Washoe County Regional Hazard Mitigation Plan

2020 Plan Update

Prepared by:

Washoe County Emergency Management
and Homeland Security

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MEMORANDUM OF TRANSMITTAL

WASHOE COUNTY
EMERGENCY MANAGEMENT AND HOMELAND SECURITY PROGRAM

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November 1, 2019

TO: Washoe County Regional Partners and Members of the Community

SUBJECT: 2020 Update of the Washoe County Regional Hazard Mitigation Plan

The County Board of Commissioners is adopting the 2020 Update of the Washoe County Regional Hazard Mitigation Plan (Regional HMP). The current update of the Regional HMP continues efforts the County and its regional partners, including the City of Reno, City of Sparks, Reno-Sparks Indian Colony, and Pyramid Lake Paiute Tribe, to reduce the risks that hazards pose to our region. The 2020 update of the Regional HMP has been expanded to include:

- New partners that have participated in the planning process, including the Truckee Meadows Fire Protection District, North Lake Tahoe Fire Protection District, and Truckee River Flood Management Agency (see the Special Hazards Jurisdictional Annex);
- Expanded discussion of program implementation to guide development of and establish an organizational structure for a regional mitigation program (see Chapter 7);
- Mitigation strategies specific to emerging closed-basin flooding hazards (see Appendix B);
- Identification of emerging public-private partnerships that encourage private industry buy-in into the mitigation planning process (see Sections 4.5.4, 5.2, 5.3, and 6.5); and
- An expanded capability assessment providing additional detail on existing human and technical resources, financial resources, and legal and regulatory resources available for hazard mitigation (see Chapter 5).

Washoe County and its regional partners continue to coordinate at the regional level to mitigate, prevent, prepare for, respond to, and recover from disasters and emergencies. Implementation of the Regional HMP will ensure our communities are taking action to reduce or eliminate risks to lives and property from hazards over the long-term.

I would like to thank all our regional partners and community members who participated in the plan development workshops and public engagement process. Your input is a vital part of the planning process and ensures that the Regional HMP incorporates the concerns and priorities of our community. I encourage all interested community members to read the Regional HMP to learn more about hazard risks in our region and strategies proposed to reduce risks in their communities.

Aaron R. Kenneston
Washoe County Emergency Manager

Comprehensive, All-Hazards Emergency Management

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PLAN ADOPTION AND APPROVAL

44 CFR §201.6(c)(5) and §201.7(c)(5) requires that the Washoe County Regional Hazard Mitigation Plan be formally adopted by the Board of County Commissioners and all participating jurisdictions. The Hazard Mitigation Plan has been adopted by each jurisdiction as of the following dates. Plan adoption resolutions are included in Appendix H.

Jurisdiction	Adopting Body	Adoption Date
Washoe County	Board of County Commissioners	
City of Reno	City Council	
City of Sparks	City Council	
Reno-Sparks Indian Colony	Tribal Council	
Pyramid Lake Paiute Tribe	Tribal Council	
Truckee River Flood Management Authority	Board of Directors	
Truckee Meadows Fire Protection District	Board of Fire Commissioners	
North Lake Tahoe Fire Protection District	Board of Fire Commissioners	

This plan was approved by the Federal Emergency Management Agency on January 24, 2020. The official approval letter follows.

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U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

January 24, 2020

Aaron Kenneston
Washoe County Emergency Manager
Washoe County Emergency Management and Homeland Security
5195 Spectrum Blvd
Reno, NV 89512

Dear Mr. Kenneston:

We have completed our review of the *Washoe County Regional Hazard Mitigation Plan* and have determined that this plan is eligible for final approval pending its adoption by all participating jurisdictions. Please see the enclosed list of approvable pending adoption jurisdictions.

Formal adoption documentation must be submitted to the FEMA Region IX office by the lead jurisdiction within one calendar year of the date of this letter, or the entire plan must be updated and resubmitted for review. We will approve the plan upon receipt of the documentation of formal adoption.

If you have any questions regarding the planning or review processes, please contact the FEMA Region IX Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

fw Juliette Hayes
Director
Mitigation Division
FEMA, Region IX

Enclosure

cc: Janell Woodward, State Hazard Mitigation Officer, Nevada Division of Emergency Management

Status of Participating Jurisdictions as of January 24, 2020

Jurisdictions – Adopted and Approved

#	Jurisdiction	Date of Adoption

Jurisdictions – Approvable Pending Adoption

#	Jurisdiction
1	Washoe County
2	City of Reno
3	City of Sparks
4	Reno-Sparks Indian Colony
5	Pyramid Lake Paiute Tribe
6	Truckee River Flood Management Authority
7	Truckee Meadows Fire Protection District
8	North Lake Tahoe Fire Protection District

ACKNOWLEDGEMENTS

The development of the Washoe County Regional Hazard Mitigation Plan was made possible by the tireless work of the Mitigation Planning Team. Over the course of 12 months, the team held six formal workshops and met informally many other times. This cross-sector team identified the hardest hitting hazards, described their risks and cascading impacts, and developed a comprehensive mitigation strategy to reduce risk to community members and their property. The following organizations participated in the development of the Washoe County Regional Hazard Mitigation Plan:

- City of Reno
- City of Sparks
- National Weather Service – Reno
- Nevada Department of Transportation
- Nevada Seismological Lab
- North Lake Tahoe Fire Protection District
- NV Energy
- Pyramid Lake Paiute Tribe
- Reno-Sparks Indian Colony
- Reno-Tahoe Airport Authority
- Tahoe Pacific Hospital
- The Red Cross
- Truckee Meadows Fire Protection District
- Truckee Meadows Water Reclamation Facility
- Truckee River Flood Management Authority
- Warm Springs Community Task Force
- Washoe County
- Washoe County Amateur Radio Emergency Service

Individuals are acknowledged for their efforts to develop an effective plan and sustainable program are listed in Appendix E. Support for the 2020 update of the Washoe County Hazard Mitigation Plan was provided under contract by Ecology and Environment, Inc.

RECORD OF PLAN UPDATE AND APPROVAL

The Washoe County Regional Hazard Mitigation Plan is required to be updated once every five years and submitted to the Board of County Commissioners for adoption and the Nevada Division of Emergency Management – Homeland Security and the Federal Emergency Management Agency for approval. The County may update the plan on a more frequent basis as needed without approval.

Refer to Chapter 7 for more information on Plan Implementation guidance.

Date of Update	Date of Adoption	Date of FEMA Approval
2010	December 2010	December 2010
2015	February 2016	January 2016

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APPENDICES

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1 INTRODUCTION

Chapter 1 describes the authorities and principles that provide the basis for Washoe County's (County's) mitigation program as well as provides a description of the program's organization and how the plan is organized to support it.

In recent years, Washoe County has endured the impacts of a variety of hazards-turned disasters. From closed-basin flooding in the North Valleys and other floods along the Truckee River, Red Rock Canyon, and Pyramid Lake, to wildland fires, and the ever-present risk of human-caused disasters, the region has experienced firsthand what hazards can do to a community. In response to hazard risks, Washoe County and its regional partners have made a long-term commitment to work together to prepare for and respond to emergencies. The 2020 update of the Washoe County Regional Hazard Mitigation Plan (HMP) represents a cooperative effort by the regional partners to identify hazards and take action to reduce hazard risks over the long-term.

1.1 Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), as amended by the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390, and its implementing Code of Federal Regulations (CFR) provisions, 44 CFR § 201, provide the legal authority for local hazard mitigation planning. The DMA 2000 requires state, local, and tribal governments to develop an HMP that identifies the jurisdiction's natural hazards, risks, vulnerabilities, and mitigation strategies. The planning process requirements mandated by the Federal Emergency Management Agency (FEMA) (outlined in 44 CFR §201.6) include the following activities:

- Document the planning process;
- Provide stakeholders with an opportunity to participate;
- Conduct and document public involvement;
- Incorporate existing plans and reports;
- Discuss continued public participation and plan maintenance; and
- Provide a method for monitoring, evaluating, and updating the HMP.

Once complete, the HMP must be submitted to FEMA for approval. FEMA's approval of an HMP is a prerequisite for federal Hazard Mitigation Assistance grant program eligibility (outlined in 42 CFR §5165(a)).

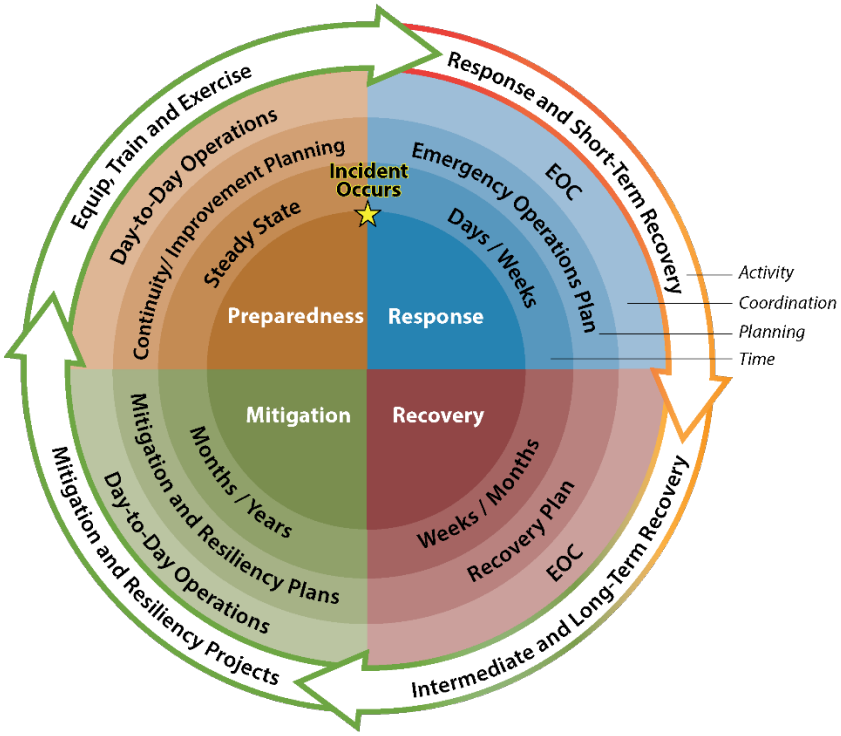
The Washoe County Regional Hazard Mitigation Plan was prepared in accordance with the requirements of the Stafford Act, as amended by the DMA 2000, and the implementing 44 CFR § 201 provisions, as well as Emergency Management Accreditation Program (EMAP) Standard 4.4. The County and all participating communities will integrate appropriate Americans with Disabilities Act standards into mitigation projects and actions implemented as a part of the planning process. For example, alterations to existing facilities, such as seismic retrofits, will comply with all applicable federal accessibility requirements.

1.2 What is Hazard Mitigation?

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property posed by hazards (44 CFR §201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

Additionally, hazard mitigation planning is one of the five mission areas presented in the National Preparedness Goal: Mitigation, Prevention, Protection, Response, and Recovery (see Figure 1-1). The Washoe County Regional HMP is an integral piece of the region's comprehensive approach to emergency management and is designed to align and integrate with other existing plans and emergency management activities.

Figure 1-1 Emergency Management Cycle



Mitigation planning is important because it not only encourages communities to become more flexible and adapt to change more easily, but it also:

- Guides mitigation activities in a coordinated and efficient manner;
- Integrates mitigation into existing tribal plans/programs;
- Considers future growth and development trends;
- Makes a community more disaster-resilient; and
- Ensures eligibility for grant funding.

1.3 Purpose and Scope

1.3.1 Purpose

The Washoe County Regional HMP assesses the potential impact of all prioritized hazards to community members and property and provides mitigation strategies and actions to reduce such risks. The HMP prioritizes these strategies and includes an implementation plan to ensure strategic actions are carried out. The 2020 HMP is the required update of the County's 2015 HMP, expanded to include additional partner agencies (see Section 1.6). The updated HMP ensures that community members have access to the most up-to-date hazard risk information and maintains the County's and participating communities' eligibility to receive federal mitigation funding.

1.3.2 Scope

While the HMP is focused on community members and property, it also includes strategies for broader community risk reduction. The County represents a geographically large region with communities throughout. The HMP attempts to account for all areas of risk concern and address the needs of each participating community. It is designed to integrate with other planning efforts and neighboring county mitigation plans, and to be multi-jurisdictional, representing the efforts of each participating communities within the region, which include:

- Washoe County
- City of Reno
- City of Sparks
- Reno-Sparks Indian Colony
- Pyramid Lake Paiute Tribe
- Truckee Meadows Flood Management Authority
- Truckee Meadows Fire Protection District
- North Lake Tahoe Fire Protection District

In addition to this HMP Basic Plan, each participating community has developed standalone Jurisdictional Annexes that identify unique capabilities, risks, and mitigation strategies to lead their mitigation programs.

Refer to each Jurisdictional Annex for additional community-specific details.

1.4 Washoe County Hazard Mitigation Program

The HMP is one component of the region's comprehensive approach to hazard mitigation. The County and its partners maintain capabilities to ensure that all elements of the participating communities are able to support hazard mitigation activities (see Chapter 5). The following hazards are the focus of region's hazard mitigation program:

- Wildland fire
- Flooding (including closed-basin flooding)
- Earthquake

- Energy emergency
- Criminal acts and terrorism
- Severe storms (including winter storm and windstorm)
- Hazardous materials incident
- Drought
- Infectious disease
- Avalanche and landslide
- Transportation incident (including aircraft crash)
- Radiological waste transport
- Volcano

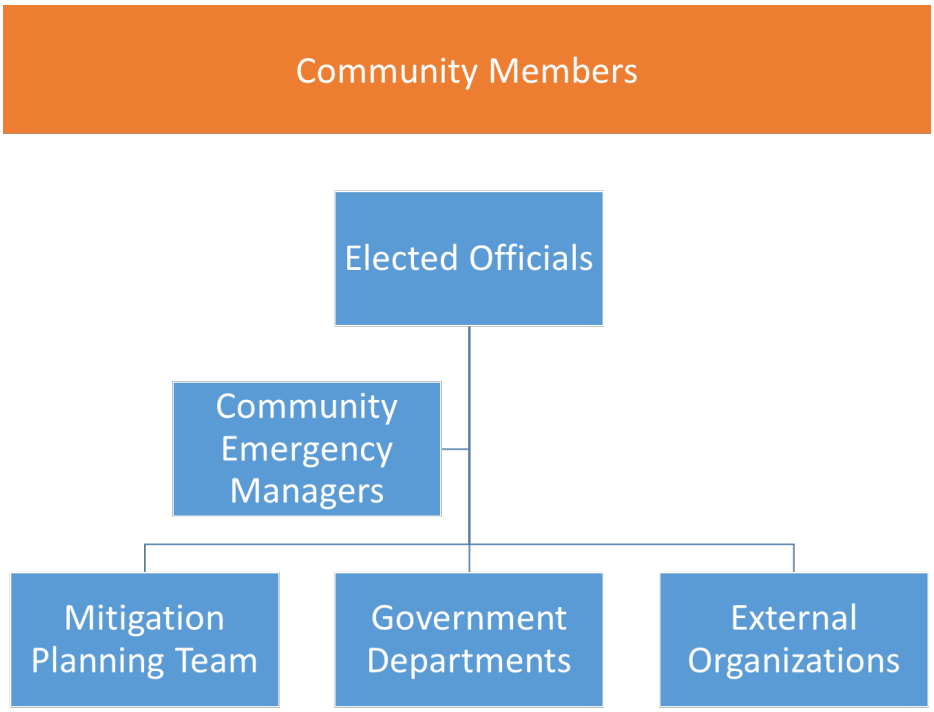
Risks associated with these hazards are prioritized and assessed in the HMP.

See Chapter 7 for details on ongoing implementation of the County's mitigation program.

1.4.1 Organization

Figure 1-2 illustrates how the County organizes to ensure an engaged and collaborative approach to mitigation planning and program implementation. This organization is informally referred to in this plan as the County's mitigation program.

Figure 1-2 Washoe County Multi-Jurisdictional Mitigation Program Organization



1.4.2 Roles and Responsibilities

The HMP exists as a framing document for the region's overall mitigation program. All community members, governmental entities, and businesses play a role in mitigation, and this section outlines those roles and responsibilities.

1.4.2.1 Community Members

Prepared and educated community members are a critical aspect of the region's resiliency, and the County and its partners actively encourage their members to participate in efforts to minimize vulnerability to hazards by engaging in the following activities:

- Participate in preparedness programs. More information can be found in newsletters, in Facebook pages, and through direct engagement.
- Engage in personal and family preparedness and mitigation activities at home and at work.

1.4.2.2 Elected Officials

Elected leadership plays a key role in the County's mitigation program. As the local decision makers, elected officials are responsible for balancing budgetary needs with the need to reduce risks. Participating community elected officials perform the following activities in support of the County's mitigation program:

- Develop and set policy guidance and direction for the County's hazard mitigation program;
- Pass required ordinances to support the hazard mitigation program;
- Provide resources, funding, and direction for protecting and enhancing the lives of community members, and protecting cultural and natural resources;
- Adopt the HMP; and
- Approve funding and projects outlined in the HMP.

1.4.2.3 Community Emergency Managers

Each participating community employs an emergency manager or emergency management department. These community emergency managers serve as the lead coordinator for the community mitigation program. The emergency manager facilitates mitigation activities, including updates to the HMP, and provides technical assistance to other departments. Key responsibilities of the emergency managers include the following:

- Facilitate the community's hazard mitigation program;
- Provide technical support to departments regarding integration of hazard mitigation into department activities; and
- Keep elected officials apprised of the status of the County's hazard mitigation program.

1.4.2.4 Mitigation Planning Team

The Mitigation Planning Team (MPT) includes members of various community partner governmental departments and was developed to ensure that the HMP is representative of capabilities, resources, and concerns throughout the region. Moving forward, the MPT will regularly convene to monitor, evaluate, and implement the region's mitigation program. Additional key responsibilities of the MPT include the following:

- Support ongoing implementation of the region's hazard mitigation program (see Chapter 7);
- Meet quarterly to address progress made on mitigation actions to date; and
- Provide input and technical support for updating and maintaining the HMP.

Refer to Chapter 2 for a discussion of the role of the MPT in the 2019 update of the Washoe County HMP.

1.4.2.5 Governmental Departments and Agencies

The success of the region's mitigation program is dependent on mitigation being a shared endeavor across all organizational elements of the governmental departments of each participating community. Departments are strongly encouraged to incorporate hazard mitigation into their plans and programs and be active participants in the County's efforts to enhance resiliency. Key responsibilities of tribal departments include the following:

- Implement actions identified in the HMP;
- Incorporate hazard mitigation into other departmental planning efforts; and
- Assign a representative to serve as a liaison to the MPT.

1.4.2.6 Community Partners and Neighboring Jurisdictions

The County is committed to a collaborative mitigation program that strives to integrate with other community efforts to mitigate the impacts of hazards. While the scope of the HMP primarily includes participating community departments, the County will continue to look for opportunities to partner with neighboring jurisdictions, private industry, nonprofit organizations, and community- and faith-based organizations in its mitigation program. In particular, the County will coordinate with neighboring counties, the State of Nevada, and FEMA Region IX. Key responsibilities of community partners include the following:

- Incorporate hazard mitigation into organizational and business activities; and
- To the greatest extent possible, coordinate hazard mitigation activities with those of the County and other community partners.

Refer to Chapter 2 for a discussion of how community partners were engaged in the 2018 update of the Washoe County Regional HMP.

1.5 Plan Organization

The 2020 update of the HMP is organized into the following chapters:

- **Chapter 1 – Introduction.** Identifies the authorities on which the plan is based, describes the plan's purpose and scope, describes how the plan is organized, and identifies changes to the plan since 2015.
- **Chapter 2 – Planning Process.** Describes the process used to update the plan, including data sources and plan integration activities, outreach and engagement strategies, MPT activities, and plan development milestones.
- **Chapter 3 – Community Profile.** Summarizes the community profile for the County, including geographic, demographic, and economic characteristics that make the area unique.
- **Chapter 4 – Hazard Profiles and Vulnerability Assessments.** Summarizes the hazards that could potentially impact the community, including a hazard-ranking table.
- **Chapter 5 – Capability Assessment.** Identifies the existing mitigation capabilities of departments and organizations and highlights mitigation accomplishments over the last planning cycle.
- **Chapter 6 – Mitigation Strategy.** Provides updated goals and objectives for the region's mitigation program and identifies a comprehensive set of prioritized mitigation actions that would contribute to the region's resiliency.
- **Chapter 7 – Program Implementation.** Describes the County's plan for monitoring, evaluating, and updating the Washoe County Regional HMP over the next five-year period.

In addition to the main document, the HMP is supported by a series of appendices that provide documentation of the planning process, expanded map sets, and additional data supporting the Vulnerability Assessment.

1.6 What's New in the 2020 Update?

The 2015 HMP served as a starting point for regional hazard mitigation planning efforts and provided a benchmark against which the community's current risk and hazard vulnerability could be considered. The MPT reviewed the 2015 plan to identify progress made in implementing the mitigation strategies proposed in that plan (see Appendix A). Chapter 7 of the HMP, Program Implementation, has been expanded to guide development of and establish an organizational structure for a regional mitigation program. This program will encourage integration of mitigation into existing planning mechanisms and continued public involvement in the planning process.

With the 2020 HMP update, the County and its partners have recognized changes in planning priorities by placing an added emphasis on incorporating actionable strategies in the mitigation implementation plan and moving away from including ongoing coordination activities. Recent disasters and emerging hazards have also influenced the planning priorities and development of mitigation actions for the 2020 HMP update.

In 2017, the County and its partners responded to major winter floods, including closed-basin flooding that affected communities in the North Valleys area. An engineering team was employed during the planning process to evaluate and continue to develop mitigation strategies for closed-basin flooding that have been developed since 2017. These strategies are discussed in detail in Appendix B. This is the first time that closed-basin flooding hazards have been addressed in the regional HMP.

The 2020 update of the Washoe County Regional HMP includes the following additional major revisions to the 2015 plan:

- New partners have participated in the planning process, including the Truckee Meadows Fire Protection District (TMFPD), North Lake Tahoe Fire Protection District (NLTFPD), and Truckee River Flood Management Agency (TRFMA) (see the Special Hazards Districts Jurisdictional Annex);
- Emerging public-private partnerships have been incorporated into the plan, as well as funding mechanisms that lean on private industry buy-in into the mitigation planning process (see Sections 4.5.4, 5.2, 5.3, and 6.5);
- The capability assessment has been expanded to provide additional detail on existing human and technical resources, financial resources, and legal and regulatory resources (see Chapter 5); and
- As part of the County's ongoing enhancement of its emergency program, the Washoe County Regional HMP has been aligned with the mitigation planning standards identified in the Emergency Management Accreditation Program (EMAP).

Additionally, to aid in plan review and to ensure that all FEMA planning requirements are met, text box callouts have been inserted into the plan that identify the planning element, based on FEMA's Local Plan Mitigation Review Tool, that is addressed in that particular section of the plan. The plan also strives to make robust use of internal callouts to ensure that its users can easily find related information. For example, in Chapter 2, which addresses the planning process, the following text box appears:

FEMA	**A1.** Does the Plan document the planning process, including how it was prepared and who was involved in the process for [Washoe County]? (Requirement §201.6(c)(1))

The County also is in the process of seeking accreditation through EMAP. EMAP includes a series of standards related to hazard mitigation, and those standards are addressed throughout the plan.

See Appendix C for the completed FEMA Local Plan Mitigation Review Tool for the Washoe County Regional HMP.

2 PLANNING PROCESS

Chapter 2 provides a narrative description of the planning process the County conducted to ensure that the County's mitigation strategy was informed by input from key departments, community partners, and community members. The process was based on strategies for inclusive engagement and integration with existing planning efforts.

FEMA	**A1.** Does the Plan document the planning process, including how it was prepared and who was involved in the process for [Washoe County]? (Requirement §201.6(c)(1))

The regional HMP's organization is informed by the needs of the County and its partners. The following priorities were used to steer development of the HMP:

- Communicate priorities and values through mitigation strategies;
- Build community through a comprehensive and inclusive planning process; and
- Engage community members, elected officials, and County partners to ensure an equitable plan and mitigation program.

FEMA recommends nine tasks for developing or updating local HMPs (see Figure 2-1). Tasks 1 through 3 address the people and process involved in the all-hazards mitigation plan development or update; Tasks 4 through 8 focus on the analytical and decision steps that need to be taken; and Task 9 includes suggestions for plan implementation.

Figure 2-1 FEMA Recommended Mitigation Planning Tasks

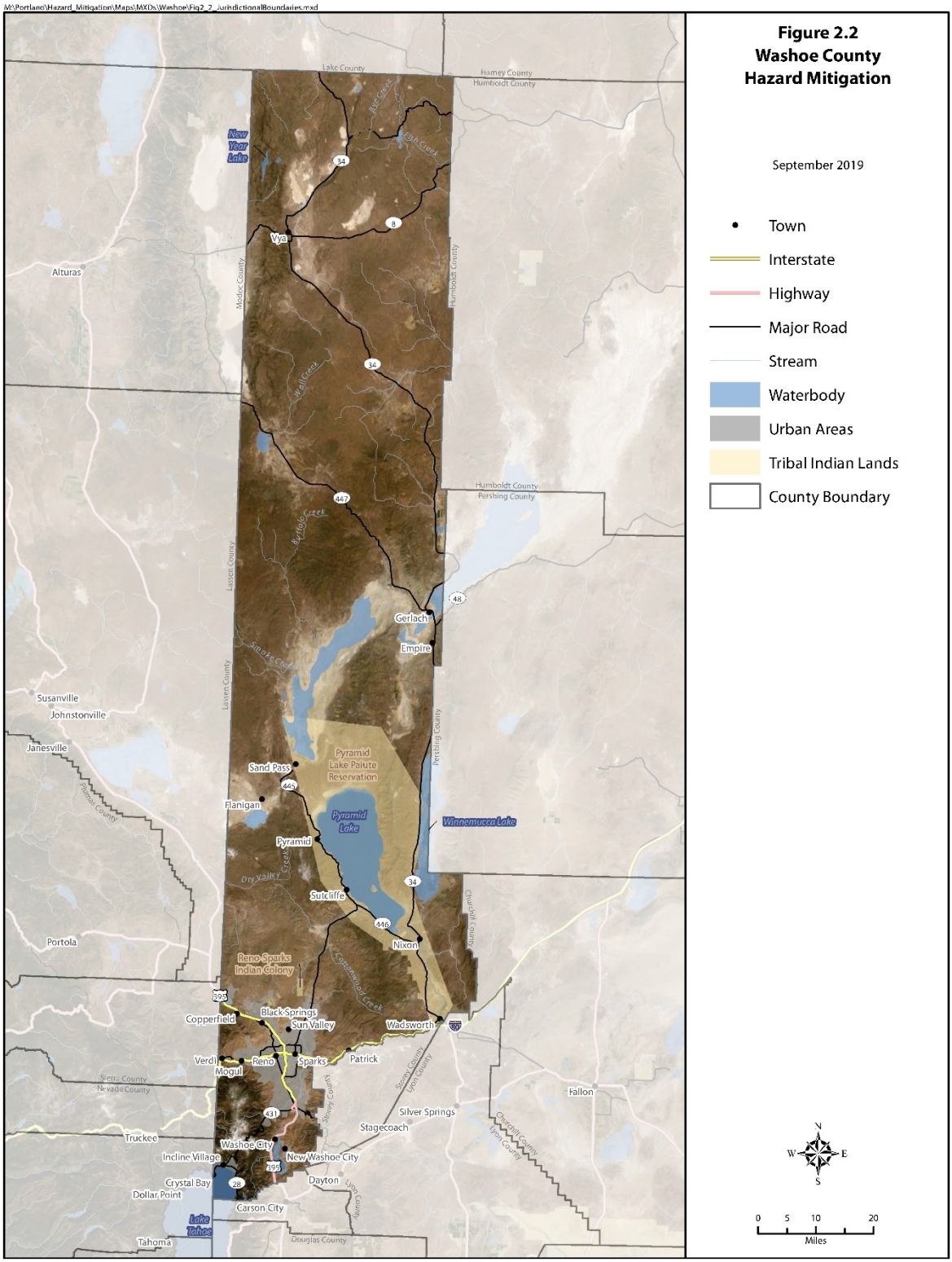
Source: FEMA Local Mitigation Planning Handbook, March 2013

2.1 Planning Area

The Washoe County Regional HMP accounts for all areas in Washoe County, Nevada, including the jurisdictions identified in Section 1.3.2. The 2020 update of the HMP has been expanded to include the special districts of the TMFMA, TMFPD, and NLTFPD, which encompass parts of the cities of Reno and Sparks and the unincorporated County.

See Figure 2-2 for a map of the planning area.

Figure 2-2 Washoe County Hazard Mitigation



2.2 Data Collection and Incorporation of Existing Plans

FEMA	**A4.** Does the Plan document the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))

Data collection efforts for the Washoe County Regional HMP focused on documents pertaining to the planning area. The primary source documents for the plan update were the 2015 HMP and geographic information system (GIS) data. Additionally, related emergency management plans; current local, tribal, county, and state hazard mitigation plans; and plans with relevant hazard mitigation topics were reviewed as part of the data collection efforts. Examples of hazard mitigation planning best practices were also reviewed for their applicability to the HMP, including the Nevada Enhanced HMP, and others.

2.2.1 2015 Washoe County Hazard Mitigation Plan

As part of the 2020 plan update, the following actions were taken to ensure that the update reflected progress in the County's mitigation efforts and any changes in priorities:

- Review and refinement of 2015 HMP goals and objectives by the MPT;
- Update of partner mitigation capabilities; and
- Update of status for all mitigation actions identified in the 2015 HMP.

Refer to Appendix A for a review of the status of all mitigation actions identified in the 2015 HMP update.

2.2.2 Washoe County Community Wildfire Protection Plan (2005 and 2008)

Collaboratively developed by countywide participants (as well as state and federal agencies), the County's Community Wildfire Protection Plan (CWPP) identifies and prioritizes areas for fuel reduction treatments in at-risk communities. The CWPP also outlines recommended measures for homeowners and communities to reduce the likelihood of a fire impacting their structures. Fire was rated as the highest risk for the County, and the CWPP was used to validate specifics related to the hazard.

2.2.3 Washoe County Regional Flood Response Action Plan (2018)

The Washoe County Regional Flood Response Action Plan (FRAP) provides a concept of operations for flood response and recovery at the regional level. Flooding is a high-priority hazard for the region, and the FRAP was used as a source of information on previous flooding events and locations within the County that are most likely to be affected by flooding.

2.2.4 State of Nevada Enhanced Hazard Mitigation Plan (2018)

The State of Nevada Enhanced HMP identifies and prioritizes potential actions throughout Nevada that would reduce the state's vulnerability to natural hazards. In addition, the plan satisfies the requirements of FEMA to ensure that Nevada is eligible to receive hazard mitigation and disaster assistance funds from the federal government. The current version of plan was approved in 2018 as an enhanced plan and is effective until 2023. (State of Nevada 2018)

2.2.5 Integration of Geographic Information Systems Data

Efforts were made to ensure that the HMP incorporates the most up-to-date and comprehensive data available. These data were used to develop maps contained within the HMP and develop comprehensive risk assessments that describe exposure to risk in terms of dollar amount and provide property counts (where available).

Refer to Appendix F1 for a comprehensive list of all GIS source data.

2.3 Coordination with Other Planning Efforts

Recognizing that disasters do not stay within jurisdictional boundaries, Washoe County has made it a practice to plan at the regional level for all emergency management activities. The HMP builds on long-standing regional partnerships between the County, the cities of Reno and Sparks, and the Pyramid Lake Paiute Tribe and Reno-Sparks Indian Colony (RSIC) and on previous regional plans, including the:

- Washoe County Regional Emergency Operations Plan
- Washoe County CWPP
- Washoe County Regional FRAP
- Truckee River Flood Management Authority Flood Protection Plan
- Washoe County Master Plan

2.4 Mitigation Planning Team

The County began preparing for the update of the HMP by preparing an application to receive FEMA funding via the Pre-Disaster Mitigation Grant Program. Funding was received in 2018, which allowed for the planning process to commence with contract support provided by Ecology and Environment, Inc. The County's Emergency Manager initiated the planning process through pre-planning via internal meetings and email exchanges with MPT members.

The MPT was convened at the start of the HMP update project to facilitate department and community member input into the HMP update. The MPT aided in the revision of mitigation goals and objectives, determination of risks and vulnerabilities, identification of mitigation strategies, refinement of mitigation review criteria, and prioritization and implementation of mitigation strategies. This planning process focused on improving intergovernmental coordination to ensure that the resulting document met the needs of all participating community departments.

2.4.1 MPT Members

The MPT was led and organized by the County's Emergency Manager. The members of the MPT who participated in the plan update are listed in Appendix E, with their associated organizations and departments and contact information.

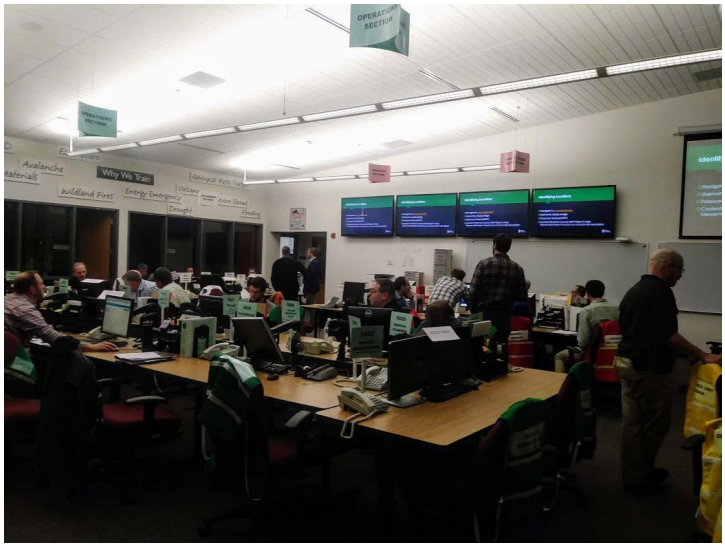
2.4.2 MPT Meetings

The needs of the HMP were discussed and key deliverables were reviewed at the MPT's formal meetings. The MPT convened for a series of six meetings over the course of the project (see Table 2-1), where representatives from key departments and other stakeholders had the opportunity to provide knowledge and insights regarding hazard risks and local capabilities, engage with the contractors, and collaboratively work on the plan's content.

The MPT meetings served as the primary data-gathering mechanism throughout the planning process, and the importance of these meetings cannot be overstated. While contract support to develop the plan was provided by Ecology and Environment, Inc., community members and government employees within the MPT crafted every concept outlined in the HMP. This includes data collection, determination of goals and objectives, articulation of specific hazards and risks, and development of a comprehensive mitigation strategy. MPT meeting outputs are referred to throughout each chapter of the HMP, indicated by the "MPT Meeting Deliverable" graphic displayed to the right.

Table 2-1 Mitigation Planning Team Meeting Schedule

MPT Meeting	Date	Objectives
Meeting #1: Project Kickoff Workshop	1/25/2019	Project kickoff, including review of the planning process, ranking of hazards, determination of goals and objectives, and information gathering.
Meeting #2: Risk Assessment Workshop	3/21/2019	Review of updated risk assessment and development of additional risk characteristics (held concurrently with Public Meeting #1).
Meeting #3: Mitigation Strategy Workshop	5/15/2019	Development and prioritization of mitigation strategies.
Meeting #4: Jurisdiction-Specific Workshops	7/30/2019 through 8/2/2019	Draft plan review, review of 2015 mitigation actions, and discussion of new mitigation actions.
Meeting #5: Draft Plan Review	10/15/2019	Draft plan review for Mitigation Planning Team (MPT) and community members.
Meeting #6: Final Presentation	February 2020	Final plan review, MPT approval



The MPT comes together to define hazard risks across the planning area.

See Appendix E for documentation of all MPT activities.

In addition to the six MPT meetings, the MPT was engaged through follow-up emails and requests to provide additional information pertaining to internal capabilities, department-specific risks, and mitigation strategy development. MPT members unable to attend meetings were consulted after all meetings to ensure that all inputs and perspectives were represented in the final HMP.

2.5 Inclusive Outreach and Public Engagement

FEMA	**A2.** 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 interests to be involved in the planning process? (Requirement §201.6(b)(2)) **A3.** Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1) and §201.6(c)(1))

A critical component of the HMP update effort is a robust stakeholder engagement process that provides "an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval" (44 CFR §201.6). While providing an opportunity for public comment on the draft plan is one way to engage with the public around hazard concerns, the MPT also wanted to ensure the public had a meaningful way to participate in the process, as outlined in the following sections.

2.5.1 Inclusive Outreach and Public Engagement Plan

2.5.1.1 Online Outreach

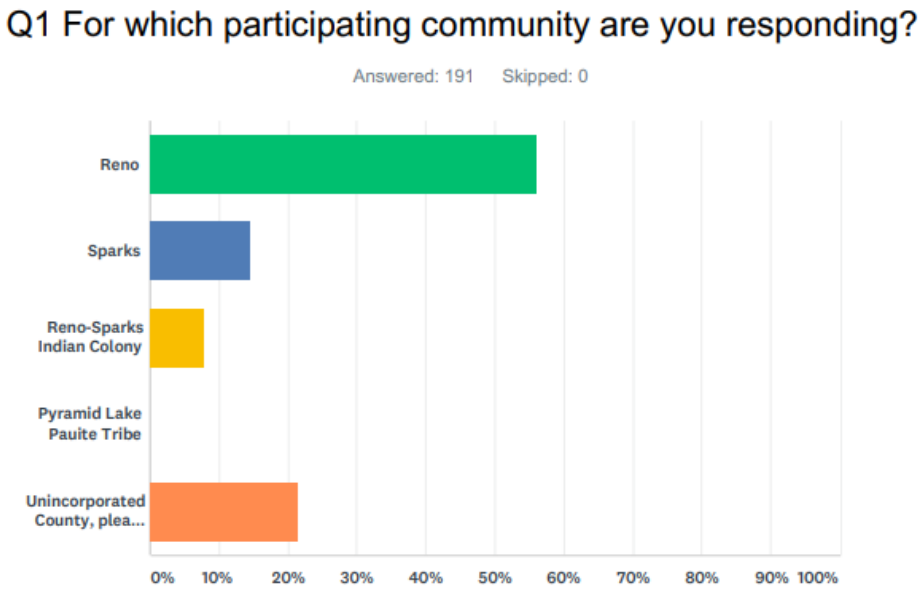
Public engagement was initiated soon after the HMP Kickoff Meeting (MPT Meeting #1). Table 2-2 and Appendix E provide summaries of outreach and engagement activities.

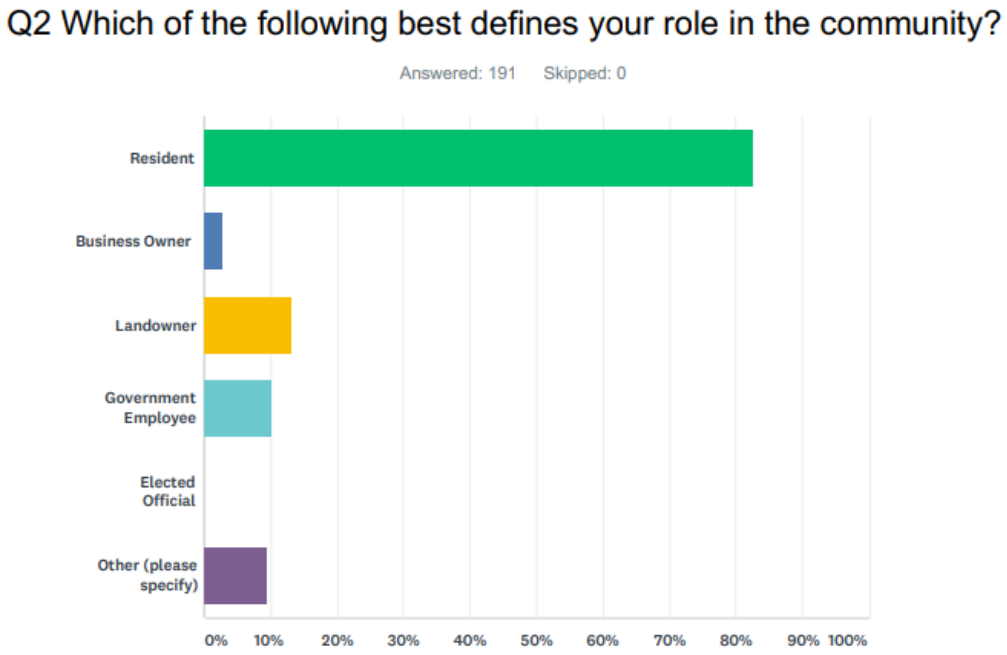
Table 2-2 Stakeholder and Public Outreach Activities Schedule

Outreach Event	Date	Objectives
Online Survey Outreach	3/8/2019-10/31/2019	Online survey developed to solicit input from community members regarding hazards or concerns.
Public Meetings	7/2019 – 10/2019	Public presentations and workshops dedicated to gathering feedback around major plan components, including risk assessment, hazard information, and initial mitigation ideas.
Public Comment Period	11/8/2019 – 12/9/2019	Community member review of draft plan available on County's website.

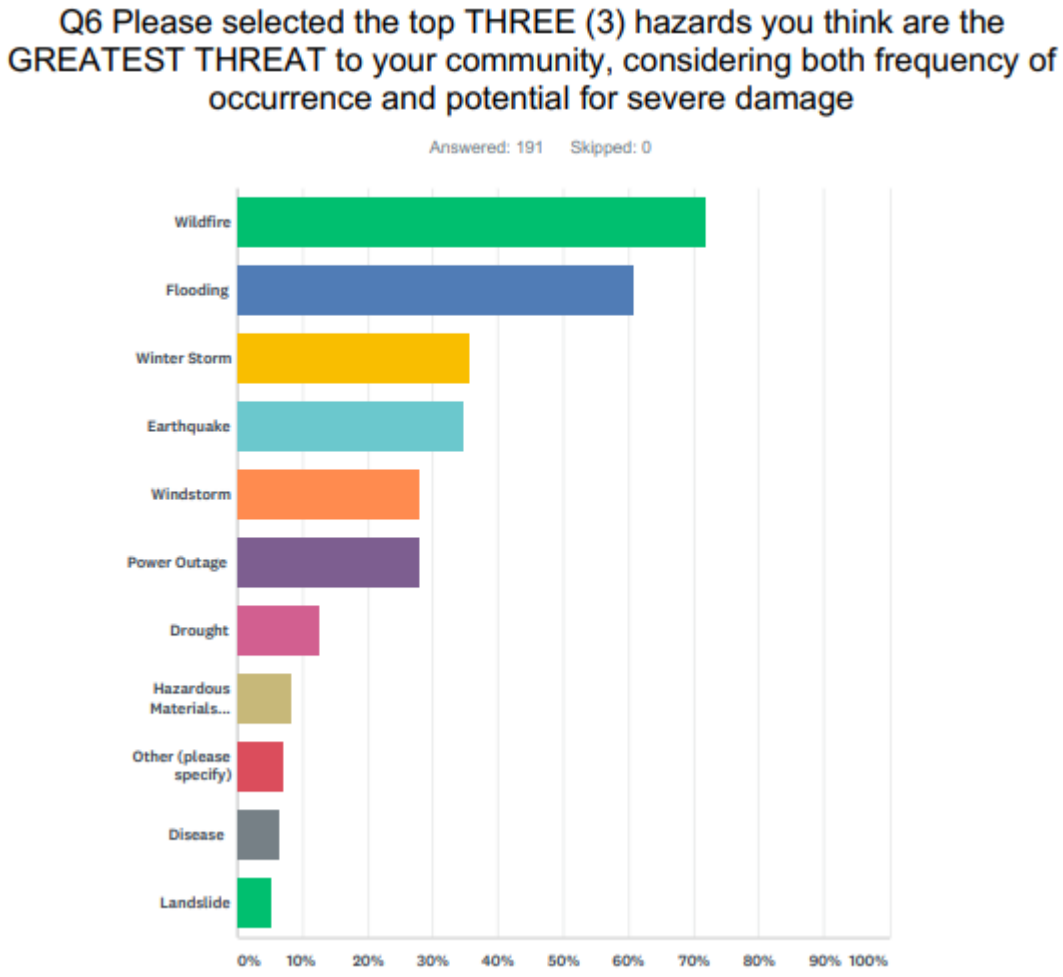
An online survey was developed to learn more about the public's initial concerns prior to plan development. The initial online survey was distributed through social media (e.g., Facebook, Next Door, etc.) beginning on March 8, 2019. Over the course of two months, over 190 individuals responded to the survey and provided their feedback. The following figures indicate some of the key findings of this initial survey.

See Appendix E for complete survey results.





Most survey responses came from residents, confirming the survey was not simply reaching government employees already engaged in the planning effort.



The public's initial hazard rankings were very similar to the MPT's (see Section 4.2), but there were some variations.

2.5.1.2 Public Meetings

The MPT hosted a series of public meetings to ensure that additional stakeholders were reached who may not routinely respond to online surveys. In an effort to avoid the issues associated with traditional public meetings (e.g., low attendance, one-way communication), the MPT embraced an open-house meeting concept that allowed the public to learn and discuss different HMP components in an inter-active setting. For example, the City of Reno Public Open House contained the following work stations for engagement:

- *Risk Assessment Mapping* – access to a computer/projector to allow for participatory mapping/GIS.
- *Storytelling* – a table established specifically for the public to tell the County Emergency Manager about their experience with disasters.

- *Mitigation Ideas* – access to a computer/projector to allow the public to share their ideas on mitigation projects and discuss the potential costs and benefits.

Table 2-3 provides a summary of public meetings held during the course of the HMP update process.

Table 2-3 Public Meeting Schedule

Outreach Event	Date	Objectives	Attendance
City of Reno Public Open House #1	7/15/2019	Provide an opportunity for residents to share their concerns and ideas.	5 individuals
Engineering Solutions Public Meeting #1	7/31/2019	Identify new solutions from local residents and engineers to address long-term closed basin flooding concerns.	21 individuals
Engineering Solutions Public Meeting #2	9/9/2019	Prioritize and rank engineering alternatives to address long-term closed basin flooding concerns.	12 individuals
Washoe County Public Meeting #1	9/9/2019	Provide an opportunity for residents of the North Valleys area to share their concerns and ideas, with a focus on closed basin flooding.	11 individuals
City of Reno Public Meeting #2	9/12/2019	Provide an opportunity for residents to share their concerns and ideas.	22 individuals
City of Sparks Public Meeting #1	10/14/2019	Provide an overview of the Hazard Mitigation Plan (HMP) process and solicit public comments on the Draft HMP.	30 individuals
Reno-Sparks Indian Colony Public Meeting #1	10/14/2019	Provide an overview of the HMP process and solicit public comments on the Draft HMP.	11 individuals

See Appendix E for additional public meeting documentation.

2.5.1.3 Plan Review

Community members were provided with the draft HMP from November 8, 2019, to the present on the County's website (www.readywashoe.com) and informed of the availability of the plan through a press release and announcements on the County's social media accounts, including Twitter and Facebook.

An initial public comment period was held from November 8, 2019, to December 9, 2019. Members of the community were invited to share their thoughts about what hazards concern them most, and how they think the County and its partners should prioritize their activities to reduce hazard risks. Neighboring jurisdictions, including Storey County and Carson City, also were invited to review the draft HMP and provide comments. Comments received during the public meetings and public comment period are summarized in Table 2-4 and included in Appendices E4 and E5.

Table 2-4 Public Comments Received on the Draft Washoe County Regional Hazard Mitigation Plan

Public Comment Summary	Date Received	Comment Response
The HMP should address extreme heat as a hazard and include a strategy to develop cooling centers.	9/12/19	Discussion of extreme heat has been added to Section 4.5.6. Mitigation action SS-2 for establishing cooling centers has been added, and mitigation actions MH-11 and MH-14 have been revised to address the potential need for cooling centers.
The HMP should include a list of locations where members of the public can dispose of hazardous materials and information on oil tanks in older neighborhoods.	9/12/19	Comment considered but determined to be outside the scope of the HMP. The Washoe County Health Department partners with Keep Truckee Meadows Beautiful to maintain a recycling and disposal guide for residents, available on Keep Truckee Meadows Beautiful's website: https://ktmb.org/recycle/. Household hazardous wastes can be disposed of during two annual collection events with Waste Management and through H2O (now Clean Harbors) during collection hours. The Nevada Department of Environmental Protection maintains lists and resources related to home heating oil tanks.
Does the HMP address cyber crime as a hazard, or is this subject addressed in other plans?	11/8/19	The Nevada State Legislature mandated last session that Washoe County complete a Cyber Security Plan in 2020. Information from that planning process will be included in the next update of the regional HMP in 2025. Washoe County Technologies Services is aware of cyber security threats and has been addressing these threats through implementation of new software and firewalls in an attempt to prevent, protect, and mitigate against potential attacks.

2.5.2 Neighboring Jurisdiction and Partner Engagement Strategies

Washoe County represents a large geographic area, which requires the coordination of many external stakeholders to support the community's needs. These partners were invited to participate in the MPT meetings to ensure that the HMP properly identified risks that County, city, and tribal agencies may not be as familiar with. The following agencies and other entities were in attendance:

- National Weather Service-Reno
- Nevada Department of Transportation (NDOT)
- Nevada Division of Emergency Management
- Nevada Seismological Lab
- NV Energy
- Regional Emergency Medical Services Authority
- Regional Transportation Commission
- Reno-Tahoe Airport Authority
- Tahoe Pacific Hospital
- The American Red Cross
- University of Nevada-Reno
- Warm Springs Community Task Force

- Washoe County Amateur Radio Emergency Service
- Washoe County School District

2.6 Plan Development and Review

FEMA	**A6.** Does the plan include a description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

Development of the HMP was conducted according to the process outlined above and described in detail in FEMA's Local Mitigation Planning Handbook. The MPT reviewed the previous plan during the Project Kickoff Workshop and identified sections that required revision.

The updated HMP serves as the written record of the comprehensive hazard mitigation planning process. In addition, the HMP reflects the region's current needs and hazard concerns. Initial development of the HMP update occurred over a nine-month period from January 2019 through September 2019. The plan was developed through a series of seven steps, as detailed in Table 2-4, many of which occurred concurrently. Table 2-5 also illustrates the corresponding FEMA local mitigation planning task for each HMP development milestone. The requisite State Hazard Mitigation Officer and FEMA review periods occurred during the draft and final HMP steps.

Table 2-5 Washoe County HMP Update Milestones and Timeline

Washoe Regional HMP Update Development Milestone	Corresponding FEMA Recommended Mitigation Planning Task	Timeline	Updates Made? (Yes/No)
1. Data Collection and Document Review	Task 1 – Determine the Planning Area and Resources Task 5 – Conduct a Risk Assessment	January 2019–March 2019	Yes
2. Mitigation Planning Team Coordination	Task 2 – Build the Planning Team	January 2019–November 2019	Yes
3. Stakeholder Engagement and Outreach	Task 3 – Create an Outreach Strategy	January 2019–November 2019	Yes
4. Hazard Mitigation Strategy Update	Task 4 – Review Capabilities Task 6 – Develop a Mitigation Strategy	May 2019–September 2019	Yes
5. Draft Hazard Mitigation Plan	Written documentation of the planning process (all tasks)	March 2019–September 2019	Yes
6. Final Hazard Mitigation Plan	Written documentation of the planning process (all tasks)	September 2019–January 2020	Yes
7. Plan Adoption	Task 8 – Review and Adopt the Plan	February 2020	Yes

3 COMMUNITY PROFILE

Chapter 3 summarizes the County's key features. The County's mitigation strategy is designed to reflect the County's unique components. Full community profiles specific to the cities of Reno and Sparks, as well as the Reno-Sparks Indian Colony, Pyramid Lake Paiute Tribe, and Truckee River Flood Management Authority can be found in the jurisdiction-specific annexes.

3.1 Governance

Washoe County was created in 1861 as one of the original nine counties of the Nevada Territory. It is named after the Washoe people who originally inhabited the area. It was consolidated with Roop County in 1864. Washoe City was the first county seat in 1861 and was replaced by Reno in 1871.

Washoe County's key officials and departments are listed below.

Washoe County - Key Elected Officials

- County Commissioner Seats (five in total)
- Assessor
- Clerk
- Recorder
- Sheriff
- Treasurer
- District Attorney
- Incline Village Constable
- Public Administrator
- County Manager

Washoe County Departments

- 311 - One Washoe. Connected.
- Adult Services
- Alternative Sentencing – Crossroads, Sober 24
- Animal Services
- Assessor's Office
- Board of County Commissioners
- Budget Division
- Building
- Children's Services
- Clerk's Office
- Code Enforcement
- Communications and Media
- Community Services Department
- Comptroller's Office
- District Attorney's Office
- District Court
- Emergency Management
- Engineering and Capital Projects
- Geographic Information Systems (GIS)
- Health District
- Human Resources
- Human Services Agency
- Incline Village Justice Court
- Juvenile Services
- Law Library
- Library System
- Medical Examiner
- Office of the County Manager
- Parks and Open Space
- Planning
- Public Administrator's Office
- Public Defender's Office
- Alternate Public Defender's Office
- Public Guardian's Office
- Purchasing Division
- Recorder's Office
- Registrar of Voters
- Reno Justice Court
- Roads Operations
- Senior Services
- Sheriff's Office
- Sparks Justice Court
- Technology Services
- Treasurer's Office
- Truckee Meadows Fire Protection District
- Utility Services
- Wadsworth Justice Court

Washoe County Districts

In addition to the five County Commissioner districts, the County also encompasses the following:

- **General Improvement Districts (GIDs):** Gerlach, Grandview, Incline, Palomino, Sun Valley, and Verdi TV. GIDs are structured to provide the County with a tool to finance infrastructure and other projects.
- **Fire Protection Districts:** North Lake Tahoe and Truckee Meadows
- **Townships:** Gerlach-Wadsworth, Incline Village, Reno-Verdi, and Sparks
- **Wards:** Reno and Sparks
- **Washoe County Health District**

Incorporated Cities:

- **Reno:** Incorporated in 1903, the "Biggest Little City in the World" is the County seat. The growing city measures 103 square miles and is home to an estimated 250,998 individuals. The city is in southern Washoe County on the eastern slope of the Sierra Nevada range in the Truckee Meadows basin.
- **Sparks:** Incorporated in 1905, the city of Sparks covers approximately 36 square miles east of the city of Reno and is home to a growing population, currently estimated at 100,878.

The County's geographical area is illustrated in Figure 2-2.

Now referred to as "The Biggest Little City in the World, the City of Reno started as a crossing point of the Truckee River for travelers moving westward during the California Gold Rush. (Photo credit Darron Bergenheier)

3.2 Geography and Climate

Washoe County is located along the eastern slopes of the Carson Range of the Sierra Nevada mountains in western Nevada. The name "Washoe" originates from the name of the aboriginal tribe that inhabited the strip of land extending along the base of the Sierra Nevada from the head of Carson River to the Truckee. The land features a series of valleys—including Carson, Eagle, Pleasant, Steamboat, and Truckee—and includes the adjacent mountains, which remain home to the indigenous people.

According to the U.S. Census Bureau, the County has a total area of 6,542 square miles (16,302 square kilometers; km^2), of which 6,302 square miles (16,426 km^2) is land and 240 square miles (541 km^2) water—3.7% of the total area. The County is located in the northwest area of Nevada and borders both California and Oregon. Because of the generally arid climate, only a small percentage of land is under cultivation. Irrigation is maintained in the cultivated areas by impounding the water from melting snow. The Sierra Nevada snowpack provides water for the valleys of Walker, Carson, Truckee, and Fallon.

The mean annual temperatures are about 50 degrees Fahrenheit (°F). In Washoe County, the summers are short and hot and the winters only moderately cold. Long periods of extremely cold weather are rare, primarily because the mountains east and north of the County act as a barrier to the intensely cold continental arctic air masses. However, on occasion, a cold air mass spills over these barriers and produces prolonged cold waves.

There is strong surface heating during the day and rapid nighttime cooling because of the dry air, resulting in wide daily ranges in temperature. Even after the hottest days, the nights are usually cool. The average range between the highest and the lowest daily temperatures is about 30°F to 35°F. Daily ranges are larger in summer than the winter. Extreme temperatures have ranged from 120°F to -50°F.

Washoe County lies on the eastern, lee side of the Sierra Nevada range, a massive mountain barrier that markedly influences the climate of the County. *(Photo credit Ken Lund)*

One of the greatest contrasts in precipitation found within a short distance in the United States occurs between the western slopes of the Sierras in California and the valleys just to the east of this range. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascends the western slopes of the Sierra range, the air cools, condensation takes place, and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the County but throughout the State, with the result that the lowlands of Nevada are largely desert or steppes.

3.3 Population and Demographics

According to the 2017 American Community Survey (ACS), the population of Washoe County was 445,551 (ACS 2017). The percentage of population growth from the 2010 Census to 2017 was approximately 5.7%, resulting in an estimated population growth of 24,144 residents.

Most of the population growth occurred in the Reno-Sparks area and in the southern most region of the county, northwest of Carson City. Table 3-1 breaks out population by a variety of characteristics and provides comparison between the County and Nevada as a whole.

Table 3-1 Population Data

	Washoe County	State of Nevada
Population by age, 2018		
Under 5 years old	5.9%	6.1%
Under 18 years old	21.6%	22.7%
65 years and older	16.4%	15.7%
Female, 2018	49.6%	49.9%
Race/Ethnicity, 2018		
White	84.8%	74.3%
Black	2.7%	10.1%
American Indian, Alaskan Native	2.2%	1.7%
Asian, Native Hawaiian, other Pacific Islander	6.5%	9.5%
Hispanic or Latino, any race	**24.8%**	**29.0%**

Source: U.S. Census Bureau n.d.(a), n.d.(b)

Table 3-2 shows a breakdown of the population growth in Washoe County as forecast in the County Consensus Forecast for 2018-2038 (Truckee Meadows Regional Planning 2018). As shown in the table, growth in the cities of Reno and Sparks is outpacing that in the unincorporated portions of the County.

Table 3-2 Washoe County Population Growth

Jurisdiction	2017 Certified Estimates*	2038 Jurisdiction Forecast	% Increase
Reno	244,612	307,425	26%
Sparks	96,928	120,108	24%
Unincorporated County	110,383	131,213	18.9%
County Total	**451,923**	**558,746**	**23.6%**

Source: Truckee Meadows Regional Planning 2018

* Cooperatively, Washoe County and the Nevada State Demographer prepare annual population estimates for Washoe County for July 1 of each year.

An estimated 8.7% of Washoe's County population under the age of 65 years is disabled, and 12.4% of the County population under age 65 do not have health insurance. In the time range between 2013 and 2017, approximately 23.5% of persons age five years or greater spoke a language other than English at home (U.S. Census Bureau n.d.[b]).

Washoe County has 201,081 housing units. Of these, 57.7% are owner-occupied. The median value of owner-occupied homes is $268,100. The median rental cost is $947. Almost 90% of households own a computer, and 80.8% have a broadband internet subscription (U.S. Census 2017).

3.4 Economy

Economic characteristics of Washoe County are provided in Table 3-3.

Table 3-3 Washoe County – Economic Characteristics

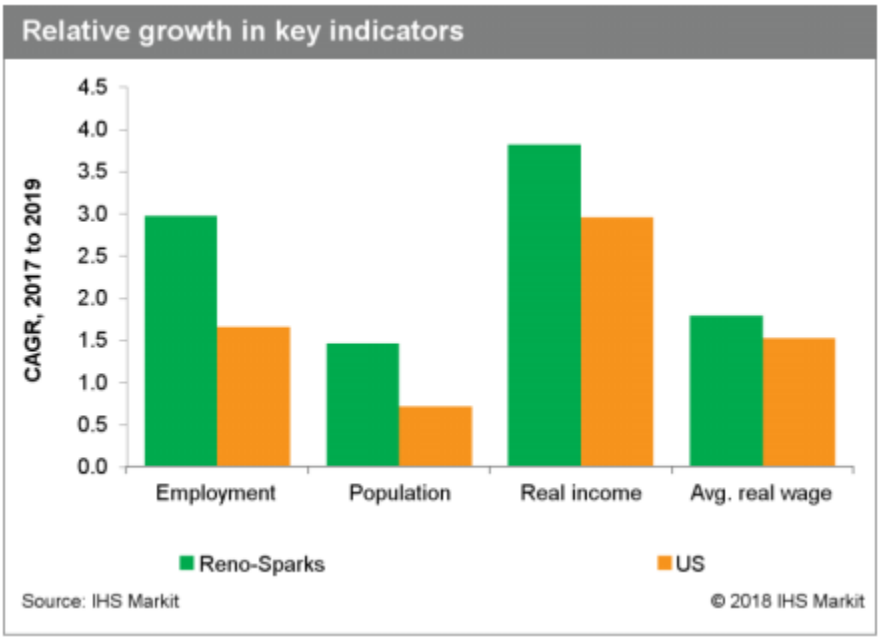
Characteristic	2009-2013 ACS	2013-2017 ACS
Individuals below Poverty Level	15.1%	13.3%
Median Home Value	$203,300	$268,100
Median Household Income	$53,040	$58,595
Per Capita Income	$28,670	$31,879

Source: U.S. Census Bureau n.d.(c), n.d.(d), n.d.(e)

Per the ACS 2013-2017, 65.9% of the population aged 16 years and older is in the labor force, with a reported 4.5% unemployed (U.S. Census Bureau n.d.[e]). This rate has been on decline since reaching 7.5% in 2013 (U.S. Census Bureau n.d.[d]).

According to data gathered through the Washoe County Consensus Forecast 2018–2038, total employment for all of Washoe County is projected to grow from 304,135 in 2018 to 384,713 in 2038 (Truckee Meadows Regional Planning 2018). This represents an average annual growth rate of approximately 1.18% and overall addition of approximately 80,578 jobs.

Relative growth across several key indicators suggests economic strength.



Source: Truckee Meadows Regional Planning 2018

Washoe County's 20 largest employers are listed below (as included in the Washoe County Consensus Forecast 2018–2038).

- Washoe County School District, elementary, and secondary schools: 9,000 to 9,499 employees
- University of Nevada-Reno, colleges, and universities: 4,500 to 4,999 employees
- Renown Regional Medical Center, general medical and surgical hospitals: 3,000 to 3,499 employees
- Washoe County Comptroller, executive and legislative combined: 2,500 to 2,999 employees
- Peppermill Hotel and Casino, casino hotels: 2,000 to 2,499 employees
- Grand Sierra Resort and Casino, casino hotels: 2,000 to 2,499 employees
- Silver Legacy Resort, casino hotels: 2,000 to 2,499 employees
- International Game and Technology, misc. manufacturing: 1,500 to 1,999 employees
- Atlantis Casino Resort, casino hotels: 1,500 to 1,999 employees
- St. Mary's Hospital, general medical and surgical hospitals: 1,500 to 1,999 employees
- Eldorado Hotel and Casino, casino hotels: 1,000 to 1,499 employees
- City of Reno, executive and legislative combined: 1,000 to 1,499 employees
- Sierra Nevada Healthcare Systems, general medical and surgical hospitals: 1,000 to 1,499 employees
- Nugget Casino Resort, casino hotels: 1,000 to 1,499 employees

- United Parcel Service, couriers: 1,000 to 1,499 employees
- Truckee Meadows Community College, Junior Colleges: 1000 to 1499 employees
- Circus Circus Casinos - Reno, casino hotels: 800 to 899 employees
- Arrow Electronics Inc., electronic parts and equipment wholesaler: 600 to 699 employees
- Amazon.com, general warehousing and storage: 600 to 699
- City of Sparks, executive and legislative offices: 600 to 699 employees

Washoe County School District is the County's largest employer, with over 9,000 employees and over 64,000 students enrolled. Pictured is drone imagery from Desert Skies Middle School in Sun Valley.
Photo Credit Washoe County School District.

Industry Outlook

Industries that employed the highest percentages of Washoe County's labor force in 2018 were Services (44.61%), Finance, Insurance, and Real Estate (12.46%), Government (10.90%), and Retail Trade (10.45%). Natural Resources, Manufacturing, and Wholesale Trade industries were all under 5% (Washoe County Consensus Forecast 2018–2038). These trends remain largely stable in projections through 2038. The Services sector will see the largest number of jobs added.

Many industries have recovered following the first recession of the decade, including the leisure and hospitality sectors. The education and health services sector is a consistent provider of jobs. Construction employment is up 70% from 2011 to 217 after a significant decline during the recession.

According to the 2012 USDA census, Washoe County had 479 farms covering 11% of land, with 69% of farms in the small range, between 1 to 49 acres (USDA 2012). The 2012 agricultural output value was

$802.8 million, accounting for 2.5% of total County production output. The highest grossing agricultural industries were cattle ranching and vegetable/melon farming. The largest food manufacturing industries were fluid milk and butter manufacturing, seasoning and dressing manufacturing, and breakfast cereal manufacturing.

Development Trends

Washoe County is becoming a hub for logistics, technology, and warehousing thanks to its strategic location and low cost of doing business. The manufacturing sector saw robust gains from 2012 to 2017. Notable examples of recent developments include the following:

- In 2016, Tesla opened the massive Gigafactory 1 east of Sparks in nearby Storey County to manufacture battery packs for its vehicles and in 2019 opened a new service location along Interstate 580 (I-580) near South Meadows Parkway in Reno.
- The Economic Development Authority of Western Nevada announced in April 2019 that health solutions company MOBE is opening a Reno office.
- Switch opened near the Tesla Gigafactory in 2017 and is building data centers that create greater data connectivity in Nevada.

Photo: A $40M New Deantronics medical device research, development, and manufacturing facility is slated to open in Spanish Springs Business Center in 2020. *Photo credit Kayla Anderson, Sparks Tribune.*

3.5 Land Use and Ownership Trends

According to Washoe County's Land Use and Transportation Plan—one component of the Master Plan—more than 78% of the County is made up of publicly owned lands under jurisdiction of several state land agencies, including the Division of State Parks, Division of Wildlife, and Division of Buildings and Grounds. There are nearly 35,681 acres of state-controlled lands in Washoe County (Washoe County 2010).

State Parks in the County include Lake Tahoe – Nevada State Park and Washoe Lake State Park.

Tribal lands in the County include the Pyramid Lake Indian Reservation (covering approximately 306,273 acres in eastern Washoe County) and the RSIC, which consists of a 28-acre urban campus in Reno and an additional 15,426 acres in Hungry Valley, in addition to various commercial locations in the region. In total, land administered by the Bureau of Indian affairs reaches approximately 356,113 acres.

The following table—provided in the Washoe County Master Plan—illustrates the approximate number of acres in Washoe County managed by a federal agency and identifies which agency has responsibility.

Table 3-4 Acres Managed by Federal Agencies

Federal Agency	Acres
Bureau of Land Management	2,682,204
Bureau of Reclamation	283
Department of Defense	1,732
Fish and Wildlife Service	185,756
Forest Service	94,395

Source: Department of Community Development 2011

Population growth will continue to play into land use. According to a report prepared by IHS Economics, employment growth surged to 4.5% year-over-year in 2016. It slowed to 1.3% in 2017 but is expected to remain above average annually Truckee Meadows Regional Planning 2018). Unemployment is near the national average. Reno and Sparks, in particular, will continue to experience significant growth.

Nevada and Washoe County offer numerous incentives to businesses and developers that have encouraged economic investment and growth over the past few years. Incentives include data center tax abatement, property tax abatement, sales and use tax abatement, and more, based on various required capital investments, minimum wage requirements, and number of jobs created. This is in addition to a tax climate that includes no personal or corporate income tax.

Population growth coupled with economic development has led to some tension between federal ownership of lands, sustainable growth, and conservation. This tension is increasingly felt as the growth within the outskirts of Reno and Sparks—where most of the County's population resides—tends toward the foothills of the mountains and other areas of higher wildland fire vulnerability.

This has in part led to development of a new proposal—the Washoe County Economic Development and Conservation Act (also known as the Washoe County Lands Bill)—designed to open up potential development on federal lands. The proposal calls for authorization of:

- "land conveyances for public purposes;
- land sales and land exchanges within the disposal boundary for potential development
- the designation of areas as Wilderness Areas
- the designation of areas as National Conservation Areas
- the designation release of Wilderness Study Areas" (Washoe County n.d.).

The 2040 Regional Transportation Plan, adopted in May 2017, outlines plans for the Washoe County metropolitan area for long-term transportation. It aims to be a catalyst for developing economic opportunities. It includes major investments in public transit, including multiple extensions of the Regional Transportation Commission (RTC) RAPID system. Other investments include pedestrian and bicycle facility improvements and maintenance of existing regional roads and bridges. The Regional Transportation Plan also invests in "complete streets," focusing investment on projects that promote livability and regional connectivity to provide safe access and travel for pedestrians, bicyclist, motorists, and transit users.

Recent funding supports the Virginia Street Bus RAPID Transit Extension Project in midtown Reno. *Photo Credit RTC.*

3.6 Transportation and Commuting Patterns

Washoe County is dissected by two main transportation corridors: Interstate 80 (I-80) (east-west route) and US Highway 395 (north-south route). State routes (SRs) in the County include SR 28 at Lake Tahoe, SR 431 at Mount Rose Highway, SR 341 Geiger Grade, and SR 445, 446, and 445, which lead north out of the Truckee Meadows. NDOT provides a Roadway Functional Classification Map that highlights interstates, expressways, and major and minor arterials for Washoe County.

The vast majority of Washoe County's approximately 445,551 residents live and work in the southern half of the County. An estimated 215,877 individuals commute to work, 77.8% of whom commute alone in a private vehicle. Just 1.9% utilize public transportation. The mean travel time to work is 21.4 minutes (U.S. Census Bureau n.d.e).

The RTC offers bus service through RTC RIDE in the greater Reno/Sparks area. Lines extend as far north as Lemon Valley and Sun Valley and as far south as South Meadows. Washoe Senior Ride is a subsidized taxi program of the RTC funded by 0.25% of the Washoe County sales tax allocated for public transportation. County residents 60 years and older and veterans of any age can purchase up to $60 worth of taxi fares for $15 (RTC 2019). There are also various carpool and vanpool lease incentives available through the RTC website (RTC 2019).

NDOT Average Annual Daily Traffic (AADT) data for Washoe County from 2011 is provided in Table 3-5, which accounts for every type of vehicle.

Table 3-5 Average Annual Daily Traffic Summary

Station	Route	Location	Functional Class	AADT
0311210	IR 80E	0.1 mile west of US-395 Interchange	1 - Interstate	113,000
0311220	IR 80E	0.5 mile east of State Route 445 Inter-change (Pyramid Highway)	1 - Interstate	78,000
0311110	IR 80E	0.9 mile east of Vista Boulevard Interchange	1 - Interstate	30,000
0311230	IR 580N	0.6 mile south of the Neil Road Interchange	2 - Principal Arterial - Other Freeways and Expressways	93,000

Infrastructure projects are underway to improve public transit. In 2019 the RTC received $40.4 million from the Federal Transit Administration to advance the Virginia Street Bus RAPID Transit Extension Project in Reno, which includes elements for new sidewalks, lighting, landscaping, improving safety, and the addition of five bus stations and two electric buses to operate on the RAPID Virginia Line to create connectivity from Meadowood Mall to Midtown Reno and the University of Nevada, Reno.

3.7 Previous Major Disaster Declarations

The County has received 20 major disaster declarations, including four since the previous HMP update. Table 4-1 identifies these declarations.

Table 4-1 Major Disaster Declarations in Washoe County

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
4307	No	Yes	Yes	3/27/2017	Severe Winter Storms, Flooding, and Mud-slides
4303	No	Yes	Yes	2/17/2017	Severe Winter Storms, Flooding, and Mud-slides
4303	No	Yes	Yes	2/17/2017	Severe Winter Storms, Flooding, and Mud-slides

Disaster Number	Individual Assistance Program Declared	Public Assistance Program Declared	Hazard Mitigation Program Declared	Declaration Date	Title
4303	No	Yes	Yes	2/17/2017	Severe Winter Storms, Flooding, and Mud-slides
2974	No	Yes	No	1/19/2012	Washoe Fire
2973	No	Yes	No	11/18/2011	Caughlin Fire
2822	No	Yes	No	7/17/2009	Red Rock Fire
2713	No	Yes	No	7/16/2007	Hawken Fire
2709	No	Yes	No	7/8/2007	Hungry Valley Fire
2704	No	Yes	No	7/6/2007	Red Rock Fire
2679	No	Yes	No	11/11/2006	Pinehaven Fire
2664	No	Yes	No	8/12/2006	Verdi Fire
2649	No	Yes	No	6/27/2006	Oregon Fire
1629	No	Yes	Yes	2/3/2006	Severe Storms and Flooding
1629	No	Yes	Yes	2/3/2006	Severe Storms and Flooding
3243	No	Yes	No	9/13/2005	Hurricane Katrina Evacuation
3204	No	Yes	No	2/23/2005	Snow
3202	No	Yes	No	2/17/2005	Record and/or Near Record Snow
2550	No	Yes	No	8/25/2004	Andrew Wildfire
2531	No	Yes	No	7/14/2004	Waterfall Fire
2524	No	Yes	No	6/30/2004	Verdi Fire Complex
2479	No	Yes	No	7/15/2003	NV-Robb Wildfire-7-14-2003
2476	No	Yes	No	7/11/2003	NV-Red Rock Fire 7-11-03
2371	No	Yes	No	8/9/2001	NV - Antelope Fire - 08/09/2001
2316	No	Yes	No	8/1/2000	NV - Arrowcreek Fire
2312	No	Yes	No	6/30/2000	Reno Fire Complex
2265	No	Yes	No	7/3/1999	Mira Loma Fire
1153	Yes	Yes	Yes	1/3/1997	Severe Storms, Flooding, Mud and Land-slides
759	No	Yes	Yes	2/28/1986	Severe Storms and Flooding
187	Yes	Yes	Yes	1/18/1965	Severe Storms, Heavy Rains and Flooding

Source: FEMA 2019

4 HAZARD PROFILES AND VULNERABILITY ASESSMENTS

Chapter 4 contains hazard profiles and vulnerability assessments to determine the potential impact of hazard to the people, economy, and built and natural environments of Washoe County. They have been streamlined to increase the effectiveness and usability of the HMP. Additional detail is contained in Appendix F.

FEMA	**B1.** Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [Washoe County]? (Requirement §201.6(c)(2)(i)) **B2.** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [Washoe County]? (Requirement §201.6(c)(2)(i)) **B3.** Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the planning area? [44 CFR § 201.6(c)(2)(ii)]

4.1 Introduction

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using a number of key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 4-2 displays the hazards that the MPT selected for further assessment.

Table 4-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Wildland Fire Flooding (including Closed-Basin Flooding) Earthquake Severe Storms (including Winter Storm and Windstorm) Drought Infectious Disease Avalanche and Landslide Volcano
Human-Caused Hazards	Criminal Acts and Terrorism
Technological Hazards	Energy Emergency Hazardous Materials Incident Transportation Incident (including Aircraft Crash) Radiological Waste Transport

The 2020 update of the vulnerability assessment replaces the version published in 2015. It meets the requirements of FEMA and EMAP, which publish standards to guide this work and ensure quality and consistency across jurisdictions.

4.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1. Participants were asked to rank hazards on a scale of 1 (lowest concern) to 5 (highest concern) based on five key attributes:

- **Probability:** Likelihood of the hazard occurring.
- **Magnitude:** Areas potentially impacted, the overall impacts, and the chance of one hazard triggering another hazard, thus causing a cascading effect.
- **Onset:** The time between recognition of an approaching hazard and when the hazard begins to affect the community.
- **Duration:** The length of time the hazard remains active, the length of time emergency operations continue after the hazard event, and the length of time that recovery will take.
- **Frequency:** How often a hazard has resulted in an emergency or disaster.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for the all MPT members. The aggregate results were shared with the MPT, and the final rankings were adopted as the official rankings for the HMP and are available in Table 4-3. No natural hazards that have the potential to affect jurisdictions within the planning area were omitted. The hazard profiles and risk assessments align with EMAP standards by focusing on hazards with a high magnitude or high probability. (Note: radiological waste transport and volcano hazards were not initially ranked by the MPT. In subsequent meetings, these hazards were identified as low probability but potentially high magnitude hazards. Risk assessments for both hazards are included in Section 4.5.)

The hazard ranking findings for each participating community are available within the Jurisdictional Annexes.

Table 4-3 Hazard Ranking Table

Washoe County - Local Hazards									
	Probability (1=lowest, 5=highest)	*Magnitude (1=lowest, 5=highest)*	*Frequency (1=lowest, 5=highest)*	*Onset (1=slowest, 5=fastest)*	*Duration (1=shortest, 5=longest)*	*Change in Risk (↑, ↓, ↔ since 2015)*		*Average*	*Rank*
Wildland Fire	4.48	3.52	4.00	4.13	2.91	0.87		4.03	1
Flooding	4.22	3.35	3.39	3.04	3.39	0.47		3.50	2
Earthquake	3.43	3.65	2.17	4.52	2.17	0.20		3.45	3
Energy Emergency	3.30	2.22	3.65	4.57	2.39	0.20		3.43	4
Criminal Acts and Terrorism	3.13	2.87	2.65	4.65	1.70	0.73		3.33	5
Severe Storms (Winter Storm)	3.74	2.43	3.87	3.04	2.65	-0.13		3.27	6
Severe Storms (Windstorm)	3.70	2.17	3.61	3.17	2.09	0.13		3.16	7
Hazardous Materials Incident	2.78	2.35	2.52	4.39	2.48	0.13		3.01	8
Drought	3.57	2.17	3.26	1.74	4.57	0.27		2.68	9
Infectious Disease	2.50	2.98	2.41	2.83	3.74	0.07		2.68	10
Avalanche and Landslide (Landslide)	2.00	2.57	1.87	3.91	2.17	0.07		2.59	11
Avalanche and Landslide (Avalanche)	2.50	3.00	3.00	3.50	1.50	0.00		3.00	
Transportation Incident (Aircraft Crash)	3.00	5.00	2.00	5.00	2.00	1.00		3.75	

Note: Radiological waste transport and volcano hazards were not initially ranked by the MPT. In subsequent meetings, these hazards were identified as low probability but potentially high magnitude hazards. Risk assessments for both hazards are included in Section 4.5.

Refer to Appendix D for hazard ranking results for each jurisdiction.

4.3 Hazard Considerations

While this risk assessment profiles individual hazards, it is important to understand that the region's exposure to hazards and how the County and its partners reduce their vulnerability to hazards requires a system thinking approach. Factors that may influence the region's approach to reducing risks and vulnerabilities include the feasibility of mitigation, project changes in future conditions, and the potential for hazards to cause cascading impacts.

4.3.1 Mitigation vs. Adaptation vs. Preparedness

Mitigation plans address the need to reduce the risks associated with hazards. However, not all risks can always be reduced. In instances when mitigation actions are too expensive or otherwise unfeasible, other approaches, such as adaptation or preparedness actions, may need to be taken. The terms mitigation, adaptation, and preparedness often are confused, but each term refers to a different method that communities can use to address risks associated with hazards, as defined below.

- **Mitigation** – FEMA defines mitigation as the effort to reduce loss of life and property by lessening the impact of disasters (FEMA 2018). The process of hazard mitigation planning involves community efforts to identify risks and vulnerabilities associated with natural, technological, and human-caused disasters and develop long-term strategies for risk reduction. The goal of a mitigation program is to reduce or avoid costs associated with disaster response and recovery.
- **Adaptation** – Changing climate conditions will affect the frequency and magnitude of natural hazards, such as flooding and wildland fires. The concept of climate adaptation encompasses the responses of communities to a changing climate. The Intergovernmental Panel on Climate Change defines climate adaptation as adjustments in human and natural systems, in response to actual or expected changes in climate, that moderate harm or take advantage of beneficial opportunities (IPCC 2001). Climate adaptation in many cases includes broader strategies such as studies and policy changes aimed at altering how a community develops in the future to take into consideration expected climate conditions.
- **Preparedness** – The Department of Homeland Security and FEMA define preparedness as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during response to a disaster or other incident (Department of Homeland Security 2012). Preparedness strategies are actions that increase the capacity of an agency, community, or individual to respond after a disaster occurs to protect lives and property. In instances where the risks of a hazard cannot be mitigated or adapted to, preparedness activities enable communities to respond to disaster.

4.3.2 Future Conditions

Climate change is changing the frequency and severity of hazard events. For example, with projected changes in extreme precipitation in Washoe County, what is currently viewed as a 100-year flood event, may soon be considered a 50-year event or even a 10-year event.

Potential impacts of future climate conditions include increased average temperatures, decreased snow accumulation, and increased peak stream flow. The increasing average temperature is expected to be more pronounced during summer months, and decreased summer precipitation is expected to accompany this shift. The frequency and magnitude of extreme precipitation events is also expected to increase, particularly in the winter. In short, what is currently viewed as a 100-year event, may soon be reconsidered as a 50-year event or even a 10-year event. This would place further stress on storm drainage systems and natural stream systems, placing Washoe County communities at an increased risk for flooding.

Changing precipitation and average temperatures may impact potable water availability. If snowmelt shifts to earlier in the spring and summers become longer, hotter, and drier, regional needs for water storage may grow. Decreased water availability combined with increased demand may exacerbate water rights conflicts.

Finally, changing climate conditions can impact ecosystems, with complicated feedbacks that may affect ecosystem services that local communities and tribes rely on for recreation, water quality, and overall well-being.

Changes in development patterns also affect the vulnerability of communities to hazards. As the cities of Reno and Sparks expand, future development is more likely to occur in areas prone to wildland fires, and local governments and developers will need to take fire risk into consideration when planning and constructing new homes, businesses, and infrastructure. Development also increases stormwater runoff and alters drainage patterns. In the North Valleys, recent and future development has the potential to increase the magnitude of closed-basin flooding.

CASCADING IMPACT EXAMPLE

An earthquake is a singular hazard presenting specific risks, but an earthquake is also likely to cause secondary hazards for the community such as:

- Landslides
- Utility Failures
- Urban Fires
- Transportation Accidents

4.3.3 Cascading Impacts

Hazards do not occur in a vacuum, and the occurrence of one hazard has the potential to cause multiple other hazards and adverse effects. Accordingly, the County and its partners have attempted to take the risk assessment one step further by identifying the potential cascading, or secondary, impacts that may be generated by a hazard. In better understanding these cascading impacts, the region will be better prepared to holistically address risks and vulnerabilities.

4.4 Risk-Driven Planning

The risk assessments discussed in this section were developed through a combination of stakeholder feedback and comprehensive geospatial analyses. The combined findings shaped a risk-driven planning process that resulted in mitigation strategies focused on the real risks and vulnerabilities faced by Washoe County and its partners.

4.4.1 Stakeholder Feedback

In addition to the hazard ranking activity identified in Section 4.2, MPT participants were also engaged during MPT Meeting #2 to provide insights regarding the risk assessment portion of the HMP. As part of the workshop, participants were asked to review each hazard based on the following attributes (which are very closely aligned with the attributes identified in Section 4.5):

- **Geographic Scope:** A description of the locations most likely to be impacted by the hazard.
- **Health Impacts:** A description of the potential short- and long-term human health complications related to the hazard.
- **Displacement:** A description of the hazard's likelihood to cause the displacement of tribal members or visitors accompanied by an estimate of the anticipated displacement duration.
- **Economic Impacts:** A description of the potential economic and financial losses related to the hazard.
- **Environmental Impacts:** A description of the potential impacts that may adversely affect natural systems.
- **Structural Impacts:** A description of the scale and scope of potential building and infrastructure damages related to the hazard.
- **Critical Services:** A summary of the agencies and functions most likely to be taxed following the hazard.
- **Cascading Effects:** A brief overview of potential secondary hazards caused by the onset of the initial hazard in question.

See Appendix D for the results of the MPT Risk Assessment Activity.

4.4.2 Geospatial Analyses

Numerous risk assessments are supported by maps and tables generated through comprehensive geospatial analyses. A series of processes were performed to identify areas in which local critical facilities intersect with mapped hazards and estimate the potential economic losses associated with such losses. This project relied heavily upon publicly available data developed by FEMA, the U.S. Geological Survey (USGS), and other federal and state agencies. The data represents some of the best data available in the United States for hazard information. Table 4-4 indicates the data sources used to estimate hazard risks.

Table 4-4 GIS Data Sources

Data Grouping	Specific Data Files
Hazard Data	Seismic Ground Motion Hazards with 2 Percent Probability
	Seismic Ground Motion Hazards with 10 Percent Probability
	Flooding Hazard
	Landslide Susceptibility
	Wildfire Hazard Potential
	HazMat
Critical Facilities Data	Police Station
	Fire Station
	Dam
	Airport
	Transfer Station
	School
	Hospital
	Power Plant
	Wastewater Treatment Plant
Base Map Data	Arterials and Highways
	Waterways and Streams
	County Administrative Lines
	Railways
	City Boundaries

Source: See Appendix F1 for GIS data sources

4.5 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 4.3 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Hazard Description:** A brief introduction to the mechanisms behind the hazard.
- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to Location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Potential Impacts from Future Climate Conditions:** A brief overview indicating ways in which the hazard profile may change over time due to a changing climate, if applicable.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Cascading Impacts:** A brief overview of secondary hazards often associated with the hazards.
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values, depending upon available data. Identifies development trends' impact on the County's vulnerability to each hazard since

the 2012 plan development (Increased, decreased, unchanged). Hazards with low planning significance are not included in the vulnerability assessment. These include radiological waste transport and volcano.

To enhance the usability of the HMP, risk assessments have been streamlined to provide only critical information within the body of this section. Additional information, including detailed, close-up maps, can be found in Appendix F.

In addition, the hazards have been organized according to planning priority (high, medium, and low) to illustrate the risk-driven nature of the HMP. The attributes of each hazard have been given serious consideration. However, profiles for low-priority hazards may be shorter in length and undergo less quantitative analyses, as there is often a lack of usable data for low-probability or low-magnitude events. The three levels of planning priority are as follows:

- **High-Priority:** Wildland Fire, Flooding (including Closed-Basin Flooding), Earthquake, Energy Emergency, and Criminal Acts and Terrorism
- **Medium-Priority:** Severe Storms (including Winter Storm and Windstorm), and Hazardous Materials Incident
- **Low-Priority:** Drought, Infectious Disease, Avalanche and Landslide, Transportation Incident (Aircraft Crash), Radiological Waste Transport, and Volcano

4.5.1 Wildland Fire

Wildland Fire

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
4.48	3.52	4.00	4.13	2.91		4.03	1

Hazard Description

A wildland fire is a fire that starts in, or moves into, areas where there is primarily vegetation and brush and limited structures. Wildland fires can result from natural causes or human activities. The main natural cause of wildland fires is lightning. Human activities that may cause fires include campfires, use of machinery near dry vegetation, improper disposal of ashes, and arson.

Wildland fires are not confined to forested areas; they can burn wherever vegetation is prevalent, including park areas. The term Wildland Urban Interface (WUI) is used to describe areas where human development meets or intermixes with vegetation that can fuel fires. Fires within the WUI can result in major losses of property and structures and human casualties.

A wildland fire spreads primarily by the consumption of vegetation, and the rate, area, and extent of consumption is dependent on three main factors: fuel, topography, and weather. These factors can sustain a wildland fire and predict a given area's fire potential and the associated damage that can occur and affect land, infrastructure, and people.

- **Fuel** – Fuel is any material that can burn. Fuels are the source of energy that drives a fire and are a significant factor in wildland fire behavior. Fire behavior is dependent on fuel type, loading, availability, and arrangement. The amount of fuel in an area is dependent on the availability of water and elevation. The six major fuel types are grass, grass-shrub, shrub, timber-understory, timber litter, and slash-blowdown. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses.

  Fuel types within the Washoe County planning area include: (1) high desert savannah, characteristic of seasonal forbs and grasses; (2) various species of sage brush, dominated by mountain blue sage; (3) bitter brush transitioning to mountain mahogany; and (4) pine-dominated forests on the eastern aspects of the Carson Mountain Range.

  Located in the western portion of the Washoe County planning area, the upper elevations of the Carson Mountain Range are an alpine ecosystem dominated by ponderosa pines, various fir species, and brush understory. The northern and eastern parts of the Washoe County planning area are characterized by the transition from savannah grass to sage brush to pinyon and juniper forests with decadent brush understory.

  Additionally, extensive invasive plant species exist within the planning area, such as cheat grass, Russian thistle, Russian knapweed, and common white top. These species threaten to overtake the native vegetation, smothering riparian areas and intensifying the wildland threat.

Fuel characteristics influence wildland fire spread and intensity. Fuel characteristics include:

- **Loading**: the amount of fuel that is present, expressed in tons per acre.
- **Availability**: the total mass of fuel that may be consumed by a fire. Fuel moisture affects the rate of spread of a fire. The drier the fuels, the faster the fire will spread because the fuels are pre-heated and devoid of moisture so the fire can move quicker, versus fuels that have more moisture, which will impede the progress of a wildland fire because it takes longer for the fuel to dry out and reach its ignition temperature.
- **Arrangement**: the manner in which fuels are spread over an identified area. Horizontal arrangement affects fire spread, patchy fuels could limit fire spread, and vertical arrangement allows a fire to move from a ground fire to a fire in the canopy of trees in a forested area.

- **Topography –** The slope and aspect of an area affect its susceptibility to wildland fire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. A fire will burn faster uphill than downhill. A fire will typically burn uphill in the daytime, influenced by upslope winds, and downhill at night, influenced by the shift in the temperature and winds that will blow downhill.

  The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. The aspect of an area can affect the fire spread and vegetation growth. South and southwest slopes are generally exposed to the sun for longer periods of time and have lighter, sparser vegetation with lower fuel moistures and higher temperatures due to exposure. North- and northwest-facing slopes tend to have heavier fuels with higher fuel moistures and lower temperatures due to less sun exposure. A north or northwest aspect will experience less fire activity than a south-facing slope.

  The Washoe County planning area is located on the lee side of the Carson Range of the Sierra at elevations that range from 4,600 feet at the Valley Floor to over 10,000 feet above sea level at the Mount Rose Summit. The higher elevations are characterized by deep topographical drainages that are oriented west to east, descending from subalpine timber-covered slopes.

- **Weather** – Weather is the most variable and unpredictable element of the fire environment. Weather conditions impact fire behavior and must be constantly monitored by fire suppression crews to ensure safety and make effective firefighting decisions. Weather components such as temperature, relative humidity, wind, and lightning affect the potential for wildland fire. High temperatures and low relative humidity dry out the fuels that feed the wildland fire, creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most hazardous weather factor affecting fires. The greater the wind, the faster a fire may spread and the more intense it may be. Lightning may ignite wildland fires, which are often in terrain that is difficult for firefighters to reach. Drought conditions contribute to concerns about wildland fire vulnerability. During periods of drought, the threat of wildland fire increases.

  Intense wildland fires can create their own weather systems, which in turn can help fires to spread “by lofting embers and causing spot fires” (Dybas and McElhatton 2017). Wildland fires modify winds in their vicinity, causing updrafts that influence how high smoke plumes

Wildland Fire

and embers will rise. Intense fires can cause turbulent winds and pyrocumulus clouds that can sometimes produce lightning (Lam 2017).

Winds can be significant at times in the Washoe County planning area during both the summer and winter fire season. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. The influence of the Carson Range of the Sierra Nevada mountains and its steepness on the eastern side of Washoe County creates three particularly dangerous situations. The Sierra Nevada mountain wave is a disrupted linear flow of fast-moving air perpendicular to the range from the west or southwest that creates rapid down slope winds that intensify in the afternoon and evenings. The Washoe zephyrs are afternoon and evening breezes that flow downhill on the east-facing slopes after the sun passes and the cool air starts sinking and flowing down slope. This creates down-slope winds that can be contrary to the normal diurnal winds and can combine with the Sierra Nevada mountain wave to scour drainages and canyons that are lined with residences in the County and its cities. The third influence is the orographic lifting that facilitates the formation of thunderstorms. These thunderstorms can create winds in excess of 50–60 miles per hour, as well as tremendous short-term downpours or dry lightning with very little or no precipitation.

Previous Occurrence/History

Data on wildland fires occurring in Washoe County between 2015 and 2019 was obtained from Washoe County GIS. Table 4-5 presents information on wildland fires occurring during these years, including acreage burned. Information on historical wildland fires between 2000 and 2014 is included in Appendix F.

Table 4-5 Wildland Fires in Washoe County between 2015 and 2019

Year	Fire Name	Total Acres Burned	Cause
2019	Cottonwood Creek	38	Natural
2019	Cottonwood	333	Natural
2019	Black Mountain 2	730	Natural
2019	Hungry	305	Unknown
2019	Jasper	1,165	Human
2018	Perry	51,386	Human
2018	Pioche	81	Human
2018	Apple	342	Human
2018	Slide	64	Human
2017	Jones	70	Natural
2017	R-4	18,618	Undetermined
2017	R-21	589	Undetermined
2017	Limbo	1,991	Natural
2017	Tohakum 2	94,221	Natural
2017	Warm Springs	921	Undetermined
2017	Hollywood	5,298	Undetermined
2017	Needle 2	970	Natural
2017	Winnemucca Ranch	4,800	Natural
2017	Truckee	98,960	Human
2017	Black Mountain	961	Natural

Wildland Fire

Table 4-5 Wildland Fires in Washoe County between 2015 and 2019

Year	Fire Name	Total Acres Burned	Cause
2017	Aspen	315	Natural
2017	Cold Springs	1,523	Undetermined
2017	Earthstone	41,545	Human
2017	Prater	2,816	Undetermined
2017	I-80	514	Undetermined
2017	Brenda	632	Human
2016	Poodle	6,557	Natural
2016	Anderson	16,284	Natural
2016	Sage	4,238	Natural
2016	Tule	36,142	Natural
2016	Seven Lakes	3,063	Natural
2016	Rock	2,293	Natural
2016	Jackpot	1,700	Human
2016	S Fire	2,554	Undetermined
2016	Hawken	278	Human
2016	Little Valley	2,291	Human
2015	Ft. Sage	146	Natural

Washoe Regional Mapping System: https://gis.washoecounty.us/wrms?qmid=quickmap

Several of the major fires that occurred in the County between 2015 and 2018 are described below:

Perry Fire – The Perry Fire burned 51,386 acres in the Grass Valley Road area. Residents in the area were ordered to evacuate, and the fire threatened cultural sites in the Pyramid Lake area. Highway 446 was closed during the incident.

Winnemucca Ranch Fire – The Winnemucca Ranch Fire burned 4,800 acres in the Palomino Valley. Residents of the valley were under a voluntary evacuation order during the incident, and five structures were destroyed.

Cold Springs – The Cold Springs Fire burned 1,523 acres south of Silver Lake. Spread of the fire was driven by high winds and aided by abundant fuel with few natural breaks. The fire damaged or destroyed power lines in multiple locations and threatened about 100 residences, though there were no casualties.

Tule Fire – The Tule Fire, part of the Virginia Mountains Complex of fires in 2017, burned 36,142 acres near Pyramid Lake, which resulted in closure of the lake for recreational use until the fire was 100% contained. The fire destroyed four residences in Sutcliffe.

Little Valley – The Little Valley Fire burned 2,291 acres north of Carson City. It destroyed 23 homes and threatened an additional 480, and residents in the affected area were under a mandatory evacuation order. Franktown Road was closed to all except residents during the response.

Wildland Fire

The Little Valley Fire burned 2,291 acres and destroyed 23 homes in October 2016. – Photo by CBS News

See Appendix F for more detail.

Potential Impacts from Future Climate Conditions

- Reduced snow pack and earlier snowmelt
- Aridification
- More frequent and prolonged drought and heat
- Shifts in the ranges of plant species
- Stressed and weakened forest ecology
- Increased tree death due to temperature increases, decreased moisture, and bark beetle infestations
- Drier vegetation or lower water content in vegetation leading to faster and hotter burning fires

Wildland Fire

Extent and Probability

While wildland fire risk is predominantly associated with WUI areas in Washoe County, significant wildland fires can also occur in heavily populated areas. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas, such as the Carson Range of the Sierra Nevada and Virginia range foothills, the risk of fire increases due to a greater chance for human carelessness and historical fire management practices.

Figure F-1 in Appendix F shows wildland fire hazard severity areas in Washoe County. In general, wildland fire risk is greatest in the mountain ranges in the middle part of the County, north of Pyramid Lake, including the Lake Range, Fox Range, and Buffalo Hills; in the Carson Range northeast of Lake Tahoe; and in the WUI outside of the cities of Reno and Sparks, including the Pah Rah Range.

Generally, the fire season extends from May through October of each year during the hot, dry months. Most fires are controlled and contained early with limited damage to residences and buildings. For ignitions that are not readily contained and become wildland fires, damage can be extensive and can quickly require state and federal assistance.

The overall magnitude and potential severity of impacts of wildland fire are considered **High** in Washoe County. Potential losses from wildland fire include human life, structures and other property improvements, natural and cultural resources, the quality and quantity of the water supply, assets such as timber, range and crop land, recreational opportunities, and economic losses. Smoke and air pollution from wildland fires can be a severe health hazard. In addition, catastrophic wildland fires can lead to secondary impacts or losses such as future flooding, landslides, and erosion during heavy rains.

Future Probability Trend – Wildland fire is an annual occurrence in Washoe County; therefore, the probability of occurrence for future fires is **High**. Based on potential decreases in annual snow pack and increases in the frequency and magnitude of drought and heat, the County may experience an **increase** in the probability of wildland fire in the future.

Cascading Impacts

- Flooding
- Landslides, washouts, erosion, and potential re-burns
- Degraded water quality and damage to fisheries
- Spread of invasive plant species
- Power outages and communications disruptions
- Health affects including asthma

Wildland Fire

Vulnerability

Fire is a risk for all development in Washoe County due to the high desert climate and vegetation. The most at-risk type of development for wildland fires is residential subdivisions located in or near the WUI, particularly in the more forested areas of the County, such as the Tahoe Basin. Based on economic trends, private land zoned for residential subdivisions in the WUI will continue to be developed, and mitigation, such as creation of defensible space and management of fuels, will be required in order to reduce the risk to the extent possible.

Existing Mitigation Case Study

Areas of the County, including the Forest Planning Area encompassing part of the Tahoe Basin, are subject to additional development standards for protection from wildland fire hazards. The current standards in place are those of the 2018 International Wildland Urban Interface Code.

Property

- Most critical facilities in the County are in areas of very low to low wildland fire potential.
- One critical facility, a dam, is located in an area of moderate wildland fire potential.
- One other dam is in an area of high wildland fire potential.

Refer to the Jurisdictional Annexes for more detail on which critical facilities are within high wildland fire potential areas.

Recent Development Trends

- **Economic:** Regional economic development has resulted in demographic changes and increased urban growth that have put more people and structures in the WUI. (Increased Vulnerability)
- **Land Use:** Recent development in unincorporated areas of the County near the cities of Reno and Sparks has occurred in the WUI. (Increased Vulnerability)

Future Land Use

Continued regional growth and development pressure is likely to result in additional development outside of the urban centers of Reno and Sparks in the WUI. As new areas are developed, additional fire response resources will be needed to quickly respond to reported fires and limit damages.

See Appendix F for full Risk Exposure Table and maps.

4.5.2 Flooding

Flooding

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
4.22	3.35	3.39	3.04	3.39		3.50	2

Hazard Description

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. Floods can cause substantial damage to structures, landscapes, and utilities, as well as jeopardize life safety. Certain health hazards are also common to flooding events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold and viruses. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts.

100-year and 500-year floods have a 1 in 100 chance or 1 in 500 chance (i.e., 0.1% or 0.2% chance) of being exceeded within a year. Major flooding at this scale generally occurs in Washoe County as a result of two types of storm events: 1) heavy, prolonged rainfall on top of a deep snowpack in the Sierra Nevada, and 2) heavy, prolonged rainfall that spills over into the normally rain-shadowed Reno/Sparks area. A hybrid of both scenarios can lead to these levels of flooding. Floods of this magnitude occur in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Truckee River flooding, in particular, has been of primary concern to the Reno/Sparks metropolitan area. Intense storms can overwhelm the local waterways and the integrity of flooding control structures.

Flash Flooding is associated with floods of great volume and short duration. Flash floods often fall short of a 100- or 500-year flooding event and generally create impacts associated with stormwater runoff. In contrast to riverine flooding, this type of flooding usually results from heavy rainfall on a relatively small drainage area, and usually occurs in the spring and summer from thunderstorms. It is important to note that even in drought, scattered summer thunderstorms can bring excessive rainfall and flash flooding, particularly near wildland fire burn scars that enhance water runoff. Flash floods produce debris flows and large amounts of water runoff laden with burn debris and mud. Urbanization increases runoff two to six times compared to undeveloped terrain, due to the relative impermeability of surfaces in urban areas.

Closed-basin flooding occurs when a lake has no outlet or a relatively small outlet that limits the lake's ability to drain during storm events. Floodwaters in closed-basin lakes accumulate over long periods of time and are susceptible to dramatic fluctuations in water levels that may remain for weeks, months, or years. Additional information on closed-basin flooding is included in Appendix B.

Location

The geographic location of flooding is concentrated in the floodway and floodplain of the Truckee River and its tributaries, including Steamboat Creek and Dry Creek in eastern Reno and southern Sparks. The Truckee River headwaters comprise the Lake Tahoe Basin. The river drains part of the high Sierra Nevada and empties into Pyramid Lake. It is the sole outlet of Lake Tahoe.

Flash flooding is usually associated with development and urbanization, as well as inadequate storm drainage systems. The majority of Washoe County's population and urbanization sits in the southern

Flooding

portion of the County, in the cities of Reno and Sparks and along the I-80 and US Highway 395 corridors. Results of the concentrated development were heavily felt during the 2005 flooding events.

Areas affected by alluvial fan flooding and flash flooding include Hidden Valley, Jumbo Grade, Stormy Canyon, Virginia Foothills, Whites Creek, Galena Creek, and Sun Valley. Some of the most valuable properties in southern Washoe County are constructed in the potential path of alluvial fan flooding in these areas. Structures have been constructed in these locations to protect properties.

The primary closed-basin flooding hazards are associated with three playas located north and west of the downtown Reno area: White Lake, Silver Lake, and Swan Lake (also called Lemmon Lake), collectively referred to as the North Valleys. White Lake is located in the western portion of the valley, north of US Highway 395 near the Nevada-California border. Silver Lake is located in the central part of the valley, northwest of the Sierra Sage Golf Course. Swan Lake is located in the eastern portion of the valley, east of the Reno Stead Airport. Closed-basin flooding also is a potential emerging hazard in Boneyard Flats.

Pyramid Lake is also a large closed basin located northeast of Reno; however, flooding impacts around that lake have been caused by riverine floods and not rising lake levels.

Flooding

Previous Occurrence/History

The County has been impacted by numerous major flooding events. The greatest impact events include:

- Closed-basin flooding in Lemmon Valley – January and February 2017
- Truckee River and tributary flooding
  - December 24, 2005, to January 3, 2006
  - December 16, 1996, to January 6, 1997
  - February 11 to February 20, 1986

Washoe County set up barriers on the edge of Swan Lake floodwaters in Lemmon Valley on Dec. 19, 2017. *(Reno Gazette Journal March 5, 2018, photo credit Jason Bean)*

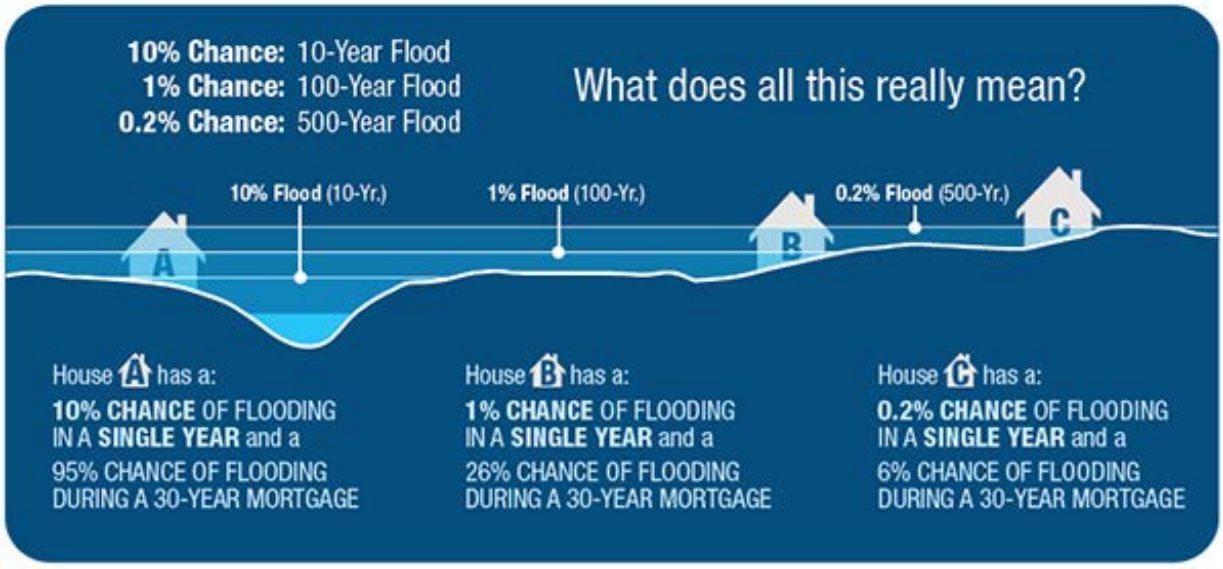
This photo taken during a Nevada Army Guard Black Hawk training flight on March 23, 2017 illustrates the extent of the Swan Lake flooding in Lemmon Valley. *(Reno Gazette Journal March 5, 2018, photo credit Tech. Sgt. Emerson Marcus/Nevada National Guard)*

See Appendix B for more detail on closed-basin flooding events in Washoe County.

Potential Impacts from Future Climate Conditions

- Increased high intensity precipitation events in winter months
- Increased intensity of winter storms
- Changing flooding regimes and return patterns

Flooding



Source: https://www.bulldogadjusters.com/types-of-claims/water-damage/floods/

Extent and Probability

The magnitude and potential severity of impacts of flooding is considered **High** in Washoe County. Severe floods may result in serious injuries and deaths as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flooding stages determined by USGS stream gauges located throughout the area. It can also be measured by comparing water elevations to past damages of flooding. Major floods may disrupt services for a period of weeks, and response likely requires state and, potentially, federal support. In closed basins, flooding conditions may be present over a long period, ranging from months to even years, because of the lack of natural drainages.

Areas of the County with poor drainage may experience limited, localized flooding on an annual basis. Major floods on the Truckee River have occurred approximately once a decade. Since 1986, closed basins in the North Valleys have also flooded approximately once a decade. The highest lake elevations were measured following winter storms in March 2017.

Future Probability Trend – The probability of occurrence of flooding in the planning area is **High**. Based on a potential increase in high-intensity precipitation events, particularly in the winter months, and increasing development resulting in additional impervious surface, the County may be impacted by an **increase** in the probability of future floods and closed-basin flooding.

Cascading Impacts

- Landslides, washouts, and erosion
- Degraded water quality
- Damage to fisheries
- Increase in traffic accidents
- Communications disruptions
- Disruptions to wastewater services
- Displacement of residents

Flooding

Vulnerability

Riverine or flash flooding in the County often results in the washout or flooding of roadways and infrastructure in waterways, such as bridges or culverts. Due to the concentration of urban development along the Truckee River, many critical facilities in the County are located within the 100-year or 500-year mapped floodplains and are vulnerable to riverine flooding. Flash flooding can affect smaller creeks and streams and areas near burn scars, and critical facilities outside of mapped floodplains may be affected.

Closed-basin flooding in Washoe County occurs in and around playas, which may become shallow lakes during periods of increased precipitation. Development on a playa or in adjacent low-lying areas is most vulnerable to the impacts of closed-basin flooding. Vulnerable areas in Washoe County include established residential neighborhoods on the shorelines of Swan Lake and commercial and residential areas near Silver Lake and White Lake. Closed-basin flooding of these lakes also affects public facilities and infrastructure, including US Highway 395, Village Parkway, Lemmon Drive, Lemmon Valley Elementary School, and the Reno-Stead Water Reclamation Facility. See Appendix B for additional discussion of closed-basin flooding hazards in Washoe County.

Major floods can impact the community by displacing residents and business owners; damaging and disrupting infrastructure, including roads and bridges, water treatment facilities, and wastewater treatment facilities; and causing health risks due to contaminated public water supplies and private wells.

Property

- 16 critical facilities, including 14 dams and two fire stations, are at least partially within the 100-year floodplain.
- Three critical facilities, including one hospital and two schools, are at least partially within the 500-year floodplain.

Existing Mitigation Case Study

Washoe County has adopted Article 416, Flood Hazards, of the Washoe County Development Code to reduce the County's vulnerability to flooding. Article 416 establishes development guidelines and requirements for properties in unincorporated parts of the County that are within flooding hazard areas. For developments in flood-prone areas of the County to be approved, mitigation measures, such as Letter of Map Revisions to FEMA Flood Insurance Rate Maps, on-site detention/retention basins, elevation/fills for building pads, and drainage improvements, must be implemented. Through its land use planning and zoning authority, the County has attempted to zone flood-prone areas for less intense development or no development at all.

Recent Development Trends

- **Economic:** The Truckee River Flood Management Authority, a joint powers authority created under an Interlocal Cooperative Agreement among Washoe County, the City of Reno, and the City of Sparks, is continuing to implement the Truckee River Flood Management Project by constructing, maintaining, and operating infrastructure designed to reduce flooding risks. (Decreased Vulnerability)

Flooding

- **Land Use:** Areas targeted for new development generally are outside of mapped floodplains. The County requires the potential impacts of new development within floodplains to be mitigated to avoid downstream flooding impacts. Residential and commercial development has resulted in creation of additional impervious surface in the closed basins of the North Valleys. (Increased Vulnerability)

Future Land Use

Additional residential development in the communities of Wadsworth and Hidden Valley and additional industrial and commercial development proposed in the Truckee Canyon planning area near the Truckee River may increase flooding risks. Development on parcels within the 100-year floodplain in the Truckee Canyon planning area will be required to comply with FEMA guidelines for development in the floodplain. Future development in the Southeast Truckee Meadows planning area, including the community of Hidden Valley, will be required to mitigate any increase in impervious surface to minimize losses associated with flooding.

Additional mixed use and residential development is planned in the North Valleys planning area as the city of Reno continues to expand into this area. This new development will continue to increase impervious surfaces within the closed basins. New development in the North Valleys planning area is required to conform to Regional Water Plan Policy 3.1.c, "Flood Plain Storage Outside the Truckee River Watershed," and any locally specific flooding control requirements adopted by the County.

See Appendix F for a full Risk Exposure Table and maps.

4.5.3 Earthquake

Earthquake

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
3.43	3.65	2.17	4.52	2.17		3.45	3

Hazard Description
An earthquake is sudden motion or trembling of the ground caused by shifting tectonic plates. Earthquakes are potentially catastrophic, capable of causing multiple fatalities and major structural and infrastructure damage, including disruption of utilities, communications, and transportation systems. Secondary effects can include landslides, seiches, liquefaction, fires, and dam failure. Earthquakes occur very abruptly, with little or no warning time. However, seismic monitoring in certain cases can detect increases in geologic and seismic activity that precedes an earthquake event. The duration of earthquakes ranges from a few seconds to a few minutes. Aftershocks can recur over hours, weeks, or months, usually with diminishing frequency and intensity.

There are many methods of measuring the power of an earthquake. The Richter Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. The velocity, acceleration, and amplitude (displacement) are examples of aspects of ground motion that can be directly measured. The amount of energy released during an earthquake is commonly expressed on the moment magnitude scale and is a measure of energy released from the fault or epicenter as recorded on seismographs. Use of the moment magnitude scale has largely replaced the use of the Richter Scale.

Another measure of earthquake magnitude is intensity. Intensity is an expression of the amount of shaking at any given location on the surface as felt by humans and defined by the Modified Mercalli Intensity (MMI) Scale. It is typically the greatest cause of losses to structures during earthquakes and is determined by many factors including distance from epicenter and soil types. Table 4-6 features abbreviated descriptions of the 12 levels of intensity of the Modified Mercalli Intensity Scale.

Table 4-6 Modified Mercalli Intensity (MMI) Scale.

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors, by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.

Earthquake

Table 4-6 Modified Mercalli Intensity (MMI) Scale.

MMI	Felt Intensity
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Location

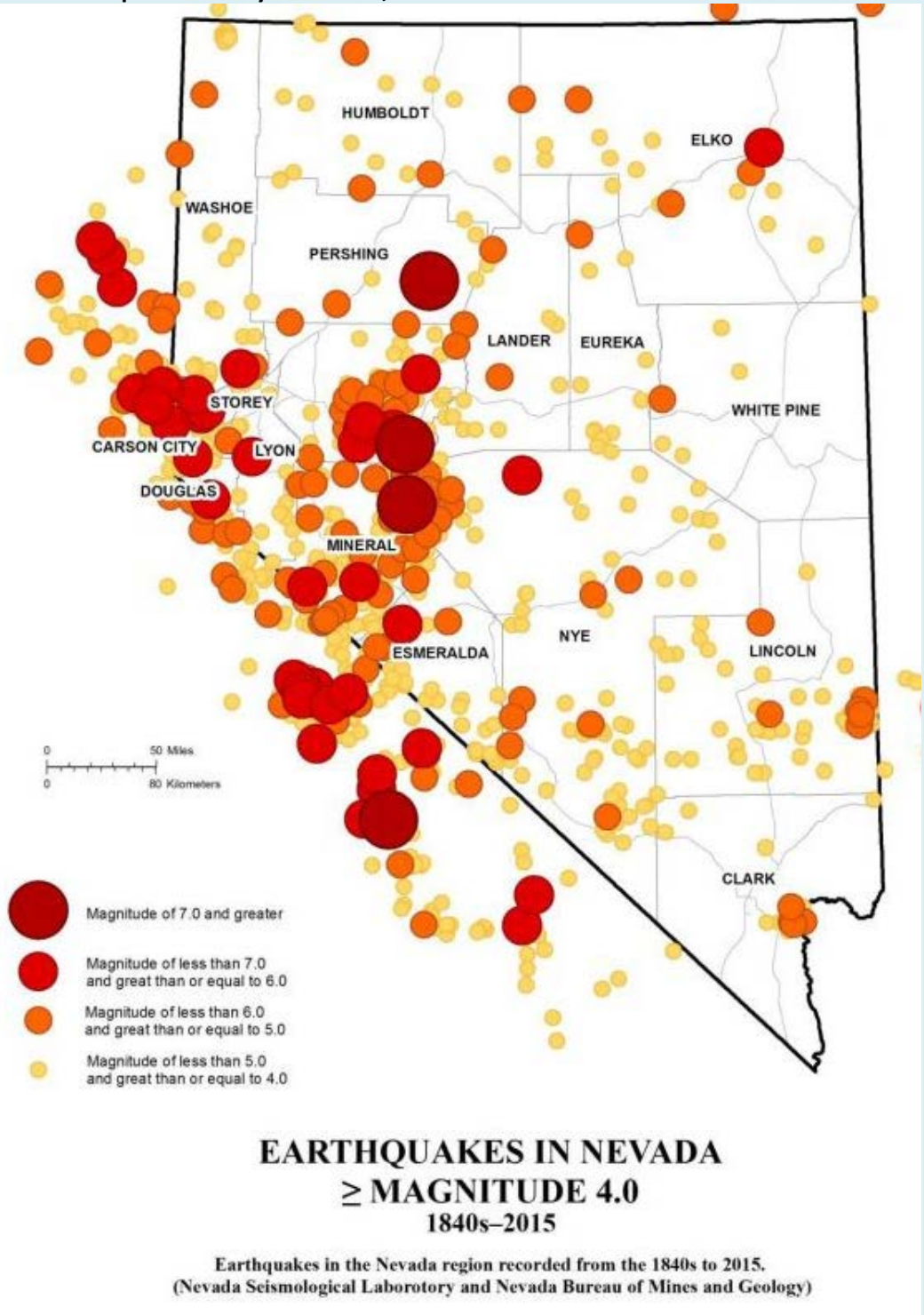
The State of Nevada is the third most seismically active state in the United States, and Washoe County is located in one the most seismically active areas in Nevada. Overall, any area of the County is susceptible to noticeable effects of earthquakes. The most hazardous fault zones in Washoe County are the Mount Rose fault zone, West Tahoe fault, and Pyramid Lake fault. Additionally, dozens of smaller faults are located in developed areas throughout the County. Fault zones within the Earth's crust are the result of shear motion between tectonic plates and are the causal locations of most earthquakes.

Seiches, or standing waves in a closed body of water, can cause inundation impacts similar to a tsunami. Areas near the shorelines along Lake Tahoe and Pyramid Lake may be affected by seiches following an earthquake. The potential inundation zone surrounding Lake Tahoe includes shoreline areas below an elevation of 6,260 feet.

The location of seismic activity in the State of Nevada from the 1840s through 2015 is indicated in Figure 4-1. Southern Washoe County, near Reno, Sparks, and north of Lake Tahoe, has higher probabilities of occurrence and more severe potential impacts due to population densities.

Earthquake

Figure 4-1 Earthquake Activity in Nevada, 1840s-2015



Earthquake

Previous Occurrence/History

Previous earthquake data in Washoe County was extracted from the Nevada Seismological Laboratory and the USGS online archives (Nevada Seismological Laboratory 2010; USGS n.d.). Magnitudes less than 5 on the MMI Scale are likely to be felt by many people but are unlikely to result in damage to property. At a magnitude of 5 or greater on the MMI Scale, earthquakes are felt by most people and some unstable objects may be broken or overturned. Previous earthquake occurrences are highlighted below when an occurrence resulted in a magnitude of 5 or higher on the MMI Scale between the years 1852 and 2018.

Previous Earthquake Occurrences, >M5, Washoe County 1852–2018

- May 30, 1868: M6.0
- December 27, 1869: M6.7
- July 10, 1877: M5.0
- June 3, 1887: M5.5
- November 18, 1894: M5.5
- February 18, 1914: M6.0
- April 24, 1914: M6.4
- April 27, 1914: M5.0
- May 25, 1937: M5.0
- June 18, 1937: M5.3
- May 9, 1942: M5.1
- December 3, 1942: M5.9
- December 29,1948: M6.0
- May 9, 1952: M5.1
- September 26, 1953: M5.5
- September 26, 1959: M5.3
- April 25, 2008: M5.0

The largest earthquake in the past 50 years in Washoe County occurred on April 25, 2008. Small earthquakes began in the western Reno, Nevada, region in February 2008 and grew in size and frequency until mid-April. On April 15, 2008, seismic activity greatly increased, producing four events of magnitude 3 and above. The earthquake swarm increased again on April 24, 2008, with two magnitude 4 events. The mainshock occurred on April 25, 2008, with a magnitude of 5 and caused violent shaking at Mogul and Somersett. A vigorous aftershock sequence followed into summer 2008.

While buildings overall survived the shock well, reports indicated that the violent rocking of buildings led to some structural damages, such as cracked paint and plaster along drywall seams, wall and ceiling corners, and doors and entryways. There were some instances of cracked stucco on outside walls and dislodged roof tiles. These types of repairs to a home can cost a couple thousand dollars. In fewer cases, garage walls were displaced from the foundation. More complicated repairs such as this are estimated to cost between $5,000 to $10,000. There was significant nonstructural damage because of the earthquake. Many homes and businesses withstood damage to household items and merchandise. One utility, a water canal used as a source for a local water treatment, withstood damage from the earthquake (Figure 4-2).

Earthquake

Figure 4-2 2008 Mogul-Somersett Earthquake Damage

Rock fall damage to water flume
(Nevada Bureau of Mines and Geology, University of Nevada, Reno; dePolo 2008)

Potential Impacts from Future Climate Conditions

- Future climate conditions are unlikely to have any effect on earthquake magnitude, severity, or probability.

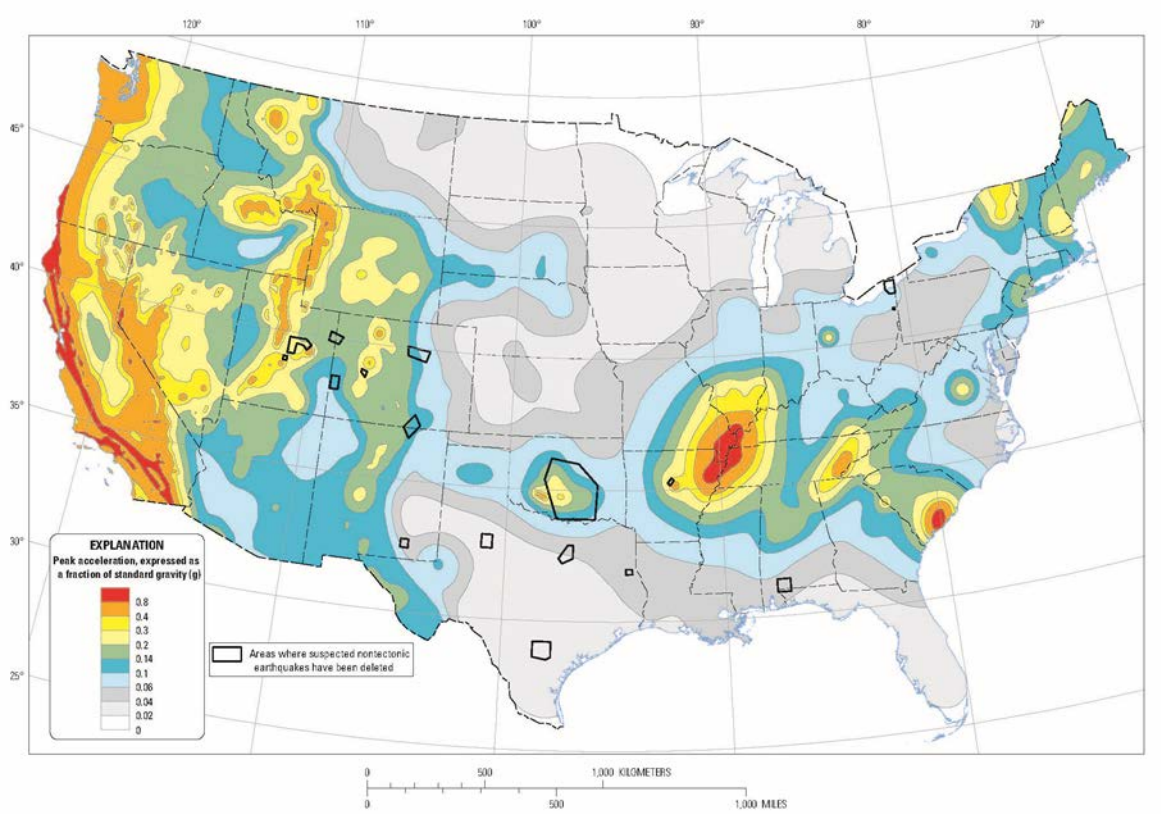
Extent and Probability

The overall magnitude and potential severity of impacts of earthquakes is considered **High** in Washoe County. Events are handled at the county level, they disrupt services for one to three days, and their economic impacts affect a city or community. In a worst-case scenario, earthquakes can require federal support, can impact critical facilities and disrupt services for more than 20 days, and can have national economic impacts.

Future Probability Trend – Figure 4-3 maps the potential intensity of earthquakes in Nevada at a common level of peak ground acceleration. The map shows the intensity of peak ground acceleration that has a 2% probability of exceedance in 50 years. The recurrence interval for an event with this probability is 2,500 years. The region of Washoe County with the highest predicted peak acceleration is centered on the Reno/Carson City metropolitan area. The peak ground acceleration range at this probability for the city of Reno is 80–120% percent gravity.

Earthquake

Figure 4-3 Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 Years



Source: USGS 2014

According to the previous lists of earthquake occurrences in Washoe County, 17 earthquakes with a magnitude >5 have occurred in the last 150 years. The probability of future occurrence can be estimated at 10%; this means that there is roughly a 10% chance of an earthquake with magnitude >5 to occur every year. The overall probability of future occurrence of an earthquake measuring 5.0 magnitude or higher is considered **Medium**, with an estimated 1% to 10% chance of occurrence in a given year. (USGS 2014)

Cascading Impacts

- Landslides
- Utility failure
- Infrastructure failure
- Conflagration
- Food, water, medical supply shortages
- Economic disruption

Earthquake

Vulnerability

Property

Earthquakes have the potential to cause significant, widespread structural damage throughout the region. The majority of critical facilities in Washoe County are located in areas that may experience relatively high seismic ground motion hazards. These facilities may experience peak ground acceleration with a 2% probability of exceedance in 50 years of greater than 48% gravity, which would be experienced as severe shaking likely to cause moderate or heavy damage to structures. For most critical facilities in the County, smaller earthquakes (resulting in peak ground acceleration with a 10% probability of exceedance in 50 years) could produce ground motion ranging from 16% to 64% gravity. These levels of peak ground acceleration would be experienced as strong to severe shaking and could cause light to heavy damage to structures.

Long-term impacts to the community following an earthquake may include displacement, disruption of government services, economic impacts, and health risks due to increased airborne particulate matter or contamination of water or soils from hazardous materials spills or releases of sewage. The severity and duration of these impacts would depend on the severity of the earthquake and damage to infrastructure and buildings across the region. A significant loss of population following an earthquake due to people relocating outside of the region could result in an extended loss of revenue for local governments and economic impacts resulting from a decrease in the work force.

Existing Mitigation Case Study

Building codes adopted by Washoe County require all development to meet building standards based on seismic zone. The currently adopted codes are the 2018 International Building Code and the 2018 International Residential Code, with the Northern Nevada Amendment package.

Recent Development Trends

- **Economic:** While the County has implemented current seismic codes to reduce risks to new development, regional economic development in recent years increases the potential dollar valuation of damages caused by a catastrophic earthquake. (Increased Vulnerability)
- **Land Use:** New buildings have been constructed to higher standards to withstand the potential impacts of an earthquake. (Decreased Vulnerability)

Future Land Use

Future development in Washoe County will be required to comply with current seismic codes, which will reduce vulnerability to earthquakes.

See Appendix F for a full Risk Exposure Table and maps.

4.5.4 Energy Emergency

Energy Emergency

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
3.30	2.22	3.65	4.57	2.39		3.43	4

Hazard Description

An energy emergency is defined as an abrupt interruption in the availability of utility services. A utility failure represents any occurrence in which vital utilities or services are rendered inoperable. A utility failure may be caused by electrical blackouts, equipment malfunction or damage, or an unanticipated surge in demand. A utility failure may impact any of the following services:

- Power outage
- Drinking water
- Wastewater or storm water
- Telecom and information technology outages.

Interruptions in energy services may also be planned, for example to allow for system repairs or maintenance. In 2019, NV Energy and Pacific Gas and Electric Company (PG&E) began implementing extensive public safety outage management programs in areas with extreme fire risks. In the planning area, this includes parts of the Lake Tahoe basin in Washoe County. To prevent downed power lines and damaged equipment from causing fires, these electricity providers may de-energize parts of the electrical grid during weather conditions conducive to wildland fires (e.g., high temperatures, low humidity, high winds, lightning storms) or based on field observations or information from first responders (NV Energy 2019). Planned outages have the potential to affect fuel availability for Washoe County. Outages affecting PG&E's system would cut power to the equipment that controls operation of the fuel pipeline serving the region.

Location

Energy emergencies can potentially affect any portion of the planning area. Rural and populated areas alike are known to experience power outages during winter and wind storms that can last anywhere from several hours to several weeks. The overall effects of a widespread energy emergency would be concentrated in population centers, but the condition is likely to be present throughout the planning area. The electric utility provider for the planning area is NV Energy (formerly Sierra Pacific Power Company). NV Energy owns and operates no facilities that are rated "Critical" per the Department of Homeland Security criteria for National Critical Facilities.

Previous Occurrence/History

Historically, utility disruptions have been caused by both natural and human-caused events. These events include earthquake, wildland fire, flood, and human activities. Most energy emergencies can be traced back to a weather event. Outages can affect less than 20 customers in rural areas or more than 50,000 in the cities of Reno and Sparks. The 2018 Nevada State Enhanced HMP references a major power outage in Washoe County due to a weather-related event. From November 9 to 10, 2015, a severe winter storm resulted in numerous broken tree branches because of heavy, wet snow. Over 35,000 customers were without power in Washoe County due to downed power lines. In

Energy Emergency

January 2019, another winter storm caused 4,000 homes in Washoe County to lose power, requiring 10 specialized NV Energy trouble crews and 50 power line technicians working for over 12 hours to address the issue (KTVN Channel 2 News 2019).

Between 2009 and 2015, there were nine large weather outages in the County, resulting in power loss ranging from 8 to 31 days. The 2013 State of Nevada Enhanced HMP lists an additional six significant outages between 2009 and 2014. NV Energy provided updated data on outages across their system for the 2020 HMP update, presented in Table 4.7 and Appendix F.

Table 4-7 Power Outages between 2014 and 2018 in Washoe County

Year	Number of Outages	Average Duration of Outages (minutes)
2014	934	201
2015	1,323	412
2016	962	219
2017	1,134	223
2018	1,042	192
Grand Total	**5,395**	**259**

Energy Emergency

Human Effects of Disaster: 2019 Washoe County Power Outage.

In January 2019, a winter storm caused 4,000 homes in Washoe County to lose power. The Reno Fire Department experienced an influx of calls due to the power outage. Thirty-five calls reported arcing power lines causing tree fires.

Utility pole with power lines and transformers.
(Photo by Jupiterimages, www.jupiterimages.com. Sourced from Reno Gazette Journal 2015)

"It was a busy night last night. After 8:00, we had 93 calls for service." – Reno Fire Department, Battalion Chief Dirk Minore (KTVN Channel 2 News 2019)

Potential Impacts from Future Climate Conditions

- Increased demand during high intensity heat could result in widespread power outages
- Potential for extreme weather events due to climate conditions could further increase risk of weather-related equipment damage

Energy Emergency

Extent and Probability

The overall magnitude and potential severity of impacts of energy emergencies is considered **Low** in Washoe County. Typical energy emergency events are handled at the regional level, and economic impacts could affect the entire County. Considering a worst-case scenario, an energy emergency could require federal support, can impact critical facilities and disrupt services for several days, and can have national economic impacts.

Future Probability Trend – Due to the sporadic history of occurrences, the broad range of potential causes, the unpredictability of these causes, and the improvements of energy supply systems due to previous failures, probability of future occurrence is difficult to measure for this hazard. Overall probability of future energy emergency events is considered **Medium**.

Cascading Impacts

- Human health impacts
- Revenue losses
- Disruptions in other critical services

Vulnerability

Prolonged power outages can result in health emergencies and increased demand for emergency medical services, especially in Nevada, where vulnerable people may be exposed to extreme summer or winter weather conditions. Power outages can also result in disrupted utilities or damaged infra-structure, such as frozen pipes, and economic impacts due to the loss of perishable food and other items. Depending on the cause, a power outage or other energy emergency can cause cascading impacts—most significantly, wildland fires, if an outage was caused by a downed line or other physical damage.

Existing Mitigation Case Study

Recognizing the potential for hazards such as wildland fires and severe weather to result in power outages, NV Energy is partnering with Washoe County to make the electric system more resilient. NV Energy is implementing strategies such as replacing wooden power poles with steel poles designed to withstand snow loading and wildland fires and integrating renewable energy generation facilities into their system. These ongoing activities under the public-private partnership between Washoe County and NV Energy have been included as new mitigation actions in the mitigation implementation plan, Section 6.5.

Recent Development Trends

- **Economic:** NV Energy has recently been working to expand their energy generation facilities to incorporate more renewable energy facilities and also replaces aging equipment on a regular basis. (Decreased Vulnerability)
- **Land Use:** The County's upward trend in development increases the overall demand on utilities. (Increased Vulnerability)

Future Land Use

Future development will create increased demand for utility services. In general, utility providers plan for and complete capital improvements to meet future demands. Factors such as budget constraints or the need to construct new utility plants, like wastewater treatment plants or power generation facilities, may affect the ability of utility providers to serve a significant number of new customers.

4.5.5 Criminal Acts and Terrorism

Criminal Acts and Terrorism

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
3.13	2.87	2.65	4.65	1.70		3.33	5

Hazard Description

An **act of violence** is any situation that presents an immediate and ongoing danger to the safety of people in the community. In addition to individuals using firearms, other types of weapons and erratic behavior can create active threat situations.

An active assailant scenario may include mass casualty incidents and workplace violence. There have been several incidents of this type in Northern Nevada in the last decade.

Domestic terrorism is perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature. One example cited by the Federal Bureau of Investigation on its domestic terrorism website is the June 8, 2014, Las Vegas shooting, during which two police officers inside a restaurant were killed in an ambush-style attack committed by a married couple who held anti-government views and who intended to use the shooting to start a revolution.

Washoe County cites four general types of terrorism:

- Conventional – such as bombing or hijacking
- Chemical – use of poisons or chemicals (nerve gas)
- Biological – use of bacteria, viruses, or other harmful organisms
- Radiological – use of nuclear or radiological materials

Location

Any populated area can be impacted by criminal acts or terrorism. These areas include, but are not limited to, shopping structures, clinics/hospitals, schools, and government offices and buildings.

Previous Occurrence/History

Active assailant incidents in Washoe County between 2015 and 2019 are listed below. No incidents of terrorism have been reported in the county since 2015.

- October 29, 2015: A Reno Walmart employee shot and wounded three Walmart employees.
- September 6, 2011: A gunman opened fire at an IHOP restaurant, killing four people and wounding seven others.
- October 21, 2013: A 12-year old student opened fire with a semi-automatic handgun at Sparks Middle School, injuring two students and killing a teacher.
- December 17, 2013: A gunman entered the Center for Advanced Medicine and accessed Urology Nevada. He shot two doctors and a patient. One of the doctors later died of their injuries.
- November 28, 2017: A gunman was shot and killed by police in downtown Reno after he fired multiple shots from a hotel. A bystander reported a minor injury.

Criminal Acts and Terrorism

Additionally, on October 1, 2017, a lone gunman committed the deadliest mass shooting by an individual in the United States in Las Vegas, Nevada, on the Las Vegas Strip. The gunman fired from a suite on the 32nd floor of the Mandalay Bay Hotel into crowds attending the Route 91 Harvest music festival. A total of 58 people were killed, and 851 people were injured during the shooting and the ensuing panic.

Potential Impacts from Future Climate Conditions

There are no direct connections between criminal acts or terrorism and future climate conditions.

Extent and Probability

It is difficult to estimate the extent or probability of criminal activity or a terrorist incident. Nonetheless, it can be deduced that these threats could affect all populated areas in Washoe County; government facilities and schools may be most likely targeted. The magnitude and potential severity of impacts of criminal activity or a terrorist incident is considered **Medium**.

Future Probability Trend – Future weather conditions have no direct connections to criminal acts or terrorism. However, increased development and urbanization have the potential to **increase** the probability of a future active threat. Based on the occurrence of previous incidents, the future probability of an incident is considered **Medium**.

Cascading Impacts

- Long-term trauma and mental health issues
- Political and social divisions

Vulnerability

No estimates are available to determine potential losses associated with criminal acts and terrorism. However, if an active threat were to be directed at the County, schools, government buildings, or other public gathering places or public events would likely be top targets. Active threats could have an impact on the community in the following ways: loss of human life; damage to buildings and structures; temporary displacement during the threat and/or investigation; stress on medical, emergency response, and security services; decrease in economic activity and hospitality business after the event; psychological and emotional trauma; and an increased need for emergency services and funding.

Existing Mitigation Case Study

To reduce the community's vulnerability to criminal acts and terrorism, the Washoe County Sheriff's Office has developed an Emmy-nominated video and webpage describing how people can respond to an active assailant threat (https://www.washoesheriff.com/sub.php?page=active-assailant-preparedness:-what-you-can-do&expand=General%20Information). The Washoe County Health District has developed a Multi-Casualty Incident Plan to provide guidelines for managing multi-casualty incidents and coordinating between multiple responding agencies and organizations (WCHD 2018).

Criminal Acts and Terrorism

Recent Development Trends

- **Economic:** Criminal acts and terrorism pose no new risk to economic interests. Regional employers and governments, including Reno-Tahoe International Airport; University of Nevada, Reno; and the RSIC have held training workshops to enable employees to respond to active assailant incidents. (Decreased Vulnerability)
- **Land Use:** Criminal acts and terrorism pose no new risk to land use. (Unchanged Vulnerability)

Future Land Use

Future development in Washoe County may be vulnerable to criminal acts and terrorism, particularly places of employment, government buildings, and public gathering places. An increased need for response training may be associated with some types of development.

4.5.6 Severe Storms (Winter Storm and Windstorm)

Severe Storms (Winter Storm and Windstorm)

	Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
Winter Storm	3.74	2.43	3.87	3.04	2.65		3.27	6
Wind-storm	3.70	2.17	3.61	3.17	2.09		3.16	7

Hazard Description

Winter storms can bring heavy rain or snow, high winds, extreme cold, and ice storms. In Nevada, winter storms begin with cyclonic weather systems in the North Pacific Ocean or the Aleutian Islands that can cause massive low-pressure storm systems to sweep across the western states. Winter storms plunge southward from arctic regions and drop heavy amounts of snow and ice. The severity of winter storms is generally minor. However, a heavy accumulation of ice can create hazardous conditions. A large winter storm event can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding. Extreme cold temperatures often accompany severe winter storms in Washoe County.

A **windstorm** is a severe weather condition that is sometimes indicated by high winds with little or no rain. High winds can also accompany thunderstorms and can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds greater than 40 to 60 miles per hour (mph) are generally considered high. Winds that exceed 100 mph can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, and debris blocking streets. Windstorms can cause dust storms and can often increase the risk of wildland fire. See section 4.5.1, Wildland Fire, for a description of red flag warnings associated with high winds.

An emerging hazard for Washoe County is **extreme heat**. Extreme heat occurs when summertime temperatures are much hotter and/or more humid than the average. Extreme heat conditions are determined by comparing temperature and humidity to average conditions for the affected location at that time of year (Centers for Disease Control and Prevention 2017).

Location

High elevations in the western portion of Washoe County experience the effects of winter storms, often snow storms, with greater frequency than the rest of the County. Locations that are often affected by snow storms include Mt. Rose Highway, Incline Village, Mt. Peavine, and I-80 near the County's border with California. Windstorms may occur anywhere within Washoe County. Properties with aboveground infrastructure, utilities, and tree stands may be more damaged during windstorms. Extreme heat also may occur anywhere within Washoe County. However, urban areas are more likely to experience extreme heat conditions due to the heat island effect, in which the impervious surfaces concentrated in cities increase the temperature of the surrounding area higher than temperatures in more rural areas.

Severe Storms (Winter Storm and Windstorm)

Previous Occurrence/History

Winter Storm

Historical snowfall data in Washoe County was extracted from the National Oceanic and Atmospheric Administration's (NOAA) online climate database covering the years 2015–2018. During this period, the average daily snowfall in the winter months ranged from 0.16 to 0.28 inches, with the highest snowfall generally occurring in February.

The 2018 State of Nevada Enhanced HMP lists the following severe winter storms occurring in Washoe County over the past 15 years:

- **December 29, 2004–January 10, 2005**: Severe winter storm in Northern Nevada, prompting FEMA to designate 16 counties for federal funding to alleviate the cost for emergency protective measures.
- **February 25, 2011**: Winter storm with up 18 inches of snow and 50 mph winds, causing multiple auto accidents, two injuries, and roughly $250,000 in damages.
- **January 13–14, 2013**: Prolonged winter temperatures led to Governor Sandoval to declare a state of emergency, and subzero temperatures were responsible for deaths across the state, including in Reno.
- **November 9–10, 2015**: Severe winter storm resulted in downed power lines due to heavy, wet snow, and over 35,000 customers were without power in Washoe County.
- **January 30–31, 2016**: Snow totals of 4 to 8 inches around Reno-Sparks area, and areas in and near the foothills west of Reno received 8 to 10 inches of snow. Whiteout conditions occurred due to heavy lake-effect snow off Pyramid Lake.

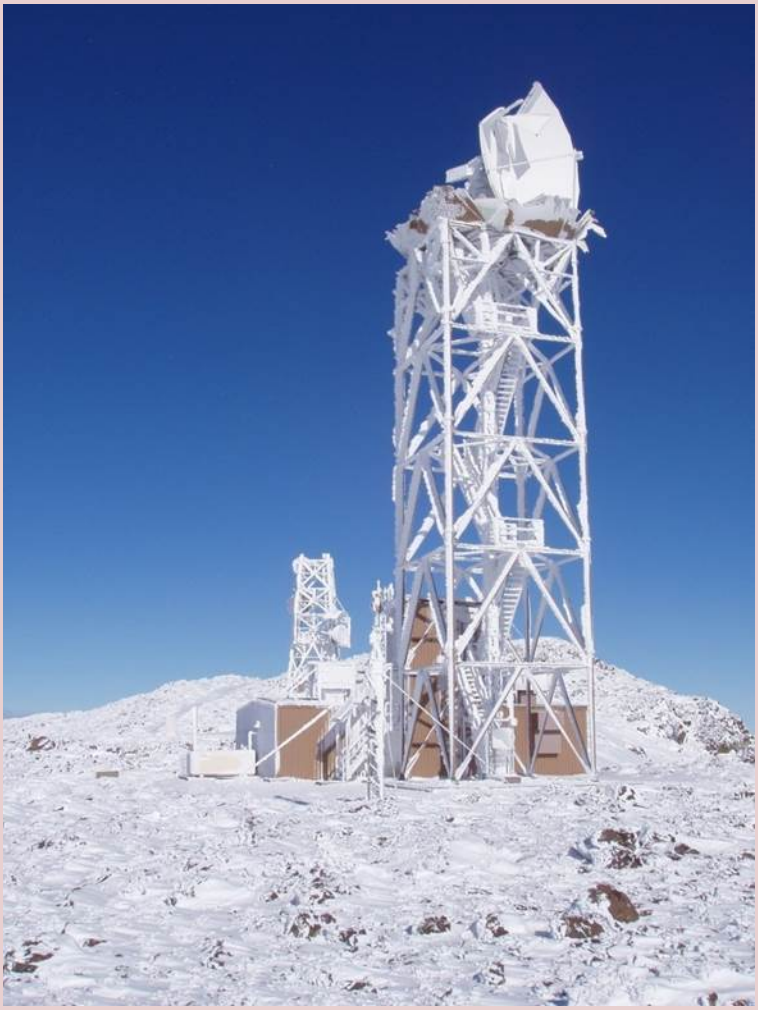
The 2018 Nevada Enhanced HMP reports that to qualify as an "extreme" event, a snowfall must be above the 15th percentile of overall snowfall for a particular county. The state complied weather-related incidents and reported deaths or damages from 1995 through 2016 using data from the National Weather Service. Over this period, Washoe County experienced one extreme cold event, 25 incidents of hail, 279 heavy snowfall events, four ice storms, and 22 winter storms. Reported damages included $128,000 due to heavy snowfall, $30,000 due to ice storms, and $600,000 due to winter storms. Winter storms also led to the deaths of three people during this period in Washoe County.

Wind Storm

Windspeeds in Washoe County can reach high levels. In 2016, Reno was ranked as the second windiest city in the United States, and Reno has reported record high wind gusts exceeding 80 mph (Deseret News 2002; Reno Gazette Journal 2017). Daily windspeeds were obtained from NOAA's online climate database for Washoe County over the years 2015 through 2018 (NOAA NCEI n.d.). The data suggest that the windiest months in Washoe County are April through June. Average daily wind-speeds from 2015 to 2018 for the months of April through June ranged from 6.09 to 7.50 mph.

The 2018 State of Nevada Enhanced HMP complied weather-related incidents and reported deaths or damages from 1995 to 2016 using data from the National Weather Service. During this period, there were over 500 incidents of high wind that accompanied winter storms, resulting in two deaths and over $7 million in damages. Additionally, there were a reported 25 incidents of dust storms, an associated hazard of wind storms, which led to 19 injuries and $240,000 in damages. Figure 4-4 illustrates how damaging high winds can be.

Figure 4-4 NWS Reno Radar Damage from Wind (December 2008)



Source: Chris Smallcomb, National Weather Service – Reno

Human Effects of Disaster: 2002 Washoe County Windstorm

In December 2002, a windstorm caused major property damage, flight cancellations, and power outages in Reno, Nevada.

"It's the strongest winds we've ever recorded in Reno. What we saw today were hurricane-force winds." – Tom Cylke, weather service forecaster (Deseret News 2002).

Extreme Heat

Washoe County is no stranger to heat during the summer months; however, truly stifling and prolonged heat waves are generally infrequent due to cooler night temperatures and lower humidity in our high desert environment. The National Weather Service in Reno posts heat health messaging and possible warnings when high temperatures exceed 100°F and overnight lows remain above 69°F for two or more consecutive days. This generally coincides with periods of increased heat health issues in the general population, based on historical studies of temperature anomalies. There is

Severe Storms (Winter Storm and Windstorm)

considerable interannual variability in how often these thresholds are reached. For example, in 2018 Reno-Tahoe International Airport hit 100°F + temperatures 20 times, setting a new annual record, while in 2019 those conditions occurred only on one day, and even then for only 3 minutes. On average, high temperatures above 100°F occur at Reno-Tahoe International Airport roughly 10 times each year, with lows above 69°F occurring about four times each year. The combination of extreme highs and lows generally occurs only one to two times in any given summer. However, there has been an increasing trend in the frequency of extreme heat events in the past one to two decades.

Figures 4-5 and 4-6 below show the number of days with high temperatures above 100°F and low temperatures above 69°F at Reno-Tahoe International Airport since 1990.

Figure 4-5 Number of Days Max Temperature >= 100 – Jan through Dec – Reno-Tahoe International Airport

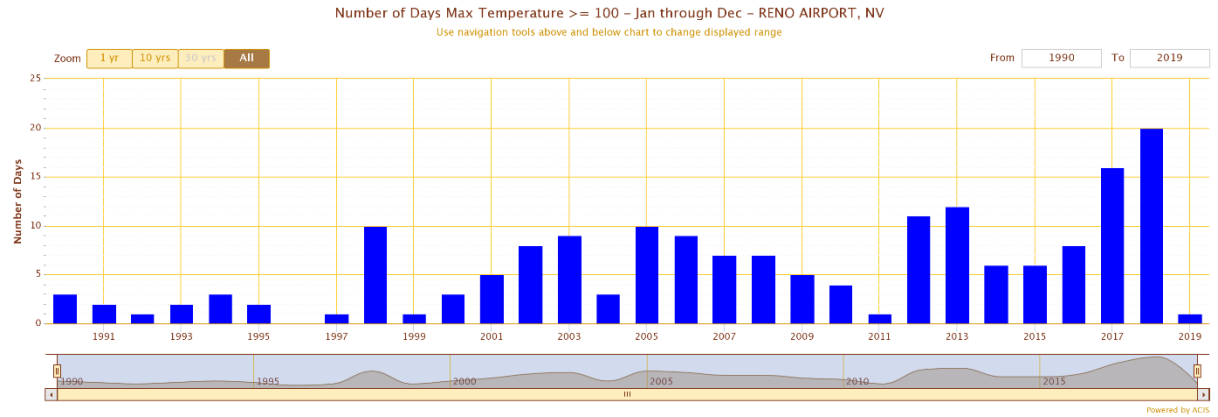
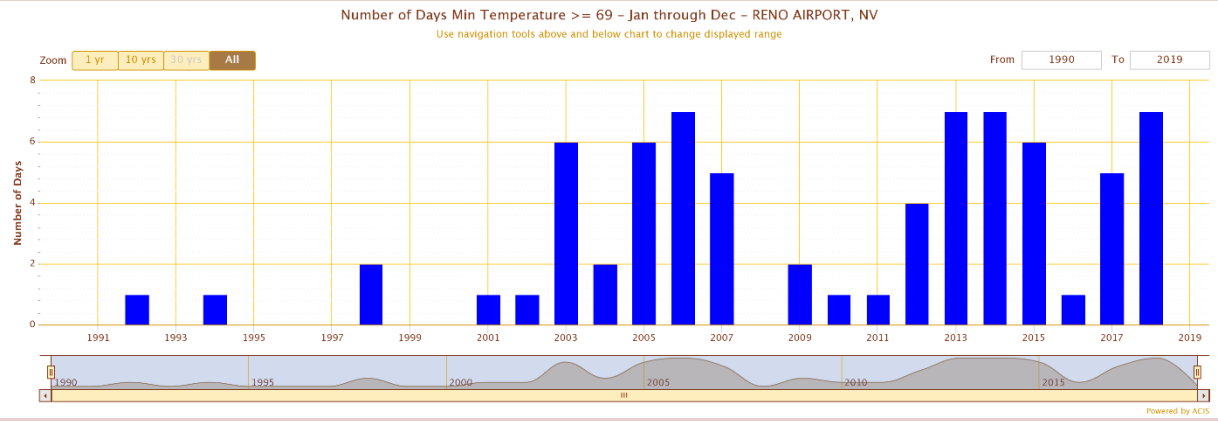


Figure 4-6 Number of Days Min Temperature >= 69 – Jan through Dec – Reno-Tahoe International Airport



Severe Storms (Winter Storm and Windstorm)

Potential Impacts from Future Climate Conditions

- Potential for larger portion of winter precipitation falling as rain instead of snow
- Potential for less frequency of heavy snow but increased risk of winter floods
- Potential for less snowpack on which to rely for summer water supply
- Potential for increased risk of severe weather events such as heavy snow
- No reliable data on whether or not windstorms will increase or decrease in frequency and intensity due to climate change (State of Nevada 2018)
- Continuing increase in average temperatures across the region, along with increases in extreme heat events

Extent and Probability

The magnitude and potential severity of impacts of severe storms is considered **Low**. Typical severe storm events are handled at the city or county level, can disrupt local government and business services for a period of days to weeks, and can have economic impacts on a statewide scale. Considering a worst-case scenario, a severe storm event could require federal level support, could impact critical facilities and disrupt services for more than 20 days, and could have nationwide economic impacts.

Future Probability Trend – The future probability of a severe storm event is **High**, and the potential impact from future climate conditions could increase the risk of severe storm events. However, since severe storms occur every year in Washoe County, local and state jurisdictions and emergency response personnel are experienced in responding to such scenarios.

Cascading Impacts

- Human health risks (e.g., hypothermia, heat-related illnesses, or respiratory illness in the case of dust storms)
- Vehicular accidents
- Fires caused by damaged power lines
- Fuel loading for fires
- Landslides from downed trees
- Utility failures
- Property/structural damage
- Economic losses

Vulnerability

The County's primary vulnerability from severe storms is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow, downed trees, or debris, or from increases in demand beyond the capacity of the electrical system. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe weather events. Members of the community who are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter

Severe Storms (Winter Storm and Windstorm)

storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Snow storms also slow the local economy, but there is a debate about whether these slowdowns cause permanent revenue losses. Productivity and sales may decline but often accelerate after a storm. Some permanent effects may occur if some areas in the region are accessible and some are not. For example, visitors traveling to the Lake Tahoe Basin may choose to cancel their trips if roads through the mountains are impassible. For workers, snow can be a hardship, especially for those who lack benefits and vacation time. For local governments, responding to snowstorms can be a major unbudgeted expense. Some have even had to issue emergency bonds to cover snowstorm recovery costs.

Recent Development Trends

- **Economic:** Increased regional economic development increases the potential for disruptions during and after severe weather events. (Increased Vulnerability)
- **Land Use:** The County's upward trend in development increases the overall strain on responding to winter storm impacts at various locations. (Increased Vulnerability)

Future Land Use

Future development in more remote areas of the County may increase the cost of responding to snowstorms and increase risk to residents in these areas, particularly those who are elderly or who have medical conditions.

4.5.7 Hazardous Materials Incident

Hazardous Materials Incident

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
2.78	2.35	2.52	4.39	2.48		3.01	8

Hazard Description

A hazardous material is any item or agent (biological, chemical, physical) that has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in the form of gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.

A release or spill of bulk hazardous materials could result in fire, explosion, toxic cloud, or direct contamination of people or property. The effects may involve a local site or many square miles. Health problems may be immediate, such as corrosive effects on skin and lungs, or be gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic, if not more so, than accidents involving stored chemicals because the lack of a fixed location leads to increased unpredictability. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property. These hazard classes are:

- Class 1-Explosives
- Class 2-Compressed Gases
- Class 3-Flammable Liquids
- Class 4-Flammable Solids; Spontaneously Combustible Materials; Dangers When Wet Materials/Water-Reactive Substances
- Class 5-Oxidizing Substances and Organic Peroxides
- Class 6-Toxic Substances and Infectious Substances
- Class 7-Radioactive Materials
- Class 8-Corrosives
- Class 9-Miscellaneous Hazardous Materials/Products, Substances, or Organisms

Location

Potential for contact with hazardous materials is present throughout all areas of Washoe County, due to three main factors:

- The widespread distribution of hazardous materials storage locations (fixed facility);
- The transport of hazardous materials via motor transportation and rail (transportation); and
- The transport of hazardous materials via pipeline (pipeline).

Hazardous Materials Incident

Fixed Facility

Under Nevada State law (Nevada Administrative Code 477.323), entities may not store hazardous materials in quantities above a designated limit, unless permitted annually through the Department of Public Safety, State Fire Marshal's Division.

Title III of the Federal Superfund Amendments and Reauthorization Act is a freestanding statute titled the Emergency Planning and Community Right-To-Know-Act (EPCRA). Under EPCRA, certain businesses are required to annually export information about hazardous substances used and stored at their facilities. These reports, known as Tier II reports, are submitted to County Local Emergency Planning Committees (LEPCs), State Emergency Response Commissions (SERCs), and local fire departments.

EPCRA includes planning requirements for facilities that store or utilize any of the 355 chemicals known as Extremely Hazardous Substances (EHSs). Facilities that contain quantities of one or more EHSs above an amount that could pose a threat are considered emergency planning facilities and must notify SERCs and LEPCs of the chemicals' presence and assist with local emergency planning efforts as requested. Approximately one-third of the chemicals on the EHS list are also included in the list of materials designated as Hazardous Substances by the Comprehensive Environmental Response, Compensation, and Liability Act, which includes hundreds of other chemicals.

In the event of a release of a chemical above its reportable quantity (as designated by the Occupational Safety and Health Administration), responsible parties are required to notify the community emergency management coordinator for the LEPC and local emergency response agency of any areas likely to be affected by the release. The SERC must also be notified.

Highway Transportation

The Washoe County area is dissected by two main transportation corridors: I-80 (east-west route) and US Highway 395 (north-south route). State routes in the area include SR 28 at Lake Tahoe, SR 431 at Mount Rose Highway, SR 341 Geiger Grade, and SR 445, 446, and 447, which lead north out of the Truckee Meadows. The Washoe County LEPC completed a study in 2013 to evaluate the transport of hazardous materials by class along the major transportation corridors: I-80 and US Highway 395. The study included field surveys over three days and a total of 15 hours to record the number of trucks with hazardous materials placards at checkpoints along these corridors. A summary of this study is provided in Table 4-8.

Table 4-8 Field Survey Placard Counts

U.S. Department of Transportation Hazardous Materials Class	Total Number of Times Placard in Hazard Class Observed	Percentage of Placarded Vehicles (%)
Class 1 – Explosives	0	0
Class 2 – Compressed Gases	9	11
Class 3 – Flammable Liquids	42	53
Class 4 – Flammable Solids	0	0
Class 5 – Oxidizers and Organic Peroxides	1	1
Class 6 – Toxic and Infectious Substances	2	2
Class 8 – Corrosives	5	6
Class 9 – Miscellaneous Hazardous Materials	8	10
Unknown (Flammable)	3	4
Multiple (Dangerous)	1	1
TOTAL	**71**	**88**

Source: Ecology and Environment, Inc. 2013

Between 2008 and 2012, 295 documented hazardous materials incidents involving highway carriers occurred in Washoe County, which averages 59 highway incidents per year. This exposes individuals and families traveling along main roads to some risk (BTS 2017a, 2017b).

Rail Transport

Nevada is served by the Union Pacific Railroad, which maintains a main line track that travels east and west along the Truckee River Corridor starting at Truckee, California, and continuing east to Fernley, Nevada. The railroad route is within 100 yards of the Truckee River at many locations and crosses waterways at several additional locations.

Hazardous materials loads can and will be mixed with other freight being transported by the train on any given day. The amount of hazardous materials being transported depends on product demand and can vary based on season.

The 2013 Washoe County, Nevada, Hazardous Materials Report discusses the types of hazardous materials transported through the county by rail (Ecology and Environment, Inc. 2013). Shipments of hazardous materials by rail in 2012 are summarized in the Table 4-9. Amtrak trains pass through Reno using the Union Pacific lines on a daily basis, stopping at the downtown Amtrak station.

Hazardous Materials Incident

Table 4-9 Union Pacific Hazardous Materials Commodity Flow Data (2012)

UN/NA Number	HazMat Class Number	Shipping Name	Total Loads
UN1987	3	Alcohols, not otherwise specified (n.o.s.)	1491
UN2212	9	Blue Asbestos	544
UN1267	3	Petroleum Crude Oil	119
UN3065	3	Alcoholic Beverages	79
UN1075	2.1	Petroleum Gases, Liquefied	65
UN1203	3	Gasoline	65
UN3257	9	Elevated Temperature Liquid, n.o.s.	50
UN1580	6.1	Chloropicrin	33
UN3268	9	Air Bag Modules	27
UN1814	8	Potassium Hydroxide, Solution	19
UN1219	3	Isopropanol	19
UN3077	9	Waste Environmentally Hazardous Substance, Solid, n.o.s.	16
99	MIX	Freight All Kinds (FAK)-Hazardous Materials	16
UN1062	2.3	Methyl Bromide	16
UN1402	4.3	Calcium Carbide	15
UN1993	3	Flammable Liquids, n.o.s.	11
UN2924	3	Flammable Liquids, Corrosive, n.o.s.	11
UN3432	9	Polychlorinated Biphenyls, Solid	10

Source: Ecology and Environment, Inc. 2013

Air

Hazardous materials may be transported through Washoe County via air carriers, including UPS, Federal Express Corporation, and others, which use Reno-Tahoe International Airport. The highest risk of a hazardous materials incident during transport by air is during the loading and unloading processes at airports or airfields. Generally, quantities of hazardous materials shipped by air are much smaller than other transportation modes. Transport of hazardous materials by air is regulated by the Federal Aviation Administration's Office of Hazardous Materials Safety and by the International Air Transport Association and the International Civil Aviation Organization.

Hazardous Materials Incident

Pipeline

Several major pipeline systems transport hazardous materials cross the County. The Paiute Transmission system, which carries liquefied natural gas, runs through the southern edge of Washoe County to the northeast into Churchill and Pershing Counties. The Tuscarora Gas Transmission system connects to the Paiute Pipeline outside of Sun Valley and runs to the northwest (connecting with several smaller liquefied natural gas (LNG) pipelines, including the Spanish Springs Lateral). The Tuscarora Pipeline connects with the Empire LNG Pipeline at the Pyramid Lake Paiute Reservation. From this point, the Empire Pipeline runs to the northeast and terminates in Empire. The Ruby Pipeline runs through the northern third of Washoe County.

The Kinder Morgan SFPP North pipeline parallels I-80 through the Reno/Sparks metropolitan area and carries petroleum products (gasoline, diesel, and jet fuel).

Previous Occurrence/History

According to the federal Pipeline and Hazardous Materials Safety Administration (PHMSA), which releases annual hazardous materials incident reports, there were 1,119 reported incidents throughout the entire state of Nevada from 2015 to 2019, resulting in 12 injuries, one of which required hospitalization. There were no fatalities during this time. Total damages over this time totaled approximately $1,500,000 (PHMSA 2019).

Of these incidents, 952 occurred on State highways and resulted in damage totaling approximately $1,000,000 and a hospitalization. Eighty-nine incidents occurred on railways, resulting in no injuries and approximately $460,000 in damages. The remaining 78 incidents were associated with airports. No damages were reported beyond five injuries that did not require hospitalization.

According to the PHMSA, within Washoe County, there was one reported pipeline spill in October 2007 along the Kinder Morgan North pipeline. The incident resulted in the release of 851 barrels (35,742 gallons) due to an equipment failure.

See Appendix F for more detail.

Potential Impacts from Future Climate Conditions

- Increased precipitation events causing an increase in traffic accidents.

Extent and Probability

The overall magnitude and potential severity of impacts of hazardous materials incidents is considered **Low** in Washoe County, but varies based on type of facility. The vulnerability to hazardous materials disasters at fixed facilities includes the potential for either an explosive release or insidious leaking of materials into the ground or groundwater. The impact of an accident and spill during roadway or rail transport depends largely on the spill location relative to population centers and waterways. According to the U.S. Bureau of Transportation Statistics, the number of hazardous materials incidents along traffic corridors increases in summer months (June through August). The cause of this is unknown; however, the nationwide trend is constant over many years (BTS 2017c). Any release from the pipeline could have severe consequences for the population and the environment. The proximity of an existing pipeline to the Truckee River, and its inlets and outlets, signifies a potential threat to the water system. The communities located along the Truckee River draw their water supply from the river or from wells that are directly affected by any product released from

Hazardous Materials Incident

the pipeline. Cascading effects of a pipeline accident, particularly the potential for causing wildland fires, is an additional concern.

More typical hazardous materials accidents are handled at the city or county level, disrupt services for up to two weeks, and have countywide economic impacts. Considering a worst-case scenario, a hazardous materials release could require federal support, could impact critical facilities and disrupt services for more than 20 days, and could have national economic impacts.

Future Probability Trend – Probability of future hazardous materials events varies based on the type of accident considered. Based on the frequency of past incidents, particularly during transportation of hazardous materials, the overall probability of hazardous materials incidents is considered **Medium**. As volume of hazardous materials transport, handling, or production increases, the expected frequency of accidents involving uncontained release increases correspondingly. It is important to note, however, that an increase in hazardous materials regulation is likely to decrease potential for hazardous materials release events. The probability of a hazardous materials release via roadway, rail or fixed facility accident is marginally higher than probability of pipeline accidents, due to increased potential for human error or mechanical failure. Indicators of probability for pipeline accidents are linked to probability for other identified hazards, including terrorism, earthquake, and, to a lesser, extent wildland fire.

Cascading Impacts

- Long-term health and environmental monitoring costs
- Contamination of water and air
- Conflagration (urban fire)

Vulnerability

Hazardous materials incidents can be caused by a number of factors, including technological failures, natural hazards such as earthquakes or floods, and human factors. The County and local governments maintain records of hazardous materials storage sites in the Regional Hazardous Materials Response Plan and maintain communications with Nevada Highway Patrol regarding shipments of hazardous materials on all transportation routes throughout the County.

Hazardous materials incidents can be caused by a number of factors. The region's most pressing vulnerability is presented by a transportation incident occurring on the I-80 and/or I-580 highway. Many of the critical facilities and valuable assets are in close proximity to I-80 and I-580, particularly in the Reno/Sparks corridor.

Property

- Hazardous materials may be transported through the Reno-Tahoe International Airport.
- Power plants, water and wastewater treatment plants, hospitals, fire stations and other critical facilities in Washoe County may store hazardous materials on site.

Recent Development Trends

- **Economic:** New businesses may increase the amount of hazardous materials coming into the region. However, industry is required to report any storage or handling of hazardous materials and comply with federal, state, and local laws governing storage, handling, and use of hazardous materials. (Unchanged Vulnerability)

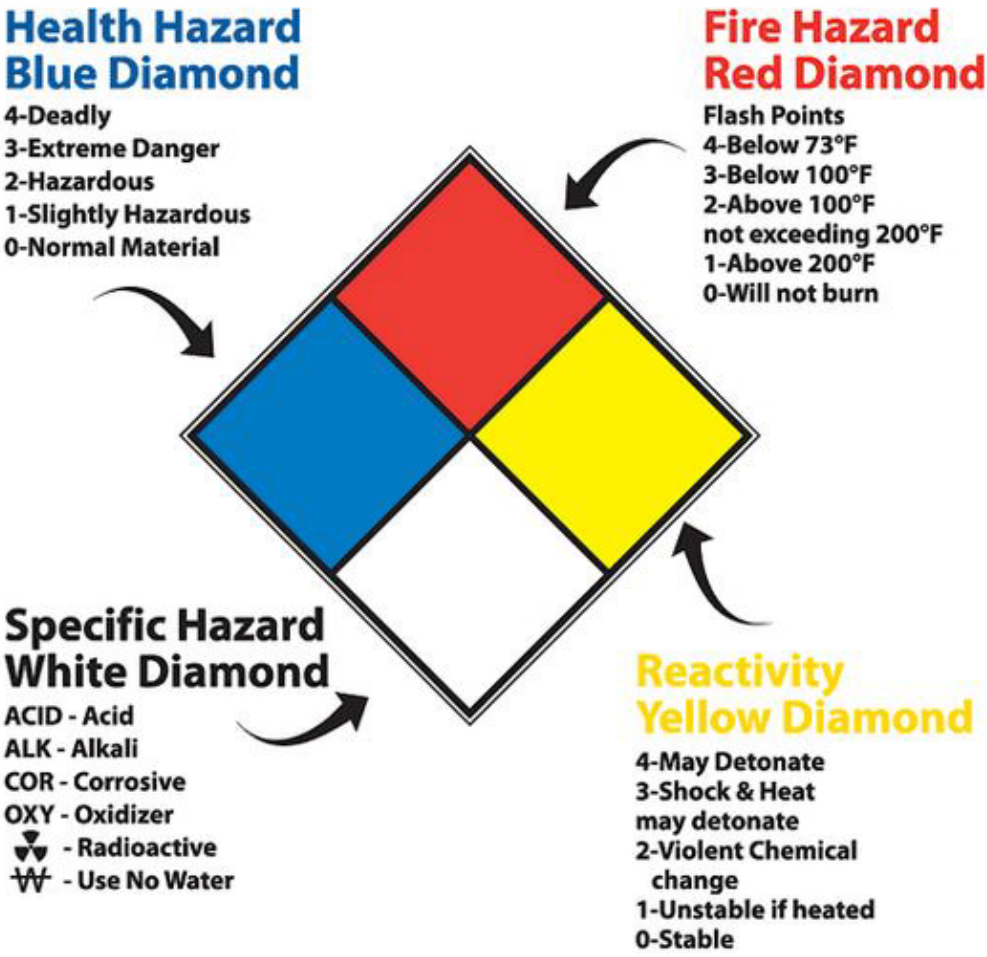
Hazardous Materials Incident

- **Land Use:** The Washoe County Development Code regulates proposed developments that would manufacture hazardous chemicals or include on-site storage for hazardous materials. (Decreased Vulnerability)

Future Land Use

Future development may increase the amount of hazardous materials coming into the region. However, new development would be subject to federal, state, and local laws that regulate the storage, handling, and use of hazardous materials, which would reduce risks associated with these materials.

Hazardous Materials Placard



Source: Environmental Safety Services 2019.

4.5.8 Drought

Drought

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
3.57	2.17	3.26	1.74	4.57		2.68	9

Hazard Description

Drought cycles consisting of successive years of low precipitation are a normal, recurrent phenomenon across the Great Basin. Drought differs from most other natural hazard events by its slow onset, gradual impact, and duration. With no defined starting period and limited long-range predictability, drought is a "creeping hazard" that may be recognized as a hazard only after it is well underway. The onset of drought involves many factors, but in Washoe County drought is generally caused by successive years of inadequate winter precipitation resulting in insufficient natural supplies to meet local demands. It is critical to note that the region depends almost exclusively on winter snowpack and rainfall for its water supply. Rains from summer thunderstorms do little to recharge reservoirs and groundwater tables.

A significant number of Washoe County water users depend on surface water supply as their primary source of water. These water users also include both residential and non-residential users. The primary surface water source for the Truckee Meadows area is the Truckee River and its tributaries, while Lake Tahoe provides surface water needed for the Incline Village/Crystal Bay area. Truckee River surface water serves as a primary water source for the Truckee Meadows Water Authority (TMWA) to serve several hydrographic basins adjacent to the Truckee Meadows basins. Drought conditions impact surface water primarily when upstream water storage is diminished becomes insufficient to provide water supply for water users. Water suppliers such as the TMWA may be required to depend more on groundwater supplies to supplement diminishing surface water supplies during drought conditions in order to meet their water supply demands. Other diverters of the Truckee River are impacted by reduced surface water availability when lower priority water right users may be "turned off" from their surface water supply.

Hydrologic conditions constituting a drought for water users in one location in the Great Basin may not constitute a drought for water users elsewhere, or for water users that have 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. The drought issue is further compounded by water rights specific to a state or region. Water is a commodity possessed under a variety of legal doctrines.

Unlike surface water from reservoirs and rivers, groundwater moves very slowly. Years may pass before a particular year's snowmelt recharges an aquifer and reaches a water well on the valley floor. Consequently, a drought-related decline in the water table may have been caused by a drought many years earlier. The impacts of a drought on the groundwater system are difficult to determine accurately and are even more difficult to predict; however, long-term monitoring of precipitation, stream flow, and water table elevations has shown that drought-related impacts are measurable and significant. For example, in 2003 the State Engineer estimated that in the Mount Rose Fan aquifer,

Drought

drought conditions resulted in 10 feet of water table decline over the prior three years (State Engineer, 2003, written communication to Washoe County Department of Water Resources).

Every resident of the region using water for domestic purposes relies on groundwater supplies to some degree. TMWA wells typically supply between 15% and 20% of annual net water production. Those wells provide water to meet summer peak demands. During extremely dry years when Truckee River water is not plentiful between June and October, the TMWA relies even more heavily on its wells to meet summer and fall peak demands. In addition to its retail customers, the TMWA provides wholesale water to the Sun Valley General Improvement District, whose only source of water is the TMWA. Other water purveyors in the region rely exclusively on groundwater to meet customer demands. All domestic well owners are solely dependent on groundwater to meet their domestic water needs.

The US Drought Monitor (USDM), produced weekly since 2000, can be used to visualize trends in drought over the region. According to the USDA, "U.S. Drought Monitor maps come out every Thursday morning at 8:30 eastern time, based on data through 7 a.m. the preceding Tuesday. The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country" (USDA Climate Hubs n.d.). The Palmer Drought Severity Index (PDSI) is one of the index values used in determining the USDM status (Table 4-10). More information on the PDSI can be found here: http://www.drought.gov/drought/content/products-current-drought-and-monitoring-drought-indicators/palmer-drought-severity-index.

Table 4-10 US Drought Monitor Drought Severity Classification

Category	Description	Ranges					
		Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (%)	USGS Weekly Streamflow (%)	Standardized Precipitation Index (SPI)	Objective Short- and Long-term Drought Indicator Blends (%)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30

Drought

D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low; some water shortages developing or imminent; voluntary water-use restrictions requested.	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed.	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/ pasture losses; widespread water shortages or restrictions.	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/ pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Source: USDM 2019

Short-term drought indicator blends focus on 1- to 3-month precipitation. Long-term blends focus on 6 to 60 months. Additional indices used, mainly during the growing season, include the USDA/National Agricultural Statics Service Topsoil Moisture, Keetch-Byram Drought Index, and NOAA/National Environmental Satellite, Data, and Information Service satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index. Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

Location

Drought affects broad regions and can include any portion of Washoe County. Historically, the southern section of the County has had a lower frequency of drought than the central and northern sections, due to extensive stored water in reservoirs in the Truckee River basin. However, low snow-pack in the Truckee River basin can result in droughts of a greater magnitude in the southern section of the County, as was experienced during drought conditions between 2012 and 2017.

Previous Occurrence/History

Washoe County is part of Nevada's Northwestern Climate Division. According to historical drought data from the National Centers for Environmental Information (formerly the National Climatic Data Center), the Northwestern division observed over 253 months from 1900 to 2018 rated as Severe Drought or higher (D2 or higher in Table 4-10, above). PDSI readings for the Northwestern Climate Division indicated Severe Drought or higher in 17.9% of reporting periods from 1900 to 2018. Between 1970 and 2018, the recurrence interval of Severe Drought was approximately every two years (NOAA NCEI 2019). Clearly, drought is a part of life in Washoe County.

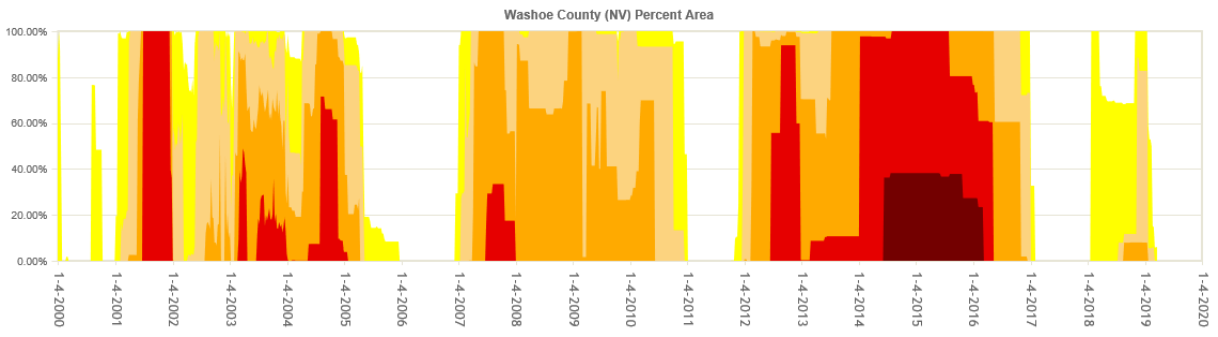
Drought

While drought conditions are frequently recorded, the TMWA Water Resources Plan notes that droughts lasting over eight years "are rare events, similar to flooding events. The estimated drought frequencies are:

- 8-year – 1 in 230 years
- 9-year – 1 in 375 years
- 10-year – 1 in 650 years" (TMWA n.d.).

According to information from the USDM, Nevada has suffered from several periods of drought since 2000. During these periods, Washoe County has suffered drought as well, as seen in Figure 4-7. Since 2000, more often than not, the County has been subject to drought and often severe or worse drought. Three pronounced but relatively brief wet periods are noted, from 2005 to 06, 2011 to 12, and in 2017, during which the region saw particularly wet/snowy winters, including major floods in December 2005 and February and March 2017. This is a clear example of the variable climate in Washoe County.

Figure 4-7 United States Drought Monitor Time Series for Washoe County



Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx

Potential Impacts from Future Climate Conditions

- Decreased snow pack and streamflows
- A shorter snow season and longer, hotter, drier summers
- Increased fuel for wildland fires
- Increased competition for water supplies
- Reduced agricultural yields and potential economic effects

Extent and Probability

The overall magnitude and potential severity of drought is considered **Low** in Washoe County. Drought may occur in any part of Washoe County. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in Washoe County are those related to water-intensive activities such as agriculture; wildland fire protection; municipal, industrial, and commercial usage; tourism; and recreation. A reduction of regional electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and reduce its ability to absorb water, potentially making an area more susceptible to flooding. An ongoing drought can impact the health of existing vegetation, which may also leave an area more prone to beetle kill and create conditions that fuel

Drought

wildland fires. Drought impacts increase with the length of a drought, as annual carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Typical events are handled at the regional level by all jurisdictions and by both public (e.g., TMWA) and private water suppliers, and can have economic impacts on the County as well as the state. Disruption of services is highly variable; in urban areas with municipal water systems and reservoir storage, disruption may be quite minimal during a typical few-year drought. In that same drought, however, disruption of water supplies to rural and agricultural communities in Washoe County may be considerable as those areas depend more on groundwater, which can be depleted quickly in drought conditions.

Considering a worst-case scenario, a decade-long drought can require federal support, impact critical facilities, disrupt water services to both urban and rural populations, and have national economic impacts. The length or nature of disruption is variable, ranging from the cessation of all agricultural production to severe water restrictions in urban communities.

Future Probability Trend – Drought is one of the least predictable hazards. The current state of seasonal weather prediction science is such that it is nearly impossible to predict well in advance the beginning or the ending of droughts with meaningful confidence levels. However, periods of drought have regularly occurred in the recent history of Washoe County and Nevada; therefore, drought can be expected to occur with some regularity in the future. Based on the assessment in the previous sections, the probability of a future severe drought event is considered **High**, with an approximately 50% chance of occurrence in any given year.

Cascading Impacts

- Communications disruptions
- Heat-borne diseases
- Water quality impacts
- Crop/wildland fire/forestry loss
- Utility failure
- Production loss
- Wildland fire

Vulnerability

The TMWA has sufficient water reserves to meet current and future regional water demands in drought years, up to and including a worst-case scenario equivalent to the 1987 to 1994 drought period, the worst drought period on record. The Truckee River Operating Agreement (TROA), implemented in 2015, now allows the TMWA to store a portion of its water allocation in reservoirs when it is not needed to meet current demand, providing more flexibility to respond to changes in climatic, hydrologic, and economic conditions. The TROA also grants the TMWA new rights to credit store water in upstream reservoirs and withdraw water from these reservoirs during drought conditions. Domestic and private well owners in East Lemmon Valley, west Pleasant Valley, Washoe Valley, Truckee Canyon, and southwest Truckee Meadows may be more vulnerable to the effects of drought due to long-term declines in groundwater levels and decreased aquifer recharge during meteorological drought conditions. Industrial facilities and utilities that rely on surface water supplies for industrial processes may also experience operational disruptions if surface water levels decrease.

Drought

The economic impacts of drought can range from crop losses and increased costs incurred by farmers and ranchers who need to buy additional water or feed for livestock to economic losses for tourism and hospitality businesses in the Lake Tahoe Basin if there is low snowpack. The effects of drought can last from one to several years, and the effects of drought are likely to be compounded the longer drought conditions last.

Existing Mitigation Case Study

The TMWA updates its water resource plan and supply strategies every five years, or as needed based on changes in water supply or other conditions, to ensure that available supplies can meet the region's water needs. The water resource plan sets out strategies to manage, develop, and use available water resources; provides direction for facility planning to ensure safe, reliable supplies of water; and identifies potential impediments that may restrict the legal use of the TMWA's water resources (TMWA n.d.).

Recent Development Trends

- **Economic:** The TROA allows the TMWA flexibility in storing and withdrawing water supplies, increasing the agency's ability to respond to hydrologic drought conditions. Economic development across the region has increased demand for water and the region's vulnerability to drought; however, the TMWA has sufficient water supplies and production facilities to meet demand through 2035. (Increased Vulnerability, but actions taken to decrease vulnerability)
- **Land Use:** Recent development across the region has resulted in increased demand for water. (Increased Vulnerability)

Future Land Use

While increased development in Washoe County will increase overall demand for water, per capita demand for water is expected to decrease over time.

4.5.9 Infectious Disease

Infectious Disease

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
2.50	2.98	2.41	2.83	3.74		2.68	10

Hazard Description

Although chronic disease has placed a lasting strain on the nation's healthcare system, acute infectious diseases are a greater immediate threat to the system's capacity. Infectious diseases may be caused by pathogenic bacteria, viruses, fungi, or parasites, and many are characterized by symptoms such as fever, diarrhea, fatigue, muscle aches, coughing and other respiratory symptoms, and rashes (Mayo Foundation for Medical Education and Research 2019). Infectious disease outbreak has the potential to paralyze socioeconomic activity and critical government functions. Various acute disease concerns are discussed below.

- Some diseases, such as Salmonella and E. coli infections, can be spread quickly through food and water sources. Though these diseases are treatable, they can lead to severe symptoms or death if not addressed quickly. Containing the spread of these diseases requires identifying and addressing the source of contamination of the food or water supply and communicating risks and safety measures to the public.
- Diseases spread through animal vectors (i.e., living organisms that can transmit infectious diseases) are constantly evolving, and diseases that were previously unknown to affect humans may evolve the ability to infect human hosts. For example, West Nile virus is an emerging pandemic that has affected communities across the country. West Nile is transmitted through mosquito bites and can be spread to birds, horses, and humans, causing severe symptoms or death.
- Diseases that affect livestock, such as West Nile virus or mad cow disease, aside from their potential to infect humans, can rapidly spread through livestock flocks or herds, sometimes requiring entire flocks/herds to be put down and causing significant financial hardship.

Many potentially devastating diseases are spread through physical contact, ingestion, insect bites, and inhalation. Airborne diseases and those spread through physical contact pose higher risks to the community because they are difficult to isolate and control. Diseases such as influenza, pertussis, tuberculosis, and meningitis are spread by these pathways and pose a significant threat to communities.

The World Health Organization monitors infectious disease conditions and their migration on a global level. In the United States, monitoring of infectious diseases is handled by the Centers for Disease Control and Prevention (CDC). On a statewide level, the Nevada Division of Public and Behavioral Health is the lead agency for the monitoring of infectious diseases. The Washoe County Health District (WCHD) is the lead local agency responsible for prevention, control, and treatment of infectious disease within the planning area. Due to the large number of tourists and travelers passing through Washoe County, highly contagious diseases can be easily spread to and from nearby communities. The WCHD's Communicable Disease Team works in conjunction with the following prevention and control programs: tuberculosis, foodborne illness, sexually transmitted disease, HIV/AIDS, vaccine-preventable diseases, and vector-borne diseases, and conducts disease surveillance in an effort to:

Infectious Disease

- Protect the health of the public
- Determine the extent of morbidity within the community
- Evaluate the risk of transmission; and
- Intervene rapidly when appropriate.

Nevada Administrative Code Chapter 441A1 identifies diseases of public health significance that must be reported to the WCHD. Persons required to report include health care providers and directors of hospitals, diagnostic laboratories, schools, child care facilities, correctional facilities, permitted food establishments, and others. In general, each report is investigated to characterize the illness, collect demographic information about the case, identify possible sources of the infection, and take steps necessary to minimize the risk of further disease transmission. Data are collected, maintained, and analyzed at the program level. For a list of reportable diseases, visit the Washoe County Health District's website at the following link: https://www.washoecounty.us/health/files/ephp/communicable-diseases/forms/Reporting%20Chart%202019-01.pdf.

Previous Occurrence/History

Selected occurrences of infectious diseases as a human health hazard in Washoe County from 2015 through 2018 are listed below:

2018 – Measles: One lab-confirmed case of measles was reported in the County in 2018. In response, the WCHD activated its Incident Command System and proactively treated, quarantined or isolated, or monitored people who had had contact with the infected person (WCHD n.d.[a]).

2018 – *Escherichia coli (E. coli)*: The WCHD identified six cases of people being infected with a superbug called *Klebsiella* pneumoniae carpapenemase (KPC)-producing *E. coli* at a state-licensed group home. The WCHD's response to this outbreak contributed to the CDC re-evaluating their recommendations for preventing the spread of similar bacteria in group home settings (WCHD n.d.[a]).

2017 – Zika: The WCHD coordinated Zika testing for 53 individuals (WCHD n.d.[b]).

2017 – Carbapenemase-producing organisms (CPO): The WCHD investigated six cases of CPO (WCHD n.d.[b]). CPO are bacteria such as Klebsiella, E. coli, Acinetobacter, and Pseudomonas that are found in normal human intestines that have acquired genes that make them resistant to broad spectrum antibiotics. CPO can spread outside the intestines and cause serious infections, such as urinary tract infections, bloodstream or wound infections, and pneumonia, that are difficult to treat due to the antibiotic resistance developed by the bacteria (BC Centre for Disease Control et al. 2014). Also in 2017, one resident of the County was diagnosed with and died from an infection of *New Delhi Metalo-Beta-Lactamase-Producing Klebsiella pneumoniae* that was resistant to all antibiotics available for treatment (WCHD n.d.[b]).

2015/2016 – Ebola: While no Ebola cases have been confirmed in Washoe County, the WCHD and partner agencies increased infectious disease preparedness efforts in response to the international Ebola outbreak. In 2015, the WCHD monitored individuals returning from countries with Ebola outbreaks, provided training and exercises for hospitals and healthcare providers, and developed a website for Point of Dispensing training (WCHD n.d.[c]). The WCHD provided personal protective equipment to first responders for use during Ebola and other highly infectious disease responses. The WCHD, regional hospitals, and REMSA designed a full-scale Ebola exercise that tested responses to

Infectious Disease

both a walk-in Emergency Room patient and a patient identified at a satellite medical facility (WCHD n.d.[d]).

2015 – Norovirus: In 2015, the WCHD investigated a large outbreak of Norovirus affecting public and private schools and daycare facilities. More than 2,000 cases were identified during this outbreak (WCHD n.d.[c]).

2015 – E. coli: An outbreak of 28 cases of E. coli resulted in hospitalization of 13 people. Five individuals developed a serious complication known as Hemolytic Uremic Syndrome (WCHD n.d.[c]).

Potential Impacts from Future Climate Conditions

- Changing climatic conditions will influence the distribution and occurrence of vector-borne diseases (Gonzalez et al. 2018).
- Infectious diseases, ground-level ozone pollution, dust storms, and changes in allergens may combine with extreme temperatures and precipitation to generate multiple disease burdens (Gonzalez et al. 2018).
- Episodes of drought and extreme precipitation coupled with rising temperatures promote growth and spread of pathogens (Gonzalez et al. 2018).

Extent and Probability

Infectious diseases spread by humans, and vector-borne infectious diseases, can occur in both urban and non-urban areas throughout the County. However, infectious diseases that are spread by humans, such as influenza, are typically more prevalent in urban areas, particularly in cities that host large numbers of tourists and travelers. Vector-borne infectious diseases, such as West Nile Virus, are typically more prevalent in non-urban areas where humans would encounter the vector.

The overall magnitude and potential severity of impacts of infectious disease outbreaks is considered **Medium** in Washoe County. Typical disease outbreaks are handled at the city or county level. Severe outbreaks may disrupt services for a period of weeks, and economic impacts may be felt at the county level.

Future Probability Trend – Cases of infectious disease occur annually in Washoe County, and the probability of future events is estimated at **Medium**. Based on potential changing climate patterns, Washoe County may be impacted by an **increase** in the probability of emerging infectious disease.

Cascading Impacts

- Loss of revenues – fear of infection or lack of workforce availability
- Bacterial mutations leading to antibiotic resistance
- Social unrest
- Transportation route closures and supply chain disruption
- Lack of food, water, and medical resources

Vulnerability

Infectious diseases have been known to spread quickly throughout communities. Many diseases spread through close contact, meaning highly populated areas like Reno and Sparks are more prone to widespread outbreaks. Public gathering places where people may be together in close quarters,

Infectious Disease

such as schools and childcare facilities, offices, and transportation terminals, provide more opportunities for diseases to pass from one person to another. Outbreaks of infectious diseases most often affect pockets of vulnerable populations. However, a worst-case scenario could overwhelm local hospitals and medical facilities and require a surge response.

Recent Development Trends

- **Economic:** Emerging infectious disease poses no new vulnerability to economic interests. (Unchanged Vulnerability)
- **Land Use:** Emerging infectious disease poses no new vulnerability. (Unchanged Vulnerability)

Future Land Use

As regional population continues to grow, there may be increased demand for emergency medical services in the event of a severe disease outbreak.

4.5.10 Avalanche and Landslide

Avalanche and Landslide

	Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
Avalanche	2.50	3.00	3.00	3.50	1.50		3.00	-
Landslide	2.00	2.57	1.87	3.91	2.17		2.59	11

Hazard Description

Avalanches are complex natural phenomena involving the interaction of weather, terrain, and mountain snowpack. Slab avalanches are the most destructive type of avalanche. They occur when a weak layer or interface allows cohesive, overlying layers of snow to break loose and slide down a steep slope. As gravity causes the original slab to accelerate, additional snow is entrained below, causing the avalanche to gain mass. Depending on the mass, density, and speed of the avalanche, enough destructive force to damage or destroy wood-frame structures can be generated. Slab avalanches can be triggered by the additional weight of 1) wind-deposited snow; 2) cornice fall; 3) smaller, loose-snow avalanches; and/or 4) human activity. Over 90% of slab avalanches initiate on slopes between 30 and 45 degrees; while 50% of slab avalanches initiate on slopes between 35 and 40 degrees. Leeward, wind-loaded slopes near the ridge tops are most likely to produce slab avalanches during and immediately following periods of heavy snowfall. Steep, east-facing slopes are most likely to produce wet-snow avalanches as solar radiation increases in the spring months. Dense trees may act to anchor the snowpack in the starting zones of avalanche slopes. Trees or other vegetation further down the slope, however, will not significantly affect the speed or direction of moving avalanche debris. The vast majority of avalanches occur during or immediately following winter storms between the months of December and March.

The slopes of the Carson Range in Washoe County contain extensive avalanche terrain. The majority of these avalanche areas only affect backcountry travelers. The slopes above Crystal Bay and the Third Creek drainage experience avalanches frequently, directly threatening homes and roads. Other slopes in the Lake Tahoe Basin along Highways 431 and 28 have been identified as avalanche areas but have yet to produce observed activity. Avalanche slopes that affect Highway 431 to the east of the summit are regularly controlled by NDOT and the Mount Rose-Ski Tahoe mountain resort. Before and during large storms, Washoe County Emergency Management will issue avalanche advisories to occupants and road crews in the Crystal Bay and Third Creek areas, depending on the degree of public risk. Avalanche advisories are issued via the Emergency Alert System or using a “reverse 911” call system. A three-stage system, the Washoe County Avalanche Call Out, has been devised to alert people within a potential avalanche area of imminent hazards that might require caution or evacuations.

Landslides (or mass movement) are caused by a combination of geological and climatological conditions. A landslide is the movement of a mass of rock, earth, or debris down a slope. Common types of landslides include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be small or very large and can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions, and human modification of the land that result in slope instability.

Avalanche and Landslide

The susceptibility of an area to landslides depends on many variables, including steepness of slope, structure and physical properties of slope materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage. Factors that directly cause a landslide include one or a combination of the following:

- Change in slope gradient or increased weight through development
- Shocks and vibrations
- Change in water content
- Weathering of rocks
- Removal of (for example, by wildland fire or through grading) or change in the type of vegetation covering slopes

Location

The geographic extent of potential avalanches is relatively small, less than 10% of the planning area. Secondary impacts such as blocked roads can affect larger areas and cause detours. Avalanche risk is highest in the steep, mountainous areas of the Carson Range of the Sierra Nevada in southwestern Washoe County. Incline Village and Crystal Bay are commonly under avalanche advisory during the winter. Mitigation measures have been proposed in the form of a snow fence to reduce the potential future avalanche occurrence. Based on information from the Sierra Avalanche Center, the Mount Rose and Rose Knobb Peak areas receive avalanche advisories more often than any other region of the County.

In Washoe County, landslides primarily occur along fractured or steep slopes (greater than 15%) or steep banks of rivers and creeks.

Previous Occurrence/History

Avalanche

Historically, avalanches occur within the County between the months of December and March, following snowstorms. Such past avalanche occurrences are listed in Table 4-11.

Table 4-11 Historic Avalanches in Washoe County

Date/Timeframe	Location	Injuries/Deaths
January 1969	Mount Rose Ski Area	0/1
1972	Mount Rose Ski Area	7/2
February 1986	Third Creek Area	None listed
December 1997	Mount Rose Highway	None listed
December 2002	Mount Rose Ski Area	None listed
March 2006	Crystal Bay Subdivision and Third Creek	None listed
2007	Mount Rose Ski Area	1/0
December 10, 2016	Mount Rose Backcountry	None listed
January 5, 2017	Mount Rose Ski Area	None listed
February 20, 2017	Mount Rose Ski Area	None listed
November 16, 2017	Mount Rose Ski Area	1/0

Avalanche and Landslide

Injuries, deaths, and the economic impacts of avalanches occurring between 2015 and 2019 are described below.

- A skier entered closed, uncontrolled terrain at Mount Rose on December 10, 2016, triggering a fatal avalanche.
- On January 5, 2017, an avalanche in the Mount Rose ski area struck two vehicles, and two backcountry skiers escaped.
- An avalanche covered Mount Rose highway with 20 inches of snow on February 20, 2017, causing the Mount Rose ski area to close the following day.
- On November 16, 2017, three skiers were partially buried in an avalanche, with one suffering minor injuries.

Landslide

Evidence of past landslides can be found throughout the County. Such events frequently follow other natural event occurrences, such as earthquakes and intense rainstorms. Some examples of past landslide events are described below:

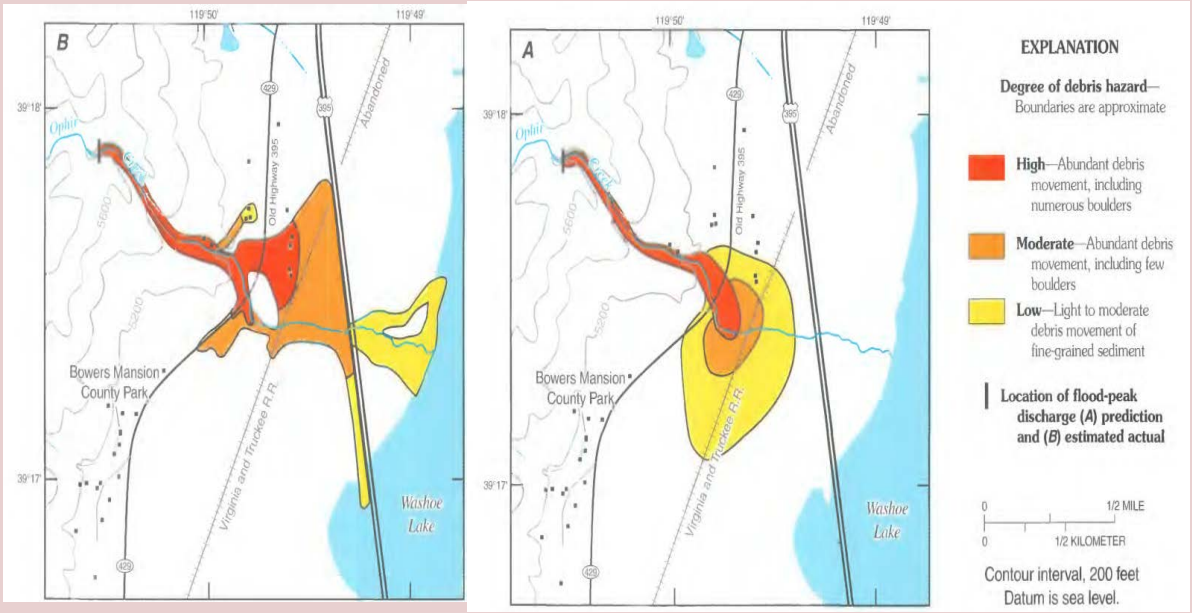
- According to the USGS, the Slide Mountain landscape shows abundant evidence of a long and continuous record of landsliding, especially large-scale rockfall avalanching. Although specific dates are unknown, investigation has revealed evidence of at least nine rockfall-avalanche and debris-flow (landslide) deposits extending from the large main scar downgradient along the axis of Ophir Creek.
- A landslide-induced flood occurred at Ophir Creek on the eastern slope of Slide Mountain in Washoe Valley on May 30, 1983. The rapidly moving flow emerged from a canyon and killed one person, injured several others, damaged 11 homes, and caused the evacuation of 5,000 people. The unusual hydraulics were the result of unseasonably hot weather, which accelerated an abnormally heavy snowpack. US Highway 395 and Freeway 395 were both closed. Figure 4-8 is a photograph showing the Slide Mountain landslide engulfing a residential home. Figure 4-9 demonstrates the degree of the debris hazards from the landslide event.

Avalanche and Landslide

Figure 4-8 Slide Mountain Photograph

Source: Unknown

Figure 4-9 Degree of Debris Hazards



Source: Washoe County 2015

Avalanche and Landslide

- A rock slide set off by a Friday night quake (April 25, 2008) was blamed for causing a 125-foot breach in a wooden flume that carried water to one of the two water treatment plants in Reno. (Washoe County 2015)
- A landslide that occurred at Mogul on the Truckee River between 1880 and 1906 was still being monitored as an active landslide as of 2014. (University of Nevada, Reno n.d., Nelson 2014)
- Landslides at the Nevada-California state line blocked all lanes of I-80 on July 2, 2013. (Washoe County 2015)

See Appendix F for additional detail.

Potential Impacts from Future Climate Conditions

- Potential for more frequent avalanches due to more extreme weather events, such as severe rainfall and snowfall that may cause an increase in unstable weight on mountains (Chiara B, Jalissa C, Anaita W 2018)
- Faster snowmelt and greater percentage of winter precipitation falling as rain may increase water content in soils on slopes
- Increased drought and fire risk will reduce vegetation, leading to slope instability

Extent and Probability

Avalanche

The overall magnitude and severity of avalanche impacts are considered **Low** throughout the entirety of Washoe County. However, avalanche impacts in the Incline Village/Crystal Bay area and the areas along Mount Rose Highway at elevations above Galena Park are considered **Medium**. Typical avalanche effects can be handled by the deployment of state, county, and local resources (e.g., Incline Village General Improvement District and North Lake Tahoe Fire Protection District). Search and Rescue efforts are supported by local volunteers organized through the County Sheriff's Office. Road clearing is generally provided via state or County resources. The duration of an avalanche's effects is usually less than three days, and the economic impact is typically contained to the immediate community affected or to the regional/local transportation network. However, considering a worst-case scenario, an avalanche might require state, County, and local level support to respond, can impact critical facilities, and can disrupt services for 4 to 7 days.

Landslide

Landslide hazard areas in Washoe County include foothill and mountain areas where fractured and steep slopes are present. These areas include the Sierra Nevada Mountains foothills just southwest of Reno, the Virginia Mountains along the western side of Pyramid Lake, the Pah Rah Range just south of Pyramid Lake, the Lake Range east of Pyramid Lake, mountain ranges to the west of Long Valley in the northwestern part of the County, and the Carson Range of the Sierra Nevada in southern Washoe County near Lake Tahoe. Small slides and slumping may occur along the steep banks of rivers and creeks. Areas where steep slopes are present are not generally heavily populated, and most are located on federal or state lands.

The overall magnitude and potential severity of impacts from a landslide is considered **Medium**.

Avalanche and Landslide

Future Probability Trend – Due to the steep mountainous terrain, high elevations, and winter snows common on the eastern slopes of the Sierra Nevada range, minor avalanches with negligible impact occur on an annual or semiannual basis in Washoe County. More severe avalanches that cause injuries, damage property, or impact roadways occur less frequently. The probability of future severe avalanche events that impact public safety, property, or infrastructure is considered **Medium**. Specific avalanche probability is monitored by the Sierra Avalanche Center, which provides forecast data to the Lake Tahoe-Sierra region at the following website: http://sierraavalanchecenter.org/index.html.

Due to the past frequency of landslides in areas of the County with steep slopes and likelihood of triggering storms, the probability of future occurrence of landslides is **Medium**. The County may be impacted by an **increase** in the probability of future landslides, based on potential increases in drought and wildland fires, as well as changes in winter precipitation.

Cascading Impacts

- Utility failure
- Economic loss
- Fatalities
- Transportation accidents
- Floods and debris flows
- Water quality impacts

Vulnerability

Mountain communities in the Lake Tahoe Basin, including Incline Village and Crystal Bay, are vulnerable to the effects of avalanches. When avalanche conditions are present, risks are highest for recreational users and others in backcountry areas who may trigger avalanches or be injured or killed by an avalanche. In addition to injuries and deaths, avalanches can damage or destroy property and utilities and cover roadways in snow. Transportation disruptions caused by avalanches or area closures due to avalanche risks can have economic impacts for ski resorts and other businesses in the Lake Tahoe Basin over a period of days to a week or more.

Landslide hazards tend to occur where the land has certain characteristics that contribute to the risk of mass movement of material, such as:

- A slope greater than 15%
- Subject to landslide activity or movement within the last 10,000 years
- Undercut banks caused by erosion through stream or wave activity
- Excavated areas creating steep slopes or undercut banks
- Excavated areas topped with fill material
- Steep channels that direct surface runoff
- The presence or potential for snow avalanches
- The presence of an alluvial fan, indicating vulnerability to flows of debris or sediments
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel

Avalanche and Landslide

Existing Mitigation Case Study

For all development in unincorporated areas of the County that is within an identified avalanche hazard area, developers must complete a geo-technical study and comply with the final recommendations of the study to reduce vulnerability to avalanches.

To address landslide hazards, the County Engineer reviews proposed developments on slopes greater than 15% to determine if a geo-technical study is required, and developers are required to comply with a study's final recommendations. Additionally, the Washoe County Building Codes (the 2018 International Building Code and 2018 International Residential Code, with the Northern Nevada Amendment package) require all development to meet building standards based on soil type.

Property

- North Lake Tahoe Fire Station 13 is located in the northern part of Incline Village, in an area susceptible to avalanches.
- 36 critical facilities within the County, including six hospitals, 20 schools, four dams, four fire stations, and two police stations, are in areas with a moderate landslide incidence, meaning that 1.5% to 15% of the area is involved in landsliding.
- Four critical facilities, including one fire station and three dams, have a moderate susceptibility to landslides due to site conditions, but a low incidence.
- 23 critical facilities, including three schools, 10 dams, and 10 fire stations, are in areas with a high landslide incidence, meaning that over 15% of the area is involved in landsliding.

Recent Development Trends

- **Economic:** The County has installed a camera system above Crystal Bay to monitor snow conditions and provide early warning of avalanches. Backcountry recreational areas and access roads may be in areas more vulnerable to landslides. Risks in these areas have not changed. (Decreased Vulnerability)
- **Land Use:** Avalanche hazard areas have been mapped near Incline Village and Crystal Bay, and development is directed away from these areas. (Decreased Vulnerability)

Future Land Use

Planned future development in the Incline Village and Crystal Bay communities will occur primarily as infill. The County reviews development proposals in these communities to identify and mitigate avalanche hazards.

County land use plans and the Washoe County Development Code include policies and regulations that apply to development on parcels with steep slopes and to grading activities that may create steep slopes. These policies and regulations will reduce potential landslide risks associated with future development in the County.

4.5.11 Transportation Incident (Aircraft Crash)

Transportation Incident (Aircraft Crash)

Probability	Magnitude	Frequency	Onset	Duration		Average	Rank
3.00	5.00	2.00	5.00	2.00		3.75	--

Hazard Description

An aircraft crash may occur for many reasons, including mechanical failure, poor weather conditions, or criminal activity. Aircraft of varying sizes are subject to this hazard, from small single-engine aircraft and gliders to helicopters and commercial jets. The damage resulting from an aircraft crash is dependent on the location of the accident (densely versus sparsely populated) and the potential for the release of hazardous materials.

Location

Washoe County has four publicly operated airports: the Reno-Tahoe International Airport (RNO), Reno-Stead Airport (RTS), and Spanish Springs Airport (N86) in Reno, and the Empire Airport (1A8) in Empire. There are also several privately operated airports throughout the County. These airports serve commercial, non-commercial, private commuter, and recreational aircraft. The greatest volume of commercial aircraft service passes through the Reno-Tahoe International Airport. Federal agencies such as the Bureau of Land Management also operate and lease airports in Nevada.

Previous Occurrence/History

The majority of aircraft crashes in Washoe County are associated with small aircraft. Recent aircraft crashes that impacted local communities are listed below:

- August 30, 2016: A single-engine Beechcraft A36 crashed into the River's Edge RV Park in Sparks. The pilot and one passenger were killed. The plane did not directly hit any RVs; however, a fire started by the crash spread into surrounding RVs and vehicles. Residents were evacuated following the crash but were allowed to return home once conditions were safe.
- September 16, 2011: *The Galloping Ghost*, a highly modified North American P-51D Mustang racing aircraft, crashed into spectators while competing at the Reno Air Races, killing the pilot and 10 people on the ground. An additional 69 people on the ground were injured. This was the third-deadliest airshow disaster in U.S. history, following accidents in 1972 in Sacramento, California, and 1951 in Flagler, Colorado.
- January 21, 1985: Galaxy Airlines Flight 203. Shortly after takeoff from Reno-Cannon International Airport (now Reno-Tahoe International Airport), the Lockheed L-188 Electra four-engine turboprop crashed about 1.5 miles from the end of the runway and burst into flames, killing all but one of the 71 passengers onboard.

Transportation Incident (Aircraft Crash)

The memorial monument for the Galaxy Airlines Flight 203 victims, located at Rancho San Rafael Regional Park in Reno. *Photo: Reno Gazette Journal, Clifton 2015*

Potential Impacts from Future Climate Conditions

- Climate change is unlikely to impact the occurrence, extent, or probability of aircraft crashes in Washoe County.

Extent and Probability

The magnitude and potential severity of impacts of an aircraft crash is considered **High** in Washoe County. It is difficult to estimate the extent or probability of the occurrence of an aircraft accident. This type of incident is most likely to occur during takeoff or landing at an airport. Aircraft crashes often result in injuries or the deaths of people in the aircraft and potentially people on the ground. Crashes can also damage or destroy structures and cause secondary hazards like fires or releases of hazardous materials. Aircraft crashes typically are handled at the local level and can disrupt transportation and business services in the local area.

Future Probability Trend – Future weather conditions have no direct connections to aircraft crashes. However, increased development and urbanization have the potential to increase the number of people on the ground that may be affected by an aircraft crash. The future probability of an aircraft crash with severe consequences on the ground is considered **Medium**.

Transportation Incident (Aircraft Crash)

Cascading Impacts

- Mass casualty
- Mental and psychological distress
- Hazardous materials release

Vulnerability

Public airports that have accepted federal assistance, including the Reno-Tahoe International Airport, are required to designate runway protection zones (RPZs) at each end of their runways to protect people and property on the ground in the event that an aircraft lands or crashes beyond the runway end. The Reno-Tahoe International Airport owns the majority of land within its RPZs in the city of Reno (Reno-Tahoe Airport Authority 2018a). Mixed commercial and residential development and commercial industrial development in the RPZs is located in areas where an aircraft crash is more likely to occur.

Reno-Stead Airport has designated airport critical areas, which are trapezoidal areas at the ends of the runways that are intended to ensure that land use is compatible with airport operations in order to reduce risks to people and property on the ground. The airport critical areas at either end of Runway 8/26 and at the south end of Runway 14/32 extend off airport property (Reno-Tahoe Airport Authority 2013). Residential areas in the County and industrial and recreational areas in the city of Reno within the airport critical areas are located in place where an aircraft crash is more likely to occur.

Aircraft crashes, particularly crashes involving small aircraft, may happen farther away from the runway in the vicinity of flight tracks. Buildings and aboveground infrastructure may be damaged or destroyed as a result of an aircraft crash. Crashes are likely to cause injury or death to the pilot and passengers on a plane and can result in injuries and deaths on the ground. Aircraft crashes are localized events and can generally be handled by local government.

Recent Development Trends

- **Economic:** The Reno-Tahoe Airport Authority's FY 2019 – 2023 Strategic Plan (2018b) calls for increasing commercial air service and cargo activities at Reno-Tahoe International Airport, which may increase the risk of an aircraft crash. (Increased Vulnerability)
- **Land Use:** Runway protection zones have been mapped at Reno-Tahoe International Airport, and airport critical areas have been mapped at Reno-Stead Airport. Development is directed away from these areas. (Decreased Vulnerability)

Future Land Use

No new development is planned in mapped runway protection zones or airport critical areas.

4.5.12 Radiological Waste Transport

Radiological Waste Transport

Hazard Description

The transportation of radiological waste and other types of radiological materials is a common practice within and through Washoe County. Washoe County roadways, railways, and airways ship different forms of radiological materials on a daily basis. Radioactive materials may be transported through Nevada if U.S. Department of Transportation hazardous materials regulations are followed. Most shipments do not require prior notification and do not follow restricted routes. If the type or quantity of radiation exceeds a "Quantity of Concern," the shipper must notify the state of the planned time and route. Radioactive Material in Quantities of Concern (RAMQC) shipments are not restricted and are not required to wait for approval. A more restricted category is Highway Route Controlled Quantity (HRCQ), which requires prior notification, and pursuant to a Governor's directive the shipment and transportation vehicle is inspected, then escorted by the Nevada Highway Patrol. These shipments occur infrequently, about once every three years, through Washoe County.

The U.S. Department of Energy (DOE) ships large quantities of low-level radioactive waste into Nevada for disposal at the Nevada National Security Site. The DOE has negotiated preferred routes for these shipments that do not cross Washoe County. Shipments could pass through Washoe County in the event of road closures on the preferred routes, but to date there are no documented cases of this happening.

The federal government initiative to establish a radiological waste storage facility at Yucca Mountain in southern Nevada brings with it the assumption that radiological waste and radioactive materials would be transported through Washoe County and that an accident involving the release of radioactive materials could occur.

Transportation of these materials is highly regulated by the DOE. Training, planning, and permitting are all provided by the DOE to help manage and mitigate the risks and hazards associated with the transportation of these materials.

Location

Radiological waste could be transported along rail systems, major airports, and highway corridors within Washoe County. The zone of potential impacts would extend beyond these transportation facilities. The size and shape of the zone of potential impacts is affected by the material released, as well as atmospheric and environmental effects such as wind speed and water flow.

Previous Occurrence/History

There is no known history of radiological waste transport spills in Washoe County.

Potential Impacts from Future Climate Conditions

There are no direct connections between transportation of radiological waste and future climate conditions.

Radiological Waste Transport

Extent and Probability

The magnitude and potential severity of impacts of a radiological waste transport incident is considered **Very High** in Washoe County. A radiological waste transport incident involving release of radioactive materials could require federal support during response, impact critical facilities and disrupt services for a period of weeks, and have nationwide economic impacts.

Future Probability Trend – Medical, construction, and traditional radiological materials, including waste, are commonly transported on major transportation routes through Washoe County. As traffic on these routes increases, the potential for a radiological waste transport incident increases. However, given the safety measures in place to prevent these incidents and the fact that no incidents have been reported in Washoe County to date, the probability of future events is estimated at **Very Low**.

Cascading Impacts

- Water quality degradation
- Public health and safety impacts
- Displacement of residents
- Transportation disruptions
- Utility disruption

Vulnerability

The MPT determined that radiological waste transport hazards have a very low probability of occurrence; therefore, these hazards are not included in the vulnerability assessment.

4.5.13 Volcano

Volcano

Hazard Description

A volcano is an opening or rupture in the earth's surface that allows ash, gases, and/or molten rock under tremendous pressure to emerge from below the surface. Volcanic activity over long time periods can either form mountains as molten rock is gradually extruded or rapidly obliterate mountains during explosive eruptions.

Depending on the type of volcano, an eruption can be among the more spectacular of natural hazard events, ejecting materials thousands of feet into the air, darkening skies, and blanketing surrounding areas with a fine powdery ash or rivers of molten lava. Due to advanced geologic and seismic monitoring techniques, warning time for major eruptions is usually measured in weeks or months, and the duration of volcanic activity typically ranges from a few weeks to a few years.

Volcanic hazards can be described based on the radius from the volcano in which they may occur. Proximal hazards like lava flows, pyroclastic flows, and lahars are considered to have an impact within a 30-mile radius. Distal hazards like eruption clouds and ash falls may impact areas further than 30 miles from the volcano.

Location

No active volcanoes are located within Washoe County. The three closest potentially active volcanoes to Washoe County are located in California. Table 4-11 indicates the approximate distances of these volcanoes from Reno.

Table 4-12 Potentially Active Volcanoes Near Washoe County

Volcano	Latitude	Longitude	Approximate Distance from Reno	Last Eruption
Mono-Inyo Craters	37° 53' N	119° 00' W	95 miles south-southeast	Between 1715 and 1865
Long Valley Caldera	37° 35' N	119° 05' W	110 miles south-southeast	1750s
Lassen Peak	40° 43' N	121° 44' W	100 miles northwest	1921
Mount Shasta	41° 36' N	121° 19' W	150 miles north-northwest	1786

Previous Occurrence/History

Table 4-12 lists the most recent eruptions of the volcanoes closest to Washoe County. The eruption of Lassen Peak in 1915 caused localized debris flows and a pyroclastic cloud that caused damage and deforestation in a 3-square-mile area and flooding and debris flows up to 10 miles from the volcano in Hat Creek. Ash fall from the eruption traveled at least 200 miles northeast to Winnemucca, Nevada. Small eruptions from the Mono Lake Craters have also sent ash into Nevada as recently as about 260 years ago.

Volcano

Potential Impacts from Future Climate Conditions

There are no direct connections between volcanic activity and future climate conditions.

Extent and Probability

The magnitude and potential severity of impacts of a volcanic eruption is considered **Medium** for Washoe County. Washoe County is close enough to the Long Valley Caldera to be impacted by ash fall less than 5 centimeters thick, based on a small to moderate sized eruption (see Figure F3-1 in Appendix F). The County could also be impacted by trace amounts of ash to ash falls of up to approximately ½ inch from an eruption of one of the Cascades volcanoes, based on the distance ash was carried from the Mount St. Helens eruption by prevailing winds (see Figure F3-2 in Appendix F). Prevailing winds would have a direct influence on the amount of ash fall the County receives following an eruption. Ash fall could significantly affect airplanes, air quality, and highway driving, as well as cause failure of combustion engines and damage to crops. State-level support may be needed to respond to volcanic eruptions, and eruptions may disrupt services and critical facilities for a period of days to a week. Eruptions could cause local economic impacts, particularly in the agricultural and transportation and distribution sectors.

Future Probability Trend – The *State of Nevada Enhanced Hazard Mitigation Plan* notes that the most likely volcanic hazard for Nevada is an eruption from the Mono-Inyo Craters in eastern California. Other volcanoes that could deposit ash in Nevada include Mount Lassen, Mount Shasta, and the Long Valley Caldera in California, as well as volcanoes in the Cascade Range in Oregon and Washington. Generally, Washoe County is situated closer to these potential volcanic events than any other county in the state.

Active volcanoes within approximately 150 miles of Reno have erupted four times in the past 304 years. This indicates a 1.3% chance of these volcanoes erupting in any given year. The probability of future occurrence with direct consequences for the planning area is therefore considered **Very Low**.

Cascading Impacts

- Disruption to transportation
- Degraded water quality
- Degraded air quality
- Economic impacts (e.g., agriculture, distribution)

Vulnerability

The MPT determined that volcanic hazards have a very low probability of occurrence; therefore, these hazards are not included in the vulnerability assessment.

4.6 Vulnerability Assessment

A vulnerability assessment estimates the extent of exposure that may result from specific hazard events of a given intensity in the HMP's planning area. The assessment provides quantitative and qualitative data to identify and prioritize mitigation actions (identified in Chapter 6). According to the DMA 2000, the vulnerability assessment should include:

- A summary of the region's vulnerability to each hazard;
- Identification of types and numbers of properties, buildings, infrastructure, and critical facilities in the identified hazard areas; and
- An estimate of the potential dollar losses to vulnerable structures and the methodology used to provide the estimate.

To improve the readability of the HMP, vulnerability assessments have been incorporated into each hazard profile within Section 4.5 and supported by further documentation in Appendix F, where appropriate.

4.6.1 Identifying Critical Infrastructure

GIS data from federal, state, and local databases was used to inform the vulnerability assessment and identify critical infrastructure. Section 4.4.2 and Appendix F1 discuss the sources and types of data used in the HMP. Data collection for the vulnerability assessment was complicated by the fact that the region has never comprehensively identified critical infrastructure; therefore, the list included in the HMP may be incomplete. Similarly, valuation information has not been compiled by the region, so valuation data was not available to be included in the vulnerability assessment. Washoe County and its partners are committed to continuing to refine and build on the list of critical infrastructure over the next five years to improve the data provided in the next plan update.

4.6.2 Asset Inventory

Regional assets that may be affected by hazards include the regional population, properties, and utilities and infrastructure. As noted in Section 4.6.1, valuation data is not available for the region's critical infrastructure. Additional data on critical infrastructure, such as date of construction, has not been compiled by the region, but will be included in future updates of the plan as this information becomes available.

4.6.3 Data Limitations

Due to a lack of data, numerous risk assessments relied on limited and/or qualitative analyses of risk. The risk assessments provided within this section used the best available data and methodologies to estimate risk. However, large gaps exist within the available datasets, and that impacted the ability to provide, with full certainty, accurate estimations of several hazard concerns. See the case study on the next page for an example of the data limitations encountered during the risk assessment.

4.6.4 Repetitive Loss Properties

Washoe County and the cities of Reno and Sparks participate in the National Flood Insurance Program (NFIP). Within the planning area, repetitive loss properties have only been reported in the city of Reno. Information on repetitive loss properties in Reno is provided in Section 3.4.3 of the Reno Jurisdictional Annex.

Case Study: Data Limitations for the Infectious Disease Risk Assessment

Discussion of previous occurrences of infectious diseases in Washoe County is limited by incomplete data. While the CDC receives a great number of communicable disease reports annually, compilation of communicable disease surveillance data in Washoe County is recognized to have the following limitations:

- "For most diseases, reported cases represent a fraction of the true number. This is because many patients with mild disease do not seek medical care. Even if they do, the health care provider may not order a test to identify the causative agent."
- "Health care providers may fail to report a case as required by law. For example, CDC estimates that there are as many as 1 million persons in the US who may be sick due to salmonellosis; however, only approximately 50,000 cases of salmonellosis are reported each year in the United States, which represents only 5% of the estimated level of illness."
- "Reported cases represent a skewed sample of the total. Severe illnesses are more likely to be reported than milder ones. Health care providers may be more likely to report contagious diseases like TB than vector-borne diseases like Lyme disease."
- "Epidemics of disease or media coverage of a particular disease can greatly increase testing and reporting rates."

With these limitations in mind, the surveillance data used in the risk assessment is useful for identifying disease trends and past outbreaks or epidemics. (WCHD n.d.[c])

4.6.5 Exposure Assessment

Impacts associated with mappable hazards are indicated in the risk assessments identified in Section 4.5 and Appendix F.

Note: Not all considered hazards can be mapped for vulnerability. Risk assessments for hazards that cannot be mapped rely upon qualitative data.

4.7 Land Use and Development Trends

FEMA	**D1.** Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

Regional economic growth and recent development are discussed briefly in Sections 3.4 and 3.5. In addition, the vulnerability subsection of each hazard profile in Section 4.5 outlines recent development trends to illustrate ways in which vulnerability may have changed over the past five years. Vulnerability changes have been measured for economic interests and land use trends. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 4-13 provides a snapshot of how vulnerability has changed since development of the 2015 HMP.

Table 4-13 Recent Development Trends

Hazard	Economic	Land Use
Wildland Fire	+	+
Flooding	+	+
Earthquake	+	-
Energy Emergency	-	+
Criminal Acts and Terrorism	-	=
Severe Storms	+	+
Hazardous Materials Incident	=	-
Drought	+/-	+
Infectious Disease	=	=
Avalanche and Landslide	-	-
Transportation Incident	+	-

Note: The MPT determined that volcanic and radiological waste transport hazards have a low probability of occurrence; therefore, these hazards are not included in the vulnerability assessment.

+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4.8 Consequence Analysis

The EMAP standard requires emergency management programs to conduct a consequence analysis for the natural and human-caused hazards that may affect participating jurisdictions. The consequence analysis considers the impact hazards may have on:

1) The public;
2) Responders;
3) Continuity of operations, including continued delivery of services;
4) Property, facilities, and infrastructure;

5) Environment;
6) Economic condition of the jurisdiction; and
7) Public confidence in the jurisdiction's governance.

The sections below present the consequence analysis for each of these areas, considering the hazards assessed in Chapter 4. Table 4-14 shows the potential (rated low, medium, or high) for each hazard included in the risk assessment to result in severe or catastrophic consequences across the region.

4.8.1 Public

Vulnerable populations in Washoe County, including rural, economically disadvantaged communities; children and the elderly; and those with access and functional needs may experience the effects of a disaster more severely and for a longer time than the general population. While some hazards the County faces, including avalanches and landslides, tend to occur in more remote, sparsely populated areas, other hazards such as wildland fires, flooding, and earthquakes, have the potential to be widespread and severe. Wildland fires, flooding, and earthquakes can result in injuries and deaths, displace large numbers of people from their homes, and destroy property. Major disasters can cause cascading effects like stress and depression, loss of income and economic losses, and increased exposure to diseases as a result of unhygienic conditions. Other disasters included in Table 4-14 can be similarly widespread but are less likely to occur or to result in catastrophic consequences.

4.8.2 Responders

The County takes a regional approach to responding to disasters, and the County and its partners maintain mutual aid agreements to assist responders if a disaster overwhelms local resources. Existing mutual aid agreements would be sufficient to respond to the types of disasters that may occur in the region. Hazards that may require activation of mutual aid agreements have been rated as Medium in Table 4-14. High risk hazards do have the potential to overwhelm intra-state mutual aid agreements and would require Emergency Management Assistance Compact (EMAC) and federal assistance.

4.8.3 Continuity of Operations

The County and its regional partners update their continuity of operations plans on an annual basis in the event that government facilities or agencies are impacted by a disaster. These plans would be implemented as needed following a disaster to ensure agencies are able to continue to operate and provide services. Private sector businesses are encouraged to develop their own business continuity plans to minimize disruptions following a disaster. Many hazards that occur in Washoe County are not likely to result in catastrophic consequences to continuity of operations. However, hazards such as wildland fires, flooding, earthquakes, energy emergencies, and severe storms can disrupt operations for a period of hours to weeks as a result of damage to or disruption of facilities, supporting infrastructure like roads and electrical infrastructure, or effects on the workforce.

4.8.4 Property, Facilities, and Infrastructure

Section 4.5 and Appendix F provide information on the potential impacts of hazards to critical facilities in the County. While many hazards that occur in the County have a low potential to cause catastrophic

damage to facilities, wildland fires, flooding, and earthquakes, can and have in the past resulted in widespread, severe damage to properties, facilities, and infrastructure. Existing hazard mitigation programs that are being implemented by the County and its partners, including the Truckee River Flood Management Project, adoption and enforcement of current international fire codes, and local programs to identify and retrofit unreinforced masonry buildings are intended to reduce risk to properties, facilities, and infrastructure across the region.

4.8.5 Environment

Many hazards can result in short- or long-term changes in the environment or degradation of the quality of air, water, soils, and natural habitats. Wildland fires, flooding, and drought in particular may result in severe consequences for environmental resources. Catastrophic wildland fires can transform habitats, making them more fire prone, and result in loss of soils. Flooding can have long-term impacts on water quality when pollutants run off into rivers and streams. Like wildland fires, drought can transform habitat and cause die-offs of plants and animals.

4.8.6 Economic Conditions

Washoe County's economy is diversifying, and the region is attracting new logistics, technology, and warehousing employers who are constructing facilities in the cities of Reno and Sparks. A disaster or emergency event like a flood or earthquake that damaged casinos and hotels in downtown Reno and Sparks, transportation infrastructure, and other businesses would be most likely to result in severe economic consequences. A significant criminal or terrorist act could also result in economic consequences if people cancel planned visits to the Reno area because of safety concerns.

4.8.7 Public Confidence

Public confidence is linked to the government's response to a major disaster or emergency event. The hazards that are most likely to affect public confidence in the government are those that are most likely to result in widespread, severe consequences to the public, including wildland fires, flooding, and earthquakes. Other events that are highly visible, such as criminal or terrorist acts or large hazardous materials incidents or transportation incidents, also can affect public confidence in the government. Washoe County and its regional partners regularly plan for and exercise response operations and coordinate public messaging during disaster response to ensure risks to the public are minimized and public information is timely and accurate.

Table 4-14 Consequence Analysis Summary

Hazard	Public	Responders	Continuity of Operations	Property, Facilities, and Infrastructure	Environment	Economic Conditions	Public Confidence
Wildland Fire	High	Medium	Medium	High	High	Medium	High
Flooding	High	Medium	High	High	High	High	High
Earthquake	High	Medium	High	High	Medium	High	High

Hazard	Public	Responders	Continuity of Operations	Property, Facilities, and Infrastructure	Environment	Economic Conditions	Public Confidence
Energy Emergency	Medium	Medium	Medium	Medium	Low	Medium	Medium
Criminal Acts and Terrorism	Medium	Medium	Medium	Medium	Low	Medium	Medium
Severe Storms	Medium	Medium	Medium	Low	Low	Medium	Medium
Hazardous Materials Incident	Low	Low	Low	Medium	Medium	Low	Medium
Drought	Medium	Low	Low	Medium	High	Medium	Medium
Infectious Disease	Medium	Medium	Medium	Low	Low	Medium	Medium
Avalanche and Landslide	Low	Low	Low	Low	Low	Low	Low
Transportation Incident	Low	Low	Low	Low	Low	Low	Low
Radiological Waste Transport	Low	Low	Low	Low	Low	Low	Low
Volcano	Low	Low	Low	Low	Low	Low	Low

5 CAPABILITY ASSESSMENT

Chapter 5 identifies the County's existing mitigation capabilities. These are the plans and policies, programs, and projects that are currently in place to reduce the County's vulnerability to hazards. It also includes key mitigation accomplishments that have been completed since the last plan update in 2012. As mitigation actions identified in the County's mitigation strategy (Chapter 6) are completed, they become new mitigation capabilities.

FEMA	**C1.** Does the plan document [Washoe County's] existing authorities, policies, programs, and resources, and its ability to expand on an improve these existing policies and programs? (Requirement §201.6(c)(3))

5.1 General

The County and its partners will implement the mitigation strategy through a number of internal and external capabilities. These human, financial, and regulatory capabilities form the baseline for the County's ability to reduce known risks. The HMP Basic Plan only addresses capabilities of the County government.

Refer to the Jurisdictional Annexes for complete capability assessments for each regional partner.

5.2 Human and Technical Resources

Table 5-1 describes the County's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 5-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
County Manager	County Manager's Office	Ensure that the mitigation program is incorporated into the County's daily business
Emergency Manager	Office of Emergency Management and Homeland Security	Oversee the mitigation program and encourage integration of mitigation planning into all County activities
Director of Planning and Building	Planning & Building Division	Integrate hazard mitigation into land use planning and enforce County building codes
Division Director	Engineering & Capital Projects Division	Plan and oversee the County's capital improvement projects and review proposed private development projects
Park Operations Superintendent	Parks and Open Space Division	Manage natural, historical, and cultural resources within County-owned parks and open space
Public Works Director	Community Services Department	Repair and maintain County infrastructure
Regional Services Manager	Technology Services Department	Integrate hazard data into the County's GIS applications and maps

Table 5-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Other		
Planners or engineers	Community Services; Project Planning Team	Integrate risk assessments and mitigation tactics into ongoing County projects
Construction professionals	Community Services Department	Manage structural mitigation activities for utility services
Washoe County Local Emergency Planning Committee	-	Plans for and assures resources are available to respond to hazardous materials incidents
Public-Private Partnerships	Multiple	Integrate hazard mitigation principles into siting, construction, and maintenance of private infrastructure, such as NV Energy's electric transmission and distribution system
Hazardous Materials Planning	Fire Protection Districts	Develop capacity for local jurisdictions to prepare for and respond to hazardous materials incidents

CAPABILITY HIGHLIGHT

Washoe County and the cities of Reno and Sparks partnered together to build and operate a Regional Emergency Operations Center (REOC), located on Spectrum Boulevard in Reno. The REOC provides a single, permanently established and ready to operate EOC location from which to provide emergency management services in support of jurisdictional emergencies or larger regional emergencies or disasters. The goal of the REOC is to provide a single, secure, and safe location for partner agencies to:

- Support public safety personnel and Incident Commanders in the field;
- Determine situational status;
- Coordinate and collaborate on response strategies and activities; and
- Make critical decisions and initiate policy-level support for critical decisions when needed during emergency and disaster situations.

5.3 Financial Resources

The County maintains many fiscal and financial resources to support its mitigation program. Table 5-2 identifies specific resources accessible for use.

Table 5-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes, Washoe County is self-insured.
User fees for utility services	Yes, through Utility Division
Incur debt	Yes
State-sponsored grant programs	Yes

Table 5-3 identifies current and potential local, federal, state, and other sources of funding to implement identified mitigation actions contained within the HMP. As a local government, Washoe County can access federal funding through the State of Nevada.

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Washoe County		
General Fund	Office of the County Manager	Funding available for mitigation efforts supporting government-wide projects and activities.
Capital Project Funds	Office of the County Manager	Funding available for capital projects, including improvement or expansion of parks and open space and regional capital projects.
Water Resources Fund	Department of Water Resources	Funding available for capital improvements to the County's water and wastewater systems and for flooding control.
Truckee River Flood Management Infrastructure Fund	Office of the County Manager	Funding appropriated for the Truckee River Flood Management Project.
Department Funding	Specific Departments	Funding available for mitigation efforts of a specific department.
Private Funding	Private Businesses	Funding controlled by private businesses that may be available for mitigation efforts that strengthen private infrastructure and produce co-benefits for the public
Federal		
Pre-Disaster Mitigation Program	Nevada Division of Emergency Management	Provides funding to develop hazard mitigation plans and implement mitigation actions contained within.
Hazard Mitigation Grant Program	Nevada Division of Emergency Management	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	Nevada Division of Emergency Management	Provides funds for flooding mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development/Governor's Office of Economic Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Nevada Division of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	Nevada Division of Emergency Management	Provides funding to support development of the flooding hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program.
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program/ Nevada Resiliency Advisory Committee/ Nevada Division of Emergency Management	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
State Fire Assistance Program	U.S. Forest Service/ Nevada Division of Forestry	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
State		
Emergency Assistance Account	Nevada Division of Emergency Management	Provides support to state agencies and local jurisdictions during declared emergencies at the state or local level.
Disaster Relief Account	Interim Finance Committee	Special account intended to stabilize the operation of the state government following a disaster. Used to match federal funding for declared disasters.
Wildfire Emergency and Mitigation Funds	Nevada Division of Forestry/ Nevada Division of Emergency Management	Administers funding from FEMA, Bureau of Land Management, and U.S. Forest Service for certain types of wildland fire emergency and mitigation funding.
Earthquake Mitigation Funds	Nevada Resiliency Advisory Committee/ Nevada Division of Emergency Management	Allocates FEMA money for earthquake mitigation efforts.
Conservation Reserve Program	U.S. Department of Agriculture Farm Service Agency and Natural Resource Conservation Service	Retires eligible cropland from agricultural production and plans the land with permanent grass cover to reduce wind erosion and dust hazards.
University of Nevada, Reno partnership with the USGS National Landslide Hazards Program	U.S. Geological Survey/University of Nevada, Reno	Conducts studies of landslide hazards.
Western States Fire Managers Grants	U.S. Forest Service/ Nevada Division of Forestry	Provides funding for fuel reduction, restoration of fire adapted ecosystems, prevention education, and community wildland fire protection planning.
Landscape Scale Restoration Grants	U.S. Forest Service/ Nevada Division of Forestry	Provides funding for projects that cross property ownership, management and/or jurisdictional boundaries and involve collaborative efforts among multiple stakeholders to address issues identified in Nevada's Forest Action Plan.
Hazardous Fuels-Community Protection Grants	U.S. Forest Service/ Nevada Division of Forestry	Provides funding for priority fuels management projects identified in a Community Wildfire Protection Plan that are adjacent to a recent, current, or planned project on U.S. Forest Service lands.
Regional Conservation Partnership Program	U.S. Forest Service/ Nevada Division of Forestry	Provides grant funds for wildland fire restoration and other sagebrush ecosystem improvements; riparian improvements; prescribed, targeted, or deferred grazing; and brush management.
Nevada State General Fund	Nevada State Legislature	Nevada State General Fund money is used to pay the labor costs of state employees working to support statewide and local

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
		hazard mitigation activities and as non-federal cost share for federally funded projects.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.

5.4 Legal and Regulatory Resources

Table 5-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2015-2019)	Hazard Mitigated
Plans	Washoe County Master Plan	Guides provision of all County services, capital improvements, and future development through 2030.	▪ Continued plan implementation	All Natural Hazards
	Washoe County Regional Emergency Operations Plan	Outlines roles and responsibilities of County and city governments in mitigating potential hazards.	▪ Plan updated to incorporate new changes in risk	All
	Nevada Community Wildfire Risk/Hazard Assessment Project, North Lake Tahoe Fire Protection District	Assesses fire hazard conditions near communities in the Lake Tahoe Basin and recommends strategies to reduce risk and manage fuels.	▪ Continued plan implementation	Wildland Fire
	Nevada Community Wildfire Risk/Hazard Assessment Project, Washoe County	Assesses fire hazard conditions near Washoe County communities and recommends strategies to reduce risk and manage fuels. This plan serves as the County's Community Wildfire Protection Plan (CWPP), along with the Landscape-scale Wildland Fire Risk/Hazard/Value Assessment.	▪ Continued plan implementation	Wildland Fire

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2015-2019)	Hazard Mitigated
	Landscape-scale Wildland Fire Risk/Hazard/Value Assessment, Washoe County, Nevada	Assesses wildland fire hazards in areas of Washoe County north of Pyramid Lake and provides guidance for determining mitigation priorities and implementing effective fuels reduction projects. This plan serves as the County's CWPP, along with the Nevada Community Wildfire Risk/Hazard Assessment Project for Washoe County.	▪ Continued plan implementation	Wildland Fire
	Truckee River Flood Management Authority Flood Protection Plan	Describes the project elements of the Flood Protection Plan that will be implemented to reduce the impacts of flooding in the Truckee River watershed.	▪ Plan updated in 2015	Flooding
	Washoe County Regional Flood Response Action Plan	Provides a concept of operations for regional response to and recovery from flooding events.	▪ Plan developed in 2018	Flooding
	Public Health Emergency Preparedness Plans	Directs regional response actions to reduce Washoe County's vulnerability to public health incidents.	▪ Three-day mass casualty incident exercise completed in 2019	Criminal Acts and Terrorism Infectious Disease Hazardous Materials Incident Radiological Waste Transport
	2012 Truckee Meadows Regional Plan	Guides future development in Washoe County, including the cities of Reno and Sparks, over a 20-year planning period. Defines the Truckee Meadows Service Area, within which municipal services and infrastructure will be provided.	▪ 2019 update in progress	All
	Northern Nevada Water Planning Commission Comprehensive Regional Water Management Plan (2017 – 2035)	Provides policy-level guidance targeted toward issues affecting municipal and industrial water supply, water quality, sanitary sewerage, sewage treatment, storm water drainage, and flooding control.	▪ Plan adopted in 2017	Flooding

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2015-2019)	Hazard Mitigated
	State of Nevada Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Plan updated in 2018 ▪ Collaboration between state and local communities	All
Policies	Development Code	Regulates land use and development in unincorporated areas of the County, including hazard areas such as steep slopes, high risk fire areas, and flooding hazard areas.	▪ Revised to include updated regulations	All
	Fire Code	Regulates development within the jurisdiction of the Truckee Meadows Fire Protection District to reduce fire risks.	▪ Adopted 2018 International Fire Code	Wildland Fire
	Subdivision Regulations	Includes design standards for subdivisions and roads, including standards for drainage.	▪ Revised to include updated regulations	Flooding Winter Storm
	Special Purpose Ordinances (Flood Hazards, Storm Drainage Standards, Hillside Development)	Establishes standards for development in hazard areas to protect property from damage.	▪ Revised to include updated regulations	Flooding Winter Storm Earthquake Landslide
Programs	Mutual Aid Agreements	Standing agreements to provide support to partners in times of need.	▪ Increased capacity and capability through partnership	All
	Public-Private Partnerships	Partnerships with private industry to accomplish mitigation strategies.	▪ Established partnership with NV Energy for fuels management and other mitigation activities	Wildland Fire
	Stormwater Management Program	Maintains the County's stormwater drainage system.	▪ Continued program implementation ▪ Projects completed include the Steamboat Ditch detention basins, Eastern Incline Village storm drainage and detention basins, and repair of Little Washoe Lake dam.	Flooding Winter Storm

5.5 FEMA Funded Hazard Mitigation Projects

Washoe County has received funding for previous hazard mitigation projects, including the planning effort to complete the 2019 update of the Regional HMP and study additional mitigation actions to address closed-basin flooding (Washoe County 2018). Table 5-5 outlines potential funding sources available to local jurisdictions with a FEMA-approved HMP.

Table 5-5 Mitigation Plan Requirement for Governments Applying for Certain FEMA Grants

Enabling Legislation	FEMA Assistance Program	Is a Mitigation Plan Required?	
		State Applicant	Local Sub-Applicant
Stafford Act	Individual Assistance (IA)	No	No
	Public Assistance (PA) Categories A and B (e.g., debris removal, emergency protective measures)	No	No
	Public Assistance (PA) Categories C through G (e.g., repairs to damaged infrastructure, publicly owned buildings)	Yes	No
	Fire Mitigation Assistance Grants (FMAG)	Yes	No
	Hazard Mitigation Grant Program (HMGP)planning grant	Yes	No
	Hazard Mitigation Grant Program (HMGP) project grant	Yes	Yes
	Pre-Disaster Mitigation (PDM) planning grant	No	No
	Pre-Disaster Mitigation (PDM) project grant	Yes	Yes
National Flood Insurance Act	Flood Mitigation Assistance (FMA) planning grant	Yes	No
	Flood Mitigation Assistance (FMA) project grant	Yes	Yes

5.6 Continuity of Operations Planning

Continuity of government and continuity of operations planning is an integral piece to any mitigation program. Ensuring that partner agencies have the ability to operate following an incident immediately mitigates the magnitude of many hazards. The region has contract support for continuity of operations planning. All partners participate in this program, and plans are updated on an annual basis.

5.7 Coordination with Community Partners

The Washoe County Emergency Management and Homeland Security Office recognizes that disasters do not occur within jurisdictional boundaries and takes a regional approach to planning for, mitigating, responding to, and recovering from disasters. The County collaborates with the community partners listed below and members of the public on an ongoing basis.

- **Education**
  - Washoe County School District
  - University of Nevada, Reno
  - Truckee Meadows Community College
  - Sierra Nevada College at Lake Tahoe
  - Numerous additional schools in the County

- **Business and Industry**
  - Local Chambers of Commerce
  - Reno-Sparks Convention and Visitors Authority
- **Healthcare**
  - Renown Health
  - Washoe County Health District
  - Washoe County District Board of Health
- **Regional and Private Utilities**
  - NV Energy
  - Truckee Meadows Water Authority
  - AT&T
  - Charter Communications
  - Various internet providers
- **Transportation**
  - Regional Transportation Commission
  - Nevada Department of Transportation

5.8 National Flood Insurance Program Participation

FEMA	**C2.** Does the Plan address [Washoe County's] participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3))

The County participates in the NFIP and has the following policy inputs:

Total Losses	Closed Losses	Open Losses	Losses Closed Without Payment (CWOP)	Total Payments
261	179	0	82	$4,759,270.45

5.9 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the County's daily operations and ongoing planning activities is a priority of the County's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an "emergency services" function and building ownership of mitigation activities across the organization;
- Reduction in duplication or contradiction across regional plans; and
- Maximization of planning resources through linked or integrated planning efforts.

The County is encouraged to consider integration actions into planning mechanisms, including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

5.9.1 Existing Plans

FEMA	**C6.** Does the Plan describe a process by which [Washoe County] will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation, and the County will work with plan owners and stakeholders when these plans are updated to consider hazard mitigation data and principles and ensure plans align with the HMP.

Table 5-6 Existing Plans for Integration with Hazard Mitigation

Plan	Description
Washoe County Master Plan	The County's Master Plan serves to direct growth and development in unincorporated areas of the County in a way that minimizes negative environmental, social, and fiscal impacts. The plan includes County land use and development policies, growth forecasts, and standards for construction of new public services and facilities. Goals in the plan related to hazard mitigation include, but are not limited to: ▪ Regulate or mitigate development to protect environmentally sensitive and/or critical land, water, and wildlife resources that present development hazards or serve highly valuable ecological functions. ▪ Regulate development in hillside and mountainous areas to mitigate drainage, erosion, siltation, and landslide problems. ▪ Incorporate technical information on geologic hazards into the land use planning and development processes. ▪ Conduct development in such a way that the threat of wildland fires is reduced. ▪ Regulate development to protect floodplains. It is anticipated that future updates of the Master Plan will reflect mitigation strategies and actions recommended in the current HMP.
Washoe County Regional Emergency Operations Plan (REOP)	The REOP provides an all-hazard approach to responding to emergencies and disasters in the community. The plan integrates concepts from all phases of emergency management, including mitigation and prevention, preparedness, response and recovery. The plan integrates the following hazard mitigation strategies: ▪ Integrate with statewide and local-level hazard mitigation plans ▪ Address accessing mitigation grant and insurance programs, including the National Flood Insurance Program ▪ Prioritize the prevention and mitigation of major property damage ▪ Utilize the recovery period to institute and invest in mitigation strategies

Table 5-6 Existing Plans for Integration with Hazard Mitigation

Plan	Description
Washoe County Capital Improvements Program (CIP)	The CIP is a five-year plan for maintaining existing County infrastructure and building or acquiring new facilities to meet increased demand, comply with legal requirements, or address health and safety issues. The County will integrate hazard mitigation strategies into the capital improvement planning process by taking hazard risks and vulnerabilities into consideration when siting and designing capital projects, updating the CIP to include high priority infrastructure projects identified in the HMP, and developing new infrastructure projects to address emerging hazards during the 5-year hazard mitigation planning period.
County-wide Parks Master Plan	The County is in the process of developing a countywide Parks Master Plan. Mitigation strategies, including maintaining vegetation on County-owned parks and open spaces to reduce fire risks, could be included in this plan based on the recommendations of the HMP.

Integration of mitigation actions into existing plans and day-to-day operations is also a priority at the community level. All communities in Washoe County are encouraged to consider integration actions into planning mechanisms, such as:

- Operating and capital improvement budgets
- Building and zoning ordinances
- Comprehensive land use plan
- Municipal ordinances
- Emergency response plans
- Local school service projects
- Economic development plans.

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6 MITIGATION STRATEGY

6.1 General

Chapter 6 describes the County's mitigation strategy, which is the primary focus of the County's mitigation planning efforts. This strategy represents the blueprint for the approach chosen by the County to reduce or prevent losses flowing from the hazards identified in Chapter 4.

The strategy is made up of three main required components: mitigation goals and objectives, mitigation actions, and a mitigation action plan for implementation (see Figure 6-1). These components provide the framework to identify, prioritize, and implement actions to reduce risk from hazards.

Figure 6-1 Mitigation Strategy Process

6.2 Mitigation Goals and Objectives

FEMA	**C3.** Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))

Mitigation goals are intended to represent what the County and its partners seek to achieve through mitigation plan implementation. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. The MPT reviewed the goals from the 2015 HMP update and determined that they needed to significantly reframe the goals for the 2019 update to improve their ability to implement the mitigation strategy.

The 2020 update of the HMP has been expanded to include objectives under each of the six goals. Objectives were created by members of the planning team and define the desired results of the mitigation actions identified in the HMP.

The County and its partners have identified the following goals and objectives for the 2020 update of the HMP:

- **Goal 1:** Maintain and expand transportation routes across the County, during and after key hazard events.
  - **Objective 1.1:** Establish and maintain evacuation routes.
  - **Objective 1.2:** Plan for continuity of operations of critical transportation facilities in the county in the event of a disaster or emergency.
  - **Objective 1.3:** Address risks of damage to high priority bridges identified by the TRFMA from flooding through stabilization, repair, or replacement.
- **Goal 2:** Maintain emergency services capabilities by providing redundancy.
  - **Objective 2.1:** Provide redundant lifeline utilities and services to allow medical and emergency response services to continue to operate following a disaster or emergency.
  - **Objective 2.2:** Establish evacuation centers and provide redundant lifeline utilities to serve communities at risk from wildland fires or flooding.
- **Goal 3:** Maintain key communications to ensure connectivity during and after key hazard events.
  - **Objective 3.1:** Provide methods for notification, warning, and emergency communications.
  - **Objective 3.2:** Establish emergency operations centers (EOCs) to serve communities without an EOC.
  - **Objective 3.3:** Harden electrical infrastructure in moderate to high risk areas for wildland fire.
  - **Objective 3.4:** Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County prior to transport of radiological waste.
  - **Objective 3.5:** Develop a response plan for clean-up and disposal of ash fall from a volcanic eruption.
- **Goal 4:** Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events.
  - **Objective 4.1:** Provide redundant or hardened utility lifelines to areas at risk of energy emergencies, loss of communications, or loss of service.
  - **Objective 4.2:** Identify vulnerable facilities and establish procedures for clean-up and disposal of ash fall from a volcanic eruption in order to minimize risk to lifeline utilities.
- **Goal 5:** Minimize property damage and reduce repetitive losses to property from key hazards.
  - **Objective 5.1:** Provide additional emergency services resources to reduce response times.
  - **Objective 5.2:** Adopt current international building and fire codes.
  - **Objective 5.3:** Develop plans and provide resources to reduce risk in moderate to high risk areas for wildland fire.
  - **Objective 5.4:** Update flood maps to incorporate changes in conditions and flood risk.
  - **Objective 5.5:** Complete improvements to storm water drainage infrastructure to address areas of localized flooding or insufficient capacity.

- **Objective 5.6:** Standardize Emergency Action Plans for dams in the city of Sparks.
- **Objective 5.7:** Complete infrastructure improvements identified as part of the Truckee River Flood Management Project.
- **Objective 5.8:** Elevate or mitigate flood risks to homes in neighborhoods identified by the TRFMA as being at a high risk of flooding.
- **Objective 5.9:** Identify and complete retrofits to unreinforced masonry buildings and other facilities at increased risk of damage from earthquakes.
- **Objective 5.10:** Implement measures to prepare first responders for active shooter incidents or acts of terrorism.
- **Objective 5.11:** Purchase equipment to minimize the risk of and protect emergency responders in the event of criminal acts or terrorism.
- **Objective 5.12:** Purchase additional equipment to perform immediate containment of hazardous materials spills.
- **Objective 5.13:** Address risks to properties within the runway protection zones at Reno-Tahoe International Airport and airport critical areas at Reno-Stead Airport.

- **Goal 6:** Increase public participation and responsibility in reducing their risks.
  - **Objective 6.1:** Educate members of the public on hazards that may affect their communities.
  - **Objective 6.2:** Provide building requirements and standards to guide property owners and developers in reducing risk.
  - **Objective 6.3:** Provide resources to involve residents in disaster preparedness, response, and recovery.

6.3 Mitigation Actions

FEMA	**C4.** Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for [Washoe County] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii) and §201.6(c)(3)(iv))

A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementation of mitigation actions helps achieve the region's mitigation goals and reduce vulnerability to the threats and hazards identified in the plan. Mitigation plan regulations require the County and its partners to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts identified in the County's risk assessment.

6.3.1 Review of 2015 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2015 plan were evaluated to determine the status of the action and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The

MPT worked through each previous action in advance of and during MPT Meeting #4 to document steps taken to fulfill the action.

See Appendix A for an overview of the status of all actions from the 2015 plan update.

6.3.2 Identification and Analysis of Mitigation Actions

In order to achieve the mitigation goals identified above, the County and its partners have identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities, which are indicated in Table 6-1:

- **Plans and Regulations**: Regulatory actions or planning processes that reduce vulnerability to hazards.
- **Infrastructure/Capital Project**: Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area.
- **Natural Systems Protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.
- **Preparedness and Response**: Actions that protect people and property during and immediately after a hazard or hazard event.

Table 6-1 2020 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	MH-2, MH-3, MH-6, WF-1, WF-2, WF-4, WF-7, WF-8, WF-13, WF-16, WF-21, FL-2, FL-3, FL-17, FL-19, FL-53, EQ-3, EQ-4, EE-1, DT-1, ID-1, RW-1, VC-1
Infrastructure/Capital Project	MH-5, MH-10, MH-11, MH-12, MH-13, MH-14, MH-15, WF-18, WF-23 – WF-25, WF-28 – WF-30, FL-3, FL-4, FL-6, FL-7, FL-8, FL-9, FL-10, FL-11 - FL-16, FL-18 - FL-52, FL-54 – FL-66, EQ-3 - EQ-10, EQ-12, EQ-14, EE-2 - EE-4, CA-1, CA-3, DT-1, DT-3, ID-1, TI-1
Natural System Protection	WF-9, WF-10, FL-6
Education and Awareness	MH-1, MH-16, WF-1, WF-2, WF-6, WF-17, WF-20, FL-5, FL-54, EQ-1, EQ-4, CA-1, DT-2, ID-1, AL-1
Preparedness and Response	MH-4, MH-7, MH-8 - MH-10, MH-16, MH-17, WF-1, WF-3, WF-4 - WF-6, WF-11, WF-12, WF-14 - WF-17, WF-19, WF-22, WF-26, WF-27, FL-1, FL-17, FL-18, EQ-2, EQ-4, EQ-9, EQ-11, EQ-13, EE-1, EE-5, CA-1, CA-2, SW-1, SS-2, HM-1, DT-1, RW-1

Mitigation actions identified for most hazards are addressed in the mitigation implementation plan provided in Section 6.5. The actions include both short- and long-term strategies for reducing vulnerability to hazards and are characterized as such in the "life of action" section of the worksheet for each

mitigation action (see Appendix A). Mitigation actions identified for closed-basin flooding are discussed in detail in Appendix B and therefore are not included in the Basic Plan.

6.3.3 2020 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 6-2 indicates which mitigation actions address which hazards.

Table 6-2 2020 Mitigation Actions by Hazard

Hazard	Related Mitigation Actions
Multiple Hazards	MH-1 – MH-17
Wildland Fire	WF-1 – WF-30, EE-2, EE-3
Flooding	WF-28, FL-1 – FL-66, EE-2, EE-3 (*Note: Closed-basin flooding strategies are included in Appendix B.*)
Earthquake	WF-1, EQ-1 – EQ-14, EE-2, EE-3
Energy Emergency	FL-15, EE-1 – EE-5
Criminal Acts and Terrorism	CA-1 – CA-3
Severe Storms	WF-24, WF-26, WF-28, WF-30, EQ-4, EE-2, EE-3, SS-1, SS-2
Hazardous Materials Incident	WF-1, WF-7, HM-1
Drought	DT-1 – DT-3
Infectious Disease	ID-1
Avalanche and Landslide	FL-6, AL-1
Transportation Incident (Aircraft Crash)	TI-1
Radiological Waste Transport	RW-1
Volcano	VC-1

6.4 Evaluating and Prioritizing Mitigation Actions

During and following MPT Meeting #3, members of MPT completed a worksheet for each identified mitigation action that included the following summary information shown in Table 6-3.

Table 6-3 Summary information for Mitigation Action

Description of the Action	***Specific*** – Target a specific area for improvement. ***Measurable*** – Quantify or at least suggest an indicator of progress. ***Assignable*** – Specify who will do it. ***Realistic*** – State what results can be achieved realistically, given available resources. ***Time-related*** – Specify when the result(s) can be achieved.
Action Status	***New*** – The action is new and will be included for the first time in the 2019 plan update. ***Existing*** – The action was implemented prior to the 2019 plan update but is ongoing and additional or ongoing action is required for completion. ***Complete*** – The action has been completed.

Table 6-3 Summary information for Mitigation Action

Type of Action	***Plans and Regulations*** ***Infrastructure/Capital Project*** ***Natural Systems Protection*** ***Education and Awareness*** ***Preparedness and Response***
Lead and supporting departments	***Tribal agencies*** ***Local or County agencies*** ***Others***
Timeline for Implementation and Expected Life of the Action	***Less than 1 year*** ***1 to 3 years*** ***3 to 5 years***
Other	Hazards Addressed by the Action Anticipated Cost and Funding Source Mitigation Goals Supported by the Action

A complete mitigation implementation plan is provided in Table 6-6, at the end of this chapter.

See Appendix A1 for a summary of the status of 2015 mitigation actions, Appendix A2 for completed worksheets for all actions identified in the 2020 HMP update, and Appendix A3 for STAPLEE scores for all actions identified in the plan.

6.4.1 Maximizing Loss Reduction

The region's mitigation strategy is directed by the mitigation goals identified in Section 6.2. However, equally important, the County and its partners seek to prioritize actions that lead to the greatest return on investment. The ultimate goal of this plan is to maximize loss reduction, and this perspective is incorporated into the region's mitigation strategy.

6.4.2 STAPLEE Analysis

In addition to the information noted above, each action was self-evaluated using STAPLEE criteria, as described in Table 6-4. Evaluators were asked to rate each STAPLEE criteria to come up with a total score that determined the relative suitability of each action.

Table 6-4 STAPLEE Criteria

STAPLEE Criteria	Evaluation Rating
S: Is it Socially acceptable?	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
T: Is it Technically feasible and potentially successful?	
A: Does the responsible agency/department have the Administrative capacity to execute this action?	
P: Is it Politically acceptable?	
L: Is there Legal authority to implement?	
E: Is it Economically beneficial?	
E: Will the project have either a neutral or positive impact on the natural Environment? (score a 3 if positive impact, 2 if neutral impact)	

6.4.3 Mitigation Effectiveness Analysis

In addition to the STAPLEE analysis, evaluators were asked to rate the effectiveness of each action, as described in Table 6-5.

Table 6-5 Mitigation Effectiveness Criteria

Mitigation Effectiveness Criteria	Evaluation Rating
Will the implemented action result in lives saved?	High = 5 Medium = 3 Low = 1
Will the implemented action result in a reduction of disaster damage?	High = 5 Medium = 3 Low = 1

STAPLEE scores can range from a low of 0 to a high of 21. Mitigation effectiveness scores can run from a low of 3 to a high of 15. When these scores are combined, mitigation actions can score within a range of 3 to 36 points.

The combined STAPLEE and Mitigation Effectiveness Score for each mitigation action identified in this plan will serve as one of the tools the County and its partners use in prioritizing the mitigation actions they wish to pursue during the next planning cycle. Of course, actions may also be prioritized based on available funding, emerging hazards, or because they align with priorities identified in other planning efforts.

FEMA regulations do not require a formal cost-benefit analysis for hazard mitigation plans; however, a formal cost-benefit analysis of mitigation measures is required in order to be approved for Hazard Mitigation Grant Program funding. Therefore, a more formal cost-benefit analysis will be conducted as a component of any future mitigation grant applications.

6.5 2020-2025 Mitigation Implementation Plan

FEMA	**C5.** Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [Washoe County]? (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the County and its partners. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix A for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 6-6. See Appendix B for discussion of mitigation strategies and actions to address closed-basin flooding.

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Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-1	Create a 3 to 5-minute video educating members of the public on hazards in Washoe County to be played at Department of Motor Vehicles offices. (Washoe County)	New	Education and Awareness	6 (6.1)	▪ Washoe County Emergency Management and Homeland Security	▪ Nevada Department of Transportation ▪ Reno Fire Department ▪ Sparks Fire Department	< 1 year	All Hazards	< $10,000	No	Grant	18	6	24
MH-2	Create a plan directing movement of patients to lower level facilities without relying on transportation by emergency medical services. (Washoe County)	New	Plans and Regulations	2 (2.1)	Washoe County Health District (WCHD) Emergency Medical Services Oversight Program	▪ Regional Emergency Medical Services Authority (REMSA) ▪ Reno Fire Department ▪ Truckee Meadows Fire Protection District (TMFPD) ▪ Sparks Fire Department ▪ Inter-Hospital Coordinating Council (IHCC)	< 1 year	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Hazardous Materials Incident Infectious Disease Transportation Incident Radiological Waste Transport	No/minimal cost	No/minimal cost	No/minimal cost	19	4	23
MH-3	Develop contract with Reno Sparks Convention and Visitors Authority for use of facilities as alternative healthcare sites. (Washoe County)	New	Plans and Regulations	2 (2.1)	WCHD	▪ IHCC ▪ Acute Care Hospitals ▪ Reno Sparks Convention and Visitors Authority	1 – 3 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Hazardous Materials Incident Infectious Disease Transportation Incident Radiological Waste Transport	No/minimal cost	No/minimal cost	No/minimal cost	16	4	20

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-4	Increase staffing level within the Reno Fire Department to allow all fire stations to be staffed with an engine company and provide for two rescue and four truck companies across the city. (City of Reno)	New	Preparedness and Response	2 (2.1), 5 (5.1)	Reno Fire Department	Reno City Manager's Office	1 – 3 years	Wildland Fire Flooding Earthquake Energy Emergency Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Infectious Disease Avalanche and Landslide Transportation Incident Radiological Waste Transport Volcano	$100,000 per employee	Anticipated	Existing Budget Grant	18	6	24
MH-5	Build an additional fire/rescue station (Station 6) so response times are equal to 4 minutes of travel time. (City of Sparks)	New	Infrastructure/Capital Project	2 (2.1), 5 (5.1)	Sparks Fire Department	▪ Sparks City Council ▪ Sparks Planning and Zoning ▪ Sparks Engineering Services ▪ Sparks Purchasing ▪ Sparks Public Works	1 – 3 years	Wildland Fire Flooding Earthquake Energy Emergency Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Infectious Disease Avalanche and Landslide Transportation Incident Radiological Waste Transport Volcano	▪ Station – $4–5 million ▪ Apparatus – $1 million ▪ Personnel (ongoing) – $1.35 million per year	No	Grant Existing Budget	18	6	24
MH-6	Adopt current International Building Code (2018). (Reno-Sparks Indian Colony [RSIC])	Existing (2015 action)	Plans and Regulations	4 (4.1), 5 (5.2), 6 (6.2)	RSIC Planning Department	RSIC Tribal Council	Ongoing	Wildland Fire Flooding Earthquake Severe Storms	No/Minimal Cost	Yes	Existing Budget	18	4	22

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-7	Install audible community warning system (sirens). (RSIC)	New	Preparedness and Response	3 (3.1)	RSIC Emergency Manager	RSIC Tribal Council	Immediate	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Hazardous Materials Incident Radiological Waste Transport	$50,000	No	Existing Budget Grant	16	4	20
MH-8	Implement and activate a Tribal Emergency Operations Center (EOC). Provide emergency generators for the designated EOC and alternate facilities. (RSIC)	Existing (2015 action)	Preparedness and Response	3 (3.2)	RSIC Emergency Manager	RSIC Tribal Council RSIC Public Works	< 1 year	All Hazards	$1 million	No	Existing Budget Grant	19	6	25
MH-9	Implement and/or utilize Community Emergency Response Teams, as well as the Citizens Homeland Security Council, to shift burden from sworn officers, where appropriate. (All Partners)	Existing (2015 action)	Preparedness and Response	2 (2.1), 6 (6.3)	All Jurisdictions – ▪ Emergency Managers ▪ Police Departments	-	Immediate	All Hazards	Minimal, administrative staff already budgeted for	Yes	Existing Budget	18	4	22
MH-10	Improve electric and broadband service (by installing fiber optic cable from Spanish Springs) to the RSIC's Hungry Valley reservation to support emergency communications. (RSIC)	New	▪ Infrastructure/Capital Project ▪ Preparedness and Response	3 (3.1), 4 (4.1)	RSIC Emergency Manager	▪ RSIC Tribal Council ▪ NV Energy ▪ Broadband providers	1 – 3 years	All Hazards	$1,000/1,000 linear feet	No	Hazard Mitigation Grant Program, Existing Budget	20	4	24

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-11	Identify facilities in Lake Tahoe to serve as evacuation centers and potential cooling centers, harden against wildland fires and power outages, and provide back-up power. (North Lake Tahoe Fire Protec-tion District [NLTFPD])	New	Infrastructure/Capital Project	2 (2.2), 4 (4.1)	NLTFPD	-	1 – 3 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Avalanche and Landslide Transportation Incident Radiological Waste Transport	Unknown	No	Grant	18	10	28
MH-12	Install a regional notification system for the Tahoe Basin that would handle all hazard notifications and traffic control. System would be operated from the regional traffic control center. (NLTFPD)	New	Infrastructure/Capital Project	3 (3.1)	NLTFPD	Tahoe Basin Regional Fire Protection Districts	3 – 5 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Avalanche and Landslide Transportation Incident Radiological Waste Transport Volcano	$50,000	Anticipated	Grant Existing Budget	19	4	23
MH-13	Construct regional dispatch center for the Tahoe Basin. (NLTFPD)	New	Infrastructure/Capital Project	3 (3.1)	NLTFPD	Tahoe Basin Regional Fire Protection Districts	3 – 5 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Avalanche and Landslide Transportation Incident Radiological Waste Transport Volcano	$1,000,000	Anticipated	Grant Existing Budget	19	6	25

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-14	Upgrade power system at North Tahoe High School to allow for an emergency generator to be installed, so the high school can be used as a community evacuation center and potential cooling center. (NLTFPD)	New	Infrastructure/Capital Project	2 (2.2), 4 (4.1)	NLTFPD	-	1 – 3 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Avalanche and Landslide Transportation Incident Radiological Waste Transport	$200,000	No	Grant	18	6	24
MH-15	Address needed technological updates and repairs for the City of Sparks' Mobile Command Center, including providing new radios, repairing the telescoping pole for the camera, and providing other updated equipment. (City of Sparks)	Existing	Infrastructure/Capital Project	2 (2.1), 3 (3.1)	Sparks Police Department	-	1 – 3 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Severe Storms Hazardous Materials Incident Transportation Incident Radiological Waste Transport	$100,000	No	Grant Existing Budget	17	6	23
MH-16	Develop an evacuation plan for northern Sparks, including evacuation routes, available emergency services, a communications strategy, animal evacuation support, and numerous other support functions. (City of Sparks)	New	▪ Education and Awareness ▪ Preparedness and Response	1 (1.1), 6 (6.3)	Sparks Community Services	▪ Sparks Police Department ▪ Sparks Fire Department ▪ Washoe County Emergency Management and Homeland Security	1 – 3 years	Wildland Fire Flooding Earthquake Criminal Acts and Terrorism Hazardous Materials Incident Transportation Incident Radiological Waste Transport	No/minimal cost	No	Existing Budget	18	2	20

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
MH-17	Complete a continuity of operations plan for Reno-Tahoe International Airport. (Washoe County)	New	Preparedness and Response	1 (1.2)	Reno-Tahoe Airport Authority	▪ Washoe County Emergency Management and Homeland Security ▪ Reno Fire Department ▪ Sparks Fire Department	1 – 3 years	Flooding Earthquake Criminal Acts and Terrorism Hazardous Materials Incident Transportation Incident Radiological Waste Transport Volcano	$40,000 - $80,000	Yes	Existing Budget	19	2	21
WF-1	Develop surge capabilities within the region to handle burn patients. (All Partners)	Existing	▪ Plans and Regulations ▪ Education and Awareness ▪ Preparedness and Response	2 (2.1)	Renown Health	▪ REMSA ▪ IHCC ▪ Acute Care Hospitals ▪ Regional Fire Districts	3 – 5 years	▪ Wildland Fire ▪ Earthquake ▪ Hazardous Materials Incident	Unknown	No	Grant – funding needed for equipment and supplies	17	6	23
WF-2	Identify moderate to high risk areas for wildland fire and develop Community Wildfire Protection Plans (CWPPs) or Fire Adapted Communities programs for each community through home owners associations. (City of Reno)	New	▪ Plans and Regulations ▪ Education and Awareness	5 (5.3), 6 (6.1, 6.3)	Reno Fire Department	▪ Reno Community Development ▪ Reno Parks, Recreation, and Community Services ▪ Nevada Cooperative Extension (Living with Fire) ▪ Nevada State Fire Marshal	1 – 3 years	Wildland Fire	$250,000	No	Grant	18	2	20
WF-3	Provide free or low-cost resources to private property owners as an incentive to maintain defensible space on their properties (e.g., free weekend use of dump trailers or free dump day drops). (City of Reno)	New	Preparedness and Response	5 (5.3), 6 (6.3)	Reno Fire Department	▪ Reno Community Development ▪ Reno Parks, Recreation, and Community Services ▪ Nevada Cooperative Extension (Living With Fire) ▪ Nevada State Fire Marshal	< 1 year	Wildland Fire	$20,000/year	No	Existing Budget Grant	15	8	23

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
WF-4	Enforce State adopted Wildland-Urban Interface (WUI) code on new developments within the WUI and monitor and enforce required vegetation manage-ment plans. (City of Reno)	Existing	▪ Plans and Regulations ▪ Preparedness and Response	5 (5.2), 6 (6.2)	Reno Fire Department	▪ Reno Community Development ▪ Reno Parks, Recreation, and Community Services ▪ Nevada Cooperative Extension (Living With Fire) ▪ Nevada State Fire Marshal	< 1 year	Wildland Fire	$100,000/year	Yes	Existing Budget	18	6	24
WF-5	Identify high risk properties owned by the City of Reno and hire an abatement crew for defensible space clearing and weed pre-emergent application. Currently identified areas of high risk include Rosewood Canyon and the Northwest Reno Peavine area. (City of Reno)	New	Preparedness and Response	5 (5.3)	Reno Fire Department	▪ Reno Community Development ▪ Reno Parks, Recreation, and Community Services ▪ Nevada Cooperative Extension (Living with Fire)	1 – 3 years	Wildland Fire	$10,000/property	No	Grant	19	6	25
WF-6	Offer incentives for private property owners to clear 30-foot fire breaks on City-owned property adjacent to their homes. (City of Reno)	New	▪ Education and Awareness ▪ Preparedness and Response	5 (5.3), 6 (6.3)	Reno Fire Department	▪ Reno Community Development ▪ Reno Parks, Recreation, and Community Services ▪ Nevada Cooperative Extension (Living with Fire)	1 – 3 years	Wildland Fire	$1,000/property	No	Grant	16	6	22
WF-7	Adopt the 2024 International Fire Code with amend-ment based on requirements in the Nevada Revised Statutes and regional challenges. (City of Reno)	New	Plans and Regulations	5 (5.2), 6 (6.2)	Reno Fire Department	Reno Community Development	3 – 5 years	▪ Wildland Fire ▪ Hazardous Materials Incident	No/minimal cost	Yes	Existing Budget	20	2	22

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
WF-8	Develop standard-ized policies and regulations across Washoe County governing open burning. (City of Sparks)	New	Plans and Regulations	5 (5.3), 6 (6.1)	Sparks Fire Department	▪ Washoe County Air Quality ▪ Regional Fire Districts	Less than 1 year	Wildland Fire	Staff time	No	Existing Budget	15	2	17
WF-9	Manage fuels through targeted grazing on an as-needed basis. (City of Sparks)	New	Natural Systems Protection	5 (5.3)	Sparks Fire Department	▪ Sparks Purchasing ▪ Sparks Public Works	1 – 3 years	Wildland Fire	$50,000/year	No	Grant	16	10	26
WF-10	Partner with Nevada Division of Forestry (NDF) crews on fuel reduction on an as-needed basis. (City of Sparks)	New	Natural Systems Protection	5 (5.3)	Sparks Fire Department	Sparks Public Works	1 – 3 years	Wildland Fire	$5,000/year	No	Grant	17	10	27
WF-11	Place containers around the City of Sparks for residents to dump wood and brush from their yards. (City of Sparks)	New	Preparedness and Response	5 (5.3), 6 (6.3)	Sparks Fire Department	Sparks Public Works	1 – 3 years	Wildland Fire	$150,000/year	No	Grant	18	6	24
WF-12	Partner with NDF to develop educational materials and multi-media blasts. (City of Sparks)	New	Preparedness and Response	5 (5.3), 6 (6.3)	Sparks Fire Department	▪ Sparks Public Information/ Community Relations ▪ NDF	1 – 3 years	Wildland Fire	$25,000	No	Grant	19	6	25
WF-13	Adopt 2018 wildland fire code County-wide. (All Partners)	New	Plans and Regulations	5 (5.2), 6 (6.2)	Regional Fire Protection Districts	-	Immediate	Wildland Fire	No/minimal cost	Yes	Existing Budget	20	2	22
WF-14	Manage fuels to mitigate wildland fire risk along the Mt. Rose corridor. (TMFPD)	New	Preparedness and Response	5 (5.3)	TMFPD	Washoe County Emergency Management and Homeland Security	1 – 3 years	Wildland Fire	$1,000,000	No	Grant Existing Budget	17	10	27

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
WF-15	Continue County chipping program and "junk the juniper" program, offering free chipping to property owners. (TMFPD)	Existing	Preparedness and Response	5 (5.3), 6 (6.3)	TMFPD	▪ Washoe County Emergency Management and Homeland Security ▪ Reno-Sparks Indian Colony Emergency Management	Immediate	Wildland Fire	$100,000	Yes	Existing Budget	19	6	25
WF-16	Review and update (as needed) evacuation plans for communities in wildland fire-prone areas and hold evacuation drills at least once every two years. (All Partners)	Existing (2015 action)	▪ Plans and Regulations ▪ Preparedness and Response	5 (5.3), 6 (6.3)	Regional Fire Protection Districts	Washoe County Emergency Management and Homeland Security	Immediate	Wildland Fire	$10,000/plan. $50,000/year	Yes	Existing Budget	19	6	25
WF-17	Create a fuels mitigation and management program to create and incentivize defensible space in housing developments by increasing community space between homes and managing/encouraging management of fuels. (RSIC)	Existing (2015 action)	Education and Awareness Preparedness and Response	5 (5.3), 6 (6.3)	RSIC Emergency Manager	▪ RSIC Planning Department ▪ RSIC Public Works Department ▪ RSIC Housing Department	< 1 year	Wildland Fire	$1,000,000	No	Grant Existing Budget	16	2	18
WF-18	Harden older residential structures in the Incline Village and Crystal Bay areas against wildland fire. (NLTFPD)	New	Infrastructure/Capital Project	5 (5.3), 6 (6.3)	NLTFPD	FEMA	1 -3 years	Wildland Fire	$10,000/structure	Anticipated	Grant	19	6	25
WF-19	Maintain and improve the local fuels management program for Lake Tahoe by maintaining the fuels management area around Crystal Bay. (NLTFPD)	New	Preparedness and Response	5 (5.3)	NLTFPD	-	Ongoing	Wildland Fire	$250,000	Yes	Grant	20	8	28

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WF-20	Hire more inspectors for the NLTFPD defensible space program to conduct outreach to the community. (NLTFPD)	New	Education and Awareness	5 (5.3), 6 (6.3)	NLTFPD	-	Ongoing	Wildland Fire	$100,000/inspector	No	Grant	18	4	22
WF-21	Work with NV Energy to develop a CWPP for the utility and develop a community plan for response to planned power outages. (NLTFPD)	New	Plans and Regulations	5 (5.3)	NLTFPD	▪ Tahoe Basin Regional Fire Protection Districts ▪ NV Energy	1 – 3 years	Wildland Fire	$75,000	Anticipated	Existing Budget	19	2	21
WF-22	Improve fire monitoring by installing fire cameras and working with Drone America to monitor high risk areas after lightning storms. (NLTFPD)	New	Preparedness and Response	5 (5.3)	NLTFPD	-	1 – 3 years	Wildland Fire	$50,000	Yes; Additional Funding Needed	Existing Budget	16	6	22
WF-23	Install fire mesh at the base of power poles to prevent poles from catching fire. (Washoe County)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	▪ NLTFPD ▪ TMFPD	1 – 3 years	Wildland Fire	$315,000	No	Existing Budget Grant	18	8	26
WF-24	Install non-explosion fuses on power poles. (Washoe County)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	-	1 – 3 years	▪ Wildland Fire ▪ Severe Storms	$1,250,000	No	Existing Budget Grant	19	8	27
WF-25	Install lightning arrestors on power poles. (Washoe County)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	▪ NLTFPD ▪ TMFPD	1 – 3 years	Wildland Fire	$350,000	No	Existing Budget Grant	19	8	27
WF-26	Vegetation management – Clear trees from powerline right-of-way (4-year cycle). (Washoe County)	New	Preparedness and Response	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	TMFPD	3 – 5 years	▪ Wildland Fire ▪ Severe Storms	$4,000,000	Yes	Existing Budget	15	8	23

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WF-27	Clear vegetation from around the bases of power poles. (Washoe County)	New	Preparedness and Response	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	TMFPD	3 – 5 years	Wildland Fire	$500,000	Yes	Existing Budget	15	8	23
WF-28	Replace wood power poles with steel poles. (Washoe County)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	-	3 – 5 years	▪ Wildland Fire ▪ Severe Storms ▪ Flooding	$30,000 per pole	No	Existing Budget Grant	17	8	25
WF-29	Purchase and install additional wildland fire cameras. (Washoe County)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1), 5 (5.3)	Washoe County	▪ TMFPD ▪ NLTFPD	1 – 3 years	Wildland Fire	$10,000 per camera	No	Existing Budget Grant	17	6	23
WF-30	Purchase and install additional weather stations. (Washoe County)	New	Infrastructure/Capital Project	5 (5.3)	Washoe County	-	1 – 3 years	▪ Wildland Fire ▪ Severe Storms	$4,000 per weather station	No	Existing Budget Grant	17	2	19
FL-1	Update flood maps to incorporate recently completed flooding mitigation projects along the Truckee River in Sparks. (Washoe County, City of Reno, City of Sparks, Truckee River Flood Management Authority [TRFMA])	New	Preparedness and Response	5 (5.4)	▪ Washoe County Emergency Management and Homeland Security ▪ Reno Fire Department ▪ Sparks Fire Department	TRFMA	< 1 year	Flooding	< $10,000	No	Existing Budget Grant	17	2	19
FL-2	Update FEMA Flood Insurance Rate Maps to incorporate recent Letter of Map Revision, Conditional Letter of Map Revision, and changes in topography and impervious surfaces using regional LiDAR data. (Washoe County, City of Reno, City of Sparks)	New	Plans and Regulations	5 (5.4)	▪ Washoe County Community Services Department	▪ Washoe County GIS ▪ Washoe County Planning ▪ FEMA ▪ U.S. Army Corps of Engineers	3 – 5 years	Flooding	$25,000	No	Existing Budget Grant	17	2	19

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FL-3	Implement scour countermeasures, including channel stabilization at bridge piers and abutments for 14 bridges identified as scour critical bridges. Work would include countermeasure design, permitting, diversions, excavation, and riprap placement. (City of Reno)	New	Plans and Regulations Infrastructure/Capital Project	1 (1.3), 5 (5.7)	Reno Public Works	-	3 – 5 years	Flooding	$3 million	No	Grant	16	8	24
FL-4	To address localized flooding on Ranger Road, connect adjacent development to the storm drain system. (City of Reno)	New	Infrastructure/Capital Project	5 (5.5)	Reno Public Works	-	3 – 5 years	Flooding	$200,000	No	Existing Budget Grant	18	6	24
FL-5	To address localized flooding on Ranger Road, work with residents of the adjacent trailer park to mitigate runoff from impervious surfaces that adds to flood depth. (City of Reno)	New	Education and Awareness	5 (5.5), 6 (6.3)	Reno Community Development	-	3 – 5 years	Flooding	$100,000	No	Existing Budget Grant	16	6	22
FL-6	Replace and upgrade culverts and natural runoffs to reduce flooding losses. (Pyramid Lake Paiute Tribe [PLPT])	Existing	Infrastructure/Capital Project Natural Systems Protection	5 (5.5)	▪ PLPT Environmental ▪ Tribal Public Utilities ▪ Tribal Roads Department	Tribal Council	3 – 5 years	▪ Flooding ▪ Landslide	$200,000/culvert	No	Other – Emergency Funds	19	10	29
FL-7	Install larger drainage pipes to reduce flooding in and around Baring Blvd. (City of Sparks)	Existing	Infrastructure/ Capital Project	5 (5.5)	Sparks Public Works	▪ Sparks Engineering Services ▪ Sparks Purchasing ▪ Sparks City Council ▪ Sparks Public Safety	3 – 5 years	Flooding	$50,000/drainage pipe	No	Grant	17	8	25

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FL-8	Increase flow capacity at bottle neck sections of the Truckee River in the city of Sparks. (City of Sparks)	Existing	Infrastructure/ Capital Project	5 (5.7)	Sparks Public Works	▪ Sparks Engineering Services ▪ Sparks Purchasing ▪ Sparks City Council ▪ Sparks Public Safety	3 – 5 years	Flooding	$2,500,000	No	Grant	15	8	23
FL-9	Complete drainage ditch improvements. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	Existing (2015 action)	Infrastructure/Capital Project	5 (5.5)	All Jurisdictions – Public Works	-	1 – 3 years	Flooding	Unknown	No	Grant Existing Budget	19	8	27
FL-10	Complete Rosewood Wash culvert and channel upgrades. (City of Reno)	Existing (2015 action)	Infrastructure/Capital Project	5 (5.5)	Reno Public Works	-	3 - 5 years	Flooding	$2,500,000	Anticipated	Grant Existing Budget	19	8	27
FL-11	Complete Cemetery Drain water quality, erosion control, drainage and sewer improvements. (City of Reno)	Existing (2015 action)	Infrastructure/Capital Project	5 (5.5)	Reno Public Works	-	1 – 3 years	Flooding	$1,000,000	Anticipated	Grant Existing Budget	19	8	27
FL-12	Complete Warren Estates Evaluation and Drainage Improvement Project. (City of Reno)	Existing (2015 action)	Infrastructure/Capital Project	5 (5.5)	Reno Public Works	-	1 – 3 years	Flooding	$3,200,000	Anticipated	Grant Existing Budget	16	8	24
FL-13	Complete Autumn Hills Flood Control Project. (City of Reno)	Existing (2015 action)	Infrastructure/Capital Project	5 (5.5)	Reno Public Works	-	1 – 3 years	Flooding	$10,000,000	Anticipated	Grant Existing Budget	17	8	25
FL-14	Complete improvements to address undersized drainage ditches and systems County-wide. (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	Existing (2015 action)	Infrastructure/Capital Improvement	5 (5.5)	All Jurisdictions – ▪ Public Works ▪ Engineering	-	3 – 5 years	Flooding	$20/linear foot of drainage ditch	No	Grant Existing Budget	17	8	25

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FL-15	Develop emergency response strategy for loss of Lemmon Valley Water Reclamation Facility due to flooding or a mechanical issue. (Washoe County)	Existing (2015 action)	▪ Plans and Regulations ▪ Preparedness and Response	4 (4.1), 5 (5.5)	Washoe County Utility Services	Washoe County Community Services	1 – 3 years	▪ Flooding ▪ Energy Emergency	$50,000	Anticipated	Grant Existing Budget	18	2	20
FL-16	Replace/improve culvert near the Eagle Canyon Smoke Shop on Eagle Canyon Road to increase capacity and address recurring flooding. (RSIC)	New	Infrastructure/Capital Project	5 (5.5)	RSIC Public Works	▪ RSIC Emergency Manager ▪ RSIC Tribal Council	1 – 3 years	Flooding	$200,000	No	Grant Existing Budget	19	8	27
FL-17	Create a master Emergency Action Plan for dams in the city of Sparks to create consistency and eliminate the confusion caused by plans in different formats. (City of Sparks)	New	▪ Plans and Regulations ▪ Preparedness and Response	5 (5.6)	▪ Sparks Community Services ▪ Sparks Engineering Services	-	1 – 3 years	Flooding	$100,000	Anticipated	Existing Budget	15	2	17
FL-18	Construct a storm drain pump station and force main and gravity main improvements at the intersection of Vista Blvd. and Prater Way to address flash flooding at this intersection. (City of Sparks)	New	▪ Infrastructure/Capital Project ▪ Preparedness and Response	1 (1.2), 5 (5.5)	▪ Sparks Community Services ▪ Sparks Engineering Services	-	1 – 3 years	Flooding	$150,000	Yes	Existing Budget	17	10	27

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-19	Complete a feasibility study, including a geotechnical investigation, hydraulic model, and outfall recommendations, to investigate detaining stormwater behind the Spanish Springs Dam to meter discharge to the North Truckee Drain during floods and winter storms. (City of Sparks)	New	▪ Plans and Regulations ▪ Infrastructure/Capital Project	5 (5.5)	▪ Sparks Community Services ▪ Sparks Engineering Services	-	1 – 3 years	Flooding	$150,000	Anticipated	Existing Budget	17	2	19
FL-20	New floodwalls: Provide a berm with a buried floodwall, with the top of the floodwall set to the 100-year water surface elevation. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$40.7 million	Anticipated	Existing Budget Grant	17	10	27
FL-21	Booth Street Bridge: Remove Booth Street Bridge, which constricts flows and increases flood water elevations. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$1.4 million	Anticipated	Existing Budget Grant	17	10	27
FL-22	Jones Street Signal Improvements: Construct signal at Jones and Keystone Avenue. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.2), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$1.8 million	Anticipated	Existing Budget Grant	16	2	18
FL-23	New Floodwalls (Geotechnical Recommendations): Drain trench along portions of the new floodwalls per Geotechnical Report. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$1.5 million	Anticipated	Existing Budget Grant	17	8	25

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-24	Pumping Station: Construct pumping station along Riverside Drive. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.2), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$20.7 million	Anticipated	Existing Budget Grant	17	10	27
FL-25	Pedestrian Closure Gate Structures: Pedestrian gates are needed along the length of the flood-wall to maintain the current pedestrian access points. A product such as FloodBreak or approved equivalent. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$3.2 million (includes costs for FL-28)	Anticipated	Existing Budget Grant	17	10	27
FL-26	Raise pedestrian bridge upstream and downstream of Arlington Ave. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$1.8 million	Anticipated	Existing Budget Grant	16	`8	24
FL-27	Floodproofing: Mis-cellaneous struc-tures in downtown Reno require flood-proofing—for example, the Post Office, Masonic building, courthouse and parking garage, Promenade assisted living home, and Methodist church. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$472,000	Anticipated	Existing Budget Grant	17	10	27
FL-28	Provide bridge pro-tection at Arlington Ave. Bridge. (TRFMA)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$3.2 million (includes costs for FL-25)	Anticipated	Existing Budget Grant	16	10	26

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-29	Replace Floodwalls: Replace old, inadequate floodwalls from Arlington St. to Lake St.	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$59.4 million	Anticipated	Existing Budget Grant	17	10	27
FL-30	Sierra Street Bridge: Replace Sierra Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$36.4 million	Anticipated	Existing Budget Grant	16	10	26
FL-31	Center Street Bridge: Replace Center Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$42.0 million	Anticipated	Existing Budget Grant	16	10	26
FL-32	Lake Street Bridge: Replace Lake Street Bridge, which constricts flows and increases flood water elevations, with a new bridge that is hydraulically efficient and capable of passing the 100-year flood. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$22.9 million	Anticipated	Existing Budget Grant	16	10	26

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-33	Remove existing pedestrian bridge at Wells Ave. Install new pedestrian bridge upstream of Wells Ave. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	1 – 3 years	Flooding	$2.9 million (includes costs for FL-34)	Anticipated	Existing Budget Grant	16	8	24
FL-34	Bank stabilization and bridge protection around Wells Avenue at Wells Ave. Bridge. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	1 – 3 years	Flooding	$2.9 million (includes costs for FL-33)	Anticipated	Existing Budget Grant	16	10	26
FL-35	Grand Sierra Flood-wall: On the south (right) bank of the Truckee River a 3,000-foot-long, 6-foot-high floodwall would be built from Glendale to Greg Street. (Costs in-cluded in Element 19 Sparks Levees and Floodwalls: Glendale to Greg.) (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$23.1 million (includes costs for FL-36)	Anticipated	Existing Budget Grant	16	10	26

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-36	Sparks Levees and Floodwalls Glendale to Greg: Replace-ment of the existing levee on the north bank with on-bank floodwalls to mini-mize construction and right-of-way impacts to the TMWA Glendale Water Treatment Plant. Trail can be incorporated into floodwall mainte-nance road. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$23.1 million (includes costs for FL-35)	Anticipated	Existing Budget Grant	16	10	26
FL-37	Mill Street Levee – Greg to Rock: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impacts to the exist-ing Pioneer Ditch. (Costs included in Element 19 Sparks Levees and Flood-walls: Glendale to Greg.) (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$33.5 million (includes costs for FL-38)	Anticipated	Existing Budget Grant	17	10	27

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-38	Terracing Greg to Rock: Reduced terracing to stabilize the river bank, reduce the amount of excavation, and avoid the existing Pioneer Ditch. The terracing and associated levee are moved northward toward the Truckee River and levee ties into the McCarran Blvd. bridge. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Sparks Public Works	3 - 5 years	Flooding	$2.4 million	Anticipated	Existing Budget Grant	17	10	27
FL-39	Abutment, pier, and bank scour protection measures (as required) from Rock Blvd Bridge to Vista Narrows. Includes East McCarren Blvd Bridge. (TRFMA, City of Reno, City of Sparks)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works Sparks Public Works	3 – 5 years	Flooding	$6.1 million	Anticipated	Existing Budget Grant	16	10	26
FL-40	Mill Street Levee – Rock to McCarran: Reduced south bank floodplain terracing with the associated levee move closer to the Truckee River. Reduces excavation costs and reduces impact to the existing Pioneer Ditch. Pioneer Ditch will be piped to allow for use of the fill disposal area. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$73.3 million (includes costs for FL-41, FL-42, FL-43, and FL-48)	Anticipated	Existing Budget Grant	16	10	26

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-41	Terracing Rock to McCarran: Reduced terracing to reduce the amount of excavation and avoid the existing Pioneer Ditch. The terracing and associated levees are moved northward toward the Truckee River and levee ties into the Rock Blvd. bridge. The land between Mill Street and the relocated levee can be used as a fill disposal site and reserved for future recreational use. (TRFMA, City of Reno)	Existing	Infrastructure/Capital Project	1 (1.3), 5 (5.7)	TRFMA	Reno Public Works	3 – 5 years	Flooding	$73.3 million (includes costs for FL-40, FL-42, FL-43, and FL-48)	Anticipated	Existing Budget Grant	16	6	22
FL-42	Sparks Levees and Floodwalls – Rock to McCarran: Replace-ment of the north bank levee with on-bank floodwalls to minimize impacts to existing properties and railroad spurs. Some minor terrac-ing on the north bank. Fill localized low lying areas on the landside of the floodwall. Trail can be incorporated into floodwall mainte-nance road. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$73.3 million (includes costs for action FL-40, FL-41, FL-43, and FL-48)	Anticipated	Existing Budget Grant	17	10	27

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-43	Terracing – Rock to Steamboat: Bench-ing on north bank at Living River Park-way. Minimized terracing on south bank along Treat-ment Plant. Remove existing buildings as necessary. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$73.3 million (includes costs for FL-40, FL-41, FL-42, and FL-48)	Anticipated	Existing Budget Grant	15	10	25
FL-44	Main Station Farm Protection: Will flood-proof select buildings and elevate the existing pads under the hay storage barns to keep hay dry. Main processing building is sufficiently elevated above flood waters. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$7.8 million	Anticipated	Existing Budget Grant	17	8	25
FL-45	Sparks Levees and Floodwalls – McCarran to Vista: Replacement of existing levee with on-bank floodwalls for approximately 20,000 feet east of McCarran to reduce overall footprint. Construction of levees for most of the remainder of the reach. Floodwall will be used in the vicin-ity of Larkin Circle to eliminate impacts to the roadway. (TRFMA, City of Sparks)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	Sparks Public Works	3 – 5 years	Flooding	$54.4 million	Anticipated	Existing Budget Grant	16	10	26

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-46	Vista Narrows Widening: Expanded benching of the Narrows extending to the first railroad bridge. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$91.9 million	Anticipated	Existing Budget Grant	16	10	26
FL-47	Hidden Valley: Voluntary home elevation. An alternative may include floodproofing for certain residences in Hidden Valley. The method of floodproofing would probably vary from structure to structure, but all would be raised to at least the 100-year flood elevation. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$24.3 million (includes cost for action FL-49)	Anticipated	Existing Budget Grant	18	10	28
FL-48	Sparks Levees and Floodwalls – Rock to McCarran: Replacement of the north bank levee with on-bank floodwalls to minimize impacts to existing properties and railroad spurs. Some minor terracing on the north bank. Fill localized low-lying areas on the landside of the floodwall. Trail can be incorporated into floodwall maintenance road. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7)	TRFMA	-	3 – 5 years	Flooding	$73.3 million (includes cost for action FL-42)	Anticipated	Existing Budget Grant	17	10	27

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Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
FL-49	Eastside Subdivision: Voluntary home elevation. Elevation of the buildings in the East Subdivision south of the Main Station Farm to above the 100-year floodwater event level. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7, 5.8)	TRFMA	-	3 – 5 years	Flooding	$24.3 million (includes cost for action FL-47)	Anticipated	Existing Budget Grant	17	10	27
FL-50	Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7, 5.8)	TRFMA	-	3 – 5 years	Flooding	Unknown	Anticipated	Existing Budget Grant	13	10	23
FL-51	Rainbow Bend Home Elevation: Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7, 5.8)	TRFMA	-	3 – 5 years	Flooding	Unknown	Anticipated	Existing Budget Grant	13	10	23
FL-52	Wadsworth Non-Voluntary Home Elevation/Mitigation: as required dependent upon further analysis. (TRFMA)	Existing	Infrastructure/Capital Project	5 (5.7, 5.8)	TRFMA	-	3 – 5 years	Flooding	Unknown	Anticipated	Existing Budget Grant	13	10	23
FL-53	Update Truckee River Flood Inundation Maps. (TRFMA)	Existing	Plans and Regulations Education and Awareness	5 (5.4), 6 (6.1)	TRFMA	-	3 – 5 years	Flooding	$862,000	Anticipated	Existing Budget Grant	16	2	18
FL-54	Autumn Hills, Offenhauser, Longley & McCarran storm drain improvements and detention solutions	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$10,000,000	Anticipated	Existing Budget Grant	17	8	25
FL-55	Sagittarius storm drain improvements	New	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$6,000,000	Anticipated	Existing Budget Grant	17	8	25

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FL-56	Miscellaneous Various Storm Drain: Greenridge to Moore, various "island 18", Edison Wy, Sage St yard area, California Ave, Isbell Rd, Avenida de Landa, Wedekind, Scottsdale/Clear Acre	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$2,500,000	Anticipated	Existing Budget Grant	17	8	25
FL-57	Double Diamond Levee Upgrades: Construct levee improvements at Double R Blvd and Double Diamond Blvd to provide FEMA certified flooding protection.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$1,000,000	Anticipated	Existing Budget Grant	17	8	25
FL-58	Belford Drainage Overpass at Lake Ditch: Provide overpass/bypass such that the Belford Drainage flows will continue down the drainageway and not be intercepted by the Lake Ditch.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$800,000	Anticipated	Existing Budget Grant	17	8	25
FL-59	In and Out Basins – 12th and Brookfield, 12th and Washington, Plumas & Hillcrest: Remove in and out basins and tie to storm drain.	New	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$500,000	Anticipated	Existing Budget Grant	17	8	25

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FL-60	Miscellaneous Grading-Regrading - Len Cir, Orange and Apple St, Hatch, Brentwood, Walker, Skyline: Grading/regrading curb and gutters to address ponding issues.	New	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$500,000	Anticipated	Existing Budget Grant	17	8	25
FL-61	Sadleir Southworth (Wells Ave) Area Storm Drain Improvements: Upgrade/enlarge or provide surcharge relief system for storm drain system.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$350,000	Anticipated	Existing Budget Grant	17	8	25
FL-62	Irrigation Ditch Tributary Crossing Improvements: Improve the ditch crossings at three irrigation ditches to reduce ditch failures and overtoppings.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$15,000,000	Anticipated	Existing Budget Grant	17	8	25
FL-63	Stead Storm Drain and Channel Improvements	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$7,000,000	Anticipated	Existing Budget Grant	17	8	25
FL-64	Aquila Ave/Krupp Cir Drainage Improvements: Enlarge and reinforce roadside ditches, upsize/install new storm drain.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$6,500,000	Anticipated	Existing Budget Grant	17	8	25

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FL-65	Thomas Creek at South Virginia St between approximately Patriot & Gavian storm drain improvements: Improve storm drainage across roadways.	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Reno Building, Planning, and Engineering Division	Reno Public Works	3 – 5 years	Flooding	$5,000,000	Anticipated	Existing Budget Grant	17	8	25
FL-66	Install new redundant force main and permanent bypass valves. (Washoe County)	Existing (2015)	Infrastructure/Capital Project	5 (5.5)	Washoe County Community Services Department	-	3 – 5 years	Flooding	$10,000,000	Anticipated	Utility Rates and Connection Fees	20	8	28
EQ-1	Provide public educational mate-rials related to earthquake hazards. (Washoe County)	New	Education and Awareness	6 (6.1)	Washoe County Emergency Management and Homeland Security	▪ Red Cross ▪ Washoe County Health District	< 1 year	Earthquake	< $5,000	No	Existing Budget	17	2	19
EQ-2	Provide kits with earthquake straps and weather radios to members of the public. (Washoe County)	New	Preparedness and Response	6 (6.3)	Washoe County Emergency Management and Homeland Security	▪ Red Cross ▪ Washoe County Health District	<1 year	Earthquake	$25/kit	No	Grant	16	6	22
EQ-3	Retrofit dialysis centers in order to maintain potable water service follow-ing a disaster. (Washoe County, City of Reno, City of Sparks)	New	Plans and Regulations Infrastructure/Capital Project	2 (2.1), 4 (4.1)	Dialysis Centers (Fresenius, DaVita)	TMWA	3 – 5 years	Earthquake	$25,000/retrofit	No	Existing Budget	19	6	25
EQ-4	Develop a process to provide financial and professional assistance for seismic retrofits to make unreinforced masonry buildings identified by the Nevada Earthquake Council safer. (City of Reno)	Existing	Plans and Regulations Education and Awareness Preparedness and Response	5 (5.9), 6 (6.3)	Reno Building, Planning and Engineering Division	-	1 – 3 years	▪ Earthquake ▪ Severe Storms	$50,000	No	Grant	18	6	24

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EQ-5	Retrofit Reno's City Hall with seismic upgrades (ex. seismic dampers and improved column splices) to ensure the building remains functional after an earthquake. (City of Reno)	New	Infrastructure/Capital Project	5 (5.9)	Reno Public Works	Reno Emergency Manager	1 – 3 years	Earthquake	Estimated $10 million	Anticipated	Grant	19	10	29
EQ-6	Relocate Reno's City Hall offices to address seismic risks. (City of Reno)	New	Infrastructure/Capital Project	5 (5.9)	Reno Public Works	Reno Emergency Manager	1 – 3 years	Earthquake	Unknown	No	Grant	15	10	25
EQ-7	Conduct study to determine City of Sparks facilities in need of reinforce-ment to withstand earthquakes. (City of Sparks)	New	Infrastructure/Capital Project	5 (5.9)	Sparks Engineering Services	Sparks Purchasing Independent Contractors	3 – 5 years	Earthquake	$100,000	No	Grant	17	2	19
EQ-8	Reinforce City of Sparks facilities not meeting seismic standards based on seismic study. (City of Sparks)	New	Infrastructure/Capital	5 (5.9)	Sparks Engineering Services	Sparks Purchasing Independent Contractors	3 – 5 years	Earthquake	Unknown	No	Grant	17	10	27

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EQ-9	Complete seismic strength evaluations of critical facilities in all jurisdictions, including schools, community colleges, public infrastructure, and other critical facilities, to identify vulnerabilities for mitigation to meet current seismic standards. Mothball or demolish life-threatening build-ings, particularly unreinforced masonry buildings. (Washoe County City of Sparks, RSIC, PLPT)	Existing (2015 action)	Infrastructure/Capital Project Preparedness and Response	5 (5.9)	Washoe County, City of Sparks, RSIC, PLPT – Public Works Engineering School Districts	-	1 – 3 years	Earthquake	Unknown	Anticipated	Grant Existing Budget	15	10	25
EQ-10	Assess, repair, and/ or replace infrastruc-ture that may fail during earthquakes (e.g., Keystone Ave. Bridge). (Washoe County, City of Reno, City of Sparks, RSIC, PLPT)	Existing (2015 action)	Infrastructure/Capital Project	1 (1.2), 5 (5.9)	All Jurisdictions – Public Works Engineering	-	1 – 3 years	Earthquake	Unknown	No	Grant Existing Budget	16	10	26
EQ-11	Incorporate seiche warning system into the Tahoe Basin traffic control center. (NLTFPD)	Existing	Preparedness and Response	3 (3.1)	NLTFPD	Washoe County Emergency Management and Homeland Security Tahoe Basin Regional Fire Protection Districts	< 1 year	Earthquake	$50,000	Anticipated	Grant Existing Budget	18	10	28

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EQ-12	Improve evacuation routes out of the Hungry Valley reservation (Winnemucca Ranch and Chickity roads) to ensure they are passable in all weather conditions. (RSIC)	New	Infrastructure/Capital Project	1 (1.1)	RSIC Public Works	-	1 – 3 years	Earthquake	$1,000,000	Anticipated	Grant Existing Budget	18	8	26
EQ-13	Continue to provide straps and related tools to encourage non-structural mitigation of earthquake hazards and provide assistance to help property owners install these improvements. (RSIC)	New	Preparedness and Response	5 (5.9), 6 (6.3)	RSIC Emergency Manager	RSIC Housing Department	Immediate	Earthquake	$50/tool kit	Yes	Existing Budget	19	10	29
EQ-14	Harden Fire Station 13 or relocate this station to mitigate earthquake risks. (NLTFPD)	New	Infrastructure/Capital Project	5 (5.9)	NLTFPD	-	3 – 5 years	Earthquake	$500,000 to harden. Unknown to relocate.	No	Grant	16	10	26
EE-1	Enact the Community and Clinical Health Services (CCHS) Continuity of Operations Plan to ensure safe handling and storage of biologicals and service to CCHS clients. (Washoe County)	Existing	▪ Plans and Regulations ▪ Preparedness and Response	2 (2.1)	WCHD CCHS Division	Partners identified in CCHS Continuity of Operations Plan	Immediate	Energy Emergency	No/minimal cost	No	No/minimal cost	17	4	21
EE-2	Replace wooden power poles in high risk areas with poles made of steel or an alternative material. (Washoe County, City of Reno, City of Sparks)	New	Infrastructure/Capital Project	3 (3.3), 4 (4.1)	NV Energy	▪ Washoe County Community Services Department ▪ Reno Community Development ▪ Sparks Community Services	1 – 3 years	▪ Energy Emergency ▪ Earthquake ▪ Flooding ▪ Severe Storms ▪ Wildland Fire	$3,000/pole	No	Grant	17	8	25

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
EE-3	Replace transmission and distribution cables with alternative cables able to withstand fallen branches and snow loading. (Washoe County, City of Reno, City of Sparks)	New	Infrastructure/Capital Project	4 (4.1)	NV Energy	▪ Washoe County Community Services Department ▪ Reno Community Development ▪ Sparks Community Services	1 – 3 years	▪ Energy Emergency ▪ Earthquake ▪ Flooding ▪ Severe Storms ▪ Wildland Fire	$1,000/1,000 Linear Feet	No	Grant	16	8	24
EE-4	Provide an emergency generator for each organization providing dialysis services. (Washoe County)	New	Infrastructure/Capital Project	4 (4.1)	WCHD	Fresenius DaVita	3 – 5 years	Energy Emergency	$50,000/generator (no design and installation)	No	Grant	18	8	26
EE-5	Install back-up generators for critical infrastructure and facilities along with other measures to improve reliability (e.g., alarms, meters, remote controls, and switchgear upgrades). (All Partners)	Existing (2015 action)	Preparedness and Response	3 (3.3), 4 (4.1)	All Jurisdictions – Emergency Management	Public Works	3 – 5 years	Energy Emergency	$100,000 per design and installation	No	Grant	18	8	26
CA-1	Implement measures to prepare for a potential active shooter incident, including new security measures, training and exercises, improved partnerships with law enforcement agencies, and policy changes (ex. Prohibiting open carry). (All Partners)	New	▪ Infrastructure/Capital Project ▪ Education and Awareness ▪ Preparedness and Response	5 (5.10)	▪ Law Enforcement Agencies ▪ Facility Managers	▪ Local Elected Officials ▪ Federal Agencies	1 – 3 years	Criminal Acts and Terrorism	$50,000/year. $120,000/officer	Anticipated	Existing Budget Grant	16	6	22

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
CA-2	Procure bullet proof vests, helmets, and other equipment needed to support rescue task forces during an active assailant, civil unrest, or terrorist event. (City of Reno)	New	Preparedness and Response	5 (5.11)	Reno Fire Department	Reno City Manager's Office	< 1 year	Criminal Acts and Terrorism	$750/medical kit. $500 per vest. $200 per helmet	No	Grant	16	6	22
CA-3	Install crash-worthy type barriers, barri-cades, and bollards in downtown Sparks to help reduce the risk of errant or intentional vehicle attacks through large crowds at special events. (City of Sparks)	New	Infrastructure/Capital Project	5 (5.11)	▪ Sparks Community Services ▪ Sparks Engineering Services	▪ Sparks Police Department ▪ Sparks Fire Department	1 – 3 years	Criminal Acts and Terrorism	$2,100,000	Anticipated	Existing Budget	16	10	26
SS-1	Purchase additional equipment needed to quickly access emer-gency water supplies during severe winter storms. (NLTFPD)	New	Preparedness and Response	4 (4.1)	NLTFPD	-	1 – 3 years	Severe Storms	$100,000	No	Grant	17	10	27
SS-2	Identify facilities and venues that could be used as cooling centers and establish use agreements with property owners. (Washoe County)	New	Preparedness and Response	4 (4.1)	Washoe County Emergency Management and Homeland Security	-	1 – 3 years	Severe Storms	No/Low Cost	Yes	Existing Budget	16	4	20

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
HM-1	Purchase additional equipment such as booms or collapsible spill containment berms or walls to ensure responding fire crews have the capability to perform immediate containment of hazardous material spills. (City of Reno)	New	Preparedness and Response	5 (5.12)	Reno Fire Department	▪ Reno Public Works ▪ Reno Emergency Manager	1 – 3 years	Hazardous Materials Incident	Estimated $20,000	Anticipated	Grant	17	10	27
DT-1	Construct new groundwater wells and water lines to provide additional water supplies. (PLPT)	New	▪ Plans and Regulations ▪ Infrastructure/Capital Project ▪ Preparedness and Response	2 (2.1), 4 (4.1)	PLPT Public Utilities	▪ Tribal Council ▪ Tribal Administration ▪ Tribal Roads Department	3 – 5 years	Drought	> $1 million	Yes	Grant	17	4	21
DT-2	Implement current TMWA Conservation Plan including encouraging transition to less water-intensive landscaping on both public and private properties. (City of Reno, City of Sparks, RSIC, PLPT)	Existing (2015 action)	Education and Awareness	6 (6.3)	City of Reno, City of Sparks, RSIC, PLPT – ▪ Water Utilities ▪ Planning Departments	All Jurisdictions – Emergency Management	< 1 year	Drought	$50,000/year	No	Grant Existing Budget	17	4	21
DT-3	Identify alternate water supplies for Tribal properties and housing in Hungry Valley, potentially including a tie-in to the County's water system in Lemmon Valley and new water tanks. (RSIC)	New	Infrastructure/Capital Project	4 (4.1)	RSIC Public Works	RSIC Tribal Council	1 – 3 years	Drought	$25,000 (identifying alternative water supplies). $1,000,00 (tie-in and install new water tanks)	No	Grant Existing Budget	17	6	23

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
ID-1	Implement a range of emission reduction strategies (e.g., policies geared toward renewable energy measures and projects, reduction in vehicle miles traveled, and increased use of transit and multi-modal transportation) to reduce levels of particulate matter, ozone, and other criteria pollutants. (All Partners)	Existing	▪ Plans and Regulations ▪ Infrastructure/Capital Project ▪ Education and Awareness	6 (6.1, 6.3)	WCHD Air Quality Management Division	Local Government and Private Sector Partnerships	3 – 5 years	Infectious Disease	Unknown	Anticipated	Existing Budget Grant	16	4	20
AL-1	Install additional signs and create materials educating the public on avalanche threats. (Washoe County)	New	Education and Awareness	6 (6.1)	Washoe County Emergency Management and Homeland Security	NLTFPD	1 – 3 years	Avalanche and Landslide	No/minimal cost	Existing	Existing Budget	17	2	19
TI-1	Purchase properties within the runway protection zones at Reno-Tahoe Interna-tional Airport and airport critical areas at Reno-Stead Airport. (Washoe County, City of Reno)	New	Infrastructure/Capital Project	5 (5.13)	Reno-Tahoe Airport Authority	Washoe County Emergency Management and Homeland Security	3 – 5 years	Transportation Incident	Unknown	No	Existing Budget	14	6	20
RW-1	Establish procedures for communication between the Governor's Office on Radiological Waste and Washoe County prior to transport of radiological waste. (Washoe County)	New	Plans and Regulations Preparedness and Response	3 (3.4)	Washoe County Emergency Management and Homeland Security	Governor's Office on Radiological Waste	< 1 year	Radiological Waste Transport	No/minimal cost	Yes	Existing Budget	18	2	20

Table 6-6 2020-2025 Mitigation Implementation Plan

Action No.	Mitigation Action (Jurisdiction)	Action Status	Type of Action	Goals Supported (Objectives)	Lead Department	Supporting Departments	Timeline	Hazards Addressed	Anticipated Cost	Funding Available?	Funding Source	STAPLEE Score	Mitigation Effectiveness Score	TOTAL SCORE
VC-1	Develop a response plan as part of the next Emergency Operations Plan update for clean-up and disposal of ash fall from a volcanic eruption, including identification/prioriti-zation of vulnerable facilities and utilities and regional partners that can aid in response. (Washoe County)	New	Plans and Regulations	1 (1.2), 3 (3.5), 4 (4.2)	Washoe County Emergency Management and Homeland Security	All Partners	1 – 3 years	Volcano	No/minimal cost	Yes	Existing Budget	16	2	18

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7 PROGRAM IMPLEMENTATION

Chapter 7 provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. This chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

The HMP is intended to be a "living" document that will help inform all interested parties about the County's regional hazard mitigation policies and projects. It will be reviewed and updated on a regular basis. The mitigation strategy identified will act as a guide for local departments in determining projects for which to seek FEMA assistance and other mitigation funds from outside sources.

7.1 Plan Adoption

FEMA	**E2.** Does the Plan include documentation that the plan has been formally adopted by the [Washoe County Board of Commissioners]? (Requirement §201.6(c)(5))

44 CFR §201.6(c)(5) requires that the HMP be formally adopted by the Board of Commissioners and elected officials from each participating jurisdiction. The Washoe County Board of Commissioners formally adopted the 2020 update of the Washoe County Regional HMP on [Date]. Dates of adoption by each participating jurisdiction are included in the Jurisdictional Annexes.

This HMP was approved by FEMA Region IX on January 24, 2020. Copies of local plan adoption resolutions are included in Appendix H. Copies of the HMP will be maintained in the emergency management offices of participating jurisdictions as well as on the County's website.

See the front matter of this plan for adoption and approval materials.

7.2 Plan Update and Review

FEMA	**A6.** Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

7.2.1 Annual Review and Evaluation

The County Emergency Manager is responsible for coordinating annual review and evaluation of the HMP and making appropriate revisions. On an annual basis, the County Emergency Manager will convene the MPT to conduct a comprehensive review of the plan to ensure that all information is current and planned initiatives are meeting the stated purpose and goals of the HMP. The review and update process is as follows:

The MPT will meet to consider:

- Progress made in achieving plan goals and objectives during the previous 12 months;
- Mitigation accomplishments in projects, programs, and policies;
- Actual losses avoided by implementation of mitigation actions;

- Emerging disaster damage trends and repetitive losses;
- Identification of new mitigation needs;
- Changes in priorities;
- Cancellation of planned initiatives, and the justification for doing so; and
- Changes in membership to the MPT.

The County Emergency Manager will request input from other departments and outside entities not represented on the MPT on issues listed above. A special effort will be made to gather information on non-capital projects and programs important to mitigation.

7.2.2 Following a Major Disaster

Within a reasonable period after a major disaster warranting a Presidential Disaster Declaration, and as determined necessary for a smaller event, the County Emergency Manager will convene the MPT. Because recovery is a long process and the full impact of a disaster may not be known for many months, this initial meeting may be followed by additional meetings over time.

The annual update process described above will also be used following a major disaster. However, post-disaster deliberations will also consider the following:

- "Lessons Learned" from the disaster and what new initiatives should be added to the plan to help reduce the likelihood of similar damage in the future;
- Follow-up needed on items relevant to mitigation from any after-action reports produced; and
- Integration of mitigation into the recovery process and coordination with local and/or regional recovery planning efforts.

7.2.3 Formal Plan Update

Every five years, the plan will be re-submitted for adoption to the Board of County Commissioners and elected officials for each participating jurisdiction. Prior to this, the County Emergency Manager will use the following process to make sure that all relevant parties are involved:

- Conduct regular reviews of the plan as described above and incorporate feedback from those reviews into the planning document;
- Conduct public engagement activities and initiate meetings with identified groups of interested parties and outside organizations to gain input and feedback;
- Integrate relevant feedback and circulate the revised plan to the MPT for approval;
- Submit the plan to the Board of County Commissioners for adoption by resolution;
- Submit the revised plan to FEMA.

It is anticipated that the next full update of this plan will begin in 2024 for the planning period of 2025 through 2029.

7.3 Monitoring Project Implementation

FEMA	**C7.** Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(ii))

Mitigation projects and project closeouts will be monitored and updated through the use of the quarterly reporting forms for FEMA-funded projects, provided by FEMA Region IX. County and local contract managers will ensure that project reporting is completed within specified timeframes. The Mitigation Project Progress Report will be requested annually by Washoe County's Emergency Manager to determine progress made to-date and track final closeout tasks. The County and its partners will comply with all applicable federal statutes and regulations in effect with respect to the periods during which they receive grant funding, in compliance with 44 CFR 13.11(c).

7.3.1 Grant Management Process

The County implements a comprehensive grant management process to ensure compliance with all applicable grant requirements. The grant management process involves key governmental entities including the Grants Coordinator, Comptroller, County Manager, Board of County Commissioners, Legal Counsel, and the appropriate program managers.

The County also maintains an extensive process to respond to audits. Office of Management and Budget Circular A-133 audits are performed annually. Through this process, new awards are reviewed to ensure that compliance has been met and funding use aligns with the County's accounting records.

7.3.2 Mitigation Action Status and Tracking Loss Reduction

All departments are tasked with tracking the ongoing status of mitigation actions for which they are the lead. Departments should track the following:

- Project progress, including status of project funding and ongoing needs;
- Actual losses mitigated by project implementation; and
- Project needs that may be addressed in the next mitigation planning cycle.

Refer to Appendix G for a sample Mitigation Action Plan Annual Progress Report.

7.4 Incorporation of Existing Planning Mechanisms

As part of the County Emergency Manager's day-to-day plan monitoring efforts, they will coordinate with departments that have jurisdiction over mitigation action implementation areas to incorporate the plan into standard policies and procedures, as well as long-term planning documents and budgets.

Short-term governmental operation changes that address and consider hazard mitigation may include updates to job descriptions, work plans, site reviews, and staff training. Long-term changes may include revisions to existing master plans, capital improvement plans, zoning and building codes, permitting, and other planning tools.

Washoe County's Emergency Manager will also work with departments to include mitigation projects in annual budgets, rather than relying solely upon grant programs, and integrate hazard mitigation in future land use and strategic planning.

Refer to Section 5.9 for more information on the incorporation of mitigation planning into existing plans.

7.5 Continued Public Involvement

FEMA	**A5.** Is there discussion of how [Washoe County] will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))

Public involvement is a key component of the plan implementation and update process. Following annual review of the HMP, the County will prepare and make available via the internet an Annual Mitigation Status Report providing an update on the implementation of the current mitigation plan. This report, along with specific reports for each mitigation measure being implemented and all stakeholder comments received, will be assessed to make improvements in the plan update, released every five years.

In addition to the ongoing input collected and compiled throughout implementation of the previous plan, the MPT, as mentioned above, will review aspects of the draft update plan. Comments received from the public will also be considered and incorporated where appropriate into updates of the plan.

The County and its partners will also engage community members on an ongoing basis through outreach at local events and meetings to ensure public participation is incorporated outside of the five-year plan update process. The County and its partners maintain public engagement and awareness programs focused on increasing the community's awareness of hazards and promoting actions to reduce individuals' and families' exposure to hazard risks. Recognizing that these are ongoing programs, the MPT decided to remove (cancel) mitigation actions included in the 2015 HMP related to public engagement and awareness. The County and its partners will continue to implement the following programs during this five-year planning period:

- Seasonal Multi-Hazard Public Awareness Program;
- Annual weather safety activities to maintain the County's StormReady Community accreditation;
- Community Wildfire Protection Plan preparation;
- Community evacuation plan preparation and evacuation drills;
- Community Emergency Response Team (CERT) academy training sessions;
- Washoe County Emergency Preparedness Program;
- Junk the Junipers wildland fire awareness event;
- City of Reno annual disaster preparedness expos;
- Meetings with homeowners associations and other community groups;
- Outreach through social media;
- RSIC non-structural earthquake mitigation program.

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LIST OF TABLES AND FIGURES

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ACRONYMS AND ABBREVIATIONS

AADT	Average Annual Daily Traffic
CCHS	Community and Clinical Health Services
CCP	Citizen Corps Program
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CIP	Washoe County Capital Improvements Program
COOP	Continuity of Operations
County	Washoe County
CPO	Carbapenemase-producing organisms
CWPP	Community Wildfire Protection Plan
DMA 2000	Disaster Mitigation Act of 2000
DOE	U.S. Department of Energy
EHS	Extremely Hazardous Substance
EMAC	Emergency Management Assistance Compact
EPCRA	Emergency Planning and Community Right-To-Know Act
FEMA	Federal Emergency Management Agency
FRAP	Regional Flood Response Action Plan
GID	Government Improvement District
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program
HMP	All-Hazards Mitigation Plan
HRCQ	Highway Route Controlled Quantity
I-580	Interstate 580

I-80	Interstate 80
IHCC	Inter-Hospital Coordinating Council
LEPC	Local Emergency Planning Committee
LNG	liquefied natural gas
MMI	Modified Mercalli Intensity
mph	miles per hour
MPT	Mitigation Planning Team
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NFIP	National Flood Insurance Program
NLTFPD	North Lake Tahoe Fire Protection District
NOAA	National Oceanic and Atmospheric Administration
PDSI	Palmer Drought Severity Index
PG&E	Pacific Gas and Electric Company
PHMSA	Pipeline and Hazardous Materials Safety Administration
RAMQC	Radioactive Material in Quantities of Concern
REMSA	Regional Emergency Medical Services Authority
REOC	Regional Emergency Operations Center
REOP	Washoe County Regional Emergency Operations Plan
RSIC	Reno-Sparks Indian Colony
RPZ	runway protection zone
SERC	State Emergency Response Commission
SR	State Route
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988
TMFPD	Truckee Meadows Fire Protection District

TMWA	Truckee Meadows Water Authority
TRFMA	Truckee River Flood Management Agency
TROA	Truckee River Operating Agreement
USDA	United States Department of Agriculture
USGS	United State Geological Survey
WCHD	Washoe County Health District
WUI	Wildland-Urban Interface

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