Environmental Assessment Middle Venada Arroyo Water Quality Improvement Project Southern Sandoval County Arroyo Flood Control Authority

Section 595 Water Resources Development Act



Prepared By:

U. S. Army Corps of Engineers Albuquerque District

Final

November 2024



US Army Corps of Engineers ® Albuquerque District (This page is intentionally left blank.)

FINDING OF NO SINGIFICANT IMPACT

MIDDLE VENADA ARROYO WATER QUALITY IMPROVEMENT PROJECT

SOUTHERN SANDOVAL COUNTY, NEW MEXICO

The U.S. Army Corps of Engineers, Albuquerque District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Environmental Assessment (EA) dated August 2024, for the Middle Venada Arroyo Water Quality Improvements Project addresses stormwater flows in Southern Sandoval County, New Mexico.

This EA, incorporated herein by reference, evaluated various alternatives that would improve water quality in the study area. Currently, all storm water runoff from around the area is discharged into the Venada Arroyo, which originates on the northwest city limits of Rio Rancho and extends through the city into the Rio Grande. The purpose of the Middle Venada Arroyo Water Quality Improvement Project is to provide stormwater quality treatment in the Venada Arroyo by slowing down the stormwater and allowing sediment, floatable trash, and other contaminants to be captured before releasing into the Rio Grande. The recommended plan involves the following improvements:

- Install two inline weir structures with a shallow-sloped settling area between them. The downstream weir would include reverse inclined ports, which would allow floatable debris (mainly trash and sediment) to remain on the upstream side of the structure for collection and disposal. The downstream weir would also include a ported riser structure to allow the settling area to fully drain while trash and debris would remain. High flow events would pass directly over the weir and continue downstream.
- The downstream weir would be equipped with a stilling basin to dissipate energy prior to continuing downstream.
- Riprap would be installed directly downstream of the stilling basin to minimize both scour from high flows and head cut from downstream.

In addition to a "no action" plan, one alternative (the No-Action Alternative) was evaluated. See Section 2 of this EA for a description of alternatives.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

	Insignificant effects	Insignificant effects as a	Resource unaffected
		result of mitigation	by action
Aesthetics	\boxtimes		
Air quality	\boxtimes		
Aquatic resources/wetlands			\boxtimes
Invasive species	\boxtimes		
Fish and wildlife habitat	\boxtimes		
Threatened/Endangered species/critical habitat			\boxtimes
Historic properties			\boxtimes
Other cultural resources			\boxtimes
Floodplains	\boxtimes		
Hazardous, toxic & radioactive waste			\boxtimes
Hydrology	\boxtimes		
Land use			\boxtimes
Navigation			\boxtimes
Noise levels	\boxtimes		
Public infrastructure			\boxtimes
Socio-economics			\boxtimes
Environmental justice			\boxtimes
Soils	\boxtimes		
Tribal trust resources			\boxtimes
Water quality	\boxtimes		
Climate change			\boxtimes

 Table 1: Summary of Potential Effects of the Recommended Plan

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) are detailed in the EA, listed below, and will be implemented, if appropriate, to minimize impacts:

- Activities would be limited to the designated or otherwise approved areas shown on the construction drawings for construction areas, staging, and access.
- Construction areas would be watered for dust control and comply with local sedimentation and erosion-control regulations.
- All fuels, oils, hydraulic fluids, and other similar substances would be appropriately stored out of the floodplain. Construction equipment would be inspected daily and

monitored during operation to prevent leaking fuels or lubricants from entering any surface water.

- BMPs would be implemented regarding the treatment and disposal of waste material. Waste material would be disposed of properly at commercial disposal areas or landfills.
- A Stormwater Pollution Prevention Plan would be required. Water resources would be protected with silt fencing, geotextiles, or straw bales according to the plan in order to prevent runoff of sediment from areas disturbed by construction.
- Areas disturbed by construction and not developed would be revegetated with native grasses.
- In compliance with the Migratory Bird Treaty Act, impacts to nesting birds would be avoided by scheduling work outside of the nesting season or conducting a nest survey prior to any vegetation removal.

A review of Corps records, and online records check of the New Mexico Office of Cultural Affairs' Historic Preservation Division New Mexico Cultural Resources Information System (NMCRIS) database were conducted on December 13, 2021. There are no known or listed historic properties within the area of potential effect or vicinity. Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the recommended plan has no effect on historic properties.

Consistent with the Department of Defense's American Indian and Alaska Native Policy, signed by Secretary of Defense William S. Cohen on October 20, 1998, and based on the State of New Mexico Indian Affairs Department and Historic Preservation Division's (NMHPD) 2019 Native American Consultations List, American Indian Tribes that have indicated they have interests in Sandoval County have been contacted regarding the proposed project. According to the NMHPD, there are seventeen tribes with lands and jurisdiction in Sandoval County, including the Comanche Nation of Oklahoma, Jicarilla Apache Nation, Kewa Pueblo, Navajo Nation, Ohkay Owingeh, Pueblo de Cochiti, Pueblo of Isleta, Pueblo of Jemez, Pueblo of Laguna, Pueblo of San Felipe, Pueblo of San Ildefonso, Pueblo of Sandia, Pueblo of Santa Ana, Pueblo of Santa Clara, Pueblo of Tesuque, Pueblo of Zia, and The Hopi Tribe. Coordination letters were submitted to each tribe on June 30, 2022 to determine if they have concerns about any traditional cultural properties, sacred sites, or properties of religious or cultural significance that may be affected by the project. Table 2 below includes the name of each tribe, date the coordination letter was sent, and any comments received from the tribes. Responses received from the tribes are included in Appendix C of the EA.

Table 2: Tribal Coordination

	Date	Response	
Tribe	Letter Sent	Received	Comments
Comanche Nation			
of Oklahoma	June 30, 2022.	No	
Jicarilla Apache Nation	June 30, 2022.	No	
Kewa Pueblo	June 30, 2022.	No	
Navajo Nation	June 30, 2022.	No	
Ohkay Owingeh	June 30, 2022.	No	
Pueblo de Cochiti	June 30, 2022.	No	
Pueblo of Isleta	June 30, 2022.	No	
Pueblo of Jemez	June 30, 2022.	No	
Pueblo of Laguna	June 30, 2022.	No	
Pueblo of San Felipe	June 30, 2022.	No	
Pueblo of			
San Illdefonso	June 30, 2022.	No	a
Pueblo of Sandia	June 30, 2022.	Yes	The Pueblo of Sandia has no objection to the project and concurs in your determination of "no historic properties affected." We welcome the water quality benefits it hopefully will realize.
Pueblo of Santa Ana	June 30, 2022.	Yes	The THPO concurs with the Corps determination of No Historic Properties Affected.
Pueblo of Santa Clara	June 30, 2022.	No	
Pueblo of Tesugue	June 30, 2022.	No	
Pueblo of Zia	June 30, 2022.	No	
The Hopi Tribe	June 30, 2022.	No	

Public review of the Draft EA and FONSI were completed from September 16, 2024, to October 16, 2024. A comment-response table is included in section 5.3 and comment letters are provided in Appendix E of this Final EA and FONSI.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the recommended plan would have no effect on federally listed species or their designated critical habitat.

The proposed work does not involve a discharge of dredged or fill material within waters of the United States regulated by Section 404 of the Clean Water Act (CWA); therefore, a Department of the Army permit under Section 404 of the CWA would not be needed for this project.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials have been completed.

Technical, environmental, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 **Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies**. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date

Matthew T. Miller Lieutenant Colonel, U.S. Army Commanding

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1. INTRODUCTION

1.1 Background and Location

The United States Army Corps of Engineers, Albuquerque District (Corps) in cooperation with, and at the request of the Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA), is planning the Middle Venada Arroyo Water Quality Improvement Project (Project) to improve water quality in the Venada Arroyo before it discharges into the Rio Grande.

The work would be conducted under Section 595 of the Water Resources Development Act of 1999 (Public Law 106-53) as amended. The Act authorizes the Corps to provide aid in the form of design and construction for water-related environmental infrastructure, resource protection, and development projects in Idaho, Montana, rural Nevada, New Mexico, and rural Utah. Types of projects included under the Act are wastewater treatment and related facilities, stormwater retention and remediation, environmental restoration, surface water resource protection and development, and sewer and water line replacement. Provisions under the Act require that the project be publicly owned to receive Federal assistance. The Non-Federal sponsor for the proposed project is the SSCAFCA and the project area is within publicly owned right-of-way.

The proposed project area is located in Sandoval County, New Mexico in the northern portion of SSCAFCA jurisdiction. The project is located west of New Mexico Highway 528 (NM528) on the Venada Arroyo. The project area crosses two municipal boundaries, the City of Rio Rancho and the Town of Bernalillo (Figure 1). Access to the project location is off Lincoln Ave, approximately 0.75 miles southwest of the NM550/528 intersection. The legal description for the project area is Township 13N; Range 3E; Section 36.

The Venada Watershed covers an area over 16 square miles (Figure 2) that can generate flows exceeding 3,150 cubic feet per second during a 100-year storm event. Flows in the Venada Arroyo ultimately discharge to the Rio Grande. Approximately 75% of the Venada Watershed discharges storm flows that currently do not receive any engineered treatment. SSCAFCA is proposing to construct a water quality facility in the main stem of the Venada Arroyo to provide storm water quality treatment and address sediment deposition that limits conveyance downstream of NM528.



Figure 1. Project Site Location

Figure 2. Venada Watershed



1.2 Purpose and Need

Currently, storm water runoff from the Venada Watershed is discharged into the Venada Arroyo, which originates on the northwest city limits of Rio Rancho and extends through the city into the Rio Grande (Figure 2). The Venada Arroyo discharges directly to the Rio Grande without any engineered treatment or attenuation. The purpose of the Middle Venada Arroyo Water Quality Improvement Project is to provide storm water quality treatment in the Venada Arroyo by slowing down the stormwater and allowing sediment, floatable trash, and other contaminants to be captured before releasing into the Rio Grande.

1.3 Regulatory Compliance

This EA was prepared by the Corps in compliance with all applicable Federal Statutes, regulations, and Executive Orders (EO), as amended, including, but not limited to, the following:

- Clean Water Act (33 U.S.C §§ 1251 et seq.)
- Clean Air Act (42 U.S.C. §§ 7401 *et seq.*)
- National Historic Preservation Act (16 U.S.C. §§ 470aa mm)
- Archaeological Resources Protection Act (16 U.S.C. 470aa et seq.)
- Endangered Species Act (16 U.S.C. §§ 1531 -1544)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations
- Executive Order 11988, Floodplain Management
- National Environmental Policy Act (42 U.S.C §§ 4321 et seq.)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Part 1500 *et seq.*)
- Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001 3013)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 11990, Protection of Wetlands
- U.S. Army Corps of Engineers' Procedures for Implementing NEPA (33 CFR Part 230; ER 200-2-2)
- Farmland Protection Policy Act (7 U.S.C. §§ 4201 *et seq.*)
- Executive Order 13112, Invasive Species
- Federal Noxious Weed Act (7 U.S.C. §§ 2814 2814)
- Energy Independence and Security Act of 2007 (Pub. L. No. 110-140, Dec. 19, 2007, Section 438; 121 Stat. 1492, 1620)
- Migratory Bird Treaty Act, (16 U.S.C. §§ 703 712)
- Fish and Wildlife Coordination Act, (16 U.S.C. §§ 661-666c et seq.)
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species
- Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All

This EA also reflects compliance with all applicable State of New Mexico and local regulations, statutes, policies, and standards for protecting the environment such as water and air quality, endangered plants and animals, hazardous, toxic, and radioactive waste (HTRW), and cultural resources.

2. ALTERNATIVES CONSIDERED

All agencies that take part or assist in projects that utilize Federal funding are mandated by the National Environmental Policy Act (NEPA) to evaluate alternative courses of action. Alternatives can include design and/or location considerations that may mitigate or reduce impacts generated by a given action. In general, the NEPA process can provide decision makers with an evaluation of the present and future conditions with regards to the implementation and timing of an action at a given site. Finally, a particular design chosen from alternatives evaluated can then be implemented in the best interest of the public and environment.

Two alternatives are considered for this NEPA analysis including the No-Action Alternative, which is used as the comparison basis, and the Proposed Action, which addresses the needs of Rio Rancho to improve water quality and drainage in Venada Arroyo.

In addition to the Proposed Action described below, SSCAFCA considered an alternative design for the Proposed Action that included the construction of a single weir in Venada Arroyo. However, this alternative was not carried forward for evaluation of impacts.

2.1 No-Action Alternative

Under the No-Action alternative, improvements to water quality and a reduction in erosion would not take place. No federal funding would be expended and there would be no new effects to the project site or surrounding environment. However, the No-Action alternative would not support SSCAFCA efforts to improve water quality in the Venada arroyo before releasing into the Rio Grande.

The No-Action alternative should be perceived as an unsound course of action due to the Venada Arroyo having a history of deficient water quality and transport of contaminants into the Rio Grande during storm events.

2.2 Proposed Action

Under this alternative, two inline weir structures with a shallow-sloped settling area between them would be constructed in the Venada Arroyo (Figure 3). The downstream weir would include reverse inclined ports, which would allow floatable debris (mainly trash and sediment) to remain on the upstream side of the structure where maintenance crews could collect and dispose of debris. The downstream weir would also include a ported riser structure to allow the settling area to fully drain while trash and debris would remain. During more frequent, smaller storm events, stormwater would be treated through the reverse inclined ports and ported riser. During larger storm events, including the 100-yr, 24-hr storm, runoff is designed to overtop both inline weir structures.



Figure 3. Proposed Project Elements

The weir structures and the banks of the settling area would be concrete lined to mitigate erosion, as soils at the project site are sandy. The upstream weir would include a 5-foot-deep toe wall, that would extend along the sloping face of the weir below the bottom elevation of the settling area to accommodate anticipated scour. The downstream weir would be equipped with a stilling basin energy dissipater to lower flow velocity prior to continuing downstream where the channel narrows and turns almost 90 degrees to the south. Riprap would be placed directly downstream of the concrete stilling basin to mitigate scour in the immediate downstream channel, including the access ramp. The new riprap would tie to existing riprap lining of the downstream channel, to provide seamless protection of the channel bottom and banks.

The proposed project would include permanent base course access roads and concrete ramps to allow access to the weirs and stilling basin for operation and maintenance after construction is complete. Enclosure 1 (Surfacing Plan) shows base course access roads in red. Final stabilization of the project site would come in the form of gravel mulch and native grass seeding (shown in Enclosure 1 as blue and green, respectively).

Construction of the proposed project is planned begin in January 2025 and last approximately five months.

3. AFFECTED ENVIRONMENT AND FORESEEABLE EFFECTS

3.1 Physical Environment

3.1.1 Physiography, Geology, and Soils

The Rio Grande flows along a series of linked troughs, or long segments of the crust of the earth that has subsided between mountain uplifts. The Albuquerque basin measures 30 miles wide and 90 miles long. The basin was probably formed during the upper Tertiary (Miocene and Pliocene) period, coincidental with the uplifting of the Sandia-Manzano-Los Pinos easterly tilted fault block mountain range. Total basin subsidence and the resultant infilling are estimated to be as much as 15,000 feet.

The project is within the Albuquerque sub-basin of the Rio Grande Watershed (NM Water Resources Research Institute, 2013). The basin is filled with thick sediments of mostly Quaternary and some Tertiary age, with a few areas of volcanic rocks and lava-capped mesas. The Santa Fe Group aquifer is the drinking water source for Albuquerque and most of the Middle Rio Grande Valley.

The general topography within the greater project area slopes gradually to the east towards the Rio Grande Valley. The general soil conditions are deep, well-drained soils that were formed in recent alluvium on floodplains of the Rio Grande. The soil in the project area is non-cohesive and susceptible to erosion. Soils mapped in the project area are presented in Table 1. The soil is mapped as Sheppard loamy fine sand with a slope of 3 to 8% (U.S. Department of Agriculture [USDA], 2024).

Map Unit	Symbol	Landform	Parent Materials
Sheppard and similar soils	191	Structural benches, stream terraces, dunes, benches, alluvial fans	Eolian deposits derived from sandstone

Table 1. Soils mapped in project area

The following best management practices would be implemented to reduce impacts to soils from construction:

- Activities would be limited to the designated or otherwise approved areas and would be shown on the construction drawings for construction areas, staging, and access.
- Construction areas would be watered for dust control.
- Construction would comply with local sedimentation and erosion-control regulations.

The Proposed Action would have short-term, minor adverse effects to soils during construction, but these impacts would be minimized by implementing best management practices and would end upon project completion. In the long-term, the proposed project is anticipated to reduce erosion and downstream sedimentation.

Under the No-Action alternative, there would be no short-term effects to soils, but storm events would continue to result in deposition of sediment lower in the arroyo and conveyance of untreated water into the Rio Grande.

3.1.2 Climate and Climate Change

The Project area is in the Albuquerque Basin Ecoregion, part of the deep physiographic basins of the Rio Grande rift (Griffith, et al. 2006). This ecoregion is lower in elevation, drier, and warmer than the surrounding ecoregions to the north, east, and west. Rio Rancho is in an arid climate due to its location in the rain shadow of the Sandia Mountains to the east and the Continental Divide to the west. The area receives roughly 9 inches of precipitation annually on average (Table 2). The region is known for its hot summers with large diurnal range in temperatures. Winters are moderate with average high temperatures hovering around freezing.

Climate change is expected to result in increased temperatures, longer periods of drought and decreased snowpack runoff, as well as potentially more frequent severe storms. Stronger, more frequent storms would increase erosion and contaminants being released into the Rio Grande.



Table 2. Climate data for the Rio Rancho, NM area (1981 – 2010) (U.S. Climate Data 2022)

Implementation of the Proposed Action would result in short-term, minor emissions from construction equipment; however, it would not result in long-term releases of greenhouse gases and would increase resilience to more frequent severe storms. The No-Action alternative would not result in any increased releases of greenhouse gases. Therefore, there would be no adverse effects to the climate from the Proposed Action or the No-Action alternative.

3.1.3 Water Resources

Discharging into the Rio Grande, a Water of the United States, requires that SSCAFCA comply with its existing municipal separate storm sewer system (MS4) permit. Specific to the Venada Arroyo, the MS4 permit pertains only to an Annual Event (i.e., the rainfall event that exceeds 0.62 inches). The MS4 permit authorizes discharge to waters of the United States under NPDES General Permit No. NMR04A000 (CDM Smith, 2016). This permit requires SSCAFCA to develop, implement and enforce a Storm Water Management Program (SWMP) designed to reduce the discharge of pollutants to the maximum extent practicable, to protect water quality and to satisfy applicable surface water quality standards (CDM Smith, 2016 and Huitt-Zollars, 2011). The SWMP must include management practices; control techniques; system, design, and engineering methods; and other provisions EPA determines appropriate for the control of pollutants (Huitt-Zollars, 2011).

Section 402 of the Clean Water Act (33 U.S.C. §§ 1251 *et. seq.*) as amended, regulates pointsource discharges of pollutants into waters of the United States and specifies that storm-water discharges associated with construction activities shall be conducted under the National Pollution Discharge Elimination System (NPDES) guidance. The NPDES general permit guidance would apply to the proposed project as the total project area (7.5 acres) is over one acre in size. Therefore, a Storm Water Pollution Prevention Plan (SWPPP) would be required and prepared by the contractor for this project.

Section 404 of the CWA (33 U.S.C. §§ 1251 *et seq.*), as amended, provides for the protection of waters of the United States through regulation of the discharge of dredged or fill material. The Corps' Regulatory Program (33 CFR Parts 320-330) requires that a Section 404 evaluation be conducted for all construction that may affect waters of the United States. The Venada

Arroyo has been determined to be ephemeral and is not a relatively permanent water. Therefore, it is not considered a water of the United States and no 404(b)(1) analysis under Section 404 of the Clean Water Act of 1972 would be required.

Section 401 of the CWA, as amended, requires that a Water Quality Certification Permit be obtained for anticipated discharges associated with construction activities or other disturbance within waterways. Because there would be no discharge to waters or wetlands of the United States, a Water Quality Certification Permit would not be required.

The following best management practices would be implemented to minimize impacts to water resources during construction:

• Prior to start of construction, a SWPPP would be prepared and construction would comply with all conditions of the SWPP.

The Proposed Action would provide a benefit to water resources by providing treatment of storm water in Venada Arroyo before releasing into the Rio Grande. Water quality impacts from construction of the proposed project are expected to be negligible and short-term and all applicable permits and regulations would be followed during construction.

Under the No-Action alternative, there would be no water quality impacts due to construction; however, improvements to water quality and a reduction in erosion would not take place.

3.1.4 Floodplains and Wetlands

Executive Order 11988 (Floodplain Management) provides federal guidance for activities within the floodplains of inland and coastal waters. The order requires federal agencies to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains. According to the Flood Insurance Rate Map, the proposed project is located within the Special Flood Hazard Area encompassing the 100-year floodplain associated with the Venada Arroyo (Figure 4). The 100-year floodplain for the Venada Arroyo is classified as "Zone AE", a high flood risk zone with a 1% change of flooding each year. Coordination with the local floodplain administrator/FEMA would be required.

Because the Proposed Action is designed to improve stormwater quality associated with storm events on human health and safety, it complies with Executive Order 11988 (Floodplain Management). A beneficial impact would be provided from the Proposed Action.

The No-Action alternative would not improve water quality, and therefore would not minimize the impacts of floods and water quality on human safety and health.

Executive Order 11990 (Protection of Wetlands) requires the avoidance, to the greatest extent possible, of both long and short-term impacts associated with the destruction, modification, or other disturbance to wetland habitats. There are no jurisdictional wetlands within or nearby the project area, and therefore, no impacts to wetlands would occur from the Proposed Action or No-Action alternative.



Figure 4. FEMA Flood Insurance Rate Maps (FIRMs) for the Venada Arroyo area (FEMA 2008).

3.1.5 Air Quality, Noise and Aesthetics

The Project area is in New Mexico's Air Quality Control Region 2 for air quality monitoring. Sandoval County is "in attainment" (does not exceed State and Federal Environmental Protection Agency air quality standards) for all criteria pollutants (NMED/AQB 2024). Air quality in the project area is generally good. The closest Class I area is Bandelier Wilderness, located approximately 85 miles to the north of the project site. Class I areas are special wilderness areas of scenic beauty and natural wonder, such as national parks, national monuments, and wilderness areas, where air quality should be given special protection. Class I areas are subject to maximum limits on air quality degradation.

All vehicles involved in construction would be required to pass a current New Mexico emissions test and have required emission control equipment. The project would maintain the work area within or outside the project boundaries free from particulates in accordance with Federal, State, and local air pollution standards. Because the Proposed Action would disturb more than three-quarters of an acre, appropriate erosion and sediment controls would be implemented under a Fugitive Dust Control Permit for the project obtained from the Albuquerque-Bernalillo County Air Quality Program. Water sprinklers and other methods would be used during construction to minimize dust.

The Proposed Action would result in a temporary but negligible increase in suspended dust particles from construction activities in the vicinity of the project site. However, air quality in Rio Rancho and Corrales, Sandoval County, would not be affected by the Proposed Action or by the No-Action alternative.

According to the Centers for Disease Control (CDC 2024), a typical, quiet residential area has a noise level of 40 decibels. A residential area near heavy traffic has a noise level of 85 decibels. Heavy machinery has a noise level of 120 decibels. The Noise Center (Center for Hearing and Communication 2024) advises that noise levels above 85 decibels would harm hearing over time, and noise levels over 140 decibels can cause damage to hearing after just one exposure.

During construction, noise would temporarily increase in the vicinity during vehicle and equipment operation. However, the increase in noise during construction would be minor and temporary, ending when construction is complete. Therefore, the Proposed Action would have no significant effect on noise. The No-Action alternative would have no effect on noise.

Proposed work would be within Venada Arroyo. The proposed project would increase the amount of concrete and riprap in the arroyo. However, only the weir structures and the banks of the settling area would be concrete lined; other areas would be seeded with native seed, mulched with gravel mulch, or left as sandy soil. The new riprap would tie to existing riprap lining downstream and would not result in a significant change to aesthetics of the area. Neither the Proposed Action nor the No-Action alternative would influence the aesthetic values or scenic quality in the area.

3.2 Hazardous, Toxic, and Radioactive Waste Environment

To identify and document the recognized environmental conditions (i.e., hazardous, toxic, and radioactive waste (HTRW)) in connection with the proposed project, a Phase I Environmental Site Assessment (Phase 1 ESA) for the Venada Arroyo and surrounding area was conducted by the Corps (Appendix D). The Phase 1 ESA was developed following American Society for Testing and Materials (ASTM) guidance (E2247-16). Environmental regulatory records and historic aerial photographs were used to assess the historic conditions within the project area and buffer.

The Phase 1 ESA revealed no evidence of recognized environmental concerns within or near the proposed construction project. The Phase 1 ESA did not identify the presence or likely presence of any hazardous substance, or petroleum products on or near the property that indicate an existing release, a past release, or threat of a release into the ground, groundwater, or surface water of the property.

The following best management practices would be implemented to ensure that release of HTRWs does not occur during construction:

• All equipment would be washed prior to initiation of work at the study site and following completion of all tasks. Fueled equipment that enters the site should be inspected at least once every working day for dripping or leaking fluids. Dripping or leaking equipment would be repaired immediately at an off-site location. All fueled equipment would carry a spill control kit which would allow the immediate control of small fuel drips and spills, and removal of stained soil resulting from this project work.

• No hazardous materials would be used in the execution of this project.

If areas of concern or contaminants are identified during construction all activities within the area would be postponed, and the Corps would coordinate with the SSCAFCA to determine the appropriate course of action. Per Engineering Regulation 1165-2-132, for cost-shared projects such as the proposed, the local sponsor is responsible for ensuring that the development and execution of federal, state, and/or locally required HTRW response actions are accomplished at 100% non-project cost.

The No-Action alternative would have no effect on known HTRW, as no recognized environmental concerns occur within or near the proposed construction project.

The Proposed Action would have no effect on known HTRW, as no recognized environmental concerns within or near the proposed construction project were identified. Based on the lines of evidence derived from the Phase 1 ESA, a Phase II investigation (ASTM E1903) is not warranted at this time.

3.3 Biological Environment

3.3.1 Vegetation Communities

The project site is within the Arizona and New Mexico plateau ecoregion that represents a large area of plateaus, valleys, and canyons that contain a mix of desert scrub, semi-desert shrubsteppe, and semi-desert grasslands. The region is covered predominantly in a mosaic of sparse semiarid grassland and desert-scrub species (Ruhlman et al., 2012). The project area is within the Venada Arroyo which is surrounded by semiarid grassland that is mostly comprised of bare ground, short grasses, and sparse shrubs. Wildlife species commonly associated with this habitat type include jack rabbits, mice, voles, kangaroo rats, a variety of birds, and reptiles.

Dominant vegetation along the outer banks of the arroyo includes Russian thistle (*Salsola tragus*), silverleaf nightshade (*Solanum elaeagnifolium*), sand sagebrush (*Artemisia filifolia*), prickly pear cactus (*Opuntia sp.*), and *Ambrosia* sp. Vegetation within the arroyo consists of Russian thistle, four wing saltbush (*Atriplex canescens*), sand sagebrush, mule fat (*Baccharis salicifolia*), and broom snakeweed (*Gutierrezia sarothrae*). During site visits by Corps biologists (August 5 and 12, 2022), no rare plant species or rare plant communities were observed within or around the project area.

The following best management practice would be implemented to minimize impacts to vegetation:

- Activities would be limited to the designated or otherwise approved areas and would be shown on the construction drawings for construction areas, staging, and access.
- Any area disturbed by construction and not covered by an impervious surface would be revegetated by seeding with native grasses.

The Proposed Action would have minor adverse effects to vegetation within the project area as vegetation would be removed to construct project features, but these impacts would be minimized by implementing best management practices. Due to the limited amount of disturbance within the project area, the previously disturbed nature of the site, and measures that would be implemented to reduce impacts to vegetation, the Proposed Action would not result in significant adverse effects on vegetation. The No-Action alternative would have no effect on vegetation.

3.3.2 Wildlife

Wildlife species expected to be encountered on site are limited to those well adapted to desert environments as the site is an open area with low-growing, scattered shrubs, with no source of consistent water in the vicinity of the project. In addition, the project area is surrounded by developed areas. Species such as desert mice, rabbits, and lizards, and predators of those species such as coyotes, roadrunners, and hawks, may infrequently use the project site. During rain events, water that flows through the wet weather conveyance may temporarily attract additional wildlife to the site.

Scattered small holes exist throughout the site that are likely used primarily by mice, lizards, and rabbits. The site was previously disturbed with illegal off road vehicle use, homeless activity, and large amounts of plastic debris (see Appendix B).

During two separate site visits by a Corps biologist (August 5 and 12, 2022), wildlife observed included coyote, whiptail lizard (*Aspidoscelis sp.*), rabbit (*Sylvilagus sp*), fence lizard (*Sceloporus sp.*), mourning dove (*Zenaida macroura*), and coopers' hawk (*Accipiter cooperii*). No nesting birds were observed on site. However, two unoccupied clusters of bank swallow nests were noted; one that would be disturbed by the proposed project and one just outside the project area (see Appendix B). Additional bank habitat that provides suitable nesting for bank swallows occurs upstream of the project area.

Disturbance of wildlife from construction of the proposed would be temporary and limited to the project area. The following measures would be implemented to minimize impacts to wildlife:

- Project work would be conducted between September 15 and April 15, outside the breeding bird season. Should any work need to take place within the breeding bird season, all potential nesting habitat to be disturbed in the work area must be surveyed for nesting birds by a qualified biologist. For any active nest found with eggs or nestlings, the area of the nest would be avoided by implementing buffers and any other requirements deemed necessary in consultation with U.S. Fish and Wildlife Service (USFWS).
- To the extent feasible, bank swallow nest sites within the project area would be avoided. Regardless of season (i.e. even outside the breeding bird season), nesting sites should be surveyed by a qualified biologist prior to disturbance of banks to ensure nest sites are unoccupied. No nest site being actively used by bank swallows or other migratory birds may be disturbed.
- Any trenches left overnight would be covered to prevent trapping of wildlife or ramps would be installed to allow animals to safely escape. Earthen escape ramps should be installed at least every 30 meters and be no steeper than 1:1.

Due to the limited amount of disturbance within the project area, the previously disturbed nature of the habitat, and measures that would be implemented to reduce impacts to wildlife, the Proposed Action would not result in significant adverse effects on wildlife. The No-Action alternative would have no effect on wildlife.

3.3.3 Special Status Species

Three agencies have primary responsibility for protecting and conserving plant and animal species within the proposed project area. The USFWS, under authority of the Endangered Species Act of 1973 (16 U.S.C. 1531) (ESA), as amended, has the responsibility for federally listed species. The New Mexico Department of Game and Fish (NMDGF) has the responsibility for state-listed wildlife species. The New Mexico State Forestry Division (Energy, Minerals, and Natural Resources Department) (NM EMNRD) has the responsibility for state-listed plant species. Each agency maintains an updated list of species that are classified, or are candidates for classification, as protected based on their present status and potential threats to future survival and recruitment into viable breeding populations. These types of status rankings represent an expression of threat level to a given species survival as a whole and/or within local or discrete populations. Special status species listed by the USFWS and the NMDGF for Sandoval County, New Mexico are provided in Table 3.

Common Name Scientific Name		Federal Status	State Status
Mammals:			·
Spotted Bat	Euderma maculatum		Т
Pacific Marten	Martes caurina		Т
Meadow Jumping Mouse	Zapus luteus luteus	E	E
Birds:			·
Yellow-billed Cuckoo (western DPS)	Coccyzus americanus occidentalis	Т	
Costa's Hummingbird	Calypte costae		Т
Broad-billed Hummingbird	Cynanthus latirostris		Т
Neotropic Cormorant	Phalacrocorax brasilianus		Т
Brown Pelican	Pelecanus occidentalis		E
Bald Eagle	Haliaeetus leucocephalus		Т
Common Black Hawk	Buteogallus anthracinus		Т
Mexican Spotted Owl	Strix occidentalis lucida	Т	
Peregrine Falcon	Falco peregrinus		Т
Southwestern Willow Flycatcher	Empidonax trailii extimus	E	E

Table 2. List of special status species that	occur or could potentially	occur in Sandoval Cou	ınty.

Gray Vireo	Vireo vicinior		Т	
Baird's Sparrow	Centronyx bairdii		Т	
Amphibians:				
Jemez Mountain Salamander	Plethodon neomexicanus	E	E	
Aquatic Organisms:				
Rio Grande Silvery Minnow	Hybognathus amarus	E	E	
Wrinkled Marshsnail	Stagnicola caperata		E	
Paper Pondshell	Utterbackia imbecillis		Е	
Invertebrates:				
Monarch Butterfly	Danaus plexippus	С		

Status Key E=Endangered; T=Threatened, C=Candidate.

No federally or state listed threatened, endangered, or proposed species were observed in the project area and the project area does not contain the preferred habitat for any of the special status species listed for Sandoval County, New Mexico. Habitat for Southwestern Willow Flycatcher (*Empidonax traillii extimus*), Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) and the Rio Grande silvery minnow (*Hybognathus amarus*) could occur in the Rio Grande and the adjacent bosque where Venada Arroyo connects with the Rio Grande. The project site is over one mile from the confluence with the Rio Grande and would not affect this area other than to provide improved water quality.

Based on the analysis above, the Proposed Action would have no effect on state or federally listed species or their critical habitat. The No-Action alternative would have no impact on state or federally listed species.

3.4 Cultural Resources

The area of potential effect (APE) for the Middle Venada Drainage Improvements 595 Project is behind a shopping center located at the intersection of NM 528 and Montoya Road. It is on an L-shaped property in a highly developed area. The APE is bordered by the shopping center to the north, NM 528 to the east, a housing development to the south, and Lincoln Ave NE to the west. The legal location for the APE is the SE and SW 1/4s of Sec 25 T13N, R 3E and the NE, NW, and SE 1/4s of Sec 36 T13N R3E. The APE is shown on the USGS 7.5- Minute quadrangle map Bernalillo, NM (35106-C5; 2020).

Pursuant to 36 CFR 800.4, the APE includes an area of 49 acres. On December 13, 2021, a Corps archaeologist conducted a search of the State of New Mexico Archaeological Records Management Section's New Mexico Cultural Resources Information System (NMCRIS) database and map server, the State Register of Cultural Properties, and the National Register of Historic Places. There have been seven surveys partially within the APE that were performed to

current standards. Only one of the previous surveys found a site potentially within the APE. In 1990, the US Environmental Protection Agency Region VI contracted Rio Grande Consultants, Inc. to perform a 915-acre linear survey (NMCRIS Activity No. 39720). One cultural resource site (LA 80867) was located potentially within the APE. The NMCRIS GIS viewer does not have a site boundary for that site, and the site forms stated that the GPS coordinates were taken from outside of the site boundary. LA 80867 was not relocated during our survey and is assumed to be located outside of the APE. LA 80867 is a multicomponent prehistoric habitation site dating between 5500 BC - 1300 AD. The site was tested and determined to be not eligible. The SHPO concurred with that determination in 1992.

Corps archaeologists conducted a survey of the Middle Venada Drainage Improvements 595 Project APE on 12/16/2021 (see Appendix C). The archaeologists performed an intensive survey by walking 15m E-W and then N-S transects. Surface visibility was approximately 60 percent. The understory consisted primarily of sagebrush and mixed grasses and forbs. No overstory was present. The area has been heavily disturbed by previous construction activities. Two roads have been created to allow heavy equipment to access the arroyo. Several manhole covers were also noted in the survey area. Modern trash and construction debris are widespread throughout the APE and within the Middle Venada Arroyo. No cultural resource sites, eight isolated occurrences, and one modern cultural phenomenon were located during this survey.

IOs 1 and 2 are both cornflower blue glass marbles of unknown age. IO 3 is a small length of barbed wire of unknown age. IO 4 is a flattened metal can fragment of unknown age. IO 5 is a white Quartzite flake measuring 4-6 cm in length. IO 6 is a potential Isolated Feature. It consists of five potential rock alignments. It doesn't appear to be a check dam or part of a foundation. Some of the alignments cross over each other and a few only consist of three rocks. The identification of the feature as a rock alignment is not certain. IO 7 is a large piece of welded iron of unknown age. IO 8 is a white Calcedony biface measuring 7 cm in length. None of the IOs could be dated to a specific time frame. It is the Corps' opinion that the informational potential of these isolated occurrences has been exhausted with recordation. The Corps determined that the eight isolated occurrences are not eligible for inclusion on the National Register of Historic Places (NRHP). The seven testing locations are not within the vicinity of the eight isolated occurrences.

The modern cultural phenomenon consists of a modern abandoned camp site that has been decorated with geometric pebble designs. The site likely dates to 2019 based on a 2019 penny that was found in a trash pile. The site consists of a modern trash pile and six geometric pebble designs (circles, a square, a serpentine shape, and the outline of a tent). The site is definitely modern and was likely created by an unhoused individual who was using the arroyo as a camp site. The geometric pebble designs were likely an attempt to beautify the area where they were temporarily living. Therefore, it is not old enough to be considered for eligibility on the NRHP. The Corps wanted to share information on this modern camp site so that it won't be mistaken for an archaeological site in the future.

The Corps initiated consultation with the New Mexico State Historic Preservation Office (SHPO) on the proposed project in a letter dated June 30, 2022 (see Appendix C). Based upon the information above, the Corps determined that the proposed Middle Venada Drainage Improvements 595 Project would result in no historic properties effected. The SHPO concurred with this determination on July 13, 2022 (SHPO Log Number 117552).

Pursuant to 36 CFR 800.2, consulting parties in the Section 106 process identified for the proposed project includes the Corps and SHPO. Scoping letters were mailed to tribes having cultural resources interests in Sandoval County, including the Comanche Nation of Oklahoma, Jicarilla Apache Nation, Kewa Pueblo, Navajo Nation, Ohkay Owingeh, Pueblo de Cochiti, Pueblo of Isleta, Pueblo of Jemez, Pueblo of Laguna, Pueblo of San Felipe, Pueblo of San Ildefonso, Pueblo of Sandia, Pueblo of Santa Ana, Pueblo of Santa Clara, Pueblo of Tesuque, Pueblo of Zia, and The Hopi Tribe, on April12, 2021. No Traditional Cultural Properties and no Indian Trust Assets are known to occur within or adjacent to the Rio Rancho Industrial Park. We received two responses to our tribal consultation letters (see Appendix C). The Pueblo of Sandia responded to our letter on July 8, 2022 with the comment, "The Pueblo of Sandia has no objection to the project and concurs in your determination of "no historic properties affected." We welcome the water quality benefits it hopefully will realize." The Pueblo of Santa Ana responded to our letter on July 22, 2022 with the comment, "The Pueblo of Santa Ana Tribal Historic Preservation Office (THPO) has reviewed the cultural resources investigation results provided in your request for consultation pursuant to Section 106 of the National Historic Preservation Act in reference to the proposed Middle Venada Drainage Improvements 595 project, in the City of Rio Rancho, Sandoval County, New Mexico. The THPO concurs with the Corps determination of No Historic Properties Affected."

3.5 Land Use and Socioeconomic Environment

Land use along both sides of New Mexico Highway 528 is characterized primarily by a mixture of residential and commercial developments.

The total estimated population of Sandoval County is 148,834 (U.S. Census Bureau 2023). The ethnic background for Sandoval County is: 41% white (non-Hispanic), 40% Hispanic (any race), 14% American Indian, 3% black, and 2% Asian. The median household income between 2018 and 2022 was estimated to be \$76,424. The average annual unemployment rate for Sandoval County in 2018 was 4.7% (New Mexico Department of Labor, 2024). Industries making major contributions to Sandoval Counties economy include health care and social assistance, retail trade, and educational services.

The Proposed Action would not affect land use or socioeconomic resources in the project area. The proposed improvements would be conducted under Section 595 of the Water Resources Development Act of 1999 (Public Law 106-53; 33 U.S.C. 2201 *et seq.*) as amended. This program is largely intended to provide needed assistance (technical, financial, etc.) to communities in which water resources are degrading and in need of improvement.

The project area does not include census tracts identified as disadvantaged or having environmental justice concerns according to the Council for Environmental Quality's Climate and Economic Justice Screening Tool. No adverse impacts on minority and low-income populations or communities with environmental justice concerns are expected. Under the definition of Executive Order 12898, there would be no adverse environmental justice impacts by the Proposed Action or under the No-Action alternative.

3.6 Cumulative Effects

The Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500-1508) defines cumulative effects as "...the effects on the environment that result from the incremental effects of the action when added to the effects of other, past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

The footprint of the proposed project lies in an area with a mix of urban growth and residential neighborhoods. The project area has been previously disturbed by adjacent development and previous stormwater management activities. The Proposed Action would not significantly impact the current conditions of the local environment. For these reasons, the proposed project when combined with the past, present, or future activities within southern Sandoval County would not significantly add to or raise local cumulative environmental impacts to a level of significance.

4. CONCLUSIONS

The Proposed Action evaluated in this EA addresses the method and potential effects for proposed water quality improvements. Impacts to the environment would be non-significant, short-term, and related solely to construction. The proposed project would not result in any moderate or significant short-term, long-term, or cumulative adverse effects. Therefore, the proposed project would not significantly affect the quality of the human environment and is recommended for implementation.

5. PREPARATION, CONSULTATION AND COORDINATION

5.1 Preparation

This EA was prepared for the Southern Sandoval County Arroyo Flood Control Authority (SSAFCA) by the U.S. Army Corps of Engineers, Albuquerque District. Personnel primarily responsible for preparation include:

Stephanie Jentsch	Biologist
Jessica Gisler	Archaeologist
Sarah Moore	Climate & Climate Change
Santiago Gallegos	HTRW
Martina Suazo	Project Manager

5.2 Quality Control

This EA has been reviewed for quality control purposes. Personnel who reviewed this EA include:

Dana Price	Biologist, Environmental Resources
Danielle Galloway	Section Chief, Environmental Resources

5.3 Consultation and Coordination

The public was provided a Notice of Availability (Appendix E) for a 30-day review period of the Draft EA on 16 September 2024. A hardcopy of the Draft EA was made available for public review at the Loma Colorado Main Library during the public review period. An electronic copy of the Draft EA was made available here –

https://www.spa.usace.army.mil/Missions/Environmental/Environmental-Compliance-Documents/Environmental-Assessments-FONSI/ The Notice of Availability was published in the Albuquerque Journal prior to the start of the public review period (Appendix E).

Agencies and entities that were contacted in preparation of this Final EA include:

Mr. Shawn Sartorius U.S. Fish and Wildlife Service New Mexico Ecological Services Field Office

Ms. Jennifer Faler U.S. Bureau of Reclamation Albuquerque Area Office

Mr. Mike Sloane New Mexico Department of Game and Fish Conservation Services Division

Ms. Jennifer Baca New Mexico Interstate Stream Commission Office of the State Engineer

Ms. Shelly Lemon Surface Water Quality Bureau NM Environment Division

Mr. John Rhoderick Water Protection Division NM Environment Department

Dr. Michelle Ensey State Historic Preservation Officer Historic Preservation Division

Mr. Wayne Johnson County Manager Sandoval County

Comments during the public review period were received from Sandoval County and the New Mexico Environment Department (NMED), Surface Water Quality Bureau. A comment response table is provided below.

Commenter	Comment	Response
Sandoval County	The County has no objection to the project.	Noted; thank you.
NMED, Surface Water Quality Bureau	Proper functioning arroyos naturally filter water and transport sediment. Clarify that there are no engineered treatments in the Venada Watershed.	Noted; changes made.
NMED, Surface Water Quality Bureau	Maintain natural sediment transport rates. Removing sediment from Arroyo Venada could exacerbate the existing sediment- starved condition of the Rio Grande that has developed downstream of Cochiti Dam.	Noted
NMED, Surface Water Quality Bureau	Include an alternative that considers arroyo restoration downstream of NM 528 to allow for the natural transport, storage, and deposition of sediment as an additional alternative.	Noted; restoration downstream of 528 is not a feasible alternative with the funding available at this time. The proposed project will improve conveyance downstream of NM528.
NMED, Surface Water Quality Bureau	Minimize the amount of contaminants that enter Arroyo Venada. Sediment basins can concentrate contaminants from urban runoff or act as reservoirs for pathogenic bacteria resulting in adverse downstream effects. Efforts should be made to minimize contaminants entering the arroyo by implementing a holistic watershed approach that includes constructing sediment basins outside of the arroyo.	Noted

6. REFERENCES

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- U.S. Census Bureau 2023. Available at: census.gov/data.html.

U.S. Department of Agriculture, 2024. Online Soil Survey for Sandoval County. <u>http://websoilsurvey.nrcs.usda.gov/app/</u>



Appendix A: Site Photos



Bank swallow nests (>200) outside of project area that would not be impacted from the proposed project.



Bank swallow nests (n=36) that would be impacted from the proposed project but outside of the migratory bird nesting season.



Evidence of illegal offroad vehicle use inside the Venada arroyo.



Encampment and debris at Venada Arroyo

APPENDIX B:

Climate and Climate Change

Environmental Assessment Middle Venada Arroyo Water Quality Improvement Project Southern Sandoval County Arroyo Flood Control Authority

Section 595 Water Resources Development Act

Rio Rancho, NM 2022



US Army Corps of Engineers ® Albuquerque District

Introduction and Guidance

This is an evaluation of climate and climate change in Middle Venada Arroyo Water Quality Improvement Project area and contributing watershed. This assessment was performed to highlight existing and future challenges facing the project's ability to mitigate flood risk in response to past and future climatic changes, in accordance with the guidance in Engineering Construction Bulletin (ECB) 2018-14, Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects, revised 10 Sep 2020. Background information on the project can be found in the main report, and background information on climate-affected risks to projects and assessments thereof can be found in the ECB.

Existing Conditions

Current Climate

Venada Arroyo is a small, low elevation watershed that originates on and cuts west to east across the mesa west of the Rio Grande. In the vicinity of the study area, the total relief of the contributing watershed is approximately 800 ft. Flows in the arroyo are intermittent: the normally dry gravelly bed only flows in response to direct precipitation in the watershed, with flood flows occurring only during intense storms directly over the small watershed area (16 sq. miles). In the project area, such storms typically occur in the summer half year (NMBGMR 2022), primarily during the North American Monsoon (NAM, July-September).

The project area has a semi-arid climate, characterized by cool winters and hot summers. While individual winter days can be very cold, average minimum temperatures exceed 25°F in the winter months, and daytime highs commonly exceed 45°F in even the coldest months. In the summer months, daytime high temperatures typically exceed 85°F from late May through early September (NWS 2022). Class A pan evaporations in this part of the state average 56 inches annually, with most of the evaporation (41 inches) in the period May to October (NMSU 2022).

Annual precipitation in the region averages approximately 9 inches (NWS 2022). In low elevation areas such as Venada Arroyo, November-June precipitation averages less than 0.5 in. / month (NWS 2022). In the winter, precipitation arrives as generally slow, steady rain or snow from large area, slow moving mid-latitude storm systems pushed west to east across the region by the jet stream (Sheppard et al. 2022). The project area is located southeast of the Rocky Mountains and Colorado Plateau, which means that even the wettest winter air masses have lost most of their humidity over this high terrain before arriving at the project area. The project is also located west of the Sandia Mountains, which blocks the more humid air that typically pushes north out of the Gulf of Mexico. Consequently, storm systems that pass over the project area will re-intensify to the east of the project area. Both processes result in less winter precipitation in the project area than in the surrounding higher terrain.

During the NAM, warm, humid air is pulled into northern New Mexico (NM) from the Gulf of California and, secondarily, from the Gulf of Mexico. The climate mechanism responsible for this change in moisture source is still debated (Boos and Pascale 2021, Adams and Comrie 1997) and there is significant annual variation in the timing, intensity and location of NAM precipitation. During the NAM, precipitation is primarily in the form of short-duration, locally-intense convective storms, and these storms are responsible for the flood flow in the arroyo. Moisture from tropical cyclones may become entrained in this flow, augmenting the moisture

available for precipitation. NAM precipitation typically averages 1-1.6 inches/month in the project area, but can vary locally by several times this amount in wet years. Parts of Rio Rancho recorded as much as 4.52 inches of rain over the period 10-18 September 2013 (https://www.weather.gov/abq/2013SeptemberFlooding-SandovalCounty), most of which fell on in the two-day window 13-14 Sept 2013 (CoCoRaHS 2022). Because of the typically hot, dry climate, the natural vegetation in the watershed is relatively sparse, with exposed bare, sandy ground between individual sand sage, salt bush, and bunch grass. Consequently, during NAM rain events, the places without canopy cover suffer from significant rainsplash erosion resulting in overland sediment transport to Venada Arroyo, and this exacerbates the problem of erosion and aggradation within the channel.

Observed Climate Trends

It was not possible to assess changes in precipitation and runoff within the project area for individual stations as required by ECB 2018-14. Long term observational records for locations in the project area do not exist. There are no stream gages or long-term precipitation gages in the Venada Arroyo watershed. Stream flows gaged on the Rio Grande main stem are not representative of local flows in Venada Arroyo. The nearest Rio Grande gaged tributary, the Jemez River, derives flows from the Jemez Mountains and would not be representative of processes operative at Venada Arroyo.

There are no detectable trends on observed precipitation intensity in the project area. Maximum 1-day precipitation is the best-available measure of trends in precipitation intensity given the way NAM precipitation falls. The nearest long-term precipitation record is the USGHCND Albuquerque International Airport, NM US (USW00023050) Cooperative Observer site. Precipitation data collection at this gage is not frequent enough to evaluate changes in precipitation at the sub-hourly scale needed to determine trends in precipitation totals. While it is likely that these totals reflect one or a very few number of storms in a given day, the data do not exist to translate these values into intensities. Trends in annual maximum 1 day precipitation were assessed using the Time Series Toolbox (Figure 3). No significant trends were identified (t-Test p-value = 0.2602, Mann-Kendall test p-value = 0.33236, Spearman Rank-Order test p-value = 0.31651), and no significant non-stationarities or breakpoints were identified in the dataset.

The lack of trend on annual maximum 1-day precipitation is consistent with the findings of Towler et al. (2020) who found no appreciable trend in summer precipitation extremes (defined as at least 0.2 inches / day) for the Rio Grande corridor above Elephant Butte Reservoir in south-central NM.



Figure 3. Trends in annual maximum 1-day precipitation, Albuquerque International Airport, NM US (USW00023050).

To assess overall regional trends in aridity in the lower elevation portions of the Rio Grande Valley, monthly precipitation for the City of Albuquerque, NM (Figure 4). The Albuquerque data highlights the overall high month-to-month and year-to-year variability in precipitation characteristic of the region. The data show no trend over time. Aggregating the data the county level (graphs not shown), which encompasses mountainous terrane not representative of the project (Jemez Mountains (Sandoval County) and Sandia Mountains (Bernalillo County)) does not change the results. However, Bernalillo County does show a very slight downward trend (0.01 inch/decade) in monthly precipitation not visible in the Sandoval County data.



Figure 4. Monthly Precipitation (1931-2022) for the City of Albuquerque, NM, with mean (grey) and trend (blue) lines (NOAA NCEI 2022).

While precipitation has remained unchanged, monthly average temperatures (Figure 5) have risen at a rate of $+0.4^{\circ}$ F per decade within the Rio Grande Valley over the period 1931-2022. Warm months appear to be increasing at a slower rate than cold months. In recent years, cold month average temperatures have remained above 32°F. Monthly average maximum (daytime high) temperature has increased at a rate of $+5^{\circ}$ F per decade within the Rio Grande Valley (NOAA NCEI 2022).



Figure 5. Monthly average temperature (1931-2022) for the City of Albuquerque, NM, with mean (grey) and trend (blue) lines (NOAA NCEI 2022).

The changes in temperature coupled with the lack of change in precipitation indicates an overall shift in the regional water balance to a more arid condition (University of Arizona 2022). Increased aridity is important because it leads to reductions in vegetation canopy cover density, exacerbating the problem of rainsplash erosion and sediment transport. This shift to increased aridity is evident in the time series of calculated 12-Month Standardized Precipitation-Evapotranspiration Index for southern Sandoval County, NM (35.3174°N, -106.5770°W) (Figure 6), which provides a measure of annual drought relative to the aridity of the entire period of record. This graph shows that the water balance has become increasingly negative over the period of record (both more frequent negative values and more extreme negative values, although not more extreme than the drought of record in the 1950s).



• A statistically significant trend (at the alpha = .05 level) was detected by the t-Test.

• A statistically significant trend (at the alpha = .05 level) was detected by the Mann-Kendall Test.

• A statistically significant trend (at the alpha = .05 level) was detected by the Spearman Rank-Order Test.

Figure 6. Southern Sandoval County observed change in SPEI, based on PRISM data (University of Arizona 2022).

Projected Future Conditions

Climate models project temperatures will continue to rise in the project area over the 21st Century in proportion to greenhouse gas emission rates, with annual average temperatures increasing by about 6°F between now and the period 2040-2069 (NMBGMR 2022). Without mitigation, multi-model mean annual average temperatures increase by almost 10°F by the end of the century (Figure 7).

In addition to increasing evaporation and, therefore, regional aridity, rising temperatures affect precipitation frequency, intensity and quantity. For every 1.8°F warming in temperature, air can hold 7% more water when saturated (NMBGMR 2022): when it rains, there is potentially a lot more water available to precipitate. Although there is no evidence to support an increase in the probable maximum precipitation event, increases in intensity of more frequent events are likely (NMBGMR 2022).

Precipitation is also expected to become more variable, with more dry days (less than a trace of precipitation) and fewer days with drizzle/light rain. Conditions favoring annual plant establishment (e.g., forbs) may be reduced, resulting in reductions in canopy cover. Such soil moisture reductions reduce infiltration rates and increase runoff rates, and in combination with more bare ground may increase erosion and sediment transport to channels (NMBGMR 2022) such as Venada Arroyo.

The Climate Hydrology Assessment Tool (CHAT) streamflow statistics apply to the largest stream segment in the HUC13020203 – Rio Grande-Albuquerque watershed, which is the Rio Grande. Flows on the Rio Grande are dependent primarily on snowmelt runoff from distant headwaters regions and, therefore, do not inform on locally-generated flows in Venada Arroyo. Modeled future temperature and precipitation data (Figure 7), however, are based on local conditions and therefore inform on the project area. The CHAT tool shows steady increases in mean annual temperature over the 21st Century, with larger increases corresponding to greater greenhouse gas emissions (relative concentration pathway (RCP) 8.5). The multi-model average annual maximum 1-day precipitation is not much changed, although some of the model extreme values are larger than those modeled historically [2.6 to 2.86 inches vs. 2.04 (modeled) and 1.96 (observed record) inches].



Figure 7. CHAT v2.2 output for HUC 13020302 - Rio Grande-Albuquerque.

Looking more closely at the CHAT, the multi-model average of the annual maximum 1-day precipitation total exhibits a small but statistically significant trend for the RCP 8.5 scenario, increasing in value from 0.69 to 0.78 inches over the 21st century (Figure 8). The trend for the RCP 4.5 scenario is not significant.



Figure 8. CHAT v2.2 simulated trends output for HUC 13020302 - Rio Grande-Albuquerque.

Most of the large flood flows in Venada Arroyo occur during the NAM. Climate models do not do a good job of projecting precipitation changes associated with the NAM because climate model resolution is too coarse to capture the dynamics of local storm formation. The climate models do project changes in overall precipitation in the NAM. Models consistently show the already fairly dry spring season is likely to become drier in the future (NMBGMR 2022), which may reduce the soil moisture available for initiate precipitation in first part of the NAM (late June, early July). Precipitation in August is also projected to be lower, followed by small increases in precipitation in September and October compared to historically (Figure 9). This pattern is evident in the boxplots of projected changes in monthly mean precipitation from the CHAT. These changes are generally interpreted as a projected shift in the timing of the NAM to later in the year (NMBGMR 2022; Cook and Seager 2013). The significance for the project area is that there timing of flood flows in the project area may shift to later in the year.

Figure 9. Projected change in monthly precipitation for HUC 13020302 - Rio Grande-Albuquerque.

The Civil Works Vulnerability Assessment Tool provides little information for HUC 1302 Rio Grande-Elephant Butte that is relevant to this project area since the flow metrics pertain primarily to the Rio Grande. It does show that population density/urbanization is likely to increase in the Albuquerque Metropolitan Area, including Rio Rancho. This would be likely to contribute to flood risk by reducing the expanse of sandy soils, thereby reducing infiltration rates off-channel and contributing to runoff, erosion and sediment transport. Individual, localized storm events cannot be directly modeled at this time, so there is no quantitative way to estimate changes in precipitation extremes that would affect Venada Arroyo.

The high level of scientific uncertainty of future extreme precipitation events leaves policymakers and water managers without clear, quantitative guidance regarding future trends in extreme precipitation—or even what the current risk of these events might be. From a risk management perspective, a conservative policy approach would seem to be to accommodate the possibility of increased extreme precipitation events in a warmer climate. This is the approach taken recently by the state of Colorado... A similar approach should be considered by the state of New Mexico. Progress in narrowing the uncertainties in quantifying likely extreme precipitation, and estimating future trends in extreme precipitation and flooding events, represents a first-order need for continuing future research. (NMBGMR 2022, p. 105)

Although the available data are not sufficient to quantify future flood risk in the project area, the information that is available indicates that the runoff and erosion along Venada Arroyo are likely to continue and worsen with time.

Summary

Existing Conditions

Climate change is assessed in accordance with Engineering Construction Bulletin (ECB) 2018-14, Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects. This section summarizes the results of the analysis presented in Appendix B.

The climate of the Venada Arroyo watershed is semi-arid, averaging approximately 9 inches per year. Vegetation in the project area consists primarily of sparse xeriphytic shrubs (sand sage, saltbush), bunch grasses, and succulents separated by bare, sandy soil. Most of the precipitation falls during the North American Monsoon (NAM) in the months of July-September. This precipitation falls in localized, intense storms able to deliver an inch or more of rain to the watershed. It is primarily these types of storms that cause flooding, erosion and sedimentation in the project area.

There are no long-term precipitation or stream gages in the project area. The nearest long-term weather station at a comparable topographic location is the USGHCND Albuquerque International Airport, NM US (USW00023050) Cooperative Observer site. Data from this site shows temperatures have been increasing at a rate of 0.4°F/decade. The rise in temperature is driving up regional evaporation rates and the climate is becoming more arid. Precipitation data collected at this gage is not frequent enough to evaluate changes in precipitation at the sub-hourly scale needed to determine trends in precipitation intensity from individual thunderstorms. The temporal resolution is limited to daily precipitation totals. While it is likely that these totals reflect one or a very few number of storms in a given day, the data do not exist to translate these values into intensities. There is no detectable trend in the annual maximum 1-day precipitation at this location.

Future Without-Project Conditions

Temperatures in the project area are projected to rise through mid-century by about 6°F between now and the period 2040-2069. Without mitigation, multi-model mean annual average temperatures are projected to increase by almost 10°F by the end of the century. Because rising temperatures increase the amount of humidity the air can hold, increases in temperature are projected to result in increasingly variable precipitation regimes (more dry days, fewer drizzle days, more intense precipitation when it rains). These changes projected to lead to:

- Increases in overall aridity in the project area, leading to decreases in soil moisture and sparser canopy cover. In turn, these changes will decrease infiltration during storm events (resulting in higher runoff rates) and increase the area subject to rainsplash erosion (resulting in more sediment available for transport to and through Venada Arroyo).
- Increases in the frequency and/or intensity of individual storm events, although this cannot be reliably quantified at this time. Stronger storms would have the potential to produce larger flood flows in the arroyo, and entrain and transport more sediment.
- Changes in the timing of flood flows is also likely as the precipitation associated with North American Monsoon (NAM) shifts to later in the year (from July-September to September-October).

Residual Risk Due To Climate Change

Because climate model resolutions are too coarse to directly model individual storm cells, it is not possible to quantify projected changes in precipitation quantity or intensity over the project area for the kinds of events responsible for flood flows along Venada Arroyo. While there is high confidence that the existing flood conditions will continue to be a problem in the future, and that these are likely to worsen (precipitation intensity and quantity increases for individual storms), these changes cannot be quantified. Therefore, potential future impacts to project performance cannot be assessed.

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