# Pueblo of Laguna
# Hazard Mitigation Plan

**FINAL DRAFT MARCH 31, 2020**

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# *I: Planning Process*

## Purpose of the Plan

The Pueblo of Laguna Hazard Mitigation Plan, originally prepared and approved in 2015 and updated and approved in 2020, was developed consistent with the federal hazard mitigation planning requirements outlined in the Code of Federal Regulations (44 CFR Part 201.7). This plan evaluates and updates the Pueblo's potential exposure to natural hazards and identifies appropriate mitigation strategies. The plan assists the community in identifying areas of risk, assessing the magnitude of the risk, and developing strategies for reducing the risk. Through this process, the Pueblo of Laguna can address issues related to incompatible land uses; identification and protection of critical facilities; and reduction of costs associated with natural disaster relief and rescue efforts. Completion and approval of this plan ensures that the Pueblo of Laguna is eligible to apply for future disaster relief and mitigation project funds.

In order to ensure the Pueblo of Laguna Hazard Mitigation Plan meets the "Standard Tribal Mitigation Plan Requirements" specified in the Tribal Mitigation Plan Review Guide (2017), this document substantially follows the outline provided in the Review Guide, with some additional material added for the Pueblo of Laguna's needs. The Guide is the official policy on and interpretation of the natural hazard mitigation planning requirements.

## Disaster Mitigation Act of 2000

The Disaster Mitigation Act of 2000 (DMA2K, P.L. 106-390, October 10, 2000) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act, P.L. 100-1-7, November 23, 1998), to emphasize pre-disaster hazard mitigation, establishing a national disaster hazard mitigation program "(1) to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters, and (2) to provide a source of predisaster hazard mitigation funding that will assist states and local governments (including tribes) in implementing effective hazard mitigation measures" (section 101). DMA2K Title I, section 102 amended the Stafford Act Title II to add Section 203, Predisaster Hazard Mitigation, which creates a program for hazard mitigation technical and financial assistance for "predisaster hazard mitigation measures that are cost-

effective and are designed to reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities." DMA2K Title II, Disaster Preparedness and Mitigation Assistance, section 104, amended the Stafford Act Title III to add Section 322, Mitigation Planning, which requires that a "state, local, or tribal government shall develop and submit for approval … a hazard mitigation plan the outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area …" as a condition for increased federal funding. Section 322 as amended states that such mitigation plans must "(1) describe actions to mitigation hazards, risks, and vulnerabilities identified under the plan, and (2) establish a strategy to implement those plans." The Stafford Act section 203 as amended includes a criterion considering "(7) if the state or local government has submitted a mitigation plan under section 322, the extent to which activities [proposed for technical and financial assistance] are consistent with the mitigation plan."

DMA2K provided the impetus for multi-hazard mitigation planning to stem the losses from disasters, reduce future public and private expenditures, and speed up response and recovery from disasters. DMA2K pertains to tribal governments:

- DMA2K establishes the requirement for tribal governments to prepare a multi-hazard mitigation plan in order to be eligible for Federal Emergency Management Agency (FEMA) assistance through the Hazard Mitigation Assistance Program.
- DMA2K establishes a requirement that natural hazards be addressed in the risk assessment/vulnerability analysis portion of the multi-hazard mitigation plan.
- DMA2K authorizes a percentage of the Hazard Mitigation Assistance Program funds to the State Administrative Authority after a federally declared disaster is declared, for use in the development of state, local, and tribal multi-hazard mitigation plans and projects.
- DMA2K established a deadline by which tribal governments are to prepare and adopt their respective plans in order to be eligible for the FEMA Hazard Mitigation Assistance Program.

# Planning Mission

According to the Federal Emergency Management Agency's Emergency Management Institute, mitigation is one of four phases of the emergency management cycle:

***Preparedness*** is the range of deliberate, critical tasks and activities necessary to build, sustain, and improve the capability of a community to be ready to respond to a disaster.

***Response*** is the process of saving lives, protecting property and the environment, and meeting basic human needs immediately after a disaster. Response includes the execution of emergency plans and actions to support short-term recovery.

***Recovery*** is the process of restoring public services and returning the community to normal while taking advantage of opportunities to mitigate future disasters and build a more resilient community.

***Mitigation*** is defined as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

The goal of mitigation is to save lives and reduce property damage. Mitigation actions should be cost-effective and environmentally sound. Mitigation can reduce the cost of disasters to property owners and all levels of government. Mitigation can protect critical community facilities, reduce exposure to liability, and minimize disruption of community services. Examples of mitigation actions include land use planning, adoption of building codes, elevation of homes, acquisition and demolition of structures in hazard-prone areas, or relocation of homes away from hazard-prone areas. *(Course IS-318, Mitigation Planning for Local and Tribal Communities, https://emilms.fema.gov/IS318/MP0101010t.htm, accessed February 5, 2020.)*

Hazard mitigation planning is intended to strengthen community resilience by identifying mitigation actions that are focused on the greatest risks, aligned with other community objectives, and cost-effective. The plan communicates priorities and helps obtain funding. The planning process itself increases awareness of risks and builds partnerships.

This plan considers natural hazards. Other types of hazards, not included in this plan, may include hazardous materials spills and unsafe structures.

The plan addresses three major missions associated with the requirements established in DMA2K:

**Reduce Hazard Risks and Impacts** – This multi-hazard mitigation plan assesses vulnerability of life and property from potential natural hazards and prioritizes corresponding mitigation strategies to reduce the risk and impact from the hazard.

**Build on Existing Efforts -** The intent of this plan is to maximize existing efforts by inventorying, coordinating, and building on them where possible, and developing new strategies to fill any gaps among existing efforts. The plan incorporates information and strategies from existing emergency response plans and other relevant plans.

**Share Information and Raise Awareness** – Public engagement methods used in the preparation of this plan sought input from a diverse range of stakeholders. Mitigation strategies identified in this plan address public information, communication, and outreach regardless of hazard type, and within a hazard-specific context, as applicable.

# Planning Process

***Review Guide Element A1***

This description includes the planning process for the original 2015 Plan and the 2020 Update.

**2015 Plan**

The 2015 Hazard Mitigation Plan was coordinated by the Department of Public Safety, Office of Emergency Management, with members of the Tribal Emergency Response Commission (TERC) and various stakeholders. The Pueblo of Laguna developed the 2015 plan through a five-phase planning process: 1. Planning; 2. Risk Assessment; 3. Mitigation Strategy; 4. Policies and Procedures for Implementation; and 5. Documentation of the Planning Process and Plan Development.

**Phase 1 - Planning.** Phase 1 involved meetings aimed at establishing the Laguna Mitigation Planning Team (LMPT) and outlining the planning process and responsibilities of many of the Pueblo of Laguna departments. The LMPT was comprised of individuals who had contributed to Local Emergency Response Commission and Tribal Emergency Response Commission (TERC) efforts. Members were selected through voluntary participation and delegation from department directors. LMPT members attended Emergency Management Institute class E582, Mitigation for Tribal Governments, to discuss initiation of the mitigation plan. LMPT members who attended E582 were given the FEMA E386 series and walked through many of the processes used to develop a mitigation plan. Completion of the trainings enabled the team to better comprehend the planning process and principles behind each process.

The LMPT consisted of multiple Pueblo departments and entities as well as federal agencies and utilities, each taking on specific roles for the plan. Cibola County, the Pueblo of Acoma, and the Ramah Chapter of the Navajo Nation were invited to LMPT meetings. The Pueblo of Laguna Emergency Management Program oversaw development of the mitigation plan. Organizations actively participating on the LMPT included:

| | |
|---|---|
| Pueblo of Laguna Departments | Public Safety – Emergency Management, Police, Fire, chaplain<br>Administrative Services - GIS<br>Public Works – Roads & Range, Maintenance<br>Environmental and Natural Resources – Environmental, Native American Lands Environmental Mitigation Program, Director<br>Community Health and Wellness – Community Health Representative, Transit, Director |
| Laguna Entities | Laguna Development Corporation<br>Laguna Rainbow Corporation<br>Laguna Department of Education<br>Pueblo of Laguna Utility Authority |
| Federal Agencies | Indian Health Service |

| | |
|---|---|
| Other Tribes | Pueblo of Acoma<br>Navajo Nation |
| Utility and Transportation | Transwestern Pipeline Co. |

*Individuals' names, position titles, and departments or agencies participating in the 2015 Plan are included on the sign-in sheets in the appendix to meet Review Guide requirements.*

All participants contributed information and other support, and reviewed, edited, and commented on the plan. Opportunities to comment on the plan as it developed were provided primarily through email. Cibola County was very helpful in editing the descriptions of the hazards through comments and review of the hazard descriptions. As time went on, each individual demonstrated a deep commitment to protecting culture, language, tradition, people, property, assets and all living things within the ecosystem of the Pueblo of Laguna.

**Phase 2 – Risk Assessment.** The Pueblo of Laguna used bi-weekly village meetings to showcase the mitigation plan and gather information important to the community. These public forums offered an ability to identify and rank natural hazards and assess potential risks to the Pueblo. The active participation of the public ensured a well-rounded plan. The public completed natural hazard surveys found in FEMA 386-2 and promoted participation from others in their communities and families. Surveys were also collected at the annual Public Safety Day where there was a booth and many community members were educated about mitigation and its importance. This event offered much more engagement with the public. The risk assessment and vulnerability process followed the E580 – Emergency Management Framework for Tribal Governments curriculum section on Knowing Your Risks. Following the curriculum encouraged increased participation in developing the list of known hazards, risks and vulnerability.

**Phase 3 – Mitigation Strategy.** In phase 3, the LMPT focused on natural disasters. The LMPT developed the list of hazards and brainstormed ideas, then selected ideas focused on mitigation. Ideas focused on preparedness, response, or recovery were incorporated into the Emergency Operations Plan. The LMPT evaluated strategies using the "STAPLE-E" process, considering Social, Technical, Administrative, Political, Legal, Economic, and Environmental feasibility. The LMPT prioritized public outreach and education due to fiscal constraints.

**Phase 4 – Policies and Procedures for Implementation.** The review of policies, laws, regulations for the 2015 Plan found that the Pueblo of Laguna had little in place in regard to emergency preparedness. The Emergency Operations Plan was dated 2006 and addressed all hazards, but did not include mitigation. The review of policies for any type of response was lacking. This phase of the process forced the LMPT to unanimously decide to review and update the Emergency Operations Plan after the mitigation plan was approved. The LMPT agreed that identifying policies and procedures that affect emergency services and response for the community must be supported and implemented.

**Phase 5 – Documentation of the Planning Process and Plan Development**. In this phase, the LMPT documented the planning process, developed a complete draft of the plan, and proceeded to plan adoption. Sophia Beym, a local contractor, assisted with editing and formatting.

**2020 Plan Update**

This Hazard Mitigation Plan, for 2020 approval, uses the plan approved in 2015 as a starting point and incorporates various updates. The update process was jointly coordinated by the Emergency Preparedness and Safety Compliance Office (the successor to the Office of Emergency Management) in the Public Safety Department, managed by Virgil Siow, and the Planning Program in the Public Works Department (formerly in the Administrative Services Department), managed by Sharon Hausam. The plan update process was coordinated through the Pueblo of Laguna Tribal Emergency Response Commission (TERC), chaired by Police Chief Greg Toya and then by Virgil Siow, with significant assistance from TERC Secretary Dorothy Beecher, Environmental Specialist.

Plan update coordinators announced the update process at the February 21, 2019 and March 21, 2019 TERC meetings and encouraged participation in the April 16, 2019 plan update kickoff meeting. At that meeting, plan update coordinators, along with Nicole Martinez with the New Mexico Department of Homeland Security and Emergency Management, presented information on hazard mitigation planning and the process for updating the Pueblo of Laguna's plan, including a proposed timeline. The timeline included review and updates to each of the plan sections as well as final presentation, approval, and adoption. It incorporated information-gathering from documents and data, stakeholder input and documentation of that input, and revisions to the written document. The plan update coordinators also provided other handouts, including FEMA fact sheets on local and tribal mitigation planning, and invited attendees of the kickoff meeting to volunteer to serve on the planning committee and to review the plan and provide comments.

The plan update coordinators hosted, through the TERC, meetings on June 3, June 17, July 8, July 23, August 12, September 3, September 30, 2019, and March 2, 2020. Representatives from the following departments, entities, agencies, and organizations attended these meetings:

Pueblo Council (Village of Seama)
Chief of Operations office
Public Safety – Emergency Preparedness and Safety Compliance, Police, Fire, Director
Administrative Services Department – Planning, GIS
Public Works Department – Roads and Range, Transportation Specialist, Director
Environmental and Natural Resources Department – Environmental Program, Natural Resources Program, Tribal Historic Preservation Office, Director
Community Health & Wellness – Behavioral Health, Director
Chief Financial Officer office – Tax Administration
Pueblo of Laguna Utility Authority
Continental Divide Electric Cooperative
Burlington Northern Santa Fe Railroad

Valencia County – Fire Department

Participants reviewed the plan section by section and commented on areas needing updates.

*Individuals' names, position titles, and departments or agencies participating in the 2020 Update are included on the sign-in sheets in the appendix to meet Review Guide requirements.*

# Public Involvement

***Review Guide Element A2***

The public of the Pueblo of Laguna is defined as the membership of the Pueblo of Laguna maintained on lists at the Laguna Enrollment Office and others residing on Laguna lands with permission. The Pueblo of Laguna Council is the governing body for the Pueblo.

For the 2015 Plan, the public was offered the opportunity to comment at local public forums and directly to the Emergency Manager whose door has always been open to community members. The public meeting for the Pueblo of Laguna mitigation plan review was during Public Safety Day, village meetings and through word of mouth. All LMPT meetings were open to the public and notices of the meetings were posted in public locations throughout the Pueblo. Notices announcing the draft plan were made available for review and were posted at each village bulletin board. The notice provided contact information to access the plan, in both the draft stages and before final adoption. The public was kept informed about the plan's meetings. The Pueblo of Laguna Office of Emergency Management actively promoted the mitigation plan in the TERC meetings, village meetings and through word of mouth. Any comments received by the Office of Emergency Management were incorporated into the plan after TERC/LMPT review.

For the 2020 update, public input was solicited at the TERC booth at Public Safety Day, July 20, 2019, held at the K'awaika Center. The plan update coordinators developed a short survey, in digital form, asking respondents to prioritize the natural hazard events at the Pueblo of Laguna that concerned them most, describe what worries them about those natural hazard events, and suggest ideas for helping Laguna safely withstand any impacts from natural hazard events (along with demographic information about the respondent). Coordinators requested that people complete the surveys on tablet computers at the event. TERC members also completed the survey. Results are described in the risk assessment section of this Plan.

The plan update coordinators held a community information session the evening of Tuesday, February 18, 2020. The session was announced in the local paper, the Kukadze'eta, in early February (see appendix), and via email to all tribal employees. The notice in the paper also invited community members to review copies of the draft plan, available at the Laguna Public Library and the Tribal

Building, and online through the Emergency Preparedness and Safety Compliance and Planning program websites, and to submit comments to the plan update coordinators.

The draft plan was revised based on comments. The final draft plan was available for public comment April 6, 2020 – April 20, 2020 through the Emergency Preparedness and Safety Compliance and Planning program websites, only (since the Pueblo of Laguna was closed due to coronavirus from March 24, 2020 to April 23, 2020). Comments on the final draft plan were incorporated prior to the presentation to the Pueblo Council for final approval.

## Partner Involvement

***Review Guide Element A3***

Please see above regarding partner involvement in the development of the 2015 Plan. Plan update coordinators invited all TERC members and other stakeholders, noted in the table below, to the April 16, 2019 kickoff meeting for the plan update:

| | TERC | Additional Organizations |
|---|---|---|
| Pueblo of Laguna Elected Officials | Staff Officers: Encinal, Laguna, Mesita, Paguate, Paraje, Seama+<br>Council: Encinal, Laguna, Mesita, Paguate, Paraje, Seama*+<br>Mayordomos: Encinal, Laguna, Mesita, Paguate, Paraje, Seama*+ | |
| Pueblo of Laguna Departments | Chief of Operations Office*<br>Public Safety*<br>Administrative Services *<br>Public Works*<br>Environmental and Natural Resources*<br>Community Health and Wellness<br>Courts*<br>Chief Financial Officer office* | |
| Laguna Entities | Laguna Development Corporation*<br>Laguna Rainbow Corporation<br>Laguna Department of Education*+<br>Pueblo of Laguna Utility Authority+ | Laguna Housing Development & Management Enterprise<br>Laguna livestock associations (Bell Rock*, Sedillo*, Turquoise Springs*) |
| Federal Agencies | Indian Health Service | BIA Southern Pueblos Agency, Branch of Forestry and Wildlife Management*<br>BIA Safety of Dams*<br>Federal Emergency Management Agency<br>U.S. Forest Service<br>U.S. Geological Survey |
| Other Tribes | Pueblo of Acoma<br>Navajo Nation | |
| State Agencies | | Department of Homeland Security and |

| | | |
|---|---|---|
| | | Emergency Management* |
| Counties | | Bernalillo+<br>Cibola*+<br>Sandoval+<br>Valencia+ |
| Non-Profits | | American Red Cross*<br>Catholic Church, Laguna* |
| Utility and Transportation | | Burlington Northern Santa Fe Railroad*<br>Continental Divide Electric Cooperative<br>Kinder Morgan<br>New Mexico Gas<br>New Mexico Department of Transportation, District 6* |
| Education | | University of New Mexico, Health |

*Attended kickoff meeting
+Organization is a member of Pueblo of Laguna TERC. Additional representatives not on the TERC were also invited.

Please see above, public involvement, regarding how tribal members and partners were invited to participate in the process.

# Incorporation and Integration

## Incorporation of Existing Plans, Studies, and Reports

***Review Guide Element A4***

For the 2015 Plan, every effort was made to integrate other Pueblo planning processes into the Hazard Mitigation Plan. Planning documents and strategies from the 2013 Tribal Housing Plan, the 2013 Bureau of Indian Affairs Paguate Dam Flood Inundation Study, the 2006 Commodity Flow Study, and the village comprehensive plans were reviewed and discussed. The mitigation plan approved by FEMA and the Pueblo of Laguna Council is considered a part of the Pueblo of Laguna EOP. The LEPC/LMPT has requested permission to review any new development or 50%+ improvement on Pueblo lands. The LEPC/LMPT has agreed to integrate any FEMA program or initiative with FEMA Region VI and through the State of New Mexico Department of Homeland Security and Emergency Management, State Hazard Mitigation Officer. Hazard Mitigation Grant Program, Flood Mitigation Assistance, and other programs will be reviewed to determine if they are compatible with Pueblo initiatives.

Plan update coordinators incorporated material on risk from several sources into this 2020 update:

- Demographics and housing data from the Pueblo of Laguna Planning and GIS programs
- Village Comprehensive Plans, land use maps and allowable use tables, 2012-2018
- Pueblo of Laguna Climate Profile, November 2019

- Pueblo of Laguna Utility Authority Drought Contingency Plan, June 2019
- New Mexico Multi-Hazard Risk Portfolio, September 2017
- Natural events that caused power outages, 2014-2018
- Natural events that were posted on the Pueblo's emergency notification system, 2015-2019
- Paguate Dam Emergency Action Plan, May 2019
- Acomita Dam Emergency Action Plan, April 2018

Plan update coordinators also incorporated material on mitigation strategies from various sources into this 2020 update:

- Village Comprehensive Plan, goals and strategies, 2012-2018
- Pueblo of Laguna Capital Improvement Plan, project worksheets, 2020
- Pueblo of Laguna Utility Authority Drought Contingency Plan, June 2019
- Pueblo of Laguna Housing Strategic Plan, February 2016
- Renewable Energy Feasibility Study Update and Plan, 2019
- Red Cross Shelter Facility Surveys

There are significant links between this Hazard Mitigation Plan and the Pueblo of Laguna Climate Vulnerability Assessment, funded through the BIA Tribal Resilience Program, grant award number A18AP00235. The Pueblo is initiating adaptation planning with vulnerability assessments on the effects of extreme weather (heat, drought, heavy rain, hail, high winds) and related events (flood, wildfire) on infrastructure and the built environment and on human health and safety. The project, contracted to a team led by Adaptation International, Inc., is developing a comprehensive understanding of concerns regarding infrastructure and the built environment, describing a comprehensive concept of Pueblo of Laguna health and safety values and concerns, preparing a vulnerability assessment analyzing exposure, sensitivity, and adaptive capacity, and prioritizing future adaptation planning steps. The vulnerability assessment was not finalized before this Hazard Mitigation Plan was required to be adopted, but information from the exposure analysis, in the Climate Profile noted above, was incorporated into the risk assessment portion of the Plan.

There are also significant links between this Hazard Mitigation Plan and the comprehensive plans adopted by all six Pueblo of Laguna villages: Encinal, Laguna, Mesita, Paguate, Paraje (including Casa Blanca), and Seama. The village comprehensive plans were completed and adopted from 2012 to 2018. Each plan includes goals, strategies, and actions for health, wellness, and public safety; housing; transportation; natural resources and environment; and economic development, as well as sections on land use and implementation. Plans include maps showing areas suitable for development, and land use maps and tables showing allowable uses in each area, while recognizing the authority of the mayordomos for land assignments and Council for leases for economic development purposes.

References for specific planning documents are included at the end of each relevant section.

## Integration with Other Planning Efforts

***Review Guide Element A5***

The Pueblo of Laguna is integrating the hazard mitigation planning process with its current climate change adaptation planning. The Pueblo received a BIA Tribal Resilience Program grant and is currently preparing vulnerability assessments for two areas of concern, health & wellness and infrastructure & buildings. The vulnerability assessments will be used to develop adaptation plans. The mitigation strategies in the Hazard Mitigation Plan can be the starting point for developing climate adaptation strategies and actions.

The Pueblo of Laguna will also integrate the hazard mitigation planning process into its annual capital improvement plan (CIP). Mitigation strategies with capital – infrastructure, buildings, and equipment – components will be incorporated in the CIP.

*Review Guide Elements A6 and A7 are included later in the Plan.*

# Plan Updates

***Review Guide Element D1-D3***

***Changes in Development.*** This plan was initially approved in 2015 and updated for 2020 approval. There were no substantial changes in residential, institutional, or commercial development from 2015 to 2020.

The plan was updated to reflect changes in community perception of hazards, with new rankings, and new data on risks, including information from the climate vulnerability assessments that are now underway and data on occurrences of natural hazards. The addition of extreme heat and heat waves was a significant change.

***Progress in Mitigation Efforts.*** This plan was initially approved in 2015 and updated for 2020 approval. The plan was updated to reflect changes in the status of mitigation actions. Notably, all of the village comprehensive plans, including land use maps and tables showing allowable uses, have been completed.

***Changes in Priorities.*** This plan was initially approved in 2015 and updated for 2020 approval. The plan was updated to reflect changes in the priority of actions, in part based on completion of some actions.

The general format and information on risk remains unchanged from the 2015 plan, which was approved by FEMA with statement of a need for change.

# Acknowledgements

The Pueblo of Laguna would like acknowledge and thank the individual participants in the development of the 2015-2020 Hazard Mitigation Plan and this 2020-2025 update. The 2015-2020 Hazard Mitigation Plan development was overseen by Emergency Management Coordinators Ken Tiller, Vince Rodriguez, and Virgil Siow. Active participants included (in alphabetical order): Sabin Chavez, Leann Cruz, Art De La O, Ramona Dillard, Leon Duran, Amy Garcia, Claudia Gonzales, Ray Gustafson, Benny James, Richard Johnson, Randy Jose, Brandon P. Mariano, Michael Natseway, Michelle Ray, Adam Ringia, Anthony Sarracino, Virgil Siow, Rick Smith Sr., and Valene Vallo. The 2020-2025 update process was jointly coordinated by Virgil Siow, Emergency Preparedness and Safety Compliance Office Program Manager in the Public Safety Department, and Sharon Hausam, Planning Program Manager in the Public Works Department (formerly in the Administrative Services Department), with substantial assistance from Dorothy Beecher, Environmental Specialist in the Environmental and Natural Resources Department. Participants included (in alphabetical order) Malcolm Bowekaty, Margaret Cerno, Paul Chavez, Paige Connolly, Ramona Dillard, Victoria Enriquez, Steve Etter, Clarice Garcia, Sarah Gillen, Bela Harrington, Art Joe, Jr., Richard Johnson, Greg Jojola, Arif Kazmi, Father Chris Kersteins, Martin Kowemy, Skylar Lempinen, Ted Leon, Nathan Lucero Sr., Ray Paul Lucero, Raymond Lucero, Lee Maestas, Edwin Martinez, Nicole Martinez, Orlando Martinez, Dustin Middleton, Malcolm Montgomery, Michael Natseway, Jesse Orozco, Kris Pearsen, Denise Price, Aaron Romero, Mark Roybal, Terri Sarracino, Rick Smith, Sr., Don Siow, Gaylord Siow, Ken Thomas, Anthony Thompson, Eric Torres, Greg Toya, Andy Trujillo, and Roxanne Vallo,

# *II: Tribal Planning Area*

***Review Guide Element B1.a***

## Pueblo of Laguna

Traditional Name: K'awaika

1-40, 43 miles west of Albuquerque, exit 114 Laguna, to main offices

505-552-6654

www.lagunapueblo-nsn.gov

A map showing the location of the Pueblo of Laguna is included as Map 1.

The Pueblo's lands consist of approximately 550,000 acres of land in Cibola, Valencia, Bernalillo and Sandoval counties. The residents of Laguna Pueblo live in six villages: Encinal, Laguna, Mesita, Paguate, Paraje-Casa Blanca, and Seama. The Pueblo administration building is located in the village of Laguna.

***Laguna History.*** Like other Keresan Tribes in New Mexico, the Laguna people believe our ancestors originated in Siapapu, migrated south, and eventually settled at the present location. Traditional accounts about the founding of Laguna Pueblo describe how Laguna ancestors came to the Rio San Jose after a lengthy migration from the Mesa Verde in the north. After migrating through Paguate, Laguna ancestors continued to the south as far as the Rio Salado but they eventually returned northward. Archaeologists date the arrival of Laguna ancestors in the Rio San Jose Valley to sometime in the A. D. 1300s. During the long migration, before settling at the present location, Laguna ancestors occupied many settlements.

During the historic period, farming villages were established in the outlying areas surrounding the principle village of Laguna Pueblo. These farming villages eventually developed into permanently occupied settlements at Mesita, Paguate, Seama, Paraje/Casa Blanca and Encinal. All of these sites had been occupied in earlier periods. The archaeological records search demonstrates that there are no gaps in the occupation of the Laguna Reservation during the Pueblo period from A.D. 700 to the present.

In 1593 a Franciscan friar, Marcos de Niza, claimed the Pueblo region for Spain. By 1616 there were nine missions that had been built at various pueblos. When the Spanish arrived in Laguna, they found a self-governing, agricultural society. The Laguna Mission of San Jose was established in 1699 and was the last mission built in this particular period of time. This is the date recognized by historians for the

establishment of the Pueblo. The mission was built under supervision of the Franciscan friars utilizing Laguna labor. Written history speaks of the brutality inflicted upon the pueblo people that resisted the Spanish rule. The Laguna people adapted to colonial rule by adopting and incorporating those aspects of the dominant culture necessary for survival while maintaining the basic fabric of traditional culture. Beyond some of the painful memories of the past 400 years, the Laguna language and culture has survived. Reconciliation continues to take place as we celebrate the feast days of various saints with both Native and Christian prayer.

***Economics.*** The Pueblo of Laguna began with a subsistence and barter economy reliant on agriculture, but has transitioned into an economy based on wage and salary employment. In the 1880s, the railroad provided the first major source of paid jobs for Laguna community members through a special agreement known as the "Flower of Friendship." It offered jobs not only in Laguna but also to members that were deployed along the rail line from Gallup through Winslow, Arizona to Barstow and Richmond, California. The railroad also initiated tourism at the Pueblo, especially in Laguna and at the train depot and Acoma Hotel in New Laguna, one of the famed Harvey House hotels built at rail stops along the AT&SF Railway line. Laguna women worked as artisans creating and selling their pottery to traders and travelers.

By the mid 1920's, the railroad had ceded some of its importance to Route 66, which had become a major thoroughfare for increased tourist access. Route 66, now primarily NM Highway 124, still runs through the Village of Laguna and along Old Laguna, but most travelers use the interstate, I-40, and bypass the Pueblo. An early Overall Economic Development Plan recognized that development around the new interstate highway might make use of the Pueblo's commercial potential.

Laguna's transition from an agrarian to a consumer-based society was also hastened by community members' service in World War I and World War II, which took them away from home and provided income. After the world wars, mining became a major source of employment for Laguna members, with the opening of the Anaconda Mining Company's Jackpile mine in Paguate in the 1950s. After the mine closed, in 2008 the Pueblo Council passed a resolution placing a permanent moratorium on uranium mining on Pueblo lands, recognizing its health impacts. The Pueblo has also formed Laguna Industries Inc., and Laguna Construction Company (LCC), and most recently, as a subsidiary of LCC, Laguna Economic Advancement.

The largest employer of Pueblo of Laguna members is currently Laguna Development Corporation (LDC), a Section 17 corporation of the Pueblo. LDC's main facilities are at Rio Puerco (Route 66 Casino, hotel, RV park, and other facilities) and at exit 108 (Dancing Eagle Casino, Travel Center, and Marketplace). In the Village of Laguna, LDC operates the Laguna 66 Pit Stop, also known as the Superette. LDC also manages the Paguate Mart, Transmix plant, and Evergreen Contractors, LLC, an electrical engineering firm it acquired in 2015. Various other entities of the Pueblo of Laguna, such as the Laguna Department

of Education, Laguna Rainbow Center (elder care facility), Pueblo of Laguna Utility Authority, Laguna Housing Development and Management Enterprise, and the Pueblo government itself, employ a substantial number of community members. Other local employers include the U.S. post offices in Laguna and New Laguna.

***The Future.*** Today Laguna thrives through a vibrant blend of modern and traditional ways. The Laguna Pueblo Council establishes annual priorities to enhance the quality of life for its members. In 2019, the priorities were Health, Education, Housing, Infrastructure, Community, and Financial Stability. Of greater importance, however, is to ensure the survival of our culture, traditions and language. As they have sustained us throughout the centuries, we must ensure they sustain future generations as well.

# Pueblo of Laguna Villages and Other Areas

A map showing the location of the six Laguna villages is included as Map 2.

## Encinal

See Map 3.

### *Residential*

| Occupied | Vacant | Total |
|---|---|---|
| 63 | 6 | 69 |

***Critical Facilities:*** Information not available

### *Other Government / Institutional / Community*

| Name | Building Composition | Type |
|---|---|---|
| **The Nativity of the Blessed Virgin Mary Church** | Traditional | Religious |
| **Kiva** | Traditional | Religious |
| **Small Kiva** | Traditional | Religious |
| **Recreation Hall** | Traditional and Portable Building | Community Hall |

***Commercial / Business / Economic:*** None noted

### *Transportation*

| Name | Jurisdiction |
|---|---|
| **Tribal Road 47, Encinal Road** | Pueblo of Laguna |

### *Utility Systems*

| Type | Components of System | Utility Operator |
|---|---|---|
| **Water System** | 14 springs, ground water under direct influence of surface water. Fresh water "ovens" for collection. 124,000- | Pueblo of Laguna Utility Authority |

| | | |
|---|---|---|
| | gallon tank and an additional 20,000-gallon irrigation tank. Water treatment is by micro-filtration and chlorination. 58 residential connections. | |
| **Waste Water System** | 1 lagoon | Pueblo of Laguna Utility Authority |
| **Natural Gas** | | New Mexico Gas Co. |
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | Transformer off Tribal Road #47 @ Kose Ville | Continental Divide Electric Cooperative |
| **Communications** | | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

***Potential Chemical Hazards:*** None noted

***Special Considerations:*** Ground water under direct influence of fresh water. Impacts of watershed pollution, flooding.

## Laguna / New Laguna

See Maps 4 and 5.

### *Residential*

| | Occupied | Vacant | Total |
|---|---|---|---|
| **Laguna** | 322 | 19 | 341 |
| **New Laguna** | 81 | 5 | 86 |
| **TOTAL** | 403 | 24 | 427 |

### *Critical Facilities*

| Name | Building Composition and Description | Services |
|---|---|---|
| **Fire Station – Sub Station** | Conventional | Public Safety / Fire Response and Emergency Medical Transport |
| **Detention / Jail Center** | Conventional | Public Safety / Inmate Housing |
| **Tribal Administration Building** | Conventional; Stucco, brick & frame | Government / Leadership, Accounting, Government Affairs, Records Management, Enrollment, Human Resources, GIS |
| **Public Services Building** | Conventional | Public Works / Engineering, General Maintenance, Transportation, Planning, Grant Writing |
| **Roads and Range** | Manufactured | Public Works / Roads & Range |

| | | |
|---|---|---|
| **Tribal Garage** | Manufactured | Public Works / Fleet Maintenance |
| **Laguna Housing Development and Management Enterprise** | Conventional | Housing / Management, construction, maintenance and repair |
| **Library** | Conventional | Information and education, communications. Possible Continuity of Operations Plan (COOP) location for governmental offices or EOC |
| **US Post Offices: Old Laguna and New Laguna** | Manufactured | Community information, postal services |
| **Recreational Hall** | Conventional | Community information, meeting facility, recreational activities |
| **Laguna Department of Education: Early Head Start, Head Start, Elementary, Middle School. Laguna Middle School is evacuation center.** | Conventional & manufactured construction | Education. **Middle School is evacuation shelter.** Short-term capacity = 500. Long-term capacity = 20. |
| **Bureau of Indian Affairs, Laguna Agency** | Manufactured | |
| **Kiva** | Traditional | Religious |

### *Other Government / Institutional / Community*

| Name | Building Composition | Services |
|---|---|---|
| **Pueblo of Laguna Utility Authority** | Manufactured | Water, wastewater, solid waste, telecommunications, construction/ repairs/ maintenance |
| **St. Joseph's Church** | Traditional | Religious |

### *Commercial / Business / Economic*

| Name | Ownership | Services |
|---|---|---|
| **Laguna Pit Stop/ Convenience Store** | Laguna Development Corporation | Diesel and Gasoline Sales; Automatic Teller Machine and some water and food |

### *Transportation*

| Name | Jurisdiction |
|---|---|
| **NM Highway 124** | NMDOT |
| **NM Highway 279** | NMDOT |
| **I-40 Underpasses for Roads: to former garage, to sand dunes** | Federal |

### *Utility Systems*

| Type | Components of System | Utility operator |
|---|---|---|
| **Water System** | (2) water storage tanks:<br>Old Laguna @ 251,000 gallons<br>New Laguna @ 253,000 gallons | Pueblo of Laguna Utility Authority |
| **Waste Water System** | Waste water system utilizes (3) lagoons. And (3) waste lifts | Pueblo of Laguna Utility Authority |
| **Solid Waste** | Transfer Station | Pueblo of Laguna Utility Authority |
| **Natural Gas** | | New Mexico Gas Co. |

| | | |
|---|---|---|
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | | Continental Divide Electric Cooperative |
| **Communications** | Repeater<br>Base Station | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

***Potential Chemical Hazards***

| Site | Hazard or Threat |
|---|---|
| **Tribal Garage** | Diesel pump<br>Storage Tanks<br>Chemicals on site<br>Risks of contamination, risks to water resource |
| **Transfer Station** | Chemicals on site<br>Risks of contamination, risks to water resource |
| **Bureau of Indian Affairs – Storage Tanks** | Chemicals on site<br>Risks of contamination, risks to water resource |
| **Transwestern Pump Station** | Natural gas releases, fire, explosion<br>Chemicals on site. Tier II reports available.<br>Risks of contamination, risks to water and air |

***Special Considerations:*** High population surges during feast days and dances.

***Concerns:*** Dam Flooding (Acomita & Laguna / New Laguna Lakes) also Blue Water Lake. Limited access points for Laguna Middle School; one way in and out.

## Mesita

See Maps 6 and 7.

***Residential***

| Occupied | Vacant | Total |
|---|---|---|
| 246 | 17 | 263 |

***Critical Facilities***

| Name | Building Composition and Description | Services |
|---|---|---|
| **Police Department** | Conventional; Stucco, Brick and Metal Construction | Public Safety / Police |

***Other Government / Institutional / Community***

| Name | Building Composition | Services |
|---|---|---|
| **Sacred Heart of Jesus Church** | Traditional | Religious |
| **Kiva** | Traditional | Religious |
| **Community Center** | Conventional | Community gathering |

| | | |
|---|---|---|
| **Tribal Warehouse** | Metal | Potential storage or staging area |

***Commercial / Business / Economic:*** Not noted

***Transportation***

| Name | Jurisdiction |
|---|---|
| **Old Route 66 Road** | NMDOT / Pueblo of Laguna |
| **I-40 Overpasses, exit 117 and Rito** | NMDOT |
| **NMDOT Highway Yard** | NMDOT |

***Utility Systems***

| Type | Components of System | Utility operator |
|---|---|---|
| **Water System** | Water storage tank, 226,000 gallons | Pueblo of Laguna Utility Authority |
| **Waste Water System** | 2 lagoons | Pueblo of Laguna Utility Authority |
| **Solid Waste** | | Pueblo of Laguna Utility Authority |
| **Natural Gas** | Transfer Station (El Paso Natural Gas) | New Mexico Gas Co.<br>El Paso Natural Gas |
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | | Continental Divide Electric Cooperative |
| **Communications** | | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

***Potential Chemical Hazards***

| Site | Hazard or Threat |
|---|---|
| **NMDOT Highway Yard** | Chemicals on site<br>Risks of contamination, risks to water resource |

***Concerns:*** Old Route 66 Hwy Relief Route used when I-40 traffic is re-routed during road closures; BNSF railroad bridge at the eastern end of the route is old and unsafe. Rio Paguate flooding, with contamination from uranium mine.

## Paguate

See Map 8.

***Residential***

| Occupied | Vacant | Total |
|---|---|---|
| 189 | 35 | 224 |

***Critical Facilities:*** Information not available

### *Other Government / Institutional / Community*

| Name | Building Composition | Services |
|---|---|---|
| **St. Elizabeth's Church** | Conventional | Religious |
| **Presbyterian Church** | Conventional | Religious |
| **Kiva** | Traditional | Religious |
| **Elizabeth Bender Hall** | Traditional | Community |
| **Community Center** | Conventional | Community |

### *Commercial / Business / Economic*

| Name | Ownership | Services |
|---|---|---|
| **Paguate Mart** | Laguna Development Corporation | Convenience Store / Gas Station |
| **Pruitt Jewelry and Fabrication** | Private | Jewelry. Note: potential chemical source |
| **Dyaami Jewelry** | Private | Jewelry. Note: potential chemical source |

### *Transportation*

| Name | Jurisdiction |
|---|---|
| **NM Highway 279, including bridge at Paguate Village** | NMDOT |

### *Utility Systems*

| Type | Components of System | Utility Operator |
|---|---|---|
| **Water System** | The Paguate Water System has 197 residential connections and 2 commercial/institution connections. It is served by two wells, Well 2 and Well 4. There are two storage tanks, 140,000-gallon Northview and 104,000-gallon Pork Chop Hill. The water distribution system was replaced in 2012-13. Water is treated by micro-filtration and chlorination. | Pueblo of Laguna Utility Authority |
| **Waste Water System** | 2 lagoons | Pueblo of Laguna Utility Authority |
| **Solid Waste** | | Pueblo of Laguna Utility Authority |
| **Natural Gas** | | New Mexico Gas Co. |
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | Paguate Lake to Seboyeta – power lines but no substation | Continental Divide Electric Cooperative |
| **Communications** | Limited cell phone service | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

### *Potential Chemical Hazards*

| Site | Hazard or Threat |
|---|---|
| **Jackpile Mine** | Potential chemicals on site. |

***Area of Special Consideration:*** Jackpile Mine. Erosion, mudslides, airborne dust. Radioactivity and chemicals.

## Paraje/Casa Blanca

See Map 9.

### *Residential*

| Occupied | Laguna Rainbow Center | Vacant | Total |
|---|---|---|---|
| 236 | 6 | 19 | 261 |

### *Critical Facilities*

| Name | Building Composition and Description | Services |
|---|---|---|
| **Fire Station** | Metal Construction, 3 bays and office complex | Public Safety / Emergency Medical Transport & Fire Suppression |
| **Dental Clinic** | Conventional | Health / X-Ray, Oxygen, Shot Serum |
| **Laguna Rainbow Center nursing home** | Conventional | Health / nursing home |
| **Teen Center** | Conventional | Health / Dental Services, Counseling, Treatment |
| **Laguna-Acoma High School** | Conventional | Education / Grades 9-12 |

### *Other Government / Institutional / Community*

| Name | Building Composition | Services |
|---|---|---|
| **St. Margaret Mary Mission Church** | Traditional | Religious |
| **Casa Blanca Presbyterian Church** | Conventional | Religious |
| **Calvary Gospel Chapel** | Conventional | Religious |
| **Kiva** | Traditional | Religious |
| **Senior Center** | Conventional | Elder care |
| **Recreation Center** | Conventional | Community |
| **Community Center** | Conventional | Community |
| **U.S. Post Office** | Manufactured | Community information, postal services |

### *Commercial / Business / Economic*

| Name | Ownership | Services |
|---|---|---|
| **Dancing Eagle Travel Center** | Laguna Development Corporation | Automatic Teller Machine, laundry, |

| | | |
|---|---|---|
| | | shower, with 24/7 traveler services |
| **Gas Station** | Laguna Development Corporation | Regular and Diesel with propane service |
| **Dairy Queen** | Laguna Development Corporation | Commercial food |
| **Pizza** | Laguna Development Corporation | Commercial food |
| **Market Place** | Laguna Development Corporation | Automatic Teller Machine |
| **Dancing Eagle Casino** | Laguna Development Corporation | Casino, Automatic Teller Machine |
| **Great American Diner** | Laguna Development Corporation | Restaurant |
| **RV Park** | Laguna Development Corporation | RV services |
| **Laguna Development Corporation Offices** | Laguna Development Corporation | Administrative offices for commercial tribal entity |

### *Transportation*

| Name | Jurisdiction |
|---|---|
| **Interstate 40, including bridges** | Federal |
| NM Highway 124 | NMDOT |
| Casa Blanca Rd (L22) | Pueblo of Laguna |
| Burlington Northern Santa Fe Railroad | BNSF |

### *Utility Systems*

| Type | Components of System | Utility Operator |
|---|---|---|
| **Water System** | Two Water Storage Tanks; Casa Blanca (400,000 gal), Paraje (500,000 gal) | Pueblo of Laguna Utility Authority |
| **Waste Water System** | Wastewater treatment facility serving Dancing Eagle and 335 residential homes | Pueblo of Laguna Utility Authority |
| **Solid Waste** | | Pueblo of Laguna Utility Authority |
| **Natural Gas** | | New Mexico Gas Co. |
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | | Continental Divide Electric Cooperative |
| **Communications** | | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

### *Potential Chemical Hazards*

| Site | Hazard or Threat |
|---|---|
| **PDI Pesticides** | Unknown chemical and risk |
| **Dancing Eagle Travel Center** | Unknown chemical and risk |
| **Market Place** | Unknown chemical and risk |

| | |
|---|---|
| **Dancing Eagle Casino** | Unknown chemical and risk |
| **Fire Station** | Unknown chemical and risk |
| **Dental Clinic** | Unknown chemical and risk |
| **Laguna Rainbow Center nursing home** | Unknown chemical and risk; bio-hazards |
| **Laguna-Acoma High School** | Unknown chemical and risk |
| **Pueblo of Laguna Potable Water System** | Unknown chemical and risk |
| **Pueblo of Laguna Waste Water Treatment Facility** | Unknown chemical and risk |

***Area of Special Consideration:*** Rainbow Center Nursing Home; houses elders, hazards include oxygen and bio-hazardous wastes. Railroad crossing on Casa Blanca Road affects evacuation routes.

## Seama

See Map 10.

### *Residential*

| Occupied | Vacant | Total |
|---|---|---|
| 152 | 10 | 162 |

***Critical Facilities:*** Information not available

### *Other Government / Institutional / Community*

| Name | Building Composition | Services |
|---|---|---|
| **St. Ann's Church** | Traditional | Religious |
| **Presbyterian Church** | Metal | Religious |
| **Kiva** | Traditional | Religious |
| **Community Center** | Conventional | Community |

### *Commercial / Business / Economic*

| Name | Ownership | Services |
|---|---|---|
| **Analla's Welding Shop** | Private | Welding Fabrication and Repairs |

### *Transportation*

| Name | Jurisdiction |
|---|---|
| **Interstate 40 and Khe Sanh bridge/ overpass** | Federal |

### *Utility Systems*

| Type | Components of System | Utility Operator |
|---|---|---|
| **Water System** | The Valley water system, which serves Seama, Paraje, Laguna, and Mesita, is located in Seama. The system has 960 residential connections and 153 commercial/institution connections. There are four water supply wells: Seama Irrigation, New York 3, New York 4, and Running Water. | Pueblo of Laguna Utility Authority |

| | | |
|---|---|---|
| **Waste Water System** | One lift station | Pueblo of Laguna Utility Authority |
| **Solid Waste** | | Pueblo of Laguna Utility Authority |
| **Natural Gas** | | New Mexico Gas Co. |
| **Propane** | | ATEX Gas Co., Ortega's Gas Co., AmeriGas Co. & Milan Bottled Gas Co |
| **Electricity** | | Continental Divide Electric Cooperative |
| **Communications** | | Century Link<br>Verizon Wireless<br>Pueblo of Laguna Utility Authority<br>K'awaika Hanu |

***Potential Chemical Hazard***

| Site | Hazard or Threat |
|---|---|
| **El Paso Natural Gas Transfer Line** | Fire and explosion risk |

***Special Considerations:*** Population surges during traditional or holiday gatherings.

***Concerns:*** El Paso Natural Gas has a large fuel line going through the village.

## Eastern Area

The Eastern Area of the Pueblo is described in the Pueblo of Laguna Eastern Reservation Area Master Plan, approved by Council by Resolution 68-09, September 22, 2009; see Map 11. The Eastern Area includes the Sanchez, Majors, Montano, Armijo, Harrington, Eidson, and Sedillo Ranch areas, as well as smaller purchased lands.

The largest land use category in the Eastern Area is "Agricultural Economic Development," "intended to be used for cattle ranching, grazing fields, feed lots, transfer facilities, and irrigated and dry farming."

The Bar PL, Diamond L, Montano, and Sedillo livestock associations graze cattle in the Eastern Area. They have expressed concern about loss of land cover and erosion, affecting roads, as well as limited water supplies.

***Commercial / Business / Economic***

| Name | Ownership | Services |
|---|---|---|
| **Rt. 66 Casino and Hotel** | Laguna Development Corporation | Automatic Teller Machine, 24/7 traveler services, Restaurants, Hotel |
| **Rt. 66 Travel Center Exit 140** | Laguna Development Corporation | Regular and Diesel with propane service, laundry, shower |
| **Dairy Queen** | Laguna Development Corporation | Commercial food |
| **Xpress Casino** | Laguna Development Corporation | Casino Automatic Teller Machine |

| | | |
|---|---|---|
| **Rt. 66 RV Resort** | Laguna Development Corporation | RV Services, Propane Service |
| **Pit Stop Gas Convenience/Gas Station** | Laguna Development Corporation | Regular and Diesel, Commercial Food |
| **Tribal Gaming Regulatory Authority** | Pueblo of Laguna | Administrative offices for Gaming Regulatory Authority |
| **Laguna Development Corporation Offices** | Laguna Development Corporation | Administrative offices for commercial tribal entity |

***Transportation***

| Name | Jurisdiction |
|---|---|
| **Interstate 40, including bridges** | Federal, NMDOT |

***Utility Systems***

| Type | Components of System | Utility Operator |
|---|---|---|
| **Water System** | Two Water Storage Tanks; Rt.66 (800,000 gal), Apache Grahben (750,000) | Laguna Development Corporation |
| **Natural Gas** | | New Mexico Gas Co. |
| **Electricity** | | PNM |
| **Communications** | | Century Link, Verizon Wireless |

## Other Areas

The Pueblo of Laguna's lands also include the Mt. Taylor Ranch, Silver Dollar Ranch, Presbyterian property, Seco Canyon, and Jackward Township, among others. The Bell Rock, Dough Mountain, and Turquoise Springs livestock associations graze cattle in some of these areas.

# III. Natural Hazards

***Review Guide Element B1.b-d***

The plan addresses various types of natural hazards. In developing the 2015 Plan, the LMPT used questionnaires found in FEMA 386-1, Appendix A, Household Natural Hazards Preparedness Questionnaire as an assessment tool. In order to determine the concerns of Laguna community members, input was sought through oral communications, using various public meetings, such as Public Safety Day, village meetings, TERC meetings and door to door assessments to determine the public opinion. Tribal members provided historic accounts of previous natural hazard occurrences such as drought, flooding, wildfires and high wind events. These public forums offered an ability to identify and rank natural hazards and assess potential risks to the Pueblo. During various public events and a door-to-door campaign, 150 questionnaires were distributed and 50 of questionnaires were returned. Figure 1, below, displays the results of the questionnaire. Criteria for ranking ranged from Extremely Concerned = 1 to Not Concerned = 5.

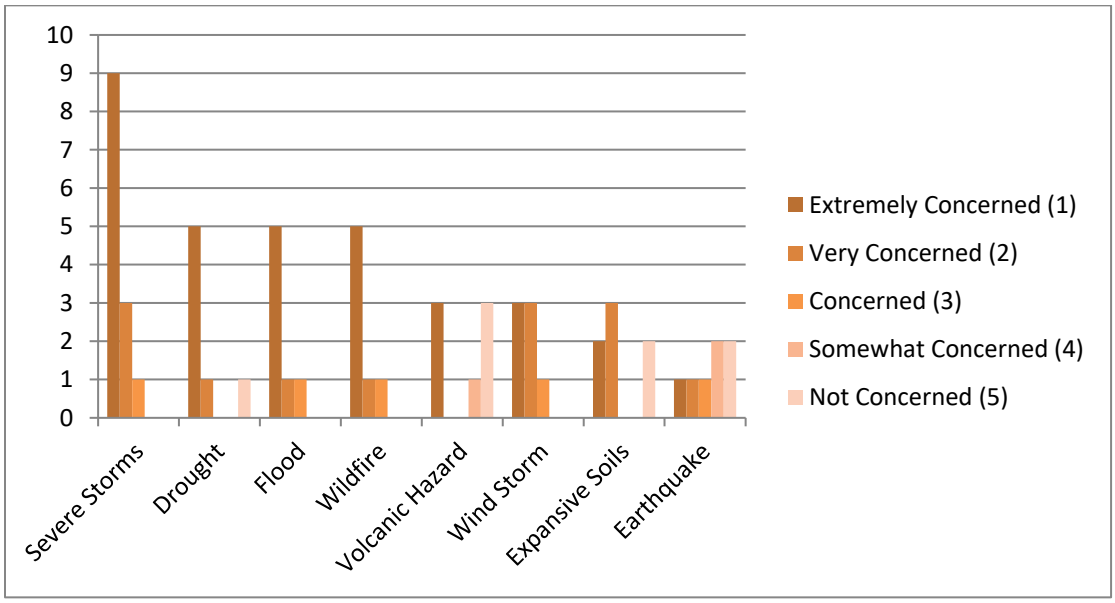



**Figure 1: Hazard Types of public concern.**

The Pueblo of Laguna considered the following natural hazards:

- Drought
- Earthquake
- Expansive Soils
- Flood

- Landslide
- Severe Storm, Including Winter Storm, High Wind, Lightning and Hail
- Tornado
- Volcanic Hazard
- Wildfire

Next, the group organized the hazards into non-geographic and geographic hazards. Non-geographic hazards are those that will affect an entire region, not just the profiled jurisdiction. Geographic hazards are those that are limited to a specific geography such as riverine flood. Therefore, winter storm, drought, wind/dust storm, tornado, lightning, hail and wildfire are non-geographic hazards. Flood and landslide are geographic hazards.

After discussion, the LMPT determined earthquake, expansive soils, tornado, landslide and volcano were of non-existent frequency, magnitude, and severity and therefore voted against profiling these risks. However, the LMPT included dam inundation because high precipitation is a contributing factor. Severe storms were considered to include winter storms, high winds, lighting and hail.

Based on the criteria, ranking from public input, and research and discussion at planning meetings, the LMPT identified the following five hazards to profile: Dam Inundation; Drought; Flood; Severe Storm; and Wildfire.

| **Probability / Frequency** | |
|---|---|
| **Low** | Occurs less than once every 10 years or more |
| **Medium** | Occurs less than once every 5-10 years |
| **High** | Occurs once every year or at least once every 5 years |

For the 2020 update to this Plan, the Pueblo conducted another survey to gauge the community's current level of concern about specific natural hazards. The survey asked respondents to weigh possible natural hazards against each other, by picking their top six concerns in order. Responses were as follows (also see Figure 2):

| | |
|---|---|
| Extreme Heat | 84% |
| High Winds/Dust Storms | 84% |
| Drought | 82% |
| Extreme Rainfall/Flooding/Erosion | 77% |
| Wildfire | 66% |
| Severe Winter Storms | 50% |
| Lightning Storms | 41% |

| | |
|---|---|
| Dam Failure/Flooding | 36% |
| Hail | 30% |
| Soil Shrinking/Swelling | 27% |
| Volcanic Activity | 14% |
| Tornadoes | 7% |
| Earthquake | 2% |

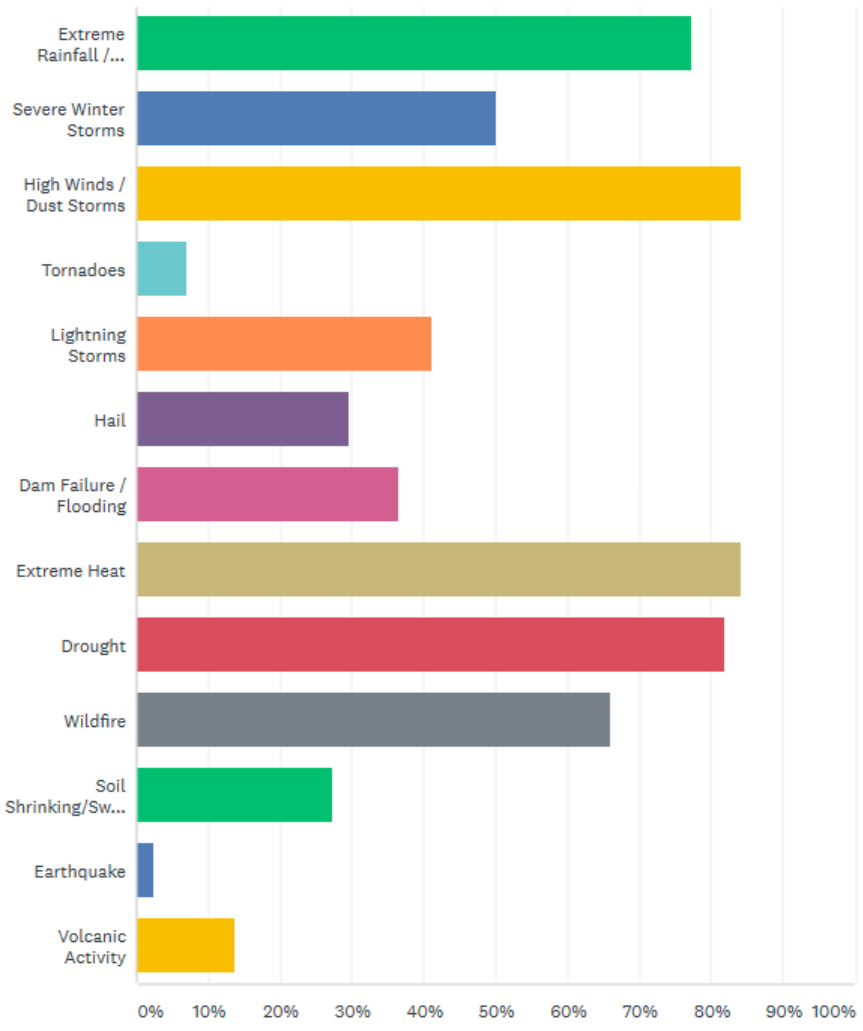



**Figure 2: Hazard Types of public concern, 2019 survey.**

Based on the survey for the update, the 2020 Plan added information on extreme heat and restructured the hazards in the plan, using the top 8 concerns and linking related concerns:

- Extreme Heat
- Severe Storms: High Winds

- Drought
- Flooding / Dam Inundation
- Wildfire / Lightning
- Severe Storms: Winter Storms

Like the 2015 Plan, the 2020 Plan concluded that hail was more of an inconvenience than a threat or hazard, and earthquake, tornado, landslide, expansive soils, and volcano were of negligible frequency, magnitude, and severity, and agreed not to profile these risks in the plan update.

The 2020 plan update coordinators added information from the Pueblo of Laguna Emergency Notification System (ENS) which was initiated in November 2015. ENS warnings are an indication of the existence of natural hazards in the area, and are listed in the section on each hazard type. However, they do not occur automatically based on weather conditions, so announcements may be affected by other factors. There are also multiple notifications associated with one event, making it difficult to tabulate percentages based on type of event.

The 2020 plan update coordinators also added information from Continental Divide Electric Cooperative's (CDEC) power outage summaries for 2014, 2015, 2017, and 2018. (2016 data was not available.) CDEC tracks outages by cause, including natural causes such as "weather" (broadly defined), lightning, wind, snow and ice, flooding, fallen trees, and tree limbs brushing, as well as mammal and fowl, manmade objects (such as vehicle collisions), equipment, and other miscellaneous causes. The percentage of outages associated with natural causes was 67%, 69%, 59%, and 68% in 2018, 2017, 2015, and 2014, respectively. Individual causes are described below. (Note that 16% of the natural causes in the four-year period was from unspecified "weather," 4% from fallen trees, and 1% from tree limbs brushing.)

The Pueblo of Laguna recently completed a climate profile through the University of Arizona Climate Assessment for the Southwest (CLIMAS), funded by the BIA Tribal Resilience Program through grant A18AP00235. The project reviewed historical climate data for the Pueblo of Laguna area (weather data from Cubero, NM) and used the Intergovernmental Panel on Climate Change's Representative Concentration Pathways (RCPs), based on scenarios considering a variety of factors, to consider changes in temperature, precipitation, and related effects such as drought, flooding, wind, and wildfire. The plan coordinators added historical and projected data on heat, severe storms/winds, drought, flooding, wildfire, and severe storms/winter storms.

# Extreme Heat

**Type of Hazard, Extent, and Location**

According to FEMA fact sheet V-1004 (June 2018), in most of the United States, extreme heat is a long period, 2 to 3 days, of high heat and humidity with temperatures above 90 degrees. High heat is often not associated with high humidity in the Southwest. FEMA's Mitigation Ideas handbook states that "extreme heat is typically recognized as the condition where temperatures stay ten degrees or more above a region's average high temperature for an extended period" (January 2013, page 19). Extreme heat may also be referred to as a "heat wave" or "hot spell." Extreme heat can also occur as individual days of unusually high temperatures.

The extent of heat is measured by temperature and duration.

Extreme heat can affect all planning areas of the Pueblo of Laguna.

**Occurrence**

Temperature records for the area date back to 1895. Climate scientists consider the average temperature over the course of an entire year as a reference point for understanding past and projected future changes, rather an indicator of how the temperature feels at any given point. Since 1995, most years have been above the long-term average of 52.8°F.

*Previous Events:* Extreme heat is an addition to the Hazard Mitigation Plan for the 2020 update. No research on previous events was conducted.

*Recent Events:* In 2016, there were two ENS notification system warnings about heat waves, on May 15 and June 16. In 2017, there were three, on June 7, 19, and 20. There were no CDEC electrical power outages reported as being due to extreme heat.

According to the Climate Profile, the hottest average temperature since 1895 was in 2017.

One respondent to the survey noted that it seems to have gotten hotter and stay hotter longer.

*Probability/Expected Frequency of Future Events:* The Climate Profile for the Pueblo indicates that the average temperature is projected to rise from about 53°F to 57°-58°F by 2050. Temperature increases are projected to be consistent across all four seasons.

The Climate Profile projected the number of days per year when temperatures exceed 90°F. Between 1986 and 2005, there were approximately 42 days each year above 90°F. By 2050, there are projected to be about 80 days per year above 90°F (moderate and high scenarios).

The Climate Profile also projected the number of "heat waves," two days or more in a row with temperatures above 95°F. Since 1977, almost every year has had at least one heat wave, some (1978, 1980, 1981, 2002, 2015, and 2017) have had as many as four, and the average has been just over two per year. By 2050, between five and six heatwaves a year will be likely.

**Impacts**

Extreme heat pushes the human body beyond its limits. Common effects are heat cramps, heat exhaustion, and heat stroke (also called sun stroke). People who need to be outside for work or other reasons are more exposed to extreme heat. People with existing illnesses, those who are on certain medications, those who are overweight, elders, and children may be more affected by extreme heat. Extreme heat may be worse in developed areas, where asphalt and concrete store heat and release it at night, reducing the possibility of cooling down overnight.

Respondents to the survey expressed concern about children being outside, getting sick and being sunburned, and also noted that domestic animals are affected by high temperatures. There were concerns about not having a place to go (that is cool) when temperatures are high.

Unusually high temperatures, whether or not they are over a long period of time, can also affect the Pueblo's infrastructure and utilities. High heat is notable for affecting electrical systems.

## Severe Storms: High Winds

**Type of Hazard**

High winds typically occur when large air masses of varying temperatures meet. Rapidly rising warm moist air serves as the "engine" for windstorm events that may include severe thunderstorms. These winds are often called "straight-line" winds to differentiate from tornadoes. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft. Storms can occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.

*Types of damaging winds*

*Straight-line winds* – a term used to define any thunderstorm wind that is not associated with rotation, used mainly to differentiate from tornadic winds.

*Downbursts* – A strong downdraft with horizontal dimensions larger than 4 km (2.5 mi) resulting in an outward burst or damaging winds on or near the ground. (Imagine the way water comes out of a faucet and hits the bottom of the sink.) Downburst winds may begin as a microburst and spread out over a

wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.

*Downdrafts* – A small scale column of air that rapidly sinks toward the ground. A downburst is a result of a strong downdraft.

*Microbursts* – A small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally small (less than 4km across) and short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 168 mph. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.

*Gust front* – A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.

*Derecho* – A derecho is a widespread thunderstorm wind event caused when new thunderstorms form along the leading edge of an outflow boundary (a surface boundary formed by the horizontal spreading of thunderstorm-cooled air). The thunderstorms feed on this boundary and continue to reproduce themselves. Derechos typically occur in the summer months when complexes of thunderstorms form over the plains and northern plains states. Usually these thunderstorms produce heavy rain and severe wind reports as they rumble across several states during the night. The word "derecho" is of Spanish origin and means "straight ahead." They are particularly dangerous because the damaging winds can last a long time and can cover such a large area.

*Bow Echo* – A radar echo which is linear but bent outward in a bow shape. Damaging straight-line winds often occur near the "crest" or center of a bow echo. Bow echoes can be over 300km in length, last for several hours, and produce extensive swaths of wind damage at the ground. (Damaging Winds Basics, http://www.nssl.noaa.gov/primer/wind/wind_basics.html, Accessed 9/28/12)

**Extent and Location**

The Beaufort Wind Scale is used to measure the effects of wind on land (Table 1). Damaging winds are classified as those exceeding 50-60 mph. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles.

Table 1. Beaufort Wind Scale

| Beaufort Wind Scale | | | |
|---|---|---|---|
| **Beaufort Number** | **Wind Speed mph** | **Description** | **Land Conditions** |
| **0** | 0 | Calm | Calm. Smoke rises vertically. |

| Beaufort Wind Scale | | | |
|---|---|---|---|
| **Beaufort Number** | **Wind Speed mph** | **Description** | **Land Conditions** |
| **1** | 1-3 | Light air | Wind motion visible in smoke. |
| **2** | 4-7 | Light breeze | Wind felt on exposed skin. Leaves rustle. |
| **3** | 8-12 | Gentle breeze | Leaves and smaller twigs in constant motion. |
| **4** | 13-18 | Moderate breeze | Dust and loose paper rises. Small branches begin to move. |
| **5** | 19-24 | Fresh breeze | Smaller trees sway. |
| **6** | 25-31 | Strong breeze | Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. |
| **7** | 32-38 | Near gale | Whole trees in motion. Effort needed to walk against the wind. |
| **8** | 39-46 | Gale | Twigs broken from trees. Cars veer on road. |
| **9** | 47-54 | Strong gale | Light structure damage. |
| **10** | 55-63 | Storm | Trees uprooted. Considerable structural damage. |
| **11** | 64-73 | Violent storm | Widespread structural damage. |
| **12** | 73-95 | Hurricane | Considerable and widespread damage to structures. |

All areas of the state can experience all 12 Beaufort categories. High winds can affect all planning areas of the Pueblo of Laguna. However, high wind events may be more likely in the eastern portion of the Pueblo lands during the spring season. This area is not protected by the high mesas and terrain found in the western portion of the reservation.

**Occurrences**

According to a National Weather Service Report by Shoemake cited in the Pueblo of Laguna Climate Profile, there were 55 high wind events, with sustained speeds of 40 mph or greater or gusts of 58 mph or higher, in Albuquerque between 1976 and 2005, an average of slightly less than 2 events per year. There were 19 high wind events record in Gallup in the same time period.

*Previous Events:* In interviews for the 2015 plan, elders did not recall any past events of high winds that caused damage to property.

*Recent Events:* On October 13, 2013 damaging winds caused 15 railroad cars to blow over near an Interstate 40 underpass approximately 4 miles southeast of Mesita. During the month of March and early April 2014, strong winds damaged roofs of several tribal members' homes in Seama and New Laguna. Laguna Housing Development and Management Enterprise assisted with emergency

rehabilitation of 5 homes in 2015, 5 homes in 2016, 4 homes in 2017, 5 homes in 2018, and 4 homes in 2019.

In 2016, there were four ENS notification system warnings of strong winds, with a severe weather watch, on April 4, April 22, April 30, and November 17. The November 17 notification also warned of blowing dust. In 2017, there were eight warnings, on February 27, March 22, March 28, March 31, April 3, April 26, April 28, and October 6. The October 6 notification also warned of low visibility. In 2018, there were six warnings, on February 19, March 18, April 11, April 12, April 16, and April 19. There were also two warnings of high wind damage in 2018, on December 12 and 13. Although tornadoes are not a strong concern for Pueblo of Laguna community members, there were two warnings of tornado/funnel cloud sightings in 2017, on September 29 and 30, and two in 2018, on June 3 and October 13.

Over the course of four reported years, 2014-2015 and 2017-2018, 20% of the nature-related CDEC power outages, 54 outages, on Laguna lands were due to wind.

*Probability of Future Events:* The Climate Profile notes that climate change may be affecting the track of the jet stream, a pathway of airflow that influences weather and storm tracks. Changes in the jet stream are linked with more extreme storms and associated winds. However, climate models cannot predict specific regional wind patterns.

Changes in wind patterns are difficult to predict, but as wind may be associated with severe storms, and thunderstorms, it is also linked to precipitation patterns. As described below, in the section on flooding, extreme storms are expected to increase on the Pueblo of Laguna. This may result in more high winds.

**Impacts**

High winds can affect people, structures and infrastructure, from minor to major incidents. Electrical service can be disrupted due to damaged wiring, causing power outages; downed trees are a major cause of disruption. Dust storms can affect traffic flows on roadways such as Interstate 40 & NM Highway 124; visibility becomes a problem for commuters. Mobile homes can be impacted by high wind events; roofs may be blown off. Railroad transportation can be affected due to sudden high wind events, including train derailments. High winds cause erosion that can also expose cultural resources. Survey respondents expressed concern about dust from roads, many of which are dirt or gravel, and risks due to electric lines being close to homes.

# Drought

**Type of Hazard**

Drought is a condition of dryness that reduces water, snow levels, or soil moisture below the minimum necessary for sustaining plant, animal, and socio-economic systems. The most commonly used drought definitions are based on meteorological, agricultural, hydrological, and socio-economic effects.

*Meteorological drought* is defined by a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.

*Agricultural drought* occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought but before hydrological drought and can affect livestock and other dryland agricultural operations.

*Hydrological drought* refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snow pack, and as lake, reservoir, and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.

*Socio-economic drought* occurs when physical water shortages start to affect the health, wellbeing, and quality of life of people, or when the drought starts to affect the supply and demand of an economic product.

Although different types of drought may occur at the same time, they can also occur independently of one another.

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

**Extent and Location**

Drought status is calculated using several indices that measure how precipitation for a given period of time has deviated from historically established norms. The Palmer drought severity index (PDSI) is used by the U.S. Department of Agriculture (USDA) to determine allocations of grant funds for emergency

drought assistance (Table 2). The Palmer index is based on the supply-and-demand concept of the water balance equation, taking into account more than the precipitation deficit at specific locations. The PDSI provides a measurement of moisture conditions that are standardized so that comparisons using the index can be made between locations and months.

Table 2: Drought severity categories, including Palmer Drought Severity Index.

| Drought Severity | Return Period (years) | Description of Possible Impacts | Drought Monitoring Indices | | |
|---|---|---|---|---|---|
| | | | Standardized Precipitation Index (SPI) | NDMC* Drought Category | Palmer Drought Index |
| Minor Drought | 3 to 4 | Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered. | -0.5 to -0.7 | D0 | -1.0 to -1.9 |
| Moderate Drought | 5 to 9 | Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested. | -0.8 to -1.2 | D1 | -2.0 to -2.9 |
| Severe Drought | 10 to 17 | Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed. | -1.3 to -1.5 | D2 | -3.0 to -3.9 |
| Extreme Drought | 18 to 43 | Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions. | -1.6 to -1.9 | D3 | -4.0 to -4.9 |
| Exceptional Drought | 44+ | Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies. | less than -2 | D4 | -5.0 or less |

*NDMC - National Drought Mitigation Center

Drought conditions are usually not uniform over the entire state. Local and regional differences in weather, soil condition, geology, vegetation, and human influence need to be considered when assessing the impact of drought on any particular location.

In the state of New Mexico, the Department of Homeland Security and Emergency Management Agency established the Local Preparedness Program to assist tribes and local jurisdictions with emergency management initiatives. Six local preparedness areas were created to better serve the many local governments by assigning Local Preparedness Coordinators to each area. The Pueblo of Laguna falls within Preparedness Area 4, which consists of Cibola, McKinley and San Juan Counties (Figure 3).

**Preparedness Area 4**
**Counties:** Cibola, McKinley and San Juan
**Pueblos:** Acoma, Laguna, Zuni
**Tribal Nations:** Navajo Nation

**Figure 3: Preparedness Area 4**

The Pueblo of Laguna Utility Authority Drought Contingency Plan describes the three water service areas of the Pueblo's six villages: Encinal, Paguate, and the Valley, which serves Seama, Paraje, Laguna, and Mesita. The Encinal system is supplied by fourteen springs whose source is a relatively shallow basalt flow aquifer fed by precipitation and snowmelt on Mt. Taylor. The springs have some reduction in flow during drought. The Paguate system is supplied by two groundwater wells in the alluvial aquifer of the Rio Paguate, recharged primarily from the Rio Paguate upstream of the village and the wells. There is no data on water well levels or changes over time, so the impact of drought is not known. The Valley system wells are located in the Rio San Jose alluvial aquifer, recharged primarily by the Rio San Jose and tributary streams. Well water levels have only been monitored since 2014, during which time there has been no significant decline. If drought leads to greater agricultural water use upstream, flow in the Rio San Jose could be reduced, with decreased aquifer recharge. The Valley system is also supplied by the Encinal system. The Encinal system is likely to be more affected by drought than the Paguate and Valley systems. Encinal and Paguate do not have back-up water sources.

Laguna Development Corporation operates its own water system.

**Occurrences**

Drought conditions at the Pueblo of Laguna have not been consistently monitored over time. The POLUA Drought Contingency Plan recommends regular monitoring.

*Previous Events:* In the 1930's, the Pueblo of Laguna cattle growers were forced to relocate their herds of cattle to southeastern New Mexico because of severe drought conditions. Since 1950, periods of drought have been documented in 1950-1957, 1963-1964, 1976-1978, 1989, 1996, 1998-1999, 1999-2003, 2003-2006, and 2011-2014.

*Recent Events:* According to the U.S. Drought Monitor, December 25, 2012, Preparedness Area 4 was considered Moderate to Severe. There was an almost 50 percent reduction in flow from the springs which supply the Encinal Water System during a 2013-2014 drought (POLUA Drought Contingency Plan). Also in 2013, a request was submitted to the Pueblo Council for authorization to use domestic water for

watering of livestock due to the stock ponds/dirt tanks having no water. Before council action was taken, the monsoon rains arrived.

There have been no drought warnings in the Pueblo of Laguna ENS, likely because of the longer-term nature of drought. There have been no reported CDEC power outages associated with drought; there is no indication of a correlation between the two.

According to the National Integrated Drought Information System, NIDIS, at Drought.gov, as of January 28, 2020, the Pueblo of Laguna had "abnormally dry" conditions, D0, with short-try dryness slowing planting and growth of crops, some lingering water deficits, and pastures or crops not fully recovered. The Southwest had reported above normal temperatures for September-October-November 2019, according to the Western Region Quarterly Climate Impacts and Outlook report, December 2019. The longest duration of drought in New Mexico was from 2001 to 2007. The most intense period drought was during the week of June 21, 2011, with drought affecting over 49% of New Mexico land.

*Probability/Expected Frequency of Future Events:* Drought is linked to both decreased precipitation and increased temperatures. Changes in precipitation in the Southwest are difficult to model because the region's rainfall is highly influenced by the North American Monsoon (NAM), which is itself challenging to model. The best available projections indicate that total annual rainfall will be relatively consistent. However, the patterns of precipitation are likely to change, with their possibly being fewer but heavier storms each year. This will mean more days with no precipitation. The Pueblo currently has an average of 270 dry days (less than 0.01 inches of precipitation) per year. This could increase to between 275 and 285 days per year.

The Pueblo currently has an average of slightly more than 4 days per year with more than 1 inch of precipitation. There may be one to two additional days, or even as many as ten more days, per year with more than 1 inch of precipitation. There may also be a slight chance of increasing days with more than 2 inches of precipitation. Heavier rainfalls are more likely to runoff rather than be absorbed into soils and aquifers.

As noted above, increased temperatures are predicted for the area. Rising temperatures will increase evaporation and evapotranspiration, increasing drought.

**Impacts**

The types of drought suggest a number of drought impacts. Agricultural drought occurs when the moisture needs of a crop cannot be met. Agricultural drought especially affects non-irrigated areas such as dryland farms and rangelands. Hydrological drought refers to surface and subsurface water supplies, including decreased water in lakes, ponds, and reservoirs, and loss of wetlands. Socio-economic drought occurs when physical water shortages affect the health, wellbeing, and quality of life of people, and economic activity.

Environmental impacts are not limited to agriculture and hydrology. Other plants and animals, including those significant to Laguna culture, are also affected. Impacts may include:

- Loss or destruction of fish and wildlife habitat
- Lack of food and drinking water for wild animals
- Increase in disease in wild animals because of reduced food and water supplies
- Migration of wildlife
- Increased stress on endangered species or even extinction
- Bark beetle outbreak which causes dry vegetation, leading to an increase in wildfire risk for the entire planning area.
- Death of vegetation, inability to hold soils, leading to wind and water erosion. This can affect infrastructure, especially roads.
- Poor soil quality

Agricultural drought and loss of crops or livestock affect farmers and farm employees, the agricultural industry, and other agriculture-related economic sectors. Agriculture may also be affected by spending more money on feed and water, and new wells or irrigation infrastructure. Additional economic impacts of drought may also include:

- Decreased recreational business, both outdoor recreation and indoor recreation that relies on people traveling, particularly if they are staying in RVs (such as casinos)
- Additional costs to pump water for commercial businesses
- Increased food costs
- Reduced incomes
- Costs of relocating

Survey respondents expressed concerns about impacts of drought on both livestock and wildlife.

Drought may lead to health problems due to reduced water quantity and poor water quality, including water for domestic use, and respiratory health impacts due to dust. Some community members expressed particular concern about the risk of blowing dust from the former Jackpile uranium mine site.

Mental health and social impacts may include anxiety and depression, particularly from economic losses, and decreased recreational activities. There are often greater impacts on vulnerable populations such as elders and youth.

The impacts of drought can be compounded by other infrastructure problems. Until the recent replacement of the Pueblo's water lines, community members were concerned about water line breaks and other system failures. The Pueblo of Laguna Utility Authority continues to replace wastewater collection system lines.

Drought increases the probability and severity of wildfire, which also affects respiratory health and public safety. Drought or fire may make soils hydrophobic, repelling water, which can result in increased runoff and erosion, and more severe flash flooding. Drought and fire also reduce vegetative cover, which increases erosion, causing serious damage to aquatic life, irrigation, and power generation by silting of streams, reservoirs, and rivers.

# Floods

**Type of Hazard**

The definition of flood used by the Cibola County New Mexico Mitigation Plan is "a body of water which rises to overflow land which is not normally submerged." This definition covers a wide range of flooding, including river and coastal flooding, rainwater flooding, flooding on level surfaces and low gradient slopes, flooding in shallow depressions caused by water-table rise, and flooding caused by backing-up or overflow of artificial drainage systems.

Floods in the Southwest are often caused by heavy rains in a short period of time. In the western United States, storms over the Pacific Ocean bring heavy rains between November and April. Monsoons occur in the Southwest in the summer. The El Niño weather pattern is characterized in the Southwest by increased precipitation and decreased temperatures in the winter, while La Niña is characterized by decreased precipitation and increased temperatures in winter. Increased winter precipitation and decreased temperatures can be beneficial in New Mexico, allowing for greater snowpack, with more reliable water supplies early in the year.

A midwinter or early spring thaw can also produce large amounts of runoff in a short period. Because the ground is hard and frozen, water cannot penetrate and be reabsorbed. The water then runs off the surface and flows into lakes, streams, and rivers, causing excess water to spill over their banks. (https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/snow_melt.jsp. Accessed 3/7/12.)

During the spring, frozen land prevents melting snow or rainfall from seeping into the ground. Each cubic foot of compacted snow contains gallons of water and once the snow melts, it can result in the overflow of streams, rivers, and lakes. Add spring storms to that and the result is often serious, spring flooding. (https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/spring_thaw.jsp Accessed 3/7/12)

Flooding can also be exacerbated by development. Construction and development can change the natural drainage and create new flood risks. Buildings, parking lots, and roads decrease the land surface that can absorb excess precipitation from heavy rains, hurricanes, and tropical storms.

(https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/new_development.jsp Accessed 3/7/12)

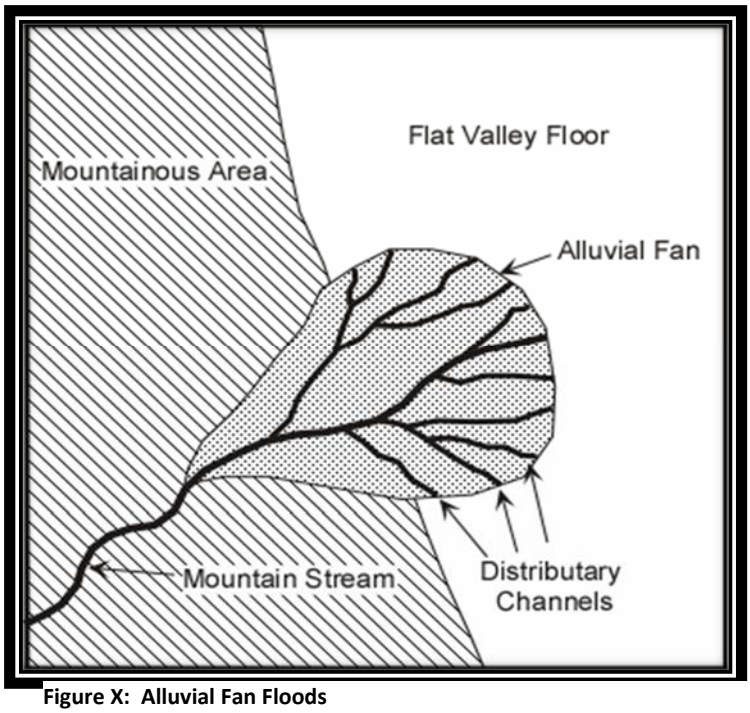



**Figure X: Alluvial Fan Floods**

*Alluvial Fan Floods:* Alluvial fans are deposits of rock and soil that have eroded from mountainsides and accumulated on valley floors in a fan-shaped pattern. The deposits are narrow and steep at the head of the fan, broadening as they spread out onto the valley floor (Figure 4). As rain runs off steep valley walls, it gains velocity, carrying large boulders and other debris. When the debris fills channels on the fan, floodwaters spill out and cut new channels. The process is repeated, resulting in shifting channels and combined erosion and flooding problems over a large area. Alluvial fan flooding is most prevalent in the arid western United States and causes damage because of high velocity flows and debris.

*Riverine Flooding:* Riverine flooding includes flooding of rivers and streams. Riverine floodplains range from narrow, confined channels in the steep valleys of hilly and mountainous areas to wide, flat, low-lying areas. The volume of water in the floodplain is a function of the size of the contributing watershed and topographic characteristics such as watershed shape and sloop and climactic and land use characteristics. A simple construction of a barrier near a waterway can actually produce a significant rise in water level and increase volume of runoff water. In steep, narrow valleys, flooding usually occurs quickly and is of short duration, and floodwaters are likely to be rapid and deep. In relatively flat floodplains, areas may remain inundated for days or even weeks. Floodwaters are typically slow moving, relatively shallow, and may accumulate over time.

*Fluctuating Lake Levels:* Water levels in lakes can fluctuate on a short-term, seasonal basis or on a long-term basis over periods of months or years. Seasonal heavy rainfall can cause high lake levels for short periods and snowmelt can increase spring lake levels. While all lakes may experience fluctuations, water levels tend to vary the most in lakes that are completely landlocked (closed basin) or have inadequate outlets to maintain a balance between inflow and outflow. These lakes may have a rise in water level as much as 5 to 15 feet over a long period, causing flooding problems.

*Local Drainage or High Ground Water Levels:* Heavy precipitation may produce flooding in localized areas other than normal floodplains and drainage channels. If local conditions cannot accommodate intense precipitation through infiltration and surface runoff, for example if ground is saturated or storm drains are backed up, water may accumulate and cause flooding problems. Inadequate drainage and shallow sheet flooding may result unless channel improvement accounts for increased flows. High ground water level may be of concern in some areas and can cause problems even when there is no surface flooding.

Flash flooding is a term widely used by flood experts and the general population. Flash floods consist of a rapid rise in water level, high velocity, and large amounts of debris caused by intense rainfall or collapse of a man-made structure or ice dam. However, there is no single definition and no clear means to separate flash floods from other floods. They are capable of tearing out trees, undermining buildings and bridges and scouring new channels, and are the number-one weather-related killer in the United States.

Major factors in describing flash floods are the intensity and duration of the floodwaters, as well as steepness of the watershed and stream gradients. The amount of watershed vegetation, natural and artificial flood storage areas, configuration of the streambed, and the floodplain are also important. Flash flooding in urban areas is an increasingly serious problem due to removal of vegetation, paving, and replacement of groundcover by impermeable surfaces that increase the amount of runoff, as well as construction of drainage systems that increase the speed of runoff.

*Mudflow:* Mudflows are rivers of liquid and flowing mud on the surface of normally dry land, often caused by a combination of brush loss and subsequent heavy rains. Mudflows can develop when water saturates the ground, such as from rapid snowmelt or heavy or long periods of rainfall, causing a thick liquid downhill flow of earth. Mudflows are different from other earth movements, such as landslides, slope failures, and even moving saturated soil masses in which masses of earth, rock, or debris move down a slope where there is not a flowing characteristic. Damage from mudflows is covered by flood insurance; damage from landslides and other earth movements is not. Mudslides can also be covered, if defined exactly as the Standard Flood Insurance Policy defines Mudflow. (https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/mud_flows.jsp, Accessed 3/7/12)

Many areas in the western states are at an increased flood risk due to wildfires. After a wildfire, charred ground where vegetation has burned away cannot easily absorb rainwater, increasing the risk of flooding and mudflows over a number of years. The Las Conchas Fire in New Mexico is one example. Properties directly affected by fires and those located below or downstream of burn areas are most at risk. (https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/flood_after_fire.jsp Accessed 3/7/12)

*See below for flooding related to breaches of dams.*

**Extent and Location**

Flooding can happen anywhere, but certain areas are especially prone to serious flooding. The majority of flood events in the United States involve inundation of floodplains. Figure 5 shows inundation of floodplains during a large-scale weather system with prolonged rainfall from storms or snowmelt.

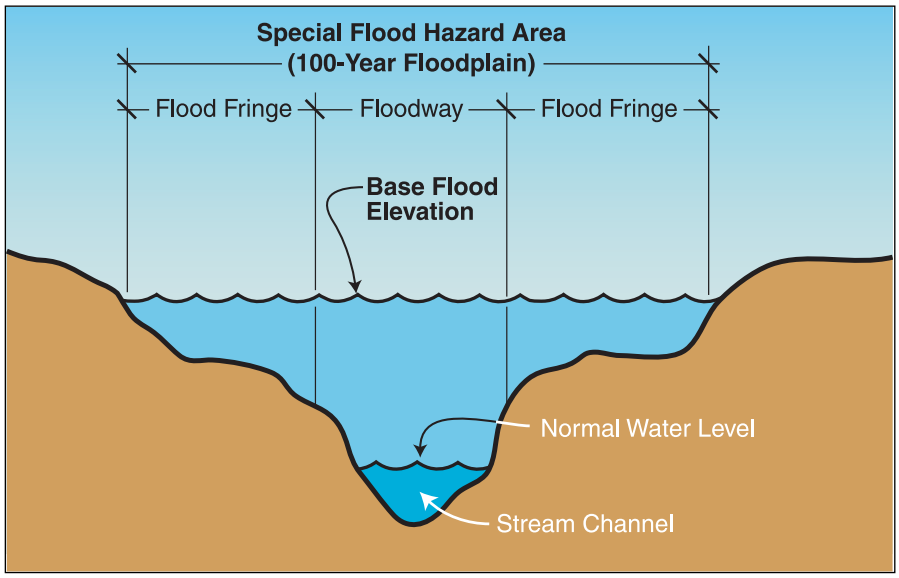



**Figure 5: Flood Definition** (Source: FEMA's "Understanding Your Risks – FEMA Publication 386-2, page 2-12)

To help communities understand their risk, flood maps (Flood Insurance Rate Maps, FIRMs) have been created to show the locations of high-risk, moderate-to-low risk and undetermined-risk areas:

*High-Risk Areas* (Special Flood Hazard Area or SFHA) in high-risk areas, there is at least a 1 in 4 chance of flooding during a 30-year mortgage. All homes and business owners in these areas with mortgages from federally regulated or insured lenders are required to buy flood insurance. They are shown on the flood maps as zones labeled with the letters A or V.

*Moderate-to-Low Risk Areas* (Non-Special Flood Hazard Area or NSFHA) in moderate-to-low risk areas, the risk of being flooded is reduced but not completely removed. These areas submit over 20% of the National Flood Insurance Program (NFIP) claims and receive one-third of disaster assistance for flooding. Flood insurance is not federally required in moderate-to-low areas but it is recommended for all property owners and renters. These are shown on flood maps as zones labeled with the letters B, C or X (or a shaded X).

*Undetermined-Risk Areas* No flood-hazard analysis has been conducted in these areas, but a flood risk still exists. Flood insurance rates reflect the uncertainty of the flood risk. These areas are labeled with the letter D on the flood maps.
(https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/defining_flood_risks.jsp Accessed 3/7/12)

Runoff from the mountain canyon north, south and to the west of the Pueblo of Laguna flowing into the Rio San Jose causes flash flooding into the Pueblo of Laguna. This runoff inundated the valley from Seama east to Casa Blanca, a four mile span.

The Rio San Jose has a large accumulation of salt cedar on the banks and into the Rio San Jose drainage. Salt cedar accumulations keep the water from draining properly. This affects the villages of Seama and Casa Blanca.

Figures 6 through 9 depict portions of NFIP floodplain maps in the Pueblo of Laguna village areas, panels 35006C0750 and 35006C0775C, including lands along the Rio San Jose that are located in SFHA's and most prone to flood events.

FIRM panel 35006C0500C includes the Village of Encinal, with no Zone A areas, and part of the Village of Paguate, with no Zone A areas. Panel 35006C0525C includes part of the Village of Paguate, with some Zone A areas along the Seboyeta Creek and the Rio Paguate after its junction with Seboyeta Creek, not near residential areas, but adjacent to the BNSF railroad. Panel 35006C0800C includes continuing Zone A areas along the Rio Paguate, but not along the Rio San Jose near Mesita.

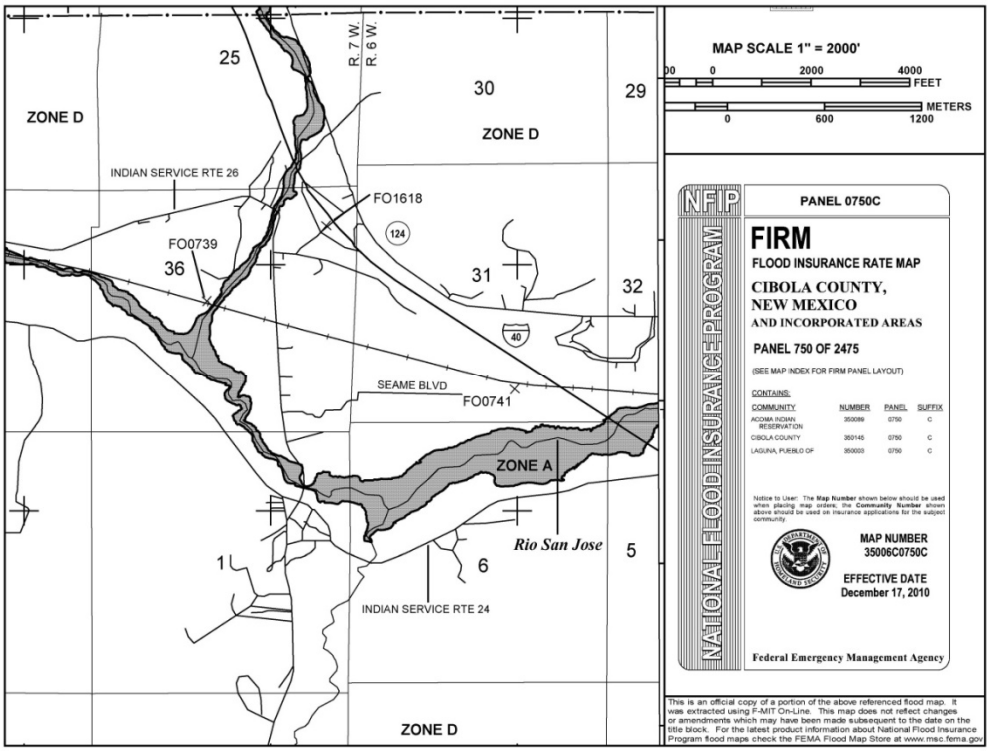



**Figure 6: NFIP, Flood Insurance Rate Map for Laguna Pueblo.**

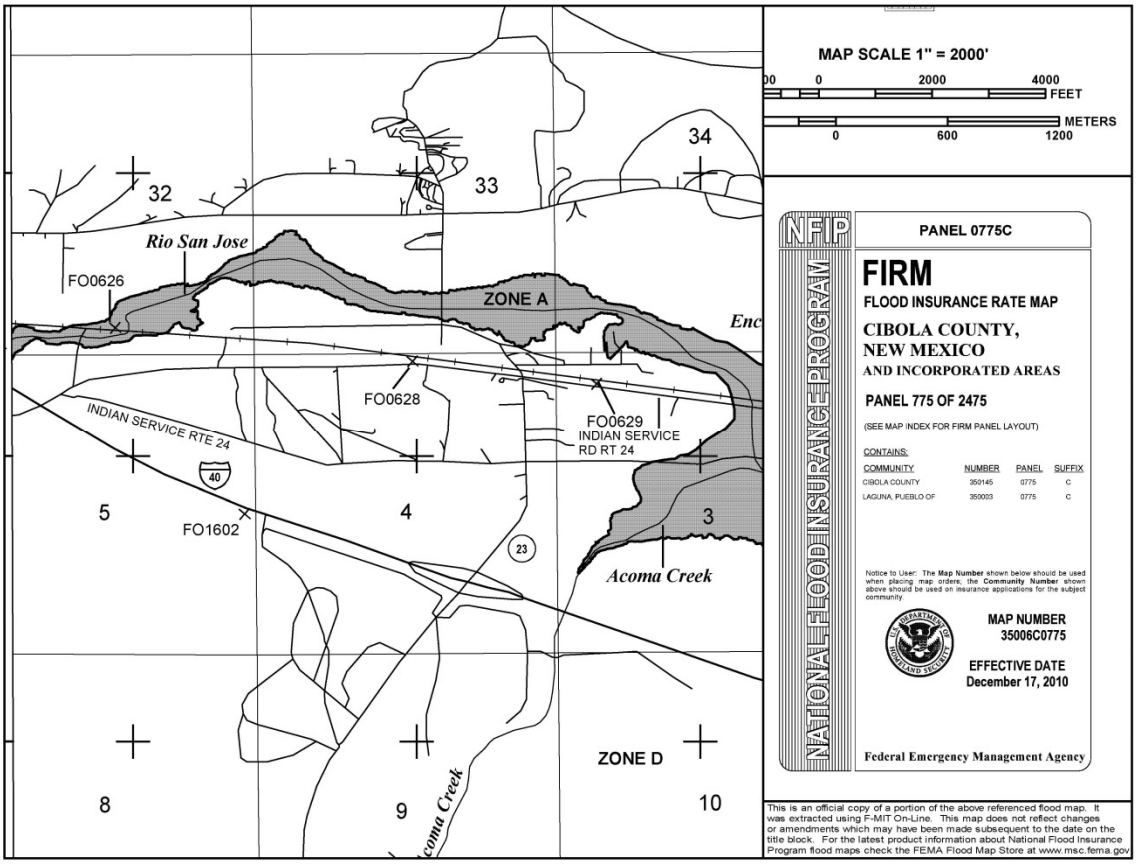



**Figure 7: NFIP, Flood Insurance Rate Map for Laguna Pueblo.**

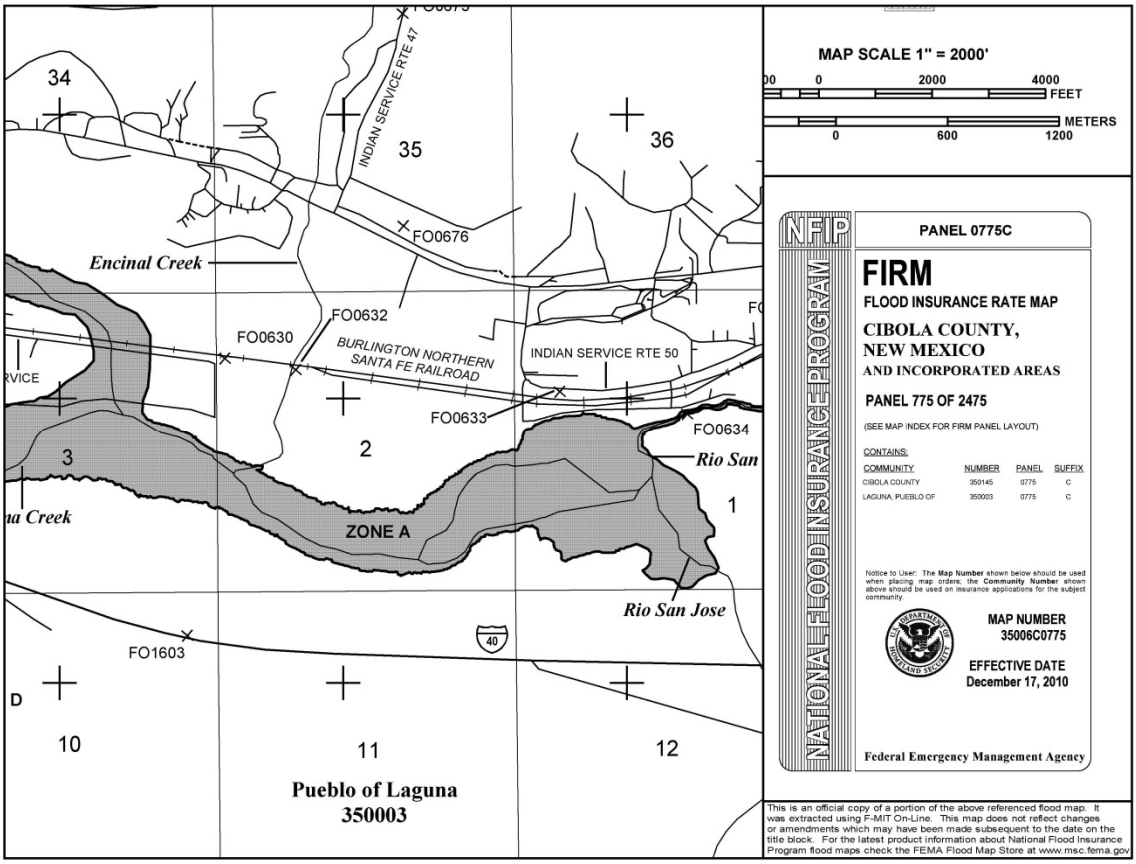



**Figure 8: NFIP, Flood Insurance Rate Map for Laguna Pueblo.**

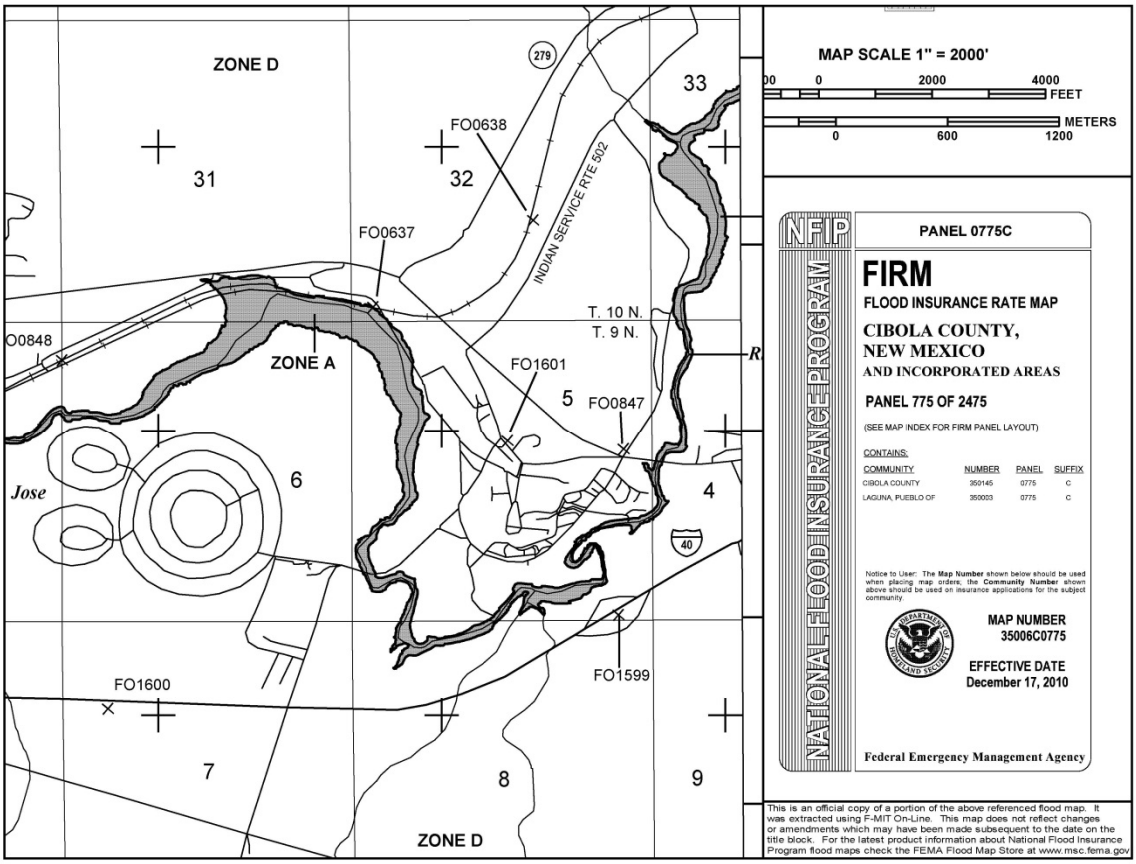



**Figure 9: NFIP, Flood Insurance Rate Map for Laguna Pueblo.**

The New Mexico Multi-Hazard Risk Portfolio (2017) characterizes flood risk based on population, area of non-federal land (since federal land has fewer residences and businesses), essential facilities at risk, and additional factors described by subject matter experts (such as recent wildfires increasing flood risk). The Rio San Jose watershed (HUC 13020207) was characterized as one of the ten highest risk watersheds in New Mexico (out of 85 HUC-8 watersheds wholly or partly in the state).

Some community members expressed concern about the potential for mudslides at the former Jackpile mine site.

**Occurrence**

*Previous:* The Pueblo has no documented flooding prior to the occurrences noted below.

*Recent:* In 2006, the Rio San Jose River overran its banks due to heavy rains and caused flooding in Paraje/Casa Blanca and Seama. Eight homes were inundated with flood water. The families were taken to the local emergency shelter or stayed with family relatives for a number of days.

In August and September of 2013, a major thunderstorm caused the Rio San Jose to overflow its banks causing flooding in Casa Blanca. Three homes were inundated with flood water. Three families were housed at the Sky City Hotel for three nights.

Also during the 2013 floods a natural gas line in Mesita Village was ruptured when silt pushed by flood water shifted the gas meter. The home was evacuated until the necessary repairs were made. At the Laguna Rainbow Facility, the nursing home south of the Dancing Eagle Casino, flooding occurred into the kitchen food storage area. Sandbags were used to divert the water away from the building. Many tribal members experienced high levels of standing water around their homes in each of the villages, leading to a high number of requests for sandbags.

In both the 2006 and 2013 flooding, major damage occurred reservation wide. Roads, culverts, fences, dirt tanks and ponds were washed out or damaged. Upstream erosion control structures were breeched, adding to the volume of water flowing into the Rio San Jose River and its tributaries. Private homes and businesses had minor to major damages.

Laguna Pueblo was a part of presidential declaration DR-4152 for flooding on November 27, 2013. Repair costs for the pueblo were in excess of $1,037,267.19.

In 2016, there was one ENS warning of flash floods, on August 3. There were two ENS warnings in 2017, on September 29 and October 4. There were warnings on October 2, 2018 and August 9, 2019. There have also been unspecified severe weather advisories, on October 8, 2017; and May 21, June 3, and August 5, 2018. These may have included heavy rainfall.

Over the course of four reported years, 2014-2015 and 2017-2018, 2% of the nature-related CDEC power outages (5 outages) on Laguna lands were due to flooding, and 1% (4 outages) were due to rain.

*Probability/Expected Frequency of Future Events:* In general, the probability of future flooding events is high given the limited vegetation and ground cover to help absorb any precipitation that may fall.

Changes in precipitation in the Southwest are difficult to model because the region's rainfall is highly influenced by the North American Monsoon (NAM), which is itself challenging to model. The best available projections indicate that total annual rainfall will be relatively consistent. However, the patterns of precipitation are likely to change, with their possibly being fewer but heavier storms each year. The Pueblo currently has an average of slightly more than 4 days per year with more than 1 inch of precipitation. There may be one to two additional days, or even as many as ten more days, per year with more than 1 inch of precipitation. There may also be a slight chance of increasing days with more than 2 inches of precipitation. More extreme levels of rainfall are likely to increase flooding. The Climate Profile also notes that areas that are already flood-prone may have more floods, and areas that do not flood now could become flood-prone.

**Impacts**

Flooding results in flowing or standing water, and in erosion caused by the flowing water.

This affects roads and bridges, disrupting transportation for school buses, public transit, commuters, and travelers. Road and bridge flooding may be caused by clogged drainage structures, culverts under roads and railroads, leading water to back up into other areas. Natural material and sediment often cause clogging, but the problem is aggravated when people throw trash in arroyos. The NMDOT and BNSF conduct irregular maintenance of culverts under their transportation facilities, a significant source concern for community members.

Livestock owners are particularly concerned about erosion of rangeland roads, preventing access to livestock. Muddy roads also reduce access for public safety and emergency vehicles.

Flooding can cause breaks in water lines and inundation of sewage lagoons.

Flooding affects homes. Homes closest to the Rio San Jose in Casa Blanca and Seama are most prone to flooding during the monsoon season. Flooding may require evacuations, and can displace people temporarily or require relocation.

Flooding can erode sensitive natural and cultural areas.

Heavy rainfall, whether it causes flooding or not, affects communication systems at the Pueblo. Copper lines are affected by rainfall. Downpours affect wireless signals.

The Pueblo of Laguna Climate Profile points out that increased drought (described above) and wildfire (described below), leading to decreased vegetation cover, can increase the amount of sediment and debris in flood flows, substantially affecting water quality.

## Dam Inundation

**Type of Hazard**

The Pueblo of Laguna specified dam inundation as a specific source of concern for flooding. Dam inundation may be caused by heavy rainfall (one example of the flooding described above) resulting in either overtopping or a breach, or by a dam breach without heavy rainfall, known as a “sunny day” flood.

More than a third of our nation’s dams are already 50 years old. About 14,000 of those dams pose a “high” or “significant” hazard to life and property if failure occurs. There are also about 2,000 "unsafe" dams in the United States and in almost every state. Dams can fail with little warning. Intense storms

may produce a flood in a few hours or even minutes for upstream locations. Flash floods can occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, because of debris jams, the accumulation of melting snow, buildup of water pressure on a dam with (unknown) deficiencies after days of heavy rain, etc. Flooding can also occur when a dam operator releases excess water downstream to relieve pressure from the dam. (https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/dams.jsp Accessed 3/7/12)

**Extent and Location**

Two dams, Paguate Dam and Acomita Dam, could cause inundation of areas of the Pueblo of Laguna.

### *Paguate Dam*

Paguate Dam is approximately 1.5 miles northwest and upstream of the Village of Paguate (Figure 10).

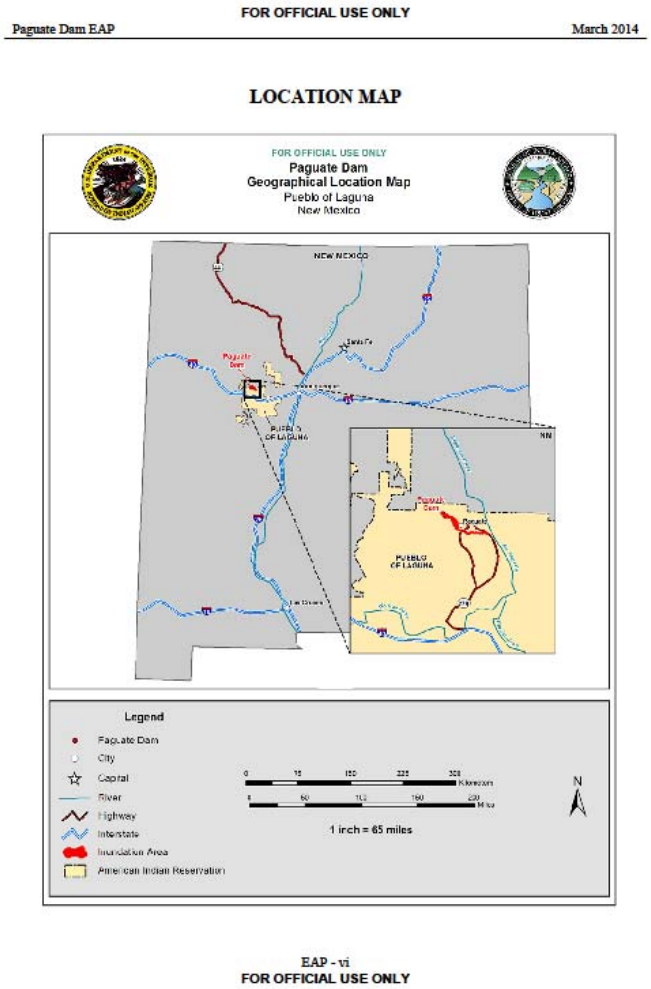


**Figure 10. Paguate Dam Inundation Boundary on the Pueblo of Laguna lands**

Paguate Dam is a storage facility for irrigation water for farmers in the village of Paguate and for recreational uses such as fishing. It is operated by the Bureau of Indian Affairs. The dam was modified in 1998 to combine the Paguate North and South Dams and make the following improvements:

- Slope flattened to a 3H:1V
- Crest raised to an elevation of 6290'
- The external drain outfall pipe is a 15-inch-diameter perforated polyethylene pipe
- Three (3), 4-foot-diameter internal drain inspections were installed complete with steel covers and access ladders.
- Bedding material and riprap is on the upstream face of the dam for erosion protection and the downstream face is seeded over with grass cover.

The new embankment has a crest width of 20 feet, length of 2625 feet, and elevation of 6290'. The dam impounds approximately 346 acre-feet, is approximately 30 feet high, and is classified as significant. The spillway is located on the right side of the dam and consists of an approach channel, a soil-cement lined trapezoidal spillway channel. The spillway has a crest elevation of 6285'. The trapezoidal spillway channel has a normal bottom width of 25 feet with 3H:1V side slopes in the inlet area and 2H:1V side slopes in the downstream channel.

The outlet works consist of:

- a trash rack-protected intake structure
- a 36-inch-diameter corrugated metal pipe (CMP) conduit
- a concrete-lined trapezoidal outlet chute
- a concrete stilling pool from which a concrete-lined irrigation ditch extends downstream

The outlet works conduit has an upstream invert elevation of 6262'. Nine piezometers were installed at Paguate dam along the upstream toe.

Pueblo of Laguna Police Department patrol the facility due to the uncontrolled access. According to the Emergency Action Plan, Paguate Dam, Pueblo of Laguna, New Mexico, Hazard Analysis "flooding – none reported; earthquake – none reported; landslide – none reported; wild land or structural fire – the likelihood of a fire affecting the integrity of the dam is minimal" (US Department of the Interior, 2009).

Paguate Dam has an Early Warning System comprised of multiple sensors at the dam which monitor reservoir elevation and rainfall.

According to the Paguate Dam Emergency Action Plan, the hydrologic basin for the Paguate Dam is relatively small, less than 0.05 acres.

Dam inundation may be due to a Potential Maximum Precipitation (PMP) event, with impacts shown in Table 3, or by a dam breach without heavy rainfall, as a "sunny day" flood, with impacts shown in Table 4.

Table 3. Potential Maximum Precipitation event, Paguate Dam.

| | Distance from Paguate Dam | Maximum Water Depth at Peak Flow | Leading Edge Arrival | Peak Flow Arrival | Maximum Flow | Maximum Velocity |
|---|---|---|---|---|---|---|
| xs1 | 0.14 | 5.8 | 0:00-0:30 | 1:15-1:145 | 11928 | 13.4 |
| xs2 | 0.42 | 6.5 | 0:00-0:30 | 1:15-1:145 | 11911 | 12.2 |
| xs3 | 0.85 | 5 | 0:00-0:30 | 1:15-1:145 | 11856 | 8.3 |
| xs4 | 1.2 | 3.8 | 0:15-0:45 | 1:15-1:145 | 11797 | 15.6 |
| xs5 | 1.58 | 16.6 | 0:15-0:45 | 1:15-1:145 | 11848 | 10.7 |
| xs6 | 1.83 | 14.8 | 0:15-0:45 | 1:15-1:145 | 11220 | 10.8 |
| xs7 | 2.9 | 11.2 | 0:15-0:45 | 1:30-2:00 | 10814 | 9.8 |
| xs8 | 3.63 | 29 | 0:45-1:15 | 1:30-2:00 | 9395 | 8.6 |
| xs9 | 4.28 | 11.2 | 0:45-1:15 | 1:45-2:15 | 8900 | 8.8 |
| xs10 | 4.71 | 7 | 1:00-1:30 | 1:45-2:15 | 7966 | 15 |
| xs11 | 5.15 | 5 | 1:00-1:30 | 2:00-2:30 | 6344 | 15.4 |

Table 4. Sunny Day event, Paguate Dam.

| | Distance from Paguate Dam | Maximum Water Depth at Peak Flow | Leading Edge Arrival | Peak Flow Arrival | Maximum Flow | Maximum Velocity |
|---|---|---|---|---|---|---|
| xs1 | 0.14 | 8.2 | 0:00-0:30 | 0:00-0:30 | 11822 | 27.8 |
| xs2 | 0.42 | 15.7 | 0:00-0:30 | 0:15-0:45 | 10261 | 11.8 |
| xs3 | 0.85 | 9.8 | 0:00-0:30 | 0:15-0:45 | 9245 | 10.9 |
| xs4 | 1.2 | 3.4 | 0:15-0:45 | 0:15-0:45 | 8970 | 16.8 |
| xs5 | 1.58 | 3.8 | 0:15-0:45 | 0:15-0:45 | 8473 | 9.5 |
| xs6 | 1.83 | 3.5 | 0:15-0:45 | 0:30-1:00 | 8075 | 8.1 |
| xs7 | 2.9 | 6.1 | 0:30-1:00 | 0:30-1:00 | 6414 | 12.3 |
| xs8 | 3.63 | 8.3 | 0:30-1:00 | 0:45-1:15 | 4889 | 10.6 |
| xs9 | 4.28 | 8.5 | 0:45-1:15 | 1:00-1:30 | 4186 | 7.1 |
| xs10 | 4.71 | 4.6 | 0:45-1:15 | 1:00-1:30 | 4044 | 14.3 |
| xs11 | 5.15 | 3.7 | 1:00-1:30 | 1:15-1:45 | 2491 | 6 |

According to the Paguate Dam Outlet Works capital improvement plan worksheet, the design of the outlet from the Paguate Dam could put the irrigation ditch and the access road at risk of being washed out in the case of an emergency release of a high flow of water from the dam. The BIA Safety of Dams Program recommends that the Pueblo "modify the outlet works outfall so that large discharges can be made from the outlet works without washing out the access road and irrigation canal." There are also concerns about with runoff carrying sediment into the ditch from the surrounding hillside and parking lot.

### *Acomita Dam*

Acomita Dam is operated and maintained by the Pueblo of Acoma under a 638 contract with the Bureau of Indian Affairs. The dam was constructed in 1937 as an off-stream facility to impound water for recreation and irrigation for the Pueblos of Acoma and Laguna. Water has been diverted into the reservoir since 1998, following many years of repairs. The primary source of water is natural springs, delivered by a ditch. Acomita Reservoir has a storage capacity of approximately 700 acre-feet. The contributing watershed is approximately 17.6 square miles.

The Acomita Dam Emergency Action Plan includes maps and tables depicting the area that would be inundated by the Probable Maximum Flood and Sunny-Day dam failure scenarios. The Plan also includes Non-Dam-Failure Advisory Flood maps, which depict flooding in response to natural rainfalls that will not overtop the dam but would endanger lives below the dam, when rainfall safely passes through the outlet works and spillway but there may still be flooding downstream. The maps depict flooding along the Rio San Jose floodplain, north of Seama village from the village to the old day school, through Casa Blanca, into New Laguna to the old New Laguna dam area, and continuing along the Rio San Jose to Mesita. Structures would be affected primarily in Seama and Casa Blanca, along with some structures along the river at the eastern edge of Old Laguna (Table 5). The area subjected to a PMF is substantially larger than the area affected by a Sunny-Day dam failure.

Table 5. Probable Maximum Flood and Sunny Day Flood at select locations at the Pueblo of Laguna, from Acomita Dam.

| | Cross-Section | Distance from Acomita Dam | Maximum Water Depth at Peak Flow | Leading Edge Arrival Time | Peak Flow Arrival Time | Maximum Flow (cfs) | Maximum Velocity (fps) |
|---|---|---|---|---|---|---|---|
| Seama – PMF | xs7 | 5.67 | 5.7 | 1:30-2:00 | 2:00-2:30 | 3,644 | 4.4 |
| Seama – Sunny Day | xs7 | 5.67 | 10.0 | 0:30-1:00 | 1:00-1:30 | 51,056 | 10.3 |
| Paraje / Casa Blanca – PMF | xs9 | 8.67 | 11.6 | 1:15-1:45 | 1:30-2:00 | 47,301 | 20.0 |
| Paraje / Casa Blanca – Sunny Day | xs9 | 8.67 | 3.5 | 3:00-3:30 | 4:45-6:15 | 1,363 | 25.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Old Laguna – PMF | xs15 | 10.20 | 6.9 | 1:30-2:00 | 2:00-2:30 | 44,441 | 12.3 |
| Old Laguna – Sunny Day | xs15 | 10.20 | 2.0 | 4:15-4:45 | 8-8:30 | 839 | 4.9 |

The NDF follows a similar path, with a smaller land area and far few structures potential affected.

The New Mexico Multi-Hazard Risk Portfolio (2017) characterizes the Rio San Jose watershed (HUC 13020207) as a high dam hazard watershed.

**Occurrence**

*Previous:* There has been no occurrence of dam inundation at the Pueblo of Laguna.

*Recent:* There have been no recent events of dam inundation at the Pueblo of Laguna.

*Probability/Expected Frequency of Future Events:* There is no history of unusual situations or minor or major impacts since the construction of the Paguate Dam. The dam is an off-stream structure, with inflow regulated by a diversion system and outflow controlled by a gate/irrigation system. The potential for dam failure is low.

**Impacts**

See above for a description of general impacts from flooding.

Dam inundation from Paguate Dam would affect roadways, notably Elizabeth Bender Road and Old Bridge Road 1.2-3 miles from the dam, and potentially NM Highway 279 and Rio Moquino Road 3.7 miles from the dam. There are no structures in the floodway, but there is a sewer lagoon on the south side of the old village that could be inundated. A failure of Paguate Dam would cause loss of irrigation water to farmers and loss of recreation for residents of and visitors to Paguate Village.

# Wildfire

**Type of Hazard**

A wildfire is any uncontrolled fire in combustible vegetation that occurs in the countryside or wilderness area (New Mexico Hazard Mitigation Plan 2010). According to the Cibola County Community Wildfire Protection Plan, there are three general types of wildland fire:

*Ground fire* – A ground fire burns in ground fuels such as duff, organic soils, roots, rotten buried logs, and so forth. Ground fuels are characterized by higher bulk density than surface and canopy fuels. Ground fires burn with very low spread rates but can be sustained at relatively high moisture contents.

Fuel consumption through ground fuels can be ignited directly; a passing surface fire most commonly ignites them.

*Surface fire* – A surface fire burns in the surface fuel layer immediately above the ground fuels but below the canopy. Surface fuels consist of needles, leaves, grass, and dead and down branch wood and logs, shrubs, low brush, and short trees. Surface fire behavior varies widely depending on the nature of the surface fuel complex.

*Crown fire* – A crown fire burns in the elevated tree and shrub canopy fuels. Canopy fuels that are normally consumed in crown fires consist of live and dead foliage, lichen, and fine live and dead branch wood found in a forest canopy. They have higher moisture content and lower bulk density than surface fuels. There are three types of crown fire: passive, active and independent.

Firestorms are events of such extreme intensity that effective suppression is virtually impossible. Firestorms occur during extreme weather and generally, burn until weather conditions change and the available fuel is exhausted.

The US Forest Service (USFS) reports arson as the largest cause of wildfires. Other types of ignition that cause wildfires are debris burns, accidental ignition (man-made) and lightning. Lightning can present particularly difficult problems when dry thunderstorms move across areas that are suffering from seasonal or long-term droughts. In such cases, multiple fires can be started simultaneously. When there is a large quantity of dry fuels, these fires can cause massive damage.

**Extent and Location**

*Fuel:* Fire behavior and severity depend on the properties of the various fuel (live and dead vegetation and detritus) strata and the continuity of those fuel strata horizontally and vertically. The fire hazard for any particular landscape can be characterized by the potential for fuels to cause specific types of fire behavior and effects. USFS Rocky Mountain Research Station General Technical Report RNS-GTR-120.8 notes that understanding the structure of fuel beds and their role in the initiation and propagation of fire is the key to developing effective fuel management strategies (RNS-GTR-120.8, Graham 2004).

Fuel beds are classified in six strata:

- tree canopy
- shrubs / small trees
- low vegetation
- woody fuels
- moss, lichens and litter
- ground fuels (duff)

Each stratum can be divided into separate categories based on physiognomic characteristics and relative abundance. Modification of any fuels stratum has implications for fire behavior, fire suppression, and fire severity (RNS-GTR-120.8, Graham 2004). According to Pueblo of Acoma Fire Chief Orlando Garcia, the categories within the fuel bed strata that Laguna and Acoma should be concerned with are shrubs / small trees and ground fuels (duff) or surface fuels. (RNS-GTR-120.8 (Graham 2004) describes surface fuels as consisting of grasses, shrubs, litter, and woody material lying on, or in contact with the ground surface, and he describes crown fuels as those suspended above the ground in trees or vegetation (vines, mosses, needles, branches, and so forth).

*Weather:* Weather patterns greatly influence fire intensity. According to the New Mexico Hazard Mitigation Plan (2010), "wildfires can occur at any time of day and during any month of the year, but the peak fire season is normally from March through June" (p. 73). The length of the fire season and the peak months vary from year to year. Land use, vegetation, amount of combustible materials present, and weather conditions such as wind, low humidity, and lack of precipitation are chief factors in determining the number of fires and acreage burned. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall. The Pueblo of Laguna is within a semi-arid region characterized by dry springs, dry autumns, hot summers, and moderately cold winters. Most of the precipitation received on the reservation occurs during the months of July and August. This precipitation results from the summer monsoon thunderstorms. In November through February, the precipitation is received in the form of snowfall and rain showers. Average annual precipitation on the Pueblo is 10 to 12 inches with approximately 50% in the form of summer rains. Mean average temperature is 57° F on the lowlands and 48° on the upper lands. Extreme temperatures range from -26°F to 100°F. Prevailing winds are generally south – southwest. Weather patterns greatly influence fire intensity.

Expressing fire potential uses several methods. Some of the indicators are:

*Relative Humidity:* Relative Humidity is the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure. Relative humidity is expressed in percent. RH is measured directly by automated weather stations or manually by wet and dry bulb readings taken with a psychrometer and applying the National Weather Service, psychrometric tables applicable to the elevations where the readings were taken.

*Fuel Moisture:* Fuel moistures are measured for live herbaceous (annual and perennial), woody (shrubs, branches and foliage) and dry dead fuels. These are calculated values representing approximate moisture content of the fuels. Fuel moisture levels are measured in 1, 10, and 100-hour increments.

*Haines Index or the Lower Atmosphere Stability Index:* The Haines Index is computed from the morning soundings from Radiosonde Observation (RAOB) stations from across North America. The index is composed of a stability term and a moisture term. The stability term is derived from the temperature

difference at two atmosphere levels. The moisture term is derived from the dew point depression at a single atmosphere level. This index has been shown to correlate with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior. Haines Indexes range from 2-6 as indicators for potentials of large fire growth.

Table 6. Haines Index.

| Index | Description |
|---|---|
| 2 | Very low potential – Moist stable lower atmosphere |
| 3 | Very low potential |
| 4 | Low potential |
| 5 | Moderate potential |
| 6 | High potential – dry unstable lower atmosphere |

*Energy Release Component (ERC):* The ERC is the estimated potential available energy released per unit area in the flaming front of a fire. Day-to-day variations of the ERC are caused by changes in the moisture contents of the various fuel classes, including the 1,000-hour lag class. The ERC is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of flaming.

*Ignition Component:* The ignition component describes the probability that a fire will result in a fire ignition when introduced into the fine fuel complex. The ignition component can range from zero, when conditions are cool and damp, to 100 on days when the weather is dry and windy. Theoretically, on a day when the ignition component registers a 60 approximately 60% of all firebrands that encounter wild land fuels will require suppression action.

*Spread Component:* The spread component is a numerical value derived from a mathematical model that integrates the effects of wind and slope with fuel bed and fuel particle properties to compute the forward rate of spread at the head of the fire. Output is in units of feet per minute. A spread component of 31 indicates a worst case, forward spread rate of 31 feet per minute. The inputs required to calculate the SC are wind speed, slope, fine fuel moisture (including the effects of green herbaceous plants), and the moisture content of the foliage and twigs of living, woody plants. Since the characteristics through which the fire is burning are so basic in determining the forward spread of the fire front, a unique SC table is required for each fuel type.

*FEMA International Fire Code Institute Wildfire Susceptibility Index:* The FEMA/IFCI, Table 7, combines slope and fuel levels.

Table 7. FEMA/IFCI Wildfire Susceptibility Matrix

| FEMA/IFCI Wildfire Susceptibility Matrix | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fuel Class | Critical Fire Weather Frequency | | | | | | | | |
| | <1 day per year | | | 2-7 days per year | | | 8+ days per year | | |
| | Slope % | | | Slope % | | | Slope % | | |
| | <40 | 41-40 | 61+ | <40 | 41-40 | 61+ | <40 | 41-40 | 61+ |
| Light | M | M | M | M | M | M | M | M | H |
| Medium | M | M | H | H | H | H | E | E | E |
| Heavy | H | H | H | H | E | E | E | E | E |
| Note: M = Medium, H = High, E = Extreme.<br>Source: International Fire Code Institute, January 2000 | | | | | | | | | |

The FPI was developed by the USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on the ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.

*Mapping:* Specific maps to identify areas that have a high probability of experiencing a severe wildfire with possible loss of human life or infrastructure should include the following factors:

- Base map with infrastructure, ownership & geopolitical boundaries
- Fire Regime Condition Class – fuel/vegetation, slope and weather patterns
- Wildfire Risk map – quantifies the concentration of historical wildfire ignition sites as high, medium and low
- Values map – identifies areas having value to humans, such as concentration of homes, roof types, road access, communication sites, hydrologic features, cultural/sacred, watershed, extraordinary wildlife habitat, post fire flood damage, and quantifies them as high, medium and low
- Threat Level Map combines the fire regime condition class and risk maps into one map identifying areas most likely to experience a severe wildfire
- Risk Assessment Map combines the values map with the threat map to identify areas that are most urgently in need of treatment because of the combination of possible severe wildfire and potential loss of identified values

**Fire Danger Rating System**

All indicators are taken into account when determining the fire danger for a specific geography. These indicators change daily or hourly. The Fire Danger Rating System, Table 8, was created as a simple

method of conveying relative danger to the public. The Laguna Pueblo has experienced Class 1-4 fires according to this rating system.

Table 8. Fire Danger Rating System

| **FIRE DANGER RATING SYSTEM** | | |
|---|---|---|
| **Rating** | **Basic Description** | **Detailed Description** |
| CLASS 1: Low Danger (L)<br>Color Code: GREEN | Fires not easily started. | Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting. |
| CLASS 2: Moderate Danger (M)<br>Color Code: Blue | Fires start easily and spread at a moderate rate. | Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Wood fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel – may not burn hot. Short-distance spotting may occur but it is not persistent. Fires are not likely to become serious and control is relatively easy. |
| CLASS 3: High Danger (H)<br>COLOR CLASS: Yellow | Fires start easily and spread at a rapid rate. | All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small. |
| CLASS 4: Very High Danger (VH)<br>COLOR CLASS: Orange | Fires start very easily and spread at a very fast rate | Fires start easily from all causes and immediately after ignition, spread rapidly and short-distance spotting is common. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens. |
| CLASS 5: Extreme (E)<br>COLOR CODE: Red | Fire situation is explosive and can result in extensive property damage. | Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens. |

Wildfires may be classified by their location as “wildland” or “wildland with urban interface.” Wildland fires typically occur in national forests and parks and are fueled by natural vegetation. Federal agencies

are responsible for the fire management and suppression in their areas. Wildland fires with urban interface typically spread into urban or residential areas. In general, the Wildland Urban Interface (WUI) is defined as "the line, area, or zone where structures and other human development meet to intermingle with undeveloped wild land or vegetative fuels" (http://www.fs.fed.us/database/feis/glossary.html. Vegetation and man-made structures provide fuel. Federal agencies and local government are responsible for joint fire management and suppression.

According to the New Mexico Hazard Mitigation Plan, the criteria used to rank WUI are:

- proximity of vegetation type to homes
- availability of water
- ease of evacuation
- topography
- type of fuels
- number and size of previous fire
- direction of prevailing and local winds
- ability of community to protect homes

The Pueblo of Laguna has no area clearly defined WUI, but wildfire is considered a hazard. During the spring season, wildland fires have occurred along the irrigation canals when the village officials prepare to clean the irrigation canals. Traditionally, the village officials burn the over grown dried weeds and brush in the canals and along the embankments. Sudden gusts of wind have caused fires to endanger homes and property along these canals. During severe lighting events, forested areas on Mt. Taylor can burn undetected for hours.

The New Mexico Multi-Hazard Risk Portfolio (2017) does not characterize the Rio San Jose watershed (HUC 13020207) as one of its highest risk watersheds for wildfire. Wildfire risk scores are generated based on population, structures in the wildland-urban interface, and an overall wildfire risk score. The Rio San Jose has a "medium" score.

The Bureau of Indian Affairs Southern Pueblos Agency is currently developing a Spatial Fire Management Plan, which will include a hazard risk assessment for wildfire and a fuel management plan.

**Occurrence**

*Previous:* On April 8, 2005, a major wildfire occurred in the median of Interstate 40 causing dangerous driving conditions for motorists. The interstate was closed for approximately 24 hours until responders were able to contain the fire. Traffic was re-routed to State Road 6. The cause of the fire was the mulch used to prevent erosion, with a suspected spontaneous combustion of the materials.

On May 20, 2005, a smaller wild land fire occurred on Mt. Taylor, Seco Canyon area. The fire was less than 10 acres and was extinguished by the local BIA Wildland Fire Crew.

On May 26, 2006, the Mt. Taylor ranch property experienced a lighting caused fire that burned approximately 150 acres. During that event, wild land fire crews from various jurisdictions were called upon to assist the local BIA Wild Land Fire Crew to contain and extinguish the fire. On May 20, 2005, a smaller wild land fire occurred on Mt. Taylor in the Seco Canyon area. The fire was less than 10 acres and was extinguished by the local BIA Wildland Fire Crew.

*Recent:* On May 23, 2014, approximately 150 acres burned near the old US 66 Highway between the villages of Laguna and Mesita. The source of the fire is unknown. The local Fire Protection Program and the BIA Wild Land Fire crews were able to contain and extinguish the fire.

There were four Pueblo of Laguna ENS "fire weather watch" warnings in 2016, on April 22, May 15, June 27, and July 8. There was one on June 28, 2017. There were two in 2018, on April 6 and September 7; the September 7 notification lifted fire restrictions. There was one brush fire notification on March 1, 2016, and three in 2018, on March 28, April 12, and May 17. Over the course of four reported years, 2014-2015 and 2017-2018, none of the nature-related CDEC power outages on Laguna lands were due to wildfire.

According to data from the BIA Fire Management Office, Southern Pueblos Agency, there were 10 wildland fires in 2015, 17 in 2016, 8 in 2017, 7 in 2018, and 1 in 2019. 32, or 74%, of the 43 fires were human-caused, and 11, 26%, had a natural cause. In 2015, the fires were between January and June; 2016, February and October; 2017, March and July; 2018, February and August; and in 2019, in August. Most fires, 31 out of 43, or 72%, were not wildland-urban fires. At the time the fire was controlled, 28, 65%, of the fires were 0.1 acres. 7 fires were greater than 0.1 but less than 1 acre, 2 fires were 1 acre, and 2 fires were 1.2 acres. Four larger fires were the Del Ojo Fire in March 2015, at 3 acres, the South Alamos Fire in April 2015, at 23 acres, the Lady Lake Fire in March 2016 at 123 acres, and the SR 491 Fire in 2017 at 10 acres; none were wildland-urban fires.

The Laguna Fire Department also reported 24 wildland fires in 2018, and 9 wildland fires in 2019. These numbers reflect a new reporting system.

*Probability/Expected Frequency of Future Events:* The probability of a future wildfire event is high, based on the Probability/Frequency Scale, due to drought conditions, dry vegetation, and tourist population that may not be aware of risks. The Pueblo of Laguna Fire Protection Program responds to small grass fires that are contained immediately. Together with the Bureau of Indian Affairs, Southern Pueblo Agency, outreach to the community has improved. The Pueblo of Laguna has a burn permit program, support from tribal administration to maintain the program, and now flys a "red-flag" to warn the community about high fire hazards.

As noted above, the Pueblo is likely to experience more severe drought in the future. Drought contributes to increased fire risk, both fire frequency and fire severity, in the near term. If vegetation is burned and does not regrow, long-term fire risk could decline.

**Impacts**

Fire can have high costs in terms of injuries, fatalities, and property damage. Wildland fire can affect the Pueblo's economic establishments and homes. Cultural sites are also very vulnerable. The Pueblo of Laguna Tribal Historic Preservation Office can be contacted to provide more detailed information regarding these sites. Hazardous fuels reduction for these areas must include consultation with the traditional society overseeing the area.

The most apparent impact of wildfire is smoke. Smoke particularly affects the elderly, young people, and other vulnerable populations. Community members noted that the biggest issue is a lack of communication about problems with air quality that would necessitate staying indoors. Public outreach and education is the best remedy for this issue.

In the event of a wildfire, livestock would be at risk. Community members were also concerned about watershed contamination following wildfires, especially at the Silver Dollar Ranch, on Mt. Taylor, and in Seco Canyon due to susceptibility to flooding and erosion, with impacts on the Rio San Jose. Paguate Reservoir has a small drainage, but impacts may be significant to the community.

## Severe Storms: Lightning

**Type**

Lightning is an electrostatic discharge (the same kind of electricity that can shock you when you touch a doorknob) between the cloud and the ground, other clouds, or within a cloud. It is one of the oldest observed natural phenomena on earth. It has been seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, and large hurricanes and thunderstorms.

We generally know what is needed to produce lightning, but there is still debate about the exact conditions. The exact way a cloud builds up the electrical charges that lead to lightning is not completely understood. Precipitation and convection theories both attempt to explain the electrical structure within clouds. Precipitation theorists suppose that different size raindrops, hail and graupel (snow pellets) get their positive or negative charge to the cloud bottom. Convection theorists believe that updrafts transport positive charges near the ground upward through the cloud while downdrafts carry negative charges downward.

Thunderstorms have very turbulent environments; strong updrafts and downdrafts occur often and close together. The updrafts carry small liquid water droplets from the lower regions of the storm to heights between 35,000 and 70,000 feet, miles above the freezing level. At the same time, downdrafts are transporting hail and ice from the frozen upper parts of the storm. When these particles collide, the

water droplets freeze releasing heat. This heat keeps the surface of the hail and ice slightly warmer than its surrounding environment, and a soft hail or graupel forms.

When this graupel collides with additional water droplets and ice particles, negatively-charged electrons are sheared off the rising particles and collect on the failing particles. The result is a storm cloud that is negatively charged at its base and positively charged at the top.

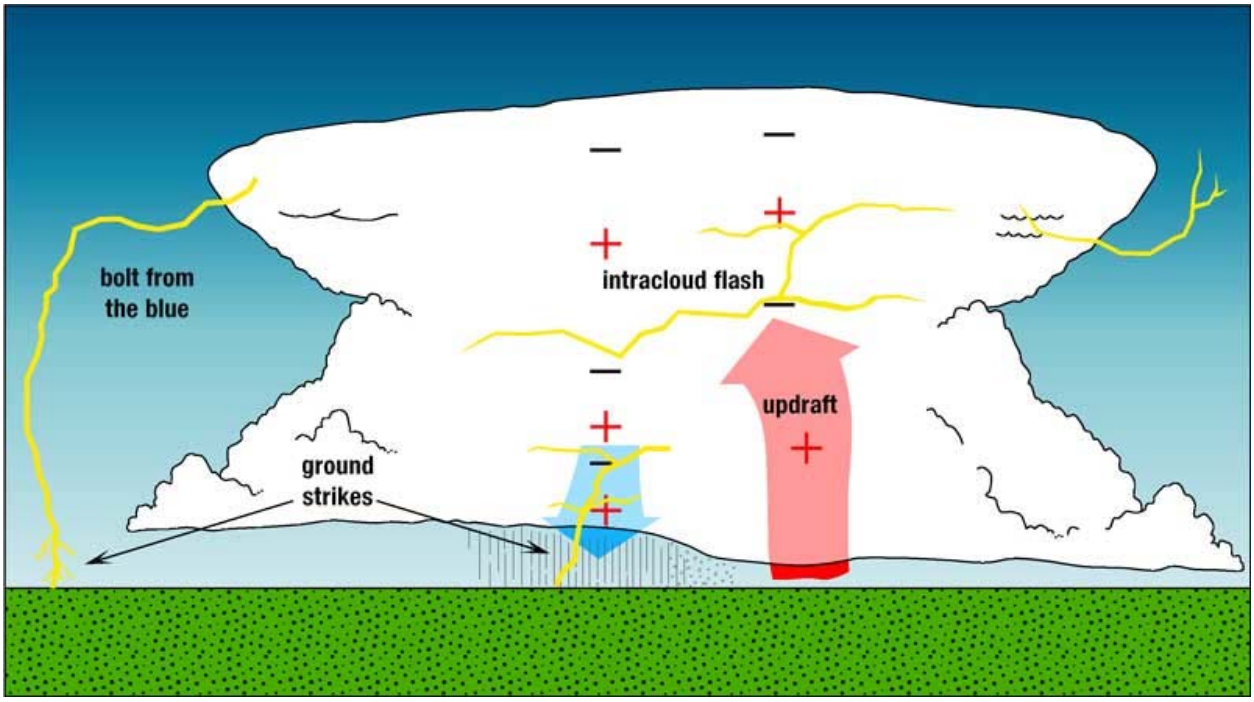
Opposite charges attract one another. As positive and negative areas grow more distinct within the cloud, the electric field is created between the oppositely-charged thunderstorm base and its top. The farther apart these regions are, the stronger the field and the stronger the attraction between charges. The atmosphere is a very good insulator that inhibits electric flow, so a large amount of charge has to build up before the strength of the electric field overpowers the atmosphere's insulating properties. A current of electricity forces a path through the air until it encounters something that makes a good connection. The current is discharged as a stroke of lightning.

While this happens inside the storm, beneath the storm positive charges begin to pool within the surface of the earth. This positive charge will shadow the storm wherever it goes, and is responsible for cloud-to-ground lightning. However the electric field within the storm is much stronger than the one between the storm base and the earth's surface; about 75-80% of lightning occur within the storm cloud.

*Types of Lightning*

*Ground Flashes* - There are various categories of ground flashes:

- Natural – cloud to ground
- Artificially initiated or triggered – goes from ground to cloud
- Forked lightning – shows branching to the ground from a nearly vertical channel
- Ribbon lightning – horizontal displacement of the channel by the wind appears as a series of ribbons
- Bead lightning - a decaying channel of a ground flash breaks into a series of bright dark spots
- Ball lightning – a luminous sphere "not well understood"




*Cloud-to-Ground* - A channel of negative charge called a step leader will zigzag downward in a forked pattern. Invisible to the eye the step leaders shoots to the ground in less time than it takes to blink. As it nears the ground the negatively charged step leader is attracted to a channel of positive charge reaching up through something tall; this is called a streamer.

When the oppositely-charged leader and streamer connect a powerful electric current begins flowing. A return stroke of bright luminosity travels about 60,000 miles per second back towards the cloud. A flash is as many as 20 return strokes. The actual diameter of a lightning channel is one to two inches.

Cloud Flashes sometimes have visible channels that extend out into the air around a storm (cloud-to-air or CA) but do not strike the ground. Sheet lighting or intra-cloud lightning (IC) is lightning embedded within a cloud that heats up as a sheet of luminosity during the flash. Heat lighting is lightning induced that is too far away for thunder to be heard. Spider lightning refers to long horizontal traveling flashes often seen on the underside of stratiform clouds. (NOAA, Cloud-to-ground lightning, 2012)

**Extent and Location**

Figure 11 shows lightning density for Preparedness Area 4 and the Pueblo of Laguna as documented by the Lightning Project conducted by Texas A&M.

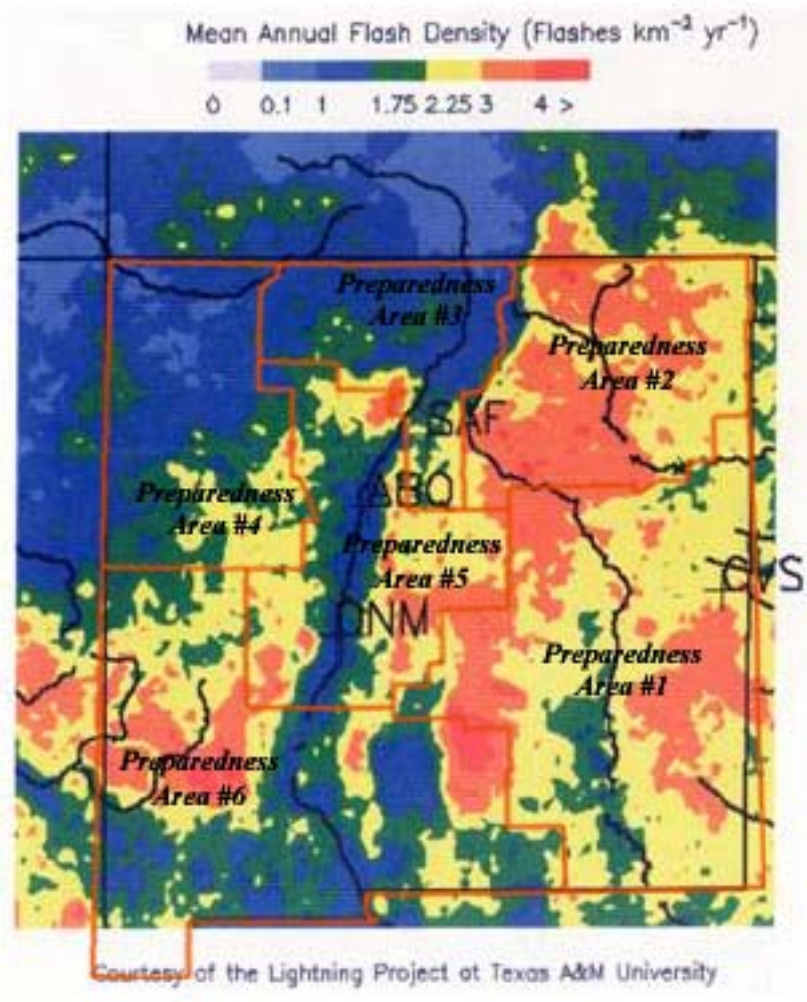



**Figure 11: Lightning Density in New Mexico Preparedness Areas, Laguna Pueblo Area Preparedness Four**

Lightning can affect all planning areas of the Pueblo of Laguna. Lighting is more prominent in the Mt. Taylor area.

**Occurrence**

*Previous:* According to USPLN, from 2006-10, in New Mexico, there are an average of 17.4 strikes per square mile with an average of 2,112,788 strikes per year. (http://www.uspln.com/)

*Recent:* In 2016, there were four ENS "severe thunder storm" warnings, on July 29, August 3, August 13, and August 22. In 2017 there were seven, on July 26, 27, and 31, August 4 and 22, and September 28

and 29. There were no severe thunder storm warnings in 2018. In 2019 there were six, on April 26, June 1 and 4, July 22 and 25, and August 27.

Over the course of four reported years, 2014-2015 and 2017-2018, 51% of the nature-related CDEC power outages, 141 outages, on Laguna lands were due to lightning. This was the most common nature-related cause of CDEC power outages, distantly followed by wind at 20%.

*Probability/Expected Frequency of Future Events:* The probability of future lightning caused events is high.

**Impacts**

According to the 2010 New Mexico Hazard Mitigation Plan, damage from lightning occurs five ways:

- Electrocution or severe shock of humans and animals
- Vaporization of materials along the path of the lightning strike
- Fire caused by the high temperature (10,000-60,000°F)
- A sudden power surge that can damage electrical or electronic equipment
- Trees or tree limbs splitting, falling and causing property damage

Lightning strikes can cause wildfires due to dry conditions. Power surges may affect radio and cell phone communication and electrical power outages, which can also cause disruption of water and wastewater utilities.

## Severe Storms: Winter Storms

**Type**

According to the New Mexico Hazard Mitigation Plan, 2012, severe winter storms can vary in size and strength and include heavy snowstorms, blizzards, and ice storms, freezing drizzle or rain, sleet, and blowing and drifting snow. Extremely cold temperatures accompanied by strong winds result in potentially lethal wind chills.

A variety of weather phenomena and conditions can occur during winter storms. The National Weather Service (NWS) approved definitions of winter storm elements are:

- Heavy snowfall is the accumulation of six or more inches of snow in a 12-hour period of eight or more inches in a 24-hour period.
- Blizzard is the occurrence of sustained wind speeds in excess of 35-mpg accompanied by heavy snowfall or large amounts of blowing or drifting snow.

- Ice Storm is an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and all exposed objects near the ground.
- Freezing drizzle/freezing rain is the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32°F or below.
- Sleet is solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.

Wind chill is an apparent temperature that describes the combined effect of wind and low air temperature in exposed skin. The wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body; a blustery 30° day would feel as cold as a calm day with 0° temperatures.

**Extent and Location**

A severe winter storm in New Mexico as defined by the NWS is:

- 4 or more inches of snowfall below 7500 feet or
- 6 or more inches of snowfall above 7500 feet in a 12-hour period or
- 6 or more inches of snowfall below 7500 feet or
- 9 inches of snowfall above 7500 feet in a 24-hour period

Severe storms are associated with cold temperatures. The Wind Chill chart (Table 9) shows the difference between actual air temperature and perceived temperature, and amount of time until frostbite occurs.

Table 9. Windchill chart. http://www.weather.com/outlook/recreation/ski/tools/windchill/

| | | Temperature (?F) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
| Wind (mph) | 60 | -98 | -91 | -84 | -76 | -69 | -62 | -55 | -48 | -40 | -33 | -26 | -19 | -11 | -4 | 3 | 10 | 17 | 25 |
| | 55 | -97 | -89 | -82 | -75 | -68 | -61 | -54 | -46 | -39 | -32 | -25 | -18 | -11 | -3 | 4 | 11 | 18 | 25 |
| | 50 | -95 | -88 | -81 | -74 | -67 | -60 | -52 | -45 | -38 | -31 | -24 | -17 | -10 | -3 | 4 | 12 | 19 | 26 |
| | 45 | -93 | -86 | -79 | -72 | -65 | -58 | -51 | -44 | -37 | -30 | -23 | -16 | -9 | -2 | 5 | 12 | 19 | 26 |
| | 40 | -91 | -84 | -78 | -71 | -64 | -57 | -50 | -43 | -36 | -29 | -22 | -15 | -8 | -1 | 6 | 13 | 20 | 27 |
| | 35 | -89 | -82 | -76 | -69 | -62 | -55 | -48 | -41 | -34 | -27 | -21 | -14 | -7 | 0 | 7 | 14 | 21 | 28 |
| | 30 | -87 | -80 | -73 | -67 | -60 | -53 | -46 | -39 | -33 | -26 | -19 | -12 | -5 | 1 | 8 | 15 | 22 | 28 |
| | 25 | -84 | -78 | -71 | -64 | -58 | -51 | -44 | -37 | -31 | -24 | -17 | -11 | -4 | 3 | 9 | 16 | 23 | 29 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | -81 | -74 | -69 | -61 | -55 | -48 | -42 | -35 | -29 | -22 | -15 | -9 | -2 | 4 | 11 | 17 | 24 | 30 |
| 15 | -77 | -71 | -64 | -58 | -51 | -45 | -39 | -32 | -26 | -19 | -13 | -7 | 0 | 6 | 13 | 19 | 25 | 32 |
| 10 | -72 | -66 | -59 | -53 | -47 | -41 | -35 | -28 | -22 | -16 | -10 | -4 | 3 | 9 | 15 | 21 | 27 | 34 |
| 5 | -63 | -57 | -52 | -46 | -40 | -34 | -28 | -22 | -16 | -11 | -5 | 1 | 7 | 13 | 19 | 25 | 31 | 36 |

Much winter precipitation on the Pueblo of Laguna is associated with Pacific Ocean storms as they move across the state from west to east. In neighboring Grants, New Mexico, there are an average of 5.5 days with snow and an average of 9.3 inches of snow per /year. (Average Annual Snowfall in New Mexico. Retrieved June 11, 2012, from New Mexico Snowfall.) Winter storms can affect all planning areas of the Pueblo of Laguna, with higher snow accumulations at higher elevations.

**Occurrence**

*Previous* According to the Utah State University, Climate Center, New Mexico Freeze Dates, the first fall freeze has occurred earliest on October 7th ; the average date is October 15 and the latest date on October 29th. The last spring freeze has occurred earliest on April 16; the average date is April 27 and the latest occurrence May 16th. This data is from a period from 1941 to 1953 from Station ACOMITA CAA AP which is in close proximity to the Pueblo of Laguna. This data allows the team to envision a predictive range of dates (https://climate.usurf.usu.edu/products/download.php accessed 6/18/12)

The Cubero weather station (ID# 292250) is located at an elevation of 6195', Latitude 35.0883 and Longitude -107.518. This weather station is also in close proximity to the Pueblo of Laguna. This weather station has published data (Figure 12) from January 14, 1984 to January 14, 2006. Cubero is less than five miles from Laguna.

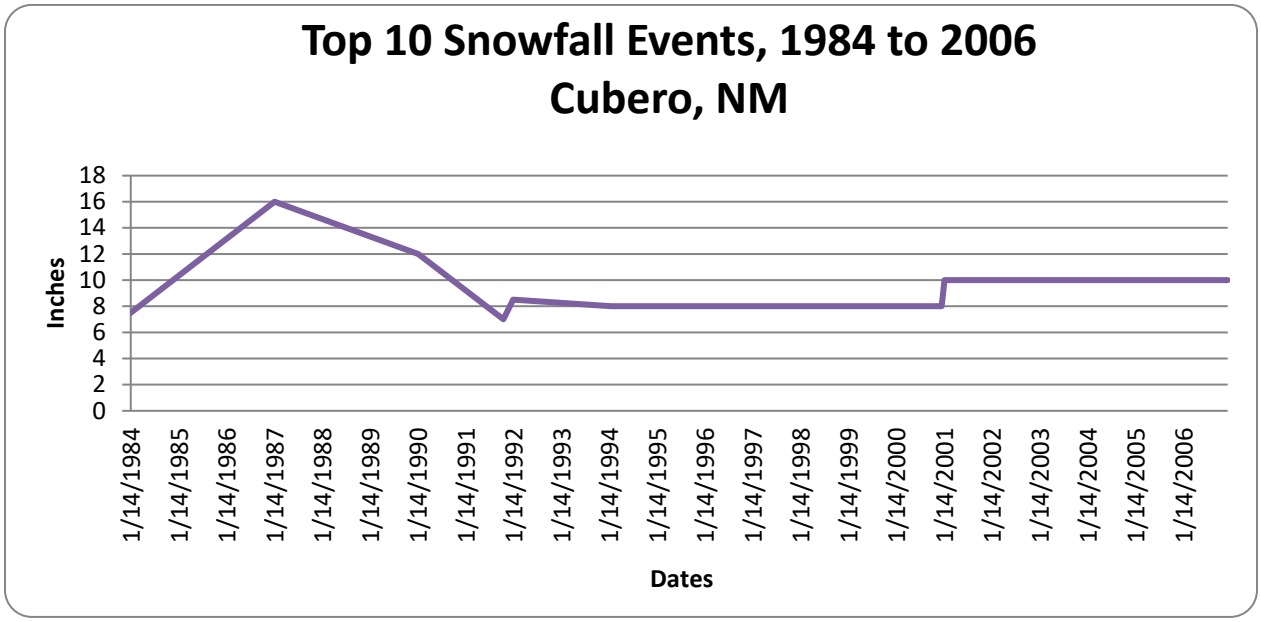



**Figure 12: Data from the Cubero Weather Station**

Significant events recorded in Cubero include:

- The deepest snowfall event, of 16 inches, was recorded was on January 16, 1987
- The second deepest snowfall event, of 12 inches, occurred on January 18, 1990
- The third deepest snowfall event, of 10 inches, occurred on January 17, 2001

324 snowfall events are recorded:

- The total snowfall recorded is 465.18 inches
- The average snowfall event is 2.89 inches
- The least amount of snowfall recorded .0005 inches 136 separate times

*Recent:* On December 22 & 23, 2011, the Pueblo of Laguna Emergency Operations Center reported 24 inches of snowfall in a 12 hour period with an estimated wind speed of ~15-20 mph and gusts of up to 35 mph. The event is named "Operation Big Snow Flake." The Pueblo of Laguna Emergency Evacuation Shelter was opened, and 81 stranded motorists took shelter for the night. Emergency responders assisted 35 motorists.

On November 23-24, 2013, heavy snows were reported across the Central Mountain Highlands with up to 7 inches reported. Severe driving conditions were reported along state road 53 where several cars slid off the road near the Ice Caves. A shelter was set up at Laguna with a few residents checked in.

Although winter storms are a lower concern for community members, they are regularly reported in the Pueblo of Laguna ENS, to help ensure the safety of travelers. In 2015, there was one notification in November and three in December. In 2016 there were two in November and six in December. In 2017

there were three in January, two in February, and one in October. In 2018 there was one in January, two in February, one in March, two in October, one in November, and six in December. In 2019 there were four in January and four in February. The emergency shelter was not set up for winter weather between 2015 and 2019.

Over the course of four reported years, 2014-2015 and 2017-2018, 5% of the nature-related CDEC power outages on Laguna lands were due to snow.

*Probability/Expected Frequency of Future Events:* A winter storm has a high or 100% probability of occurring yearly. However, the intensity of the winter event is somewhat unpredictable. With increasing temperatures, the frequency of winter storms may decrease.

**Impacts**

Winter storms may result in the following:

- Business and government offices close
- Electric outages
- Railroad switches are affected
- Postal service delayed
- No access to stock ponds or cattle
- Possible price gouging of snow shovels, ice scrapers, snow blowers, salt, pellets for wood-burning heating stoves, heat tape, pipe insulation, chainsaws and woodcutting equipment
- Insurance companies overwhelmed
- Emergency warnings and warming shelters
- Demand for parking area and sidewalk clearing
- Stranded motorists
- Domestic pets requiring shelter
- Broken water pipes

Respondents to the survey expressed concerns about difficulty delivering fuelwood or propane during winter storms, to heat homes when most needed.

# Overall Summary of Vulnerability

**Overall Summary of Vulnerability**

The Pueblo of Laguna's greatest vulnerabilities to natural hazards are:

- Extreme heat, which can affect the Pueblo of Laguna population, and contributes to drought
- Flooding, which can affect buildings (including homes), utilities, and roads
- Drought, which can affect essential needs for domestic water, irrigation water, and wildlife and plant needs

The Pueblo has additional vulnerabilities to:

- Wildfire, which could affect buildings, utilities, and transportation infrastructure within the Pueblo, but will likely have a greater effect in wildland areas and on cultural resources, and on human health due to smoke
- Wind, which can cause structural damage, and is also a concern because it increases evaporation and evapotranspiration, reduces water availability, aggravates drought, and increases wildfire risk
- Severe thunderstorms and lightning, which increase wind and can cause wildfires
- Dam inundation, specifically from Paguate Dam and Acomita Dam, with flooding impacts
- Severe winter storms, which affect both residents and travelers

Extreme heat, flooding, drought, and wildfires are expected to increase over time.

Based on these vulnerabilities, the Pueblo's natural hazard mitigation strategy emphasizes:

- Reducing flood risk by avoiding development, mitigating drainage problems, resolving current flooding issues, and restoring land and waterways
- Improving buildings to reduce the risk of natural hazards, with improved roofing for precipitation and fire protection, weatherization for heat and cold, and redundancy of electrical power sources
- Water conservation and management for drought conditions, with irrigation system improvements, building water efficiency, and restoration of land and waterways
- Preparedness for immediate needs such as evacuation and decreasing health risks from heat and smoke, with public awareness, community shelters, and telecommunications equipment.

# References for Section III

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Pueblo of Laguna Utility Authority Drought Contingency Plan. Intertribal Council of Arizona. June 14, 2019.

# *IV: Mitigation Strategy*

## Policies, Programs, and Capabilities

### Existing Capabilities

***Review Guide Element C1.a***

**Pre-Disaster Hazard Management Programs**

All six Pueblo of Laguna villages have adopted comprehensive plans, with land use maps and tables of allowable uses (see Appendix C). The maps recommend avoiding development in areas prone to flooding, and with steep slopes and unsuitable soils. The maps serve as guidance for residential land assignments by the mayordomos, officials from each village, and commercial and institutional leases by the Pueblo Council.

The Pueblo adopts building codes as needed for construction projects, but there is no consistent building code. There is little residential home insurance on the Pueblo. The Pueblo is not administering the National Flood Insurance Program.

The Pueblo has adopted a 2006 resolution committing to compliance with National Incident Management System and Incident Command System. The Pueblo of Laguna Emergency Operations Plan was updated to include all current regulations administering emergency management and adopted by the Pueblo Council on February 28, 2020, by Resolution 08-20.

**Post-Disaster Hazard Mitigation Programs**

The Pueblo of Laguna has a grant writer, a grants management staff within the Accounting Department, and a Construction Records Specialist and Transportation Specialist in the Public Works Department who support the administration of FEMA post-disaster funding. The Accounting Department, which is overseen by the Pueblo Treasurer, includes the Chief Financial Officer, Controller, Accounting Supervisor, Grant Accountant, Grant Accounting Technician, and purchasing and accounts payable staff, among other positions. The accounting department manages and administers over 150 federal, state, and county grants for the Pueblo's four departments, Public Safety, Environmental and Natural Resources , Community Health and Wellness Department, and Public Works. Directors and program managers are responsible for complying with the narrative reporting requirements for each of the grants according to the specifics of the awarding agency. Pueblo entities such as Laguna Department of Education, Laguna Housing Development and Management Enterprise, Laguna Rainbow Corporation

(nursing home and senior center), and Pueblo of Laguna Utility Authority administer their own grants with support from the Pueblo of Laguna government staff as needed.

## Evaluation

***Review Guide Element C1.b***

The Pueblo of Laguna Emergency Operations Plan was updated to include all current regulations administering emergency management and adopted by the Pueblo Council on February 28, 2020, by Resolution 08-20.

The Pueblo's land assignment process for residential and agricultural land use is administered by the mayordomos of each village. Leases for commercial and institution use are approved by the Pueblo Council, under the Pueblo of Laguna Constitution. The process considers suitability of land, but there are no formal review procedures.

The Pueblo adopts building codes as needed for specific construction projects, for example, the International Building Code for a new school. Laguna Housing Development and Management Enterprise uses standard building codes for housing construction. However, there is no standard building code for Pueblo projects, and no building code for individual residential construction.

It is worth noting that the Pueblo has robust cultural traditions of preparedness, such as harvesting and storage of crops, gathering wood, and drying meat from fall hunts, and of working together to support all community needs. The Pueblo's core values are to love one another, respect one another, self discipline, and obedience. The Pueblo continues to develop and adopt written policies to formally support these traditions.

# Funding

***Review Guide Element C2***

The Pueblo of Laguna uses the full range of grant funding available to tribal governments. Table 10 indicates a range of funding sources administered by the Pueblo.

Table 10. Grants managed by Pueblo departments.

| Grant or Contract | POL Department | POL Program | Awarding Agency |
|---|---|---|---|
| BIA Highway Safety | Public Safety | Law Enforcement | US Department of Transportation |
| Detention Center | Public Safety | Detention | US Department of Interior |
| Emergency Medical Services | Public Safety | EMS/Fire Protection | US Department of Health and Human Services |
| Community Health Representative | CHWD | Community Health Representative | US Department of Health and Human Services |
| Air & Water Quality | ENRD | Environmental | US Department of EPA |

| | | | |
|---|---|---|---|
| FEMA | Public Works | Roads & Range | US Department of Homeland Security |
| NALEMP-DOD Reclamation/Clean Up | ENRD | Environmental | US Department of Defense |
| USDA Water/Waste Water Projects | Chief of Operations | Chief of Operations | US Department of Agriculture |

The Pueblo has used FEMA funding for post-disaster projects, specifically to address flooding and erosion impacts on roads, and replacement of homes damaged by flooding.

Potential sources of funding to implement mitigation actions and/or projects include:

- *Army Corps of Engineers* – watershed management and flood mitigation
- *Bureau of Indian Affairs* – road, bridge, bike/pedestrian improvements, for multiple risks. Office of Indian Energy funding for electrical redundancy and resilience. Burned Area Emergency Response Program for post-fire flood mitigation.
- *Burlington Northern Santa Fe Railroad* – drainage maintenance and improvements for railroad, for flood mitigation
- *Bureau of Reclamation* – water conservation and drought mitigation
- *Catholic Church* – roofing and other building project specific to Catholic churches on Pueblo land, which serve as community focal points, for multiple risks. May be supplemented by funding from the *National Park Service* for heritage preservation
- *Department of Energy* – electrical redundancy and resilience
- *Environmental Protection Agency* – watershed management and flood mitigation
- *Federal Emergency Management Agency*, multiple programs, particularly the Pre-Disaster Mitigation program – most projects, for multiple risks
- *Department of Housing and Urban Development* – housing improvements, for multiple risks
- *Indian Health Service* – water and wastewater improvements, for multiple risks
- *New Mexico legislative capital outlay/Tribal Infrastructure Fund* – building and infrastructure improvements, for multiple risks
- *NM Department of Transportation* - road, bridge, bike/pedestrian improvements, for multiple risks
- *Natural Resources Conservation Service* – water conservation and drought mitigation
- *Pueblo of Laguna* – Debt service fund, through the Pueblo of Laguna Capital Improvement Plan
- *State Fire Administration* – fire mitigation, including outreach and awareness

The Pueblo of Laguna Council is required, by Council Resolution and policy, to adopt a Capital Improvement Plan (CIP) each year. The Pueblo's CIP is distinct from the New Mexico Infrastructure Capital Improvement Plan (NM ICIP), and includes substantial information about each project, including the scope of work, benefits, current status of the project (planning, design, or construction phase), expected budget, and likely funding sources. The Pueblo also participates in the NM ICIP as a tool for publicly stating its capital projects and requesting funding.

# Goals

***Review Guide Element C3***

The Pueblo of Laguna's Hazard Mitigation goals are:

- Reducing or avoiding long-term vulnerabilities to natural hazards with the overarching goal of saving lives and reducing risk to known hazards
- Promote responsible land use and development
- Develop awareness of the known impacts of natural hazards
- Decrease risk from known hazard and decrease response time

# Mitigation Actions and Projects

***Review Guide Element C4***

For the 2020 plan update, plan coordinators analyzed actions and projects included in the 2015 plan and other current Pueblo of Laguna plans.

**Village Comprehensive Plans**

The six village comprehensive plans, which were developed with a robust community involvement process, included their own goals, strategies, and actions. These are listed below and summarized for the 2020 action plan.

***Resilient Housing Construction***
*Goal: Traditional home building materials and techniques are widely used.*
Strategy: Incorporate building standards for traditional homes into written policies.

Action: Develop and adopt guidelines or policies, such as a revised building code, that support or require that traditional home building materials be used in home construction, while ensuring community safety; build homes using traditional materials.

Action: Working with the mayordomos and other community members, develop a list of acceptable building materials for traditional homes; incorporate into guidelines and policies.

Strategy: Continue to practice traditional building techniques.

Actions: Continue and expand village-based programs to train community members in the use of traditional home building materials and methods.

*Goal: The community is prepared for emergencies, including natural events.*
*Goal: Homes are safe and of top-quality construction, to stand the test of time and be passed on from generation to generation.*
Strategy: Design and construct homes to withstand natural events.

Action: Develop and adopt guidelines or policies that support or require that homes be designed and constructed to withstand projected heavier rainfalls, hail storms, high winds, and other natural events; design homes to withstand natural events.

Strategy: Ensure that home repairs and renovations meet safety standards.

Action: Develop a program for inspection of all home repairs and renovations; obtain support and implement the program.

Action: Develop procedures to hold contractors accountable for housing work done on the Pueblo; obtain support and implement procedures.

Strategy: Coordinate and share information about qualified home repair and renovation contractors.

Actions: Assess housing repair and renovation services available through LHDME, the Pueblo's Public Works Department General Maintenance Program, POLUA, Native American Independent Living, and any other outside resources; develop and implement new programs. (One such program could be a "one-stop shop," or single point of entry into the Pueblo's multiple service providers.)

Actions: At the village level, develop a list of qualified home repair professionals, and provide it to community members.

Actions: Acting individually, encourage people to accept assistance with home maintenance.

Strategy: Rehabilitate, or if necessary rebuild, homes in the village proper.

***Drainage***

*Goal: Homes and other buildings reflect the community's connection to the environment.*

*Goal: The village is safe and secure.*

*Goal: The community is prepared for emergencies, including natural events.*

Strategy: Design and improve stormwater drainage systems to withstand typical and projected heavier rainfalls, using traditional and natural methods where possible.

Action: Plan, fund, design, and construct improvements to stormwater drainage in Old Laguna and other areas as needed, considering building designs and layout as well as stormwater infrastructure, and using traditional and natural methods where possible.

***Flooding***

*Goal: Development is located in appropriate areas, and risks are mitigated in other areas.*

*Goal: Land is used efficiently and in ways that support traditional life.*

Strategy: Carefully select areas for future housing development and plan efficient site layouts.

Action: Gather additional information on floodplains and flood elevations, for land suitability analysis.

Strategy: Avoid development in areas that present safety and security risks; define and implement mitigation measures in areas where development cannot be avoided.

Action: Designate and map floodplains. Limit development in this area, and require mitigation for any necessary development.

***Transportation Access***

*Goal: Roads are designed and operated to ensure appropriate connections and access.*

*Goal: Transportation infrastructure is safe and in good condition.*

*Goal: Roadways are maintained on an ongoing basis.*

*Goal: The village is safe and secure.*

*Goal: The community is prepared for emergencies, including natural events.*

Strategy: Improve road access and connectivity.

Strategy: Develop and promote plans for emergency response, including transportation access.

Action: Fund, plan, design, and construct an additional connection to the Green Acres/Subdivision area.

Action: Assess the potential for an interstate interchange near Stovepipe Road (south of the Green Acres/Subdivision area).

Action: Assess the potential for redesign of the interstate interchange at I-40 exit 114, considering a diamond interchange and direct connection to Rodeo Drive.

Action: Assess the need for and feasibility of improved access in the area south and southeast of the Old Laguna plaza.

Action: Assess the need for and feasibility of connecting Mousetown Road to Rodeo Drive.

Action: Assess the need for and feasibility of an additional connection between the Arrowhead area and Mesita, possibly by extending Rodeo Road to the north and east, or by extending Flint Road, with connections to Old Route 66 Road.

Action: Designate emergency evacuation routes out of the village (and also from the schools, in the villages of Laguna and Paraje).

Action: Designate and enforce appropriate routes through the village and surrounding areas when traffic is re-routed from interstate 40.

Strategy: Improve drainage and reduce erosion.

Action: Fund, plan, design, and construct drainage improvements in Old Laguna.

Action: Assess options for reducing erosion at Sandy Hill Road and I-40 (East Laguna area).

Strategy: Improve paved roads.

Action: Study and design improved drainage on Rainfall Road (including culverts near the sewer lagoon).

Actions: Fund, plan, design, and repave Vietnam Veterans Road (the Questa Road).

Strategy: Improve unpaved roads.

Action: Assess the potential for paving Arrowhead Road. Fund, design, and construct.

Action: Assess the need for and costs of paving Rainfall Road in New York.

Action: Study and develop a plan to stabilize some unpaved roads with gravel (Cottonwood Road, the back road to Acoma).

Strategy: Enhance safety of interstate and railroad crossings.

Action: Design improvements for the interstate underpass on Rainfall Road (L24) to Casa Blanca, considering vehicle, bicycle, and pedestrian access.

Strategy: Improve bridges.

Action: Construct improvements to Seama Bridge (on Rainfall Road, L26, in the village between Sacred Shield Road and Pollen Drive, over the Rio San Jose, BIA ID# M108)

Strategy: Improve maintenance of roads and bridges.

Action: Develop a plan for consistent maintenance of community roads; implement the plan.

Action: Address current problems with potholes (Rainfall Road near Philadelphia, Yellow Flower Road near the cul-de-sac).

***Power Supply***

*Goal: Solar power helps meet community energy needs.*

*Goal: Solar power is used for housing needs.*

*Goal: Energy for home use is affordable.*

*Goal: Land and resources are used efficiently for housing.*

Strategy: Design homes that allow for efficient use of solar energy.

Action: Develop and adopt Pueblo guidelines or policies that support or require that homes be designed for passive solar heating; design homes for passive solar heating.

Action: Develop and adopt Pueblo guidelines or policies that support or require that homes be designed with roofs that can be used for solar hot water heating and/or solar electric panels; design homes with roofs that can be used for solar hot water heating and/or solar electric panels.

Action: Research appropriate solar and wind power equipment that will not interfere with culturally-significant viewsheds, and are of an acceptable scale.

Action: Research opportunities for financial support for individual homeowners to install solar energy equipment; develop and implement a plan to promote these opportunities.

Actions: Educate community members on the advantages of solar power; enlist the assistance of Pueblo members who work in this field for this effort.

Strategy: Use solar power in community facilities to reduce long-term energy consumption and costs.

Action: Plan, design, and construct new community centers so that they are ready for solar power.

Action: Assess feasibility of converting existing community buildings to solar power; plan, fund, design, and purchase and install or construct.

Action: Develop and adopt Pueblo guidelines or policies that support or require that community facilities have passive solar heating, solar hot water panels, and/or solar electric panels; design community facilities with these features.

Strategy: Develop solar energy to provide power to the community.

Actions: Assess the feasibility of a field of solar panels to provide energy to the village; develop and implement a plan.

***Drought, General Preparedness***

*Goal: Water is available and safe for domestic and agricultural use, wildlife habitat, and other community uses.*

Strategy: Conserve scarce water resources.

Action: Develop and adopt guidelines or policies that support or require that commercial and institutional buildings incorporate water conservation measures into their design (e.g., those proposed by the Leadership in Energy and Environmental Design, LEED, program); incorporate water conservation measures into design.

Strategy: Protect land and water in and upstream from Paguate.

Actions: Develop a mechanism for ongoing assessment of mining, development, and other activities upstream from Paguate, particularly their impacts on significant natural areas (Mt. Taylor, Paguate Canyon, Rio Paguate and areas along it, fields and ditches); conduct assessments; use the results of the assessments to assist with developing strategies and making decisions.

Actions: Develop a strategy or plan to secure land and upstream water sources through Pueblo ownership; implement.

Actions: Develop a watershed management plan with strategies and best practices to reduce erosion, improve wildlife habitat, and protect water quality; implement.

***Drought – Irrigation***

*Goal: Water is available for cultural practices and agricultural use.*

*Goal: Water is available and safe for domestic and agricultural use, wildlife habitat, and other community uses.*

Strategy: Keep the Rio San Jose flowing.

Action: Persist in ongoing water rights case and discussions with the Pueblo of Acoma.

Action: Meet with mayordomos from other villages to discuss needs for water and ensure that each village has water available for farming.

Action: Continue removal of salt cedar.

Action: Continue to allow beaver trapping, to reduce beaver dams.

Strategy: Improve infrastructure to provide water to farm fields.

Action: Regularly assess the irrigation system to determine the need for ditch repair and improvement; plan and implement improvements.

Action: Assess the irrigation system to determine ditches which may be best suited to concrete lining; plan and line ditches as appropriate.

Action: Design and construct improvements to Seama (New York) Reservoir so that it will hold water.

Action: Design and construct a diversion dam (repair, rehabilitate, or replace the existing diversion dam) on the Rio San Jose upstream of the village (in conjunction with a wetland; see below).

Action: Design and construct improvements to upstream water holding facilities, such as the dam at New Laguna.

Strategy: Conserve scarce water resources through agricultural practices.

Action: Study feasibility of using drip irrigation systems to maximize the efficiency of water use for agriculture; if feasible, fund, purchase, and install systems.

Action: Develop and implement a village-based teaching program to teach new farming methods that conserve water during the irrigation process.

Action: Study feasibility/develop preliminary engineering report, plan, fund, design, and construct structures to shade irrigation ditches and support solar panels.

Strategy: Develop additional sources of water for farming.

Action: Continue efforts to develop additional wells, pipes, and/or storage tanks to provide water for farming. As needed, plan, design, and construct new facilities.

Action: Design and construct a flume from the south ditch over the Rio San Jose, to improve flows to farmers in Casa Blanca.

Action: Study feasibility/develop preliminary engineering report, plan, fund, design, and construct infrastructure to use treated wastewater for farming.

Action: Study feasibility of using other water infrastructure, such as domestic water system flush valves and hydrants, to supply water for farming.

Strategy: Improve land to make irrigation more efficient.

Action: Level the land using laser leveling technology, to improve the flow of irrigation water on fields.

Action: Consolidate farm fields and serve consolidated areas with improved irrigation infrastructure.

Strategy: Develop alternative sources of water for agriculture in residential and institutional (e.g., schools, government buildings) areas.

Action: Develop and adopt Pueblo guidelines or policies that support or require that new homes include gray water systems that can be used for home gardening; design and construct homes with gray water systems.

Actions: Research the potential for retrofitting homes with gray water systems (e.g., kitchen sink or shower to holding tank) that can be used for gardening; design and construct.

Action: Develop and adopt Pueblo guidelines or policies that support or require that new homes be designed to allow for water harvesting off roofs, to be used for home gardening; design and construct homes that allow for water harvesting off roofs.

Action: Research the potential to retrofit homes to allow water harvesting off roofs, to be used for gardening; design and construct.

Action: Develop a program to provide water barrels to community members interested in starting home gardens; obtain support and implement.

Strategy: Protect springs and wells.

Action: Work with elders to identify springs and wells, and develop a plan to protect them.

Strategy: Assess water availability.

Action: Study surface water availability.

Action: Study groundwater availability, including water table levels.

Action: Analyze future needs for domestic and agricultural water use, and compare with surface and ground water availability.

***Drought – Livestock***

*Goal: Rangelands and associated infrastructure support raising livestock.*

*Goal: Livestock raising is an important part of community life.*

Strategy: Encourage improvements to rangeland. + Strategy: Improve the ecological health of the rangelands.

Actions: Develop a range management plan with strategies and best practices; implement.

Action: Plan, design, and construct improvements such as rebuilt and lined dirt tanks, solar systems for pumping water to stock tanks, water lines, boundary fencing, and improved range roads.

Strategy: Improve facilities for livestock.

Actions: Assess livestock facilities; plan, fund, design, and construct improvements.

***Cultural Resource Protection***

*Goal: Culturally-significant areas are appropriately protected.*

***Emergency Preparedness – Awareness***

*Goal: The community is prepared for emergencies, including natural events.*

*Goal: Information is shared throughout the village.*

Strategy: Develop and promote plans for emergency response in the village. + Strategy: Ensure transportation access during emergencies.

Actions: Assess any existing community education programs on basic emergency preparedness; develop and implement new or improved programs.

Actions: Assess any existing community education programs on emergency management operations and plans; develop and implement new or improved programs.

Strategy: Improve information sharing throughout the Village.

Actions: Develop and implement a village newspaper.

Actions: Acting individually, work with the Pueblo's newspaper to improve its quality.
Actions: At the village level, make hard copies of the Council minutes available in the community center.
Actions: Assess feasibility, plan, design, and construct improved cell phone service to the entire village of Paguate.

***Emergency Resources***
*Goal: The community is prepared for emergencies, including natural events.*
Strategy: Enhance emergency preparedness through development of emergency facilities.
Actions: Assess the need for emergency housing; plan, fund, design, and construct.
Actions: Assess the need for emergency shelters; plan, fund, design, and construct.
Strategy: Develop relationships with potential partners who may assist in the event of an emergency.
Actions: Maintain the relationship between the Pueblo and the American Red Cross and other programs that support emergency preparedness and emergency management.

**Pueblo of Laguna Capital Improvement Plan**

As noted above, the Pueblo of Laguna Council is required, by Council Resolution and policy, to adopt a Capital Improvement Plan (CIP) each year. The actions in the village comprehensive plans, also noted above, are used as tools for determining projects in the CIP. The Pueblo's CIP includes substantial information about each project, including the scope of work, benefits, current status of the project (planning, design, or construction phase), expected budget, and likely funding sources. As of March 2020, the most recent CIP was adopted by the Pueblo Council in November 2019. The CIP was reviewed for the Hazard Mitigation Plan. The projects listed below are included in the approved plan.

***Kachina Walkway Retaining Walls, Village of Laguna*** – The Village of Laguna is on a rocky hill and has issues with drainage. Retaining walls currently help with ground stabilization and some erosion control. One wall is starting to deteriorate due to erosion along natural drainage pathways, following a seasonal monsoon rain event. The project would re-align and rebuild the wall.

***Roof Replacement Projects*** – The Pueblo has multiple roof replacement projects pending:

- St. Joseph Church Roof Improvement (Village of Laguna)
- Bender Hall Roof Repair and Future Use Study (Village of Paguate)
- St. Elizabeth Church Re-Roof (Village of Paguate)
- St. Margaret Mary Church Re-Roof (Village of Paraje)
- Mesita Facility (Police Department) Roof Replacement
- Rehabilitation Center (Detention Center) Roof Replacement
- Tribal Building Roof Replacement

***Montano Range Unit Rehabilitation*** – Replace boundary fencing. Construct water catchments. Develop conservation and rehabilitation plan. Submit conservation projects for EQIP funding and Working Lands for Wildlife Program (NRCS). Implement projects. Develop Management Plan with cattle association. Reintroduce livestock after rangeland has improved.

***Boundary Fence Replacement Program*** – Control feral livestock. Decrease overgrazing and degradation of POL rangelands, which results in water and wind erosion, removing topsoil and leaving bare ground.

***Rio San Jose River Restoration*** – Return healthy stream flows. Restoration from a degraded channelized state to a more natural meander, constructing sediment capture structures and sloping the earth banks away from the channel to allow more natural flow. As a result of the changing water availability and channelization in the stream, the river no longer meets any of those characteristics, and is causing erosion issues in some locations. The nature of the current river results in flash flooding and no opportunity for alluvial recharge. Repairing the stream would improve riparian habitat for wildlife and fish, slow flooding events, and reconnect the stream with its aquifer. The Planning phase is considering existing infrastructure, maximum and minimum flows, and sedimentation.

***Encinal East Dam and Irrigation Line Rehabilitation*** – This project would rehabilitation the existing dam and irrigation channel from the Encinal Canyon outlet to the inlet of the dam, for community use and revitalization of farmlands southeast of the village.

***Encinal Village Dam Rehabilitation*** – The Encinal Village dam, also known as Beecher Dam, is the primary reservoir for village irrigation water from Encinal Canyon. This project would repair the current leaks in the dam.

***New Laguna Irrigation Ditches*** – This project would line over 11,000 linear feet of earthen ditch to reduce water loss from absorption, and would install new turnouts.

***Mesita Windmill*** – This project would plan, design, and construct a windmill in the Village of Mesita, as a water source.

***Paguate Ditch Relining*** – This project would design and construct an approximately 1,200 linear feet concrete ditch lining in the Paguate ditch below Pork Chop Hill to improve the efficiency of conveyance of irrigation water.

***Paguate Irrigation Projects*** – In 2017, the village completed a preliminary engineering report for their irrigation system. The PER identifies multiple improvements.

***Seama Irrigation Railroad Crossing*** – The project will line an existing dirt irrigation channel near the BNSF railroad to improve the efficiency of conveyance.

**Drought Contingency Plan**

The Pueblo of Laguna Utility Authority Drought Contingency Plan recommends the following actions:

- Supplemental well for Encinal water system, beginning with further investigation of options
- Evaluation of inactive wells in Paguate and Valley systems, for possible rehabilitation and use during a drought
- Feasibility study of aquifer storage of surface water, when there is high river flow
- Improved monitoring of water supply and drought conditions, water levels in wells
- Weather station on Pueblo land
- Water loss study, including assessment based on metered water usage
- Metering of all water usage
- Targeted leak reduction and repair
- Operating and management procedures such as warnings and communications during a drought
- Water conservation restrictions during drought; adopt them now (UA, PSD)

**Renewable Energy Feasibility Study Update and Plan**

The 2018 Renewable Energy Plan listed six goals for the Pueblo's energy:

- *Energy Reliability:* Having energy that is consistently available.
- *Community Resilience:* Being prepared with alternative energy as the availability, cost, and impacts of our current energy change.
- *Relationships to People and the Natural World:* Minimizing negative effects on health, nature, and culture & tradition.
- *Energy Sovereignty:* Making our own decisions about energy (regardless of the decision).
- *Economic Development:* Obtaining revenue from electricity generation/distribution (e.g., leases, short-term construction and long-term jobs, taxes, etc.).
- *Community Development:* Receiving energy and/or energy cost savings from energy development on our lands.

Energy reliability was ranked highest by Council and third by focus groups of Pueblo employees. Community resilience was ranked second by Council.

The Renewable Energy Plan includes projects at multiple levels. Distributed energy projects focus on community centers. Community-scale projects focus on village-level energy supplies.

**Eastern Reservation Area Master Plan**

The Eastern Reservation Area Master Plan includes actions relevant to hazard mitigation:

- Incorporate measures to reduce erosion of the Rio Puerco into road design (e.g., the proposed Rt. 6 spur connecting to I-40 at the Rio Puerco).
- Adopt a Land Use Ordinance and Land Use Map, and amend and update these documents as needed.
- Set up a Development Review Committee process and establish design standards for the Eastern Reservation Area.
- Look for ways to optimize cattle ranching on less land or on the most productive land by improving water wells, water quality and infrastructure, water tanks, irrigation systems, and range management practices.

**Community Shelter Assessments**

The Pueblo of Laguna partnered with the American Red Cross to assess community buildings and other locations for their capacity as emergency shelters in 2014. The shelter surveys indicate the need for improvement at many sites. However, certain surveys were conducted on older recreation halls, which have been replaced with new community centers facilities; new surveys should be conducted.

*Encinal Community Center (new Center to be constructed)*
No fire safety equipment
No generator on site
Heating and cooling from natural gas
Not fully wheelchair accessible
No laundry facilities

*K'awaika Center*
No fire safety equipment
No generator on site
Heating natural gas, cooling electric
Mostly wheelchair accessible
No laundry facilities

*K'awaika Senior Center*
Designated as a warming, cooling/information center for day use only
Has fire safety equipment
Heating natural gas, cooling electric
No generator on site
Wheelchair accessible
Laundry facilities

*Laguna Middle School Gymnasium*
Has fire safety equipment
Heating natural gas, cooling electric
Has a generator on site
Wheelchair accessible
Laundry facilities not stated

*Laguna Village Rec Hall (new Center to be constructed)*
No fire safety equipment
Heating electric, cooling electric
No generator on site
Not fully wheelchair accessible
No laundry facilities

*Mesita Village Rec Hall (new Center constructed)*
No fire safety equipment noted
Heating natural gas, no cooling
No generator on site
Not fully wheelchair accessible
No laundry facilities

*Paguate Village, Bender Hall (new Center constructed)*
No fire safety equipment noted
Heating and cooling from natural gas
No generator on site
Not fully wheelchair accessible
No laundry facilities

*Paraje Rec Hall (new Center constructed)*
No fire safety equipment noted
Heating natural gas, cooling electric
No generator on site
Not fully wheelchair accessible
No laundry facilities

*Seama Rec Hall (new Center constructed)*
No fire safety equipment noted
Heating natural gas, cooling electric
No generator on site
Not fully wheelchair accessible
No laundry facilities

**2020 Plan Update**

Participants in the 2020 plan update meetings reiterated the need for certain projects and suggested additional projects:

- Floodplain mapping
- Culvert cleaning
- Construction easement for BNSF to do work
- Safe places
- LDC could shelter at Dancing Eagle
- Erosion control in eastern area
- Evacuation routes

Respondents to the community survey wrote in suggestions:

- Road improvements
- Housing improvements
- Places to go, such as community centers
- Water park (for heat)
- Evacuation routes/plans
- Notification
- Readiness, preparedness
- Building capacity for long-term recovery
- Ways of getting families back together after a hazard event

**Completed Projects**

Participants in the 2020 plan update reviewed the 2015 plan and noted completion of the following projects:

- Village comprehensive plans and land use maps, with recommended areas for minimal to no development

- Drought contingency plan
- Updated grazing ordinance and livestock herd reduction. Temporary closure of Montano Range Unit
- Emergency notification system

# Action Plan

***Review Guide Element C5***

The Pueblo of Laguna's mitigation actions are listed in the tables below, by the type of action. Acronyms are as follows:

**Hazard/Risk Addressed:**
D = Drought
Fi = Wildfire, may be caused by severe storms with lightning.
Fl = Flooding, including severe storms and dam inundation. May include post-wildfire flooding.
H = Heat
SS = Other sever storm effects, such as high winds, hail, lightning. May include power outages.
WS = Winter severe storm

**Type of Project:**
PDC = Plan/Assess, Design, Construct, or Install
PP = Policy of Program

**Source of Mitigation Action Idea:**
2020 = new input for 2020 plan
CIP = Pueblo of Laguna Capital Improvement Plan
DCP = Drought Contingency Plan
ERMP = Eastern Reservation Area Master Plan
HMP = 2015 Hazard Mitigation Plan
HSP = Housing Strategic Plan
RE = Renewable Energy Feasibility Study Update and Plan
VCP = Village Comprehensive Plans (one or more of six)

**Project Lead (*Review Guide Element C5.b*):**
BIA = Bureau of Indian Affairs
BNSF = Burlington Northern Santa Fe Railroad
CHW = Community Health & Wellness
GAD = Government Affairs
IT = Information Technology
LDC = Laguna Development Corporation
LHDME = Laguna Housing Development and Management Enterprise
NMDOT = NM Department of Transportation

Pl = Planning
PS = Public Safety
PW = Public Works
UA = POL Utility Authority
V = Village

**Funding Sources:**
ACOE = Army Corps of Engineers
BIA = Bureau of Indian Affairs
BNSF = Burlington Northern Santa Fe RR
BOR = Bureau of Reclamation
CC = Catholic Church (+ possible National Park Service funding)
DOE = Department of Energy
FEMA = Federal Emergency Management Agency, multiple programs
HUD = Department of Housing and Urban Development
IHS = Indian Health Service
NMCO/TIF = NM capital outlay/Tribal Infrastructure Fund
NMDOT = NM Department of Transportation
NRCS = Natural Resources Conservation Service
POL = Pueblo of Laguna
SFA = State Fire Administration

**Prioritization**

***Review Guide Element C5.a***

For the 2015 plan, planning meetings were held where all Pueblo villages identified their unique issues and risks to the five hazards profiled. TERC and the LMPT evaluated the mitigation actions using the following criteria:

- Safety of life and property
- Immediate need for action
- Actions most valuable to the Pueblo
- Benefit to the Pueblo versus cost of the project
- Availability of funding and staffing to accomplish the necessary actions

The prioritization of the mitigation actions is not intended to be absolute.

For the 2020 plan update, participants first discussed criteria for prioritizing the proposed actions. Similar to the 2015 plan, they determined that it was essential to evaluate actions based on both the risk associated with the hazard, and the feasibility of undertaking the action. Participants then voted using "sticky dots," choosing their top priority project for each of eight categories: general, transportation, irrigation, buildings, utilities, lands and natural resources, data and monitoring, and community awareness. It should be noted that this ranking is specific to natural hazard mitigation, and may not

encompass the entire value of the listed actions, which may be important for other reasons. Participants ranked the actions as follows:

**General:** floodplain mapping (5), development review and enforcement process (2), building codes (1), Laguna village kachina walkway retaining walls/Old Laguna drainage (0), Seama and Paraje flood control berms (0), mayordomos ordinance update with no building in the flood zone (0)

**Transportation:** evacuation routes for schools (4), culvert maintenance and cleaning for drainage (3), roadway drainage studies (2), road maintenance (2), "all" (1), improved access to housing areas (Green Acres, Old Laguna, Laguna Stovepipe Road, south and southeast of Laguna plaza, Mousetown Rd. to Rodeo, south end of Seama) (0)

**Irrigation:** drip irrigation (4), treated wastewater (2), land improvements for irrigation (leveling) (2), Encinal East Dam (0), Encinal Village Dam (0), Mesita windmill repair (0), New Laguna ditches (0), Paguate irrigation system (0), Seama irrigation railroad crossing repair (0), Seama reservoir (0), New Laguna reservoir (0)

**Buildings:** community center renewable energy + energy storage (4), community centers as shelters (3), institutional building fire extinguishers and sprinklers (1), residential retrofits (weatherization) (0), traditional homebuilding and home reconstruction (0), Mesita facility roof replacement (0), rehab center roof replacement (0), tribal building roof replacement (0), Bender Hall roof repair (0), St. Elizabeth Church re-roof (0), St. Joseph Church roof improvement (0), St. Margaret Mary Church re-roof

**Utilities:** water and wastewater infrastructure drainage studies (4), aquifer storage (3), telecommunications equipment replacement (emergency communications) (3), supplemental wells/reactivation of wells (0), water loss study (0), leak replacement and repair (0)

**Lands and Natural Resources:** watershed planning and management (4), Rio San Jose Restoration (2), spring protection (1), Montano range unit rehabilitation (1), livestock and wildlife watering (1), boundary fence replacement (0)

**Data and Monitoring:** heat monitoring and notification (3), weather station (2), drought monitoring (2), water metering and monitoring (0), water loss study (0)

**Community Awareness:** Heat impacts and health protection (5), water conservation (2), evacuation routes (1), "all" (1), wildfire prevention (1), smoke impacts and health protection (1)

Participants then discussed their choices and noted other criteria that factored into their decisions. Participants scored actions that underpinned multiple future projects, such as floodplain mapping and drainage studies, and community information, education, and awareness, higher than other actions. They also scored actions that addressed multiple hazards, such as telecommunications equipment

upgrades, higher than other actions. Some participants scored actions that have been under discussion for a long time, such as evacuation routes, higher.

The highest ranked actions are listed as “high,” other actions that scored are listed as “medium,” and actions without any points are listed as “low” in the table of actions.

The timeline for actions considers not only the priority of the action but also its current status in the Pueblo’s capital improvement plan. For example, the roofing projects are listed as low priority actions in this plan, but they are already included in the capital improvement plan. Some projects have existing funding for assessments and design, which may allow them to proceed faster than their prioritization would otherwise indicate.

Costs were taken from the Capital Improvement Plan when available. If costs in the CIP were for planning or design, only, a multiplier was used to roughly estimate future construction costs.

## Mitigation Actions for the Pueblo of Laguna, Existing and New Buildings and Infrastructure

***Review Guide Element C4.b***

| Action for: Multiple buildings and infrastructure | Hazard/ Risk | Type of Project | Source of Project | Lead | Timeline | Priority | Funding Sources | Cost Estimate, $ |
|---|---|---|---|---|---|---|---|---|
| Floodplain mapping | Fl | PDC | VCP, HSP, HMP | PW, Pl | 1 year | High | ACOE, FEMA | 2,500,000 |
| Building codes: no flood zone development, standards for roofing, windows, insulation, energy, water conservation | Fl, H, Fi, SS, WS, D | PP | VCP, HSP, HMP | Pl, GAD | 2 years | Medium | FEMA | 100,000 |
| Development review and enforcement process | Fl, H, Fi, SS, WS, D | PP | VCP, ERMP | Pl, GAD | 3 years | Medium | POL | 50,000 |
| Mayordomos ordinance: no flood zone development, standards for roofing, windows, insulation, energy, water conservation | Fl, H, Fi, SS, WS, D | PP | VCP, HSP, HMP | Pl, GAD | 3 years | Low | FEMA | 50,000 |
| Kachina Walkway retaining walls / Old Laguna drainage | Fl | PDC | CIP, VCP | V, PW | Started | Low | POL, NMCO/TIF | 500,000 |
| Flood control berms in Seama and Paraje | Fl | PDC | HMP | PW | 4 years | Low | BNSF, FEMA, ACOE | 7,000,000 |
| Paguate dam outlet | Fl | PDC | CIP | PW, V | 4 years | Low | BIA | 500,000 |
| Residential relocation from floodplain | Fl | PDC | HMP | V | 3 years | Low | FEMA | 1,000,000 |
| Residential retrofits for cooling, heating, roofing, energy, water conservation | H, Fi, SS, WS | PDC | VCP, HSP, RE, HMP | LHDME, Pl | 2 years | Low | HUD, DOE | 2,000,000 |
| Traditional homebuilding and home reconstruction | H | PDC | VCP | PW, Pl | 2 years | Low | POL, HUD | 5,000,000 |

| Action for: Transportation | Hazard/ Risk | Type of Project | Source of Project | Lead | Timeline | Priority | Funding Sources | Cost Estimate, $ |
|---|---|---|---|---|---|---|---|---|
| Roadway drainage studies, with scenarios for increased flow. Roadway improvements, possibly including paving (Rainfall, Arrowhead), repaving (Vietnam | Fl | PDC | VCP, HMP | PW, NMDOT, BIA | 1 year (improve, with road designs) | High | BIA, NMDOT | 300,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Veterans), gravel (Cottonwood). Rainfall Rd. I-40 underpass improvements. | | | | | | | | |
| Culvert maintenance, cleaning - roads and railroads. Agreements and implementation | Fl | PP + PDC | HMP | PW, GAD, BNSF, NMDOT | 1 year | High | BNSF, NMDOT | 500,000 |
| Evacuation routes for schools | Fl, Fi | PDC | VCP, HMP | PS | 1 year | High | BIA, NMDOT | 4,000,000 |
| Road maintenance, including pothole repair | Fl, Fi | PDC | VCP | PW, BIA, NMDOT | Ongoing | Medium | BIA, NMDOT | 1,000,000 |
| Improved access for residential areas (Laguna subdivision/Green Acres, Laguna Stovepipe Rd., south and southeast of Laguna plaza, Mousetown Rd. to Rodeo, Seama south end) | Fl, Fi | PDC | VCP, HMP | PW, BIA | 3 years | Low | BIA, NMDOT | 5,000,000 |

| **Actions for: Irrigation** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|
| Drip irrigation | D | PDC | VCP | UA, V | 2 years | High | BOR | 5,000,000 |
| Treated wastewater for irrigation | D | PDC | VCP | UA, LDC | 3 years | Medium | BOR | 5,000,000 |
| Land improvements for irrigation efficiency (leveling) | D | PDC | VCP | V, PW | 3 years | Medium | BOR | 5,000,000 |
| Encinal East Dam and Irrigation Line Rehab | D | PDC | CIP, VCP | PW, V | Started | Low | BOR | 1,000,000 |
| Encinal Village Dam Rehabilitation | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 1,020,000 |
| Mesita Windmill Repair | D | PDC | CIP, VCP | PW, V | Started | Low | BOR | 500,000 |
| New Laguna Irrigation Ditches - phase 1 | D | PDC | CIP, VCP | PW, V | Started | Low | BOR | 430,000 |
| New Laguna Irrigation Ditches - phase 2 | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 530,000 |
| New Laguna Irrigation Ditches - phase 3 | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 310,000 |
| Paguate Ditch Relining | D | PDC | CIP, VCP | PW, V | Started | Low | BOR | 110,000 |
| Paguate Irrigation Improvement 2nd Diversion Dam | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 4,000,000 |
| Paguate Irrigation Lateral 2 Improvement | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 550,000 |
| Paguate Irrigation Middle Ditch Improvement | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 3,100,000 |

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|---|---|---|---|---|---|---|---|---|
| Paguate Irrigation North Ditch Segment 6 | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 355,000 |
| Paguate Irrigation North Lake Pipe | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 1,200,000 |
| Paguate Irrigation Pork Chop Connection | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 1,450,000 |
| Seama Irrigation Railroad Crossing Repair | D | PDC | CIP, VCP | PW, V | 3 years | Low | BOR | 60,000 |
| Reservoir improvements, Seama/New York and New Laguna | D | PDC | VCP | PW, V | 5 years | Low | BOR | 5,000,000 |

| **Actions for: Utilities** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|
| Water and wastewater infrastructure drainage studies | Fl (Fi, D) | PDC | HMP | UA, PW | 1 year (improve, with new design) | High | FEMA, ACOE | 5,000,000 |
| Study aquifer storage | D | PDC | DCP | UA | 2 years | Medium | BOR | 550,000 |
| Supplemental well, Encinal | D | PDC | DCP | UA | 3 years | Low | BOR | 650,000 |
| Reactivation of wells, Paguate and Valley systems | D | PDC | DCP | UA | 3 years | Low | BOR | 250,000 |
| Water loss study | D | PDC | DCP | UA | 1 year | Low | BOR | 75,000 |
| Targeted leak reduction and repair | D | PDC | DCP | UA | 2 years | Low | BOR | 100,000 |

| **Actions for: Specific Buildings** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|
| Community center renewable energy + storage | H, Fl, Fi, SS, WS | PDC | VCP, RE | Pl, PW | Started | High | DOE, BIA | 400,000 |
| Community centers and other buildings as shelters - improvements for energy, cooling, accessibility, function | H, Fl, Fi, SS, WS | PDC | VCP, HMP | Pl, PW | 2 years | Medium | FEMA, NMCO/TIF | 600,000 |
| Institutional building fire extinguishers | Fi | PDC | HMP | PW, PSD | 1 year | Medium | tbd | 10,000 |
| Mesita Facility (Police Department) Roof Replacement | SS, Fi, H | PDC | CIP | PW | 2 years | Low | NMCO/TIF | 750,000 |
| Rehabilitation Center (Detention Center) Roof Replacement | SS, Fi, H | PDC | CIP | PW | 2 years | Low | NMCO/TIF | 500,000 |
| Tribal Building Roof Replacement | SS, Fi, H | PDC | CIP | PW | 3 years | Low | NMCO/TIF | 650,000 |
| Bender Hall Roof Repair and Future Use | SS, Fi, H | PDC | CIP | PW, V | Started | Low | POL | 340,000 |

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|---|---|---|---|---|---|---|---|---|
| Study (Village of Paguate) | | | | | | | | |
| St. Elizabeth Church Re-Roof (Village of Paguate) | SS, Fi, H | PDC | CIP | PW, V | 2 years | Low | POL, CC | 810,000 |
| St. Joseph Church Roof Improvement (Village of Laguna) | SS, Fi, H | PDC | CIP | PW, V | 2 years | Low | POL, CC | 200,000 |
| St. Margaret Mary Church Re-Roof (Village of Paraje) | SS, Fi, H | PDC | CIP | PW, V | Started | Low | POL, CC | 1,000,000 |

| **Actions for:<br>Land and Natural Resources** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|
| Watershed planning and management | Fl, Fi, D | PDC | VCP, 2020 | ENRD | 1 year | High | EPA, ACOE, BOR | 120,000 |
| Rio San Jose restoration | Fl, Fi, D | PDC | CIP, VCP, HMP | ENRD | 2 years | Medium | EPA, ACOE, BOR | 800,000 |
| Mesita Diversion Dam rehabilitation | D | PDC | CIP | ENRD | 2 years | Medium | ACOE, BOR | 1,200,000 |
| Spring protection | D | PDC | VCP | ENRD | 2 years | Medium | EPA, ACOE, BOR | 500,000 |
| Montano Range Unit rehabilitation | D, Fl | PDC | CIP | ENRD | Started | Medium | NRCS | 2,650,000 |
| Boundary fence replacement | D, Fl | PDC | CIP | ENRD | 3 years | Low | NRCS | 350,000 |
| Livestock and wildlife watering | D | PDC | VCP | ENRD | 3 years | Low | NRCS | 2,650,000 |

| **Actions for:<br>Data and Monitoring** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|
| Heat monitoring and notification | H | PP | 2020 | CHW | 2 years | High | IHS, POL | 50,000 |
| Weather station | H, Fl, D, SS, WS | PP | DCP | UA | 2 years | Medium | BOR | 100,000 |
| Drought monitoring | D | PP | DCP | UA, ENRD | 2 years | Medium | POL, BOR | 750,000 |
| Water metering and monitoring | D | PP | DCP, VCP | UA | 3 years | Low | BOR | 100,000 |
| Water loss study | D | PP | DCP | UA | 3 years | Low | BOR | 75,000 |

| **Actions for:<br>Community Awareness and** | **Hazard/ Risk** | **Type of Project** | **Source of Project** | **Lead** | **Timeline** | **Priority** | **Funding Sources** | **Cost Estimate, $** |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Coordination** | | | | | | | | |
| Heat impacts and health protection | H | PP | 2020 | CHW | 2 years | High | IHS | 20,000 |
| Water conservation | D | PP | DCP | UA, V | 2 years | Medium | BOR, BIA, NRCS, EPA, POL | 20,000 |
| Evacuation routes | Fl, Fi | PP | VCP, HMP | PS | 2 years | Medium | FEMA | 20,000 |
| Wildfire prevention (e.g., defensible space), including coordination with BIA SPA Prevention Program | Fi | PP | HMP | V | 3 years | Medium | BIA, FEMA, SFA, NRCS | 20,000 |
| Smoke impacts and health protection | Fi | PP | 2020 | CHW | 3 years | Medium | IHS | 20,000 |

# Incorporation into Other Plans

***Review Guide Element C6***

The Pueblo of Laguna is integrating the hazard mitigation planning process with its current climate change adaptation planning. The Pueblo received a BIA Tribal Resilience Program grant and is currently preparing vulnerability assessments for two areas of concern, health & wellness and infrastructure & buildings. The vulnerability assessments will be used to develop adaptation plans. The mitigation strategies in the Hazard Mitigation Plan will be the starting point for developing climate adaptation strategies and actions.

As noted above, the Pueblo of Laguna Council is required, by Council Resolution and policy, to adopt a Capital Improvement Plan (CIP) each year. The Pueblo's CIP is distinct from the New Mexico Infrastructure Capital Improvement Plan (NM ICIP), and includes substantial information about each project, including the scope of work, benefits, current status of the project (planning, design, or construction phase), expected budget, and likely funding sources. The Pueblo also participates in the NM ICIP as a tool for publicly stating its capital projects and requesting funding. The Pueblo of Laguna will also integrate the hazard mitigation planning process into its annual capital improvement plan (CIP). Mitigation strategies with capital – infrastructure, buildings, and equipment – components will be incorporated in the CIP. Selected projects will also be included in the NM ICIP.

The Tribal Emergency Response Commission will ensure incorporation of mitigation into these and other planning mechanisms.

# Monitoring, Evaluating, and Updating

***Review Guide Elements A6 and C7***

**Monitoring and Tracking**

The Tribal Emergency Response Commission (TERC) will include prioritized tasks from the plan in its monthly meeting agenda, to monitor their status and ensure their success. Lead departments or agencies will report on the status of actions. The Emergency Preparedness and Safety Compliance Program Manager will report to the Pueblo Council on progress of these projects/actions. If it is deemed necessary, priorities may be changed for projects with an explanation from the responsible department.

a. Schedule: monthly
b. Responsible for coordination: TERC

c. Responsible for implementation: lead listed in action table
d. Closeout: lead listed in action table, plus Accounting department staff

Grant administration and project closeouts will be the responsibility of the Finance Department. Finance department staff include: Tribal Treasurer, Chief Finance Officer, Controller and federal Grants Manager. The Finance Department will report to the Emergency Preparedness and Safety Compliance Program Manager any administration or closeout reports required for mitigation measures.

**Evaluating**

The Pueblo of Laguna Emergency Preparedness and Safety Compliance and Planning program managers, in collaboration with a subcommittee of the TERC, will evaluate the plan on an annual basis. This evaluation will consider changes in the probability of individual risks and in capability to administer and evaluate hazard mitigation actions. Department directors and program managers will report on their evaluation. The plan will also be reviewed after any applicable natural hazard event to consider how well mitigation measures reduced risk, and what other mitigation measures may need to be added to future plan updates.

**Updating**

The Emergency Preparedness and Safety Compliance Program and Planning Program will gather information for the next update on an ongoing basis, confirming compilation of information at least once a year, in order to ensure that materials are readily available for the next plan update. Information will include new data on the hazards from tribal, regional, state, and federal sources, as well as the status of actions. As needed, amendments, possibly in the form of a “changes” table, may be adopted.

When new leadership enter office in January, the Emergency Preparedness and Safety Compliance Program will provide copies and present an overview of the Hazard Mitigation Plan for the new administration. A thorough review of responsibilities, available trainings, and current emergency operation plans for the community will be provided for the new Tribal Council and administration.

In the year prior to the next update (every five years), the Emergency Preparedness and Safety Compliance Program, in coordination with other programs such as Planning, as needed, will develop a timeline for the plan update. Future plan updates will include:

- Public outreach activities
- Natural disasters that may have occurred during the year
- The need for additional maps or hazard data

- New facilities that need to be added to the plan
- Additional funding streams
- Technical assistance to consider
- Progress on mitigation action implementation

Upon completion of the process described above and reviewing/assessing the information, the emergency manager, TERC and the planning team will revise and update the mitigation action plans.

The plan will also be reviewed by any new membership of the Pueblo Council and Administration.

## Continuing Public Participation

***Review Guide Element A7***

Ongoing public participation in hazard mitigation planning will be incorporated into the Pueblo's ongoing work in multiple ways. The Pueblo of Laguna Public Safety Department sponsors an annual Public Safety Day. The Emergency Preparedness and Safety Compliance Program will ensure that mitigation information is available and public input is solicited at Public Safety Day. The Planning Program coordinates the Pueblo of Laguna Capital Improvement Plan (CIP), and conducts outreach about the capital planning process with the villages on an annual basis. Planning will include information about mitigation and solicit input on projects through the CIP process. The Pueblo Council reports on the minutes from Council meetings at biweekly village meetings. As the Council reports on hazard mitigation activities, the community will have an opportunity to provide feedback.

The Pueblo of Laguna has additional opportunities for outreach, with a local paper, the Kukadze'eta (Towncrier) and village and post office bulletin boards.

## References for Section IV

Pueblo of Laguna Capital Improvement Plan. Approved by Council November 22, 2019, Resolution 83-19.

Pueblo of Laguna Eastern Reservation Area Master Plan. Approved by Council by Resolution 68-09, September 22, 2009.

Pueblo of Laguna Utility Authority Drought Contingency Plan. June 14, 2019.

Renewable Energy Feasibility Study Update and Plan for the Pueblo of Laguna. Prepared by Avant Energy. September 6, 2018. Adopted by the Pueblo of Laguna Council, Resolution 83-18, December 7, 2018.

Village of Encinal Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Encinal January 29, 2015.

Village of Laguna Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Laguna December 13, 2018.

Village of Mesita Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Mesita August 9, 2012.

Village of Paguate Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Paguate October 22, 2015.

Village of Paraje Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Paraje June 19, 2014.

Village of Seama Comprehensive Plan. Prepared by the Pueblo of Laguna Planning Program. Approved by the Village of Seama October 23, 2014.

# *V: Assurances and Plan Adoption*

## Assurances

***Review Guide Element E1***

The Pueblo of Laguna will comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding including 2 CFR Parts 200 and 3002. The Pueblo will amend its mitigation plan whenever necessary to reflect changes in Pueblo or federal laws and statutes.

## Adoption

***Review Guide Element E2***

The Pueblo of Laguna Council has formally adopted this plan by Resolution _____. The Pueblo commits to fulfilling the hazard mitigation goals outlined in the plan and will authorize responsible agencies to execute their responsibilities.