with infected birds. This disease could have spread from poultry farmers or visitors to live poultry markets who had been in very close contact with infected birds and contracted fatal strains of Avian Influenza. Thus far, Avian Influenza viruses have not mutated and have not demonstrated easy transmission from person to person. However, if Avian Influenza viruses were to mutate into a highly virulent form and become easily transmissible from person to person, the public health community would be very concerned about the potential for an influenza pandemic. Such a pandemic could disrupt all aspects of society and severely affect the economy.

Vector-Borne Diseases

Vector-borne diseases are human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors. Every year there are more than 700,000 deaths from diseases such as malaria, dengue, schistosomiasis, human African trypanosomiasis, leishmaniasis, Chagas disease, yellow fever, Japanese encephalitis and onchocerciasis. Vectors are living organisms that can transmit infectious pathogens between humans, or from animals to humans. Many of these vectors are bloodsucking insects, which ingest disease-producing microorganisms during a blood meal from an infected host (human or animal) and later transmit it into a new host, after the pathogen has replicated. Often, once a vector becomes infectious, they can transmit the pathogen for the rest of their life during each subsequent bite/blood meal.

Mosquito-Borne Viruses

Mosquito-borne viruses belong to a group of viruses commonly referred to as arboviruses (for arthropod-borne). Although 12 mosquito-borne viruses are known to occur in California, only West Nile virus (WNV), western equine encephalomyelitis virus (WEE), and St. Louis encephalitis virus (SLE) are significant causes of human disease. WNV continues to seriously affect the health of humans, horses, and wild birds throughout the state. Since 2003, there have been over 6,000 WNV human cases with 248 deaths, and over 1,200 equine cases.

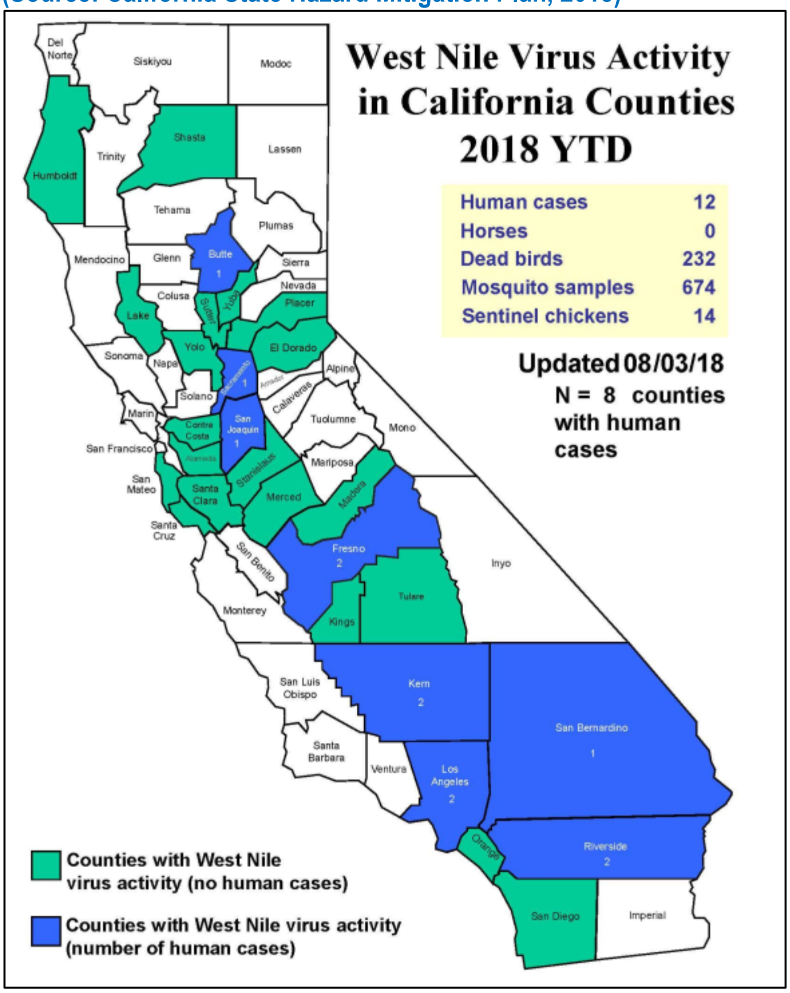
WNV first appeared in the United States in 1999 in New York and rapidly spread across the country to California in subsequent years. California has historically maintained a comprehensive mosquito-borne disease surveillance and control program including the Mosquito-borne Virus Surveillance and Response Plan, which is updated annually in consultation with local vector control agencies.

Climate change will likely affect vector-borne disease transmission patterns. Changes in temperature and precipitation can influence seasonality, distribution, and prevalence of vector-borne diseases. A changing climate may also create conditions favorable for the establishment of invasive mosquito vectors in California.

For most Californians, WNV poses the greatest mosquito-borne disease threat. Above-normal temperatures are among the most consistent factors associated with WNV outbreaks. Mild winters are associated with increased WNV transmission due, in part, to less mosquito and resident bird mortality. Warmer winter and spring seasons may also allow for transmission to start earlier. Such conditions also allow more time for virus amplification in bird-mosquito cycles, increasing the potential for mosquitoes to transmit WNV to people.

The effects of increased temperature are primarily through acceleration of physiological processes within mosquitoes, resulting in faster larval development and shorter generation times, more frequent mosquito biting, and shortening of the incubation period time required for infected mosquitoes to transmit WNV. During periods of drought, especially in urban areas, mosquitoes tend to thrive more due to changes in stormwater management practices. Mosquitoes in urban areas can reach higher abundance due to stagnation of water in underground stormwater systems that would otherwise be flushed by rainfall. Runoff from landscape irrigation systems mixed with organic matter can also create ideal mosquito habitat. Drought conditions may also force birds to increase their utilization of suburban areas where water is more available, bringing these WNV hosts into contact with urban vectors.

Map: West Nile Virus Activity in California Counties
(Source: California State Hazard Mitigation Plan, 2018)

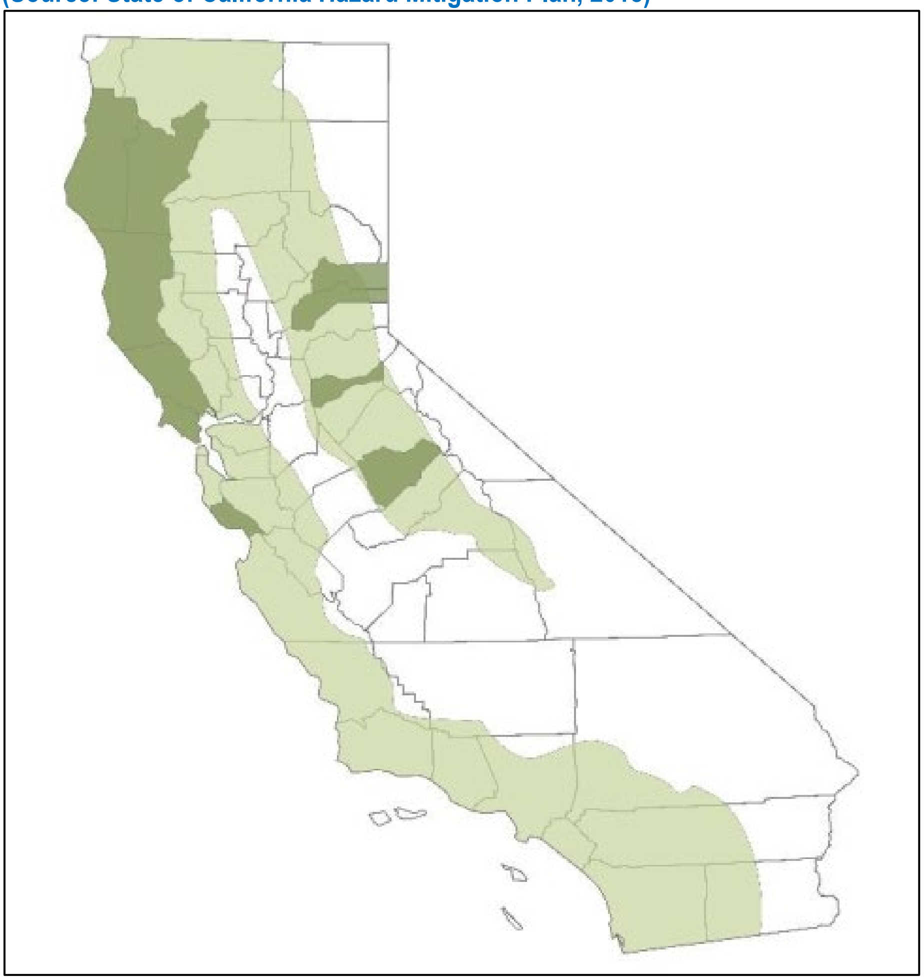


Lyme Disease

Lyme disease is caused by a spirochete (a corkscrew-shaped bacteria) called Borrelia burgdorferi and is transmitted by the Western black-legged tick. Lyme disease was first described in North America in the 1970s in Lyme, Connecticut, the town for which it was then named. Though the tick has been reported from 56 of the 58 counties in California, the highest incidence of disease occurs in the northwest coastal counties and northern Sierra Nevada counties with western-facing slopes. Ticks prefer cool, moist areas and can be found in wild grasses and low vegetation in both urban and rural areas.

The map below shows Western black-legged tick and Lyme disease incidence in California. The Western black-legged tick is commonly found in all green areas shown on the map; dark green areas on the map show where reported Lyme disease cases most often had exposure.

Map: Tick and Lyme Disease Incidence in California
(Source: State of California Hazard Mitigation Plan, 2018)



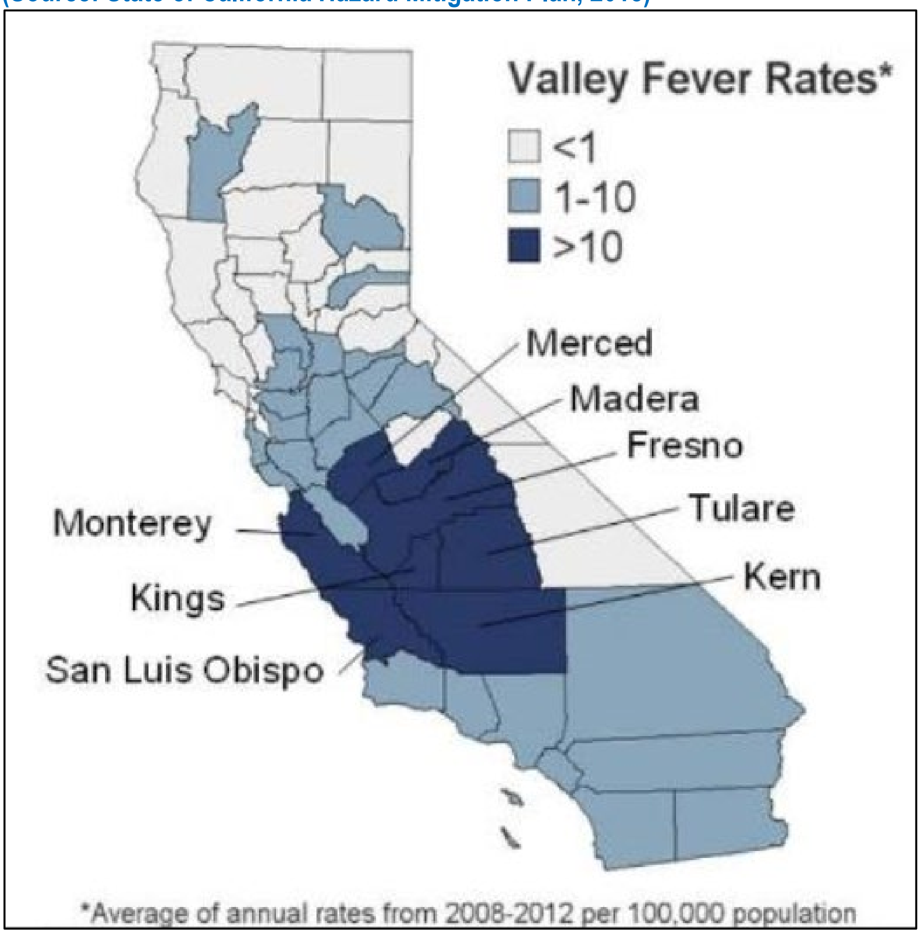
Valley Fever

Valley Fever is caused by Coccidioides, a fungus that lives in the soil in the southwestern United States and parts of Mexico, Central America, and South America. Inhaling the airborne fungal spores can cause an infection called coccidioidomycosis, which is also known as “cocci” or “Valley Fever.”

Most people who are exposed to the fungus do not get sick, but some people develop flu-like symptoms that may last for weeks to months. In a very small proportion of people who get Valley Fever, the infection can spread from the lungs to other parts of the body and cause more severe conditions, such as meningitis or even death. Valley Fever cannot spread from person to person.

Most cases of Valley Fever in the U.S. occur in people who live in or have traveled to the southwestern United States, especially Arizona and California. The map below shows the areas where the fungus that causes Valley Fever is thought to be endemic, or native and common in the environment. The full extent of the current endemic areas is unknown and is a subject for further study.

Map: Valley Fever Average Annual Rates by California County
(Source: State of California Hazard Mitigation Plan, 2018)



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Epidemic/Pandemic and Vector-Borne Diseases in the Metro Service Area** below.

Previous Occurrences of Epidemic/Pandemic and Vector-Borne Diseases in the Metro Service Area

The tables below show previous occurrences of West Nile and Influenza cases affecting Los Angeles County:

Table: Confirmed West Nile Infections and Fatalities in Los Angeles County by Year (Source: Acute Communicable Disease Control, County of Los Angeles Public Health, 2019)

Year	Infections	Hospitalizations	Deaths
2015	300	262	24
2016	153	131	6
2017	268	224	27
2018	47	37	3
2019	29	24	3

Table: Los Angeles County Influenza Surveillance Summary, 2018-19 Influenza Season (Source: Influenza in Los Angeles County, County of Los Angeles Public Health, 2019)

Year	Influenza	Respiratory Outbreak (Influenza)	Unknown Respiratory Outbreak	Deaths
2017-2018	12,429	43	113	289
2018-2019	6,429	25	21	125

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general description of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Regional Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii))   **A:** See **Regional Conditions** below.

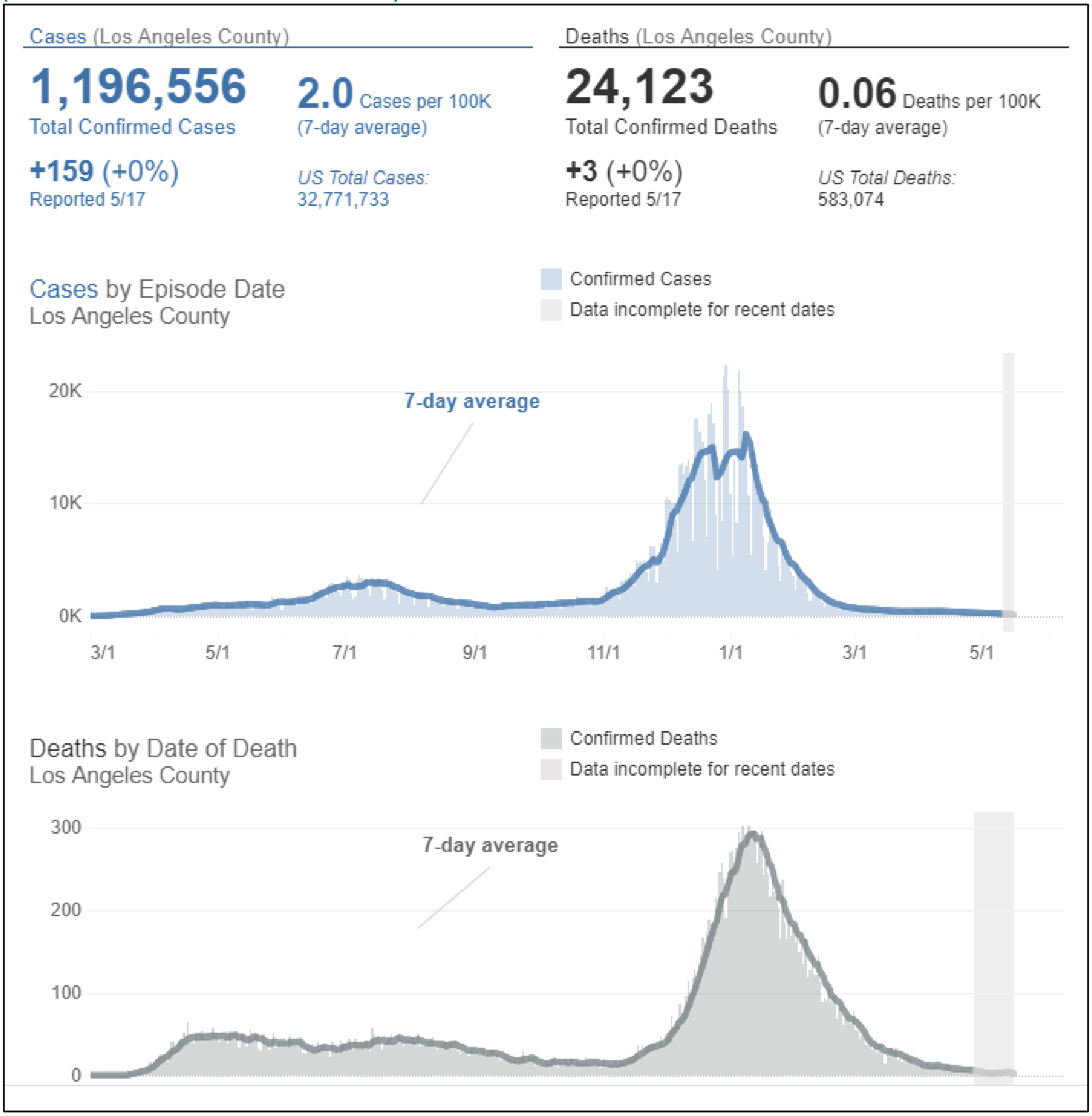
Regional Conditions

Epidemic/Pandemic in Los Angeles County

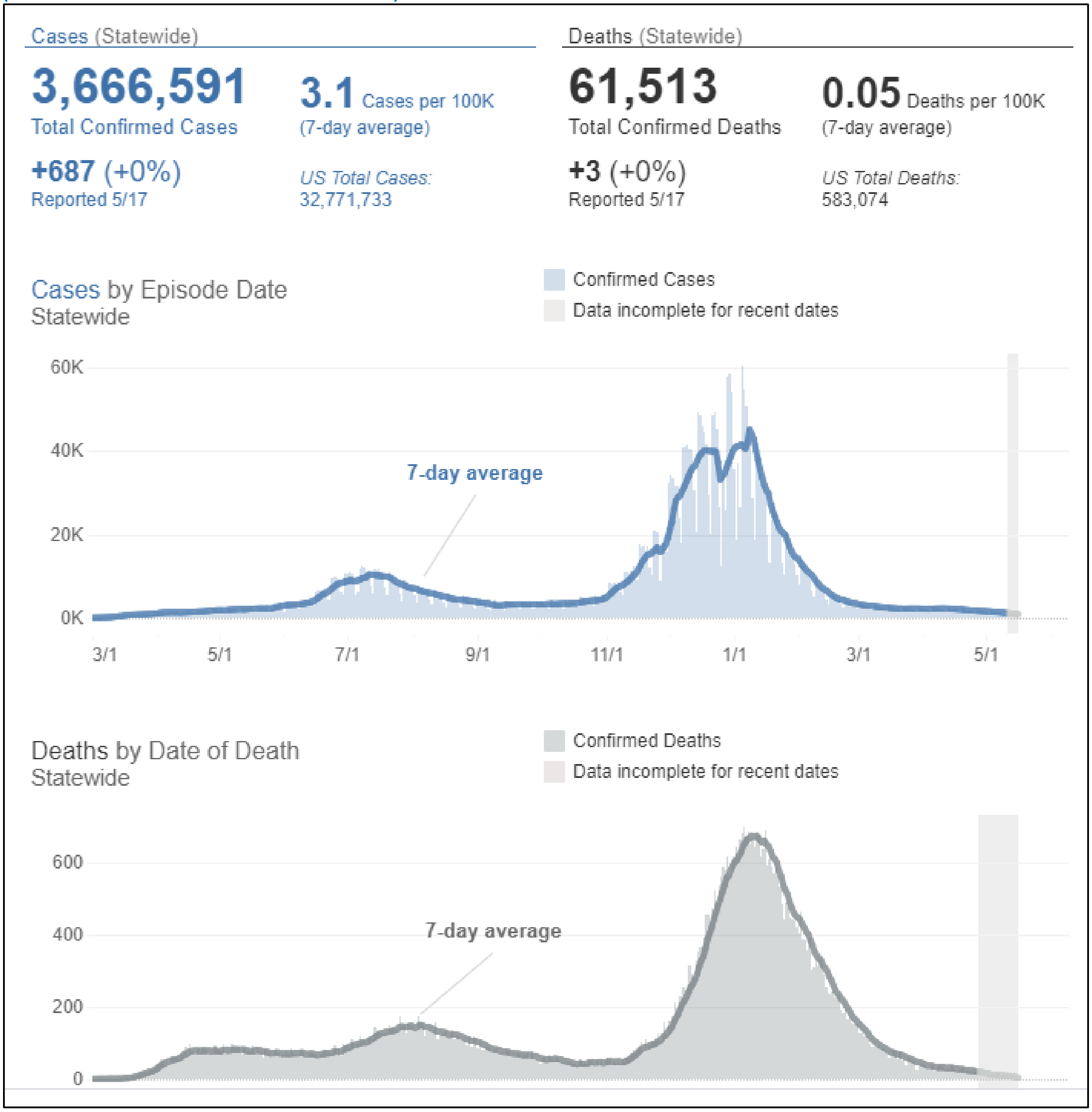
While the variety of influenza, vector borne, and mosquito borne diseases continue to affect the Service Area, COVID-19 currently has the biggest impact. According to California's COVID-19 website as of May 18, 2021, Los Angeles County had 159 new cases reported, contributing to the

1,196,556 total cases reported. COVID related deaths have taken 24,123 lives in Los Angeles County. The state of California's data reflects a total of 3,666,591 cases and 61,513 deaths.

Graph: Daily Cases and Deaths by Episode Date: COVID-19 – Los Angeles County (Source: California's COVID-19 Website)



Graph: Daily Cases and Deaths by Episode Date: COVID-19 – State of California (Source: California's COVID-19 Website)



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's impacts on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Epidemic/Pandemic and Vector-Borne Diseases in the Metro Service Area** below.

Impact of Epidemic/Pandemic and Vector-Borne Diseases in the Metro Service Area

Based on the risk assessment, it is evident that Epidemic/Pandemic and Vector-Borne Diseases will continue to have potentially devastating economic impacts to the Metro Service Area. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life
- ✓ Disruption of public infrastructure
- ✓ Disruption of the educational process
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Closure of businesses and public services
- ✓ Reduction of transportation services

PART III: MITIGATION STRATEGIES

Mitigation Strategies

Overview of Mitigation Strategy

As the cost of damage from disasters continues to increase nationwide, Metro recognizes the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation Plans assist communities in reducing risk from natural hazards by identifying resources, information and strategies for risk reduction, while helping to guide and coordinate mitigation activities at Metro facilities.

The plan provides a set of action items to reduce risk from hazards through education and outreach programs, and to foster the development of partnerships. Further, the plan provides for the implementation of preventative activities.

The resources and information within the Mitigation Plan:

1. Establish a basis for coordination and collaboration among agencies and the public in the Metro service area;
2. Identify and prioritize future mitigation projects; and
3. Assist in meeting the requirements of federal assistance programs

The Mitigation Plan is integrated with other plans including the Metro System Security Emergency Preparedness Plan (SEPP) and Facilities Maintenance Plan as well as department-specific standard operating procedures.

Mitigation Measure Categories

Following is FEMA's list of mitigation categories. The activities identified by the Planning Team are consistent with the six broad categories of mitigation actions outlined in FEMA publication 386-3 *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies*.

- ✓ **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
- ✓ **Property Protection:** Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- ✓ **Public Education and Awareness:** Actions to inform and educate citizens, property owners, and elected officials about hazards and potential ways to mitigate them.

  Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- ✓ **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses preserve or restore the functions of natural systems. Examples include sediment and

erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- ✓ **Emergency Services:** Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- ✓ **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, retaining walls, and safe rooms.

Q&A | ELEMENT C. MITIGATION STRATEGY | C3
Q: Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i)) **A:** See **Goals** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D3
Q: Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.

Goals

The Planning Team established goals based on the risk assessment that represent a long-term vision for hazard reduction and enhanced mitigation capabilities.

Each goal is supported by mitigation action items. The Planning Team developed these action items through its knowledge of the local area, risk assessment, review of past efforts, identification of mitigation activities, and qualitative analysis.

The five mitigation goals and descriptions are listed below.

Protect Life and Property

Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural, human-caused, and technological hazards.

Improve hazard assessment information to make recommendations for avoiding new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural, human-caused, and technological hazards.

Increase Public Awareness

Develop and implement education and outreach programs to increase public awareness of the risks associated with natural, human-caused, and technological hazards.

Provide information on tools; partnership opportunities, and funding resources to assist in implementing mitigation activities.

Protect Natural Systems

Support management and land use planning practices with hazard mitigation to protect life.

Preserve, rehabilitate, and enhance natural systems to serve hazard mitigation functions.

Promote Partnerships and Implementation

Strengthen communication and coordinate participation with public agencies, riders, non-profit organizations, business, and industry to support implementation.

Encourage leadership within Metro and public organizations to prioritize and implement local and regional hazard mitigation activities.

Enhance Emergency Services

Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Coordinate and integrate hazard mitigation activities where appropriate, with emergency operations plans and procedures.

Q&A | ELEMENT C. MITIGATION STRATEGY | C5a.
Q: Does the plan explain how the mitigation actions and projects will be prioritized (including cost benefit review)? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
A: See **Benefit/Cost Ratings** and **Priority Rating** below.

Benefit/Cost Ratings

The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

Cost ratings were defined as follows:

> **High:** Existing jurisdictional funding will not cover the cost of the action item so other sources of revenue would be required.
>
> **Medium:** The action item could be funded through existing jurisdictional funding but would require budget modifications.
>
> **Low**: The action item could be funded under existing jurisdictional funding.

Benefit ratings were defined as follows:

High: The action item will provide short-term and long-term impacts on the reduction of risk exposure to life and property.

Medium: The action item will have long-term impacts on the reduction of risk exposure to life and property.

Low: The action item will have only short-term impacts on the reduction of risk exposure to life and property.

Q&A | ELEMENT D. MITIGATION STRATEGY | D3
Q: Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3)) **A:** See **Priority Rating** below.

Priority Rating

The Planning Team utilized the following Priority Rating method. Designations of “High”, “Medium”, and “Low” priority have been assigned to all of the action item using the following criteria:

Does the Action:

- ☐ solve the problem?
- ☐ address Vulnerability Assessment?
- ☐ reduce the exposure or vulnerability to the highest priority hazard?
- ☐ address multiple hazards?
- ☐ benefits equal or exceed costs?
- ☐ implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?

Can the Action:

- ☐ be implemented with existing funds?
- ☐ be implemented by existing state or federal grant programs?
- ☐ be completed within the 5-year life cycle of the LHMP?
- ☐ be implemented with currently available technologies?

Will the Action:

- ☐ be accepted by the community?
- ☐ be supported by community leaders?
- ☐ adversely impact segments of the population or neighborhoods?
- ☐ require a change in local ordinances or zoning laws?
- ☐ positive or neutral impact on the environment?
- ☐ comply with all local, state and federal environmental laws and regulations?

Is there:

- ☐ sufficient staffing to undertake the project?
- ☐ existing authority to undertake the project?

As mitigation action items were updated or written the Planning Team, representatives were provided worksheets for each of their assigned action items. Answers to the criteria above determined the priority according to the following scale.

- 1-6 = Low priority
- 7-12 = Medium priority
- 13-18 = High priority

Q&A | ELEMENT C. MITIGATION STRATEGY | C1b.
Q: Does the plan document each jurisdiction's ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4a.
Q: Does the plan identify and analyze a comprehensive range (different alternatives) of specific mitigation actions and projects to reduce the impacts from hazards? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4b.
Q: Does the plan identify mitigation actions for every hazard posing a threat to each participating jurisdiction? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4c.
Q: Do the identified mitigation actions and projects have an emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C5a.
Q: Does the plan explain how the mitigation actions and projects will be prioritized (including cost benefit review)? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C5b.
Q: Does the plan identify the position, office, department, or agency responsible for implementing and administering the action/project, potential funding sources and expected timeframes for completion? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D1
Q: Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D2
Q: Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D3
Q: Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6c.
Q: The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. (Requirement §201.6(c)(4)(ii)) **A:** See **Mitigation Actions Matrix** below.

Mitigation Actions Matrix

Following is **Table: Mitigation Actions Matrix** which identifies the existing and future mitigation activities developed by the Planning Team.

Table: Mitigation Actions Matrix: Bus Facilities and Property Maintenance (BFPM)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
MH-1														
MH-2														
Earthquake														
EQ-1 Protect Critical facilities and Infrastructure.	BFPM	GF	5-20 years	GF	X					M	H	H	Y	Terminals 47 & 48 are not up to the latest building codes. There are pedestrian bridges that span over the freeways and could potentially collapse.

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Flood														
FLD-1 Improve Stormwater Drainage System Capacity	BFPM	GR	5-10 years	GF	X				X	L	M	M	Y	With “El Nino” type storms, water has to be removed from several divisions. Terminal 19’s lower level is in jeopardy of flooding. Pumps may be overwhelmed
Wildfire														
WF-1														
WF-2														
Landslide														
LND-1 Monitor and address Subsidence Hazard Areas	BFPM	GR	5-10 years	GF	X					L	M	M	Y	There is gradual settling of the

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
														surface at Terminal 48. This is the upper level (West Bound) where vehicles travel & a bus stop resides.
LND-2 Stabilize Erosion Hazard Areas	BFPM	GF	5-10 years	GF	X					L	M	H	Y	Terminal 42 (Echo Park) sits next to a hillside. The hillside needs securing and could slide with heavy rains.
Windstorms														
WND-1 Numerous trees at various locations vulnerable to severe wind.	BFPM	GF	1-10 years	GF	X					L	L	M	Y	Trim or replace trees susceptible to falling over

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
														causing additional infrastructure damage.
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1 Retrofit Water Supply Systems	BFPM	GF	5-20 years	GF	X					L	L	H	Y	To save water timers can be installed on the steamers. Occasionally they run all day.
CC-2 Extreme Temperature – Improve ventilation system, for patrons at the lower level of the bus terminal	BFPM	GR	5-20 years	GF	X					L	L	M	Y	

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
CC-3 In the future, hydration station signage should be integrated into bus station designs.	BFPM	GF	5-10 years	GF	X					L	M	H	Y	
CC-4 Examine the feasibility of decreasing intervals for buses and rails in areas likely to experience up to 95 days a year above 95 F.	BFPM	GF	5-10 years	GF	X					L	M	H	N	
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Bus Operations (BO) and Rail Operations (RO)

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
Multi-Hazard														
MH-1 Capital Project 202338 - Bus Division Improvement. Specifically, repairing bus facilities and divisions. Currently working on the roofs at divisions 5 and 7. Division 5 has asbestos in the HVAC tape and the roof was leaking excessively. Division 7 also has leaking and asbestos in the roofing at the fuel building.	BO – Transportation Operations	GR	1-5 years	GR	X					H	H	H	Y	Capital Project 202338
MH-2 Rail Facilities Project 204142 is for rail facilities improvements including: + replacing the leaking roofs at rail divisions 11, 22, and 60. All three locations have asbestos in the roofing materials.	RO – Rail Transportation Operations	GR	1-5 years	GR	X					H	H	H	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
+ Divisions 11 and 22 also need new HVAC systems due to freon leaks. Currently Division 22 has no working HVAC due to leaking.														
MH-3 Project 202213 for removing leaking underground fuel and oil storage tanks.	BO – Transportation Operations	GR	1-5 years	GR	X					H	H	H	Y	
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1														
FLD-2														
Wildfire														
WF-1														
WF-2														
Landslide														
LND-1														
LND-2														
Windstorms														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Environmental Compliance and Sustainability (ECS)

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
Multi-Hazard														
MH-1 Install strobe light for emergency generators at all facilities, as has been piloted at Division 2, to alert site when backup power starts up.	Facilities Maintenance	GF	1-5 years	CAAP	X	X			X	H	H		Y	2019 CAAP Risk Assessment Matrix
MH-2 Protection of above ground storage tanks.	Environmental Compliance and Sustainability	GF	1-5 years	GF	X		X		X	M	H	M	Y	
MH-3 Update and implement Inclement Weather Plan	Operations	GF	1-3 years	GF	X	X	X	X	X	H	H	L		2015 Draft Inclement Weather Plan
MH-4 Collaborate with municipalities to enhance resilience of vulnerable transit stops and routes	Planning & Engineering	GR	1-30 years	CAAP	X	X	X	X	X	M	H	H	Y	2019 CAAP
MH-5 Integrate climate resilience as part of project planning and design for Measure M transit projects	Planning & Engineering	GR	1-30 years	CAAP	X	X	X	X	X	H	H	M	Y	2019 CAAP

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
MH-6 Increase redundancy in power systems, installing additional backup generators and establishing micro grids at Metro facilities.	Facilities Engineering, Environmental Compliance and Sustainability, Engineering	GR	1-10 years	CAAP	X				X	H	H	M	Y	2019 CAAP
MH-7 Increase use of vegetation on Metro property to improve air quality, water quality, carbon storage and community health.	Facilities Engineering, Environmental Compliance and Sustainability	GF	1-30 years	CAAP, GF			X			L	M	M	Y	2019 CAAP
MH-8 Ensure Sustainable Acquisition Program accounts for climate resilience of materials (i.e., heat-, water-, fire-resilient materials).	Environmental Compliance and Sustainability, Vendor Contract Management	CAAP	1-5 years	CAAP	X	X	X	X		H	H	L		2019 CAAP
MH-9 Revise insurance coverage for natural hazards to align with predicted impacts from climate hazard assessment.	Risk, Safety, and Asset Management	Unknown	Unknown	CAAP	X				X	L	H	L		2019 CAAP
MH-10 Develop comprehensive enterprise-	ITS	GF	1-5 years	GF, CAAP	X		X	X	X	H	H	L		2019 CAAP

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
wide data management and spatial data database and program, inclusive of weather and asset maps, that are easily accessible and regularly updated to aid quick response to risks.														
MH-11 Develop Climate Resilience Implementation Framework to categorize and prioritize climate resilience investments in the system.	Environmental Compliance and Sustainability	CAA P	5-25 years	CAAP	X	X	X	X	X	H	H	M	Y	2019 CAAP
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1 Install permeable pavement at facilities (such as Divisions 21, 5, and 11) and stations (such as the Westlake/MacArthur Park, Hollywood/vine, and Del Amo stations) with high exposure	Environmental Compliance and Sustainability	GR	1-30 years	CAAP, GR	X	X	X	X	X	M	H	H	Y	2019 CAAP

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
risk for heavy precipitation and riverine flooding to alleviate inundation impacts and recharge aquifers.														
FLD-2 Improve stormwater management systems at facilities (such as Divisions 21, 5, and 11) and stations (such as the Westlake/MacArthur Park, Hollywood/vine, and Del Amo stations) with high exposure risk for heavy precipitation and riverine flooding to alleviate inundation impacts and recharge aquifers.	Engineering & Facilities Maintenance	GR	1-30 years	CAAP, GR	X	X	X	X	X	M	H	H	Y	2019 CAAP
FLD-3 Implement green infrastructure to capture and reuse stormwater runoff at assets with high exposure risk for heavy precipitation and riverine flooding.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP, GR	X	X	X	X	X	M	H	H	Y	2019 CAAP

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
FLD-4 For assets or locations where flooding occurs often, or that are located in a flood zone, relocate assets to other areas, elevate, or incorporate low-impact development to avoid flood damage.	Environmental Compliance and Sustainability, Facilities Maintenance, Engineering	GF/ GR	1-30 years	CAAP, GF, GR	X	X	X	X	X	M	H	M	Y	2019 CAAP Critical Asset Identification Interview
Wildfire														
WF-1														
WF-2														
Landslide														
LND-1 Improve stabilization of slope at Division 21	Facilities Maintenance	GF/ GR	Unknown	CAAP	X		X		X	H	H		Y	2019 CAAP Critical Asset Identification Interview; 2019 CAAP Risk Assessment Matrix
LND-2 Implement erosion and mudslide control devices for assets at extreme risk to landslide and mudslides.	Engineering & Facilities Maintenance	GF/ GR	Unknown	CAAP	X		X		X	H	H	M	Y	2019 CAAP Risk Assessment Matrix

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
LND-3 For areas adjacent to non-Metro landslide-prone areas, develop P3 to protect infrastructure.	OEI	GR	15 years	GR	X			X		L	M	H	Y	
LND-4 Map and Assess Vulnerability to Erosion.	ECSD	GR	1 year	GR	X	X		X		M	M	L		
LND-5 Stabilize Erosion Hazard Areas. Specifically, Blue Line.	Wayside Engineer	GR	5 years	GR	X		X			L	M	H	Y	
Windstorms														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1 Develop a coastal hazard management plan for Metro assets at risk to sea level rise, coordinating with local municipalities with Local Coastal Programs (LCPs).	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X	X	X	X	X	L	H	H	Y	2019 CAAP

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
CC-2 Convert Metro's bus fleet to Zero Emission Buses (ZEB) by 2030. Specifically, transition the Metro Orange Line and Metro Silver Line to ZEBs by 2020 and 2021, respectively. Develop a Zero-Emissions Bus Master Plan for accomplishing a 100% ZEB Fleet by 2030.	Vehicle Acquisition	GF/ GR	1-10 years	GR	X	X	X	X	X	H	H	M	Y	Board Report #2019-0458, Metro Bus Fleet Forecast and Zero Emission Bus Program Update; 2019 CAAP
CC-3 Replace non-revenue vehicles with Battery Electric Vehicles (BEVs)	Maintenance Administration, Non-Revenue Fleet Maintenance	GF/ GR	1-30 years	CAAP	X	X	X	X	X	L	H	M	Y	2019 CAAP; draft Electric Vehicle Implementati on Plan
CC-4 Wayside Energy Storage Substation (WESS) Installation	Rail Mow Engineering	GR	1-30 years	CAAP	X	X	X	X	X	L	L	L	Y	2019 CAAP; Solis et al. 2015. Saving Money Every Day: LA Metro Subway Wayside

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
														Energy Storage Substation.
CC-5 Expand Use of Renewable Energy	Environmental Compliance and Sustainability	GF	1-15 years	CAAP	X		X	X	X	H	H	L		2019 CAAP
CC-6 Install up to 51.2 MW of new solar photovoltaics on-site Metro existing facilities	Environmental Compliance and Sustainability	GR	1-10 years	CAAP			X	X	X	M	M	M	Y	2019 CAAP; LA Metro. 2018. LA Metro Solar Potential Square Footage Extraction.; LA Metro. 2018. Photovoltaic Cost Benefit Analysis.
CC-7 Install retrofits of low-water sanitary fixtures that require less water and energy in existing	Environmental Compliance and Sustainability	GR	1-10 years	CAAP			X	X	X	L	L	M	Y	2019 CAAP; 2010 Water Action Plan; Hendrickson,

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
buildings and new low-water fixtures in new buildings.														et al. Impacts of Groundwater Management on Energy Resources and Greenhouse Gas Emissions in California; Los Angeles Department of Water and Power (LADWP). 2015. Urban Water Management Plan
CC-8 Install non-potable recycled water systems on existing and new facilities.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X		X	X	X	L	L	M	Y	2019 CAAP; 2010 Water Action Plan;

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
														Hendrickson, et al. Impacts of Groundwater Management on Energy Resources and Greenhouse Gas Emissions in California; Los Angeles Department of Water and Power (LADWP). 2015. Urban Water Management Plan

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
CC-9 Replace interior and exterior lighting fixtures with LEDs at facilities.	Environmental Compliance and Sustainability	GR	1-10 years	CAAP					X	L	M	M	Y	2019 CAAP; Division 18 ASHRAE Audit
CC-10 Install electric heating systems at facilities.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X		X		X	L	H	M	Y	2019 CAAP
CC-11 Replace appliances with high-efficiency electric appliances at facilities.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X		X		X	L	L	M	Y	2019 CAAP
CC-12 Install EV charging infrastructure at Metro facilities.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X	X		X		L	M	H	Y	2019 CAAP; 2019 Metro EV Implementati on Plan; LA Metro 2017 Average Vehicle Rider Report
CC-13 Replace Gold, Green, Blue, and Expo Line overhead catenary systems with spring tensioner system.	Systems Engineering	GR	1-30 years	CAAP, GR	X	X		X	X	H	H	H	Y	2019 CAAP; Metro Light Rail Resiliency

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
														Project FY 2016 TIGER Discretionary Grant Application
CC-14 Increase shading of 33 railway stations identified as extreme risk to extreme heat.	Environmental Compliance and Sustainability	GR	1-30 years	CAAP	X	X	X	X	X	M	H	H	Y	2019 CAAP Risk Assessment Matrix
CC-15 Partner with local jurisdictions to implement bus shelters at high priority bus stops/hubs.	Countywide Planning, Transit Oriented Communities	GR	1-30 years	CAAP	X	X		X		H	H	H	Y	2019 CAAP
CC-16 Plant trees around transit stops, parking lots, yards and other open-space areas to provide shading at assets, facilities, locations, and stations identified as extreme and high risk to extreme heat.	Facilities Maintenance	GR	1-30 years	CAAP	X	X	X	X		H	H	M	Y	2019 CAAP
CC-17 Develop a plan for future drought events.	ECSD	GR	1 year	GR	X	X		X		M	M	L		Water Action Plan

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
CC-18 Identify at-risk underground equipment and design for critical temperatures and /or cooling systems.	Program Management	GR	X	GR						H	H	H	Y	
CC-19 Install large fans at division maintenance facilities.	Facilities Maintenance	GF	10 years	GF	X					M	H	M	Y	
CC-20 Protect Buildings and Infrastructure from sea level rise. Specifically, Blue Line /Long Beach.	Facilities Engineering	GR	10 years	CAAP	X			X		L	M	H	Y	CAAP 2019
CC-21 Install fans or air circulation systems for patrons in underground stations.	Program Management	GR	10 years	CAAP	X	X				H	H	H	Y	CAAP 2019
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Emergency Management (EM)

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
MH-1 Certify staff to be qualified to conduct inspections of Metro buildings and infrastructure after an earthquake or other destructive event occurs.	Emergency Management	GR	2-10 years	GR	X				X	M	H	H	Y	
MH-2 Analyze and establish alternate water supply for divisions and headquarter for use following a disaster. It is generally estimated that following a M7.0 earthquake that water lines will be damaged if not severed. Metro desires to plan for an alternate source of water supply to satisfy needs for a week.	Emergency Management	GR	2-10 years	GR	X				X	M	H	H	Y	
MH-3 Geographically locate emergency response	Emergency Management	GR	2-4 years	GR	X				X	M	H	M	N	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
equipment, supplies and personal protective equipment (PPE) for all Metro responders.														
MH-4 Develop specifications for mobile emergency operations center response vehicle.	Emergency Management	GR	2-5 years	GR	X				X	M	H	H		
MH-5 Maintain and update a Continuity of Operations Plan. The purpose of the plan is to ensure that capability exists to continue Metro's essential governmental functions across a wide range of potential emergencies. A COOP will be maintained and updated for each of the organizational entities within Metro.	Emergency Management	GR	2-5 years	GR	X	X	X	X	X	H	H	H	Y	
MH-6 Investigate the possibility of working with The Boring Company to install batteries underground that														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
could be utilized in emergencies.														
Earthquake														
EQ-1 Purchase and install an agency-wide earthquake early warning system to include notification and/or electronic automations at sites, on bus/rail system, and dash boards of impending ground shaking.	Emergency Management	GR	3-6 years	GR	X	X		X	X	M	H	H	Y	
EQ-2 Conduct study to assess Metro existing facilities for non-structural retrofitting.	Emergency Management	GR	2-10 years	GR	X					M	H	H	Y	
EQ-3 Conduct a seismic safety inventory of all Metro critical assets (i.e., bridges, tunnels, stations, buildings) to determine if seismic retrofitting is necessary to the most current standards.	Emergency Management	GR	2-6 years	GR	X					M	H	H	Y	
EQ-3 Provide emergency power to all Metro critical	Emergency Management	GR	2-5 years	GR	X			X	X	M	H	H	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
facilities in the event of a prolonged power failure.														
Flood														
FLD-1 – Purchase equipment (i.e., sump pumps, sandbags, etc.) to minimize impact to flooding near or adjacent to bus/rail revenue services.	Emergency Management	GR	2-6 years	GR	X				X	M	H	H		
FLD-2														
Wildfire														
WF-1 Increase the tree trimming and add fire-safe vegetation around all Metro bus and rail service areas that abut the wild land-urban interface.	Emergency Management	GR	4-6 years	GR	X					L	M	H		
WF-2														
Landslide														
LND-1														
LND-2														
Windstorms														
WND-1														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1 Maintain and improve upon existing COVID mitigation protocols based on: + Emphasizing individual responsibility for implementing recommended personal-level actions +Minimizing disruptions to daily life to the extent possible and ensuring access to health care and other essential services.	Emergency Management	GR	Ongoing	GR	X	X		X	X	M	H	H	Y	
EPV-2 Maintain Healthy Environments:	Emergency Management,	GR	Ongoing	GR	X	X		X	X	M	H	H	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
+Regularly clean high-touch surfaces and objects. +Ensure ventilation systems operate properly and increase circulation of outdoor air as well as utilizing air filtration and purification methodologies. +Ensure all water systems are safe to use. +Modify layouts to promote social distance of at least 6 feet between people – especially for persons who do not live together. +Install physical barriers and guides to support social distancing if appropriate.	Facilities Maintenance, General Services													
EPV-3 Maintain and update pandemic Plan and develop and deliver training module for all employees, to increase	Emergency Management	GR	Ongoing	GR	X	X		X	X	M	H	H		

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
preparedness and awareness of operational response.														

Table: Mitigation Actions Matrix: General Services (GS)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
Multi-Hazard														
MH-1 Install new bollards and tilt up barriers for hardening the facility at all parking and building entrances for the safety and security of patrons and employees.	General Services	HMGP, PDM, BRIC	10 years	GR	X	X	X		X	H	H	H	Y	
MH-2 The USG parking garage emergency phone system includes installation of 52 emergency voice/video phone stations for public safety. These will be accessible to our patrons and employees providing Security with voice and video communications enhancing safety within the Gateway Center.	General Services	GR/Phase 1 GR/Phase 2	10 years	GR	X	X	X		X	H	H	H	Y	General Services Capital Projects Phase 1 started in Sept 2019
MH-3 Installation of 37 digital message display	General Services	HMGP, PDM, BRIC	10 years	GR	X	X			X	H	H	H	Y	General Services

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
boards including sign enclosures and electronics throughout the USG garage for public announcements and emergency notifications including lock down periods. General Services will install signs and supporting pathways to bring power and IT connections to 37 locations in the USG parking garage. This new infrastructure will expand notification signal to garage to accommodate digital sign installation for mass notification purposes.														Capital Projects
MH-4 Installation of cat walks and access into the dome area for maintenance and housekeeping. Also adding safety and	General Services	HMGP, PDM, BRIC	10 year	GR	X			X		H	H	H	Y	General Services Capital Projects

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
protection for dome glass cleaning access.														
MH-5 Renovation/replacement of obsolete fire detection system for USG facility. The equipment manufacturer has discontinued the support and services. Replacement is required to comply to fire code (NFPA 72) and maintain compliance for occupancy.	General Services	HMGP, PDM, BRIC	10 year	GR	X	X	X	X	X	H	H	H	Y	General Services Capital Projects
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1 Replacement of all horizontal and vertical drainage piping for the storm drain, overflow storm drain and the sewer drain piping within the Gateway	General Services	HMGP, PDM, BRIC	10 years	GR	X		X			H	H	H	Y	General Services Capital Projects

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
building, parking structure and the east portal.														
FLD-2Enlarge sump tanks and scale up the size of the pumps in the P-4 level Parking garage to mitigate flooding due to the flood zone that the parking structure is in.	General Services	HMGP, PDM, BRIC	10 years	GR	X					H	H	H	Y	Flood Zoning Map
Wildfire														
WF-1														
WF-2														
Landslide														
LND-1														
LND-2														
Windstorms														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
CC-1 Reconfigure the Gateway building's data center to reduce energy consumption by placing IT systems in a centralized location. Electrical, lighting, controls, and cooling systems will be reconfigured in conjunction with the data center IT based systems.	General Services	HMGP, PDM, BRIC	10 years	GR			X			H	H	H	Y	General Services Capital Projects
CC-2														

Table: Mitigation Actions Matrix: Information Technology (IT)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
Ensure power stability for communications at all Bus and Rail Divisions with uninterruptible power systems to support mission critical communications during power-outage.	Information Technology	GF	1-10 years	GF	X				X				Y	
Ensure power stability for Bus & Rail Divisions critical operating systems during power-outage.	Information Technology	GF	1-10 years	GF	X				X				Y	
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1														
FLD-2														
Wildfire														
WF-1														
WF-2														
Landslide														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
LND-1														
LND-2														
Windstorm														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Maintenance of Way Engineering (MOW Eng)

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
MH-1 Install generator receptacles at street level with automatic transfer switch (ATS) and redistribution of backup power loads on all underground stations. The underground in the LA area accumulates explosive and toxic gases that must be monitored and fans to circulate the air. Current design has for two external power feeds with four hours of battery backup connected to a very small collection of systems. Providing for a generator receptacle would allow a generator to quickly be connected to power the underground system. Additionally, the low voltage power distribution system	MOW Eng	GR			X				X	M	H	H	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
would be modified to increase the amount of systems on battery backup.														
MH-2 Maximize resiliency of the network communication architecture, Metro wishes to close the fiber optic loop to create a survivable dual backbone network		GF			X			X	X	H	M	M		
MH-3 Capture AS-Is configuration of railroad by performing a 3D laser scan of system and rooms.		GF			X				X	M	M	M		
MH-4 Install a backup generator at Division 24 – Monrovia Yard for the ability to power the yard and facilities in the event of long-term power loss. Division 24 is currently the only heavy maintenance facility for the entire light rail system. Additional infrastructure and electrical	MOW Eng / Facilities Maintenance	GF			X				X	H	M	M	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
work would have to be installed to support the site-wide generator.														
MH-5 Elevate Blue Line to separate rail line from traffic and flood plain	MOW Eng									H	H	H		
MH-6 Perform emergency restoration study to identify equipment, procedures, and action required to restore rail service (such as traction power, rail, com, or track) in the event of some type incident.	MOW Org	GR						X	X	H	H	L		
Earthquake														
EQ-1 Adopt and Enforce Building Codes to Protect Against Damaging Earthquakes.					X					H	H	H	Y	
EQ-2 Incorporate Earthquake Mitigation into Metro planning.					X					H	H	M	Y	
Flood														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
FLD-1 There are a few EXPO Traction Power substation that require sand bagging of doors when it rains. To protect the property from flooding damage, it is recommended that flood prevention measures be implemented at these locations.		GR			X				X	L	M	H		
FLD-2 Form partnerships to support floodplain management.		GF		GF	X			X		M	M	L	Y	
FLD-3 Conduct regular maintenance for drainage systems and flood control structures.		GF/ GR		GF/GR	X					H	H	M	Y	
Wildfire														
WF-1 Map and assess vulnerability to wildfire. Maintain and update the Wildfire Critical Facilities Map included in the 2020 Hazard Mitigation Plan.		GR			X			X	X	L	L	H	Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
WF-2 During periods of high winds and fire conditions impacting the Monrovia yard, it is vulnerable to outages through the new PSPS program. To keep the yard function to supply rail vehicles, the yard requires a generator of sufficient size to power the yard.		GR	1 year	GR	X			X	X	H	H	H	Y	
Landslide														
LND-1 There is a hillside slope that is owned by LA Metro and LA County along the Gold Line near Highland Park and South Pasadena (CM 593) that needs stabilized to prevent the continual sliding into our ROW during rainstorms.		GF			X		X	X		M	M	M		Hazard Analysis
LND-2 There is a hillside slope that is owned by LA Metro along the Gold Line near pocket track (CM 510 – 520)		GF			X		X			M	M	M		

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
that needs stabilized to prevent the continual sliding into our ROW during rainstorms.														
LND-3 Utilize and Update the Landslide Critical Facilities Map in the 2020 Hazard Mitigation Plan		GF		GF	X		X			H	H	L		
Windstorms														
WND-1 Assess Vulnerability to Severe Wind. Perform an assessment.		GF		GF	X					H	M	L		
Tsunami														
TSU-1 Map and Assess Vulnerability to Tsunami. Utilize and update the Tsunami Critical Facilities Map in the 2020 Hazard Mitigation Plan.		GF	yearly	GF	X			X		L	M	L		
TSU-2 Management Metro Development in Tsunami Hazard Area.		GF	Ongoing	GF	X			X					Y	
Climate Change														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
CC-1 The summer temperatures along the Gold Line are rising and the weight stacks which maintain tension along the OCS do not have sufficient range for these increased temperatures. This project would replace the weight stacks with a spring tensioning system that can handle the higher temperatures.		GR	1-10 years	GR	X			X	X	M	M	M	Y	
CC-2 Due to increase in heat, air conditioners and other heat reduction Improvements should be performed at control boxes, signal huts, COM rooms and other wayside structures which house electronics.		GF	1-10		X	X			X	M	M	M		
CC-3 Assess vulnerability to drought.		GF	1-10					X		H	M	L		

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants)	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, General Fund, Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
CC-4 Evaluate HVAC capacity of existing cabinets used in train control systems. Upgrade as required.		GF	1-10							H	H	M		
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Program Management (PM)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
Multi-Hazard														
MH-1 Certify staff to be qualified to conduct inspections of Metro buildings and infrastructure after an earthquake or other destructive event occurs.	Program Management - Engineering	HMGP, PDM, BRIC	2-10 years	GR	X				X	M	H	H	Y	
MH-2 Analyze and establish alternate water supply for divisions and headquarter for use following a disaster. It is generally estimated that following a M7.0 earthquake that water lines will be damaged if not severed. Metro desires to plan for an alternate source of water supply to satisfy needs for a week.	Program Management - Engineering	HMGP, PDM, BRIC	2-10 years	GR	X				X	M	H	H	Y	
Earthquake														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
EQ-1 Map and assess Metro facilities, aerial structures, and tunnels vulnerable to seismic hazards and subsidence.	Program Management - Engineering	HMGP, PDM, BRIC	2-10 years	GR	X				X	H	H	H	Y	
EQ-2														
Flood														
FLD-1 Replacement of 12 miles (6 miles in each direction) of median barrier along Gold Line at Interstate 210 freeway. This project is required to prevent future freeway vehicles from breaching into Metro right-of way. Twelve such incidents have occurred to date (approximately 2 per year). Replace existing median barrier with a taller/stronger one. Under normal	Program Management - Highways	GF	3-5 years	CIP	X					H	M	L		CIP

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
conditions, drivers are having issues driving through the "S" curve with the 2 foot buffer between the HOV lane and the median barrier. This condition is worsened during rainstorms and if flooding occurs.														
FLD-2														
Wildfire														
WF-1 Utilize and update the map showing Metro facilities and infrastructure vulnerabilities to wildfire. Map was created for the 2020 Hazard Mitigation Plan (Wildfire Hazard Specific Section).	Program Management - Engineering	GF	Ongoing	GF	X	X	X			M	H	L	Y	
WF-2														
Landslide														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
LND-1														
LND-2														
Windstorms														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Rail Facilities Maintenance (RFM)

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard Action Item														
MH-1 Purple Line secure, treat and resurface to prevent tar intrusion, from La Brea Tar Pits.	RFM	GF	10 years		X		X			M	H	H	Y	
MH-2 Continue tree trimming along all lines.	RFM	GF	Ongoing		X		X			M	M	M	Y	
Earthquake														
EQ-1 Reduce potential damage to critical facilities and infrastructure from future seismic events through mitigative actions. Specifically, Redline Segment 3.	RFM	GF	10 years											
EQ-2 Seismic Tunnel (Intrusion) at MRL – Segment 3.	RFM	GF	10 years		X		X			M	H	H	Y	
EQ-3 Reduce potential damage to critical facilities and infrastructure from future seismic events through mitigative actions.	RFM	GF	10 years		X								Y	

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Specifically, Rail Operations Command Control														
Flood														
FLD-1 Stop runoff into below grade rail system at MBL/Portal, MRL/Hatches, MRL/ Ancillary, PGL/Ancillary, and East/West Portals.	RFM	GF	10		X			X	X					
FLD-2 Install 75hp sump pump to prevent flooding in system at MRL CP39A.	RFM	GF	10 years		X		X			H	H	H	Y	
FLD-3 Demolish, resurface and treat cross passages to prevent water intrusion at 60+ Red Line cross passages and 6 on Gold Line (MRL/PGL).	RFM	GF	10 years		X		X			M	H	H	Y	
FLD-4 Install sump pumps with generator back-up to avoid flooding ant ground and subterranean levels of Division 13.	RFM	GF	10 years		X								Y	
Wildfire														
WF-1														

Action Item	Coordinating Organization	Funding Source: GF = General Fund, GR = Grants	Timeline	Planning Mechanism: CAAP - Climate Action and Adaptation Plan, GF - General Fund, GR - Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
WF-2														
Landslide														
LND -1 Division 21 hillside stabilization, relocate facility or create a secondary ingress/egress.	RFM	GF	10 years		X		X	X	X	H	H	H	Y	
LND-2														
Windstorm														
WND-1		GF			X					H	H	H	Y	
WND-2		GF			X					H	H	H	Y	
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1 Reduce Impacts to Roadways. Protect roadways at all facilities and Orange Line.	RFM	GF	10 years		X		X							
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Rail Fleet Services (RFS)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
MH-1 Protect Infrastructure and Critical Facilities. Install quick connect emergency generator hookups for Rail Fleet Services at all rail yards and some stations.	RFS	GF, BRIC	2-10 years	GF	X			X	X	L	M	H	Y	
MH-2														
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1														
FLD-2														
Wildfire														
WF-1														
WF-2														
Landslide														
LND-1														
LND-2														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Windstorm														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: Regional Rail (RR)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
Multi-Hazard														
MH-1 Maintain over 203 track miles of rail Metro owns in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Regional Rail	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 2-7
MH-2 Maintain over 390k wood and 180k concrete ties metro owns in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	5-30 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 2-25
MH-3 Maintain 112 Metro owned vehicle and 20 pedestrian crossings in a	Metro	HMGP, PDM, BRIC	2-20 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.														Plan, pg. 2-40
MH-4 Maintain over 250 wood and 1 concrete tie turnouts Metro owns in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-20 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 2-51
MH-5 Maintain over 1 million track feet of ballast Metro owns in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to	Metro	HMGP, PDM, BRIC	2-30 years	GR	X		X	X		M	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 2-65

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
move people and goods throughput.														
MH-6 Maintain 135 Metro owned bridges in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	1-20 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-3
MH-7 Maintain 358 Metro owned culverts in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-30 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-3
MH-8 Maintain Tunnel 18 at MP 45.2-45.47 in state of good repair that is used on a daily basis by other commuter, intercity and	Metro	HMGP, PDM, BRIC	1-15 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-40

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
freight rail operators to move people and goods throughput.														
MH-9 Maintain Tunnel 19 at MP 44.98-45.05 in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-40
MH-10 Maintain Tunnel 25 at MP 26.63-27.95 in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-40
MH-11 Maintain Tunnel 26 at MP 441.19-442.59 in state of good repair that is used on a daily basis by	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
other commuter, intercity and freight rail operators to move people and goods throughput.														Plan, pg. 3-40
MH-12 Maintain Tunnel 27 at MP 442.89-443.06 in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-40
MH-13 Maintain Tunnel 28 at MP 443.88-443.99 in state of good repair that is used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 3-40
MH-14 Central Maintenance Facility	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
located at 1555 N San Fernando Road, LA														Plan, pg. 7-3
MH-15 Keller Yard located at 720 Keller Street, LA	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-16 Metrolink Operations Center Address located at 2558 Supply Street, Pomona	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-17 Dispatch Operations Center located at 2704 Garey Avenue, Pomona	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-18 Melbourne Office located at 2703 Melbourne Avenue, Pomona	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-19 MOW Headquarters located at 2701 N. Garey Avenue, Pomona	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
MH-20 Lancaster Layover Yard located at 48812 N. Sierra Hwy, Lancaster	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-21 Bauchet Engineering (Yard) located at 413 E. Bauchet Street, LA	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-22 Lang Yard located at 13903 Lang Station Road, Canyon Country	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-23 Claremont Station located at 200 W. 1st Street, Claremont	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan, pg. 7-3
MH-24 Burbank Airport N. Station located at 3600 N. San Fernando Blvd, Burbank	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	
MH-25 Burbank Airport S. Station located at 3750 W. Empire Ave, Burbank	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed					Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
					Protect Life and Property	Increase Public Awareness	Protect Natural Systems	Promote Partnerships and Implementation	Enhance Emergency Services					
MH-26 Van Nuys Station located at 7720 Van Nuys Blvd, Van Nuys	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	
MH-27 Los Angeles Station located at 800 N. Alameda Street, LA	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	
MH-28 Maintain 380 Metro owned switches in state of good repair that are used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan
MH-29 Maintain over 135 Metro owned signal system types in state of good repair that are used on a daily basis by other commuter, intercity and freight rail operators to move people and goods throughput.	Metro	HMGP, PDM, BRIC	2-20 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
MH-30 Maintain 13 Metro owned communication shelters in state of good repair that are used on a daily basis by other commuter, intercity and freight rail operators.	Metro	HMGP, PDM, BRIC	1-10 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan
MH-31 Maintain 26 Metro owned CIS systems in state of good repair that are used on a daily basis by other commuter, intercity and freight rail operators.	Metro	HMGP, PDM, BRIC	1-15 years	GR	X			X	X	H	H	H	Y	2018 Metrolink Rehabilitation Plan
Earthquake														
EQ-1														
EQ-2														
Flood														
FLD-1														
FLD-2														
Wildfire														
WF-1														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
WF-2														
Landslide														
LND-1														
LND-2														
Windstorms														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Table: Mitigation Actions Matrix: System Security and Law Enforcement (SSLE)

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
Multi-Hazard														
MH-1 Update to an enterprise access control system. Metro's access control uses the Pinnacle card access control system manufactured by Sielox at all of the Metro Operating Divisions. A major weakness of this system is that if the primary server were to fail, a Metro staff member must manually push a "red" button to failover to the backup server, during which time any access or intrusions cannot be detected or assessed in real-time. A second major weakness is that many components of	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	Security Assessment Report, July 10, 2108

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
the access control equipment are in poor working order with several locations having expired or damaged batteries and hardware that is installed improperly.														
MH-2 Update to an enterprise Video Management Systems (VMS). Currently, Metro supports two VMS, Bosch by Bus Operations and Panasonic Video Insight by Rail Operations, which can lead to in compatibilities and non-standardization. Most critically, the video surveillance systems at the Operating Divisions are not consistently monitored in real-time nor are security events assessed as they	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	Security Assessment Report, July 10, 2018

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
are occurring locally by contracted security or remotely by Metro Security. This results in either a delayed response or no response to emergency events.														
MH-3 Install an enterprise intrusion detection system. There is no intrusion detection system in use at the majority of Metro's Operating Divisions. Many critical assets at these locations are left vulnerable. With no alarm or monitoring to alert security to investigate, it creates a security reaction in lieu of a response to emergency incidents.	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	Security Assessment Report, July 10, 2018
MH-4 Install an enterprise emergency communication	System Security &	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	Security Assessment

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
system. There is no effective emergency communication system for Metro staff to request help or to notify security of an incident. Of particular concern for Metro staff are employees at remote parking locations where there is no means to ask for help and managerial staff who are subject to harm when handling emergency related matters.	Law Enforcement													Report, July 10, 2018
MH-5 Retrofit Metro facilities located in high hazard areas.	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X					H	H	H	Y	
MH-6 Install quick-connect emergency generator hook-ups for critical facilities.	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X					H	H	H	Y	
Earthquake														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
EQ -1 Identify and harden critical lifeline systems, i.e., critical public services such as transportation facilities	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	
Flood														
FLD-1														
FLD-2														
Wildfire														
WF-7 Create defensible space around structures & infrastructures	System Security & Law Enforcement	HMGP, PDM, BRIC	3-5 years	GR	X				X	H	H	H	Y	
Landslide														
LND-1														
LND-2														
Windstorms														
WND-1														
WND-2														
Tsunami														
TSU-1														
TSU-2														
Climate Change														

Action Item	Coordinating Organization	Funding Source: GF-General Fund, HMGP-Hazard Mitigation Grant Program, PDM-Pre-Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Timeline	Planning Mechanism: CAAP-Climate Action and Adaptation Plan, GF-General Fund, GR-Grant	Plan Goals Addressed: Protect Life and Property	Plan Goals Addressed: Increase Public Awareness	Plan Goals Addressed: Protect Natural Systems	Plan Goals Addressed: Promote Partnerships and Implementation	Plan Goals Addressed: Enhance Emergency Services	Priority: L– Low, M-Medium, H-High	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Buildings & Infrastructure: Does the Action Item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y)	Notes or Source Document, if applicable
CC-1														
CC-2														
Epidemic / Pandemic / Vector-Borne														
EPV-1														
EPV-2														

Plan Maintenance

The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how Metro will integrate public participation throughout the plan maintenance process.

Local Mitigation Officer

The Planning Team that was involved in research and writing of the Plan will also be responsible for implementation. The Planning Team will be led by the Planning Team Chair Moniek Pointer and Co-Chair Aldon Bordenave who will be referred to as the Local Mitigation Officers. Under the direction of the Local Mitigation Officers, the Planning Team will take responsibility for plan maintenance and implementation. The Local Mitigation Officers will facilitate the Planning Team meetings and will assign tasks such as updating and presenting the Plan to the members of the Planning Team. Plan implementation and evaluation will be a shared responsibility among all of the Planning Team members. The Local Mitigation Officers will coordinate with Metro leadership to ensure funding for 5-year updates to Plan as required by FEMA.

The Planning Team will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The Local Mitigation Officers will be authorized to make changes in assignments to the current Planning Team.

The Planning Team will meet no less than bi-annually to monitor the status of the Plan. Meeting dates will be scheduled once the final Planning Team has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan. The Local Mitigation Officers or designee will be responsible for contacting the Planning Team members and organizing the bi-annual meetings. The second meeting of the year will also include time to evaluate the effectiveness of the plan and the planning process.

Method and Scheduling of Plan Implementation

	Year 1	Year 2	Year 3	Year 4	Year 5
Monitoring	XX	XX	XX	XX	XX
Evaluating					
Internal Planning Team Evaluation	X	X	X	X	X
Cal OES and FEMA Evaluation					X
Updating					X

Monitoring and Implementing the Plan

Plan Adoption

The Metro Board of Directors will be responsible for adopting the Mitigation Plan. This governing body has the authority to promote sound public policy regarding hazards. Once the plan has been adopted, the Local Mitigation Officers will be responsible for submitting it to the State Hazard Mitigation Officer at California Office of Emergency Services (Cal OES). Cal OES will then submit the plan to the Federal Emergency Management Agency (FEMA) for review and approval. This review will address the requirements set forth in 44 C.F.R. Section 201.6 (Local Mitigation Plans). Upon acceptance by FEMA, Metro will gain eligibility for Hazard Mitigation Grant Program funds.

Q&A | ELEMENT A: PLANNING PROCESS | A6a.
Q: Does the plan identify how, when, and by whom the plan will be **monitored** (how will implementation be tracked) over time? (Requirement §201.6(c)(4)(i)) **A:** See **Monitoring the Plan** below.

Monitoring the Plan

The Local Mitigation Officers will hold bi-annual meetings with the Planning Team members in order to gather status updates on the mitigation action items. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan. See the **Bi-Annual Implementation Report** discussed below which will be a valuable tool for the Planning Team to measure the success of the Hazard Mitigation Plan. The focus of the bi-annual meetings will be on the progress and changes to the Mitigation Actions Matrix.

Q&A | ELEMENT C. MITIGATION STRATEGY | C6a.
Q: Does the plan identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated? (Requirement §201.6(c)(4)(ii)) **A:** See **Implementation through Existing Program** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6b.
Q: Does the plan describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms? (Requirement §201.6(c)(4)(ii)) **A:** See **Implementation through Existing Programs** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6c.
Q: The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. (Requirement §201.6(c)(4)(ii)) **A:** See **Implementation through Existing Programs** below.

Implementation through Existing Programs

Metro addresses statewide planning goals and legislative requirements through the General Fund, Capital Projects, and Grants. The Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. Metro will implement recommended mitigation action items through existing programs and procedures.

Metro is responsible for adhering to the State of California's Building and Safety Codes. In addition, Metro may work with other agencies at the state level to review, develop and ensure Building and Safety Codes are adequate to mitigate or present damage by hazards. This is to ensure that life-safety criteria are met for new construction.

Some of the goals and action items in the Mitigation Plan will be achieved through activities recommended in the strategic and other budget documents. The various departments involved in developing the Plan will review it on a bi-annual basis. Upon review, the Planning Team will work with the departments to identify areas that the Mitigation Plan action items are consistent with the strategic and budget documents to ensure the Mitigation Plan goals and action items are implemented in a timely fashion.

Upon FEMA approval, the Planning Team will begin the process of incorporating risk information and mitigation action items into existing planning mechanisms including the General Fund (Operating Budget and Capital Projects - see Mitigation Actions Matrix for links between individual action items and associated planning mechanism). The bi-annual meetings of the Planning Team will provide an opportunity for Planning Team members to report back on the progress made on the integration of mitigation planning elements into Metro's planning documents and procedures.

Specifically, the Planning Team will utilize the updates of the following documents to implement the Mitigation Plan:

- ✓ Risk Assessment, Service Area Profile, Planning Process (stakeholders) – Emergency Operations Plan, Climate Action Plan, Continuity of Operations Plan, Security emergency Preparedness Plan, etc.
- ✓ Mitigation Actions Matrix – General Fund, Capital Projects, Grants

Bi-Annual Implementation Report

The Bi-Annual Implementation Matrix is the same as the Mitigation Actions Matrix but with a column added to track the status of each Action Item. Upon approval and adoption of the Plan, the entire Bi-Annual Implementation Report will be added to the Appendix of the Plan. Following is a view of the Bi-Annual Implementation Matrix:

Insert sample here when completed

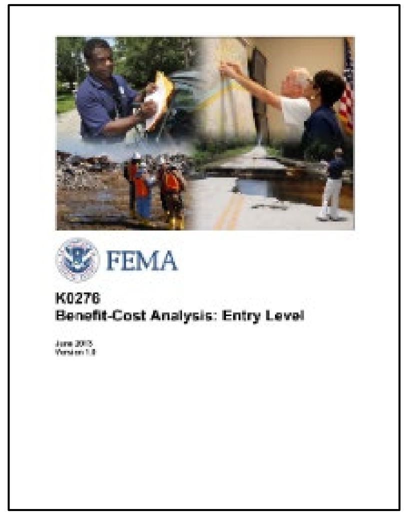
An equal part of the monitoring process is the need to maintain a strategic planning process which needs to include funding and organizational support. In that light, at least one year in advance of the FEMA-mandated 5-year submission of an update, the Local Mitigation Officers will convene the Planning Team to discuss funding and timing of the update planning process. On the fifth year of the planning cycles, the Planning Team will broaden its scope to include discussions and research on all of the sections within the Plan with particular attention given to goal achievement and public participation.

Economic Analysis of Mitigation Projects

FEMA's approach to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

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.
Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Planning Team will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Planning Team will use other approaches to understand the costs and benefits of each action item and develop a prioritized list.



The “benefit”, “cost”, and overall “priority” of each mitigation action item was included in the Mitigation Actions Matrix located in Part III: Mitigation Strategies. A more technical assessment will be required in the event grant funding is pursued through the Hazard Mitigation Grant Program. FEMA Benefit-Cost Analysis Guidelines are discussed below.

FEMA Benefit-Cost Analysis Guidelines

The Stafford Act authorizes the President to establish a program to provide technical and financial assistance to state and local governments to assist in the implementation of hazard mitigation measures that are cost effective and designed to substantially reduce injuries, loss of life, hardship, or the risk of future damage and destruction of property. To evaluate proposed hazard mitigation projects prior to funding FEMA requires a Benefit-Cost Analysis (BCA) to validate cost effectiveness. BCA is the method by which the future benefits of a mitigation project are estimated and compared to its cost. The end result is a benefit-cost ratio (BCR), which is derived from a project’s total net benefits divided by its total project cost. The BCR is a numerical expression of the cost effectiveness of a project. A project is considered to be cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs.

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training to support the effort and assist with estimating the expected future benefits over the useful life of a retrofit project. It is imperative to conduct a BCA early in the project development process to ensure the likelihood of meeting the cost-effective eligibility requirement in the Stafford Act.

The BCA program consists of guidelines, methodologies and software modules for a range of major natural hazards including:

- ✓ Flood (Riverine, Coastal Zone A, Coastal Zone V)
- ✓ Hurricane Wind
- ✓ Hurricane Safe Room
- ✓ Damage-Frequency Assessment
- ✓ Tornado Safe Room
- ✓ Earthquake
- ✓ Wildfire

The BCA program provides up to date program data, up to date default and standard values, user manuals and training. Overall, the program makes it easier for users and evaluators to conduct and review BCAs and to address multiple buildings and hazards in a single BCA module run.

Evaluating and Updating the Plan

Q&A | ELEMENT A: PLANNING PROCESS | A6b.
Q: Does the plan identify how, when, and by whom the plan will be **evaluated** (assessing the effectiveness of the plan at achieving stated purpose and goals) over time? (Requirement §201.6(c)(4)(i)) **A:** See **Evaluation** below.

Evaluation

At the conclusion of the Second Bi-Annual Implementation Meeting, the Local Mitigation Officers will lead a discussion with the Planning Team on the success (or failure) of the Mitigation Plan to meet the plan goals. Metrics used will include examining outcomes, number of action items implemented, identification of internal and external barriers to implementation. The results of that discussion will be added to the Evaluation portion of the Bi-Annual Implementation Report and inclusion in the 5-year update to the Plan. Efforts will be made immediately by the Local Mitigation Officers to address any failed plan goals.

Q&A | ELEMENT A: PLANNING PROCESS | A6c.
Q: Does the plan identify how, when, and by whom the plan will be **updated** during the 5-year cycle? (Requirement §201.6(c)(4)(i)) **A:** See **Formal Update Process** below.

Formal Update Process

As identified above, the Mitigation Actions Matrix will be monitored for status on a bi-annual basis as well as an evaluation of the Plan's goals. The Local Mitigation Officer or designee will be responsible for contacting the Planning Team members and organizing the bi-annual meetings. Planning Team members will also be responsible for participating in the formal update to the Plan every fifth year of the planning cycle.

The Planning Team will begin the update process with a review the goals and mitigation action items to determine their relevance to changing situations within Metro as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Planning Team will also review the Plan's **Risk Assessment** portion of the Plan to determine if this information should be updated or modified, given any new available data. The **coordinating organizations** responsible for the various action items will report on the status of their projects, including the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised. Amending will be made to the Mitigation Actions Matrix and other sections in the Plan as deemed necessary by the Planning Team.

Q&A | ELEMENT A: PLANNING PROCESS | A5
Q: Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii)) **A:** See **Continued Public Involvement** below.

Continued Public Involvement

Metro is dedicated to involving the public directly in the continual review and updates to the Mitigation Plan. Copies of the plan will be made available at Metro Headquarters and on the Metro website. The existence and location of these copies will be publicized in Metro Newsletters and on the website. This site will also contain an email address and phone number where people can direct their comments and concerns. At the discretion of the Local Mitigation Officers, a public meeting may be held after the Annual Implementation Meeting. The meeting would provide the public a forum in which interested individuals and/or agencies could express their concerns, opinions, or ideas about the plan.

The Local Mitigation Officers will be responsible for using Metro resources to publicize any public meetings and always free to maintain public involvement through the public access channel, web page, and newspapers.

Attachments

FEMA Letter of Approval

Board of Directors Adoption Resolution

Staff Report to Board of Directors

Secondary Stakeholders Input

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
October 2021	LA Metro Executive Team, Aston Greene, Executive Officer	Minor administrative corrections	All incorporated into Third Draft Plan
September 16, 2021	Los Angeles County Chief Executive Office, Office of Emergency Management Leslie Luke, Deputy Director	N/A	
September 16, 2021	Los Angeles City Emergency Management Department Gary Singer, Emergency Management Coordinator 2	N/A	
September 16, 2021	Access Services Mike Greenwood, Chief Operations Officer	N/A	
September 16, 2021	TransMAC (Transit Mutual Assistance Compact) Mike Greenwood, Chair of TransMAC. TransMAC is an association of transit agencies which meet monthly and have agreed to provide mutual assistance to member agencies such as Los Angeles County Metropolitan Transportation Authority, Orange County Transportation Authority, Riverside County Transportation Commission, San Bernardino County Transportation Authority, and Ventura County Transportation Commission under the TransMAC Agreement.	N/A	

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
September 15, 2021	Jackie Ayer	AHMP does not address the windstorms that also create dust storms in the northern part of the county. In December (22), 2015 20 big rig trucks were turned over by 80mph winds, shutting down the 14 Freeway, shutting of routes between norther and southern CA.	This information was included into the Windstorm Hazards Chapter under Previous Occurrences.
September 15, 2021	Myanna Dellinger	Ought to consider electrifying all your trains. I believe they are diesel-operated.	The Metro rail is electric powered. The Metro Board has made a commitment to have 100% electric buses by the year 2030.

September 15, 2021	Chase Engelhardt Policy Analyst and Organizer Climate Resolve	1. **Related to Heat** Tree installation around Metro infrastructure is listed as low priority However, trees can reduce ambient surface temperatures by up to 40°F. This is also true of shade, generally, so this action may be best amended to include other appropriate shade structures. The plan makes mention of shade at rail stations and in the form of bus shelters, but shade can also protect riders along important first mile/last mile corridors, or used to protect metro infrastructure. Implemented correctly near energy consuming infrastructure, this could also decrease energy use. 2. Hydration station access can greatly reduce the amount of hospitalizations or deaths experienced during extreme heat days and heatwaves, and should be included in the plan 3. We recommend examining the feasibility of decreasing headways for buses and rail (but especially buses) in areas like the valley that are likely to experience up to 95 days a year above 95°F. Reducing the time that riders are exposed to extreme heat will greatly reduce hospitalizations and deaths from extreme heat. 4. **Related to Wildfire** As is briefly mentioned in the report on hazards, wildfire has a very substantial impact on air quality throughout the LA Basin. The mitigation steps currently mentions improved air ventilation and	1. **Trees -** Metro thanks Mr. Engelhardt for his comments. The Planning Team agrees with his assessment that the tree installations should be a high priority. The Matrix has been updated. 2. **Hydration Station –** A Mitigation Action Item has been added to the Bus Facilities and Property Maintenance (BFPM) Matrix. 3. **Decreasing Intervals –** A Mitigation Action Item has been added to the Bus Facilities and Property Maintenance (BFPM) Matrix.

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
		circulation, but without using any form of air filtration or purification (we recommend at least MERV 13 for wildfire) it will be devastating to riders' health. 5. **Related to All Hazards** As the COVID-19 pandemic has demonstrated, workers are critical to the functioning of County services and infrastructure. Climate Resolve advises analyzing the workforce needs for critical services and infrastructure like electricity, water supply, and communications to ensure that routes and modes that those workers rely on have contingency routes and resources.	4. **Wildfire –** Metro already utilizes air ventilation and circulation methods and has added air filtration and purification as a Mitigation Action Item to the Emergency Management Matrix. 5. **All Hazards –** These comments are related to Metro's continuity of operations planning and not related to the mitigation plan.

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
September 15, 2021	Hamid Mahramzadeh, M.S., P.E., S.E. LA Metro Senior Director, Metro Engineering Structures Major Capital Project Engineering	1. Page 33: Is earthquake “Previous Occurrence: 2014 La Habra” still applicable, since preparation of the plan? 2. Page 56: Local Conditions – A Note: California Building Code (CBC) was substantially revised and updated in the aftermath of the Northridge Earthquake. Various building types (Steel, Concrete, Masonry, Wood or hybrid) designed and constructed after the Northridge EQ would perform much better in a seismic event with less severe damage, in comparison to buildings designed and constructed prior to Northridge EQ. 3. Page 63: What is it meant by “thick soils” in the last sentence? Is it intended to imply “fill material or fill soils”? 4. Page 63: Recommend “compacted soils” as oppose to “consolidated soils” in the last sentence.	1. Previous Occurrences: The 2021 Ridgecrest 7.1 earthquake has been added to the section. 2. Language has been added to Earthquake-Local Conditions. 3. Soils are defined by compression and thickness. 4. The change has been made.

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
	Van Ajemian Board Member of Sage Global	I urge you to talk to The Boring Company, not because of what it is now doing, but, rather, because of what it can be doing with the tunnels it digs: The Boring Company creates safe, fast-to-dig, and low-cost transportation, utility, and freight tunnels. The mission: solve traffic, enable rapid point-to-point transportation and transform cities. Imagine if LA Metro did a demonstration project with The Boring Company for installing batteries nderground. Imagine if the company did it for free as a way to pique the curiosity of others around the country, "If caverns can be created for batteries, for what other purposes can caverns be used?" This might become a big advancement for emergency and homeland-security preparedness.	The Planning Team supports installing batteries underground. A Mitigation Action Idea has been added to the Matrix.

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan
	Roy Thun At-Large Trustee Sustainable Remediation Forum (SURF)	I have reviewed Metro's May 28, 2021 draft All-Hazards Mitigation Plan. I found the HMP to be very well done. I have two recommendations. 1. My first recommendation is that it would be appropriate to acknowledge in the HMP the forthcoming release of FEMA's Risk Rating 2.0 and potential impact it may have to the NFIP as it pertains to Metro. FEMA Risk Rating 2.0 is expected to produce a significant shift in how flood insurance premiums are set by accounting for a number of property-specific factors instead of setting prices solely based on the zone where a property sits. 2. My second recommendation is to expand the HMP to identify and more fully recognize critical dependencies, such as water, power and communications infrastructure, and support agencies/organizations, etc..., that if severely impacted by a natural disaster would delay or prevent Metro from providing services.	1. Metro is self-insured. 2. This is considered a response activity and therefore not included in a Hazard Mitigation Plan.

External agencies listed above were invited via email and provided with an electronic link to the Metro website. Following is the email distributed along with the invitation to contribute to the planning process:

External Agencies Email Invite – Sent September 15, 2021

Submit Public Comment by October 18th for Metro's Local All-Hazard Mitigation Plan

The Federal Emergency Management Agency (FEMA) requires Metro to prepare a *Local All-Hazard Mitigation Plan* (LAHMP) in order to apply for non-emergency disaster assistance funding to support protection of its public facilities.

The LAHMP identifies Metro's assets, natural hazard threats and mitigation actions to reduce risks from these hazards to public facilities owned and operated by LA Metro that help provide a safe and world-class transportation system for the LA Region. **We are seeking public comment on the LAHMP to ensure we identify and mitigate for all potential natural hazards.**

UPDATED LINK: Review The draft Local All-Hazard Mitigation Plan

Please email your comments by October 18th to Metro's Emergency Management Department at *MetroEM@metro.net*.

If you have any questions, please contact Moniek Pointer, Emergency Preparedness and homeland Security Manager via email at MetroEM@metro.net.

Metro

Web Posting

metro.net/about/plans/metro-strategic-plan/

Apps Everbridge Login WebEOC Login Other bookmarks Reading list

Vision 2028 Appendices

Goals

Better mobility means safe and convenient access to the basic needs in your life, such as more job opportunities, housing, education and health services. Vision 2028 seeks to provide great mobility to everyone, whether they walk, bike, take transit or drive.

The plan builds on some key initiatives already underway now at Metro — and includes strategic actions that go well beyond the status quo.

Vision 2028 sets Metro's strategic direction and serves as the foundation for all other Metro plans, programs, and services:

- Customer Experience Plan
- Short Range Transportation Plan
- Long Range Transportation Plan
- Moving Beyond Sustainability
- Recovery Task Force Reports
- NextGen Bus Study
- All-Hazards Mitigation Plan

Content

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Contract Kick Off Meeting – May 14, 2019

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Local All-Hazard Mitigation Plan (PS60250)

Project Kick-off Meeting Minutes

Date: 5/14/2019 - 10.30 AM to 12:00 PM
Metro - 100 S. Santa Fe Avenue Ls Angeles, CA 90012

Attending:

- Aldon Bordenave (AB) - Metro
- Moniek Pointer (MP) - Metro
- Carolyn Harshman (CH) - EPC
- Rawad Hani (RH) - GTS

1. AB informed the consultant team that MP will be the day-to-day project manager and he will serve in the capacity of a Program Manager overseeing the contract and supporting as needed.

2. The Metro departments to be invited to nominate members for the Planning team were discussed. AB mentioned that he already reached out to several departments informing them of the project award and the need for their support. MP will share the email sent out with RH and CH and will also provide a list of the departments.

3. CH mentioned that the Planning Meetings would be about 3 hours each and there will be 4 of these meetings. The three hours provides sufficient time for presentation and discussions.

4. AB asked that the meetings be inclusive and to ask the members of the Planning Team to provide their wish list with respect to projects

5. The schedule of the planning team meetings was discussed to be in June, July, August, and September. It was agreed that the timing of meetings 2,3, and 4 will be agreed upon with the planning team.

6. CH stressed that it is important for the same person (nominated by the respective department) to show up for all 4 meetings. CH will draft the email wording and provide to MP with the overview of each meeting. CH stated that the level of effort will be about 20 hours for the planning team members to participate and provide their feedback.

7. Reporting was discussed and will be a done on a monthly basis to include the updated schedule, completed tasks, and tasks planned for the upcoming month. Invoicing was

discussed and it was agreed to invoice on a monthly basis the completed work. The invoices will also reference Exhibit B - Payment schedule of the contract agreement.

8. Stakeholders were discussed. CH mentioned that the planning team is the first level of stakeholders and they will review the first draft. The second draft will be circulated to the public which includes primarily the 28 sites, the DMACs, as well as posted on the Metro website. MP is coordinating both the outreach as well as the website aspects and she will support in getting the word out in due time.

9. Available Data was discussed; AB will provide the emergency operations plan as well as vulnerability analysis, a spreadsheet with all the assets, climate adaptability plan, and other available documents . An NDA might need to be signed to obtain the THIRA. MP will send the NDA to RH and CH.

10. Training workshops were discussed and it was agreed to have 2 -3 workshops instead of 6 and invest the resources in having an online e-learning video.

Action items:

- MP will send a draft of the departments
- MP will share the email sent earlier by AB to the departments (done)
- CH will send the wording for the planning team email (done)
- MP will send a notice to the first planning meeting
- MP will send the NDA
- AB will send the supporting documents identified under item 9

Updated schedule is provided on the following page

Planning Team Minutes and Attendance: Meeting 1 - June 28, 2019

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Local All-Hazard Mitigation Plan (PS60250)

Planning Team Meeting #1

Date: 6/28/2019 - 8.00 AM to 11:00 AM
Metro - One Gateway Plaza - Los Angeles, CA 90012

Invitees and Attendees:
A total of 43 Metro staff members were invited out of whom 30 were in attendance. The names and corresponding departments are shown in the following table.

First Name	Last Name	Department	Attended (Y: yes)
Albert	Escarcega	Information Technology	Y
Aldon	Bordenave	Emergency Management	Y
Andrina	Dominguez	Environmental Compliance & Sustainability	Y
Androush	Danielians	Projects Engineering	Y
Anthony	Chua	Information Technology	Y
Ashad	Hamideh	Countywide Planning & Development	
Aspet	Davidian	Program Management	Y
Ayda	Safaei	Communications	
Bob	Spadafora	RFS	Y
Brady	Branstetter	Facilities Maintenance	Y
Brian	Boudreau	Program Control	
Carolyn	Harshman	EPC (consultant)	Y
Chirag	Rabari	Countywide Planning & Development	Y
Craig	Reiter	Environmental Compliance & Sustainability	Y
Dana	De Vera	Project Management	Y
Denise	Longley	Asset Management	Y
Donell	Harris	Bus Maintenance	
Eddie	Boghossian	Corporate Safety	
Edna	Stanley	Rail Operations	Y
Errol	Taylor	Maintenance & Engineering	Y
Gelito	Ocdamia	Project Engineering - Facilities - Systems -	Y
Heather	Severin	Environmental Compliance & Sustainability	Y
James	Jimenez	Environmental Compliance & Sustainability	Y
James	Pachan	Bus Maintenance	Y
James D.	Andrew	Countywide Planning & Development	
Janice	Lim	Cyber Security	
Jeanet	Owens	Regional Rail	Y
Jonathan	Hofert	Project Management - Engineering	Y
Karen	Parks	Systems Security & Law Enforcement	Y
Mario	Del Rosario	Project Engineering: Facilities - Systems	Y
Marshall	Epler	Maintenance & Engineering	
Moniek	Pointer	Emergency Management	
Nadine	Triche-Williams	Bus Operations	Y
Patrick	Soto	Information Technology	
Rawad	Hani	GTS (consultant)	Y

First Name	Last Name	Department	Attended (Y: yes)
Raymond	Lopez	Corporate Safety	Y
Robert	Castanon	Rail Operations	
Ron	Tien	Project Engineering	Y
Stephen	Toms	Asset Management	Y
Steve	Jaffe	General Services	Y
Thinh	Dinh	Project Engineering: Facilities - Systems	Y
Timothy	Lindholm	Construction Management	
Ty	Henderson	Transit Security	
Brian	Balderrama	Regional Rail	Y
Kate	Amissah	Regional Rail	Y

Program Manager Aldon Bordenave introduced the project and the consultant team. He highlighted the importance of the project not only for identifying hazards and mitigation action items but also for being able to apply for federal grants that are available only to public entities with FEMA-approved Hazard Mitigation Plans. He introduced Moniek Pointer as the project manager and highlighted the previous work he carried out on the HMP at the Los Angeles Unified School District which led to numerous grant opportunities.

Carolyn Harshman from EPC (consultant team) provided an overview of her experience completing Hazard Mitigation Plans and provided an interactive presentation on the Hazard Mitigation Planning Process which also included video simulations on earthquakes in the Los Angeles region. The attendees had a chance to engage at various points asking questions or clarifying certain aspects of the presentation.

The following is a listing of the main topics covered in the presentation:

a. Definition of Mitigation
b. Examples of Previous Hazards with impacted areas and human tolls highlighting the pitfalls as well as the lessons learned
c. Disaster Mitigation Act 2000 (DMA 2000) that among other things streamlines the administration of disaster relief
d. Local Plan Requirements 44 CFR Section 201.6 which provides opportunities for public input during the plan drafting stage
e. Description of the Hazard Mitigation Planning 5-Steps (planning process description, risk assessment, mitigation strategy, plan maintenance process, and plan adoption process)
f. Illustration of the Community Profile and Risk Assessment presenting the Calculated Priority Risk Index (CPRI). The CPRI value is obtained by assigning varying degrees of risk to four categories for each hazard, and then calculating an index value based on a weighting scheme.
g. Examples were provided to highlight the four criteria (and their weight) in the CPRI which are Probability (45%), Magnitude/Severity (30%), Warning Time (15%) and Duration (10%). For each of the criteria, there are four (4) options from which to choose: 1,2,3,4. Zero (0) is the value taken when an option is not assigned.
h. Wants and Needs which include copies of Metro's Emergency Operations Plan, Capital Improvement Program, Mapping Resources, and other resources including information on hazards.

i. Project Timeline with emphasis on the future planning team meetings. Carolyn Harshman mentioned that the Planning Meetings would be about 3 hours each and there will be a total of 4 of these meetings. The three-hour meetings are required to provide sufficient time for presentation and discussions.

2. Throughout the presentation the consultant fielded various questions including:
    a. The distinction between Hazard Mitigation Plan and an Emergency Operations or Response Plan highlighting that the mitigation plan focuses on actions taken ahead of time to minimize or eliminate threats associated with hazards - not how to respond in the case of an emergency
    b. Impact of hazards on Metro-owned critical and essential facilities is an important component of the Mitigation Plan
    c. The number of facilities was estimated at approximately 150
    d. The attendees showed different perspectives when discussing CPRI value calculations based on the perceived probabilities and magnitudes of hazards
    e. Development of mitigation action items - the consultant explained that discussion on developing a Mitigation Strategy was intended to begin in meeting #2, but entertained various questions on this topic

3. The attendees showed keen interest in the process and asked that the second meeting be scheduled in August in order for documents to be gathered and time allowed to identify department-specific mitigation action items..

4. CH stressed that it is important for the same person (appointed by the respective department) to show up for all 4 meetings in order to maintain continuity and allow the Planning Team to make forward momentum.

Action items:

- MP will coordinate the next planning team meeting in August
- All: gather documents and create a "needs list"

Planning Team Minutes and Attendance: Meeting 2 – August 28, 2019

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Local All-Hazard Mitigation Plan (PS60250)

Planning Team Meeting #2

Date: 8/28/2019 - 2.00 AM to 4:30 PM
Metro - One Gateway Plaza - Los Angeles, CA 90012

Invitees and Attendees:
A total of 43 Metro staff members were invited out of whom 21 were in attendance. The names and corresponding departments are shown in the following table. Some departments whose representatives attended the first meeting and could not attend this meeting provided alternate representatives who are listed in the table below the dotted line.

First Name	Last Name	Department	Attended (Y: yes)
Albert	Escarcega	Information Technology	
Aldon	Bordenave	Emergency Management	Y
Andrina	Dominguez	Environmental Compliance & Sustainability	Y
Androush	Danielians	Projects Engineering	
Anthony	Chua	Information Technology	
Ashad	Hamideh	Countywide Planning & Development	
Aspet	Davidian	Program Management	Y
Ayda	Safaei	Communications	
Bob	Spadafora	RFS	Y
Brady	Branstetter	Facilities Maintenance	
Brian	Boudreau	Program Control	
Carolyn	Harshman	EPC (consultant)	Y
Chirag	Rabari	Countywide Planning & Development	
Craig	Reiter	Environmental Compliance & Sustainability	Y
Dana	De Vera	Project Management	Y
Denise	Longley	Asset Management	Y
Donell	Harris	Bus Maintenance	
Eddie	Boghossian	Corporate Safety	
Edna	Stanley	Rail Operations	Y
Errol	Taylor	Maintenance & Engineering	
Gelito	Ocdamia	Project Engineering - Facilities - Systems -	
Heather	Severin	Environmental Compliance & Sustainability	
James	Jimenez	Environmental Compliance & Sustainability	
James	Pachan	Bus Maintenance	
James D.	Andrew	Countywide Planning & Development	
Janice	Lim	Cyber Security	
Jeanet	Owens	Regional Rail	
Jonathan	Hofert	Project Management - Engineering	
Karen	Parks	Systems Security & Law Enforcement	Y
Mario	Del Rosario	Project Engineering: Facilities - Systems	Y
Marshall	Epler	Maintenance & Engineering	Y
Moniek	Pointer	Emergency Management	Y
Nadine	Triche-Williams	Bus Operations	Y

First Name	Last Name	Department	Attended (Y: yes)
Patrick	Soto	Information Technology	
Rawad	Hani	GTS (consultant)	Y
Raymond	Lopez	Corporate Safety	Y
Robert	Castanon	Rail Operations	
Ron	Tien	Project Engineering	Y
Stephen	Toms	Asset Management	
Steve	Jaffe	General Services	
Thinh	Dinh	Project Engineering: Facilities - Systems	
Timothy	Lindholm	Construction Management	
Ty	Henderson	Transit Security	Y
Brian	Balderrama	Regional Rail	
Kate	Amissah	Regional Rail	
Chris	Limon	Facilities Management	Y
Roger	Largaespada	ITS	Y
John	Slay	General Services	Y
Brian	Balderrama	Regional Rail	Y
Romerica	Eller	Finance / Accounting	Y

The meeting room was organized in such a way to allow for staff to work together in one of 5 groups to develop mitigation action items. The attendees were grouped by departments as such:

1. Systems Security & Law Enforcement; Information Technology; Cyber Security
2. Countywide Planning & Development; Communications / Community Relations; Finance
3. Program Management; Project Engineering; Construction Management; Environmental Compliance & Sustainability; Program Control; Regional Rail; Wayside Systems Engineering & Maintenance; Maintenance & Engineering.
4. Risk Safety & Asset Management; Corporate Safety; Asset Management; General Services
5. Operations: Rail Ops; Rail Fleet Services; Bus Ops; Bus Maintenance

Project Manager Moniek Pointer (MP) re-introduced the project and the purpose of the second meeting. She highlighted the importance of the project in identifying hazards and mitigation action items and for being able to apply for federal grants that are available only to public entities with FEMA-approved Hazard Mitigation Plans. MP mentioned that the purpose of this meeting is to develop the mitigation action items for the various hazard categories that were identified in the first meeting.

Carolyn Harshman (CH) from EPC (consultant team) then lead an interactive presentation where the attendees had a chance to engage at various points asking questions or clarifying certain aspects of the presentation.

The following is a listing of the main topics covered in the presentation:

a. Introductions of Metro Staff and Departments and giving examples of some mitigation action items. CH clarified the difference between emergency response and hazard mitigation in response to some suggestions of mitigation action items.

b. Project Timeline highlighting the two future planning team meetings. CH mentioned that the next Planning Team Meeting will also include developing and refining the mitigation action items. The final Planning Team Meeting will be preceded with a copy of the First Draft Hazard Mitigation Plan.
c. A brief re-Cap of meeting #1 was provided.
d. HAZUS analysis results were presented for 3 scenarios: a magnitude 7.8 earthquake along southern the San Andreas Fault, a magnitude 7.2 earthquake along Newport - Inglewood Fault, and a magnitude 7.2 earthquake along Sierra Madre Fault. CH illustrated the economic loss on the rail and bus systems in Los Angeles County (associated with such disasters) in terms of hundreds of billions of dollars. She noted that HAZUS uses Census data which is 2010 data at this point.
e. Maps were presented showing hazard vulnerability of Metro's 361 assets representing divisions and facilities, rail stations, BRT stations, regional rail stations, rail division priority sites, and bus operations. The hazards included Fire Hazard Severity, Landslide Susceptibility, Liquefaction, Flooding and Tsunami Areas in Los Angeles County. CH noted that in addition to the maps a vulnerability matrix was produced showing which hazard might impact which of the Metro assets.
f. Examples of Mitigation Measures were presented including prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects.
g. A sample mitigation actions matrix was presented. CH illustrated the benefit and cost aspects needed for the matrix.

Throughout the presentation, CH fielded various questions related to the level of detail needed for costs in the mitigation actions matrix, the sources of the HAZUS data, and the FEMA process in general.

The attendees showed an understanding of the process and a keen interest; they asked for an electronic version of the mitigation actions matrix to be sent to them so as to provide their lists of mitigation action items.

Action items:

- CH to send an electronic copy of the department-specific matrices to MP for distribution to specific departments
- MP will coordinate the next planning team meeting in early October

Planning Team Minutes and Attendance: Meeting 3 – October 17, 2019

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Local All-Hazard Mitigation Plan (PS60250)

Planning Team Meeting #3

Date: 10/17/2019 - 2.00 PM to 5:00 PM
Metro - One Gateway Plaza - Los Angeles, CA 90012

Invitees and Attendees:
A total of 43 Metro staff members were invited out of whom 14 were in attendance. The names and corresponding departments are shown in the following table. Some departments whose representatives attended the first meeting and could not attend this meeting provided alternative representatives who are listed in the table below the dotted line.

First Name	Last Name	Department	Attended (Y: yes)
Albert	Escarcega	Information Technology	
Aldon	Bordenave	Emergency Management	Y
Andrina	Dominguez	Environmental Compliance & Sustainability	Y
Androush	Danielians	Projects Engineering	
Anthony	Chua	Information Technology	
Ashad	Hamideh	Countywide Planning & Development	
Aspet	Davidian	Program Management	
Ayda	Safaei	Communications	
Bob	Spadafora	RFS	
Brady	Branstetter	Facilities Maintenance	
Brian	Boudreau	Program Control	
Carolyn	Harshman	EPC (consultant)	Y
Chirag	Rabari	Countywide Planning & Development	
Craig	Reiter	Environmental Compliance & Sustainability	Y
Dana	De Vera	Project Management	Y
Denise	Longley	Asset Management	Y
Donell	Harris	Bus Maintenance	
Eddie	Boghossian	Corporate Safety	
Edna	Stanley	Rail Operations	Y
Errol	Taylor	Maintenance & Engineering	
Gelito	Ocdamia	Project Engineering - Facilities - Systems -	
Heather	Severin	Environmental Compliance & Sustainability	
James	Jimenez	Environmental Compliance & Sustainability	
James	Pachan	Bus Maintenance	
James D.	Andrew	Countywide Planning & Development	
Janice	Lim	Cyber Security	
Jeanet	Owens	Regional Rail	
Jonathan	Hofert	Project Management - Engineering	
Karen	Parks	Systems Security & Law Enforcement	Y
Mario	Del Rosario	Project Engineering: Facilities - Systems	
Marshall	Epler	Maintenance & Engineering	Y
Moniek	Pointer	Emergency Management	Y
Nadine	Triche-Williams	Bus Operations	Y

First Name	Last Name	Department	Attended (Y: yes)
Patrick	Soto	Information Technology	
Rawad	Hani	GTS (consultant)	Y
Raymond	Lopez	Corporate Safety	
Robert	Castanon	Rail Operations	
Ron	Tien	Project Engineering	
Stephen	Toms	Asset Management	Y
Steve	Jaffe	General Services	
Thinh	Dinh	Project Engineering: Facilities - Systems	
Timothy	Lindholm	Construction Management	
Ty	Henderson	Transit Security	
Brian	Balderrama	Regional Rail	
Kate	Amissah	Regional Rail	
Chris	Limon	Facilities Management (attended Mtg #2)	Y
Roger	Largaespada	ITS (attended Mtg #2)	Y
John	Slay	General Services (attended Mtg #2)	Y
Mike	Ornelas	RFS	Y

The meeting room was organized in such a way to allow for staff to work together in 5 groups on developing the mitigation action items. The attendees were grouped by department (similar to the previous meeting), as such:

1. Systems Security & Law Enforcement; Information Technology; Cyber Security
2. Countywide Planning & Development; Communications / Community Relations; Finance
3. Program Management; Project Engineering; Construction Management; Environmental Compliance & Sustainability; Program Control; Regional Rail; Wayside Systems Engineering & Maintenance; Maintenance & Engineering.
4. Risk Safety & Asset Management; Corporate Safety; Asset Management; General Services
5. Operations: Rail Ops; Rail Fleet Services; Bus Ops; Bus Maintenance

Carolyn Harshman (CH) from the consultant team lead an interactive presentation followed by a facilitated "working in groups" session.

The following is a listing of the main topics covered in the presentation:

a. Project Timeline highlighting the overall progress and the future planning team meeting.
b. A brief re-Cap of meeting #2 was provided which included (i) reviewing HAZUS, (ii) examining FEMA mitigation categories, and (iii) reviewing parameters for capturing mitigation action items.
c. CH mentioned that over the past month, the mitigation matrices were received from various departments including Environmental Compliance & Sustainability, Program Management, Maintenance & Engineering, IT, Transportation Operations, and General Services. However, there are some departments that are yet to send their matrices.
d. CH shared a sample matrix provided by one of the departments highlighting the significance of the various matrix categories

e. CH mentioned that each table has a hard copy of the FEMA Mitigation Ideas that will be used in this session. She indicated that this resource is also online and will be sent electronically by Moniek Pointer (MP) to the various departments.
f. The purpose of this meeting is to develop new ideas based on the FEMA Mitigation Ideas Manual. CH presented what is meant in the HMP plan context by ranking Benefits and the Costs. Benefits should be rated as low if only short-term impacts or risks to life and property, medium for long term impacts/risks to life and property and high for both short- and long-term impacts to life and property. Costs should be rated low if funds are already available within the department's budget), medium if funds available within Metro with a budget re-allocation) and high if funds must be obtained outside of Metro.
g. CH expressed her thanks to Moniek for all the time she had spent contacting and coaching the department representatives as they developed their Mitigation Actions Matrices.

The attendees were provided with the FEMA Mitigation Ideas document who worked in groups to identify new/additional mitigation ideas to the matrices they have already developed.

Action items:

- CH to send an electronic copy of the First Draft HMP to Moniek Pointer within approximately one month who will share with the Planning Team.

MP will coordinate the next Planning Team meeting in early December.

Planning Team Minutes and Attendance: Meeting 4 – February 3, 2020

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Local All-Hazard Mitigation Plan (PS60250)

Planning Team Meeting #4

Date: 2/3/2020 - 1.00 PM to 4:00 PM
Metro - One Gateway Plaza - Los Angeles, CA 90012

Invitees and Attendees:

A total of 43 Metro staff members were invited out of whom 20 were in attendance. The names and corresponding departments are shown in the following table. Some departments whose representatives attended the first meeting and could not attend this meeting provided alternative representatives who are listed in the table below the dotted line.

First Name	Last Name	Department	Attended (Y: yes)
Albert	Escarcega	Information Technology	
Aldon	Bordenave	Emergency Management	Y
Andrina	Dominguez	Environmental Compliance & Sustainability	Y
Androush	Danielians	Projects Engineering	
Anthony	Chua	Information Technology	
Ashad	Hamideh	Countywide Planning & Development	
Aspet	Davidian	Program Management	Y
Ayda	Safaei	Communications	
Bob	Spadafora	RFS	Y
Brady	Branstetter	Facilities Maintenance	Y
Brian	Boudreau	Program Control	
Carolyn	Harshman	EPC (consultant)	Y
Chirag	Rabari	Countywide Planning & Development	
Craig	Reiter	Environmental Compliance & Sustainability	Y
Dana	De Vera	Project Management	
Denise	Longley	Asset Management	Y
Donell	Harris	Bus Maintenance	
Eddie	Boghossian	Corporate Safety	
Edna	Stanley	Rail Operations	Y
Errol	Taylor	Maintenance & Engineering	
Gelito	Ocdamia	Project Engineering - Facilities - Systems -	Y
Heather	Severin	Environmental Compliance & Sustainability	
James	Jimenez	Environmental Compliance & Sustainability	
James	Pachan	Bus Maintenance	
James D.	Andrew	Countywide Planning & Development	
Janice	Lim	Cyber Security	
Jeanet	Owens	Regional Rail	
Jonathan	Hofert	Project Management - Engineering	
Karen	Parks	Systems Security & Law Enforcement	Y
Mario	Del Rosario	Project Engineering: Facilities - Systems	
Marshall	Epler	Maintenance & Engineering	Y
Moniek	Pointer	Emergency Management	Y
Nadine	Triche-Williams	Bus Operations	

First Name	Last Name	Department	Attended (Y: yes)
Patrick	Soto	Information Technology	
Rawad	Hani	GTS (consultant)	Y
Raymond	Lopez	Corporate Safety	Y
Robert	Castanon	Rail Operations	
Ron	Tien	Project Engineering	
Stephen	Toms	Asset Management	Y
Steve	Jaffe	General Services	
Thinh	Dinh	Project Engineering: Facilities - Systems	Y
Timothy	Lindholm	Construction Management	
Ty	Henderson	Transit Security	
Brian	Balderrama	Regional Rail	
Kate	Amissah	Regional Rail	
Chris	Limon	Facilities Management (attended Mtg #2 & 3)	Y
Steve	Rank	Bus Operations	
John	Slay	General Services (attended Mtg #2 & 3)	Y
Jerry	Whelan	Wayside SCADA	Y

Moniek Pointer (MP) welcomed the planning team and thanked them for their support during developing the plan and participation in the team meetings. MP noted that this is the last in a series of planning team meetings.

Carolyn Harshman (CH) from the consultant team in her turn thanked MP and the planning team and the purpose of the final meeting to collect comments on the First Draft Hazard Mitigation Plan. Also, she underlined the next steps in the process which include a public review period and then sending the plan for Cal OES and FEMA for their review, feedback, and ultimately approval. CH noted that following receipt of FEMA's "Approval Pending Adoption", the Metro Board will need to adopt the plan before FEMA's final approval.

CH asked about the public outreach venues that Metro has to share the Second Draft HMP document and the planning team noted that it is best to engage with Metro's Community Relations Department who will propagate the message for public review and feedback. MP will follow-up with Metro's Community Relations Department.

CH went through the First Draft Plan and solicited comments from the planning team; the main comments noted are the following:

- request to provide the full spelling of department names in the Credits
- the planning team noted that there is a Metro intranet that defines the roles of the various departments that will be provided to the consultant to include in the Capabilities Assessment in the Plan (reference p. 18 of the draft HFMP document)
- make sure all data sources are noted (p.19 of the draft HFMP document)
- revise the APTA reference
- rail lines were changed in the past week from colors to letters - it is recommended to refer to lines by their new names
- produce 2 maps - one for rail and one for bus when describing the existing system
- provide a map for the future system expansion

- In the vulnerability table in the Risk Assessment - the planning team will check the operations center to identify the date of the last impact of earthquakes on Metro facilities.
- Also, in the vulnerability table - the planning team noted that the heavy winds have impacted some facilities in recent days
- The planning team discussed how to organize the "Vulnerability of Critical Facilities to Hazards" table and suggestions were to do it by line and to ensure consistency in terms of presentation (station name followed by address).
- change the color scheme of the landslide maps so as not to confuse with fire maps
- update the map on page 83
- add the legend to the Tsunami map
- CH noted that some of the risk line items were missing and asked the teams to clarify
- page 180 - typo 2018 rather than 2108
- discussions of plan maintenance where it was agreed the implementation meetings will be held bi-annually.
- The meeting ended with a big push from the project managers and consultants to spend more time gathering mitigation action items to avoid missing out on grant funding.

The attendees were thanked again by the consultant and encouraged to reach out to CH with any questions.

Action items:

- CH will incorporate all corrections and requests identified during the meeting into the Second Draft Plan.
- Consultant team to revise the First Draft Plan based on the feedback received during the meeting
- MP will coordinate with the Community Relations Department and provide the items noted above by the planning team to the consultant
- CH will send the most recent mitigation actions matrices to MP for distribution to the departments.
- CH will provide email and website language to be used in posting the Second Draft Plan and emphasized the importance of keeping proof of all communications from outside the planning team. FEMA requires evidence of all communications and input gathered.

Project Management Meeting – June 11, 2020

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All-Hazards Mitigation Plan (PS60250)

Project Team Meeting 2

Date: 6/11/2020 - 10.00 AM to 11:30 AM via video-conferencing

Invitees and Attendees:

First Name	Last Name	Department	Attended (Y: yes)
Aldon	Bordenave	Emergency Management	Y
Carolyn	Harshman	EPC (consultant)	Y
Moniek	Pointer	Emergency Management	Y
Rawad	Hani	GTS (consultant)	Y

Rawad Hani (RH) noted that the meeting was called for in order to obtain an update from Metro on the status of the responses to the First Draft All-Hazards Mitigation Plan (AHMP) document and to discuss the next steps. A draft agenda was shared with the attendees which included the following items:

- COVID-19 Response and Updates
- Updates on the Comments Received on the First Draft Plan
- Finalizing the Second Draft for Public Input
- Cal OES and FEMA Review Process
- Board of Directors Adoption
- Finalizing the Plan/Project

The attendees discussed the above items and the following summarizes the main points:

- Moniek Pointer (MP) and Aldon Bordenave (AB) provided an update on Metro's response to COVID-19 as well as the ongoing protests. They noted the demands of 24-hour EOC activations, mounting public health and public safety regulations, and decreasing revenues among many other elements which are impacting the agency as a whole. They also noted the particular impacts on the Emergency Management Department which has decreased time available to focus on the AHMP.

- MP noted that the project timeline ends March of 2021 which needs to include the Cal OES and FEMA review/approval and adoption by the Board of Directors.

- MP also noted that there were comments received from internal Metro stakeholders on the First Draft Plan that will be provided to the consultant team over the next couple of weeks.

- Carolyn Harshman (CH) pointed out that the next step is to have the Second Draft Plan posted on Metro's website and available or input from the general public and external agencies (jurisdictions and special districts within Metro's service area).

- MP noted that she coordinated with Metro's Community Relations Department as to how the document circulation would be done during these (pandemic) times. CH offered to assist with this task as needed to answer any questions the Community Relations Department might have.

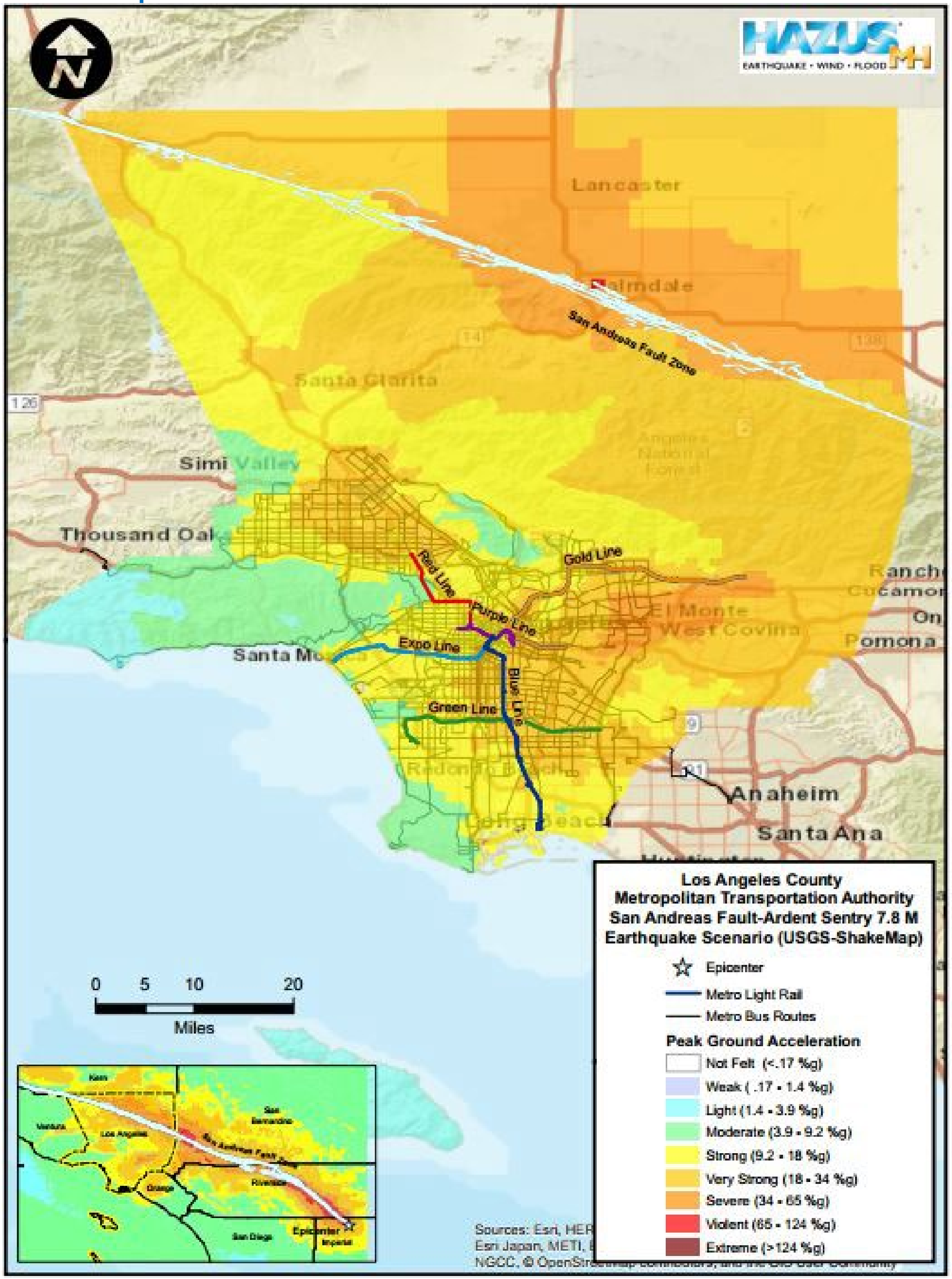
- CH suggested that an Epidemic/Pandemic/Vector-Borne Hazard section will be added to the Plan. This was well received by MP and AB. CH will add this as part of the Second Draft. With the addition of this section, each of the contributing department will need to be informed and encouraged to add any mitigation actions items to their Mitigation Actions Matrix. MP and AB asked CH about developing items for the Emergency Management Department to which she responded "yes".

- CH noted that the total review time for Cal OES and FEMA has been about 4 months this year. CH mentioned that after the Cal OES and FEMA review and issuance of Letter of Approval Pending Adoption, that the plan will then be ready for the Board of Directors consideration and adoption. The attendees discussed the timeline and thought this could potentially take place in November-December 2020.

Action items:

- Consultant team to revise the plan based on the feedback received during the meeting
- MP will provide the feedback received on the First Draft Plan and coordinate with the Community Relations Department.

HAZUS Map - San Andreas M7.8



HAZUS Report - San Andreas M7.8

Hazus: Earthquake Global Risk Report

Region Name:	CountyofLA
Earthquake Scenario:	M7.8-Ardent Sentry 2015 Scenario v1
Print Date:	July 27, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,083.89 square miles and contains 2,343 census tracts. There are over 3,241 thousand households in the region which has a total population of 9,818,605 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,391 thousand buildings in the region with a total building replacement value (excluding contents) of 1,134,130 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 51,120 and 10,482 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,391 thousand buildings in the region which have an aggregate total replacement value of 1,134,130 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 120 hospitals in the region with a total bed capacity of 28,258 beds. There are 3,230 schools, 50 fire stations, 166 police stations and 12 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,735 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 61,602.00 (millions of dollars). This inventory includes over 2,994.39 miles of highways, 3,129 bridges, 95,079.70 miles of pipes.

Table 1: Transportation System Lifeline Inventory

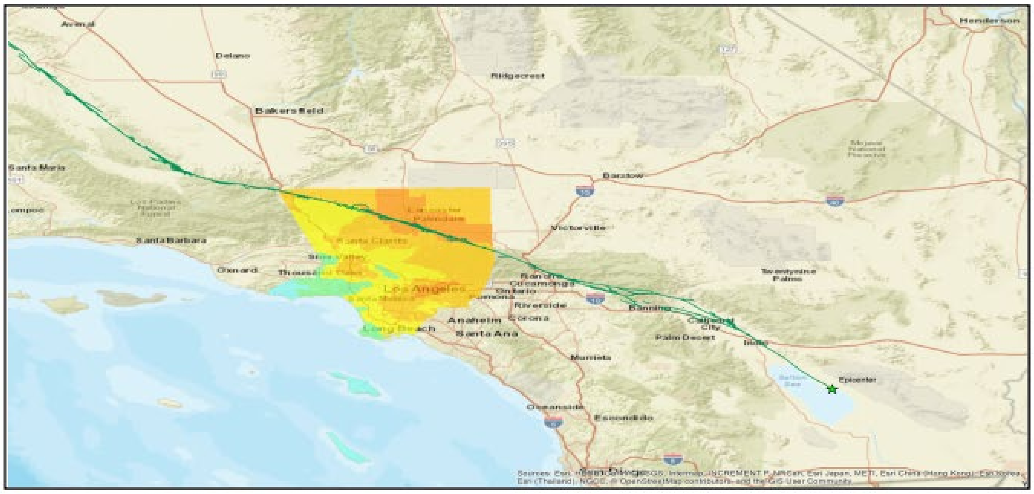
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	3,129	10915.3464
	Segments	4,391	36848.3892
	Tunnels	17	34.2700
		Subtotal	**47798.0056**
Railways	Bridges	144	28.3554
	Facilities	47	125.1610
	Segments	594	885.4233
	Tunnels	0	0.0000
		Subtotal	**1038.9397**
Light Rail	Bridges	28	6.1737
	Facilities	92	244.9960
	Segments	99	376.5065
	Tunnels	0	0.0000
		Subtotal	**627.6762**
Bus	Facilities	42	54.0204
		Subtotal	**54.0204**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	159	317.5230
		Subtotal	**317.5230**
Airport	Facilities	16	170.4160
	Runways	29	1100.9560
		Subtotal	**1271.3720**
		Total	**51,120.80**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1530.1674
	Facilities	15	589.4100
	Pipelines	0	0.0000
		Subtotal	**2119.5774**
Waste Water	Distribution Lines	NA	918.1005
	Facilities	19	1493.1720
	Pipelines	0	0.0000
		Subtotal	**2411.2725**
Natural Gas	Distribution Lines	NA	612.0670
	Facilities	1	1.2862
	Pipelines	0	0.0000
		Subtotal	**613.3532**
Oil Systems	Facilities	44	5.1920
	Pipelines	0	0.0000
		Subtotal	**5.1920**
Electrical Power	Facilities	41	5321.8000
		Subtotal	**5321.8000**
Communication	Facilities	94	11.0920
		Subtotal	**11.0920**
		Total	**10,482.30**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.8-Ardent Sentry 2015 Scenario v1
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.80
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 260,680 buildings will be at least moderately damaged. This is over 11.00 % of the buildings in the region. There are an estimated 31,303 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

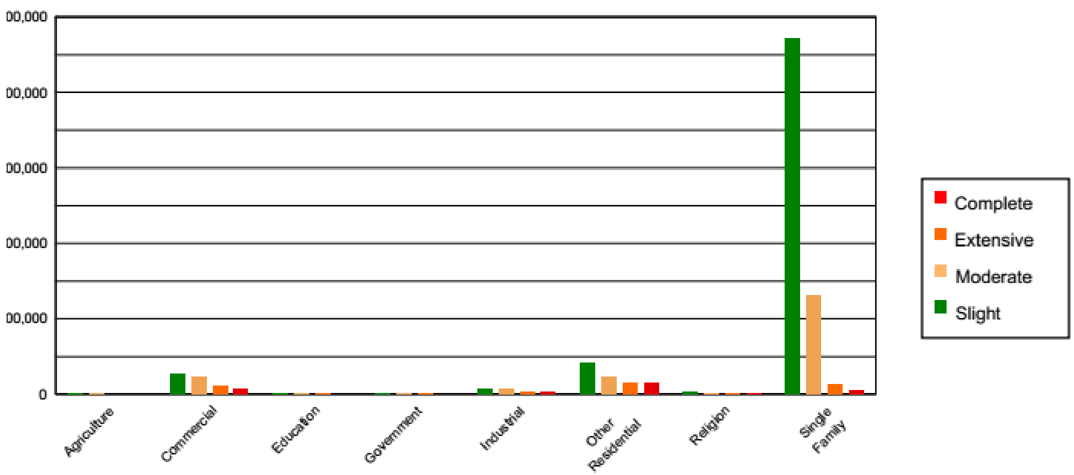


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1798.44	0.11	588.57	0.11	390.79	0.21	173.69	0.41	150.51	0.48
Commercial	86618.65	5.49	27729.35	5.02	23102.28	12.36	10922.71	25.68	8126.01	25.96
Education	3592.71	0.23	1063.61	0.19	647.33	0.35	266.65	0.63	184.70	0.59
Government	1499.66	0.10	473.89	0.09	391.95	0.21	219.15	0.52	191.36	0.61
Industrial	18679.31	1.18	6736.62	1.22	6310.41	3.38	3266.58	7.68	2710.09	8.66
Other Residential	132142.08	8.37	42145.99	7.63	23710.95	12.69	14386.52	33.82	15091.45	48.21
Religion	7143.61	0.45	2254.28	0.41	1574.26	0.84	783.08	1.84	616.77	1.97
Single Family	1326862.85	84.07	471495.29	85.34	130711.62	69.96	12518.37	29.43	4232.79	13.52
Total	**1,578,337**		**552,488**		**186,840**		**42,537**		**31,304**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1437123.70	91.05	506458.63	91.67	139358.44	74.59	13861.72	32.59	5493.57	17.55
Steel	23501.24	1.49	8682.91	1.57	9573.62	5.12	5136.62	12.08	4001.97	12.78
Concrete	26761.44	1.70	8910.37	1.61	6249.70	3.34	3470.32	8.16	2992.99	9.56
Precast	22826.74	1.45	7672.83	1.39	7324.78	3.92	2993.81	7.04	1887.35	6.03
RM	50450.40	3.20	10280.14	1.86	9118.64	4.88	4246.05	9.98	2404.98	7.68
URM	7652.36	0.48	2999.66	0.54	2352.84	1.26	937.21	2.20	806.66	2.58
MH	10021.45	0.63	7483.04	1.35	12861.57	6.88	11891.02	27.95	13716.15	43.82
Total	**1,578,337**		**552,488**		**186,840**		**42,537**		**31,304**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 28,258 hospital beds available for use. On the day of the earthquake, the model estimates that only 23,720 hospital beds (84.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 98.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	120	0	0	115
Schools	3,230	18	0	2,799
EOCs	12	1	0	11
PoliceStations	166	1	0	143
FireStations	50	1	0	43

Transportation Lifeline Damage

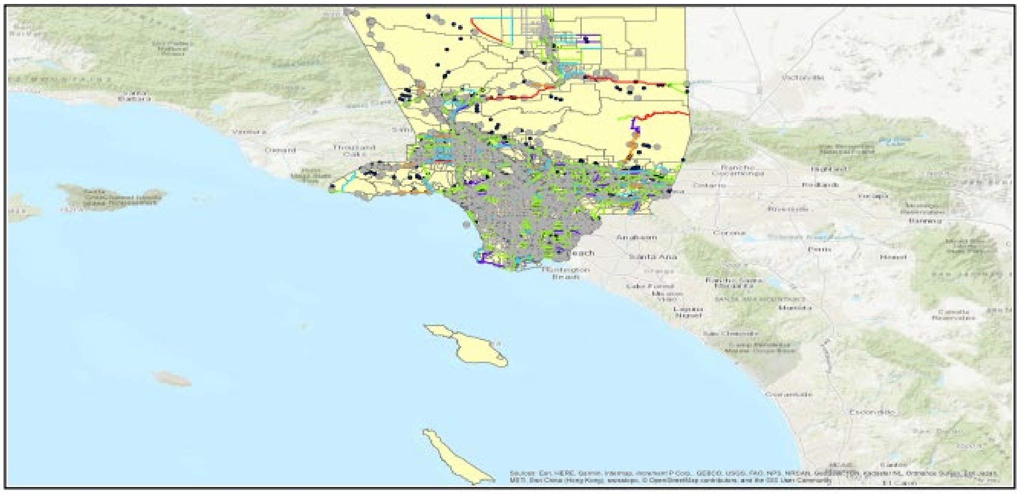


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,391	0	0	4,391	4,391
	Bridges	3,129	314	27	2,803	2,954
	Tunnels	17	0	0	17	17
Railways	Segments	594	0	0	594	594
	Bridges	144	10	0	134	142
	Tunnels	0	0	0	0	0
	Facilities	47	0	0	47	47
Light Rail	Segments	99	0	0	99	99
	Bridges	28	3	0	25	26
	Tunnels	0	0	0	0	0
	Facilities	92	3	0	92	92
Bus	Facilities	42	1	0	42	42
Ferry	Facilities	10	0	0	10	10
Port	Facilities	159	0	0	159	159
Airport	Facilities	16	2	0	16	16
	Runways	29	0	0	29	29

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	15	2	0	11	15
Waste Water	19	2	0	12	19
Natural Gas	1	0	0	1	1
Oil Systems	44	1	0	40	44
Electrical Power	41	5	0	31	41
Communication	94	7	0	94	94

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	47,540	540102	135026
Waste Water	28,524	271307	67827
Natural Gas	19,016	92948	23237
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,241,204	3,239,690	3,239,688	3,239,684	3,239,662	3,239,603
Electric Power		99,656	60,551	24,428	4,701	141

Induced Earthquake Damage

Fire Following Earthquake

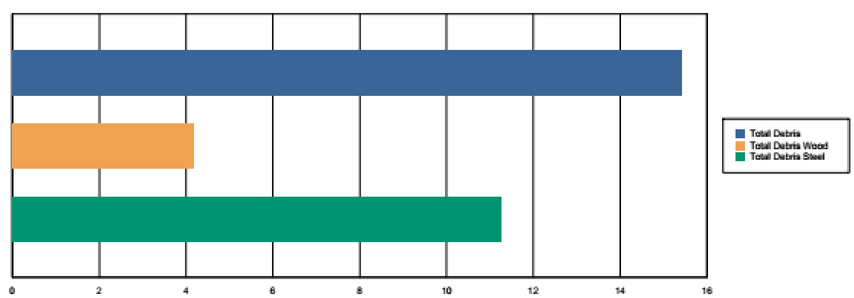
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 195 ignitions that will burn about 2.12 sq. mi 0.05 % of the region's total area.) The model also estimates that the fires will displace about 30,026 people and burn about 2,733 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 15,428,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 27.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 617,120 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



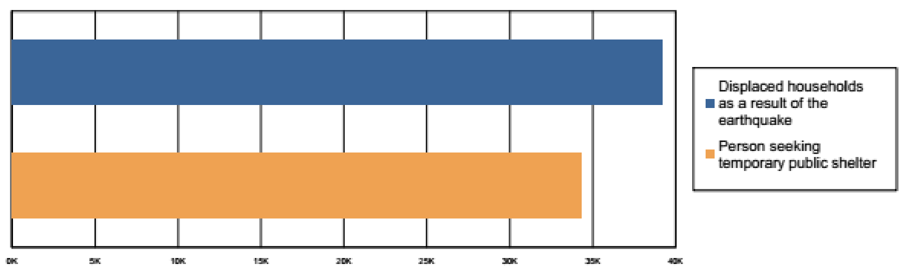
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
4.17	11.26	15.43	617,120 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 39,227 households to be displaced due to the earthquake. Of these, 34,361 people (out of a total population of 9,818,605) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
39,227	34,361

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

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

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	417.32	122.00	19.97	39.50
	Commuting	1.51	2.54	3.65	0.74
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	617.19	177.87	27.68	54.45
	Other-Residential	6455.49	1667.80	217.90	418.63
	Single Family	3329.99	471.55	32.50	59.32
	Total	**10,822**	**2,442**	**302**	**573**
2 PM	Commercial	24731.43	7231.37	1186.80	2332.34
	Commuting	13.60	22.90	32.89	6.66
	Educational	8553.69	2579.35	438.68	859.20
	Hotels	0.00	0.00	0.00	0.00
	Industrial	4549.90	1307.21	204.19	397.49
	Other-Residential	1447.37	377.92	50.41	94.57
	Single Family	732.19	106.08	8.08	13.04
	Total	**40,028**	**11,625**	**1,921**	**3,703**
5 PM	Commercial	17525.68	5110.27	841.81	1633.14
	Commuting	238.82	404.81	578.85	117.39
	Educational	943.15	281.52	47.59	93.40
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2843.69	817.01	127.62	248.43
	Other-Residential	2422.07	626.05	83.28	156.24
	Single Family	1276.43	183.73	13.93	22.47
	Total	**25,250**	**7,423**	**1,693**	**2,271**

Economic Loss

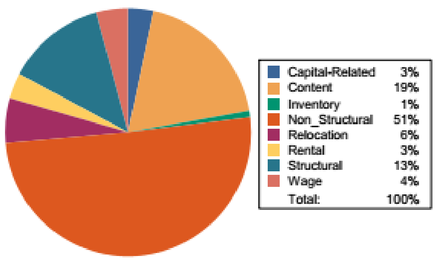
The total economic loss estimated for the earthquake is 74,554.85 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 69,162.30 (millions of dollars); 16 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 42 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

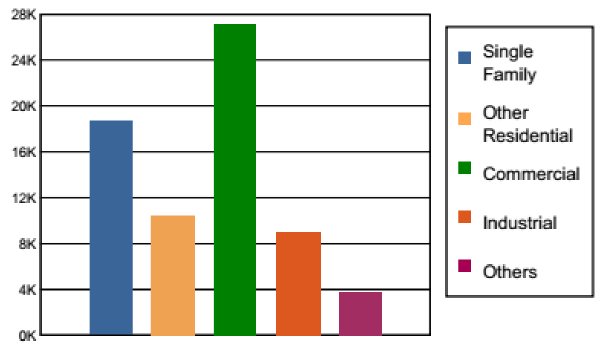


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	140.3400	2446.5920	142.0213	110.4317	2,839.3850
	Capital-Related	0.0000	59.6882	2076.0627	89.0491	26.9114	2,251.7114
	Rental	323.9000	497.3533	1191.0981	53.6205	61.4636	2,127.4355
	Relocation	1128.2826	406.6088	1848.8392	248.3149	439.8114	4,071.8569
	Subtotal	**1452.1826**	**1103.9903**	**7562.5920**	**533.0058**	**638.6181**	**11290.3888**
Capital Stock Losses							
	Structural	2345.4648	1276.3634	3831.9728	1161.5826	543.1520	9,158.5356
	Non_Structural	11571.5654	6655.7820	10825.1380	4193.8541	1819.6576	35,065.9971
	Content	3319.7190	1444.4347	4817.0462	2721.7833	790.6291	13,093.6123
	Inventory	0.0000	0.0000	135.3211	414.1299	4.3139	553.7649
	Subtotal	**17236.7492**	**9376.5801**	**19609.4781**	**8491.3499**	**3157.7526**	**57871.9099**
	Total	**18688.93**	**10480.57**	**27172.07**	**9024.36**	**3796.37**	**69162.30**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	36848.3892	0.0000	0.00
	Bridges	10915.3464	636.8165	5.83
	Tunnels	34.2700	0.1477	0.43
	Subtotal	**47798.0056**	**636.9642**	
Railways	Segments	885.4233	0.0000	0.00
	Bridges	28.3554	1.7658	6.23
	Tunnels	0.0000	0.0000	0.00
	Facilities	125.1610	19.8491	15.86
	Subtotal	**1038.9397**	**21.6149**	
Light Rail	Segments	376.5065	0.0000	0.00
	Bridges	6.1737	0.3516	5.70
	Tunnels	0.0000	0.0000	0.00
	Facilities	244.9960	33.8192	13.80
	Subtotal	**627.6762**	**34.1708**	
Bus	Facilities	54.0204	8.6416	16.00
	Subtotal	**54.0204**	**8.6416**	
Ferry	Facilities	13.3100	0.6991	5.25
	Subtotal	**13.3100**	**0.6991**	
Port	Facilities	317.5230	21.4215	6.75
	Subtotal	**317.5230**	**21.4215**	
Airport	Facilities	170.4160	25.4899	14.96
	Runways	1100.9560	0.0000	0.00
	Subtotal	**1271.3720**	**25.4899**	
	Total	**51,120.85**	**749.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	589.4100	48.5440	8.24
	Distribution Lines	1530.1674	2430.4583	158.84
	Subtotal	**2119.5774**	**2479.0023**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1493.1720	90.7845	6.08
	Distribution Lines	918.1005	1220.8814	132.98
	Subtotal	**2411.2725**	**1311.6659**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	1.2862	0.0377	2.93
	Distribution Lines	612.0670	418.2649	68.34
	Subtotal	**613.3532**	**418.3026**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.1920	0.2652	5.11
	Subtotal	**5.1920**	**0.2652**	
Electrical Power	Facilities	5321.8000	433.7306	8.15
	Subtotal	**5321.8000**	**433.7306**	
Communication	Facilities	11.0920	0.5822	5.25
	Subtotal	**11.0920**	**0.5822**	
	Total	**10,482.29**	**4,643.55**	

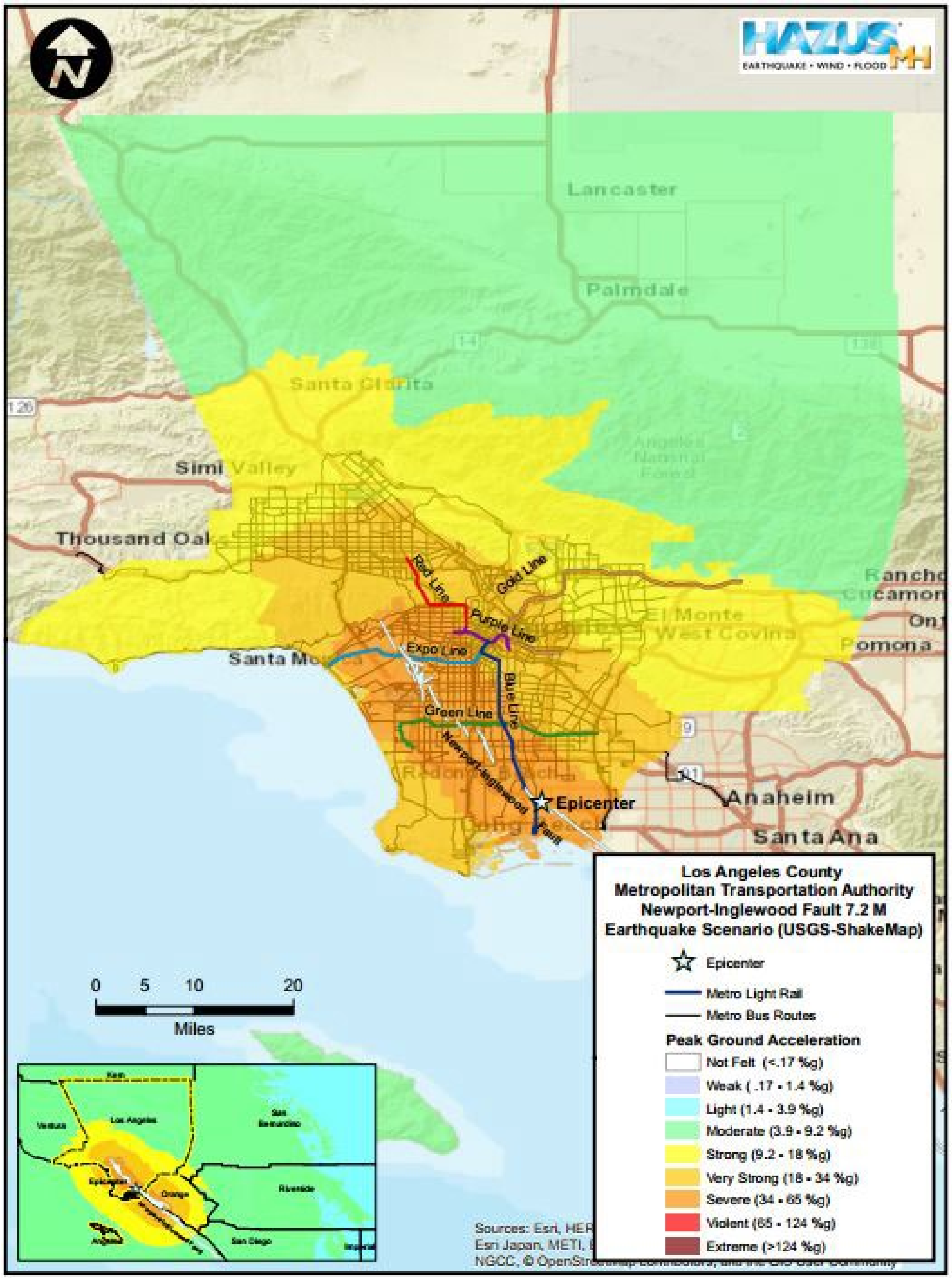
Appendix A: County Listing for the Region

Los Angeles,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
Total Region		**9,818,605**	**868,901**	**265,229**	**1,134,130**

HAZUS Map – Newport Inglewood M7.2



HAZUS Report – Newport Inglewood M7.2

RiskMAP
Increasing Resilience Together

Hazus: Earthquake Global Risk Report

Region Name: CountyofLA

Earthquake Scenario: M7.2-Newport-Inglewood alt 1 v10

Print Date: July 27, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

HAZUS EARTHQUAKE · WIND · FLOOD · TSUNAMI

FEMA

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,083.89 square miles and contains 2,343 census tracts. There are over 3,241 thousand households in the region which has a total population of 9,818,605 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,391 thousand buildings in the region with a total building replacement value (excluding contents) of 1,134,130 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 51,120 and 10,482 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,391 thousand buildings in the region which have an aggregate total replacement value of 1,134,130 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 120 hospitals in the region with a total bed capacity of 28,258 beds. There are 3,230 schools, 50 fire stations, 166 police stations and 12 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,735 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 61,602.00 (millions of dollars). This inventory includes over 2,994.39 miles of highways, 3,129 bridges, 95,079.70 miles of pipes.

Table 1: Transportation System Lifeline Inventory

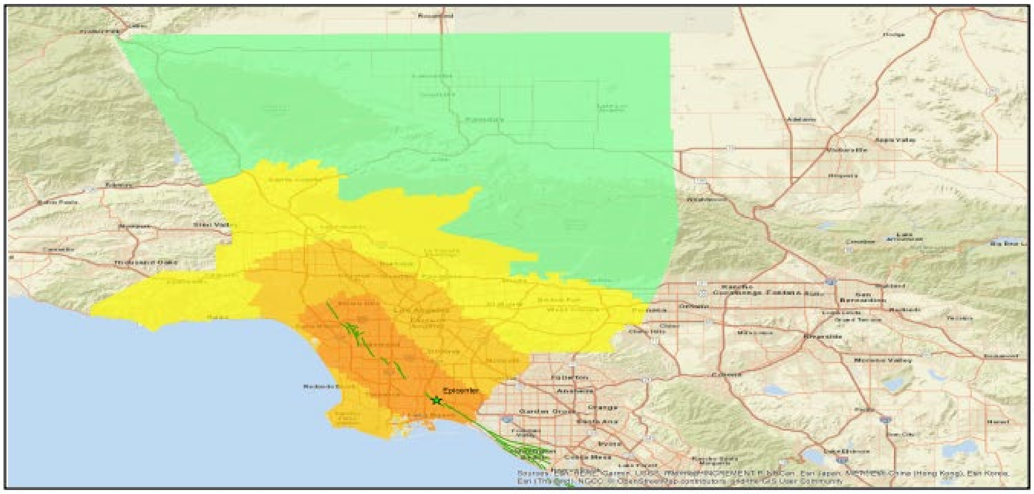
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	3,129	10915.3464
	Segments	4,391	36848.3892
	Tunnels	17	34.2700
		Subtotal	**47798.0056**
Railways	Bridges	144	28.3554
	Facilities	47	125.1610
	Segments	594	885.4233
	Tunnels	0	0.0000
		Subtotal	**1038.9397**
Light Rail	Bridges	28	6.1737
	Facilities	92	244.9960
	Segments	99	376.5065
	Tunnels	0	0.0000
		Subtotal	**627.6762**
Bus	Facilities	42	54.0204
		Subtotal	**54.0204**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	159	317.5230
		Subtotal	**317.5230**
Airport	Facilities	16	170.4160
	Runways	29	1100.9560
		Subtotal	**1271.3720**
		Total	**51,120.80**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1530.1674
	Facilities	15	589.4100
	Pipelines	0	0.0000
		Subtotal	**2119.5774**
Waste Water	Distribution Lines	NA	918.1005
	Facilities	19	1493.1720
	Pipelines	0	0.0000
		Subtotal	**2411.2725**
Natural Gas	Distribution Lines	NA	612.0670
	Facilities	1	1.2862
	Pipelines	0	0.0000
		Subtotal	**613.3532**
Oil Systems	Facilities	44	5.1920
	Pipelines	0	0.0000
		Subtotal	**5.1920**
Electrical Power	Facilities	41	5321.8000
		Subtotal	**5321.8000**
Communication	Facilities	94	11.0920
		Subtotal	**11.0920**
		Total	**10,482.30**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.2-Newport-Inglewood alt 1 v10
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.15
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 350,166 buildings will be at least moderately damaged. This is over 15.00 % of the buildings in the region. There are an estimated 21,746 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

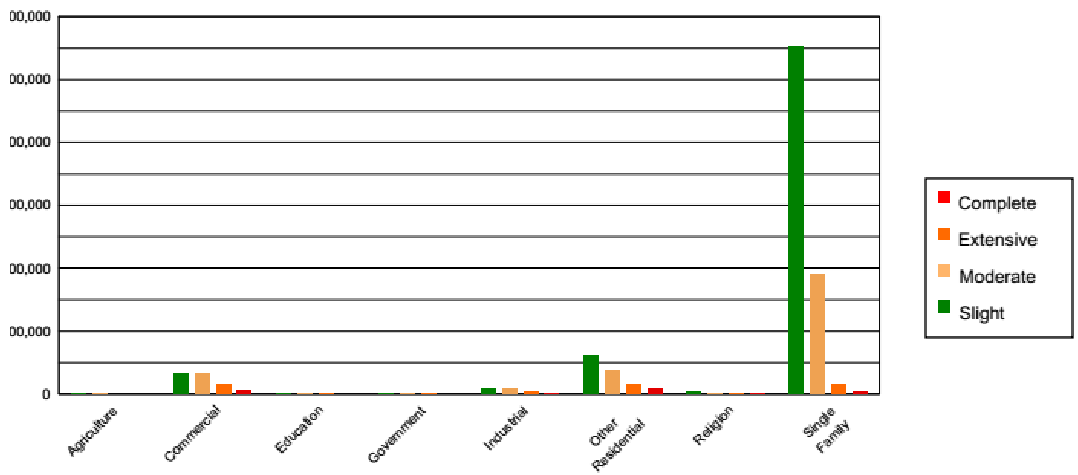


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	1688.96	0.12	658.14	0.10	479.35	0.17	188.48	0.35	87.07	0.40
Commercial	69525.58	5.04	32225.35	4.86	32356.33	11.76	15618.94	29.31	6772.80	31.14
Education	3056.80	0.22	1285.96	0.19	931.24	0.34	354.85	0.67	126.15	0.58
Government	1260.77	0.09	577.50	0.09	542.03	0.20	274.84	0.52	120.86	0.56
Industrial	16615.18	1.20	7366.20	1.11	7954.89	2.89	3957.61	7.43	1809.12	8.32
Other Residential	101754.21	7.38	63126.40	9.53	38792.07	14.10	15755.35	29.57	8048.97	37.01
Religion	5737.11	0.42	2670.34	0.40	2292.27	0.83	1144.35	2.15	527.93	2.43
Single Family	1179272.05	85.52	554517.83	83.71	191782.13	69.71	15995.27	30.02	4253.66	19.56
Total	**1,378,911**		**662,428**		**275,130**		**53,290**		**21,747**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1253420.05	90.90	610438.66	92.15	214765.72	78.06	18298.29	34.34	5373.35	24.71
Steel	19585.35	1.42	8732.20	1.32	12023.48	4.37	7324.27	13.74	3231.08	14.86
Concrete	20824.98	1.51	10880.57	1.64	9347.15	3.40	4999.17	9.38	2332.93	10.73
Precast	17400.08	1.26	8210.01	1.24	10227.69	3.72	4964.70	9.32	1903.01	8.75
RM	40629.08	2.95	12844.58	1.94	14115.70	5.13	6887.64	12.92	2023.21	9.30
URM	5004.67	0.36	2927.74	0.44	3361.71	1.22	1908.68	3.58	1545.94	7.11
MH	22046.46	1.60	8393.95	1.27	11288.88	4.10	8906.92	16.71	5337.02	24.54
Total	**1,378,911**		**662,428**		**275,130**		**53,290**		**21,747**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 28,258 hospital beds available for use. On the day of the earthquake, the model estimates that only 20,570 hospital beds (73.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 96.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	120	0	0	99
Schools	3,230	0	0	1,923
EOCs	12	0	0	9
PoliceStations	166	0	0	88
FireStations	50	0	0	33

Transportation Lifeline Damage

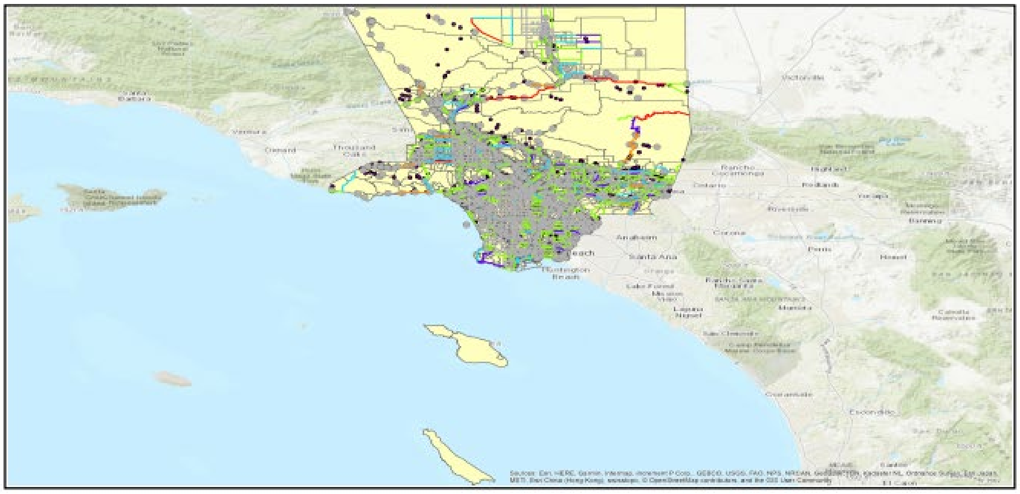


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,391	0	0	4,391	4,391
	Bridges	3,129	127	18	3,008	3,045
	Tunnels	17	0	0	17	17
Railways	Segments	594	0	0	594	594
	Bridges	144	0	0	144	144
	Tunnels	0	0	0	0	0
	Facilities	47	10	0	47	47
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	92	20	0	92	92
Bus	Facilities	42	8	0	42	42
Ferry	Facilities	10	2	0	10	10
Port	Facilities	159	0	0	159	159
Airport	Facilities	16	3	0	16	16
	Runways	29	0	0	29	29

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	15	3	0	10	15
Waste Water	19	5	0	8	19
Natural Gas	1	1	0	0	1
Oil Systems	44	29	0	9	37
Electrical Power	41	13	0	16	41
Communication	94	18	0	87	94

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	47,540	16190	4048
Waste Water	28,524	8133	2033
Natural Gas	19,016	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,241,204	728,528	714,317	685,847	522,199	143,522
Electric Power		386,947	222,982	82,316	14,320	576

Induced Earthquake Damage

Fire Following Earthquake

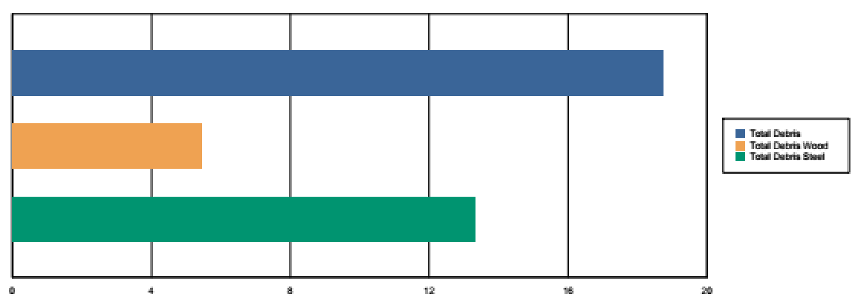
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 195 ignitions that will burn about 2.12 sq. mi 0.05 % of the region's total area.) The model also estimates that the fires will displace about 30,026 people and burn about 2,733 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 18,762,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 29.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 750,480 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



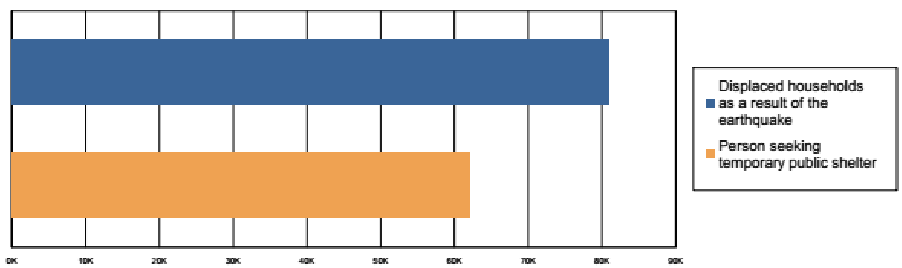
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
5.44	13.32	18.76	750,480 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 80,902 households to be displaced due to the earthquake. Of these, 62,082 people (out of a total population of 9,818,605) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
80,902	62,082

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

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

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	377.07	101.36	15.87	31.35
	Commuting	1.06	1.46	2.40	0.47
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	437.64	114.45	16.90	33.18
	Other-Residential	7885.78	1859.19	244.31	474.20
	Single Family	3961.05	501.89	23.59	41.23
	Total	**12,663**	**2,578**	**303**	**580**
2 PM	Commercial	21820.37	5863.76	919.99	1807.19
	Commuting	9.51	13.12	21.62	4.21
	Educational	5601.27	1491.69	237.19	463.70
	Hotels	0.00	0.00	0.00	0.00
	Industrial	3221.91	841.09	124.69	242.43
	Other-Residential	1641.82	389.73	52.12	97.78
	Single Family	855.28	110.58	6.05	9.02
	Total	**33,150**	**8,710**	**1,362**	**2,624**
5 PM	Commercial	15189.00	4074.48	641.63	1244.91
	Commuting	174.97	239.18	396.71	77.17
	Educational	682.36	181.34	28.79	56.41
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2013.69	525.68	77.93	151.52
	Other-Residential	3018.18	716.38	96.24	180.59
	Single Family	1517.38	195.89	10.71	15.94
	Total	**22,596**	**5,933**	**1,252**	**1,727**

Economic Loss

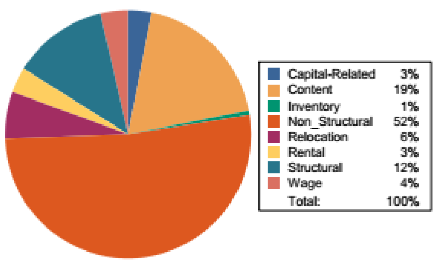
The total economic loss estimated for the earthquake is 93,753.55 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 92,005.41 (millions of dollars); 16 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 50 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

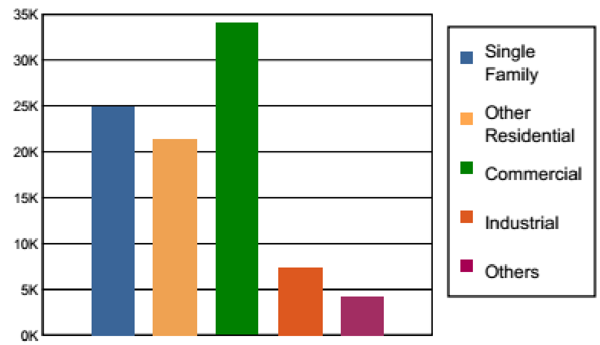


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	241.4570	2898.5956	119.4949	121.5504	3,381.0979
	Capital-Related	0.0000	102.9149	2597.3180	74.0633	29.5968	2,803.8930
	Rental	433.6428	1080.1545	1587.7105	49.5868	65.9224	3,217.0170
	Relocation	1546.1676	760.8657	2456.2679	243.1318	492.4122	5,498.8452
	Subtotal	**1979.8104**	**2185.3921**	**9539.8920**	**486.2768**	**709.4818**	**14900.8531**
Capital Stock Losses							
	Structural	2990.8174	2196.7749	4648.8581	975.6765	572.4820	11,384.6089
	Non_Structural	15304.0991	13759.6995	13480.0236	3369.1859	1978.0528	47,891.0609
	Content	4688.7733	3288.9142	6210.5973	2248.7654	912.7677	17,349.8179
	Inventory	0.0000	0.0000	151.7207	323.3625	3.9875	479.0707
	Subtotal	**22983.6898**	**19245.3886**	**24491.1997**	**6916.9903**	**3467.2900**	**77104.5584**
	Total	**24963.50**	**21430.78**	**34031.09**	**7403.27**	**4176.77**	**92005.41**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	36848.3892	0.0000	0.00
	Bridges	10915.3464	554.9992	5.08
	Tunnels	34.2700	0.1213	0.35
	Subtotal	**47798.0056**	**555.1205**	
Railways	Segments	885.4233	0.0000	0.00
	Bridges	28.3554	1.1839	4.18
	Tunnels	0.0000	0.0000	0.00
	Facilities	125.1610	29.2653	23.38
	Subtotal	**1038.9397**	**30.4492**	
Light Rail	Segments	376.5065	0.0000	0.00
	Bridges	6.1737	0.3265	5.29
	Tunnels	0.0000	0.0000	0.00
	Facilities	244.9960	57.2412	23.36
	Subtotal	**627.6762**	**57.5677**	
Bus	Facilities	54.0204	11.1165	20.58
	Subtotal	**54.0204**	**11.1165**	
Ferry	Facilities	13.3100	2.9872	22.44
	Subtotal	**13.3100**	**2.9872**	
Port	Facilities	317.5230	82.2394	25.90
	Subtotal	**317.5230**	**82.2394**	
Airport	Facilities	170.4160	31.1027	18.25
	Runways	1100.9560	0.0000	0.00
	Subtotal	**1271.3720**	**31.1027**	
	Total	**51,120.85**	**770.58**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	589.4100	55.3611	9.39
	Distribution Lines	1530.1674	72.8552	4.76
	Subtotal	**2119.5774**	**128.2163**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1493.1720	154.8867	10.37
	Distribution Lines	918.1005	36.5970	3.99
	Subtotal	**2411.2725**	**191.4837**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	1.2862	0.2713	21.09
	Distribution Lines	612.0670	0.0000	0.00
	Subtotal	**613.3532**	**0.2713**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.1920	1.0521	20.26
	Subtotal	**5.1920**	**1.0521**	
Electrical Power	Facilities	5321.8000	655.7230	12.32
	Subtotal	**5321.8000**	**655.7230**	
Communication	Facilities	11.0920	0.8117	7.32
	Subtotal	**11.0920**	**0.8117**	
	Total	**10,482.29**	**977.56**	

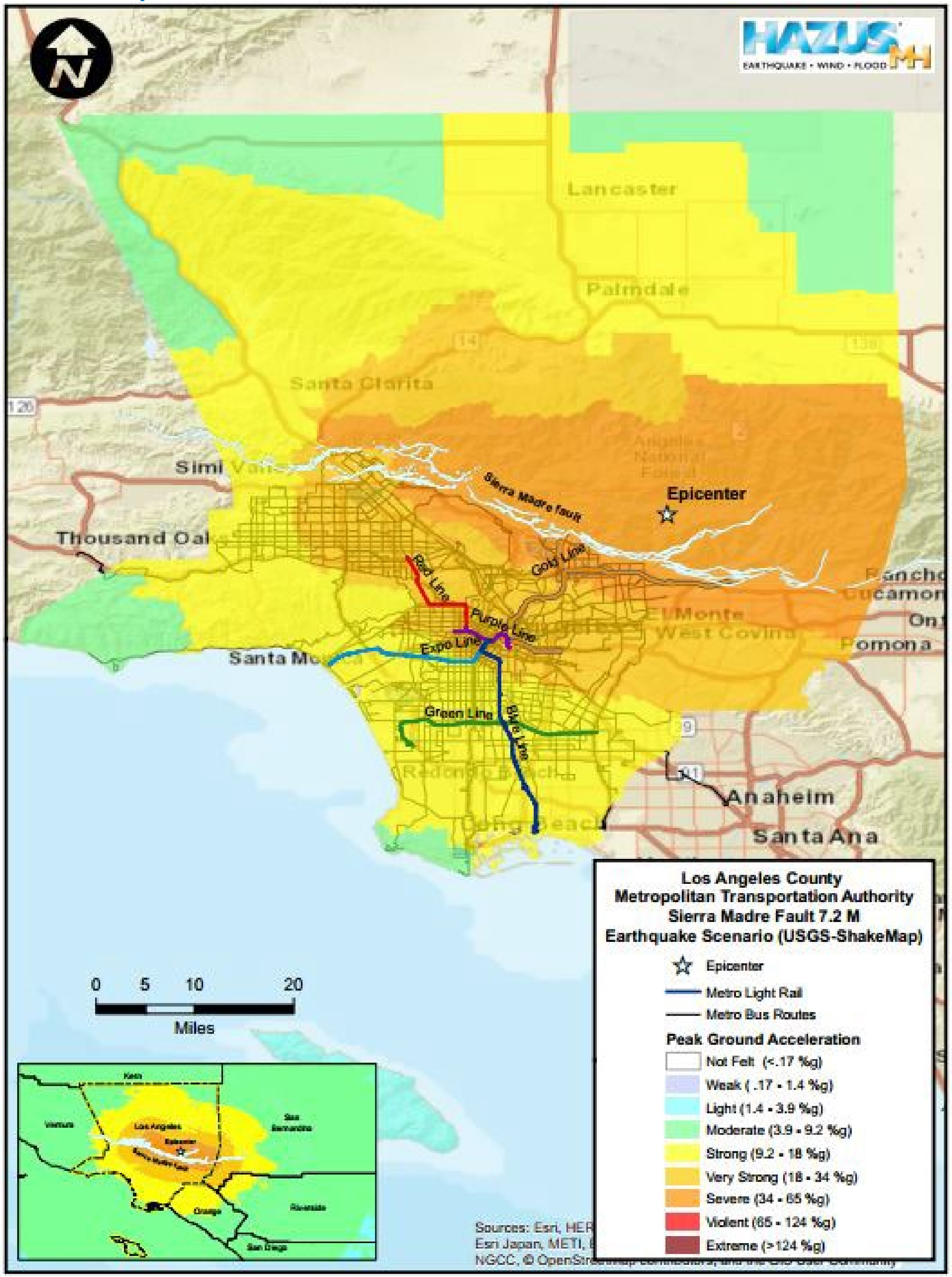
Appendix A: County Listing for the Region

Los Angeles,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
Total Region		**9,818,605**	**868,901**	**265,229**	**1,134,130**

HAZUS Map – Sierra Madre M7.2



HAZUS Report – Sierra Madre M7.2

Hazus: Earthquake Global Risk Report

Region Name:	CountyofLA
Earthquake Scenario:	M7.2-Sierra Madre v11
Print Date:	August 02, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,083.89 square miles and contains 2,343 census tracts. There are over 3,241 thousand households in the region which has a total population of 9,818,605 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,391 thousand buildings in the region with a total building replacement value (excluding contents) of 1,134,130 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 51,120 and 10,482 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,391 thousand buildings in the region which have an aggregate total replacement value of 1,134,130 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 120 hospitals in the region with a total bed capacity of 28,258 beds. There are 3,230 schools, 50 fire stations, 166 police stations and 12 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,735 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 61,602.00 (millions of dollars). This inventory includes over 2,994.39 miles of highways, 3,129 bridges, 95,079.70 miles of pipes.

Table 1: Transportation System Lifeline Inventory

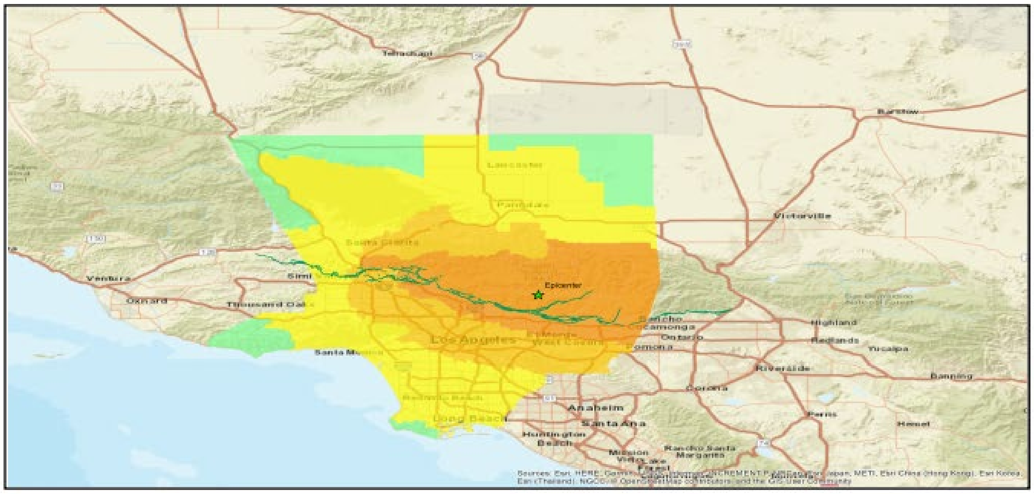
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	3,129	10915.3464
	Segments	4,391	36848.3892
	Tunnels	17	34.2700
		Subtotal	**47798.0056**
Railways	Bridges	144	28.3554
	Facilities	47	125.1610
	Segments	594	885.4233
	Tunnels	0	0.0000
		Subtotal	**1038.9397**
Light Rail	Bridges	28	6.1737
	Facilities	92	244.9960
	Segments	99	376.5065
	Tunnels	0	0.0000
		Subtotal	**627.6762**
Bus	Facilities	42	54.0204
		Subtotal	**54.0204**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	159	317.5230
		Subtotal	**317.5230**
Airport	Facilities	16	170.4160
	Runways	29	1100.9560
		Subtotal	**1271.3720**
		Total	**51,120.80**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1530.1674
	Facilities	15	589.4100
	Pipelines	0	0.0000
		Subtotal	**2119.5774**
Waste Water	Distribution Lines	NA	918.1005
	Facilities	19	1493.1720
	Pipelines	0	0.0000
		Subtotal	**2411.2725**
Natural Gas	Distribution Lines	NA	612.0670
	Facilities	1	1.2862
	Pipelines	0	0.0000
		Subtotal	**613.3532**
Oil Systems	Facilities	44	5.1920
	Pipelines	0	0.0000
		Subtotal	**5.1920**
Electrical Power	Facilities	41	5321.8000
		Subtotal	**5321.8000**
Communication	Facilities	94	11.0920
		Subtotal	**11.0920**
		Total	**10,482.30**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.2-Sierra Madre v11
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.16
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 245,221 buildings will be at least moderately damaged. This is over 10.00 % of the buildings in the region. There are an estimated 8,668 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

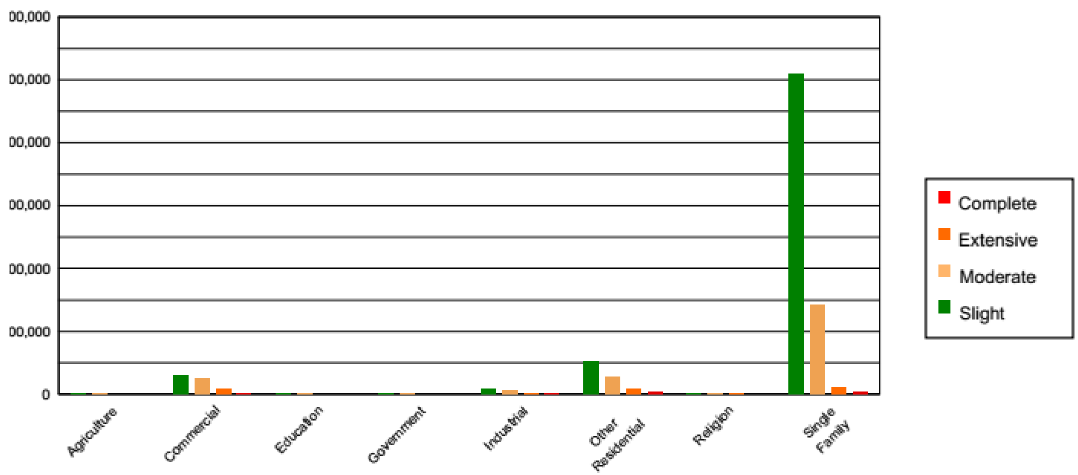


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1803.71	0.12	664.56	0.11	439.94	0.21	146.32	0.46	47.47	0.55
Commercial	89933.72	5.84	31710.57	5.23	24571.55	12.00	8207.46	25.85	2075.70	23.94
Education	3546.31	0.23	1212.87	0.20	733.34	0.36	214.89	0.68	47.59	0.55
Government	1642.56	0.11	552.51	0.09	407.94	0.20	139.19	0.44	33.81	0.39
Industrial	20285.37	1.32	7614.78	1.26	6697.42	3.27	2430.76	7.65	674.67	7.78
Other Residential	134398.27	8.73	52505.45	8.66	27772.06	13.56	9870.19	31.08	2931.01	33.81
Religion	7390.93	0.48	2540.73	0.42	1697.84	0.83	584.54	1.84	157.96	1.82
Single Family	1280750.48	83.18	509730.28	84.04	142478.02	69.57	10161.37	32.00	2700.77	31.15
Total	**1,539,751**		**606,532**		**204,798**		**31,755**		**8,669**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1383681.51	89.86	551839.28	90.98	153229.33	74.82	10574.74	33.30	2971.20	34.27
Steel	27458.46	1.78	9668.70	1.59	9478.66	4.63	3389.91	10.68	900.64	10.39
Concrete	28067.50	1.82	10320.43	1.70	6860.66	3.35	2526.90	7.96	609.33	7.03
Precast	22613.22	1.47	8339.91	1.38	8187.54	4.00	2908.89	9.16	655.94	7.57
RM	50111.36	3.25	11605.92	1.91	10349.38	5.05	3831.73	12.07	601.82	6.94
URM	7296.44	0.47	3219.85	0.53	2666.34	1.30	1053.35	3.32	512.75	5.91
MH	20522.88	1.33	11537.67	1.90	14026.20	6.85	7469.20	23.52	2417.28	27.88
Total	**1,539,751**		**606,532**		**204,798**		**31,755**		**8,669**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 28,258 hospital beds available for use. On the day of the earthquake, the model estimates that only 22,172 hospital beds (78.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 97.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	120	0	0	106
Schools	3,230	0	0	2,514
EOCs	12	0	0	10
PoliceStations	166	0	0	130
FireStations	50	0	0	30

Transportation Lifeline Damage

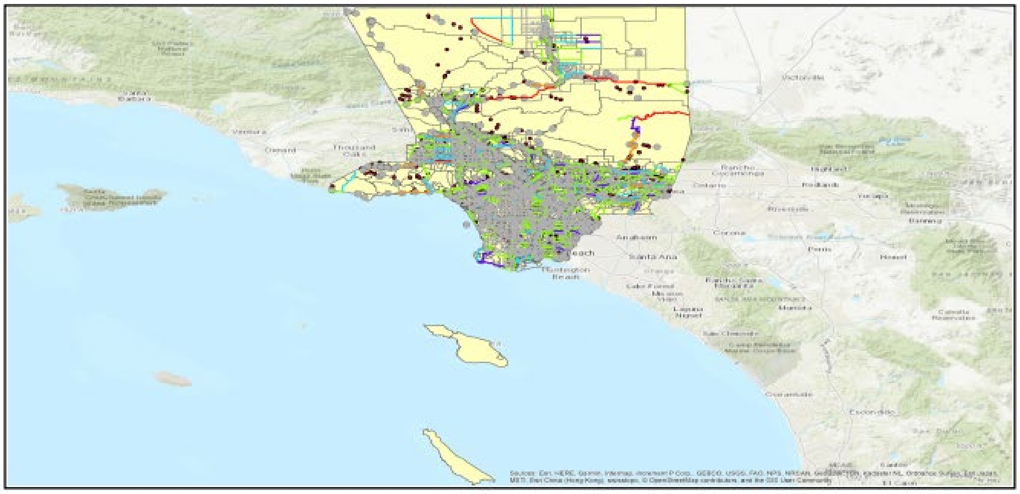


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	4,391	0	0	4,391	4,391
	Bridges	3,129	21	1	3,105	3,119
	Tunnels	17	0	0	17	17
Railways	Segments	594	0	0	594	594
	Bridges	144	0	0	144	144
	Tunnels	0	0	0	0	0
	Facilities	47	1	0	47	47
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	92	4	0	92	92
Bus	Facilities	42	2	0	42	42
Ferry	Facilities	10	0	0	10	10
Port	Facilities	159	0	0	159	159
Airport	Facilities	16	1	0	16	16
	Runways	29	0	0	29	29

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	15	3	0	12	15
Waste Water	19	2	0	12	19
Natural Gas	1	0	0	1	1
Oil Systems	44	0	0	44	44
Electrical Power	41	10	0	25	41
Communication	94	50	0	53	94

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	47,540	9218	2305
Waste Water	28,524	4631	1158
Natural Gas	19,016	1586	397
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,241,204	250,325	238,321	214,891	98,854	0
Electric Power		133,488	78,204	29,595	5,277	195

Induced Earthquake Damage

Fire Following Earthquake

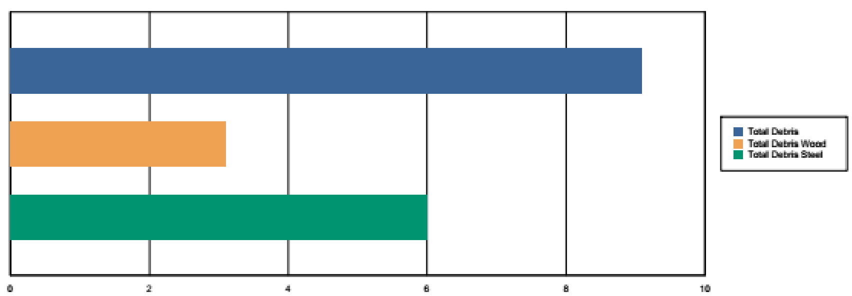
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 157 ignitions that will burn about 1.04 sq. mi 0.03 % of the region's total area.) The model also estimates that the fires will displace about 11,815 people and burn about 1,162 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 9,094,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 34.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 363,760 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



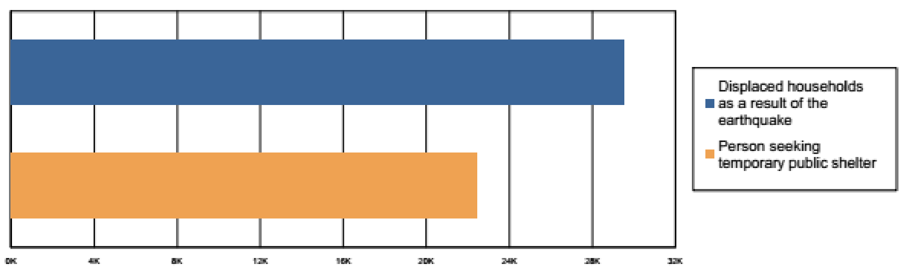
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
3.09	6.00	9.09	363,760 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 29,496 households to be displaced due to the earthquake. Of these, 22,479 people (out of a total population of 9,818,605) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
29,496	22,479

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

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

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	159.23	36.63	5.24	10.33
	Commuting	0.31	0.58	0.77	0.16
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	191.88	42.86	5.76	11.29
	Other-Residential	2892.77	527.83	55.62	106.66
	Single Family	2868.90	318.99	12.21	20.79
	Total	**6,113**	**927**	**80**	**149**
2 PM	Commercial	9203.23	2116.55	303.38	594.94
	Commuting	2.76	5.25	6.97	1.45
	Educational	2517.77	567.18	81.56	159.08
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1410.97	314.99	42.49	82.51
	Other-Residential	608.46	112.82	12.23	22.61
	Single Family	610.22	69.46	3.19	4.53
	Total	**14,353**	**3,186**	**450**	**865**
5 PM	Commercial	6407.52	1473.15	212.10	410.66
	Commuting	51.18	97.38	129.12	26.79
	Educational	334.20	76.71	11.17	21.85
	Hotels	0.00	0.00	0.00	0.00
	Industrial	881.86	196.87	26.55	51.57
	Other-Residential	1093.43	202.10	22.04	40.78
	Single Family	1090.98	124.43	5.73	8.14
	Total	**9,859**	**2,171**	**407**	**560**

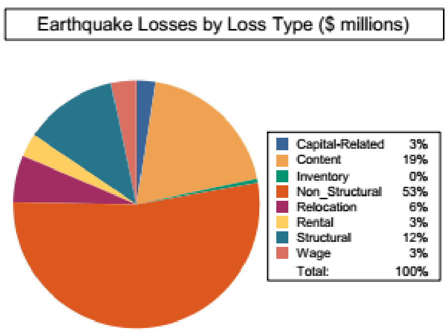
Economic Loss

The total economic loss estimated for the earthquake is 53,452.10 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 52,465.52 (millions of dollars); 15 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.



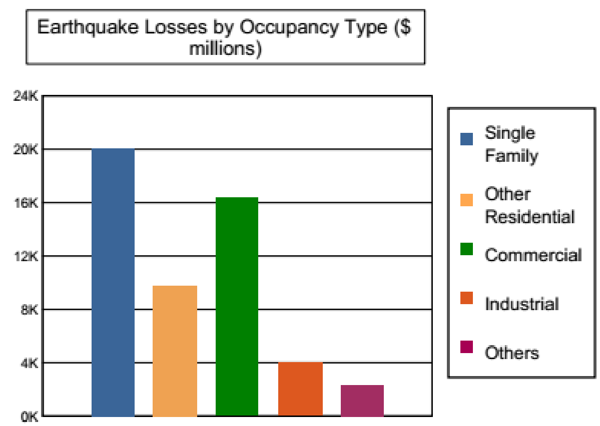


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	107.5233	1455.4768	67.9113	67.8940	1,698.8054
	Capital-Related	0.0000	45.6984	1262.7966	42.0650	17.8809	1,368.4409
	Rental	326.4661	444.3822	813.7970	29.1403	35.5513	1,649.3369
	Relocation	1146.3490	345.7675	1261.3673	152.9196	277.1000	3,183.5034
	Subtotal	**1472.8151**	**943.3714**	**4793.4377**	**292.0362**	**398.4262**	**7900.0866**
Capital Stock Losses							
	Structural	2417.3961	998.1220	2158.4707	533.0490	309.3284	6,416.3662
	Non_Structural	12406.1033	6307.3647	6313.1739	1794.4822	1099.4362	27,920.5603
	Content	3745.0500	1508.8862	3000.7951	1194.8010	530.6243	9,980.1566
	Inventory	0.0000	0.0000	73.3276	172.1536	2.8664	248.3476
	Subtotal	**18568.5494**	**8814.3729**	**11545.7673**	**3694.4858**	**1942.2553**	**44565.4307**
	Total	**20041.36**	**9757.74**	**16339.21**	**3986.52**	**2340.68**	**52465.52**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	36848.3892	0.0000	0.00
	Bridges	10915.3464	207.6083	1.90
	Tunnels	34.2700	0.3349	0.98
	Subtotal	**47798.0056**	**207.9432**	
Railways	Segments	885.4233	0.0000	0.00
	Bridges	28.3554	0.2786	0.98
	Tunnels	0.0000	0.0000	0.00
	Facilities	125.1610	16.0292	12.81
	Subtotal	**1038.9397**	**16.3078**	
Light Rail	Segments	376.5065	0.0000	0.00
	Bridges	6.1737	0.1177	1.91
	Tunnels	0.0000	0.0000	0.00
	Facilities	244.9960	39.5211	16.13
	Subtotal	**627.6762**	**39.6388**	
Bus	Facilities	54.0204	8.9750	16.61
	Subtotal	**54.0204**	**8.9750**	
Ferry	Facilities	13.3100	0.6383	4.80
	Subtotal	**13.3100**	**0.6383**	
Port	Facilities	317.5230	20.0176	6.30
	Subtotal	**317.5230**	**20.0176**	
Airport	Facilities	170.4160	21.8276	12.81
	Runways	1100.9560	0.0000	0.00
	Subtotal	**1271.3720**	**21.8276**	
	Total	**51,120.85**	**315.35**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	589.4100	54.5316	9.25
	Distribution Lines	1530.1674	41.4816	2.71
	Subtotal	**2119.5774**	**96.0132**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1493.1720	94.3508	6.32
	Distribution Lines	918.1005	20.8373	2.27
	Subtotal	**2411.2725**	**115.1881**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	1.2862	0.0362	2.81
	Distribution Lines	612.0670	7.1387	1.17
	Subtotal	**613.3532**	**7.1749**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.1920	0.1973	3.80
	Subtotal	**5.1920**	**0.1973**	
Electrical Power	Facilities	5321.8000	450.3216	8.46
	Subtotal	**5321.8000**	**450.3216**	
Communication	Facilities	11.0920	2.3385	21.08
	Subtotal	**11.0920**	**2.3385**	
	Total	**10,482.29**	**671.23**	

Appendix A: County Listing for the Region

Los Angeles,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
Total Region		**9,818,605**	**868,901**	**265,229**	**1,134,130**