Chapter 12 Resilience & Sustainability

12A Background & Analysis

12.A.1 Introduction

Resilience and sustainability can be used as a unifying framework to better understand the complex interrelationship between the state of the natural environment and some of the biggest challenges we face as a society today.

In this Plan, resilience and sustainability are guiding principles woven throughout, rather than stand-alone topics narrowly focused on environmental regulations. These principles provide a common lens for understanding and addressing challenges related to the environment, natural resources, land use, economic development and housing.

These principles also merit a standalone chapter to establish a common understanding of what resilience and sustainability mean in the context of the Comprehensive Plan. This chapter will highlight the concepts of resilience and sustainability as tools for developing holistic solutions for challenges with interconnected causes relating to the natural environment.

Many discussions in this chapter, organized into the following categories, will intersect with strategies presented in other chapters:

- Water resources
- Air Quality
- Soil Quality
- Natural Areas, Wildlife Habitat, and Vegetation
- Natural Hazards
- Climate Change
- Environmental Justice

[Sidebar]

Definition of Sustainability

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Benson and Craig, 2014, via Melinda Harm Benson, 16th Water Assembly Conference 2015).

Definition of Resilience

“The capacity of a system to absorb a spectrum of disturbances and reorganize so as to retain essentially the same function, structure and feedbacks – to have the same identity” (Walker and Salt 2012, via Melinda Harm Benson, 16th Water Assembly Conference 2015).
12.A.2 Guiding Principles

12.A.2.1 Strong Neighborhoods

12.A.2.1.1 Green infrastructure makes neighborhoods more pleasant places to live.

12.A.2.1.2 Revitalization efforts that target economic and health disparities in the community improve social sustainability.

12.A.2.2 Mobility

12.A.2.2.1 Enhancing non-motorized mobility options reduces greenhouse gas emissions.

12.A.2.3 Economic Vitality

12.A.2.3.1 A more diverse and resilient economy is less dependent on natural resource industries and less prone to boom-and-bust cycles.

12.A.2.3.2 Clean and renewable energy technology is a growing sector with potential to be a major local economic driver.

12.A.2.3.3 Protection of unique natural features increases opportunities for responsible ecotourism and outdoor recreation-based business and attracts talented workers and employers.

12.A.2.4 Equity

12.A.2.4.1 Public investments are measured not just in terms of economic returns but also for the social and environmental benefits they contribute to the community (e.g. sustainability’s “triple-bottom line”).

12.A.2.4.2 Decreasing pollution, natural hazards, and negative impacts on ecosystems addresses problems that often disproportionally impact vulnerable populations and improves health outcomes in stressed communities.

12.A.2.5 Sustainability

12.A.2.5.1 Framing challenges through a lens of sustainability helps maximize environmental, social and economic health for today’s generations without compromising the ability of future generations to do the same.

12.A.2.5.2 The triple-bottom-line evaluates social and economic benefits, often eclipsed by purely environmental concerns.
12.A.2.6 COMMUNITY HEALTH

12.A.2.6.1 Balanced approaches to increasing resilience and sustainability improve the overall health of the community.

12.A.2.6.2 Holistic sustainability strategies address community health simultaneously with social, environmental, and economic issues.

12.A.3 In the Future

A sustainable, clean water supply will be protected and managed carefully to support excellent ecological, social, and economic health.

Compact development patterns will stem unsustainable demand for infrastructure expansion and will redirect investment toward neighborhood revitalization in established residential areas.

New buildings meet the highest standards for energy efficiency, sustainable design and use of renewable materials. Low Impact Development (LID) and integration of Green Infrastructure into new development and redevelopment will become the new “business as usual,” reducing per capita resource consumption and negative environmental/social impacts.

Wildlife habitat is abundant and thriving, supported by well-funded conservation measures, restoration projects, and a high-functioning ecosystem.

Health outcomes have improved for vulnerable populations and health hazards from development are no longer disproportionately located in low-income neighborhoods.

12.A.4 Challenges

1. A limited and vulnerable water supply
2. Complex water governance structure
3. Variable effects of climate change
4. Natural hazards (flooding, drought, and fire)
5. Community health and well-being
6. Continued compliance with changing air quality standards
7. Drought conditions affecting the tree canopy and green space
8. Insufficient funding and cross-jurisdictional and departmental coordination

12.A.5 Strategies

1. Promoting sustainable, resource-efficient growth and development
2. Protecting and enhancing natural resources and the ecosystem functions they perform
3. Developing a resilient community
4. Supporting overall community health
5. Mitigating environmental injustice
6. Coordinating with relevant agencies to promote responsible and sustainable use of water and other natural resources

12.A.6 Context & Analysis

12.A.6.1 Sustainable Growth

12.A.6.1.1 Centers and Corridors

The City and County strive to grow and evolve into a more sustainable region. The Centers and Corridors strategy was adopted by the City and County as the vision for growth that would move us away from large greenfield subdivisions at the periphery of our urban footprint. Extensive low-density development requires infrastructure investment and maintenance costs that cannot be supported by our current tax and fee structure. It also consumes more land that the community would prefer to remain as open space, range land, and agricultural land. Growing forever outward on our edges is not a sustainable pattern.

Concentrating new development in already developed areas uses fewer resources for new infrastructure, preserves open space, habitat and agricultural land, and reduces the risk of hazards such as wildfire and flooding.

For more background information, context, and policies related to sustainable growth patterns, see the Land Use, Urban Design, and Transportation Chapters. [xref needed]

12.A.6.1.2 Mixed-Use and Multi-Modal Development

A mix of land uses in close proximity allows people to work, go to school, shop, and recreate near where they live. This reduces the need for auto travel, which improves air quality and reduces carbon emissions. With proper community design, it also increases options for active transportation that keeps people healthier and encourages positive social interactions.

12.A.6.1.3 Responding to the Landscape

There are many features of the natural landscape that can both be easily damaged by and pose threats to new development. To maximize the ability of our surrounding environment to continue providing invaluable ecosystem services — such as clean air and water, resilience to climate change, outdoor recreation, and beautiful vistas — development patterns must avoid constructing new buildings in hazardous areas, including floodplains.

Limited development outside of urban areas can contribute to sustainable growth only if it is carefully sited and designed to preserve agricultural land and open space, minimize impacts on vegetation, wildlife and natural topography, and respect the traditional, low density settlement patterns of communities in
those areas. This type of development should also be limited to the ability of existing resources and infrastructure to sufficiently serve new households and amenities.

12.A.6.1.4 Stormwater Management

One of the most far-reaching consequences of urban development has been damage to property and ecological health from the increased pooling, volume, and velocity of stormwater during and after major precipitation. This results from the covering of natural surfaces in pavement, asphalt and other impermeable materials. Sustainable growth must limit its additions to impermeable surfaces and integrate natural and human-made infrastructure to adequately slow, filter and return stormwater to underground aquifers.

12.A.6.1.5 High Quality Development

Sustainable development is high-quality development that uses sustainable materials and sound construction techniques to minimize maintenance and repair costs, and extend the lifetime of buildings and infrastructure. High quality development prioritizes the long-term safety of users and preservation of surrounding natural landscape.

12.A.6.1.6 Resilient infrastructure

Infrastructure that preserves the resilience of the surrounding ecosystem is more resilient itself. Sustainable infrastructure has lower lifecycle costs, including energy consumption, water use, and maintenance and repair costs. Sustainable infrastructure can better withstand future hazards and extreme climate conditions, such as rising temperatures and more violent precipitation patterns.

12.A.6.2 Water

Achieving the community’s vision of an economically, environmentally, and socially vibrant future hinges on a safe and dependable supply of water into the future. Meeting growing demand in the face of climate change, complex water governance, and severe impairment of natural hydrologic function is one of the most important challenges for Albuquerque, Bernalillo County, and the entire Southwest region.

Recent conservation efforts have been effective. Over the past 20 years, there has been an over 50 percent reduction in per capita water use. The San Juan Chama Drinking Water project was a successful supply-side measure that shifted primary drinking water dependency from severely restricted groundwater sources (aquifers) to surface water (the Rio Grande and San Juan Rivers). That source, however, will not be immune to extended periods of drought and low flows predicted as the climate grows incrementally warmer over the 21st Century. Careful planning will be needed to manage the supply of water from
surface and ground sources to ensure sustainable water resources into the future.

Land use and development patterns play a huge role in both determining water demand and the quality and quantity of supply. It is critical that the framework for future development decisions be integrated with a system-wide strategy across scales and disciplines to manage and coordinate supply and demand.

12.A.6.2.1 Existing Sustainability Efforts

Since 2008, the Drinking Water Treatment Plant has treated surface water for potable use throughout the service area, which greatly reduces the use of the aquifer. The surface water that is treated at the plant comes from the San Juan-Chama project, which transports water from the San Juan River across the continental divide through 26 miles of tunnels and discharges it into the Chama River for use by New Mexico municipalities and agriculture. The movement of this imported water from the Colorado River watershed gives added resiliency to the water supplies of the communities in the Middle Rio Grande.

In 2014, 60% of the Albuquerque metropolitan’s drinking water came from surface water and only 40% came from the aquifer. As a result of the change to surface water being the primary source of supply starting in 2008, aquifer levels throughout the Middle Rio Grande region have been rising steadily and are anticipated to continue to rise at least through 2025.

At the same time, water conservation has successfully lowered both overall production and gallons per capita per day water use. In 1995, before the water conservation program began, per capita use was 251; by 2014, it had dropped to 134. In 1995, approximately 40 billion gallons of water were produced to serve 445,000 customers. In 2014, approximately 32 billion gallons of water were produced to serve 656,000 customers.

[Insert graphic on overall water use]

[Insert graphic on gallons per capita per day]

[Add graphic illustration of water supply system]

12.A.6.2.2 Managing Our Water Resources

The Albuquerque Bernalillo County Water Authority (Water Authority) manages water and wastewater throughout most of the planning region and serves over 650,000 customers. An integral part of managing a water system in the desert is effective water resources planning.

The Water Authority adopted a Water Resources Management Strategy (WRMS) in 1997 to address declining water levels in the aquifer, develop surface water as a drinking water supply, implement water
conservation policies and utilize reclaimed water to extend the life of the area’s water resources.

The WRMS was updated in 2007 and is expected to be updated again in 2016 to address impacts to the area’s water supply due to climate change. The update process involves input from staff, consultants, other government regulatory agencies, and numerous public meetings. The 2016 WRMS update will plan for a 100-year time horizon and will address potential gaps in water supply due to climate change, drought, and growth in demand, along with the supply alternatives to fill those gaps.

The 2016 update to the WRMS reflects the changes in our water resource situation. Demand is lower, and supply is increasing and is projected to continue increasing for another decade or so. The primary goal of the 2016 WRMS remains the same as in previous strategies though, to preserve and protect the aquifer so that it is available for use by many future generations. Although the Middle Rio Grande region has experienced drought for six of the last seven years, the water supply has been increasing.

Examining the effects of climate change on water supply will be a significant component in the 2016 WRMS. The Water Authority has developed a predictive model to analyze various combinations of water supply scenarios and water demand scenarios to evaluate potential supply gaps in the next 100-years. Previous WRMS’s only planned for one water supply future or scenario. By utilizing a combination of three supply scenarios and three demand scenarios, the 2016 WRMS will create nine possible water futures and allow us to prepare for a broad range of conditions.

The climate change data used in the WRMS analysis were derived by the Bureau of Reclamation from base data first developed as part of the West-Wide Climate Risk Assessment. This climate data was then used to develop three possible future water supply scenarios. The high water supply scenario in the WRMS reflects historic flows in the Rio Grande, so the highest water supply we anticipate seeing in the future is the one we’ve seen in the past. The medium supply scenario is based on the central tendency of the climate change data, it is no more likely to occur than the many other scenarios that were developed but because it is in the middle it is a good one to use for planning purposes so that we can make adjustments up or down in the future as we get more data on the changes that occur due to climate change. Finally, we have modeled a high dry scenario. This is the “worst case” scenario and one that we need to anticipate in case that is where we are headed.

[Insert graphic of climate change scenarios]
There are also three possible future demand scenarios: low, medium and high. These demand scenarios are in part based on anticipated future populations, but they also cover future demands that may occur from the location of a high water demand industry in the service area or an increase in the need for irrigation water due to climate change.

Data used to develop the demand projections were historical system growth, Bureau of Business and Economic Research projections from 2008 and 2012 and the Middle Rio Grande Council of Government 2035/2040 report. High demand projects a water need of 275,000 acre-feet in 2130. The medium demand projects a need for 225,000 acre-feet in 2130 and the low demand projects a need for 180,000 acre-feet in 2130. For reference, water demand in 2014 was about 98,000 acre-feet.

We have seen that the aquifer can be used and replenished and the 2016 WRMS divides the aquifer into three zones. (GRAPHIC OF THREE PARTS)

The lowest level from 300 feet below the pre-development water level and below is the part of the aquifer we plan to never use because a 300 foot drop in the water level of the aquifer is defined as the subsidence threshold (the level at which land subsidence will begin to occur). From 250 feet below the pre-development water level to 300 feet is the “safety reserve”. This is an area of the aquifer that is set aside for unforeseen emergency circumstances. Finally, the top level of the aquifer from 250 feet to 55 feet is the “working reserve”. This part of the aquifer will be used when needed and refilled over time with new supply projects. It is intended to handle increased demand due to growth, droughts, and climate change. With good management over the coming decades, we should never have need for the safety reserve, but it will be there to get our community through emergency situations that we cannot currently foresee.

12.A.6.2.3 Threats to Water Supply

In addition to population growth and climate change, other serious threats to water supply are described below.

Population and Economic growth

Increasing households and economic growth will increase residential and commercial water demand.

[Add graphic showing historic population growth related to water demand over time]

Climate change
Compounding the increased demand from population growth, rising temperatures will increase the amount of water needed for irrigation of landscaping and agricultural crops.

The directional change in precipitation is less predictable than in temperature. Regardless, the timing and intensity of precipitation events will almost certainly be altered by climate change. This uncertainty indicates the need to prepare for a range of future circumstances, and implications for competing water demands, with the resources available.

Overall, projected changes in Southwestern hydrology linked to lower flows include:

- Decline in usable water supply and ability to store water in the form of snowpack
- Changes in spatial and temporal distribution of water
- Increased variability and uncertainty of water supply
- Cascading impacts due to feedback between climate change impacts
- Uncertain effects from new development and human activity (MRCOG 2014)
In one estimate, the Volpe Center anticipates that by the end of the 21st Century, average flows will have decreased by one third in the Rio Grande and by one quarter in the San-Juan Chama. Together, these surface water sources currently provide nearly half of the city and county’s water. Declining snowpack contributes to those flow reductions, as warmer temperatures encroach upon the region’s natural ability to store water at higher elevations through the winter months.

**Development Patterns**

Density, landscaping, water efficiency of new development will greatly impact future water demand. According to recent analysis of residential water use, there is a direct link between household levels of water consumption and lot size. Following this logic, it would seem to hold that denser development is much more water efficient, likely due to reduced need for landscape irrigation (MRCOG, 2014).
Figure 3-63: Residential Water Consumption Rates by Lot Size, Bernalillo County

Agriculture

Existing irrigation systems for agriculture, including the acequias, draw primarily from surface flows of the Rio Grande. The lack of metering for agricultural uses promotes a “use it or lose it” approach to irrigation, as there is no economic incentive for water efficiency.

Hazards - Drought, flooding and forest fires

Cycles of drought – prolonged periods of time with lower than normal precipitation – are common and naturally occurring in the arid Southwest region, but will be exacerbated beyond normal levels by increasing temperatures and rates of evaporation. While net changes in precipitation are unpredictable, the likelihood that precipitation will fall with less frequency and more intensity, in combination with diminished snowpack, drought conditions that are today considered extreme may become commonplace by the end of the 21st Century.

Flash flooding, drainage overflow and riverine flooding (discussed further in the Resilience sub-topic heading below) can all have devastating effects on water quality, depending on the volume and velocity of water involved.

Wildfire, whether human- or lighting-ignited, leaves a thick mat of burned material that is often nearly impenetrable. The combination of vegetation loss, erosion and steep slopes can be a particularly insipid recipe for large sediment deposits that block and contaminate waterways and prevent reabsorption of water into the ground.
All three of these hazards have a high likelihood of for frequent occurrence in the future due to climate change combined with unsustainable development patterns.

**Groundwater Depletion**

The Santa Fe aquifer system – the source of all the groundwater accessed through wells in the City and County—is much smaller than was originally thought. It also replenishes very slowly, which made the “realization in the early 1990s that the groundwater aquifer in the region did not contain as large of a volume of drinkable water as once thought” even more disconcerting (Ecosystem Management, Inc., 2014).

In addition, draw down of aquifers concentrates naturally occurring elements in groundwater that do not cause problems at more diluted levels, but require additional treatment with lower water levels to decrease salinity and remove concerning levels of arsenic. Analysis is still on-going, but it is possible that groundwater depletion much higher than recharge rates could have other unknown impacts on water quality and overall watershed hydrology.

[Add graphic: how big we thought the aquifer was, how big it really is, source: ABCWUA Water Resource Management Strategy]

**Complex Water Governance System**

The following are challenges presented by the complex water governance system that has evolved over time in the region:

- Governments, agencies, actors are thinking about water at different scales and geographies
- Have different directives and priorities, represent different interests
- Murky legal waters - unadjudicated water rights prevent transfer of water rights
- Lack of historic documentation assigning Senior and Junior water rights
- Conflicting directives/regulations
- Lack of standard approach to water management
- Historic systems and cultural role of water

12.A.6.2.4 Water Supply Strategies

**Integrated Urban Water Management**

According to the Water Research Foundation, integrated water management is “an approach for urban water utilities (ideally in concert with the planning community) to plan and manage urban water systems to minimize their impact on the natural environment, to maximize their
contribution to social and economic vitality, and to engender overall community improvement. IUWM considers:\(^1\)

- All parts of the water cycle – natural and man-made, surface and subsurface, and recognized them as an integrated system
- The full range of demands for water, both anthropogenic and ecological requirements
- The full range of water supplies available over time
- The practices which can provide water fit for purpose in both quality and quantity, and reduce the demand for potable water
- The sustainability of water service provision
- The local context and stakeholder views
- The scale, engineering, and functional aspects of the water system
- The means by which transition from current practice can be achieved”

ABCWUA and Middle Rio Grande Conservancy District already integrate many aspects of IUW into their current plans and policies. The point of this discussion, though, is to point out how important it is for land use and development decision-makers to participate in and contribute to that process, as well as integrating system-wide thinking about water into their own decision-making processes.

Conservation

While new and alternative water supplies are being explored—desalination, drawdown of deeper aquifers, and greywater systems, to name a few—existing technology is far more favorable toward successful intervention on the demand side of the water equation.

Conservation can occur at many different scales and with different motivations. Conservation may require behavioral changes, introducing technology to treat and reuse wastewater, or adopting more water efficient agricultural practices. The Low Impact Development and Green Infrastructure approaches presented below address conservation of water supply quantity and quality.

**Low Impact Development (LID) and Green Infrastructure (GI)**

LID and GI Green infrastructure techniques cover a range of physical features in the built environment, from green building, to onsite greywater reuse, to street trees, to watershed restoration.

What is Low Impact Development (LID)?

“Low impact development minimizes the environmental impact of development by managing stormwater close to its source, mimicking

\(^1\) Water Research Foundation, 2014
natural systems that would allow stormwater to infiltrate into the ground, or providing temporary storage so its release into the stormwater system is slowed. “(Water Research Foundation, 2014)

What is Green Infrastructure (GI)?

“Green infrastructure has emerged as the main term used in the context of low impact development to describe the types of systems that can be used to manage stormwater in a more natural way.” (Water Research Foundation, 2014)

12.A.6.3 Natural Resources

Natural resources are critical to our livelihood and well-being, yet they are often damaged or destroyed by development and related activities. By minimizing the footprint of new development, we can help preserve and even begin to restore key natural resources that will keep our community healthy and functioning into the future.

Key natural resources include:

- Open space
- Floodplains
- Wildlife habitat
- Irrigated agriculture
- Renewable and non-renewable energy sources
- Groundwater, surface water, and precipitation
- Unique land formations and view corridors

Though Albuquerque and Bernalillo County have a varied landscape with a wealth of natural resources, one of its most defining features is the Rio Grande. It represents the convergence of many of the area’s most prominent environmental features, including the 200-mile-long bosque woodlands, the Middle Rio Grande watershed that provides drinking and irrigation water for nearly 50% of New Mexico’s population, rare riparian habitat, home to the silvery minnow and other threatened or endangered species, and floodplains.

Threats to those natural resources that will be influenced by our future land use and development patterns include, but are not limited to:

- Increased storm water runoff due to increasingly paved surfaces, vegetation loss, erosion, and other side effects of development
- Higher temperatures and changing precipitation patterns due to climate change
- Introduction of invasive species
- Habitat fragmentation by roads and urban development
- Contamination of air, water and soil with hazardous materials
- Depletion of water sources
Preservation of key land formations, petroglyphs and arroyos is also an important part of sustaining natural resources, and is covered in the Heritage Conservation chapter.

12.A.6.3.1 Solid Waste Management Strategies

Waste that is not properly disposed of can contaminate air, soil, and water. Hazardous waste in particular can pose a serious threat to human and ecological health. Prioritizing reuse and recycling of waste products reduces raw resources being used to create new products. This can include repurposing waste products or converting them into clean bioenergy, when feasible.

Locating waste management facilities—which are often categorized as locally unwanted land use, or LULUs—is difficult and must take into account nearby land uses and residences, impacts to surrounding habitat and natural resources, and the economic and environmental cost of transporting waste between origin and destination. Downstream impacts to communities that may be geographically remote should also be considered. It is also important to have special sensitivity in locating these facilities near low-income neighborhoods, or neighborhoods that have historically been exposed to a disproportionate number of waste facilities, industrial activity or other health hazards.

Other criteria for siting and designing solid waste management facilities:

- Impact of the logistics involved in waste management that occur outside of the facility itself
- Costs and benefits of environmentally sound waste disposal methods
- Use energy and value of materials (i.e. wood products or bioenergy from wood thinned to reduce fire fuel)
- Improving capacity and efficiency of recycling systems

12.A.6.3.2 Energy Management Strategies

Building codes, development standards and incentive programs can encourage the integration of alternative and renewable energy sources and systems into new development and redevelopment. These tools can also promote energy efficiency measures in design and construction of new buildings and infrastructure. These strategies help mitigate climate change, minimize air pollution from standard energy sources such as coal, and lessens the community’s dependence on fossil fuels, which have negative environmental impacts even if they aren’t extracted or processes locally. Increasing system capacity for generating and using alternative, renewable and clean energy sources will also bolster the community’s resiliency in the face of large-scale disasters or extreme weather events in the future. In particular, development
standards and programs should capitalize on the excellent access to solar energy in the region.

12.A.6.3.3 Stormwater Management Strategies

Stormwater management is one of the central tenants of low impact development (LID), discussed previously in the water section. Methods for sustainably managing stormwater range widely, with a major focus on limiting the amount of impervious surfaces introduced by new development. Other strategies include:

- Design new development to minimize soil erosion during and after construction
- Grading and revegetation to prevent erosion and sediment deposits
- Manage and preserve the Arroyos as natural drainage features

12.A.6.3.4 Preserving Key Natural Features

Particular natural features add provide ecosystem services as well as shape the physical character and identity of the region. Prime examples include Arroyos and their natural function as drainage channels, and the Bosque cottonwood forest adjacent to the Rio Grande. These elements should be preserved and enhanced to capitalize on the ecological and social value to the community. [See Heritage Conservation chapter] [xref needed]

12.A.6.3.5 Ecological Conservation and Restoration Strategies

Land use and development policies can support ecological conservation and restoration by integrating the location of wildlife corridors, crucial habitat for threatened and endangered species, sensitive natural areas, and areas with native vegetation into the decision-making process. Land use and development decisions should minimize habitat fragmentation and disturbance to undeveloped areas. As mentioned in the earlier water section, land use decisions should also integrate a whole-system perspective of water supply and management.

12.A.6.4 Resilience

In the context of this chapter, resilience refers to the community’s ability to withstand, adapt to and recover from unexpected hazards. This section covers hazards and climate change because there is a significant feedback loop between them. Here “community” refers to the ecological, social, and economic systems that sustain our desired way of life in Albuquerque and Bernalillo County. Those systems include land use, transportation, and infrastructure planning, which are some of the primary means through which the Comprehensive Plan can improve our community’s resilience.
12.A.6.4.1 Understanding Hazards

A hazard is a situation that poses a threat to life, health, property or the environment. Most hazards are potential, rather than imminent, and they can be natural or human made. The hazards posing the greatest threat to our communities are wildfire, drought, flooding, and extreme heat.

In this section each of these hazards are briefly described, including the nature of the threats they pose and likelihood to occur in the future. Included are the possible impacts of climate change on the degree of threat from a given hazard.

Strategies are presented for increasing our resilience in the face of those threats. Some of the strategies are broad-ranging, but there is a particular focus on land use and transportation-related approaches, as those are the arenas in which this Comprehensive Plan can achieve the most agency.

Two documents this section references heavily are the multijurisdictional Hazard Mitigation Plan (2014), and the report Climate Change Effects on Central New Mexico’s Land Use, Transportation System, and Key Natural Resources (Ecosystem Management, Inc., 2014).

The greatest threats to our region come from wildfire, drought, flooding and extreme heat. A Priority Risk Index was developed to categorize hazards, according to degree of risk, for the 2014 Hazard Mitigation Plan.
Though the dynamics of climate change often seem abstract, it is important to note the fundamental relationship between human activity and environmental change so that we understand the range of possible outcomes we must prepare for, and what our role can be in helping reduce the threats of climate change.

Climate change is occurring because global greenhouse gas concentrations in the atmosphere at the highest levels in the past 800,000 years, causing rising sea levels and increased surface and ocean temperatures (Environmental Management, Inc., 2014). The International Governmental Panel on Climate Change states, in 2013, that “it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century” (IPCC 2013).

Even with extremely aggressive mitigation efforts, it is expected that there will be a 0.3-1.7 degree C increase in global temperatures by the end of the 21st Century.

The Southwest Region and Central New Mexico are especially sensitive to these impacts due to topography and the influence of weather-
forcing effects, such as El Niño. In the Southwest region of the U.S., impacts of climate change will likely include:

- Increase in the number of days requiring building heating and cooling, and the number of consecutive hot days
- Change in timing and intensity of precipitation
- More drought due to higher evaporation rates
- An average climate by the mid-21st Century that resembles that of the climate during a multi-year drought today

For Central New Mexico, the further impacts of climate change may include:

- Increased drought severity and frequency
- Greater variability and duration of precipitation events
- Extended heat waves
- Increased flooding
- Earlier snowmelts
- Greater frequency large-scale forest fires
- Declining water quality and availability (Environmental Management, Inc. 2014)

Though the discussion of hazards, and how they may be impacted by climate change, will help us to grow more resilient against those threats, the other side of the coin involves reducing the threat posed by climate change itself. The discussion below will cover the global and local implications of climate change. It will discuss the existing plans and programs in place to combat climate change at the local level, and will highlight the key land use and transportation-related strategies for doing so.

This section will refer frequently to the City of Albuquerque Climate Action Plan. Although this plan is specific to the City of Albuquerque, it contains many issues and strategies that may also be applicable to unincorporated Bernalillo County.

12.A.6.4.3 Flooding

Bernalillo County has experienced frequent flooding in the past, and this pattern is highly likely to continue (HMP 2014). The three types of flooding that can pose hazards to people and property are flash floods, storm drainage, and riverine flooding.

*Flash Floods* - Flash floods occur after heavy rain from a thunderstorm or rapid snowmelt when a large amount of water moves through an area at a very high speed. They can be difficult to predict and can wash along large volumes of debris and sediment, increasing their danger.
Slope steepness, vegetation and channel width can all influence the speed and destructive potential of the water in a flash flood.

*Storm Drainage* – When rain falls faster than it can be absorbed into the ground or available drainage systems it will pond at the lowest point in the area and stay there until it evaporates or is removed by other means.

*Riverine Flooding* - Flooding along the Rio Grande can occur during rainfall in areas where the levee system is damaged or has deteriorated. When the volume of water in the river is much higher than normal it will flow over the banks and into the surrounding areas.

*Causes of flooding include:*

**Weather** - There are seasonal differences in the causes of floods. About half of the area’s precipitation falls during the summer in brief and intense thunderstorms. In the winter, precipitation falls as rain or snow. Flash flooding is most likely during the late-summer monsoon season. Rapid snowmelt from warm rains or thunderstorms can also cause flooding of the Rio Grande.

**Erosion** – Lack of proper erosion controls in new development, or a previous wildfire or flash flood can all contribute significantly to erosion that contributes to increased chance of flooding by removing elements of the land that allowed water to soak into the ground gradually over time.

**Wildfires** - Burned matter from wildfires in particular can create an essentially impermeable surface, causing water to move more quickly downhill, especially on steep slopes. In addition, wildfires at high elevations such as the East Mountains can cause significant changes to hydrology, potentially increasing risk of flooding in lower areas.

**Floodplain Modification** - The floodplains in almost all urban areas have been significantly modified over time to accommodate agriculture and human settlement, and the Rio Grande is no exception. Stormwater often exceeds capacity of arroyos to carry water from Sandia Mountain foothills across the mesa to the valley, and water spreads out in unpredictable patterns through alluvial channels.

**Infrastructure Deficiencies** - While infrastructure such as levees, drainage channels and storm sewers have been integrated into urban development to help manage stormwater and high river flows, insufficient capacity or deterioration can cause area-specific flooding, such as in some of the older, river-adjacent neighborhoods near Downtown Albuquerque.

**Urbanization** - Paved and other impermeable surfaces cover large portions of developed land – as development has extended across the
east and west uplands, the capacity of land to absorb water has decreased and water often travels toward the low-lying valley areas. As levees, irrigation channels and development have obstructed natural outfalls for this water to reach the river, it often pools behind levees and ditches.

The impacts of flooding can be wide ranging, and include:

- Costly damage to property and infrastructure
- Chronic flooding of neighborhoods adjacent to the river
- Economic disruption
- Agricultural disruption
- Degraded water quality
- Impassable Roads
- Overtaxed emergency services
- Potential for regional flood event and disaster, especially during monsoon season

Impacts of Climate Change on Flooding

Central New Mexico is expected to experience more intense precipitation events and flooding by the mid-21st Century, in spite of the possibility of relatively little change in overall precipitation levels, and lower flows overall. (Environmental Management, Inc. 2014)

12.A.6.4.4 Wildfires

The likelihood of wildfire in Bernalillo County is “highly likely,” according to the 2014 Hazard Mitigation Plan. With our arid climate, drought conditions, and degraded timber stands, even the likelihood of catastrophic wildfire is extremely high in Bernalillo County.

Wildfires are characterized by uncontrolled spreading fueled by burning vegetation, threatening homes, businesses and other community assets. Wildfires spread quickly in wild areas, and can burn in different ways, known as surface, ground or crown fires, or a combination of all three. Surface burns “crawl” across the landscape; these burns are fueled by low-lying vegetation and consume only ground cover. Ground fires are fed by underground roots and plants. Crown fires burn suspended material at the canopy level, such as the tops of trees.

In Bernalillo County, there are close to 180,000 acres located in areas susceptible to damage from wild fires (WUI Assessment). Areas that are especially susceptible include the East Mountains and the Bosque. Grasslands in the western portion of the County (West Mesa) are also vulnerable.

Causes
Development in the Wildland Urban Interface - The wildland urban interface (WUI) is the area where human development transitions to undeveloped land. The more people settle in this area – as has been the case with the increase of low density residential development at the urban fringe – the more people and property are in close proximity to wildfire risk.

Increased ignitions – Wild fires are split between human caused and lighting-ignited; in the Sandia Forest Service District fires are 48% human caused and 52% lighting caused (EMI pg 13). That being said, the human-caused ignitions are, in theory, entirely preventable.

Human-induced changes to vegetation – Changes in vegetation densities, compositions and regimes can influence the type and amount of fuel available for fires. Activities impacting fuel availability and fire risk include past fire suppression (which allow tree densities to reach higher-than healthy levels, as in the case of the Bosque and East Mountains), logging activity, and overgrazing of cattle.

Hairdryer effect - Windblown dry air typical of New Mexico creates what’s known as a hairdryer effect that dries out vegetation, making it more likely to ignite.

Bark beetle – infestations of bark beetles have become rampant and are especially visible in the East Mountains. They greatly increase the risk of wildfire, and beetle populations are increasing due to prolonged drought conditions.

**Impacts from wildfires are often dramatic, and include:**

- Property damage and loss
- Infrastructure damage
- Loss of life
- Increased erosion and runoff rates
- Increased sediment yields
- Damage to the watershed
- Flooding due to a loss of ground cover
- Post-fire rehabilitation expenses
- Increased potential for invasive species colonization and native insect outbreaks
- Health and safety hazards from poor air quality and visibility due to smoke (EMI 35)

**Climate Change Impacts on Wildfire**

In Central New Mexico, it is likely that the winter season may shorten, lengthening the prescribed fire season for fuels treatment to reduce the
risk of wildfire. On the other hand, increased drought likelihood could also increase risk of wild fires.

[Sidebar]

“In 2013, 221,951 acres (5% of all acreage burned in the US) burned in New Mexico (estimated from National Interagency Fire Center 2014). As the climate changes, the severity and frequency of wildfires is expected to increase in central New Mexico (USDOI 2013, Weiss 2014). Central New Mexico is already experiencing these types of effects; the region is currently in the midst of a very long stretch of unusually dry weather, and as recently as February 2014 there was an unusually early and severe wildfire on Isleta Pueblo” (Brauer 2014, Ekwurzel 2014). (EMI 2014)

Drought

Drought is a period of prolonged dryness that contributes to depletion of water supplies, both underground and on the surface (HMP). Located in an arid climate, with an average annual rainfall in the Rio Grande Valley of 10 inches, the entire county is at risk for all levels of drought. The probability of recurring droughts with moderate to exception severity is “likely” (HMP) in Bernalillo County.

In last 115 years, New Mexico has suffered four devastating periods of drought; 1900-1910, 1931-1941, 1942-1956, and 1974-1979. Due to the fact that in May 2013, 44.14% of the state was at the highest level of drought intensity (Exceptional), and 81.68% was either Exceptional or Extreme (the second highest level), the drought that continues through 2014 is considered by some federal meteorologists as the worst drought since the 1950s (HMP).

Droughts can be categorized as meteorologic, hydrologic, agricultural or socioeconomic:

- Meteorologic – droughts period of less than average or normal precipitation
- Hydrologic droughts – when meteorologic drought begins to affect surface and subsurface water supplies. The frequency and severity of a meteorological drought is often defined at the watershed or basin level.
- Agricultural drought – refers to effects of meteorological or hydrological drought on agriculture, especially related to soil moisture levels and crop viability
- Socioeconomic drought– when water shortages affect public health and economic activity including agriculture

The length and severity of drought are often defined at a watershed or basin level, but can also be categorized as regional, spanning multiple
basins and watersheds. Drought is a naturally occurring cyclical process, but its severity as a hazard is increasing due to both climate change and a growing population putting increasing demand on a limited water supply in the Southwest.

It is not always apparent when a period of drought begins or ends, or what the full severity of it will be until much later. Dry weather conditions must persist for months or even years before a drought can be verified, and it can be difficult in an arid state to determine if an area has actually recovered from drought. Many drought events are followed by years of average or slightly below average rainfall that are not enough to restore surface water and groundwater levels to normal. (HMP)

**Causes**

- Lower than normal precipitation
- High temperatures, high winds, and low humidity exacerbate drought conditions
- Human demands and actions exacerbate drought-related impacts
- Seasonal variations in precipitation plus monsoon effect cause extended periods of low flow in state’s rivers and streams.
- Annual precipitation is relatively small and falls in concentrated periods

**Previous Occurrences**

- Due to the fact that in May 2013, 44.14% of the state was at the highest level of drought intensity (Exceptional), and 81.68% was either Exceptional or Extreme (the second highest level), the drought that continues through 2014 is considered by some federal meteorologists as the worst one since the 1950s drought.
- As of June 2014, all of New Mexico was in various stages of drought severity which had generally lessened considerably from May 2013. This drought had also been in effect in 2012 when the Governor of New Mexico declared a Drought State of Emergency on May 15, 2012.
- Bernalillo County, as of June 2014, is located primarily in an area with a “Severe” level of drought.
Chapter 12 – Resilience & Sustainability

**Figure 4.7: New Mexico Drought Map (as of June 17, 2014)**

**U.S. Drought Monitor**

**New Mexico**

**June 17, 2014**
(Released Thursday, Jun 18, 2014)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

<table>
<thead>
<tr>
<th></th>
<th>NC</th>
<th>DO</th>
<th>DR</th>
<th>SC</th>
<th>DR</th>
<th>DS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>0.00</td>
<td>100.00</td>
<td>96.00</td>
<td>64.00</td>
<td>25.74</td>
<td>0.42</td>
</tr>
<tr>
<td>Last Week</td>
<td>0.00</td>
<td>100.00</td>
<td>95.77</td>
<td>65.64</td>
<td>29.24</td>
<td>0.41</td>
</tr>
<tr>
<td>3 Months Ago</td>
<td>0.00</td>
<td>100.00</td>
<td>95.00</td>
<td>64.50</td>
<td>25.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Start of Calendar Year</td>
<td>0.00</td>
<td>100.00</td>
<td>94.80</td>
<td>75.21</td>
<td>12.08</td>
<td>3.96</td>
</tr>
<tr>
<td>Start of Normal Period</td>
<td>1.00</td>
<td>100.00</td>
<td>96.62</td>
<td>78.64</td>
<td>27.01</td>
<td>3.38</td>
</tr>
<tr>
<td>One Year Ago</td>
<td>1.00</td>
<td>100.00</td>
<td>96.62</td>
<td>88.00</td>
<td>96.10</td>
<td>44.13</td>
</tr>
</tbody>
</table>

**Indicators:**
- D0 Abnormal dry
- D1 Moderate drought
- D2 Severe drought

The Drought Monitor focuses on broad-scale conditions; local conditions may vary. See accompanying text summary for finer text statements.

**Author:**
Eric Liaudat
U.S. Department of Agriculture


**Impacts**

- Most damage is done in a prolonged drought
- May interrupt normal operation of government, such as county facilities on wells that may lose water supply
- Leaves exposed soils susceptible to erosion and flash flooding.
- Can limit or disrupt agricultural activities such as cattle-grazing and crop irrigation
- Can disrupt the tourist economy and outdoor recreation
- Reduces groundwater recharge to the aquifer
- Harm to riparian and wetland environmental communities
- Places a higher demand on the present water supply systems, can cause line breakage
- Limits amount of growth that can be expected for the county and its municipalities due to the lack of recharge of the already finite water supply
- Possible water restrictions in case of prolonged drought
- Some wells may become unusable unusable
- Drought conditions make wildfires more likely
- Limited water supply can impede fire fighting
• Urban and agricultural water users who rely on reservoirs and wells that are not dependent on high rates of aquifer recharge are last to feel effects

*Climate Change Impacts on Drought*

• Changes in precipitation less certain than rise in temps
• Regardless, rise in temps and increased evaporation rates will make prolonged drought increasingly likely in the future
• Evidence showing prolonged periods of drought are increasingly likely in the future in this area

12.A.6.4.5 Extreme Heat

Extreme heat is classified in the Hazard Mitigation Plan as a moderate threat. Combined with other factors, such as the vulnerability of priority populations to heat-related health problems, the likelihood of rising temperatures, and the relative impact land use and transportation planning and investment can have on the urban temperatures, it is worth addressing extreme heat on par with other hazards with higher risk scores.

The urban heat island effect is the phenomenon of urban areas that have significantly higher temperatures than surrounding less developed areas. Core urban areas tend to be hotter than surrounding areas, and the effect is more pronounced at night, when urban temperatures remain higher because buildings, paving and other built structures re-radiate heat they absorbed during the day.

*Causes*

• Buildings and urban development
• Paved surfaces
• Lack of vegetation, tree canopy and shade

*Impacts*

Human fatalities from extreme heat are usually caused by lack of adequate air circulation inside or heat exhaustion, particularly for people who work outdoors. The most vulnerable populations are the young, the elderly, and the infirm, especially those with low and fixed incomes who cannot afford air conditioning.

Extreme heat increases risk of wildfires and drought, exacerbating other hazards. Heat can cause structural damage to transportation infrastructure – pavement and rail lines have been known to buckle in extreme heat.

While existing buildings and infrastructure are not currently at as great of a risk from extreme heat as from fire and flooding, we can expect...
higher maintenance and operational costs for infrastructure – particularly transportation infrastructure – in the future as average temperatures and instances of extreme heat rise. Because a well-functioning transportation infrastructure is a critical component of resilience, it is worthwhile addressing the implications of and mitigating strategies for the impacts of extreme heat on transportation infrastructure.

*Climate Change Impacts on Extreme Heat*

- Increased heat waves/extreme heat
- Shorter lifetime for roadway pavement as result of higher temps and resulting expansion, softening, and rutting of pavements and migration of liquid asphalt, esp at temps exceeding 90 degrees F. (EMI 28)
- Road damage increases vehicle maintenance costs and accident risks
- Traffic signals may be affected by blackouts
- Very high temps discourage bike and walking trips
- Vegetation survival may be harder
- Rising water temps for fish and wildlife
- May increase emissions due to increased use of AC in buildings and vehicles

12.A.6.4.6 Other Hazards

In addition to wildfire, drought, flooding and extreme heat, several other hazards are identified in the County hazard mitigation plan:

- Earthquakes
- Severe Winter Storms
- Thunderstorms
- High Wind
- Tornadoes
- Dam Failure
- Landslides
- Land Subsidence

12.A.6.4.7 Coordinating with Hazard Mitigation Plan

The City and County already have adopted ordinances, land use policies, and building codes that are effective in mitigating hazards, such restrictions on development in the 100-year floodplain. The Hazard Mitigation Plan comments on further steps that could be taken to bolster our resilience against the relevant hazards:

*Hazard mitigation efforts are any sustained actions taken to reduce or eliminate the long-term risks. Mitigation efforts also address other*
community goals such as preserving open space, protecting vital infrastructure, designing sustainable buildings, maintaining environmental health, and protecting critical facilities.

For each investment considered by the County and its municipalities like construction or renovation of infrastructure and facilities, hazard mitigation should be considered.

As part of implementing the resolutions of the Bernalillo County Mitigation Plan, all proposed new development should be evaluated against identified hazard-prone areas. Therefore, the building permit approval system should include a review of all newly-proposed development projects to keep them from being built in known hazard-prone areas such as floodplains.

If a proposed project falls within such an area, the permit may be disapproved or additional construction requirements may be established to eliminate any dangers that could be caused by the existence of the hazard.

In addition, county and city planning staffs should ensure that all comprehensive plans that are developed based on the community’s predicted growth patterns consider both hazard locations and the mitigating action plans to eliminate or reduce them.

To accomplish this, the planning staff and the mitigation team should collaborate during the revision and updating of future comprehensive plans. Melding these two efforts would help steer growth away from identified hazard locations, wherever possible, and avoid increasing the potential damage risk they represent.

When the hazard locations cannot be avoided, building codes and zoning codes can be utilized to minimize the danger. Additional projects may also be developed by the cooperative works of the planning staffs and the mitigation planning team during the revision and updating process of the comprehensive plans.

Projects identified in this manner should be included in the revision and updating of the Bernalillo County Hazard Mitigation Plan.²

12.A.6.4.8 Resilience Strategies

General

- Implementation of Hazard Mitigation Plan – continue interjurisdictional coordination
- Controlling the growth of new development within known hazard areas

² Bernalillo County Hazard Mitigation Plan, 2015
• Integrate hazard mitigation

Wildfire
• Limit development in WUI, focus growth in existing developed areas
• Building code requirements for development in areas with high fire risk
• Appropriate management of fuel loads in non-developed areas

Flooding
• Avoid development within floodplain
• Limit development on steep slope
• Work to reduce wildfire risk
• Maintain infrastructure
• Anti-erosion measures

Drought
• Conservation measures

Extreme Heat
• Limit paved surfaces
• Plan for increased transportation maintenance costs
• Design new facilities with future environmental changes in mind

12.A.6.5 Community Health
This section directly reflects the Guiding Principle of community health, which firmly establishes the community priority of protecting all citizens from harm where they live, work and play, with convenient access to healthy food, parks and open space. It discusses community health specifically through a lens of sustainability, which encompasses environmental justice as well.

Connection between land use and human health
• Disproportionate impacts on minority races and ethnicities, low-income neighborhoods
• Sprawl and health – respiratory disease, vehicle-related fatalities, physical activity and overweight, and obesity, cardiovascular disease and cerebrovascular disease; stress and mental health
• Pockets of poverty
• Walkability measures of different neighborhoods?
• Show racial/ethnic/poverty segregation by area

Farmlands
• Agriculture – Acequia culture and local/small farming
• Food security
Chapter 12 – Resilience & Sustainability

- Fresh, nutritious food

**Natural Lands**
- Access to natural lands/parks and open space is beneficial to health
- Decline in per capita parks/open space?

**Historic Neighborhoods**
- Displacement/gentrification

**Health Hazards**
- Noise
- Air quality
- Water quality
- Brownfields/Soil contamination
- Air quality
- Water quality
- Noise
- Soil quality
- Hazardous materials from development and waste management

**Factors that Contribute to Community Health**
- Access to healthy food
- Access to parks and open space
- Development and land use patterns

12.A.6.5.1 **Air Quality**

Good air quality in Albuquerque and Bernalillo County is one of the most highly valued assets by area residents. In the 1980s and 1990s, the region faced significant air quality issues, which were addressed by the City’s Environmental Health Department, which serves the entire Bernalillo County area to come into compliance with air quality standards from the federal Environmental Protection Agency.

Air quality in Albuquerque is heavily influenced by three primary factors:

- **Geographic location:** Situated within a river valley, bounded by high mountains to the east
- **Large seasonal variations in meteorological conditions:** This causes frequent winter temperature inversions resulting in poor dispersion of pollutants.
- **Wind patterns:** Mountain down-slope winds and valley drainage winds help disperse and flush pollutants out of the air, but inversions can sometimes trap pollutants valley areas.
Primary sources of air pollutants include vehicle emissions, residential wood burning, dust from unpaved roads and construction sites, and, to a lesser degree, industrial operations. The Albuquerque-Bernalillo County Joint Air Quality Control Board administers and enforces the Air Quality Control Act and City and County air pollution regulations—including burn regulations that limit wood burning during the winter, and fugitive dust control requirements. The Board consists of four city residents, appointed by the Mayor, and three county residents, appointed by the County Commission.

The City of Albuquerque Environmental Health Department Air Quality Division measures ambient air quality conditions for carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), coarse particulate matter (PM10) and fine particulate matter (PM2.5).

The Community-Scale Air Toxics Monitoring and Risk Assessment Project, performed by the Desert Research Institute from 2007 -2009\(^3\) found levels of air toxics including heavy metals, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs)—all of which can have serious adverse health impacts—at or below national averages for urban areas, with no indication that levels posed serious health risks. Heavy metal levels were found to be below those of most other urban areas, even when measured in the winter when they are highest.

12.A.6.5.2 Urban Heat Island

Increased heat exposure can lead to increased heat-related mortality, and these impacts are likely to be inequitably distributed across communities (McGeehin and Mirabelli 2001). The very young and the elderly are known to have a decreased ability to regulate body temperature. Additionally, low-income residents of a city are less likely to have access to cooling and may have other complicating medical factors (Kovats and Hajat 2008).

12.A.6.5.3 Coordination

The following organizations and issues impact community health and should be coordinated and collaborated upon across departments and jurisdictions:

Agencies

- Albuquerque-Bernalillo County Air Quality Control Board

---

Chapter 12 – Resilience & Sustainability

- Environmental Health Department
- Community and Family Services
- City of Albuquerque Open Space Division
- Bernalillo County Place Matters and other non-profit health advocacy groups

Issues

- Brownfield remediation
- Dust control enforcement
- Use of Environmental Assessments and Health Impact Assessments in development decisions
- Growth management (combating sprawl)
- Farmland preservation
- Access to Natural Areas
- Access to healthy food
- Parks and Recreation

12.A.6.5.4 Community Health and Environmental Justice Strategies

Protection from Toxic Air Emissions and Poor Air Quality

- Continue leadership on air quality issues
- Integrate air quality into land use and development decision-making process
- Focusing growth in Centers and Corridors to minimize vehicle traffic and emissions
- Green building standards that improve indoor air quality
- Fugitive dust control
- Coordinate with other municipalities

Public Safety/Welfare

- Protect neighborhoods from harm from new development
- Support clean and environmentally friendly industrial development

Support Other Community Health Efforts and Programming

- Promote local food production
- Collaborate with other City and County departments to plan, fund and implement a robust Street tree program
- Prioritize maintenance and enhancement of community facilities using green building practices

Protection from Stormwater Hazards

- Address new stormwater issues
- Promote landscaping as a mitigation approach
• Promote enhanced landscapes and trees as major element in healthy environment

*Other Areas of Community Health to Integrate into Land Use and Development Decisions*

• Wastewater treatment
• Solid waste hazards
• Noise
• Buffering from industrial uses
• Design a built environment that fosters active transportation and other physical activity, especially for vulnerable populations
• Equitable distribution of parks and open space

12B Goals, Policies & Actions

**Goal 12.1 Sustainable Growth**

Promote sustainable, resource-efficient growth and development.

**Policy 12.1.1** Encourage more intensive growth to occur in Activity Centers – mixed-use districts served by multi-modal facilities and appropriately scaled to their contexts.

a) Existing and proposed Activity Centers (mixed-used districts served by multi-modal facilities) are designated by a Comprehensive Plan map* where appropriate to help shape the built environment in a sustainable development pattern. 4[ABC]

b) New Activity Centers may be designated and added to the Comprehensive Plan through local government review and approval based upon the following criteria: 5 [ABC]

i. The proposed Activity Center’s potential for shaping the built environment, consistent with policies of the Comprehensive Plan

ii. Market potential for concentrating activities to higher than average intensities, and potential for promoting infill on vacant land inside the existing urban services boundary.

iii. Appropriateness of the proposed Activity Center, including location relative to the market area and access/connections including transit service potential;

---

4 ABC Comp Plan [44]
5 ABC Comp Plan [48], North I-25 SDP [608], SW Area Plan [832]
iv. Compatibility of the proposed Activity Center with surrounding neighborhoods;

v. Fiscal impact of the proposed Activity Center on City government and the private sector;

vi. Capacity and availability of public services such as transportation, water, and sewer systems to support the Activity Center as proposed;

vii. Environmental impact of the proposed Activity Center

Policy 12.1.2 Protect scenic views and landmarks by building in harmony with the landscape.

   a) Building siting should minimize alteration of existing vegetation and topography and minimize visibility of structures in scenic vista areas.⁶ [ABC]

Policy 12.1.3 In each Community Planning Area, strategic planning, neighborhood planning, development and redevelopment should be evaluated in light of its relationship to and effect upon the following: ⁷ [ABC]

   a) The natural environment: Indigenous vegetation and other materials appropriate to landscapes; Topography and landscape features such as arroyos, the Rio Grande and Bosque, the foothills, and escarpments; Soils and erosion potential; Colors and textures of the natural environment; Views

   b) Built environment: Height and massing of buildings; Setbacks from the street; Placement of entrances and windows; Walls and fences; Parking areas design and relationship to buildings; Road widths, sidewalks, curb cuts, medians; Grain of streets/size of parcels; Patterns of movement (e.g. pedestrian connections, access to transportation/ transit); Street furniture (e.g. bus stops, street lights, signs); Landscaping materials, both planting and hardscape; Public infrastructure (e.g. drainage facilities, bridges) - Social interaction opportunities; Relationship between built and natural environment

   c) Local history; Architectural styles and traditions; Current and historic significance to Albuquerque; historic plazas and other gathering places; culture and traditions; cultural characteristics of residents; community celebrations and events.

⁶ ABC Comp Plan [100]
⁷ ABC Comp Plan [103], Westside Strategic Plan [1026] [1028] [1032]
Policy 12.1.4 Development should be carefully planned in rural, undeveloped, or partially developed areas of the County and City to prevent environmental deterioration, and be compatible with the resource base and natural recreational and scenic assets applicable to a given context.\(^8\) [ABC]

a) Development in Rural Areas should be compatible with natural resource capacities, including water availability and soil capacity, community and regional goals, and should include trail corridors where appropriate.\(^9\) [ABC]

b) Land which is suitable for agriculture should be maintained to the extent feasible in agricultural production and discouraged from non-agricultural development.\(^10\) [ABC]

c) Development should be carefully controlled in floodplains and valley areas where flood danger, high water table, soils and air inversions inhibit extensive urbanization.\(^11\) [ABC]

d) New development will be compatible with drainage patterns. Wherever possible, preserve arroyos in as natural a state as possible and allow for pedestrian access.\(^12\) [ABC]

d) Maintain existing low-density areas of the North and South Valley, while providing for a variety of housing needs.\(^13\) [ABC]

Policy 12.1.5 Preserve the natural appearance and function of the Calabacillas Arroyo and maintain pedestrian connections to this feature.\(^14\) [A]

Policy 12.1.6 When development requires grading, changes to natural topography should be kept to a minimum. Contour grading should be encouraged to preserve natural features and vegetation. Reconstruction and revegetation of graded areas to a natural setting is strongly encouraged.\(^15\) [ABC]

Policy 12.1.7 All development and subdivisions shall be required to limit the level of water runoff generated from new construction or paving in order to reduce velocity and volume of runoff, and to ensure the viability and capacity of down-stream facilities.\(^16\) [ABC]

\(^8\) ABC Comp Plan [180]
\(^9\) ABC Comp Plan [176]
\(^10\) ABC Comp Plan [178], SW Area Plan [821]
\(^11\) ABC Comp Plan [177]
\(^12\) La Cueva SDP [396], Volcano Cliffs SDP [902], Westside Strategic Plan [1249]
\(^13\) North Valley Area Plan [647]
\(^14\) Westside Strategic Plan [1112]
\(^15\) Coors Corridor Plan [246]
\(^16\) SW Area Plan [792]
Policy 12.1.8 Encourage infrastructure strategies that are economically, aesthetically and environmentally sound. These could include renewable energy systems, buried transmission infrastructure, high-capacity fiber optics to meet future bandwidth needs, and coordinated investment in water source and water quality improvements. [ABC]

Policy 12.1.9 Provide for the orderly, high-quality development of the Volcano Mesa

a) Developments and subdivisions should be designed and sited to maximize solar gain, minimize negative impact on views from the Northwest Mesa to the Sandia Mountains and to minimize visual impact on views across the Rio Grande west toward the Volcanoes. [A]

b) Encourage orderly, contiguous development in the Volcano Mesa area to maximize the efficient provision of urban infrastructure and utilities, and should allow cluster development that provides more open space. [ABC]

Goal 12.2 Water

Protect and conserve our limited and vulnerable water supply.

Policy 12.2.1 Maintain a dependable, quality, safe supply of water for the City and County’s needs. [ABC]

a) Provide greater emphasis on a total systems approach to water as a valuable resource. [ABC]

b) Practice efficient water management and use. [ABC]

Policy 12.2.2 Practice water conservation.

a) Measures should be adopted to discourage wasteful water use, such as extensive landscape water runoff to uncultivated areas. [ABC]

b) Encourage and support alternative water uses for industrial and commercial sites. [ABC]

17 Volcano Heights SDP [938] [962]
18 Volcano Heights SDP [1004]
19 Westside Strategic Plan [1243] [1244]
20 ABC Comp Plan [66] [67] [68] [69]
21 ABC Comp Plan [71]
22 ABC Comp Plan [112]
23 ABC Comp Plan [113]
24 SW Area Plan [831]
Chapter 12 – Resilience & Sustainability

c) Use water harvesting techniques and water reuse systems when possible for trees and landscaping to reduce municipal water use.  

d) Require majority-xeric landscapes for all new development.  

Action 12.2.2.1 Bernalillo County and the City of Albuquerque shall jointly support new metropolitan area water conservation standards which require methods to reduce water consumption and conserve the water available.  

Action 12.2.2.2 The City and County will incorporate water conservation principles through specific requirements for xeriscape design standards, water recycling/harvesting techniques, low-flow fixtures, and other means of achieving conservation goals.  

a) Design storm drainage facilities to carry out their drainage management functions and to optimize recharge of the aquifer.  

b) Follow best management practices for Rainwater Design and Management Standards. See specific standards for the design and management of rainwater flows contained in Chapter 4 Section II-General Standards C.8 and Chapter 5 General Regulation E.  

c) Clean stormwater by natural processes prior to entering the storm drain system.  

d) Incorporate Low Impact Design (LID) techniques in developments and open space areas wherever possible and appropriate.  

e) West Side: Develop naturalized rainwater management facilities where possible, and provide recreational access where appropriate. Traditional permaculture strategies and designs should be considered for naturalized channels. Designs and strategies include but are not limited to gabions

---

25 Uptown SDP [874]  
26 Westside Strategic Plan [1274]  
27 Westside Strategic Plan [1275]  
28 Southwest Area Plan [791]  
29 ABC Comp Plan [114]  
30 Volcano Cliffs SDP [919]  
31 Volcano Heights SDP [963]  
32 Volcano Heights SDP [971] [1008]
and multiple smaller structures rather than fewer, larger structures.\(^{33}\) [ABC]

f) Volcano Heights: Property owners should coordinate to address storm drainage needs:

Property owners should consult and/or incorporate AMAFCA’s Drainage Master Plan for Volcano Heights, being drafted as of 2013, for key drainage infrastructure. [See Section 14.2.5 starting on page 248.]

i. Where possible, natural stormwater treatments, such as bioswales, linear ponds, etc., should be used to provide flood control and for stormwater quality.

ii. A bioswale/linear pond should be designed and incorporated into the median and/or eastern edge of the Park Edge Road. Such a pond, designed in consultation with the City Hydrologist, can help provide a preferred alternative to stormwater drains while helping to meet the City’s water quality goals. [See also Section 10.6.8 starting on page 195 and Goal 12.5.5 starting on page 222 in this Plan.]\(^{34}\) [1008]

**Action 12.2.2.3** The City and AMAFCA shall test and monitor storm water for contaminants and implement management programs to reduce pollutants which exceed acceptable levels per State or Federal guidelines.\(^{35}\) [ABC]

---

\(^{33}\) Volcano Cliffs SDP [918]

\(^{34}\) Volcano Heights SDP [1008]

\(^{35}\) North Valley Area Plan [634]
a) Coordinate water quality management plans to assure Bernalillo County’s citizens receive adequate water quantity and quality that meets essential needs. Establish techniques to ensure water quality and to enhance water conservation and to prevent further groundwater contamination in the Plan area through coordination of the appropriate governmental agencies to enforce policies adopted in the Ground-Water Protection Policy and Action Plan. The City of Albuquerque and Bernalillo County shall take the lead in establishing a Regional Authority Task Force to address the regional issue of water supply and quality. (See also Policy 5.1). The City of Albuquerque Public Works Department shall study and prepare a strategy on various options in response to changes in water and wastewater treatment standards now being considered. When responses to new standards require changes to existing State regulations, a regional approach (information sharing and lobbying with other communities in New Mexico at the State level) shall be utilized. The Bernalillo County Public Works Department shall prepare standards for wastewater treatment and water supply in the unincorporated areas of the West Side which eliminate further proliferation of septic tanks and shallow wells. These standards shall be consistent with other recently developed groundwater protection policies, but take the unique West Side landforms into consideration. The use of constructed wetlands and other alternative wastewater treatment options should be considered.

Goal 12.3 Natural Resources

Protect, conserve and enhance natural resources, habitat and ecosystems.

Policy 12.3.1 Solid Waste Management

a) Continually seek out economically and environmentally sound methods of solid waste disposal that utilize the energy content and material value of municipal solid waste.
b) Continually improve solid waste recycling systems that reduce the volume of waste while converting portions of the waste stream to useful products and/or energy.  

Policy 12.3.2 Energy Management

a) Maintain an adequate, economical supply of energy through energy management techniques and use of alternative and renewable energy sources such as solar, wind, solid and liquid waste.  

Policy 12.3.3 Undertake land use planning that will maximize potential for efficient use of alternative and renewable energy sources.  

Sustainable Development

a) Encourage landscape, especially trees, within public and private rights-of-way to control water erosion and dust, and create a pleasing visual environment; native vegetation should be used where appropriate.  

b) Carefully design development that abuts the boundary of open space areas such as the Bosque, the Petroglyph National Monument, or Sandia Foothills to provide access to these lands while still preserving the natural wildlife habitat and maintaining essential flood control and drainage functions.  

c) Design high intensity mixed-use areas with clusters of tall buildings to mitigate the urban heat island effect. Where they cannot be avoided, seek to mitigate these effects through design, materials, and tree canopies and other vegetation where feasible.  

d) Acquire or seek dedication of private lands abutting Major Public Open Space, such as the Bosque, the Petroglyph National Monument, and the Tijeras Arroyo when such lands could offer improvement to access or enjoyment of existing open space.  

---

42 ABC Comp Plan [74]  
43 ABC Comp Plan [116] [117] 118  
44 ABC Comp Plan [119]  
45 ABC Comp Plan [99]  
46 Coors Corridor Plan [238], Westside Strategic Plan [1077]  
47 Uptown SDP [873]  
48 Coors Corridor Plan [238]
e) Minimize disturbance or removal of existing natural vegetation from any publicly owned open space area. 49[ABC]

f) Promote green building and energy conservation in new construction or major redevelopment. 50[ABC]

g) All development should seek to preserve, protect, and enhance significant natural and cultural features, including arroyos, landforms, rock outcroppings, ground water, and natural viewsheds. 51[ABC] 245

h) All new development and redevelopment should seek to limit the amount and extent of impervious surfaces by utilizing permeable pavement and other technologies. 52[ABC]

i) All new development and redevelopment should seek to protect iconic cottonwood trees through site design that limits compaction and allows water infiltration. 53[ABC]

i. Develop and adopt a tree protection ordinance in the City and County which requires protection of existing cottonwood trees. 54[ABC] Bernalillo County shall prepare a Rio Puerco plan which examines the resources of the area and develops policies to protect significant natural and cultural resources. 55[BC]

ii. See Land Use chapter

iii. See Neighborhoods chapter

iv. See Parks, Open Space, and Community Facilities Chapter

Policy 12.3.4 Stormwater Management

a) Recognize the arroyo classifications and policies of the Facilities Plan for Arroyos and other adopted plans and policies. These public agencies shall recognize that these
arroyos require unique development standards in order to satisfy the drainage/flood control and open space/recreational needs of these key natural features on the West Side. 56 [ABC]

b) Design all new development and redevelopment to minimize soil erosion during and after construction. 57 [ABC]

c) Allocate adequate funding for trash and debris clean-up in the arroyos to prevent debris from accumulating in the North Diversion Channel outfall area. AMAFCA should attempt more frequent trash clean-up of the outfall area. 58 [ABC] [633]

d) Use rip-rap for bank stabilization on the Alameda Drain. 59 [ABC]

e) Require grading and re-vegetation as appropriate to prevent erosion and sediment deposition within future grading and drainage plans. 60 [ABC]

f) Volcano Mesa: Mitigate rainwater run-off from development on Volcano Mesa. The National Park Service has a policy of only allowing limited and controlled flows from development in the Monument, and all development plans should address how flows will be mitigated. Standards should be developed (or project-specific studies may be requested) for roadway and development projects to prevent runoff onto the National Monument or abutting properties. Methods may include: cisterns and rainwater catchment systems, piping to control flows, and energy dissipating rockery. 61 [ABC]

g) See Parks, Recreation, Open Space, and Community Facilities chapter

Policy 12.3.5 Preserve natural drainage functions of arroyos.

a) Bernalillo County Public Works, AMAFCA, and City of Albuquerque Public Works Department should identify the costs associated with increased maintenance needs of prototypical naturalistic arroyos and channels of various

56 Westside Strategic Plan [1248]
57 Southwest Area Plan [775]
58 North Valley Area Plan [633]
59 North Valley Area Plan [637]
60 North Valley Area Plan [640]
61 Volcano Cliffs SDP [928] [929]
Chapter 12 – Resilience & Sustainability

types, and program funds for that purpose in future budgets.62 [ABC]

b) Prohibit development within the drainage easements of arroyos. Trails and other Open Space amenities are allowed as approved by the Open Space Division and in accordance with the Rank II Facility Plan for Arroyos. 63 [ABC]

c) Limit vehicular crossings of arroyos. Vehicular crossings of the North Fork of the Boca Negra Arroyo should be limited to Rosa Parks and Scenic Boulevards. Crossings of the Middle Fork of the Boca Negra Arroyo should be limited to Albericoque, Quivira, and Boulevard de la Oeste on the far west boundary of the plan. Other crossings should be considered if warranted. An oversized culvert should be used to provide for wildlife movement. The length of the culverts should be minimized. 64 [ABC]

d) The use of earth tone colors, natural building materials, or vegetative slope in drainage channels coverings should be considered whenever possible. 65 [ABC] [1058]

e) Include performance-based standards for drainage improvements on the West Side in the Unified Development Code. [ABC] [1057]

f) The City and County should coordinate with the National Park Service to determine where and how drainage improvements will cross National Monument Lands. [ABC] [1062]

g) The natural drainage function of the North and Middle Forks of the Boca Negra Arroyo should be maintained. To accommodate historic and developed storm flows in the North and Middle Fork of the Boca Negra Arroyo, use an improved naturalistic channel, using grouted and/or stacked basalt boulder grade control structures of no more than 3 foot in height and basalt rip rap bank protection, provided that the channel side slopes are 4:1 or flatter (except at the grade control structures, crossing structures, and reasonable upstream and downstream transition lengths at each) and 100 year flow velocities are typically less than 10 feet per second throughout the channel, and typically less than 6 feet per second mid-way between the grade control structures.

---

62 Westside Strategic Plan [1059]
63 Volcano Cliffs SDP [917]
64 Volcano Cliffs SDP [923]
65
Chapter 12 – Resilience & Sustainability

(See Figure 1, Naturalistic Arroyo Cross Section Diagram.)
The drainage right-of-way dedicated for this naturalistic channel should include the channel cross section, plus two 15-foot wide maintenance access corridors, along each side of the channel, one of which should be surfaced with gravel, plus a 40-foot wide open space buffer, which may be on a single side or split along both sides of the drainage corridor, all as approved by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) and the City Engineer.

(See Figure 1, Naturalistic Arroyo Cross Section Diagram.)

h) See Parks, Recreation, Open Space, and Community Facilities chapter

Policy 12.3.6 Conserve the unique environmental, geological, visual, recreational, archaeological and historical qualities of the Northwest Mesa Escarpment and Petroglyph National Monument.

i) Conserve the Northwest Mesa Escarpment as an entire unit with a recognizable relationship to the volcanoes which created it, the mesa top which borders it and the arroyos which bisect it.

j) Preserve views to and from the black escarpment face, which is recognized as a visual reference point for the community.

k) Maintain the archaeological/historical resources found in the Northwest Mesa Escarpment, which are recognized as inexorably linked to their setting. [ABC] [679]

l) Mitigate any damage to the Northwest Mesa Escarpment, including removal of vegetation, or movement of boulders during construction. [ABC] [682]

m) Design infrastructure and development projects within the Escarpment Transition zone to minimize potential negative impacts to the Petroglyph National Monument. [ABC] [972, 1036]

n) Ensure public access and public facilities are compatible with the sensitive nature of the escarpment. Public access shall be at points which are least sensitive to use, whenever possible. Utilities and roads shall be limited to areas which are least sensitive to disturbance. Areas to be avoided, if at all possible, are Piedras Marcadas Canyon, the point where the middle branch of the San Antonio crosses the escarpment, the marsh peninsula, Rinconada Canyon, the
escarpment south of Rinconada Canyon and Petroglyph Park. [ABC] [686]

o) Design drainage facilities near the Northwest Mesa Escarpment to be sensitive to the character of the escarpment. Arroyo corridor and drainage management plans are the appropriate planning level for specific channel treatment recommendations for arroyos identified in the "Facility Plan for Arroyos". [ABC] [690]

p) Volcano Mesa: Encourage Mitigation of Area-Wide Development Impacts on Major Public Open Space and the Petroglyph National Monument. A sensitive neighborhood edge treatment and transition to Major Public Open Space and the Monument should be established and should address issues, including shared usable open space, scenic corridors (single-loaded streets), and rainwater mitigation. [925] [abc]

q) Volcano Mesa: Encourage shared, usable open space and park development to connect to adjacent Major Public Open Space or the Petroglyph National Monument. Where possible, shared useable open space and/or parks should connect to Major Public Open Space or the Petroglyph National Monument. [926] [abc]

r) Volcano Mesa: Encourage private conservation easements to protect ecologically and culturally sensitive areas on Volcano Mesa. [932] [abc]

s) Volcano Mesa: Development Envelope. Development Envelopes define an area in which buildings (including accessory structures), landscaping (restricted to the plants contained in Plant Lists A or B found in Chapter 5 General Regulation C), construction activity, walls and fences, and recreational activities are permitted. Impermeable surfaces should be limited. Rainwater should not be concentrated, except through the use of naturalized swales. Backyards are contained within Development Envelopes and are areas where recreational activities may occur. Walls and fences also are allowed for the purpose of enclosing private areas, mitigating noise, and providing security.

t) Volcano Mesa: Development on Volcano Mesa should be designed to preserve and protect rock outcroppings and cultural sites in the area. Where possible, public access and permanent protection via a conservation easement or dedication to the City or County is desirable. [966] [abc]
u) Volcano Mesa: Sensitive lands – whether rock outcrops or significant cultural, archaeological, volcanic, or geologic land – that cannot be or have not been purchased by City Open Space should be permanently protected privately through either a Transfer of Development Rights, a Conservation Easement, or replatting as private open space. [See Appendix D for more about options for private preservation options.] The costs of archaeological resource mitigation tend to be much higher than the alternative of in-place avoidance. The protection of archaeological sites through avoidance is included in this Plan as an incentive for greater development density and height through the optional bonus height system as well as rock outcroppings counting double their square footage to satisfy either usable or detached open space requirements. [See Section 6.4 starting on page 111 and Table 6.1 on page 112 for the bonus height system and Section 9.5.11 starting on page 146 for the square footage incentive.] [A] [966]

v) The City and County should coordinate with the National Park Service to determine where and how drainage improvements will cross National Monument Lands. [ABC] [1062]

w) The Ladera Neighborhood Association and the National Park Service shall continue discussions regarding potential visitor impacts on residential areas adjacent to Unser as well as potential impacts of surrounding development on the monument. (WSSP) [ABC] [1078]

**Goal 12.4 Resilience**

Maximize capacity to withstand hazards and threats, adapt to change, and recover efficiently.

**Policy 12.4.1** Emergency preparedness capabilities should be maintained. [ABC] [170]

**Policy 12.4.2** Develop an emergency energy curtailment plan through cooperation between governmental agencies and private utilities. [ABC] [121]
Policy 12.4.3 Maintain a strong fire prevention and suppression program to protect lives and property. [ABC] [169]

Policy 12.4.4 Continue and improve emergency and routine crime prevention efforts. [ABC] [172]

Policy 12.4.5 Implement a comprehensive system of emergency medicine and rescue services. [ABC] [174]

Goal 12.5 Community Health

Create safe and healthy environments where people can thrive.

Policy 12.5.1 Improve air quality through the enforcement of air quality standards to safeguard public health and welfare. [ABC] [54][55]

a) Continue to meet and maintain Federal standards for air quality for this region. [ABC] [868] [881]

b) Reduce automobile travel’s adverse effects on air quality through a balanced land use/transportation system that promotes the efficient placement of housing, employment and services. [ABC] [56] [870]

c) Minimize pollution from particulates. [ABC] [61]

d) During air stagnation episodes, activities which contribute to air pollution should be reduced to the lowest level possible through methods such as no-burn days or limited-driving days. [ABC] [62] [621]

e) Maintain and monitor existing air quality standards for effectiveness over time. [ABC] [1210]

f) North Valley: Preserve air, water, and soil quality in the North Valley area. [ABC] [648]

Action 12.5.1.1 Continue ongoing enforcement efforts to mitigate the effects of blowing dust from grading for development on the West Side. [ABC] [1211]

Policy 12.5.2 Increase efforts to inform the public about existing regulations pertaining to air quality & continue enforcement of existing air quality regulations. [ABC] [617]

Policy 12.5.3 Continue leadership on air quality issues by meeting with other local jurisdictions and agencies and working toward cooperative solutions, including expansion of vehicle emission and fl replace restrictions beyond Bernalillo County’s borders. [ABC] [1208]
Chapter 12 – Resilience & Sustainability

**Policy 12.5.4** Prevent new environmental hazards, correct existing environmental problems and promote resource conservation. [745]

**Policy 12.5.5** Eliminate conditions which are detrimental to the public health, safety, and welfare (LMSDP, LGSDP, MSBSDP) [ABC] [400, 479, 483, 702]

- a) Protect neighborhoods from potentially harmful impacts of new development within the City and County. [ABC] [757]
- b) Support future planning efforts for Industrial Parks that highlight the importance of environmentally-friendly industry. [ABC] [226]

**Policy 12.5.6** Support efforts that enhance community health.

- a) Promote the development of community and family gardens, farms, locally grown produce and a continuation of livestock raising where appropriate. [ABC] [464]
- b) Maintain programs and buildings, expand and/or improve the community center facilities, and neighborhood park facilities using sustainable and green development practices. [ABC] [473]
- c) Prepare and implement a robust street tree program to increase the City and County’s urban forest canopy, especially in activity centers and along transit corridors.

**Policy 12.5.7** Protect citizens from toxic air emissions and poor air quality. [ABC] [65]

- a) Integrate air quality considerations into zoning and land use decisions to prevent new air quality/land use conflicts. [ABC] [63]
- b) Minimize motor vehicle emissions and their adverse effects. [ABC] [59]
- c) Minimize hydrocarbon emissions from gasoline handling processes. [ABC] [60]
- d) Reduce levels of indoor pollution. [ABC] [64]
- e) Minimize the negative effects of blasting and fugitive dust to the Petroglyph National Monument. [ABC] [939]
- f) Increase efforts to inform the public about the effect of motor vehicle usage on air quality. [ABC] [616]
Chapter 12 – Resilience & Sustainability

**Action 12.5.7.1** Encourage the communities of Los Ranchos de Albuquerque, Corrales, and Rio Rancho to participate in addressing air quality issues in the North Valley. (NVAP) [ABC] [622]

**Action 12.5.7.2** Explore ways to limit unauthorized motor vehicle use on irrigation facilities and other open areas & stabilize areas which are already considered substantial dust sources. [ABC] [619, 620]

**Policy 12.5.8** Protect citizens against environmental hazards related to stormwater control and promote landscape as a mitigation approach. (new)

a) Address any storm water drainage issues, such as flooding, that might negatively impact the quality of life of residents. [ABC] [558, 610, 650, 632]

b) Promote enhanced landscapes and trees as a major element in maintaining a healthy environment through encouraging shaded parking, utilizing large shade trees, and encouraging vegetation to filter storm water before it reaches the river. [ABC] [871]

c) Use landscape, shade, and openings for winter sun and non-glare materials advantageously when designing outdoor spaces in order to create inviting and comfortable places for people to gather in all seasons. [ABC] [876]

**Action 12.5.8.1** Develop landscaped medians to reduce surface runoff and heat island effect. [ABC] [546]

**Action 12.5.8.2** Replace and replant unhealthy and dying trees in public streetscapes in the appropriate areas. [548] [abc]

**Policy 12.5.9** Protect citizens against environmental hazards related to wastewater treatment systems.

a) Take an active role in planning and managing wastewater collection and treatment systems in unincorporated County areas by evaluating wastewater options to determine the type, location, and cost of collection systems. [BC] [668]

b) Identify potential low-density, low-lying areas appropriate for onsite alternative wastewater systems and promote and monitor the use of approved non-polluting on-site wastewater treatment systems where appropriate. [BC] [668]
c) Limit conventional discharging septic tank systems for new homes and encourage installation of alternative on-site wastewater treatment systems. [BC] [668]

Policy 12.5.10 Protect citizens against environmental hazards related to landfills and the waste stream.

a) Minimize illegal dumping. [ABC] [75]
b) Minimize the potential for water and air pollution from regional landfills. [ABC] [76]
c) Continue development of a program for managing hazardous waste generated by households and conditionally exempt small quantity generators. [ABC] [78]
d) Monitor former landfills in an effort to protect the environment and public’s health and safety. [611] [abc]
e) North Valley: Prohibit hazardous waste disposal sites and transfer stations and solid waste disposal sites; and address problems of individual waste disposal systems on lots of inadequate size. [648] [abc]

Policy 12.5.11 Protect citizens against environmental hazards related to noise.

a) Integrate noise considerations into the planning process so that future noise/land use conflicts are prevented. [ABC] [79, 80]
b) Construction of noise sensitive land uses near existing noise sources should include strategies to minimize adverse noise effects. [ABC] [81]

Goal 12.6 Environmental Justice

Recognize and work to ameliorate the disproportionate impact and health outcomes for underrepresented and at-risk communities.

Policy 12.6.1 Encourage transitional land uses as a buffer to prevent further contamination from heavy industry, and to protect the health and safety of residents, agricultural land, and water table, while promoting diverse economic activity. [ABC] [825]

Policy 12.6.2 Prevent the incursion of new industrial uses into or in close proximity to existing residential areas without appropriate regulations and safeguards.