FINAL REPORT

Maintenance Access and Trails Master Plan

Southern Sandoval County
Arroyo Flood Control
Authority

June 2018

This page intentionally left blank

Table of Contents

List of Figures

List of Tables

Appendices

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ADA	American Disability Act
ADAAG	American Disability Act Accessibility Guidelines
AMAFCA	Albuquerque Metropolitan Arroyo and Flood Control Authority's
ATV	All-Terrain Vehicle
CMAQ	Congestion Mitigation and Air Quality Improvement
FAST Act	Fixing America's Surface Transportation Act
FFY	Federal Fiscal Year
HUD	Housing and Urban Development
LEE	Lateral Erosion Envelope
LWCF	Land and Water Conservation Fund
MAP-21	Moving Ahead for Progress in the 21st Century
MRCOG	Mid-Region Council of Governments
MTP	Metropolitan Transportation Plan
MUTCD	Manual of Uniform Traffic Control Devices
NAAQS	National Ambient Area Air Quality Standards
NMDOT	New Mexico Department of Transportation
NRCS	Natural Resource Conservation Service
NRTFA	National Recreational Trails Fund Act
O&M	Operations and Maintenance
ORV	Off-Road Vehicle
QoL Plan	Quality of Life Master Plan for Watershed Parks
RAP	Recycled Asphalt Pavement
ROW	Right-of-Way
RTP	Recreational Trails Program
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SRTS	Safe Routes to School
SSCAFCA	Southern Sandoval County Arroyo Flood Control Authority
TAP	Transportation Alternatives Program
TPL	Trust for Public Land
USDA	United States Department of Agriculture

Definitions

Primitive Trail – A primitive trail is a path in an area with rustic scenery where there are no maintain roads or permanent structure

Social Path – A social path is a route that others use repeatedly to move from one area to another, which can quickly become an established trail.

Mobility – Mobility is defined as the act or ability to move from one's present position to one's desired position in another part of the environment safely, gracefully, and comfortably.

Buffers – Filter pollutants from storm water runoff before it reaches the arroyo. Storm water discharges from trails should be designed for maximum treatment, sedimentation, infiltrations, and level-spreading before entering any stream or river.

This page intentionally left blank.

Section 1
Introduction

Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) is a storm water management agency, established by the New Mexico Legislature in 1990. SSCAFCA's mission is to provide flood protection; to restore natural resources; to reduce sediment, water pollution and erosion; and to actualize the multi-use potential of land purchased or managed for flood control purposes.

SSCAFCA has developed this Maintenance Access and Trails Master Plan (Master Plan) to provide guidance and facilitate interagency cooperation on the development and management of off-street trails within storm water facilities and arroyo channels. As further detailed below, the trails system will have the added benefit of increasing community access and connectivity for all modes of transportation.

1.1 Vision Statement

This Master Plan presents a long-term vision of a comprehensive trails network that utilizes mostly SSCAFCA drainage right-of-way (ROW) to provide safe and convenient access and maintenance for the widest range of users of varying interests and abilities to community, transportation, and recreational facilities.

1.2 Goals

The purpose of this Master Plan is to provide a quality system of environmentally sustainable trails, ranging from minimally to fully developed. The following goals, not listed in priority, serve to support the vision statement.

Maintenance

To provide a comprehensive plan for effective access to maintain arroyo channels and flood control facilities throughout the SSCAFCA jurisdiction.

Safety

To recommend strategies that provide a safe and secure trail system for users of all abilities, such as removing barriers to access, improving arroyo crossings and minimizing security concerns.

Recreation

To accommodate a variety of outdoor active and passive recreational opportunities, not typically supplied by community parks and recreational facilities.

Local and Regional Connectivity

To establish an integrated and interconnected network of trails that links neighborhoods to local destinations, such as libraries, civic and community centers, parks, schools, historic landmarks, tourist attractions, transit stops, places of employment, medical facilities, and commercial and retail establishments, as well as linkages to other trail systems that can provide regional access.

Environmental

To minimize ecological impacts and preserve sensitive natural areas through sustainable trail design and construction.

Funding

Pursue a variety of public funding sources, while leveraging capital investments and development projects, to develop and maintain the trails system.

1.3 Benefits

A variety of benefits are associated with trail development, as listed in **Table 1-1**.

Table 1-1 Trail Benefits

Economic	Environmental	Health and Fitness	Community
– Increased property values – Lower road infrastructure maintenance costs – Reduced spending on health care costs – Increased tourism and recreation spending, such as bikes, rentals, clothing, lodging, food, maps, etc. – Increased access to local employment opportunities – Reduced costs resulting from environmental degradation and flood damage	– Reduce traffic congestion – Increased commuter pedestrian and bicycle (non-motorized transportation modes) travel opportunities – Improved air quality – Reduced greenhouse gas emissions – Enhanced use of open space – Protection of wildlife environments – Preserved floodplain functionality	– Increases attractive and easily accessible exercise – Reduces risk of health-related problems, such as coronary heart disease, diabetes, cancer, and obesity – Builds muscular strength and flexibility – Enhances well-being	– Higher quality of life – Improved overall community appeal – Increased community pride and character – Improved natural aesthetics – Increased learning about nature and the environment – Enhanced passive recreational opportunities – Provide equitable access to community resources

1.4 Consistency with Quality of Life Plan

In 2006, SSCAFCA adopted the Quality of Life Master Plan for Watershed Parks (QoL Plan), which contains strategies for realizing the vision of a connected system of joint-use improvements along their extensive network of arroyos or other large contiguous land tracts to provide public benefits and enhance well-being, in addition to flood protection. As part of its storm water management mission, SSCAFCA recognized that its arroyo watershed parks can host multiple amenities and present opportunities to interface with various types of adjacent property development. Therefore, the QoL Plan introduced the concept of arroyo watershed parks, each consisting of comprehensive program components to encourage joint-use partner commitments, including:

- Target Locations: trail, joint-use siting suggestions
- Legislative Initiatives: enacting regulations and guidelines to enforce quality criteria

- Funding Sources: resource development for financing arroyo improvements
- Management Responsibility: partnering agencies or organizations to operate and maintain amenities

Whereas the QoL Plan sets the policy direction and lays the vision for the multi-use of arroyo watershed parks, this Master Plan is implementation-focused by refining proposed access trail locations and alignments and identifying funding strategies. This Master Plan continues the valued-added purpose of arroyo land utilization, developed in the QoL Plan, to create a continuous, connected network of trails.

This page intentionally left blank.

Section 2

Existing Trails Network

2.1 Setting

2.1.1 SSCAFCA Jurisdictional Area

SSCAFCA serves the City of Rio Rancho, Village of Corrales, Town of Bernalillo, and a portion of Sandoval County. Parts of the Zia and Santa Ana Pueblos also are contained within SSCAFCA's service area. SSCAFCA oversees approximately 200 square miles or nearly 128,000 acres of land. The boundaries of its authority include the southern portion of Sandoval County bounded on the east by the Rio Grande, on the south by the Sandoval County border, on the west by the watershed park boundary of the Rio Puerco drainage and on the north by the top of the drainage that lies on the southern boundary of the Zia Pueblo, the Santa Ana Pueblo, and US Highway 550 (Hwy 550). **Figure 2-1** shows SSCAFCA's jurisdictional area.

There are 14 distinct watershed parks (also referred to as drainage basins) in SSCAFCA's service area, including the La Barranca Arroyo, Black Arroyo, Calabacillas Arroyo, Coronado, Corrales East, Corrales West, Montoyas Arroyo, NM 528, Red River, Rio Rancho Urban Center, Venada Arroyo, Willow Creek Watershed Park, and the Zia Watershed Park. The major watershed parks are the Calabacillas Arroyo, Montoyas Arroyo, Black Arroyo, La Barranca Arroyo, and Venada Arroyo. The watershed parks located within SSCAFCA's service area are shown in **Figure 2-2**.

2.1.2 Lateral Erosion Envelope

There are highly erodible soils in the SSCAFCA service area, which pose a serious flood risk. Floodwaters with high peak flows and volumes that occur in a much shorter time period due to the urbanization of the arroyo watershed parks has accelerated erosion resulting in deeper and wider channels. In addition, increased traffic, both motorized and non-motorized, within the arroyo channels has further disturbed the non-cohesive soils that comprise the bed and banks. Without some form of control, this will continue to disturb the channels and result in higher erosion rates.

The LEE is a boundary along a natural arroyo within which there is a high possibility of lateral channel degradation during high flow events and channel degradation due to erosion. Land within the LEE needs to be preserved for flood conveyance purposes. For any activity, including trails, proposed along arroyo channels within the LEE boundary, an engineering study must be performed to evaluate the potential effect on the vertical and lateral stability of the arroyo channel. SSCAFCA works with all entities within its jurisdiction to limit development within the LEE in a safe manner. No development, such as trails and channel crossings, within the LEE can have an adverse impact on channel or floodplain stability. **Figure 2-3** shows the LEE within SSCAFCA's service area.

2.2 Existing Trails

The following is a description of the various trail systems that are adjacent to or within the SSCAFCA service area. Existing trails belonging to different jurisdictional service areas commonly overlap or intersect to increase user convenience. The existing SSCAFCA trails and their connections to other trail networks are shown in **Figure 2-4**.

2.2.1 SSCAFCA

Much of the existing system consists of trails that are largely disconnected from one another; affording minimal opportunity for continuous travel on the trails without having to exit to a roadway or venture cross-country.

The newest trail by SSCAFCA is the Black Arroyo Trail, an approximately 1.25-mile paved path that roughly follows the course of the Black Arroyo. The trail is part of the 72-acre Black Arroyo Wildlife Park. The northern end of the trail is on Southern Boulevard opposite Lisbon Avenue, and the southern end is on 19th Avenue just north of Westside Boulevard. The trail includes a single-span pedestrian bridge up to 220 feet long over the arroyo just west of Maggie Cordova Elementary School. The trail also includes two culverted crossings, trailhead parking areas, interpretive signage, shade structures, and wildlife drinking fountains supplied with harvested water.

2.2.2 City of Rio Rancho

The City of Rio Rancho prepared a Bike and Pedestrian Master Plan in 2011 that has been used as a basis for the continued development of a trails system. This master plan identified numerous trails associated with parks. The five major trails include Bosque Trail, Enchanted Hills Path, Los Rios Trail, Trailhead Trail, and Willow Creek Trail. **Figure 2-5** shows existing and recommended trails as of 2011, and identifies trail access opportunities, several of which are located along arroyos including Venada Arroyo and La Barranca Arroyo. The map also identifies proposed trail connections along the Calabacillas Arroyo, Montoyas Arroyo, and Venada Arroyo.

2.2.3 Village of Corrales

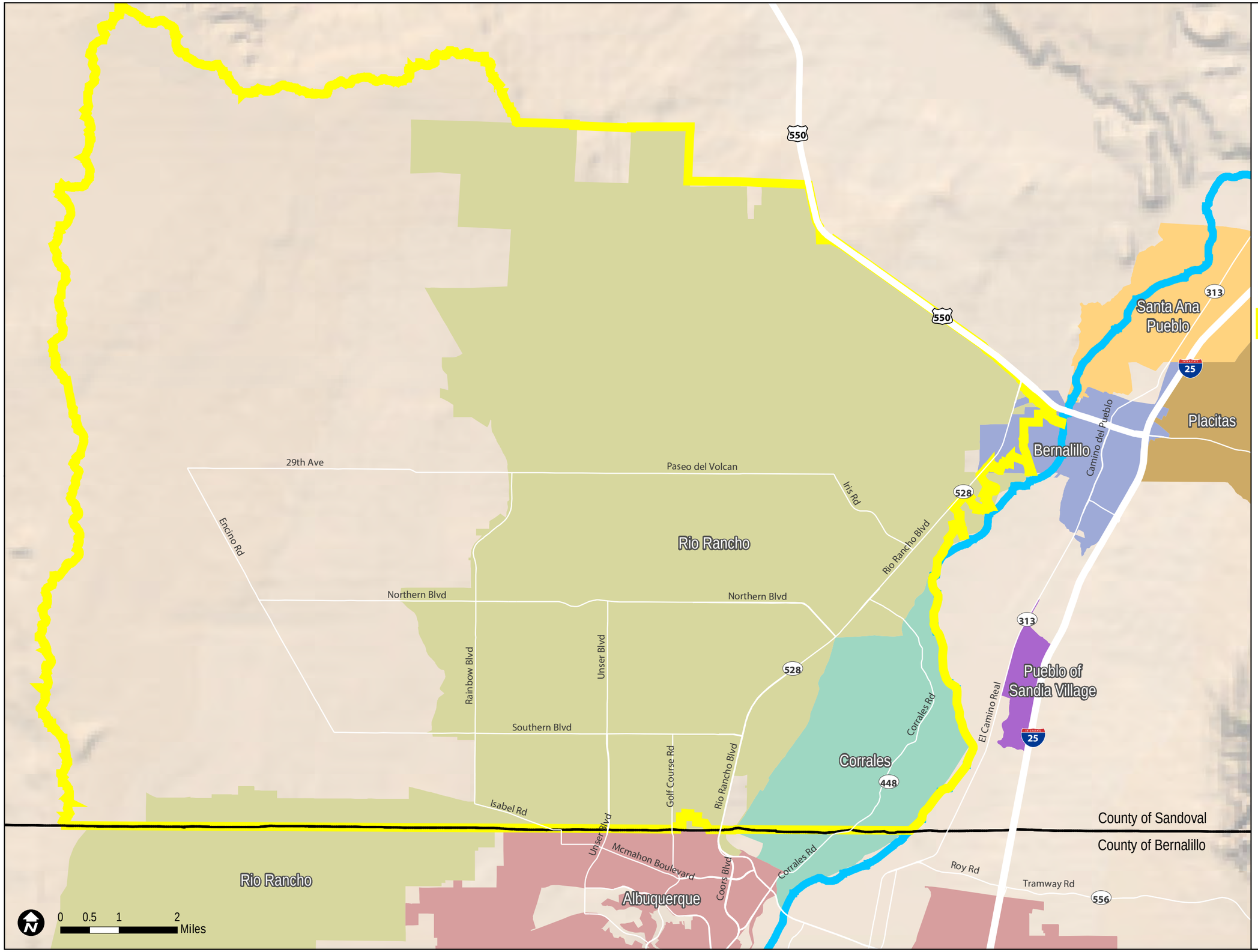
There are numerous primitive trails[1] that run primarily north to south through the Corrales Bosque Preserve, a narrow riverside strip of relatively natural cottonwood forest along the Rio Grande. North of the Rio Grande Valley State Park, it is located between the river and the levee and is bounded on the north by the Corrales Siphon and on the south by the Alameda Bridge. The intent of this preserve is to maintain wildlife habitat in the Rio Grande bosque, allowing passive, non-destructive recreation activities, including hiking, jogging, fishing, horse-back riding, bicycling, and bird watching. No formal trails are designated in the preserve, although there is a non-maintained single-track trail that appears to run the length of the preserve, in addition to several social trails.

[1] Generally, a primitive trail is a path in an area with rustic scenery where there are no maintain roads or permanent structure.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 2-1
SSCAFCA Jurisdictional Area



Legend

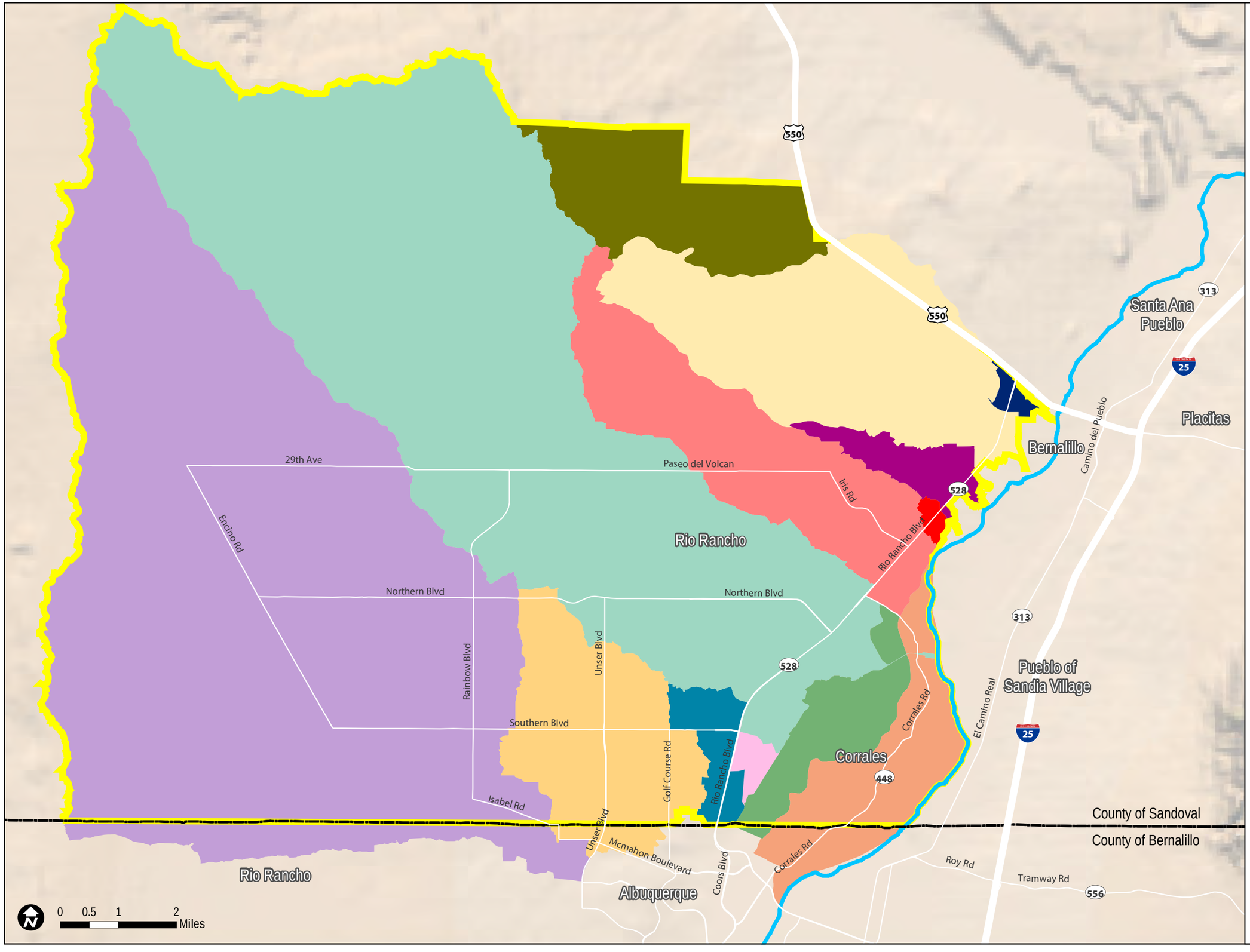
- County Boundary
- SSCAFCA Service Area
- Rio Grande
- Albuquerque
- Bernalillo
- Corrales
- Placitas
- Pueblo of Sandia Village
- Rio Rancho
- Santa Ana Pueblo

This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 2-2
SSCAFCA Watershed Parks



Legend

- County Boundary
- Rio Grande
- SSCAFCA Service Area
- Barranca Watershed Park
- Black Watershed Park
- Calabacillas Watershed Park
- Coronado Watershed Park
- Corrales East Watershed Park
- Corrales West Watershed Pard
- Montoyas Watershed Park
- NM 528
- RRUC Watershed Park
- Red River Watershed Park
- Venada Watershed Park
- Willow Creek Watershed Park
- Zia Watershed Park

This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 2-3
SSCAFCA Lateral Erosion Envelope

Legend

- SSCAFCA ROW
- Lateral Erosion Envelope
- Rio Grande
- County Boundary
- Soft Channel
- Hardened Channel
- Other Stream/River
- SSCAFCA Service Area

ARROYO DE LOS MONTOYAS
ARROYO PANTADELEON
NORTHERN MEADOWS
ARROYO BARRANCA
ARROYO VENADA
LOWER VENADA
ENCANTADO CHANNEL
LOWER BARRANCA
ARROYO DE LAS LOMITAS NEGRAS
ARROYO DE LOS MONTOYAS
ARROYO DE LAS CALABACILLAS
LISBON ARROYO
CORRALES MAIN CHANNEL
CORRALES ACEQUIA
RIVERSIDE DRAIN

29th Ave
Paseo del Volcan
Encino Rd
Northern Blvd
Rainbow Blvd
Unser Blvd
Rio Rancho Blvd
Southern Blvd
Isabel Rd
Golf Course Rd
Mcmahon Boulevard
Coors Blvd
Corrales Rd
El Camino Real
Camino del Pueblo
Iris Rd
Roy Rd
Tramway Rd

550
313
25
528
448
556

Rio Rancho
Santa Ana Pueblo
Placitas
Bernalillo
Pueblo of Sandia Village
Corrales
Albuquerque
County of Sandoval
County of Bernalillo

0 0.5 1 2 Miles

This page intentionally left blank.

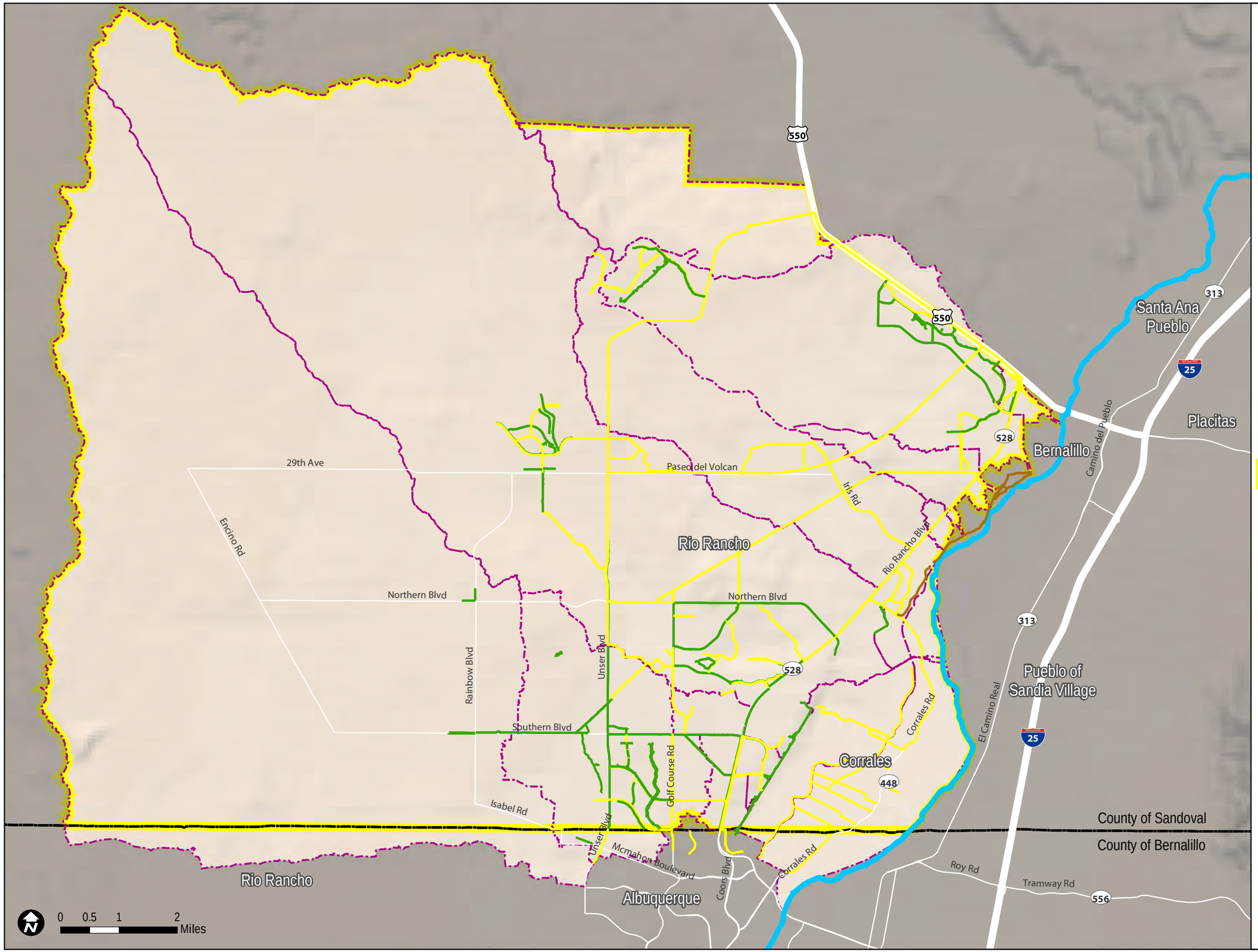
Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 2-4
Existing Trails

Legend

- Existing Bike Lane and/or Route
- Existing Unpaved Multi-Use Trail
- Existing Paved Multi-Use Trail
- Rio Grande
- Watershed Park
- County Boundary
- SSCAFCA Service Area



This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 2-5
Recommended Trail Improvements in the City of Rio Rancho

Legend

- Development Nodes
- Grade Separation Crossings
- Principal Arterial
- Minor Arterial
- Collector/Private
- Bike Lane
- Bike Route
- Bike Path
- Bike Trail
- Unpaved Trail
- Proposed Lane
- Proposed Route
- Proposed Path
- Proposed Trail
- Arroyo (with 75' buffer Impact Area)
- School
- Parks and Rec Properties Commercial
- Land Uses
- City Limits

Recommended Improvements

- Trail Access Opportunity
- Intermodal Connection
- Pedestrian Connection
- Complete Street

Souce: City of Rio Rancho, 2011.

1 0 1
MILES

This page intentionally left blank.

2.2.4 City of Albuquerque

The City of Albuquerque has more than 620 miles of bike paths and trails, including the Paseo del Bosque Trail. This trail extends approximately 16 miles from Alameda Boulevard to Rio Bravo Boulevard and runs along the east side of the Rio Grande. A variety of low-impact recreation uses are allowed on this paved trail such as hiking, bicycling, mountain biking, in-line skating, and horseback riding. Access to the Paseo del Bosque Trail is available from Alameda Boulevard, Paseo del Norte, Montaño Road, Campbell Road, Central Avenue, Marquez Street, and Rio Bravo Boulevard. This trail is the premiere trail in the metropolitan area and provides connections to SSCAFCA's service area.

2.2.5 Bernalillo County

In 2009, Bernalillo County contained 71 miles of multi-use trails, bike lanes and routes. An additional 47 miles of multi-use trails and bike lanes were proposed in 2012. Bernalillo County pedestrian and bicycle trails provide connection between the quadrants of the Albuquerque metropolitan area. Multi-use and bike trails in the northwest Bernalillo County jurisdiction provide nodal connections to the SCCAFCA service area.

2.3 Future Trails

The bike and pedestrian plans of the Cities of Rio Rancho and Albuquerque identify numerous trails proposed that include, or are adjacent to, the SSCAFCA service area.

2.3.1 Mid-Region Council of Governments

The Mid-Region Council of Governments (MRCOG), a multi-county governmental agency for the Albuquerque Metropolitan Planning Area, updated the region's long-range transportation plan, the *Futures 2040 Metropolitan Transportation Plan* (MTP). The MTP identified connectivity of roadways, transit, trails and paths as a regional challenge and need. It specifically recommended that proposed roadways and trail systems in developing areas facilitate travel to adjacent neighborhoods. In both developing and developed areas, drainage and utility easements are recommended to be assessed as possible trails or local roads. However, none of the trail projects identified in the *Futures 2040 MTP* are located within the SSCAFCA service area.

2.3.2 Lisbon Channel and Multi-Use Trail

SSCAFCA has proposed a maintenance access/multi-use trail along the east bank of the Lisbon Channel, extending from an existing trail near Southern Boulevard less than a mile northeast to Tarpon Avenue. The trail will be surfaced with either a base course or pavement. Construction of the trail is anticipated for 2018.

This page intentionally left blank.

Section 3
Proposed Trails Network

This section describes the proposed trails network, including enhancements to existing trails currently in place, connections to numerous destinations, potential acquisition of ROW, and identification of trail crossings.

3.1 User Group Type

The proposed trail network aims to effectively accommodate a wide range of user groups. Depending on the conditions of the trail, various users may share a trail path simultaneously.

3.1.1 Pedestrian

Pedestrians include a combination of those using trails for recreational or commuting purposes. Recreational pedestrians use trails for exercise or viewing scenery and/or wildlife. Recreation use along trails is often a social activity with two or more participants in a group. Typically, trail use for recreational purposes may not have a distinct destination; it is the activity that defines the purpose.

Pedestrian commuters, however, usually have a distinct destination, such as a transportation hub, community or government center, shopping district, educational or medical facility, and work location. Commuters often use more than one mode of transportation (i.e., walking a trail to access a bus stop or train station).

Both recreational users and commuters may use a combination of sidewalks and trails. Where neither is available, they may use streets or social paths[2] for access purposes. While sidewalks are important to the overall circulation network for pedestrians, the focus of this Master Plan is the off-street trails network.

In addition, some pedestrians are mobility-impaired[3] and require assistance to access trail paths.

3.1.2 Bicycling

Bicyclists also use trails for recreational and commuting purposes. Their characteristics are very similar to pedestrians, although bicyclists move at a higher rate of speed. This difference can present a conflict between bicyclists and pedestrians, resulting in safety hazards when both are present on the same trail, particularly if they are traveling in groups. Although this conflict cannot always be eliminated, good trail design can minimize it.

[2] A social path may be a route that others use repeatedly to move from one area to another, which can quickly become an established trail.

[3] Generally, mobility is defined as the act or ability to move from one's present position to one's desired position in another part of the environment safely, gracefully, and comfortably.

As commuters, a bicyclist's primary concern is for ease of use and ability to travel quickly in a safe manner. As such, commuter bicyclists usually prefer hard trail surfaces, such as concrete or asphaltic pavements.

Recreational bicyclists can be divided into two groups: road bikers and off-road or mountain bikers. Road bikers generally stay on paved trails and bike lanes along roadways, often using a combination of both. Mountain bikers prefer soft surface or dirt trails that require more technical riding abilities to overcome obstacles. As such, mountain bikers use paved trails to access unpaved and unimproved trails. Mountain bikers have an aesthetic preference for single-track trails, but also use double-tracks that serve recreational motorized vehicles. In addition, mountain bikers often share trails with equestrians, regardless of single- or double-track.

3.1.3 Equestrian

Equestrians, those riding horses, are primarily recreational trail users and generally prefer a safe, contiguous trail experience within a natural setting with good sight lines and clearing width. A horse weighs approximately 800 to 1,400 pounds and travels three to five miles per hour at a walking pace or slow canter. This slow pace allows riders to travel safely in groups or single file. They desire variety, such as stream crossings, grade climbs and descents, and open areas. They also prefer loose or compacted dirt trails because hard surfaces and coarse gravel can injure horse hooves.

A main concern of equestrian trail users is maintaining control over their horse. A horse that shies or starts unexpectedly represents a hazard to its rider and others nearby on the trail. Therefore, proper equestrian trail design needs to provide a combined sense of security for both the horse and the rider. Due to the risks and uncertainties associated with interactions between horse, bicyclists and even pedestrians, equestrian trails may often be physically separated from trails used by others. Separation can be as simple as a soft trail adjacent to a paved trail. Where separation is not possible, educational signage is necessary to alert users of trail etiquette and right-of-way requirements between pedestrians, bicyclists and equestrians. The same is true for single- and double-track trails that may convey bicyclists, ORVs and horses.

3.1.4 Off-Road Vehicle

Motorized recreational transportation includes a class of vehicles termed off-road vehicles (ORV), which are all-terrain three or four wheeled vehicles (ATVs), dirt bikes, and motorcycles. These vehicles are primarily designed for non-roadway travel in natural terrain. ORV use along arroyo channels in the SSCAFCA service area has been increasing, apparent from obvious tracking and bed and bank disturbance. Arroyos are often used to access off-road areas along the Rio Puerco/Rio Grande escarpment west of the SSCAFCA service area. One such area is the End of Southern trailhead which links up with 32 miles of primitive trails used by ORVs and motorbikes. The Arroyo Calabacillas ends at the Rio Grande and is used by mountain bikers and ORV users to access the End of Southern trailhead. The lower Arroyo Montoyas area also experiences ORV traffic as do other arroyo channels in the SSCAFCA service area.

Because of its popularity, ORV use and consequent impacts on SSCAFCA arroyos cannot be ignored. Indiscriminate use of ORVs in arroyo channels result in water quality impacts as the bed and bank disturbance increases the likelihood of sediment entrained in arroyo flows. In addition,

ORV use on trails shared with other trail users can result in increased safety hazards. ORV use also creates a noise nuisance for residents and businesses. Therefore, ORV use should be strictly controlled, both through regulation and design. ORV trails should be physically separated from trails used by pedestrians, non-motorized bicyclists and equestrians. Alternative access to primitive trailheads that does not include travel along arroyo channels or within LEE boundaries should be considered. ORV access within the LEE should be prohibited, both by regulation and physical means.

3.2 Trail Analysis

As indicated in Section 2, significant trail system planning has already been performed by the cities of Albuquerque, and Rio Rancho as well as Bernalillo County, the Village of Corrales, and the MRCOG. Proposed trails identified by these three entities often overlap and can benefit from connections to or extensions of existing trails that provide SSCAFCA maintenance access and are sanctioned for multi-modal usage. New trails that border SSCAFCA rights-of-way can increase the effectiveness of both existing and planned trails

3.2.1 Methods

The identification of the proposed trail segments under this Master Plan is based on a review of previous planning documents and policies, a review of existing and future trails, collection of geospatial data and aerial imagery, consideration of public input received from past outreach efforts, and a nodal analysis to identify best connections possible.

3.2.2 Right-of-Way

Most, if not all, of the proposed trails would be located along existing arroyos and/or drainageways. Many drainageways present a unique opportunity because they have sufficient ROW width to accommodate multi-use trails. If ROW is not available within a corridor, then the development of a proposed trail may require the acquisition of additional property and/or easements. Due to SSCAFCA's flood control responsibility, ROW acquisition should be within the LEE and must be in accordance with drainage improvements. However, ROW acquisition should consider corridors that can accommodate maintenance vehicle access, multi-modal transportation elements, connections to existing and future trails, and user destinations.

3.2.3 Nodal and Trail Connections

A properly designed trail system provides access to various destinations and connects to existing trails, either directly or indirectly. As such, a nodal analysis, with the objective of locating new trails precisely where they may provide the optimum connection, is a method for achieving effective and efficient design. The nodal analysis considered the following criteria: opportunity for increased connectivity; anticipated trail users and usage; potential community benefits; existing development; environmental constraints; and topographical barriers (e.g., steep hills, rocks and debris). A nodal network map is included in **Appendix C**.

A variety of situations that integrate a trail into a neighborhood or community include the proximity to schools, shopping centers, transit stops and depots, places of employment, municipal buildings, recreational facilities, schools and other activity centers. These destinations require special emphasis because of their potential to attract trail users. The Arroyo de los Montoyas has

potential to provide access to several community parks and public schools. The SSCAFCA maintenance access road/trail in the Coronado Watershed Park could achieve ideal links to the recreational amenities at Coronado State Park and Rio Grande. Most, if not all, of the SSCAFCA maintenance access roads/trails can lead potential trail users to local schools and parks, especially within and adjacent to Rio Rancho Estates. Considerable links to the Cottonwood Mall and other retail commercial activity could be provide via the Arroyo de las Calabacillas due to its proximity.

Most of the municipalities within the SSCAFCA service area have trail programs that, along with SSCAFCA trails, can provide local and regional connectivity and continuous trail travel. However, currently most existing trails are largely disconnected from one another. There are exceptions. For example, the Los Rios Trail in the Montoyas Watershed Park from Rio Vista Drive to Rio Ruidoso Road is roughly more than a mile in length, but interfaces naturally with SSCAFCA's maintenance access road/trail along the Arroyo de las Lomitas Negras. There are also a series of existing trail segments in the Northern Meadows Subdivision of the Montoyas Watershed Parks that can easily link up with SSCAFCA maintenance access roads/trails. In the Venada Watershed, the Mariposa Recreation Trail intercepts several different SSCAFCA maintenance access roads/trails, just northeast of the Picuda Peak; this area is like a maze due to the large number of intersections, which can cause confusion for a trail user. Lastly, in the Black Watershed Park, the SSCAFCA maintenance access roads/trails, located south of the Lisbon Channel, parallels an existing multi-use paved trail that can join well with adjacent trails along Southern and Unser Boulevards.

3.3 Proposed Trails

As indicated in Section 2, significant trails system planning has already been performed by the cities of Albuquerque and Rio Rancho, as well as the MRCOG. Proposed trails identified by these three entities often overlap and can benefit from connections to existing trails that provide SSCAFCA maintenance access and are sanctioned for multi-modal usage. Proposed trails that border SSCAFCA right-of-way can increase the effectiveness of both existing and planned trails. **Table 3-1** and **Figure 3-1** show the proposed trails within SSCAFCA's service area. The SSCAFCA-owned land parcels and required land acquisitions to construct the proposed trails is shown in **Figure 3-2**.

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Corrales Acequia	From Arroyo de las Calabacillas to Perea Lane	– Rio Grande Valley State Park – Southwestern Indian Polytechnic Institute – Los Griegos – Cottonwood Mall – NW Quadrant Modular Skate Park – Corrales Community Recreation Center – Corrales Community Library – Corrales Senior Center – Corrales Elementary – Casa San Ysidro	3.6	0%	0%	Nine bicycle routes in Corrales Village
Snead Channel	From County Trail (between Spring Dr SE and Wagon Trail Dr SE) connecting to Cabezon Linear Park Trail, which ends at Westside Blvd SE.	– Snead Park – Western Winds – Nicklaus Park – Martin Luther King Jr. Elementary – Chianti Park – Linear Park Trail – A Park Above	1.3	16%	84%	Maintained by City of Rio Rancho – Bike route along Spring Road – Multi-use asphalt trail along Southern Boulevard – Two multi-use asphalt segments of Cabezon Linear Park Trail
Lisbon Channel	From Southern Blvd SE to Tulip Rd SE via unnamed arroyo, then crosses Idalia Rd SE and Inca Rd SE to Sandia Blvd NE, then west to the Arroyo de las Calabacillas.	– Sugar Park – Star Heights Park	4.7	4%	45%	Maintained by City of Rio Rancho – Multi-use asphalt trail called “Powerline Trail” – Multi-use asphalt trail along Southern Boulevard – Paved trail parallel to Veranda Road

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Venada Watershed Park via unnamed arroyo	From Arroyo Venada to Enchanted Hills Dam 1 to Encantado Channel (Enchanted Hills Path) to Huskey and back to Santa Fe Hills and Chayote	– Sports Complex North – Sandia Vista Elementary – Vista Grande Elementary – Mountain View Park	3.5	63%	70%	Maintained by City of Rio Rancho – Multi-use asphalt trail along Chayote Road – Multi-use asphalt trail called "Enchanted Hills Trail" – Bike route along Springer Drive
Zia Watershed Park	Primarily follows the northern end of the Venada Watershed Park north of US 550, then follows southern boundary of Zia Watershed Park at west end of Old Hwy 44, then southwest to Osage Rd NE to Unser Blvd NE	– Mountain View Park – Vista Grande Park – Loma Barbon – Loma Machete	5.3	51%	0%	Maintained by City of Rio Rancho – Bike route along Unser Boulevard – Bike route along US 550 – Multi-use asphalt trail along Chayote Road – Multi-use paved trail at Vista Grande Park
Coronado Watershed Park via unnamed stream	From Bosque de Bernalillo at the Rio Grande to NM 528 along Joiner Pipeline	– Pilgrim Indian Mission School – Santa Ana Star Casino – Coronado State Monument – NM Environmental and Human Services Department offices	1.0	0%	49%	Bike lane along Rio Rancho Boulevard, maintained by City of Rio Rancho
Arroyo de la Barranca	Follows Arroyo Barranca from Rio Rancho Bosque to Outer Loop Trail, with a short segment along an unnamed stream that leads to V. Sue Cleveland High School	– University of New Mexico, West Campus – Central New Mexico Community College, Rio Rancho Campus – UNM Sandoval Regional Medical Center – High Range Park – Rio Vista Park – Rio Rancho Bosque	11.9	81%	79%	Maintained by City of Rio Rancho – Bike route along Unser Boulevard – Bike route along Paseo del Volcan – Bike route along Idalia Road – Bike route along Rio Rancho Boulevard – Mountain bike trail at Rio Rancho Bosque – North Beach Bosque Trail for mountain bikers

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Arroyo de las Lomitas Negras	From Rio Rancho Boulevard (State Route 528) to Idalia Road NE then to Loma Colorado north to Arroyo de la Barranca	– High Range Park – Rio Rancho Middle School – Enchanted Hills Elementary	3.5	89%	84%	Maintained by City of Rio Rancho – Bike route along Idalia Road – Bike route along Rio Rancho Boulevard – Bike route along Corrales Road, which provide an additional link to the North Beach Bosque Trail – Multi-use asphalt trail called “Los Rios Trail”
Outer Loop						
Segment 1 (via Venada Arroyo)	From Rio Grande at Rio Rancho Bosque to Paseo del Volcan near Sports Complex North	– Rio Rancho Bosque – Sports Complex North – Sandia Vista Elementary – Mountain View Middle School – NM Public Health and Human Services offices – Bernalillo Church of Christ	3.0	59%	83%	Maintained by City of Rio Rancho – Unpaved gravel trail for mountain bikers, called “North Loop” along Rio Grande – Multi-use asphalt trail along Lincoln Avenue – Bike routes along Rio Rancho Boulevard, Lincoln Avenue, and Paseo del Volcan
Segment 2 (via Venada Arroyo)	From Paseo del Volcan to Unser Boulevard near Unser Dam	– Watermelon Ranch Dog Rescue – V. Sue Cleveland High School	4.3	93%	84%	– Bike routes along Paseo del Volcan and Unser Boulevard, maintained by City of Rio Rancho
Segment 3 (via Venada Arroyo)	From Unser Blvd to Arroyo de la Barranca	– Picuda Peak	2.1	56%	79%	Maintained by City of Rio Rancho – Multi-use asphalt trail, called “Mariposa Recreational Trail” – Bike routes along Unser Boulevard, Blue Grama Drive, and Reservoir Road

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Segment 4 (via unnamed arroyo and Arroyo Pantadeleon)	From Arroyo Barranca to Arroyo de los Montoyas	– Los Montoyas Park – Havasu Park	4.2	0%	40%	Bike route along Reservoir Road, maintained by City of Rio Rancho
Segment 5 (via unnamed arroyo)	From Arroyo de los Montoyas to intersection of Vicksburg Road RW and Torcido Road NW	None	5.0	44%	71%	None
Segment 6 (via unnamed arroyo and Arroyo de las Calabacillas)	From Jeep Trail NW south along unnamed arroyo to Arroyo de los Calabacillas; Callabacillas Arroyo south to the Sandoval and Bernalillo county line	– Rainbow Park – Camino Crossing Park – Cielo Vista Park – Puesta del Sol Elementary	13.1	100%	85%	Multi-use asphalt trail along Southern Boulevard, maintained by City of Rio Rancho

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Segment 7 (via Arroyo de las Cabacillas)	From Sandoval and Bernalillo county line to Rio Grande. A significant portion of Segment 7 lies outside of SSCAFCA jurisdiction	– Central New Mexico Community College Westside Campus – Sierra Vista Elementary – Paradise Skies Park – Seville Park – Park Hill – Tuscany Park – Paradise Meadows – Black Arroyo Park – Salida del Sol Park – Lovelace Westside Hospital – Seven Bar Elementary – Cottonwood Mall – Hunters Run Park – Cibola High School – NW Quadrant Modular Skate Park – Congress Heights Park – Rio Grande Valley State park – Shining River Parking Area	5.4	2%	0%	– Bicycle lane along Unser Boulevard, maintained by City of Albuquerque – Paseo del Bosque Trail along Rio Grande

Table 3-1 Proposed Trails

Trail Name	Description	Nodal/Trail Connections	Length (miles)	Percent Within		Connections to Existing Trails
				LEE	SSCAFCA ROW	
Arroyo de los Montoyas						
Segment 1	From Rio Grande to Unser Boulevard NE	– Olympus Park – Vista Hills Park – Veja Baja Park – Sierra Norte II Park – Rio Rancho Sports Complex	6.7	78%	75%	Maintained by City of Rio Rancho – Multi-use trails and bike lanes along Unser Boulevard, and Broadmoor Boulevard – Bike route along Northern Boulevard and Corrales Road – Bike lane along Loma Vista Boulevard – Multi-use asphalt trail called "Retention Pond Trail" – Multi-use asphalt trail along Loma Colorado Boulevard, Rio Rancho Boulevard, and parallel to Rio Ruidoso Road
Segment 2	From Unser Boulevard NE to Outer Loop	– North Hills Park – Canyon Park – Calinas Del Norte Elementary – Cherry Open Space – Cielo Grande Park – Zia Park – Clayton Meadows Park – Havasu Park	6.0	97%	97%	Maintained by City of Rio Rancho – Bike lane along Camino de los Montoyas – Multi-use trails and bike lanes along Unser Boulevard and King Boulevard – Three NM Recreational Trails near Havasu Park
Segment 3	From Northern Meadows Channel to proposed Outer Loop Trail	– King Meadows Park – Los Montoyas Park – Clayton Meadows Park – Havasu Park	2.8	99%	51%	Multi-use Trail and bike lane along King Boulevard, maintained by City of Rio Rancho

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 3-1
Proposed Trails

Legend

- Proposed Trail
- Existing Bike Lane and/or Route
- Existing Unpaved Multi-Use Trail
- Existing Paved Multi-Use Trail
- Rio Grande
- County Boundary
- SSCAFCA Service Area
- View extents shown in Figures 3-2 through 3-4

View Extent 1
View Extent 2
View Extent 3

OUTER LOOP SEGMENT 5
OUTER LOOP SEGMENT 4
OUTER LOOP SEGMENT 3
OUTER LOOP SEGMENT 2
OUTER LOOP SEGMENT 1
OUTER LOOP SEGMENT 6
OUTER LOOP SEGMENT 7
ARROYO DE LOS MONTOYAS SEGMENT 3
ARROYO DE LOS MONTOYAS SEGMENT 2
ARROYO DE LOS MONTOYAS SEGMENT 1
ARROYO DE LA BARANCA
ARROYO DE LAS LOMITAS NEGRAS
ZIA WATERSHED PARK
VENADA WATERSHED PARK
CORONADO WATERSHED PARK
LISBON CHANNEL
SNEAD CHANNEL
CORRALES ACEQUIA

550
313
25
528
448
556

Santa Ana Pueblo
Placitas
Bernalillo
Rio Rancho
Pueblo of Sandia Village
Corrales
Albuquerque

29th Ave
Paseo del Volcan
Encino Rd
Iris Rd
Rio Rancho Blvd
Northern Blvd
Rainbow Blvd
Unser Blvd
Southern Blvd
Golf Course Rd
Isabel Rd
Mcmahon Boulevard
Coors Blvd
Corrales Rd
El Camino Real
Camino del Pueblo
Roy Rd
Tramway Rd

County of Sandoval
County of Bernalillo

0 0.5 1 2 Miles

This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 3-2
SSCAFCA Owned and Required Land Acquisitions

Legend

- Watershed Park
- County Boundary
- Rio Grande

Proposed Trail

- Arroyo de Las Lomitas Negras
- Arroyo de Los Montoyas
- Arroyo de la Baranca
- Coronado Watershed Park
- Corrales Acequia
- Lisbon Channel
- Outer Loop
- Snead Channel
- Venada Watershed Park
- Zia Watershed Park
- SSCAFCA ROW
- Existing Bike Lane and/or Route
- Existing Multi-Use Trail
- SSCAFCA Service Area
- Department of Defense Land
- Tribal Land
- Private Land
- New Mexico State Land

0 0.5 1 2 Miles

This page intentionally left blank.

3.3.1 Outer Loop Trail

The seven segments of the proposed Outer Loop Trail are intended to serve as a primary transportation route, connecting to a system of feeder trails each serving a particular destination located within a reasonable distance. These trails are intended to strategically enhance utilization of existing and proposed trails. This main trail extends west from the Rio Grande to the outlet of the Venada Arroyo at the downstream end of the Coronado Watershed Park boundary. A grade-separated crossing would be needed at Paseo del Volcan. It travels up Venada Arroyo and west to Mariposa, then continues west to the top of the Calabacillas Watershed Park, and finally south along the Calabacillas Arroyo back to Rio Grande.

3.3.2 Venada Watershed Park Trail

This trail extends from a residential easement adjacent to Springer Dr NE, to Chayote Rd NE, before following Kennard Rd NE to an unnamed arroyo. It then follows the unnamed arroyo south across Offenbach Rd NE, and south across Caldera Rd NE. The trail continues following the unnamed arroyo before connecting to where the Outer Loop Trail crosses Progress Blvd NE and intersects Arroyo Venada. The Venada Watershed Park Trail will require road crossings where it intersects Caldera Rd NE, and Offenbach Rd NE.

3.3.3 Zia Watershed Park Trail

This trail extends northwest from U.S. 550, near Vista Grande Park, along an unnamed arroyo before crossing under U.S. 550, north of where Old State Highway/Road 44 NE intersects the highway. It then continues west, crossing Old State Highway/Road 44 NE, and following an unnamed road. Following the unnamed road, the trail then crosses through multiple residential streets before ending at the intersection of Unser Blvd NE and Osage Rd NE, approximately half a mile north of the Outer Loop Trail.

3.3.4 Coronado Watershed Park Trail

The Coronado Watershed Park Trail spans one mile from the Rio Grande to State Route 528. It follows an unnamed arroyo along Joiner Pipeline leading northwest from the Rio Grande, crossing Sheriff's Posse Rd, before again following the unnamed arroyo. The arroyo continues northwest and ends just over one mile north of where Outer Loop Trail intersects State Route 528.

3.3.5 Arroyo de la Barranca Trail

This trail begins in the Rio Rancho Bosque at a pedestrian trailhead, following a dirt path southwest along the Rio Grande, before following the Arroyo de la Barranca northwest away from the river. The trail would then cross under State Route 528 and continue northwest along the Arroyo de la Barranca before splitting into two trails.

The northwestern portion of the trail will continue along an unnamed arroyo, crossing Idalia Rd NE, before ending at Paseo Del Volcan NE, just south of Cleveland High School.

The western portion of the trail continues along Arroyo de la Barranca, crossing multiple streets, before coming to an end at the Outer Loop Trail near the Mariposa Subdivision.

3.3.6 Arroyo de las Lomitas Negras Trail

This trail begins where the Arroyo de las Lomitas Negras intersects State Route 528, extending northwest along the arroyo. Following the arroyo, it runs adjacent to Enchanted Hills Elementary, crosses Saratoga Dr NE, continues northwest along Huron Dr NE, before crossing Idalia Rd NE east of Rio Rancho Middle School and connects to Loma Colorado Blvd NE north of High Range Park, then continuing north before connecting to the proposed Arroyo de la Barranca Trail.

3.3.7 Arroyo de los Montoyas Trail

Collectively, the three segments of this proposed trail connect the Outer Loop Trail to Rio Grande, following the Arroyo de los Montoyas. The main trail extends west from two feeder trails -where Corrales Rd overpasses the Rio Grande running west, and just north of the Rio Rancho-Corrales city borders, running south along Calle Contenta, before connecting to the main trail stem. The trail extends west along the Arroyo de los Montoyas, crossing under State Route 528, continuing along the Arroyo de los Montoyas, west of Rio Rancho High and Eagle Ridge Middle schools, before splitting from the Arroyo de los Montoyas and following an unnamed arroyo west of Havasu Park. The trail then continues north to join the Outer Loop Trail approximately half of a mile south of White Rock Ave NE.

The disconnected segment of this trail begins at King Meadows Park, crossing under Rainbow Blvd, and follows the Arroyo de los Montoyas northwest, before ending at the intersection of the Outer Loop Trail and Sheba Dr NW.

3.3.8 Corrales Acequia

This trail extends north along the Corrales Acequia from the intersection of the Arroyo de las Calabacillas and the Rio Grande. Following the acequia, it crosses Alameda Blvd NW, and continues along Corrales Rd NW, joining an existing bike route. The trail continues north from the existing bike route at Montano Ln along Corrales Rd NW before ending at Perea Ln.

3.3.9 Snead Channel

This trail extends north from an unnamed arroyo, crossing Southern Blvd SE, through Nicklaus Park, crossing Nicklaus Dr SE. The trail continues north past Snead Park, crossing Western Hills Dr SE, and ends at Spring Dr SE.

3.3.10 Lisbon Channel

This trail extends from two feeder trails – from Southern Blvd SE between Lisbon Ave SE and Tarpon Ave SE north along the channel, and east from Ivory Rd SE between Cascade Rd SE and Hood Rd SE. The trails combine west of Sagebrush Ct SE and continue north, crossing under Tarpon Ave SE, following Lisbon Ave SE north until intersecting Tulip Rd SE. The trail then continues west along Tulip Rd SE. It then crosses north over Tulip Rd SE and Idalia Rd SE before following Sandia Blvd SE west to where the road intersects the Outer Loop Trail at the Arroyo de las Calabacillas.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 3-3
Nodal and Trail Connections
(View Extent 1 of 3)

Legend

- Connection Point
- Recreational Amenities
- Gov't/Community Resources
- Public Schools K-12
- Proposed Trail
- Existing Bike Lane and/or Route
- Existing Unpaved Multi-Use Trail
- Existing Paved Multi-Use Trail
- Rio Grande
- Stream
- Park

Mariposa Pkwy
Unser Blvd NE
Old State High/Road 44 NE
ZIA WATERSHED PARK
Osage Rd NE
OUTER LOOP SEGMENT 3
Kennard Rd NE
Chayote Rd NE
Springer Dr NE
Offenbach Rd NE
Vista Grande Park
ENCANTADO CHANNEL
550
Caldera Rd NE
ARROYO VENADA
VENADA WATERSHED PARK
OUTER LOOP SEGMENT 2
OUTER LOOP SEGMENT 1
CORONADO WATERSHED PARK
Progress Blvd NE
ARROYO DE LA BARRANCA
Cleveland High School
Paseo del Volcan
Nativitas Rd
LOWER VENADA
Sheriff's Posse Rd
528
Iris Rd
ARROYO DE LA BARANCA
ARROYO DE LAS LOMITAS NEGRAS
Idalia Rd
Rio Rancho Blvd
Rio Rancho Bosque

0 0.25 0.5 1 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA,

This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 3-4
Nodal and Trail Connections
(View Extent 2 of 3)

Legend

- Connection Point
- College/University
- Public School K-12
- Proposed Trail
- Existing Bike Lane and/or Route
- Existing Unpaved Multi-Use Trail
- Existing Paved Multi-Use Trail
- Rio Grande
- Stream
- Park

OUTER LOOP SEGMENT 5
OUTER LOOP SEGMENT 6
OUTER LOOP SEGMENT 4
OUTER LOOP SEGMENT 3
ARROYO DE LOS MONTOYAS SEGMENT 3
ARROYO DE LA BARRANCA
ARROYO DE LOS MONTOYAS SEGMENT 2
ARROYO DE LOS MONTOYAS SEGMENT 1
Sheba Dr NW
Rainbow Blvd
29th Ave
Encino Rd
Unser Blvd
Paseo del Volcan
King Meadows Park
Havasu Park

0 0.25 0.5 1 Miles

This page intentionally left blank.

Maintenance Access
and
Trails Master Plan

CDM Smith

Figure 3-5
Nodal and Trail Connections
(View Extent 3 of 3)

Legend

- Connection Point
- College/University
- Library
- Public School K-12
- Coronado State Monument
- Government Community Resource
- Train Station
- Proposed Trail
- Existing Bike Lane and/or Route
- Existing Unpaved Multi-Use Trail
- Existing Paved Multi-Use Trail
- Rio Grande
- Stream
- Park

Northern Blvd
Rainbow Blvd
Idalia Rd
Eagle Ridge Middle School
Tarpon Ave SE
Tulip Rd SE
Sandia Blvd SE
LISBON CHANNEL
Idalia Rd SE
Cascade Rd SE
Ivory Rd SE
Lisbon Ave SE
Unser Blvd
Spring Dr SE
Western Hills Dr SE
Snead Park
Nicklaus Park
SNEAD CHANNEL
Southern Blvd
OUTER LOOP SEGMENT 6
ARROYO DE LAS LOMITAS NEGRAS
ARROYO DE LA BARANCA
528
Rio Rancho Blvd
Rio Rancho High School
Calle Contenta
ARROYO DE LOS MONTOYAS SEGMENT 1
Rio Rancho Blvd
Golf Course Rd
Corrales Rd NW
Perea Ln
CORRALES ACEQUIA
448
Isabel Rd
ARROYO DE LAS CALABACILLAS
Unser Blvd
Mcmahon Boulevard
OUTER LOOP SEGMENT 7
ARROYO DE LAS CALABACILLAS
Coors Blvd
Corrales Rd NW
Montano Ln
Alameda Blvd NW

0 0.25 0.5 1 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA,

This page intentionally left blank.

Section 4
Design Guidelines

This section describes the context-sensitive standards for planning and developing trails. Trail design should reflect the environmental and social character of the surrounding community. For instance, a trail needs to accommodate projected uses by the local community. As such, design criteria contained herein should be integrated, balanced, and optimized to address local and regional transportation and recreational needs. However, the criteria contained within these guidelines should be used with the understanding that design adjustments may be necessary in certain situations to achieve the best results. On a case-by-case basis, trail segments should be evaluated and refined through the actual engineering and construction phase, in consultation with SSCAFCA, a qualified landscape architect, and/or engineer.

Discussion of standards related to trail facilities and amenities is not included as part of the Master Plan. This includes landscaping, benches, bicycle racks and lockers, drinking fountains and dog-friendly drinking fountains, bag dispensers and trash receptacles, shaded rest areas, composting toilets or restrooms, hitching posts or mountain blocks, parking and staging areas, trailheads, and camping grounds.

4.1 Trail Surface

Trails can be constructed from a variety of soft or hard surface materials. Soft, natural surfaces are preferred by multiple user groups such as mountain bikers, walkers, runners, hikers, and equestrians. Hard surfaces are preferred for bicycles and handicap accessible use and may be more practical for urban and suburban trails. Both surface types are relatively stable when compacted.

Most proposed trails would be located within the LEE. Soft surface trails can be in LEEs, depending on whether the arroyo is restricted or unrestricted. However, hard-surfaced material may be a necessary option within the LEE.

4.1.1 Soft Material

4.1.1.1 Native soil

Naturally-occurring or native soil is quite variable. In general, native soil used to construct the trail base is adequate to accommodate foot traffic. However, its durability and erodibility should be considered, especially if a trail may be used by equestrians, mountain bikers, and ORVs. Hoofs, boots, and wheels may damage the trail tread when wet and detach/transport soil particles when dry. Coarsely textured native soils are augmented with gravel and sand when additional strength and firmness is required. Finely textured native soils with silt and clay tend to be poor surface materials.

4.1.1.2 Crusher Fines

Crusher fines are considered a soft stone surface, consisting of finely crushed rock, such as granite, limestone, and sandstone. Generally, it is a byproduct of rock crushing operations. This surface type provides a rustic feeling of a natural gravel-like surface, complementing the natural environment and its aesthetic appeal. Although crusher fine trails are more suitable for mountain bikes, it is an appropriate base or surface material that can accommodate most trail activities. With proper compaction and drainage, a crusher fine trail should remain stable long-term in all weather conditions. Because of its firm and stable characteristics, crusher fines are considered an appropriate trail surface for wheelchair accessibility.

4.1.1.3 Gravel

Gravel is a coarse, granular material produced by the natural weathering and erosion of rock or as a crushed mining product. A gravel-surfaced trail is usually eco-friendly and economical compared to paved surfaces. Anticipated uses along gravel trails include ORVs, mountain bikes, pedestrians, and horses, where specifically designed. It is suitable for flat areas and can preserve primitive settings due to its natural visual look. Although this material is durable, it has a higher ongoing maintenance cost, especially after heavy rains and/or usage. Because compacted gravel with fines is not very permeable, gravel paths can be washed away by hard rains and floods. Additionally, loose gravel may decrease stability, especially on steep slopes. Gravel trails are generally not considered to be wheelchair accessible, although roller-compacted gravel is considered a firm and stable trail surface.

4.1.2 Hard Material

4.1.2.1 Paved

A paved surface usually consists of asphalt, concrete or a combination of the two. Paved trails are more expensive to construct, but, if designed and installed correctly, require less maintenance and can withstand higher impact use. Regular, minor maintenance typically includes filling cracks, patching, slab stabilization or grinding to reestablish an even surface. Wash-off of deposited silt and dirt can be an on-going maintenance activity, particularly in flood-prone areas. With proper drainage, a paved surface trail is cleaner than soft surface trails, and, if designed and installed correctly, will not wash or break apart in flood areas or on steep slopes. Paved surfaces work well on urban trails used for bicycle commuting; however, may not be preferred by joggers and walkers, including equestrians because it offers poor traction for horseshoes. Paved surfaces can be roughened to provide a degree of traction. Snow can be removed more easily from paved trails than soft-surfaced trails. Properly designed and installed paved trails can provide a long-term service life.

4.1.2.2 Stabilized Soil

Soil stabilization is the alteration of one or more soil types with an emulsion polymer which bonds soil particles together, creating a cementitious composite material. Soils may be stabilized to achieve desired engineering properties such as increased strength and durability, improved structural support, and to prevent erosion and dust generation. Stabilized soil can be used for trail surface rehabilitation and new construction. Once applied, stabilizing agent is thoroughly mixed with the top soil, graded and shaped for proper drainage, compacted, and seal coated.

In contrast to asphalt, soil stabilization products may be environmentally friendly. A wide range of proprietary soil stabilization products exists, allowing selection of appropriate product depending on the intended end-use and existing soil conditions.

As an example, Landlock™ is an environmentally-friendly proprietary process, which may be installed topically or by integrating into the existing trail pavement, which can be either soil or geriatric asphalt. Integration is a process that utilizes the existing in-place material to provide a reconditioned pavement that has been used on paths, trails, and roads. As an alternative, Landlock™ can be topically applied as a sealcoat and can include pigment to tailor the appearance of the finished surface. Landlock™ maintains that this process results in a surface that is impervious to water, UV resistant, crack-resistant, erosion-resistant, dust-free, and up to twice as strong as Portland cement. Typical maintenance for Landlock™ requires reapplication of the topical sealcoat, as the surface will become porous over time depending on climate and use.

4.1.2.3 Reclaimed Asphalt Pavement

Reclaimed asphalt pavement (RAP) and can be used for trail surface rehabilitation and new construction. RAP refers to a variety of materials, all of which contain some portion of recycled content derived from re-processed materials, such as tires, asphalt concrete and cement concrete. Reclaimed asphalt (milled and pulverized) is integrated with an aggregate base; thoroughly mixed, graded and shaped for proper drainage; and compacted. Installation cost of RAP varies depending on the virgin material-to-RAP mixture ratio, with costs generally increasing as the virgin material content becomes greater.

Rubberized asphalt concrete incorporates rubber grains, usually from recycled car tires, directly into the asphalt concrete (AC) layer. The rubber grains are mixed directly with the AC or blended with an aggregate before mixing with the AC. According to the Caltrans Highway Design Manual, rubberized AC thickness is not to exceed 2.5-inches and shall not be less than 1-inch. Rubberized AC is more durable than conventional AC, and requires less material to match the performance of conventional AC. The rubber content causes the material to become much more viscous and therefore difficult to work with compared to conventional AC. Material cost for rubberized asphalt is significantly higher than recycled asphalt ($120/ton vs. $11.50/ton); however, rubberized asphalt is only about $30/ton higher than virgin asphalt ($90/ton) (Callander 2007). Because of the difficulty of handling rubberized asphalt, the installation cost can be higher still, although this cost comparison data is not available.

4.1.3 Selection Criteria

In general, trail surfacing is dependent on the level of expected usage, type of user group and specific maintenance requirements. **Table 4-1** and the following criteria can help in selecting the appropriate surface for a trail.

- Initial Cost: Trail construction costs can vary depending on the chosen surface material; construction costs include excavation, sub-base preparation, aggregate base placement, and application of selected trail surface.

- Maintenance and Durability: Anticipated life of a trail can be as long as 25 years or more, depending on quality of construction and materials. Each trail surface type has varying maintenance needs that will require regular to predetermined inspections and follow up.
- Soil Conditions: The permeability of the soil conditions play a critical role; for example, the lower the permeability and moisture, the greater risk of failure.
- Environmental Resources: Consider the extent that the material can mitigate potential long-term impacts to ecological resources.
- Aesthetics: If possible, materials indigenous to the area should be used; trail surfaces should fit with the surrounding landscape setting.
- Anticipated Use: Each surface has varying degrees of roughness and therefore accommodates varying users.

Table 4-1 Surface Types

Surface Material	Traction	Durability	Natural Appearance	Dust	Cost	Maintenance
Native soil	Medium	Medium	High	High	Low	Medium
Crusher Fines	High	Low	High	High	Low	Medium
Gravel	Medium	Low	Low	High	Low	High
Asphalt	Low	High	Low	Low	High	Low
Stabilized Earth	Medium	Medium	High	Low	High	Medium
Rubberized Reclaimed Asphalt Pavement	High	High	Low	Low	High	Low

4.2 Accessibility

In 1990, the U.S. Congress passed the Americans with Disabilities Act (ADA), a landmark law that protects the civil rights of persons with disabilities. The act was established to prohibit state and local governments from discriminating on the basis of disability. Among other provisions, the ADA requires places of public accommodation (e.g., recreation and transportation facilities) and commercial facilities to be designed, constructed, and altered in compliance with the accessibility standards established by the ADA. Prepared by the U.S. Access Board, the ADA Accessibility Guidelines (ADAAG) serves as the basis for standards used to enforce the design requirement of the ADA. **Table 4-2** provides design standards for development of ADA accessible trails.

The U.S. Access Board also published the Final Guidelines for Outdoor Developed Areas (2013), which proposes accessible design requirements for outdoor recreation access routes and trails located on federal lands, including the U.S. Forest Service, National Park Service, Fish and Wildlife Service, Bureau of Land Management, Bureau of Reclamation, and Army Corps of Engineers. These guidelines are also proposed for non-federal entities that construct or alter facilities on federal lands on behalf of the federal government.

Table 4-2 Design Standards for ADA Accessible Trails

Topic	Criteria	Purpose
Surface	Hard surface (e.g., asphalt, concrete, compacted gravel)	To provide smooth surface for wheelchair
Gradient	Max of 5% without landings; max of 8.33% with 3-foot landings every 30-50 feet, depending on gradient	To reduce strenuous activity and avoid excessive gravitational pull
Width	Min of 3-foot tread width	To allow passing space
Signage	Distance markers, tread conditions, and trail profile	User convenience and safety

Source: FHWA, 1999.

The proposed trail system should comply with ADA standards, where reasonably appropriate. It is recognized that constructing trails in natural settings may have limitations that make meeting ADA guidelines difficult and sometimes prohibitive. Prohibitive impacts include:

- Harm to significant cultural or natural resources;
- A significant change in the intended purpose of the trail;
- Requirements of construction methods that are prohibited by federal, state or local regulations, or;
- Presence of terrain characteristics that prevent compliance.

ADA standards apply to pedestrian trails—not equestrian, mountain bike or ORV trails. A multi-use trail specifically designated for hiking and bicycling is considered a pedestrian trail.

4.2.1 Surface Material

The ADAAG defines accessible surfaces are firm, stable, and slip-resistant. Firm and stable surfaces resist deformation, especially by indentation or the movement of objects. A firm and stable surface, such as concrete and asphaltic pavement, resists indentation from the forces applied by a walking person's feet and reduces the rolling resistance experienced by a wheelchair (U.S. Access Board, 2002; 2013). When a mobility-impaired pedestrian or wheelchair user crosses a surface that is not firm or stable (i.e., gravel), energy that would otherwise result in forward motion deformations or displacement of the surface instead. They value smooth, level, wide paths that are easily navigable. While hard surfaces offer more options to comply with ADA design requirements in highly developed areas, they may not be suitable for trails in open space, parks, and the backcountry (U.S. Department of Justice, 2010). However, it may be possible to stencil, stamp, stain, and color hard-surfaced trails to a more desirable pattern to increase the natural experience for the user. Crusher fines and other natural materials, if properly compacted and maintained, can also provide the required degree of stability and firmness to be ADA compliant. Overall, a prepared surface is a critical component of an accessible trail. The intended use and length of the trail may ultimately regulate the preferred degree of stability and firmness.

4.2.2 Slope

Trails and associated ramps should be designed and constructed with the least possible slope. The maximum slope allowed by ADA design standards for a walkway should be 1:12 or 8.33 percent of rise, over 30 feet of run. When designing for the maximum slope, landings are needed

every 30 inches of rise along with handrails. Ramps should be provided for grades exceeding the five percent slope. In locations where surface pitch could divert a wheelchair into a dangerous place, the cross slope should be as close to zero percent as possible. Breaks in long grades and lessening grades at drainage crossings are examples of simple accessible improvements.

4.3 Crossings

Two trail crossing types are addressed in this Master Plan: grade-separated and at-grade. The selection of an appropriate crossing at the right location is critical to the success and durability of a trail. In general, safety should be the primary consideration in trail crossing design.

4.3.1 Grade-separated Crossings

A grade-separated crossing would be required to cross over a drainage arroyo, roadway, or abandoned railroad trackway. Although there are major roadways, the main barrier for trail users are arroyo crossings. Inadequate or unavailable crossings may likely cause trail users to cross arroyos randomly, creating an unsafe environment and resulting in disturbance of the arroyo LEE and channel. There are several types, such as a bridge overpass; underpass; culvert crossing; and wood stringer bridge.

4.3.1.1 Underpass

An underpass should be considered for crossing a railroad track or high traffic thoroughfare with greater than 20,000 vehicle trips per day and speeds 35 miles per hour and over. It should be designed to be open and spacious, well lit, and completely visible for its entire length. Proper drainage must be established to avoid pooling of storm water. In addition, it should have a minimum vertical clearance of 10 feet and a minimum clearance width of 12 feet. To be ADA compliant, ramp grades cannot exceed eight percent; however, it is recommended that ramp grades not exceed five percent.

4.3.1.2 Bridge Overpass

A bridge overpass increases the safety and comfort of trail users and reduces potential conflicts. Prefabricated steel bridges are recommended to overpass drainage arroyos because of their relative low installation cost and minimal disturbance to the arroyo channel. The size of the bridge can vary depending on the trail type, width of the arroyo, frequency of water flow, intensity of peak water flows, and other specific site characteristics. A minimum width of 12-14 feet is required where the length of the bridge exceeds 200 feet. This allows sufficient width for bi-directional travel and maintenance vehicle access. Otherwise, the design width of a trail may be used for the length of the bridge. Bridges over the arroyos may not need to be wide, if the arroyo banks are hardened.

Bridge overpass constructed as part of SSCAFCA's Black Arroyo Wildlife Park project allows pedestrian access to Maggie Cordova Elementary School from adjacent neighborhood.

In addition, such bridges must be designed to safely handle loads associated with emergency response and occasional maintenance vehicular use. An overpass bridge should support a minimum gross weight of 6.25 tons.

4.3.1.3 Culvert Crossing

A culvert crossing may be appropriate to cross smaller drainageways. Concrete and corrugated metal are commonly used for culvert crossings.

4.3.1.4 Stringer Bridge

A small bridge constructed from wood or steel stringers and planking may be considered for a short crossing over a narrow drainage. Bridge abutments need to be skillfully installed but can often be completed with native stone or imported materials. Handrails are usually required if the bridge decking is greater than 30 inches above the ground surface.

4.3.2 At-grade Crossings

Trails should be separated from vehicle traffic, in general. However, if opportunities for grade-separated crossings are limited at roadway arterials and/or where heavy equestrian traffic is expected, at-grade crossings can provide a reasonable degree of safety, comfort and convenience for trail users. It should incorporate traffic control and safety measures, and comply with the Association of American State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities, Part 9 of the Manual of Uniform Traffic Control Devices (MUTCD)(2009), or other national standards related to trail user safety. Sufficient signage and road striping should be in-place to warn both trail user and roadway traffic. To ensure trail safety, an evaluation of at-grade crossings includes analyzing width of roadway or arroyo, traffic speeds and volumes, line of sight, and user profile (e.g., age distribution and destinations).

4.4 Signage Systems

A comprehensive signage system provides trail users with necessary information to help them achieve navigability, comfort, and safety. Signage guidelines herein are intended to provide general direction on consistency, placement and installation, and signage types. Specific considerations for signs may need to be evaluated on a case-by-case basis.

Signage installed as part of SSCAFCA's Black Arroyo Wildlife Park project restricts trail use by motorized vehicles.

The City of Albuquerque has developed custom signage for their trail system as described in their Bikeways & Trails Facilities Plan (2015). Signage recommendations are not included in the Rio Rancho Bicycle and Pedestrian Bicycle and Pedestrian Transportation Master Plan (2011).

4.4.1 Installation

Trail signage should conform to AASHTO's Guide for Development of Bicycle Facilities 4th Edition (2012) and the MUTCD (2009). Signs should be mounted on wood or metal posts on pavement or stone base, where applicable. It is recommended that signs be built at a pedestrian scale with a height of four to five feet (from the bottom of the sign to the near edge of the trail surface). Signs should be in a clearly visible location at least two feet from the edge of the trail and at regular intervals along the trail. However, signs should also be posted where necessary to avoid visual pollution.

4.4.2 Sign Type

There are several types of signs that are associated with a trail system: information signs, regulatory and warning signs, and directional or distance signs.

4.4.2.1 Informational Signs

Informational signage is typically found at trailheads, trail intersections, and parks where trails are accessed. The information often provided on these signs includes: trail name, photos and maps, trail difficulty ratings to aid users in determining which route they may want to select, and education element related to environmental and cultural features.

4.4.2.2 Regulatory Signs

Regulatory signs are used to display trail policy and rules regarding the safe and appropriate use of all facilities. Below is a sample set of rules that stresses etiquette and cooperation with others rather than a restrictive set of laws.

- Motorized vehicles prohibited except emergency and maintenance vehicles
- Keep pets on a leash
- Keep trail clean by picking up after yourself and pets
- Stay to the right except when passing
- Give a clear, audible warning signal before passing
- Refrain from loud noises near adjacent homes
- Bicyclists yield to pedestrians
- When entering or crossing the trail, yield to those on the trail
- Exercise caution and obey all traffic laws at all intersections

These signs also display warnings related to potentially hazardous conditions that cannot be avoided such as road intersections or uneven terrain.

4.4.2.3 Distance Signs

Distance signs may display a variety of information, including the distance from the beginning of the trail to the mileage marker; average times from points along the trail; mileage and/or direction to destinations; directions to destinations; and directions to amenities such as restrooms or water fountains. These signs are usually placed in half-mile increments to indicate to the trail user how far they have traveled.

4.5 Safety Measures

Table 4-3 lists design treatments that can help to minimize and prevent safety concerns.

Table 4-3 Safety Measures

Visibility	Shoulder Zone	Crime and Vandalism
– Clear sightlines of at least 100 feet – Good visual surveillance at roadway/trail intersections	– A minimum of 2-5 feet from arroyo, which allows a trail user to recover should he/she lose control while along the trail – Safe transition to adjacent properties	– Use of durable and graffiti-resistant materials – Access for law enforcement vehicles – Use of neighborhood-friendly fencing

4.6 Layout Configuration

Summarized in **Table 4-4**, the following elements are based on national best practices.

- Width: Set a trail width of five to 10 feet; in areas of high use, widths of 12 to 14 feet are recommended.
- Grade: Maintain an average grade of no more than six to eight percent, and not exceeding 12 to 15 percent for short trails; a variety of slopes (at a reasonable amount) may create a more interesting/positive experience.
- Buffer Setback: Retain a buffer[4] of up to 25 feet wide adjacent to arroyo drainageways or other water resources by using native vegetation, rocks, and other natural features; these buffers may help to preserve wildlife habitat and water quality.

Table 4-4 Trail Layout Configuration

	Minimum	Standard	Maximum
Width	5-8 ft	10 ft	12-14 ft
Design Speed	20 mph	NA	30 mph if grade less than 4%
Curves (at superelevation)	2%	NA	5%
Vertical Clearance	8 ft	10 ft	NA
Standard Grade	6-8%	NA	12-15 %

Note: Grade variations for up to 50 to 800 feet can be from six to 11 percent.

[4] Buffers can filter pollutants from storm water runoff before it reaches the arroyo. Storm water discharges from trails should be designed for maximum treatment, sedimentation, infiltrations, and level-spreading before entering any stream or river.

4.7 Estimated Costs

Table 4-5 summarizes the estimated unit price for trail-related construction and the construction costs for proposed surface materials, per mile. The estimated costs are provided as a guide to establish a trail construction budget for planning purposes. Planning level costs for each proposed trail, as shown in **Table 4-5**, are estimated based on the construction costs for surface materials, per mile. Estimated construction costs are based on the following assumptions:

- Trail width of 10 feet
- No ROW land acquisitions required
- No additional excavation, fill, or slope stabilization required
- No environmental considerations for construction
- Construction costs only, no additional fees for engineering, planning, or construction management
- No consideration of site-specific conditions pertaining to construction or demolition for new trails
- No haul-distance, transportation, or mobilization consideration for materials or services
- No contingency for any costs

Table 4-5 Construction Cost Unit Prices and Costs per Mile

Item	Unit	Unit/Cost	Extended Construction Cost, per Mile					
			Native Soil	Crusher Fines	Gravel	Asphalt	Stabilized Soil (Landlock™)	Recycled Asphalt Pavement (Rubberized Asphalt)
Clearing and grubbing	SY	$0.58	$3,403	$3,403	$3,403	$3,403	$3,403	$3,403
Grading	SY	$1.70	$9,973	$9,973	$9,973	$9,973	$9,973	$9,973
Subgrade preparation	SY	$2.34	$13,728	$13,728	$13,728	$13,728	$13,728	$13,728
Base course - 4"	SY	$8.69			$50,981	$50,981		
Stabilized crusher fines	SY	$2.58		$15,136				
Hot mix asphalt - 2"	SY	$11.87				$69,637		
Rubberized Asphalt - 2.5"	SY	$0.60						$4,400
Proprietary Stabilizer (Landlock™)	SY	$17.10					$100,320	
Signage - Every 1/5 mile	EA	$172.00	$860	$860	$860	$860	$860	$860
Pavement striping - 4"	LF	$0.56				$3,285		
Fencing - 10% of trail	LF	$5.50	$2,904	$2,904	$2,904	$2,904	$2,904	$2,904
		Subtotal	**$30,868**	**$46,004**	**$81,849**	**$154,771**	**$131,188**	**$35,268**

Table 4-6 Construction Costs for Proposed Trails

Proposed Trail	Length (miles)	Extended Construction Cost, per Mile					
		Native Soil	Crusher Fines	Gravel	Asphalt	Stabilized Soil (Landlock™)	Reclaimed Asphalt Pavement (Rubberized Asphalt)
Corrales Acequia Trail	3.6	$111,000	$166,000	$295,000	$557,000	$472,000	$127,000
Snead Channel Trail	1.3	$40,000	$60,000	$106,000	$201,000	$171,000	$46,000
Lisbon Channel Trail	4.7	$145,000	$216,000	$385,000	$727,000	$617,000	$166,000
Venada Watershed Park Trail	3.5	$108,000	$161,000	$286,000	$542,000	$459,000	$123,000
Zia Watershed Park Trail	5.3	$164,000	$244,000	$434,000	$820,000	$695,000	$187,000
Coronado Watershed Park Trail	1	$31,000	$46,000	$82,000	$155,000	$131,000	$35,000
Arroyo de la Barranca Trail	11.9	$367,000	$547,000	$974,000	$1,842,000	$1,561,000	$420,000
Arroyo de las Lomitas Negras Trail	3.5	$108,000	$161,000	$286,000	$542,000	$459,000	$123,000
Outer Loop Trail							
Segment 1	3	$93,000	$138,000	$246,000	$464,000	$394,000	$106,000
Segment 2	4.3	$133,000	$198,000	$352,000	$666,000	$564,000	$152,000
Segment 3	2.1	$65,000	$97,000	$172,000	$325,000	$275,000	$74,000
Segment 4	4.2	$130,000	$193,000	$344,000	$650,000	$551,000	$148,000
Segment 5	5	$154,000	$230,000	$409,000	$774,000	$656,000	$176,000
Segment 6	13.1	$404,000	$603,000	$1,072,000	$2,028,000	$1,719,000	$462,000
Segment 7	5.4	$167,000	$248,000	$442,000	$836,000	$708,000	$190,000
Arroyo de los Montoyas Trail							
Segment 1	6.7	$207,000	$308,000	$548,000	$1,037,000	$879,000	$236,000
Segment 2	6	$185,000	$276,000	$491,000	$929,000	$787,000	$212,000
Segment 3	2.8	$86,000	$129,000	$229,000	$433,000	$367,000	$99,000

Section 5
Operations and Maintenance

Comprehensive operations and maintenance (O&M) are significant factors in the ultimate success or failure of a trails system. Therefore, the proposed trail facilities and resources must be proactively managed and maintained in a safe, usable condition. This section describes the day-to-day supervising tasks, routine maintenance and inspection efforts, and regulatory requirements from public service providers, such as local fire and law enforcement departments. SSCAFCA intends to partner with other agencies, municipalities, or private sector organizations to establish the responsibility for O&M duties.

5.1 Routine Operations

Safety

- Coordinate with fire/rescue and police personnel to establish procedures for patrol and emergency response (i.e., routing plans and access points)
- Promote trail watch program to help identify safety issues
- Arrange detours, where appropriate, when trails must be closed long-term for repairs, rebuilding, or construction of adjacent properties
- Review accident and crime reports, and take the necessary actions on a case-by-case basis to limit or mitigate safety concerns

Record Keeping

- Maintain documentation of inspections and occurrences of medical emergencies
- Review scheduling of routine maintenance to achieve efficiency and eliminate overlap or gaps in service
- Analyze annual maintenance budget and pursue various funding sources

Program Development

- Update signage, as necessary
- Update maps and brochures to reflect any changes to the overall trails network
- Maintain a website for questions, comments, concerns, or complaints
- Sponsor public education and citizen participation programs

5.2 Routine Maintenance

A high-quality routine maintenance program can help encourage trail use; improve safety; extend the life of trails; influence trail users to assist in trail care and upkeep; preserve positive public relations; and deter vandalism, litter, and encroachments.

Debris removal

- Keep trails and arroyos clear of debris (e.g., sand, loose gravel, and storm-deposited mud and silt) by using blowers or other specialized equipment

Trash removal

- Empty trash receptacles regularly
- Pick up litter along trails and arroyos, especially broken glass and other sharp objects
- Unclog culverts

Vegetation control

- Keep trails clear of plant shrubs and weeds
- Trim stray branches

Table 5-1 is intended to provide general guidance on the frequency of routine maintenance activities, which varies by location. Maintenance needs depend upon many factors, such as trail surface type and user traffic volumes.

Table 5-1 Routine Maintenance Schedule

Activity	Frequency
Sweeping	Every 3 weeks
Trash disposal	Weekly
Litter pickup	Bi-weekly or monthly
Vegetation trimming	Every 3 weeks
Erosion inspection	Monthly during wet season and immediately after any storm that brings flooding
Signage replacement	1-3 years, inspect bimonthly
Surface replacement	1-3 years, inspect bimonthly
Pavement sealing	5-15 years
Stabilized soil topical sealcoat	2-4 years, inspect biannually

5.3 Periodic Maintenance

Periodic maintenance refers to activities conducted on an as-needed basis, such as arroyo stabilization or resurfacing of paved trails, sign replacement, fencing, painting, and pest control. These maintenance tasks should be prioritized to first correct unsafe conditions, then repair

environmental damage, and finally restore trail to desired condition. Minor items may occur over a five to 10-year cycle. Major items may occur over a longer period or after an event such as a flood.

Surface repair

- Replenish gravel or other soft surfaces
- Repave asphalt or concrete and seal coat any cracks
- Repaint, restripe, or stain
- Stabilize severely eroded arroyos

Replacement of amenities, fencing, signs, and vegetation

- Revegetate damaged areas to minimize erosion
- Replace or use temporary fencing to reestablish safety and security
- Restore trail furnishings and signs that are in a visually poor condition

Graffiti removal

- Remove graffiti immediately
- Document and report to local authorities

5.4 Risk Management and Liability

Liability is an important area of concern for trail projects. Liability refers to the obligation of the trail operator or owner to pay or otherwise compensate a person who is harmed through some fault of the trail operator. Exposure to potential liability can be reduced by adopting the O&M practices, as described above. For example, routine maintenance can help to ensure that hazardous conditions are identified and corrected in a timely manner, thereby averting injury to trail users. Documentation of diligent O&M practices serves to protect the responsible agency from liability.

This page intentionally left blank.

Section 6
Implementation

6.1 Agency Coordination

SSCAFCA is spearheading the implementation of the Master Plan; however, it will rely heavily on partnerships to fulfill its mission and to create a trail network that is most beneficial to the local communities that utilize it. SSCAFCA aims to establish and maintain regular communications between the Village of Corrales, Town of Bernalillo, City of Rio Rancho, Sandoval County, various Pueblos, Middle Rio Grande Conservancy District, NMCOG, New Mexico Department of Transportation's (NMDOT) Bicycle/Pedestrian/Equestrian Technical Committee, and other affected agencies regarding trail priorities and issues of mutual concern. Clear coordination among local jurisdictions will help define tools and guidance necessary to not only identify trail segments and crucial linkages, but to ensure programming, planning, construction, operations, and maintenance in a timely, cost effective, and efficient manner. A close working relationship with schools, community partners, and law enforcement will also create safe environments for trail use.

6.2 Public Education and Outreach Strategies

As described below, education programs and outreach are vital for trail users to be cognizant of storm water runoff/pollution and to achieve a safe trail-supportive environmental, especially in vicinity to schools.

6.2.1 Storm Water Quality

Part of the scope of the Master Plan is to educate the public about the impacts of municipal storm water discharges and pollutant reduction. Education kiosks posted throughout the trail network can be an effective tool to increase public awareness of these issues. These kiosks can include a map of the storm water drainage system; and panel on common types of trash, debris and chemicals that pollute the natural arroyos and the Rio Grande (e.g., appliances and electronics, used motor vehicle fluids, glass and cement, household cleaners, prescription and other-the-counter medicines, yard waste, and pet waste[5]); and facts and figures on storm water runoff quality and ways to prevent storm water pollution.

The Black Arroyo Dam is a water quality facility that also provides pedestrian access. The facility is jointly maintained between Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) and SSCAFCA.

[5] Pet waste is a major source of E coli contamination in the Rio Grande.

In addition to educational resources provided in a signage or kiosk format, supplemental community outreach that leverages trail usage can help to bolster this message. Community-wide events that are associated with trails include daylong stream or trail clean up, tree or vegetation planting, Earth Day, neighborhood festivals, school field-trips, or a series of short interpretive trail walks. As appropriate, participation at these various events affords an opportunity to distribute printed materials on prevention of storm water pollution; to giveaway posters or other prizes related to storm water quality awareness; and, most importantly, to speak directly to the community and answer questions about ways to reduce discharge of bacteria in storm water contributed by trail recreational use. Printed materials should include descriptions on litter reduction, reduction in pesticide/herbicide use, recycling and proper disposal, and sustainable practices (including xeriscaping, reduced water consumption, and water harvesting).

Establishment of a community hotline and/or social media account is a low-cost strategy to engage the public about storm water-related concerns along the trails, such as illicit discharge. Public reporting of illicit connections or discharges and improper disposal of waste can help identify areas in need of attention.

6.2.2 Safe Routes to School

In addition to promoting the safe use of trails for recreation, the Master Plan aims to make walking and bicycling along the trails to school a safer and more appealing transportation alternative. The Safe Routes to School (SRTS) program is a national and international movement to enable and encourage children, including those with disabilities, to walk and bicycle to school safely. It educates children about safe and appropriate behaviors along pedestrian routes, including trails. Example topics in the SRTS program include infrastructure improvements, bike and pedestrian safety education, bike-to-school events, bike rodeos, and traffic safety assemblies. The program is usually run by a coalition of city government, school and school district officials, and teacher, parents, students, and neighbors.

6.3.2 Maintenance

Maintenance costs vary greatly depending on the type and location of the trail, amount of volunteer labor use, and other available services. Based on national averages, the estimated maintenance costs per mile of a multi-use paved and single-use unpaved trail is approximately $9,200 and $4,250, respectively, per year (Rails to Trails Conservancy, 2001).[6] Trails that require a high level of maintenance should be evaluated for possible redesign or realignment. Typical maintenance costs do not include reconstruction, resurfacing, or other major repair issues. The estimated costs are provided as a guide to establish a projected budget for a trail maintenance program. Funding for ongoing maintenance should be part of a long-term capital improvements plan.

6.4 Funding Opportunities

A variety of potential funding programs and sources offer financial aid for trail construction and improvements. Most grant funding involves the completion of extensive applications with clear

[6] Adjusted to inflation.

documentation of the project need, costs, and benefits, and which compete with similar applications from other agencies.

6.4.1 Federal

The federal government has numerous programs and funding mechanisms to support bicycle, pedestrian and trail projects, most of which are administered by the United States Department of Transportation in cooperation with state and regional entities.

6.4.1.1 Transportation Alternatives Program

The Federal Highway Administration directs the current surface transportation funding and authorization bill, Fixing America's Surface Transportation Act (FAST Act). Many of the funding programs from the previous transportation bills, the Moving Ahead for Progress in the 21st Century (MAP-21) and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), have been consolidated and reorganized in a manner that allows for greater discretion for state and local entities.

The Transportation Alternatives Program (TAP) is a federal-aid funding program authorized through the FAST Act for allocation to transportation projects. TAP funds are apportioned to the NMDOT, who in turn allocates the funds using its own competitive process, in accordance with the law. New Mexico's estimated TAP funding amounts for FFY18 and FFY19 are $6,019,418 and $6,185,906, respectively. Per the FAST Act, 50 percent of New Mexico's annual TAP apportionment (estimated at $3,009,709 in FFY18 and $3,092,953 in FFY19) is sub-allocated to areas based on their relative share of the total state population. The remaining 50 percent is available for use in any area of the state. Sub-allocated funds are divided into three categories: areas with populations of 200,001 or more; areas with populations of 5,001 to 200,000; and areas with populations of 5,000 or less. These are special census designations related to population density and do not correspond with city or town boundaries.

The Recreational Trails Program (RTP) is a set-aside within TAP that provides federal funding to eligible entities within New Mexico to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized uses. The program funds engineering, architect, planning and construction. In fiscal year 2016, approximately $1.43 million was set aside for the RTP from the total TAP allocation that NMDOT received (NMDOT, 2016). New Mexico's estimated RTP funding amount for FFY18 and FFY19 is $1.4 million each year. Per Federal requirements, the RTP apportionment must be awarded according to the following distribution: 30 percent of the funds for non-motorized trails (Categories 1 and 2); 30 percent for motorized trails (Categories 4 and 5); and 40 percent for diverse-use trails (Category 2, 3, and 5).

In general, TAP and RTP funds may be used for bicycle and pedestrian infrastructure and activities, non-driver access to public transportation, environmental mitigation, conversion of abandoned railway corridors to trails, and development of safe routes to school, in addition to other projects. **Table 6-1** lists the project types eligible for TAP and RTP funding sources. For specific funding and matching requirements related to the TAP and RTP, refer to the New Mexico Active Transportation and Recreational Programs Guide.

Table 6-1 Projects Eligible for TAP and RTP Funding

Project Type	TAP Eligibility	RTP Eligibility
Non-motorized, paved, shared-use paths	✓	✓
Equestrian Trails, if built as part of a shared-use path	✓	✓
Motorized trails		✓
ADA improvements	✓	✓*
Lighting for bicycle and pedestrian facilities	✓	✓*
Storm water projects related to bicycle or pedestrian improvements	✓	✓*
Trail maintenance		✓
Trailside or trailhead facilities		✓
Bicycle parking	✓	✓*
Bicycle/pedestrian plans	✓	✓
Trail and road intersection improvements	✓	✓
Trail connections	✓	✓
Bridges or tunnels for motorized trails and equestrian trails		✓
Bridges or tunnels for bicycles and pedestrians (off-road)	✓	✓*
General educational programs/trainings		✓
Bicyclist/pedestrian education for children in grades K-8	✓	
Safe routes to school coordinator positions	✓	
Lease of trail construction and maintenance equipment		✓

Note: Asterisk (*) denotes that the project must be directly related to a trail, trailside, or trailhead facility.
Source: NMDOT, 2017.

6.4.1.2 Congestion Mitigation and Air Quality Improvement

The Congestion Mitigation and Air Quality Improvement (CMAQ) program was created to reduce traffic congestion and improve air quality. Funds are available to communities designated as "non-attainment" areas for air quality, in which the air is more polluted than national ambient area air quality standards (NAAQS) allow. Funds are also available to "maintenance" areas, former non-attainment areas that are now in compliance. States without non-attainment or maintenance areas may use CMAQ funds for any CMAQ-eligible project. Funds are distributed to states based on population and the severity of air quality problems.

The construction of pedestrian and bicycle facilities using CMAQ funding must explicitly provide a transportation function. Non-construction projects such as printed materials related to safe walking are eligible for CMAQ funds as well. These projects must be geared towards walking primarily for transportation rather than recreation. CMAQ funds are administered through the NMDOT and Metropolitan Planning Organizations.

6.4.1.3 Land and Water Conservation Fund

The Land and Water Conservation Fund (LWCF) offers grants for the acquisition or development of public outdoor recreation areas and facilities, including trails and greenways. Money for the fund comes from the sale or lease of nonrenewable resources, primarily federal offshore oil and gas leases and surplus federal land sales. The LWCF program is annually distributed by the National Park Service. Communities must match LWCF grants with 50 percent of the project costs through in-kind services or cash. The maximum grant amount is $250,000.

The Trails for Life Grant, under the LWCF program, offers funds for two project types: looped fitness trails of a quarter-mile in length, with maximum $35,000; and projects that target public health and fitness, such as linear trails with a maximum of $70,000. There are no matching requirements but the applicant must provide the land where the trail will be constructed. Funds can be used for engineering costs.

6.4.1.4 National Recreational Trails Fund Act

The National Recreational Trails Fund Act (NRTFA) can assist with the construction and maintenance of non-motorized and motorized trails. NRTFA projects are 80 percent federally funded, and grant recipients must provide a 20 percent match. Local matches can be in the form of donations of services, materials or land.

6.4.1.5 Safe Routes to School Program

As mentioned previously, the purpose of the SRTS program is to make walking and bicycling to school safe and more appealing. SRTS infrastructure projects funded through TAP must be located within two miles of a K-8th-grade school. The program can provide funding for trail planning and development projects that improve safety and access to schools. Potential projects may include sidewalks, traffic calming and speed reduction, pedestrian and bicycle crossing, off-street bicycle and pedestrian facilities, bike parking and traffic diversion near schools.

6.4.1.6 Other Federal Grants

The United States Department of Agriculture (USDA) provides small grants of up to $10,000 to communities for the purchase of trees to plant along city streets and for trails and parks. To qualify for this program, a community must pledge to develop a street tree inventory; a municipal tree ordinance; a tree commission, committee or department; and an urban forestry-management plan.

The USDA's Natural Resource Conservation Service (NRCS) also provides funding to state and local agencies or nonprofit organizations authorized to carry out, maintain and operate watershed park improvements involving less than 250,000 acres. The NRCS provides financial and technical assistance to eligible projects to improve watershed park protection, flood prevention, sedimentation control, public water-based fish and wildlife enhancements, and recreation planning.

The United States Department of Housing and Urban Development (HUD) offers financial grants to communities for neighborhood revitalization, economic development, and improvements to community facilities and services. Trail development within targeted low-to moderate income areas are eligible activities.

6.4.2 Private

The most successful method of funding trails is to combine private sector funds with funds from local, state and federal sources. Many agencies involved with trail implementation will seek to leverage local money with outside funding sources to increase resources available for trail acquisition and development. Below are a few examples of how SSCAFCA may obtain private funds to develop trail facilities.

6.4.2.1 Adopt-a-Trail

Community trail adoption programs are similar to the widely-instituted Adopt-a-Highway program. These programs identify local individuals, organizations, or businesses that would be interested in "adopting" a bikeway, walkway, trail, or shared-use path. Adopting a facility makes a person or group responsible for the facility's maintenance, either through direct action or as the source of funding for facility maintenance costs. It may be possible to substantially lower the cost of maintaining one mile of paved trail through an Adopt-a-Trail Program. The managers of an adopted trail or bikeway may be allowed to post their name on signs to display their commitment and civic pride in the trail system.

6.4.2.2 Trail Sponsors

A sponsorship program for trail amenities allows for smaller donations to be received from individuals and businesses. Trail elements that may be funded can include benches, trash receptacles, signage, and picnic areas. Typically, plaques recognizing the individual contributors are placed on the constructed amenities or at a prominent entry point to the trail.

6.4.2.3 Community Volunteers

Community volunteers can be resourceful in fundraising and garnering support for trail construction and other facility improvements. They can also substantially reduce costs associated with construction and routine maintenance by offering physical assistance. Volunteers may include high school or college students, trail user groups, local historical groups, neighborhood associations, local churches, conservation groups, local civic clubs.

6.4.2.4 Land Trusts

Land Trusts are local, regional, or statewide nonprofit conservation organizations directly involved in helping protect natural, scenic, recreational, agricultural, historic, or cultural property that is important to the community. The Trust for Public Land (TPL) is the most notable nationally by conserving land for public use, such as park, greenways, recreation areas, historic landmarks, forests, watershed parks, and wilderness. It applies its expertise in negotiations, finance, and law. Typically, the TPL steps in to negotiate the purchase of real estate and holds the land until a public agency can acquire it.

Section 7
References

American Association of State Highway and Transportation Officials (AASHTO), 2012. Guide for Development of Bicycle Facilities 4th Edition. Publication Code GBF-4t. ISBN 978-1-56051-527-2. Washington, DC. Available online: https://app.knovel.com/hotlink/toc/id:kpGDBFE008/guide-development-bicycle/guide-development-bicycle.

Bernalillo County, 2012. Pedestrian and Bicyclist Safety Action Plan. July. Available online: https://www.bernco.gov/uploads/FileLinks/7c646c58fc2d45fa95a1b4c972417bf0/pedestrian_safety_action_plan__BCC_final_.pdf.

Callander Associates Landscape Architecture, Inc. Feasibility Study Trail Program: Use of Recycled Pavements. Prepared for: City of San Jose, CA. July 11, 2007.

City of Albuquerque, 2015. Bikeways & Trails Facilities Plan. Albuquerque, NM. May 18.

City of Rio Rancho, 2009. Development Manual, Volume II: Design Criteria. Section II.5, Parks and Trail Design. Available online: https://rrnm.gov/DocumentCenter/View/8102 .

City of Rio Rancho, 2011. Rio Rancho Bicycle and Pedestrian Transportation Master Plan. Rio Rancho, NM. February 9. Available online: https://www.rrnm.gov/DocumentCenter/View/8302.

City of San Jose, 2007. Feasibility Study, Trail Program: Use of Recycled Pavements. July 11. Available online: http://atfiles.org/files/pdf/Recycled-pavement-materials-study.pdf.

Cole, David N. 2004. Impacts of Hiking and Camping on Soils and Vegetation: A Review. Missoula, MT: Aldo Leopold Wilderness Research Institute. Available online: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.606.7471&rep=rep1&type=pdf.

Crimmins, Tom M. In association with the National Off-Highway Vehicle Conservation Council, 2006. Management Guidelines for Off-Highway Vehicle Recreation. Available online: http://nohvcc.org/docs/miscellaneous-files/ohvguidelines.pdf?sfvrsn=0.

Federal Highway Administration (FHWA), 1999. Design Sidewalks and Trails for Access. Part 1 of 2: Review of Existing Guidelines and Practices. Available online: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/sidewalks.pdf.

FHWA, 2000. Accommodating Bicycling and Pedestrian Travel: A Recommended Approach. Available online: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design.cfm.

FHWA, 2002. Scenic Byways: A Design Guide for Roadside Improvements. Coordinated Federal Lands Highway Technology Implementation Program. FHWA-FLH-02-001. San Dimas, CA: U.S.

Department of Agriculture, Forest Service, San Dimas Technology and Development Center. Available online: https://www.fs.fed.us/eng/pubs/pdf/fhwa02001.pdf.

FHWA, 2003. Manual of Uniform Traffic Control Devices for Streets and Highways (MUTCD). Revision 1 dated November 2004 and Revision 2 dated December 2007, Chapter 9 Bikeway Facilities. Washington, D.C.

FHWA, 2007. Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds. Recreational Trails Program. Available online: https://www.fs.fed.us/t-d/pubs/pdfpubs/pdf07232816/pdf07232816dpi72pt00.pdf.

FHWA, 2017. Equestrian Design Guidebook for Trails, Trailheads and Campgrounds. Recreational Trails Program. Available online: https://www.fhwa.dot.gov/environment/recreational_trails/publications/fs_publications/07232816/toc.cfm.

Hans, Mandy; Marchesani, Steve; Watson, Chris; Whittaker, Lara, 2005. Building Trails: A Benefit-Cost Analysis. The College of William and Marry Thomas Jefferson Program in Public Policy. December. Available online: https://www.wm.edu/as/publicpolicy/documents/prs/trails.pdf.

Institute of Transportation Engineers, 1998. Design and Safety of Pedestrian Facilities, A Recommended Practice. Available online: https://safety.fhwa.dot.gov/ped_bike/docs/designsafety.pdf.

International Mountain Bicycling Association (IMBA), 2004. Trail Solutions: IMBA's Guide to Building Sweet Single-track.

Lewiston, Diana, 1992. Bicycling in Traffic, Intermediate Bicycling Handling and Beginning/Intermediate Urban Traffic Skills. April. Available online: https://thinkbicyclingblog.files.wordpress.com/2012/04/bicycling_in_traffic_lewiston_1988.pdf.

Makusa, Gregory Paul, 2012. Soil Stabilization Methods and Materials. State of the Art Review. Available online: https://www.diva-portal.org/smash/get/diva2:997144/fulltext01.pdf

Mid Region Council of Governments (MRCOG), 2017. Futures 2040 Metropolitan Transportation Plan (MTP). Mid-Region Metropolitan Planning Organization. Metropolitan Transportation Board. Albuquerque, NM. April 17.

National Cooperative Highway Research Program and Transportation Research Board of the National Academies, 2010. Update of the AASHTO Guide for the Planning, Design, and Operation of Bicycle Facilities. NCHRP 20-07/Task 263. Available online: http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(263)_FR.pdf.

National Highway Traffic Safety Administration, Centers for Disease Control and Prevention, Federal Highway Administration, 2001. National Strategies for Advancing Bicycle Safety. Available online: https://icsw.nhtsa.gov/people/injury/pedbimot/bike/bicycle_safety.

National Park Service, 1996. North Country National Scenic Trail: A Handbook for Trail Design, Construction, and Maintenance. Available online: https://www.nps.gov/noco/learn/management/upload/Handbook-complete-2.pdf.

National Park Service, 2007. Guide to Sustainable Mountain Trails: Trail Assessment, Planning, and Design Sketchbook. September. Available online: http://npshistory.com/publications/wilderness/trail-sketchbook-2007.pdf.

New Mexico State Parks, 2008. Rio Grande Trail Corridor Study Trail Surfacing Report. Energy, Minerals and Natural Resources Department. August. Available online: http://atfiles.org/files/pdf/RioGrandeSurfaceStudy.pdf.

Portland Parks and Recreation, 2009. Trail Design Guidelines for Portland's Park System. Available online: https://www.portlandoregon.gov/parks/38306?a=250105.

Rails to Trails Conservancy, 2000. Rails with Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines. Available online: https://www.railstotrails.org/resourcehandler.ashx?name=rails-with-trails-design-management-and-operating-characteristics-of-61-trails-along-active-rail-lines&id=3491&fileName=Rails-with-Trails%20Report%20reprint_1-06_lr.pdf.

Rails to Trails Conservancy, Charles Flink, Kristine Olka, Robert Searns, 2001. Trails for the Twenty-First Century: Planning, Design, and Management Manual. Island Press: Washington DC.

Southern Sandoval County Arroyo Flood Control Agency (SSCAFCA), 2006. Quality of Life Master Plan for Watershed Park. Albuquerque, NM. Accepted September 15.

State of Minnesota, Department of Natural Resources, 2007. Trail Planning, Design, and Development Guidelines. Trails and Waterways Division. 500 Lafayette Road, St. Paul, MN 55155-4052. 306 pages. Available online: https://www.leg.state.mn.us/docs/2007/other/070340.pdf.

State of New Mexico, Department of Transportation (NMDOT), 2016. Transportation Alternatives Program. Annual Report Federal Fiscal Year 2016, released November. Available online: http://dot.state.nm.us/content/dam/nmdot/planning/TAP_Annual_Report_FFY16.pdf

NMDOT, 2017. Active Transportation and Recreational Programs Guide: Federal Fiscal Years 2018 and 2019. Available online: http://dot.state.nm.us/content/dam/nmdot/planning/FFY18-19_TAP-RTP_Guide.pdf

State of Pennsylvania, Department of Conservation and Natural Resources, 2004. Pennsylvania Trail Design Manual for Off-Highway Recreational Vehicles. March. Available online: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_002295.pdf.

Transportation Research Board, 1987. Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas. Volume 294 of National Cooperative Highway Research Program Report 294B, Washington, DC.

U.S. Access Board, 2002. ADA Accessibility Guidelines. Available online: https://www.access-board.gov/attachments/article/1350/adaag.pdf.

U.S. Access Board, 2013. Final Guidelines for Outdoor Developed Areas. 36 CFR Part 1191. Published in the Federal Register September 26. Available online: https://www.access-board.gov/attachments/article/1500/outdoor-rule.pdf.

U.S. Department of Justice, 2010. Guidance on the 2010 ADA Standards for Accessible Design. September 15. Available online: https://www.ada.gov/regs2010/2010ADAStandards/Guidance_2010ADAStandards.pdf

U.S. Forest Service, 2013. Designing Sustainable Off-Highway Vehicle Trails: An Alaska Trail Manager's Perspective. Missoula, MT: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. Available online: https://www.fs.fed.us/t-d/pubs/pdfpubs/pdf11232804/pdf11232804dpi100.pdf.

U.S. Forest Service, 2014. Standard Trail Plans and Specifications. Available online: https://www.fs.fed.us/recreation/programs/trail-management/trailplans/index.shtml.

U.S. Forest Service, 2016. Trail Fundamentals and Trail Management Objectives. Recreation, Heritage and Volunteer Resources Washington Office. Available online: https://www.fs.fed.us/recreation/programs/trail-management/documents/trailfundamentals/1623-3801_TrailFdml+TMO_Sec508_11-14-16_150dpi.pdf.

Village of Corrales, 2009. Comprehensive Land Use Plan. Adopted August 11. Available online: http://corrales-docs.cividocs.com/Documents/Files/pnz/2009-ComprehensivePlan-FINAL.pdf.

Wernex, Joe. Off-Highway Motorcycle and ATV Trails: Guidelines for Design, Construction, Maintenance and User Satisfaction. American Motorcyclist Association: Pickerington, Ohio. Available online: http://atfiles.org/files/pdf/WernexReport.pdf.

Wood, Dr. Gene W., 2007. Recreational Horse Trails in Rural and Wildland Areas Design, Construction and Maintenance. Department of Forestry and Natural Resources: Clemson University.

Appendix A
Trail Type Matrix

This page intentionally left blank.

APPENDIX A - TRAIL TYPE MATRIX

Trail Type	Primary Users	Design Considerations	Maintenance	Construction Cost per Mile[1]
Unpaved: Native Soil	Horseback Riders Mountain Bikers	Hard surfaces (asphalt and concrete) and coarse gravel can injure horse hooves, so equestrians prefer loose or compacted dirt trails. A softer, separate 5-foot wide tread for horses alongside the main path is recommended if designed in combination with a paved path. Vertical clearance should be at least 10 feet, with a horizontal clearance of at least 5 feet. – Removable bollard(s) at entry points – Wider clearance will be required for use by arroyo maintenance vehicles – Grades steeper than 3 percent are not practical because of erosion – May require surface treatment to minimize dust	– High potential for erosion. Will require routine maintenance to repair potholes/ruts – Trash/debris removal	$31,000
Unpaved: Crusher Fines	Walkers Hikers Joggers Dog Walkers Bird Watchers Mountain Bikers	Pedestrians tend to have fewer design requirements than other users. Most prefer softer surfaces to lessen impacts on their knees, though some users, such as power walkers and those pushing strollers may prefer more compact surfaces. The minimum recommended vertical clearance for pedestrians is eight feet. – Removable bollard(s) at entry points	– Low to moderate potential for erosion. Will require routine maintenance to ruts – Vegetative maintenance – Trash/debris removal	$46,000
Unpaved: Gravel	Walkers Hikers Joggers Dog Walkers Mountain Bikers Off-Road Vehicles	Equestrians prefer loose or compacted dirt trails, though gravel may be suitable if specifically designed. Though roller-compacted gravel is considered a firm and stable surface, gravel trails are generally not wheelchair accessible. A softer, separate 5-foot wide tread for horses alongside the main path is recommended if designed for equestrian use. Vertical clearance should be at least 10 feet, with a horizontal clearance of at least 5 feet. – Removable bollard(s) at entry points – Grades steeper than 3 percent are not practical because of erosion – May require surface treatment to minimize dust	– Moderate to high potential for erosion. Will require routine maintenance to ruts – Vegetative maintenance – Trash/debris removal	$82,000
Paved: Asphalt	Walkers Dog Walkers Bird Watchers Recreational Cyclists Commuting Cyclists Touring Cyclists Inline Skaters	The AASHTO Guide for the Development of Bicycle Facilities is viewed as the national standard for bikeway design. Bicyclists prefer hard surfaces and require a vertical clearance of at least 8 feet, with 10 feet needed for overpasses and tunnels. Adequate sight distances for cyclists are critical for user safety; AASHTO recommends that multi-use trails provide a minimum sight distance of 150 feet. Ideal grades for bicyclists, over long distances, are less than 3 percent, although up to 5 percent is acceptable. – Removable bollard(s) at entry points – Designed to accommodate arroyo maintenance vehicles – May include a compacted dirt or crusher fines shoulder for joggers – Engineered intersections with roadways – 2 percent cross slope to accommodate drainage / adequate drainage adjacent to path	– Very low potential for erosion – Edge protection – Trash/debris removal – Erosion	$155,000
Stabilized Soil (Landlock™)	Walkers Dog Walkers Bird Watchers Recreational Cyclists Commuting Cyclists Touring Cyclists Inline Skaters	Proprietary soil-stabilizing products may be combined with either soil or geriatric asphalt to provide added benefits such as increased strength, erosion resistance, water impermeability, and dust control. – Removable bollard(s) at entry points – Designed to accommodate arroyo maintenance vehicles – More natural-looking than paved surfaces with comparable strength and durability – May include a compacted dirt or crusher fines shoulder for joggers – 2 percent cross slope to accommodate drainage / adequate drainage adjacent to path – Provides erosion and fugitive dust control	– Low potential for erosion – Edge protection – Trash/debris removal – Minimal maintenance – Stabilized soil surfaces become porous over time, depending on use and climate – requiring reapplication of topical sealcoat.	$132,000
Reclaimed Asphalt Pavement (Rubberized Asphalt)	Walkers Dog Walkers Bird Watchers Recreational Cyclists Commuting Cyclists Touring Cyclists	Rubberized asphalt can be used as a mixture with virgin materials. Rubber crumbs can also be incorporated into the asphalt concrete layer of pavement, providing a longer-lasting asphalt concrete layer. – Removable bollard(s) at entry points – Designed to accommodate arroyo maintenance vehicles – May include a compacted dirt or crusher fines shoulder for joggers – 2 percent cross slope to accommodate drainage / adequate drainage adjacent to path	– Very low potential for erosion – Edge protection – Trash/debris removal – Minimal maintenance – Less frequent maintenance than traditional asphalt	$35,268

[1] Refer to SSCAFCA Trails Master Plan for assumptions and description of construction cost estimating.

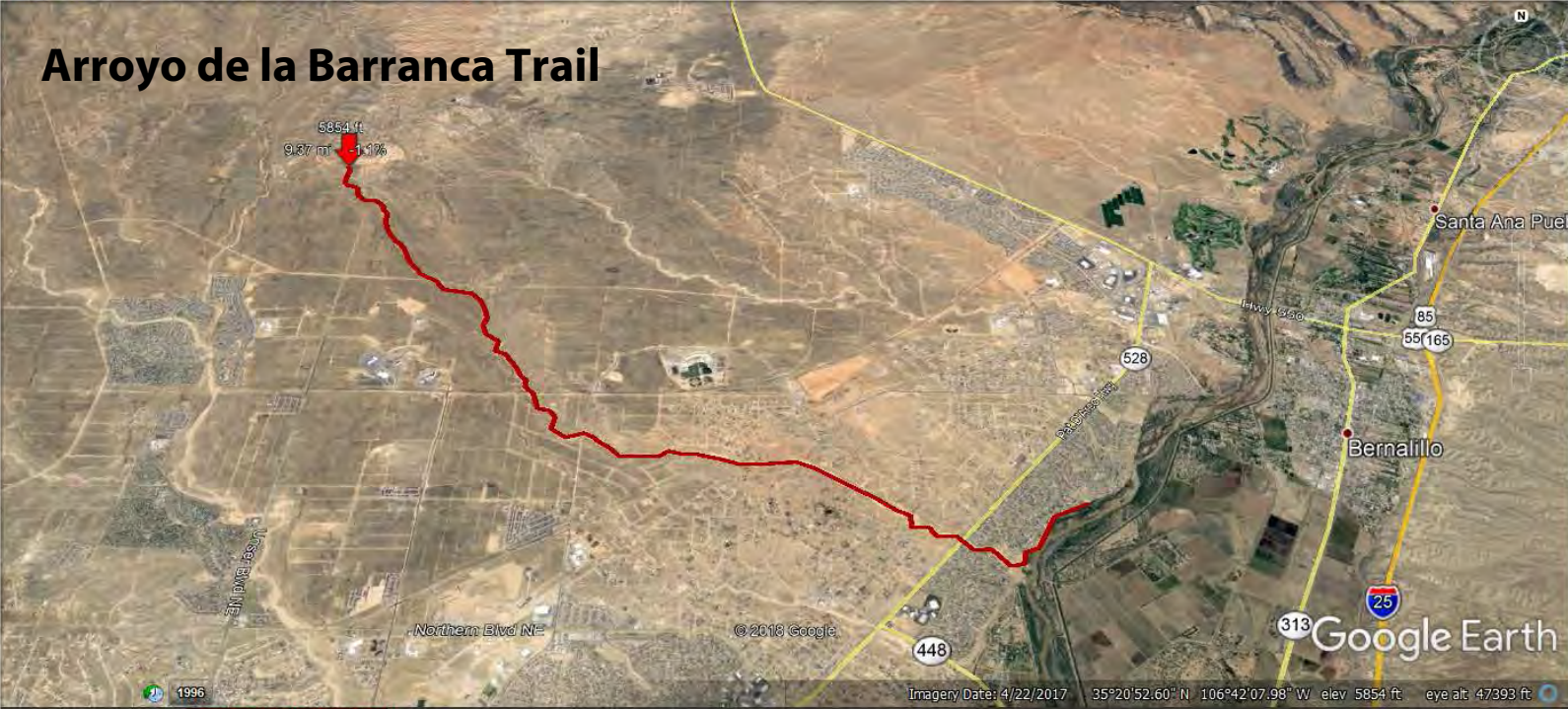
This page intentionally left blank.

Appendix B

Elevation Profiles

This page intentionally left blank.

Arroyo de la Barranca Trail



This page intentionally left blank.

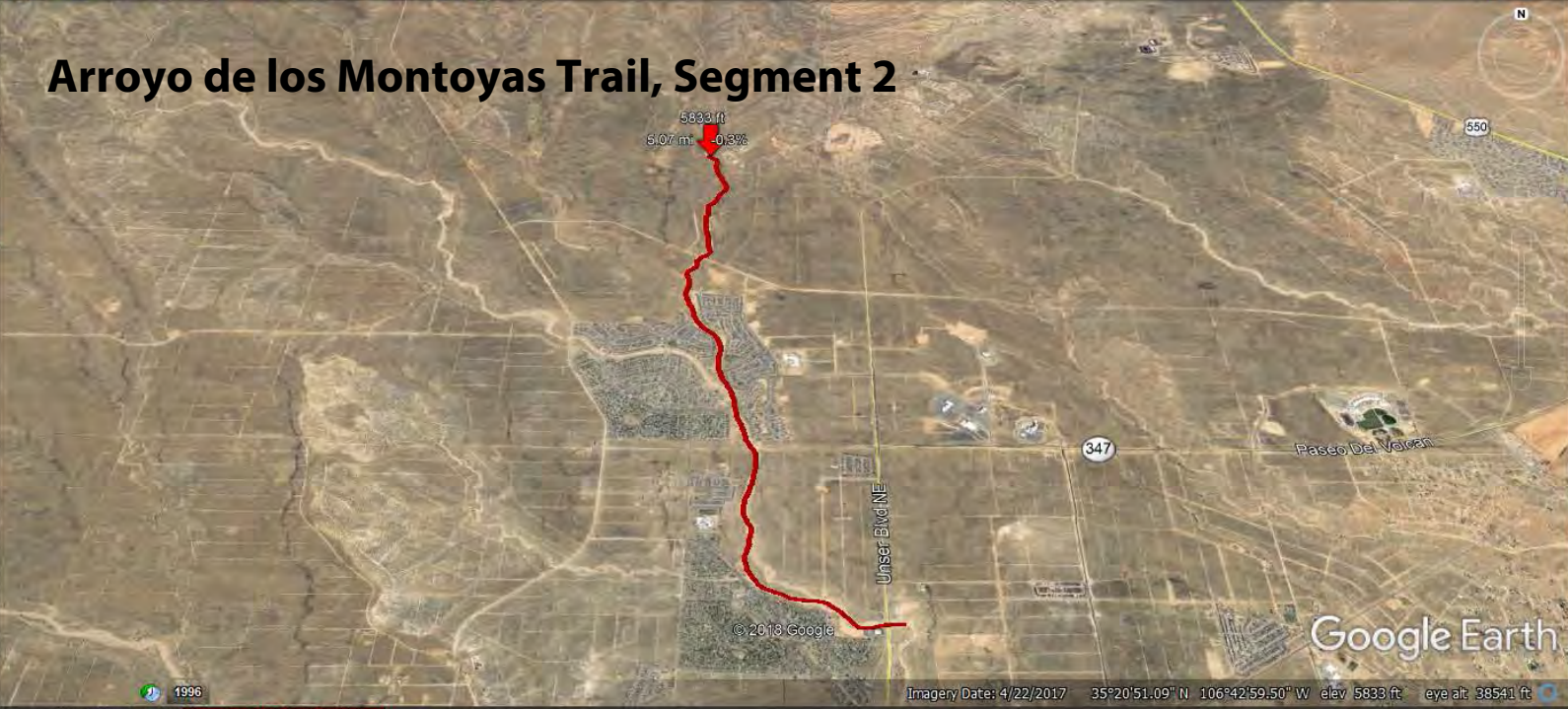
Arroyo de las Lomitas Negras Trail

This page intentionally left blank.

Arroyo de los Montoyas Trail, Segment 1

This page intentionally left blank.

Arroyo de los Montoyas Trail, Segment 2



This page intentionally left blank.

Arroyo de los Montoyas Trail, Segment 3

This page intentionally left blank.

Coronado Watershed Trail

This page intentionally left blank.

Corrales Acequia Trail

This page intentionally left blank.

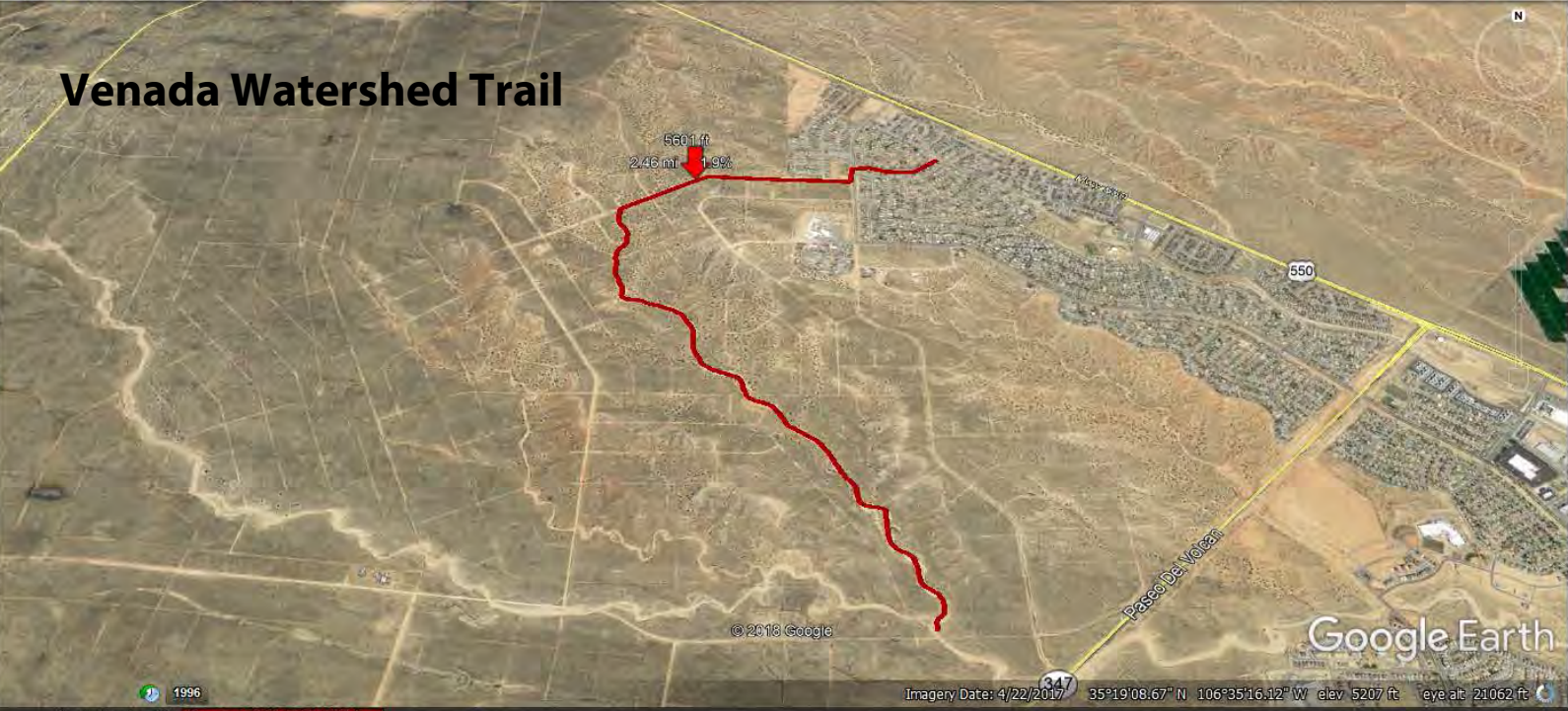
Lisbon Channel Trail

This page intentionally left blank.

Snead Channel Trail

This page intentionally left blank.

Venada Watershed Trail

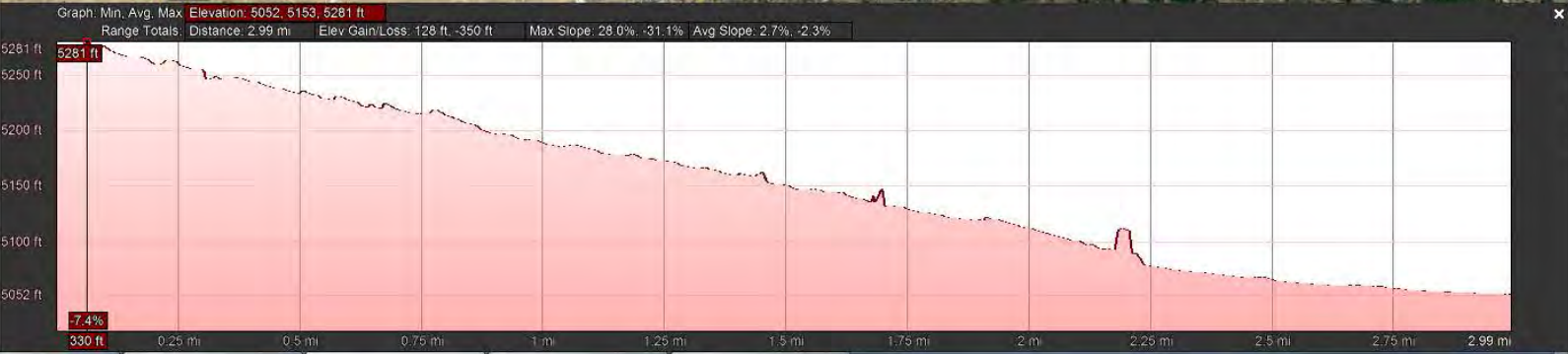


This page intentionally left blank.

Zia Watershed Trail

This page intentionally left blank.

Outer Loop Trail, Segment 1

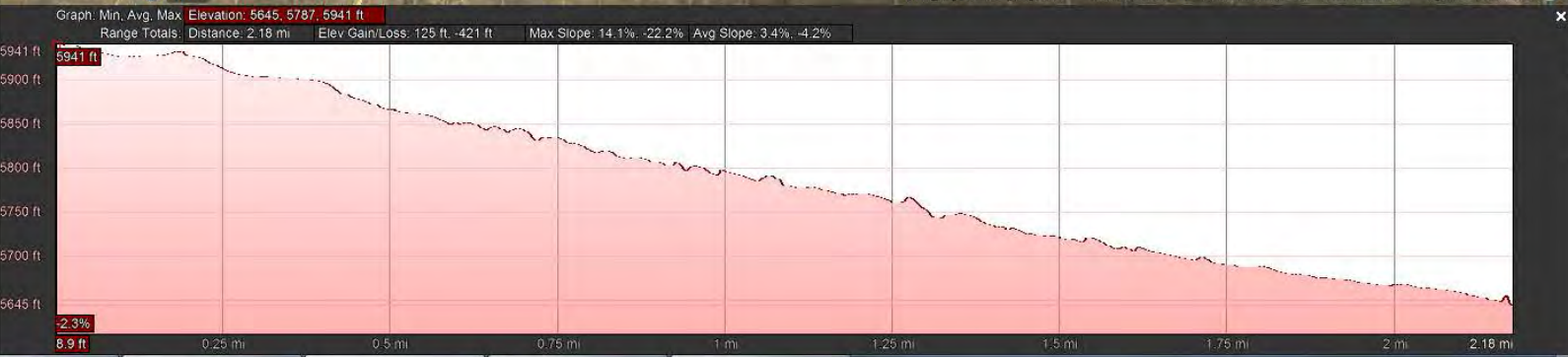


This page intentionally left blank.

Outer Loop Trail, Segment 2

This page intentionally left blank.

Outer Loop Trail, Segment 3

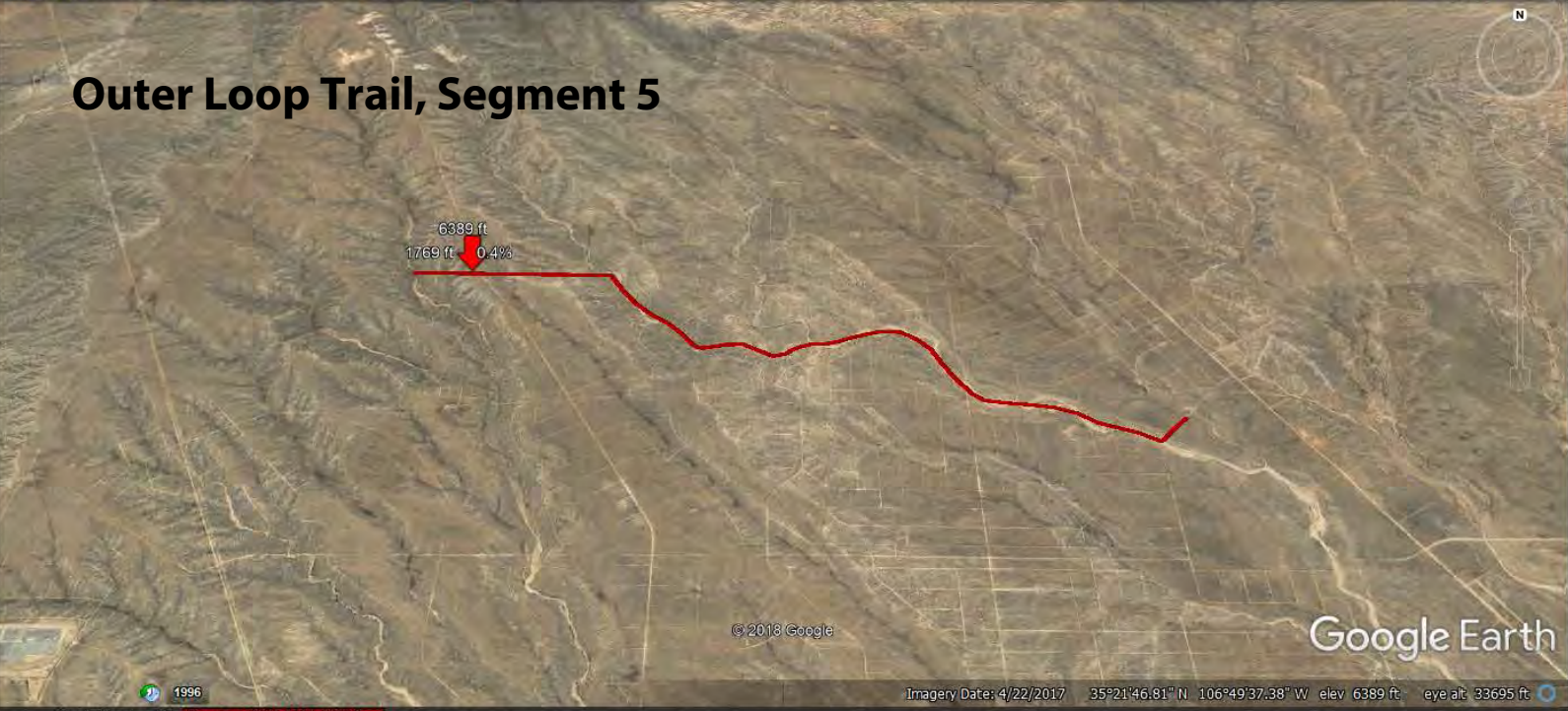


This page intentionally left blank.

Outer Loop Trail, Segment 4

This page intentionally left blank.

Outer Loop Trail, Segment 5



This page intentionally left blank.

Outer Loop Trail, Segment 6

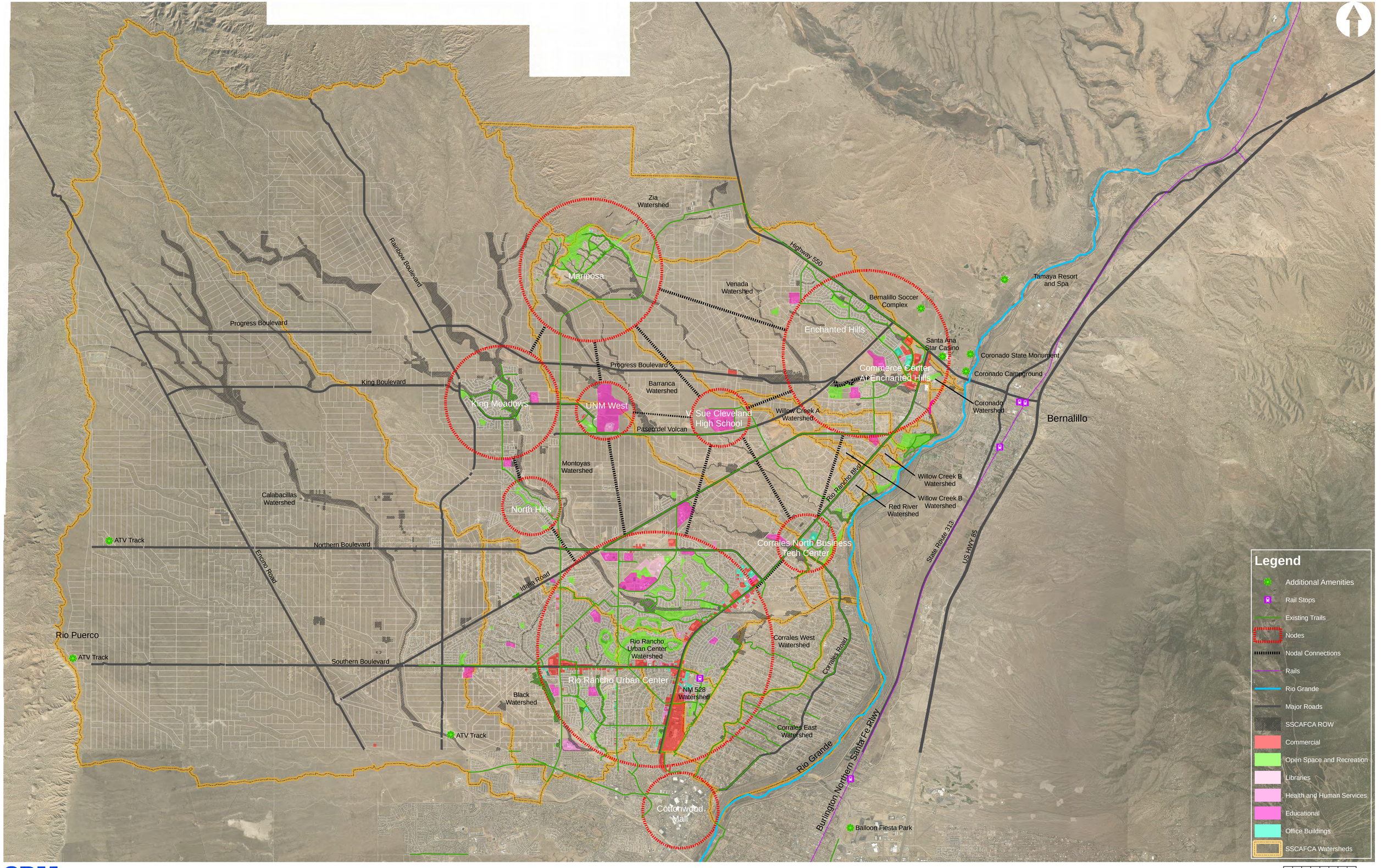
This page intentionally left blank.

Outer Loop Trail, Segment 7

This page intentionally left blank.

Appendix C
Nodal Analysis

This page intentionally left blank.



CDM Smith

SSCAFCA Nodal Analysis and Potential Connections

Southern Sandoval County Arroyo Flood Control Authority

This page intentionally left blank.