Rapid Watershed Assessment for La Cienega, La Cieneguilla, and El Canon Areas

Santa Fe County, New Mexico

Prepared for

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1. Introduction

This rapid watershed assessment (RWA) has been prepared for the portion of the Santa Fe River subwatershed that includes Santa Fe County's La Cienega and La Cieneguilla (LCLC) planning area, as well as the surrounding area. RWA documents gather and summarize readily available data about a watershed's physical, social, and environmental conditions. They compile information for local stakeholders and decision makers, help identify resource concerns, and may be used to help prioritize conservation efforts. In 2011, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) completed an RWA for the full Rio Grande-Santa Fe Watershed 8-digit hydrologic unit code (HUC) 13020201 (NRCS, 2011). HUC 13020201 begins at Otowi, west of Pojoaque, New Mexico, includes Cochiti Reservoir, and extends downstream to the confluence between the Rio Grande and Jemez River. The full Rio Grande-Santa Fe watershed includes an area of over 2 million acres within portions of Bernalillo, Los Alamos, San Miguel, Sandoval, and Santa Fe Counties (NRCS, 2011). The RWA exercise has been repeated and updated as part of the current La Cienega, La Cieneguilla, and El Canon integrated water planning (IWP) and preliminary engineering report (PER) project being performed for Santa Fe County (County) by Daniel B. Stephens & Associates, Inc. (DBS&A), Hazen and Sawyer (Hazen), and Sites Southwest.

2. Physical Setting

The Santa Fe River watershed is a subwatershed of the Rio Grande watershed, including an area of over 180,000 acres (285 square miles) (City of Santa Fe, 2025a). The Santa Fe River watershed and LCLC planning area boundary are shown on Figure 1. This RWA focuses on the LCLC planning area, as well as the surrounding area. The Santa Fe River subwatersheds that are located within the study area are shown on Figure 2. This RWA looks specifically at the Lower Santa Fe River, which extends from the City of Santa Fe's Paseo Real Water Reclamation Facility (PRWRF) downstream.

The Santa Fe River's major tributaries and arroyos include Arroyo Calabasas, Arroyo de los Chamisos, Arroyo Hondo, Cienega Creek, Guicu Creek, and Alamo Creek. Natural streamflow comes primarily from the Upper Santa Fe River and Cienega Creek system. The river also receives inflows from stormwater flow, groundwater discharge, and discharge from the PRWRF. The region is hydrologically unique, with numerous springs, seeps, and wetlands emerging in the valleys and along the river channels. Groundwater flows west-southwest through the Santa Fe Group aquifer from the Sangre de Cristo Mountains in the east. The Santa Fe Group sourced groundwater feeds the springs and wetlands. The regional aquifer system consists of thick alluvial deposits of the Tesuque Formation overlain by shallow, thin (less than 250 feet), coarse deposits of the Ancha Formation.

The LCLC planning area includes the traditional communities of La Cienega (Upper and Lower), La Cieneguilla, El Canon, and the surrounding areas (Santa Fe County, 2025). The area is unique, historic, and rural. The planning area boundary follows the La Cienega Traditional Historic Communities boundary that was established by Santa Fe County Ordinance 2000-07, recognizing the historic importance of the area and preventing annexation by the City of Santa Fe (Santa Fe County, 2025).

Figure 3 shows the elevation in the study area, which ranges from approximately 5,200 feet above mean sea level (feet msl) along the Santa Fe River channel to approximately 7,320 feet msl (USGS, 2025a). The 30-year average precipitation (1991-2020) within the study area is shown on Figure 4, and ranges from approximately 10.5 to 12.5 inches per year (OSU, 2025).

3. Land Ownership

Figure 5 presents land ownership for property within the study area, which includes private ownership, as well as federal land (e.g., U.S. Forest Service [USFS] and Bureau of Land Management [BLM]), Pueblo land (i.e., Cochiti Pueblo), and State land (BLM, 2012). Table 1 provides the number of acres and percent of the total area within the LCLC planning area for each type of ownership. More than half of the study area is privately owned.

As part of the previous County LCLC Domestic Well Monitoring Program project, DBS&A obtained current parcel data from the Office of the Santa Fe County Assessor web portal in May 2022, and the parcel data were clipped to include those parcels located partially or entirely within the LCLC planning area. A total of 1,341 parcels were identified (DBS&A, 2023).

Staff from DBS&A and Hazen presented the draft RWA figures developed for this document at the County's Water Policy Advisory Committee (WPAC) Drinking Water and Wastewater working group meeting on May 28, 2025, and there was a comment that Public Law 98-344 (dated July 9, 1984) required that a cadastral survey of Pueblo de Cochiti Trust Lands be performed, and that it has not been; therefore, the Cochiti Pueblo land ownership information shown on Figure 5 and quantified in Table 1 may not be accurate.

Table 1. Land Ownership

Owner	Area (acres)	Percent of Total (%)
Bureau of Land Management	6,543.37	33.7
U.S. Forest Service	1,870.15	9.6
Cochiti Pueblo [a]	324.06	1.7
Private	9,941.79	51.2
State	726.21	3.7
Total	19,405.58	100.0

Source: BLM, 2012

[a] This area does not account for the former Downs at Santa Fe property that is now owned by Pojoaque Pueblo.

4. Land Cover and Ecosystems

Figure 6 and Table 2 present land cover data for land within the study area, distinguishing between developed and undeveloped areas.

These are national land cover dataset (NLCD) data developed by the U.S. Geological Survey (USGS) in collaboration with the U.S. Environmental Protection Agency (EPA). The data include 12 dominant land use/cover classes as a consistent land cover data layer for the conterminous United States (USGS, 2025b). The classifications include shrubland, herbaceous grasslands, evergreen forest, low-intensity residential, high-intensity residential, row crops, woody wetlands, deciduous forest, open water, commercial/ industrial/transportation, mixed forest, and pasture/hay (USGS, 2025b). As shown by the Figure 6 inset box that zooms in on La Cienega, development in this area is primarily of low intensity. These data indicate that approximately 8.5 percent of the study area is developed (open space is one of the development land use classes and accounts for approximately 6.0 of the 8.5 percent of the developed area), and 88 percent of the study area is shown as the shrub/scrub land use/cover class.

Table 2. Land Cover

Land Cover	Area (acres)	Percent of Total (%)
Open Water	3.34	0.02
Developed, Open Space	1,153.33	5.94
Developed, Low Intensity	469.16	2.42
Developed, Medium Intensity	20.23	0.10
Developed area (subtotal)	*1,642.72*	*8.47*
Evergreen Forest	126.74	0.65
Shrub/Scrub	17,035.56	87.79
Grasslands/Herbaceous	29.35	0.15
Pasture/Hay	139.64	0.72
Woody Wetlands	187.89	0.97
Emergent Herbaceous Wetlands	239.03	1.23
Total	19,404.27	100.0

Source: USGS, 2025b

The Southwest Region Gap Analysis Project (SWReGAP) was a multi-institutional cooperative effort to map and assess regional terrestrial biodiversity for a five-state region in the southwestern U.S. (Arizona, Colorado, Nevada, New Mexico, and Utah), and participants included USGS and state institutions. The project included development of detailed maps showing land cover, native terrestrial vertebrate species, land stewardship and management status (SWReGAP, 2025). The mapping shows the extent of 12 dominant ecosystems; the dominant ecosystems within the study area are shown on Figure 7 and Table 3. Approximately 75 percent of the study area is either inter-mountain basins semi-desert grassland (approximately 48 percent) or southern Rocky Mountain juniper woodland and savanna (approximately 27 percent).

Table 3. Dominant Ecosystems

Zone	Ecological System	Area (acres)	Percent of Total (%)
158	Southern Rocky Mountain Ponderosa Pine Woodland	1.33	0.01
186	Colorado Plateau Pinyon-Juniper Shrubland	0.22	0.00
188	Southern Rocky Mountain Juniper Woodland and Savanna	5,278.15	27.20
189	Southern Rocky Mountain Pinyon-Juniper Woodland	1,604.70	8.27
194	Western Great Plains Riparian Woodland and Shrubland	4.45	0.02
270	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	856.72	4.41
326	Western Great Plains Foothill and Piedmont Grassland	8.23	0.04
484	Inter-Mountain Basins Mat Saltbush Shrubland	11.78	0.06
485	Inter-Mountain Basins Mixed Salt Desert Scrub	20.46	0.11
491	Inter-Mountain Basins Montane Sagebrush Steppe	1,333.88	6.87
497	Inter-Mountain Basins Semi-Desert Grassland	9,263.76	47.74
529	Rocky Mountain Cliff, Canyon and Massive Bedrock	24.46	0.13
556	Cultivated Cropland	43.14	0.22
557	Pasture/Hay	4.22	0.02
574	Disturbed/Successional - Grass/Forb Regeneration	23.79	0.12
579	Open Water (Fresh)	5.11	0.03
581	Developed, Open Space	458.93	2.36
582	Developed, Low Intensity	431.13	2.22
583	Developed, Medium Intensity	30.68	0.16
584	Developed, High Intensity	0.89	0.00
	Total	19,406.03	100.0

SWReGAP, 2025

Beavers are active along the Lower Santa Fe River in La Cieneguilla. As part of the La Cienega, La Cieneguilla, and El Canon IWP and PER project, the consultant team and County staff participated in a series of site visits, and beaver activity was noted at the Santa Fe Girls' School and adjacent properties in La Cieneguilla. Beavers have been present on the Santa Fe Girls' School property for about the last 3 to 4 years, and were also active on the property about 10 years ago (Williams, 2025). Beavers have diverted Santa Fe River water on the Santa Fe Girls' School property in significant ways. The school property has been experiencing flooding and ponded water is limiting access, but no beaver lodges have been identified on this property

(Williams, 2025). The area includes a lot of wildlife (e.g., beavers, elk, fox, bobcats, and mountain lion).

5. Geology and Groundwater

DBS&A and the New Mexico Bureau of Geology and Mineral Resources (NMBGMR) completed the first phase of the LCLC Domestic Well Monitoring Program planning services project for the County in 2022-2023. The discussion of geology and water levels that has been included in this focused RWA is largely from that report (DBS&A, 2023).

In 2003, the NMBGMR began a hydrogeological investigation of the Española Basin, with a special focus on the wetlands at La Cienega, with the goal of understanding groundwater flow in the area and potential influences on the wetlands (DBS&A, 2023). NMBGMR implemented a groundwater monitoring network around La Cienega beginning in 2015, and they prepared a summary of the hydrogeologic setting for the LCLC planning area for the previous LCLC study (DBS&A, 2023). The geology of the area is shown on Figure 8; a key to the geologic units is provided as Figure 8a. Regional groundwater elevation maps for the area show that groundwater in the southern Española Basin flows west-southwest through the Santa Fe Group aquifer from the Sangre de Cristo Mountains in the east (DBS&A, 2023).

Sources of recharge to the Santa Fe Group aquifer include mountain-front and stream channel recharge near the western border of the Sangre de Cristo Mountains, small amounts of areal recharge through coarse surface materials, and focused recharge in the southern Española Basin via streambed infiltration along ephemeral channels (DBS&A, 2023). Groundwater discharges through springs and seeps in the La Cienega and La Cieneguilla areas, in arroyo bottoms, and on hillsides at the contact of the Ancha Formation with underlying rocks (Spiegel and Baldwin, 1963). The groundwater that feeds springs and wetlands in the study area is sourced from the Santa Fe Group aquifer, which is a regional aquifer system of thick alluvial deposits of the Tesuque Formation, overlain by shallow, thin (less than 250 feet), coarse deposits of the Ancha Formation (DBS&A, 2023).

The La Cienega area has been the subject of numerous groundwater level studies over the past 60 years; as a result, there is a robust dataset of groundwater levels in this area (DBS&A, 2023). Groundwater level records in the area stretch back more than 50 years for some area wells. Compiled water level data from previous reports show that water levels in the Ancha aquifer have consistently dropped from the beginning of the records until the early 2010s because of long-term groundwater depletion upgradient (east) of the wetlands (DBS&A, 2023). These long-term records of water level in the area show consistent declines by as much as 0.3 foot per year. It is especially important to compare water levels collected at the same time of year over multiple years for this area; water levels are significantly higher in the winter when wetland vegetation is dormant.

A comparison of Ancha water levels in the mid-1970s and 1980s with water levels measured in the same wells between 2004 and 2012 show long-term water table declines up to 8.9 feet (DBS&A, 2023). The largest depletions and decline rates have occurred in the Valle Vista area and south of the New Mexico State Penitentiary, near the northern and southern edges of the Ancha zone of saturation (DBS&A, 2023) (Figure 9). Since 2012, water levels in the La Cienega area have begun to stabilize and, in some cases, even begun to recover, likely resulting from efforts to connect upgradient water users to the County water utility and to transition to using more surface water and less groundwater (DBS&A, 2023).

Johnson et al. (2016) mapped the thickness and extent of the Ancha Formation (Figure 9) and found that the largest area of saturation occurs along Cienega Creek east of the wetlands east of NM 14 and north to where NM 599 intersects Arroyo de los Chamisos (Johnson et al., 2016). Figure 9 shows the extent and saturated thickness of the Ancha Formation (Johnson et al., 2016). The saturated thickness ranges from 1 to 5 feet around the edges of the Ancha Formation's saturated extent and 80 to 100 feet in the center, as well as along Cienega Creek east of the wetlands. As shown, there is an area where there is a high Tesuque Formation surface dividing the saturated Ancha Formation, and this divide is located east of La Cieneguilla and the Santa Fe River. This divide causes groundwater to discharge to springs and streams in the La Cienega area. During 2000-2005, the saturated area of the Ancha Formation was about 14,000 acres, or 22 square miles, and Johnson et al. (2016) estimated that about 67,000 acre-feet of groundwater resides in the portion of the Ancha Formation that feeds the wetlands at La Cienega (Johnson et al., 2016). The study states that groundwater is being withdrawn at rates that exceed recharge, and the mining will eventually lead to depletion of the groundwater resource. Buried valley aquifers like those that maintain the wetlands focus pumping drawdowns along their buried channels, exacerbating groundwater depletion (Johnson et al., 2016). The wetlands in Arroyo Hondo, Guicu Creek, and Cienega Creek have large drawdown responses, but are linked to sources of enhanced recharge (Johnson et al., 2016).

At the project site visits and community meetings held for the current project to date, residents expressed concern over the decrease in water supply for diversion by area acéquias, the area's springs drying up, and spring discharge to the river no longer running year-round. Feedback at these events has reiterated the current project’s stated objective of restoring the area springs.

6. Soils

Figure 10 provides information about the soil type for soils in the study area; a key to the soil types presented on this figure is provided as Figure 10a (NRCS, 2024a). The key provides the name and identifier for each soil type, along with a general description of the soil type and range in slope. These data are from the Soil Survey Geographic Database (SSURGO) collected by the National Cooperative Soil Survey by pedestrian survey over the course of a century at scales ranging from 1:12,000 to 1:63,360 (NRCS, 2024a). Erosion susceptibility may be evaluated using SSURGO information, and the criteria used in the soil erosion susceptibility model include saturated hydraulic conductivity, slope, soil loss tolerance, wind erodibility group, and dominant soil type.

Hydrologic soil groups are shown on Figure 11 and defined on Table 4 (NRCS, 2024b). These soil groups provide information about infiltration rates and the amount of runoff expected when saturated (NRCS, 2024b). The infiltration rates decrease by soil group, with Group A having the highest infiltration rates, Group B soils having moderate infiltration rates, Group C having slow infiltration rates, and Group D having very slow infiltration rates (NRCS, 2024b). As shown on Figure 11, the soils along the stream channels through the study area are predominantly Group A soils.

Figure 12 presents the soil erodibility factor, also known as K factor, which is one of the five inputs to the Universal Soil Loss Equation (NRCS, 2025). The Universal Soil Loss Equation is a mathematical model often used to estimate soil erosion rates. The soil erodibility factor quantifies the susceptibility of soil particles to detachment and movement by water; the lower the K factor value, the less susceptible the soil is to detachment (NRCS, 2025).

A common resource area (CRA) is a land unit identified by the NRCS to describe areas with similar soil, climate, and other resource characteristics. The agency uses this information to understand how different areas can be managed for various resource uses, such as agriculture, forestry, or wildlife habitat. Each CRA is associated with conservation system guides, and for a given CRA and land use, there are different resource management system components. The entire study area is classified as CRA 36.2, defined as southwest plateaus, mesas, and foothills/ warm semiarid mesas and plateaus, and this CRA includes much of Santa Fe, Sandoval, and Los

Alamos Counties. Elevation typically ranges between 6,000 and 7,000 feet msl in this CRA. Precipitation ranges from approximately 10 to 16 inches per year, and cropland is a significant land use in this land unit classification (NRCS, 2011).

Table 4. Hydrologic Soil Groups

Soil Group	Group Color	Description
A		Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B		Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C		Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D		Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Source: NRCS, 2024b

7. Surface Water

The LCLC planning area is located within the lower reach of the Santa Fe River, and includes several of its major tributaries and arroyos, including Arroyo Calabasas, Arroyo de los Chamisos, Arroyo Hondo, Cienega Creek, Guicu Creek, and Alamo Creek (DBS&A, 2023). This region is hydrologically unique, with numerous springs, seeps, and wetlands emerging in the valleys and along the river channels (DBS&A, 2023). Figure 13 presents the surface water features located in the study area, and shows the perennial, intermittent, and ephemeral reaches. The PRWRF discharges treated wastewater to the Santa Fe River upstream of the LCLC planning area, and discharge from this facility increases the river's flow downstream of the facility outfall. This facility treats water that originates from both inside and outside of the Santa Fe River watershed.

The USGS National Hydrography Dataset (NHD) provides information about naturally occurring and manmade bodies of water. The information was mapped at 1:24,000 or larger scale and the data were historically updated and maintained through stewardship partnerships; however, as of October 1, 2023, the NHD was retired. NHD data will continue to be available, but will no longer be maintained (USGS, 2025a). The NHD identifies a total of approximately 21.6 miles of perennial stream reaches within the portion of the Santa Fe River subwatershed that are located within the County's LCLC planning area (Table 5).

Table 5. Surface Water Features

Description	Length (miles)
Artificial path [a]	3.71
Canal ditch [b]	4.70
Connector [c]	0.19
Pipeline [d]	0.92
Stream/river: hydrographic category = ephemeral	39.78
Stream/river: hydrographic category = intermittent	0.67
Stream/river: hydrographic category = perennial	21.56

Source: USGS, 2025a

[a] Used to complete the stream network where there is no obvious channel

[b] An artificial open waterway constructed to transport water, irrigate or drain land, connect two or more water bodies, or serve as a waterway for watercraft

[c] A known but nonspecific connection between two non-adjacent network segments used when two surface-water features appear to interact but there is no discernable evidence of the interaction on the surface

[d] A surface or subsurface, closed, constructed conduit for conveying water

Figure 14 shows the location of the one active USGS stream gaging station located in the study area. This is gage 08317200, Santa Fe River above Cochiti. Figure 15 shows the monthly average of mean daily flow for the Santa Fe River above Cochiti gage (USGS gage 08317200) for the period of record of 1970-2024 (USGS, 2025c). This plot indicates that the maximum mean annual discharge occurred in 1992, when it was nearly 40 cubic feet per second (cfs), but typical flows are much less (averaging 9 cfs). The La Bajada Community Ditch's diversion is located upstream of this stream gage.

Figure 16 shows the gaining, losing, and neutral reaches of the Santa Fe River. As shown, the segment of the Santa Fe River located downstream of the PRWRF outfall that extends into the far northwest portion of the study area is a losing reach (surface water recharges groundwater in this area). The segment of the Santa Fe River that flows between La Cieneguilla and La Cienega is gaining (groundwater discharges to the river in this reach). The segments of Cienega Creek and Alamo Creek just upstream of La Cienega and their confluences with the Santa Fe River are neutral, and Guicu Creek and the segment of Cienega Creek upstream of Guicu Creek are gaining (Johnson et al., 2016).

Figure 17 shows the wetland and riparian areas in the study area (USFWS, 2025a). This information shows that the wetland and riparian vegetation is primarily present in the upstream reaches of the streams located in the study area. At the WPAC Drinking Water and Wastewater working group meeting on May 28, 2025, a participant stressed that the wetlands located near the City-County boundary at Calle Debra and Paseo Real are manmade, and that it is important that they be maintained to keep them from becoming a hazard.

Figure 18 shows mapped locations for springs within the study area (Johnson et al., 2016). The spring locations shown on this figure are predominantly along Cienega Creek and Arroyo Hondo within the La Cienega area. It should be noted that the study area for the Johnson et al. study is smaller than the full study area for the current project. As shown in Figure 17, wetland vegetation is also present along the Santa Fe River channel in La Cieneguilla.

The wetland water chemistry and age differ depending on water source, and there is partitioning between the east and west wetland zones (Johnson et al., 2016). The east zone (Upper Cienega Creek, Las Lagunitas in Guicu Creek, Leonora Curtain Wetland Preserve in Cañorita de las Bacas) is connected to the buried El Dorado valley east of La Cienega, has a young age (2,480 to 5,720 radiocarbon years before present [prior to 1950]) with a small amount of tritium (meaning post-1952 recharge), and higher calcium concentration over sodium (Johnson et al., 2016). The east zone water is a mixture of old groundwater and modern, locally derived recharge (Johnson et al., 2016). The west zone (Las Golondrinas, western slopes of Arroyo Hondo, and Sunrise Springs) is connected to the ancestral Santa Fe River buried valley, and is of older age (4,860 to 7,240 radiocarbon years before present [prior to 1950]), with no tritium, and the water is rich in sodium (Johnson et al., 2016). This is old groundwater sourced from the Tesuque Formation to the north (Johnson et al., 2016). Treated wastewater discharged from the PRWRF has different chemical composition (e.g., ion concentrations and chloride-bromide content) from area groundwater and springs, indicating that the wetlands are not chemically influenced by the PRWRF discharge (Johnson et al., 2016).

Figure 19 presents the Federal Emergency Management Agency (FEMA) flood map for the study area (FEMA, 2025), and identifies the Santa Fe River channel in La Cieneguilla and adjacent areas as the areas at the greatest (and high) risk for flooding within the study area. This is consistent with information obtained from local residents during the project site visits.

Under Section 303(d) of the Clean Water Act, states, territories, and authorized tribes, are required to develop lists of impaired waters, which are waters that do not meet the water quality standards set by states. The law requires that states establish priority rankings for impaired waters and develop total maximum daily loads (TMDLs) for these waters. A TMDL is a calculation of the maximum amount of a pollutant a water body can receive and still safely meet water quality standards. The New Mexico Water Quality Control Commission (NMWQCC) issues water quality standards for interstate and intrastate waters in New Mexico. Figure 20 shows the impaired reaches in the study area (U.S. EPA, 2025). Table 6 defines the waterbody condition types that are shown on Figure 20 (U.S. EPA, 2025).

Table 6. Waterbody Condition

Waterbody Condition	Definition
Good	Waterbodies fully supporting their designated uses under the Clean Water Act.
Impaired	Waterbodies not fully supporting their designated uses under the Clean Water Act.
Condition Unknown	A waterbody is identified for a specific use but has not been assessed for that use.

Source: U.S. EPA, 2025

As shown on Figure 20, the Santa Fe River is classified as impaired through the entire LCLC planning area, and this classification extends upstream of the LCLC planning area boundary to the location of the PRWRF outfall to the Santa Fe River. There are two impaired reaches, as follows:

- Santa Fe River (Cienega Creek to PRWRF), State Waterbody ID: NM-2110_00
  - Impaired for E. coli for the primary contact designated use
  - Impaired for nitrogen and/or phosphorus for the coldwater aquatic life designated use
- Santa Fe River (Cochiti Pueblo bend to Cienega Creek), State Waterbody ID: NM-2110_02

- Impaired for nitrogen and/or phosphorus for the coldwater aquatic life designated use

There is a TMDL for the Santa Fe River from Cochiti Pueblo to the PRWRF for chlorine and stream bottom deposits (State Waterbody ID: NM-2110) affecting the marginal coldwater fishery designated use (NMED, 2025). These limits are 0.78 pounds per day (lb/d) for total residual chlorine, and 79,594 lb/d of total suspended solids (TSS) for stream bottom deposits (NMED, 2025).

There is a TMDL for the Santa Fe River from Cochiti Reservoir to the PRWRF for dissolved oxygen (DO) and pH (State Waterbody ID: NM-2110) affecting the marginal coldwater fishery, warmwater fishery, livestock watering, irrigation, and secondary contact designated uses (NMED SWQB, 2025). These limits are 5.0 milligrams per liter (mg/L) for DO, and a pH range of 6.6 to 9.0 standard units (s.u.) (NMED SWQB, 2025).

There is a TMDL for the Santa Fe River from Cienega Creek to the PRWRF (State Waterbody ID: NM-2110_00) for E. coli of 7.3 x 10^{10} colony forming units per day (cfu/d) under low flow conditions, and 1.2 x 10^{11} cfu/d under high flow conditions (NMED SWQB, 2025). There are also TMDLs for E. coli in reaches of the Santa Fe River upstream of the PRWRF (e.g., PRWRF to Guadalupe Street and Guadalupe Street to Nichols Reservoir) (NMED SWQB, 2025).

The City of Santa Fe is under an administrative order with EPA regarding the water quality of the treated wastewater discharged from the PRWRF into the Santa Fe River upstream of the LCLC planning area. EPA issued the administrative order in March 2024, and the City is currently upgrading the PRWRF to ensure long-term compliance with the facility's National Pollutant Discharge Elimination System (NPDES) permit. Recent daily E. coli data and the daily permit limit are provided on Table 7 (City of Santa Fe, 2025b). Between March 7 and August 31, 2025, there were eight exceedances of the daily permit limit for E. coli.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025 Page 1 of 6

Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
3/7/2025	14
3/8/2025	6
3/9/2025	4
3/10/2025	46
3/11/2025	28
3/12/2025	8
3/13/2025	6
3/14/2025	28
3/15/2025	6
3/16/2025	5
3/17/2025	2
3/18/2025	10
3/19/2025	6
3/20/2025	3
3/21/2025	6
3/22/2025	3
3/23/2025	5
3/24/2025	6
3/25/2025	12
3/26/2025	3
3/27/2025	2
3/28/2025	8
3/29/2025	5
3/30/2025	13
3/31/2025	14
4/1/2025	16
4/2/2025	13
4/3/2025	12
4/4/2025	5
4/5/2025	5
4/6/2025	8
4/7/2025	11

Notes are provided at the end of the table.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025
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Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
4/8/2025	10
4/9/2025	7
4/10/2025	6
4/11/2025	3
4/13/2025	8
4/14/2025	18
4/15/2025	14
4/16/2025	32
4/17/2025	11
4/18/2025	8
4/19/2025	13
4/20/2025	6
4/21/2025	64
4/22/2025	10
4/23/2025	17
4/24/2025	6
4/25/2025	10
4/26/2025	5
4/27/2025	5
4/28/2025	3
4/29/2025	7
4/30/2025	4
5/1/2025	7
5/2/2025	4
5/3/2025	5
5/4/2025	5
5/5/2025	5
5/6/2025	7
5/7/2025	7
5/8/2025	2
5/9/2025	15
5/10/2025	20

Notes are provided at the end of the table.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025 Page 3 of 6

Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
5/11/2025	15
5/12/2025	**840**
5/13/2025	19
5/14/2025	6
5/15/2025	3
5/16/2025	2
5/17/2025	14
5/18/2025	43
5/19/2025	26
5/20/2025	75
5/21/2025	**160**
5/22/2025	8
5/23/2025	25
5/24/2025	9
5/25/2025	23
5/26/2025	10
5/27/2025	8
5/28/2025	123
5/29/2025	8
5/30/2025	23
5/31/2025	19
6/1/2025	9
6/2/2025	18
6/3/2025	14
6/4/2025	50
6/5/2025	28
6/6/2025	30
6/7/2025	10
6/8/2025	3
6/9/2025	12
6/10/2025	50
6/11/2025	22

Notes are provided at the end of the table.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025
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Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
6/12/2025	27
6/13/2025	69
6/14/2025	22
6/15/2025	28
6/16/2025	14
6/17/2025	12
6/18/2025	16
6/19/2025	36
6/20/2025	30
6/21/2025	80
6/22/2025	2
6/23/2025	8
6/24/2025	4
6/25/2025	6
6/26/2025	8
6/27/2025	8
6/28/2025	16
6/29/2025	6
6/30/2025	4
7/01/2025	8
7/02/2025	13
7/03/2025	5
7/04/2025	3
7/05/2025	32
7/06/2025	4
7/07/2025	8
7/08/2025	6
7/09/2025	21
7/10/2025	6
7/11/2025	3
7/12/2025	8
7/13/2025	7

Notes are provided at the end of the table.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025 Page 5 of 6

Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
7/14/2025	12
7/15/2025	14
7/16/2025	10
7/17/2025	47
7/18/2025	20
7/19/2025	5
7/20/2025	8
7/21/2025	3
7/22/2025	12
7/23/2025	11
7/24/2025	**143**
7/25/2025	47
7/26/2025	**154**
7/27/2025	**360**
7/28/2025	34
7/29/2025	99
7/30/2025	27
7/31/2025	120
8/01/202	17
8/02/2025	34
8/03/2025	19
8/04/2025	**230**
8/05/2025	20
8/06/2025	18
8/07/2025	69
8/08/2025	67
8/09/2025	29
8/10/2025	22
8/11/2025	32
8/12/2025	**190**
8/13/2025	**147**
8/14/2025	83

Notes are provided at the end of the table.

Table 7. PRWRF Discharge E. Coli Data, March–August 2025 Page 6 of 6

Date	Daily E. coli (cfu/100 mL)
Permit Limit	*126*
8/15/2025	30
8/16/2025	54
8/17/2025	20
8/18/2025	12
8/19/2025	8
8/20/2025	33
8/21/2025	26
8/22/2025	26
8/23/2025	8
8/24/2025	3
8/25/2025	7
8/26/2025	3
8/27/2025	123
8/28/2025	4
8/29/2025	8
8/30/2025	7
8/31/2025	8

Bold indicates that value exceeds the permit limit.
cfu/100 mL = Colony-forming units per 100 milliliters

8. Wells and Permitted Diversions

The portion of the Santa Fe River subwatershed that is located within the LCLC planning area and the surrounding area is located within the Rio Grande underground water basin (UWB), which was declared by the New Mexico Office of the State Engineer (OSE) in 1956. Figure 21 shows all permitted wells located in the Santa Fe River watershed (monitoring wells were removed from this figure). The number of wells that were added during each decade between 1950 and 2020 are shown on Figure 22 for the LCLC planning area and full Santa Fe River watershed. This figure indicates that the greatest number of wells were installed during the 1990s, and that well installations have significantly decreased since then.

Information from the OSE's New Mexico Water Rights Reporting System (NMWRRS) in 2022 indicated that there were 934 permitted wells in the LCLC planning area (DBS&A, 2023). Table 8 shows the number of permitted wells by type and their permitted diversion volumes. This includes 823 domestic wells permitted under NM Stat §72-12-1 (this value is the sum of the permitted 72-12-1 NMSA wells for the domestic and livestock watering, domestic one household, and multiple domestic household well types). As shown on Table 8, permitted water diversions in the LCLC planning area totaled 2,682.34 acre-feet per year (ac-ft/yr), including 2,332.00 ac-ft/yr in permitted groundwater diversions (DBS&A, 2023). This total includes 1,658.00 ac-ft/yr for 72-12-1 NMSA domestic one-household wells and 292.00 ac-ft/yr for 72-12-1 NMSA domestic multiple-household wells (DBS&A, 2023). Accurate data for the volume of groundwater pumped from these wells are not available (DBS&A, 2023).

Table 9 provides more detail from NMWRRS in 2022 for the irrigation water rights in the LCLC planning area. Permitted irrigation diversions totaled 482.17 ac-ft/yr, including 350.34 ac-ft/yr for surface declarations and 131.83 ac-ft/yr for permitted groundwater diversions (DBS&A, 2023), allowing for the estimation of the total permitted water diversions in the LCLC planning area.

8.1 Community Water Systems

The LCLC planning area includes three community water systems: La Cienega Mutual Domestic Water Consumers Association (MDWCA), La Cienega Water Users Association, and Wild and Wooley Trailer Ranch (DBS&A, 2023).

Table 8. Number of Permitted Wells and Permitted Diversions in the LCLC Planning Area

OSE Use Code	Use Description	Number of Wells	Permitted Diversions (ac-ft/yr)
DOL	72-12-1 Domestic and livestock watering	24	57
DOM	72-12-1 Domestic one household	693	1,658
MUL	72-12-1 Multiple domestic households	106	292
STK	72-12-1 Livestock watering	5	15
IRR	Irrigation [a]	15	482.17
MDW	Community type use - MDWCA, private or commercial supplied	4	68.07
MOB	Mobile home parks	4	20.4
PDL	Non 72-12-1 Domestic and livestock watering	3	9
PDM	Non 72-12-1 Domestic one household	3	9
PUB	72-12-1 Construction of public works	2	0
SAN	72-12-1 Sanitary in conjunction with a commercial use	12	47.2
BPW	Brine production well	3	0
CLS	Closed file	1	0
EXP	Exploration	6	0
MON	Monitoring	2	0
NOT	No use of right or POD	1	0
TBD	To be determined	1	0.5
	Unknown	49	24
	Total	934	2,682.34
	Total permitted groundwater diversions		2,332.00

Source: OSE NMWRRS, 2022
[a] Includes surface water declarations totaling 350.34 acre-feet per year (ac-ft/yr)

Table 9. Irrigation Water Rights in the LCLC Planning Area

POD	Status	Use	Total Diversion (ac-ft/yr)	Ditch Name	Sub-File	Owner Name
RG-00590 [a]	ADJ	IRR	0.00		58.1	Public Service Company of New Mexico
RG-32048	DCL	IRR	12.48		SUMP 42, MAP 13 TRACT 42.1	Raymond Ulibarri, Delfina Ulibarri
RG-70212	DCL	IRR	5.70			Bill Schenck
RG-70213	ADJ	IRR	1.20		36A.1	Bill Schenck
SD-02125	DCL	IRR	70.89	Los Tanques		Lalo Enriquez, Henry Gonzales, Y.A. Paloheimo
RG-31961	DCL	IRR	20.22		TRACT 42.43.45.1	Herman Pino
RG-31961-SUMP 42	DCL	IRR				Raymond Ulibarri
RG-31961-SUMP 43	DCL	IRR				Facudono Pino
RG-07767-H	DCL	IRR	0.75			Maurice R. McDonald
RG-29242 [b]	LIC	IRR	28.60			Frank Mancuso, Kimberly Mancuso
SD-06667	OOJ	IRR	6.00		SF HYDRO SURVEY MAP 13, TRACT 35.1	William C. Schenck
SD-00869	PMT	IRR	273.45	Acequia de La Cienega	6.2829 & 11.28.18B	Acequia de la Cienega
RG-88082	DCL	IRR	46.47		12-13-14.1	Jesusita P. Larranaga, Edward J. Sceery
RG-90070	ADJ	IRR	4.50		9.A1	Toribio Lopez, Nellie Lopez
RG-94801	PMT	IRR	11.91		41.1	Gable S Corporation
Total permitted diversion (ac-ft/yr)			482.17			
Total permitted groundwater diversion (ac-ft/yr)			131.83			

Source: OSE NMWRRS, 2022
[a] NMWRSS lists 2 PODs (RG-00590 and RG-00590 POD1)
[b] NMWRSS lists 3 PODs (RG-29242, RG-29242-S, and RG-61187 POD1)

ac-ft/yr = Acre-feet per year
POD = Point of diversion
IRR = Irrigation
ADJ = Adjudicated
DCL = Declared
LIC = License
OOJ = Offer of judgment
PMT = Permit
RG = Rio Grande
SD = Surface declaration

La Cienega MDWCA provides residential water supply to a large portion of Lower La Cienega, and to become a member of the system, groundwater rights must be contributed to the system (Santa Fe County, 2015). The OSE Water Use by Categories report indicates that La Cienega MDWCA used 28 acre-feet in 2020, serving a population of 525 (Valdez et al., 2024).

The La Cienega Water Users Association is located in Lower La Cienega, at the end of Paseo C de Baca, and is associated with the former Lakeside Mobile Home Park (Santa Fe County, 2015). A water delivery agreement was entered into between the La Cienega Lakeside Mobile Home Park and Santa Fe County in 2018, the system was connected to the County water utility, its water rights were transferred to the County, and its wells were plugged (Santa Fe County, 2015).

Wild and Wooley Trailer Ranch has a 72-12-1 NMSA well with a diversion right of up to 3 ac-ft/yr. The 2015 LCLC Community Plan indicated that connection to the County water utility is anticipated in the future, and that the system was connected to the County's wastewater system in 2012 (Santa Fe County, 2015). To date, this system has not been connected to the County water utility. The OSE Water Use by Categories report indicates that Wild and Wooley Trailer Ranch used 5 acre-feet in 2020, serving a population of 59 (Valdez et al., 2024).

8.2 Eldorado Area Water and Sanitation District

The Eldorado Area Water and Sanitation District (EAWSD) is not located within the LCLC planning area; however, 4 of its wells are completed in the Ancha-Tesuque Formations, upgradient of the LCLC planning area. In 2024, a total of 54.2 acre-feet was produced from EAWSD's 4 active wells that are completed in the Ancha-Tesuque Formations (OSE NMWRRS, 2025). EAWSD will begin buying water from the County this year, up to a volume of 200 ac-ft/yr.

8.3 Other Trailer Parks

The trailer parks that are located along Los Pinos Road across from the former Downs at Santa Fe (now Pojoaque Pueblo's Eagle Ridge) property were discussed at one of the project's community meetings, and there was concern that there has been a lot of growth in this area and that water use by these trailer parks has become year-round. This includes Wild and Wooley Trailer Ranch, Piñon RV Park, Los Pinos Park, and Ebar Park. With the exception of Wild and Wooley Trailer Ranch (Section 8.1), water use by these entities is not included in the OSE's 2020 Water Use by Categories report (Valdez et al., 2024).

Trailer parks that are regulated by the New Mexico Environment Department (NMED) Drinking Water Bureau (DWB) as community water systems (indicating that they serve more than

25 people) include Wild and Wooley Trailer Ranch and Piñon RV Park. The estimated population served by Piñon RV Park is 18 people (NMED DWB, 2025). Other trailer parks in this area that are not being regulated by the NMED DWB as community water systems (indicating that they serve fewer than 25 people) include Ebar Park and Los Pinos Park (NMED DWB, 2025). Community members said that these trailer parks may be serving more than 25 people.

9. Threatened and Endangered Species

A review of state and federally listed threatened, endangered, and candidate species located in or near the study area was conducted using the New Mexico Department of Game and Fish (NMDGF) web-based Environmental Review Tool (ERT) (NMDGF, 2025) and the U.S. Fish and Wildlife Service (USFWS) web-based Information, Planning, and Conservation System (IPaC) tool (USFWS, 2025b).

A threatened species is one that is likely to become endangered in the foreseeable future. The NMDGF ERT tracks the status of threatened and endangered species identified by the state (NMDGF, 2025), while the USFWS IPaC program tracks the status of threatened and endangered species listed on the federal government's endangered species list (USFSW, 2025b). Table 10 lists the species that are currently listed in the study area.

On the project site visit held on May 14, 2025, Alonzo Gallegos indicated that leopard frogs are present on Tres Rios Ranch within the study area. Neither the NMDGF ERT Tool nor the USFWS IPaC tool identified any species of leopard frogs as being proposed or listed as threatened or endangered (NMDGF, 2025; USFWS, 2025b).

A rare plant survey was conducted on the County's open space properties, and it identified all County open space properties as potential habitat for cyanic milkvetch (*Astragalus cyaneus*) and Santa Fe milkvetch (*Astragalus feensis*). This potential habitat includes two open space properties located within the project area. These milkvetch species are included on the New Mexico Rare Plant Technical Council's New Mexico Rare Plants list for Santa Fe County (Harmon, 2025). There are no statutory or policy protections for the rare plants on the New Mexico Rare Plants list; however, these species are included in the New Mexico Rare Plant Conservation Strategy, which aims to improve land and data management for rare plants and increase collaboration, education, and outreach (Harmon, 2025).

Table 10. Threatened and Endangered Species
Page 1 of 4

Species Category	Species	Status	Habitat Associations	Potential for Presence in Study Area
Birds	Southwestern willow flycatcher (*Empidonax trailii extimus*)	FE, SE	Habitat for the southwestern willow flycatcher consists of dense riparian vegetation along rivers, streams, or other wetlands where its diet consists primarily of insects. Vegetation includes dense growth of willows (*Salix* spp.), arrow weed (*Pluchea sericea*), alder (*Alnus* spp.), and saltcedar (*Tamarix ramosissima*).	The study area contains wetlands, riparian forests, and open shrubland for foraging. Therefore, *there is a possibility of the southwestern willow flycatcher occurring in the project area*.
	Yellow-billed cuckoo (*Coccyzus americanus*)	FT	Occurs at elevations where stream conditions provide sufficient permanent moisture for emergent plants, or for a narrow band of deciduous trees and shrubs; at low elevation characterized by cottonwood and sycamore, at mid-elevation by white alder (*Alnus rhombifolia*) and bigleaf maple (*Acer macrophyllum*), and at high elevation by willow.	The Project Area contains riparian forest and open shrubland for foraging. However, the elevation of the study area is at the high end of the preferred elevation for the cuckoo. Therefore, the yellow-billed cuckoo is not likely to occur except as a vagrant.
	Bald eagle (*Haliaeetus leucocephalus*)	ST	Bald eagles require proximity to large bodies of water for food and mature trees, cliffs, or artificial structures for nesting, perching, and roosting. Their habitat includes coastal areas, rivers, large lakes, and associated forests, wetlands, and open country where fish are abundant.	The study area contains wetlands, riparian forests, and open shrubland for foraging. However, the bald eagle is rare in New Mexico. Therefore, *there is a possibility of the bald eagle occurring in the project areas, though likely only as a vagrant*.
	Aplomado falcon (*Falco femoralis*)	SE	Aplomado falcons habitat consists of open, savanna-like areas, including desert grasslands, prairies, and coastal plains, with scattered trees and relatively low ground cover for hunting and nesting. Key elements of their habitat are open terrain with a supply of abandoned stick nests, such as those built by other birds like ravens or hawks, along with an abundance of small birds, insects, and rodents.	The Project Area contains riparian forest and open shrubland for foraging. Therefore, *there is a possibility of the Northern Aplomado falcon occurring in the project area*.

Notes are provided at the end of the table.

Table 10. Threatened and Endangered Species
Page 2 of 4

Species Category	Species	Status	Habitat Associations	Potential for Presence in Study Area
Birds (cont.)	Peregrine falcon (*Falco peregrinus*)	ST	Habitat of the peregrine falcon is primarily located in open wetlands near cliffs. In New Mexico, the breeding territories center on cliffs that are in wooded/forested habitats with large "gulfs" of air nearby in which these predators can forage.	The study area contains wetlands, riparian forests, and open shrubland for foraging. Therefore, *there is a possibility of the peregrine falcon occurring in the project areas, though likely only as a vagrant*.
	Gray vireo (*Vireo vicinior*)	ST	In New Mexico, the gray vireo prefers open pinyon-juniper woodland or juniper savannah with a shrub component. In northwest New Mexico, gray vireos are found in broad-bottomed, flat or gently sloped canyons, in areas with rock outcroppings, or near ridgetops. In these areas, bitterbrush (*Purshia tridentate*), mountain mahogany (*Cercocarpus breviflorus*), Utah serviceberry (*Amelanchier utahensis*) and big sagebrush (*Artemisia tridentata*) are often present. Gray vireos are often found in areas of moderate shrub cover (35-45%) with large amounts of bare ground between herbaceous plants.	The study area contains wetlands, riparian forests, and open shrubland for foraging. However, the bald eagle is rare in New Mexico. Therefore, *there is a possibility of the gray vireo occurring in the project areas, though likely only as a vagrant*.
Insects	Monarch butterfly (*Danaus plexippus)*	FPT	Monarch butterflies live in a variety of habitats, including grasslands, prairies, meadows, fields, and gardens. They lay eggs exclusively in milkweed (*Asclepias* spp.). In arid regions, they are dependent on riparian habitats.	Unlikely to occur. New Mexico does not harbor any known migration routes.

Notes are provided at the end of the table.

Table 10. Threatened and Endangered Species
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Species Category	Species	Status	Habitat Associations	Potential for Presence in Study Area
Insects (cont.)	Suckley's cuckoo bumble bee (*Bombus suckleyi*)	FPE	Suckley's cuckoo bumble bee has historically inhabited meadows and grassland ecosystems at a wide range of elevations across the western U.S., relying on floral diversity during spring and summer. The nests that host Suckley's bees are primarily underground cavities that have been created naturally or by other animals such as abandoned rodent nests and are generally known to hibernate close to the ground surface an inch or two under loose soil or under leaf litter or other debris, in sites that are undisturbed and have adequate organic material to provide shelter.	Unlikely to occur. The Suckley's cuckoo bumble bee has not been observed in the contiguous United States since 2016. There are no historical occurrence records from New Mexico (The Xerces Society et al., 2017; Center for Biological Diversity, 2020).
Mammals	Spotted bat (*Euderma maculatum*)	ST	Known in New Mexico from the Rio Grande, Rio Chama, and Animas River Valleys, the Mogollon Plateau, and the Jemez, San Mateo, and Sacramento Mountains. However, it is undoubtedly more widespread in the state than records indicate. Occupies a wide range of vegetation types, moving downslope after the reproductive season. Preferred habitat consists of meadows in subalpine coniferous forests. In the Mogollon, San Mateo, and Jemez Mountains, spotted bats were netted over streams or water holes in ponderosa or mixed coniferous forest. Bats are cliff dwellers whose diurnal roosts are the cracks and crevices of canyons and cliffs. Also recorded in pinyon-juniper woodlands and open semidesert shrublands. Rocky cliffs are necessary to provide suitable cracks and crevices for roosting, as is access to water.	The study area contains wetlands, riparian forests, pinyon-juniper woodlands, and open semidesert shrublands. Therefore, *there is a possibility of the spotted bat occurring in the project area*.

Notes are provided at the end of the table.

Table 10. Threatened and Endangered Species
Page 4 of 4

Species Category	Species	Status	Habitat Associations	Potential for Presence in Study Area
Mammals (cont.)	New Mexican meadow jumping mouse (*Zapus luteus luteus*)	SE	The New Mexico meadow jumping mouse (jumping mouse) is endemic to New Mexico, Arizona, and a small area of southern Colorado. The jumping mouse is a habitat specialist nesting in dry soils, but uses moist, streamside, dense riparian/wetland vegetation up to an elevation of about 8,000 feet. The jumping mouse appears to only use two riparian community types: (1) persistent emergent herbaceous wetlands (i.e., beaked sedge and reed canarygrass alliances) and (2) scrub-shrub wetlands (i.e., riparian areas along perennial streams that are composed of willows and alders). It specializes in microhabitats of patches or stringers of tall dense sedges on moist soil along the edge of permanent water. Home ranges vary between 0.37 and 2.7 acres (0.15 and 1.1 hectares) and may overlap. The jumping mouse is generally nocturnal, but occasionally diurnal. It is active only during the growing season of the grasses and forbs on which it depends.	The study area contains wetlands, riparian forests, and open shrubland for foraging. Therefore, *there is a possibility of the New Mexican meadow jumping mouse occurring in the project area*.

Source: USFWS, 2025b
FE = Federal Endangered
FT = Federal Threatened
FPE = Federal Proposed Endangered
FPT = Federal Proposed Threatened
SE = State Endangered
ST = State Threatened

10. Demographics and Population

To examine demographics for the study area, information was referenced for the La Cienega census designated place (CDP). The La Cienega CDP is smaller than the LCLC planning area, and does not include La Cieneguilla.

The LCLC community plan updates cite planning area populations of 1,775 in 1990 (Santa Fe County, 2015), 3,007 in 2000, and 3,819 in 2010 (Santa Fe County, 2025). The U.S. Census American Community Survey 2017-2021 demographic and housing estimates gives a 2021 population of 4,110 for the La Cienega CDP (U.S. Census, 2021). This population estimate is approximately 8 percent higher than the 2010 population, 37 percent higher than the 2000 population, and more than double the 1990 population, as given in the 2015 LCLC community plan update (Santa Fe County, 2015), although as noted above, the La Cienega CDP area is smaller than the LCLC planning area and does not include La Cieneguilla. This means that the growth in the LCLC planning area has exceeded these growth rates (growth in the LCLC planning area exceeded 8 percent between 2010 and 2020). Table 11 provides 2020 population information for the La Cienega CDP.

Table 11. Socioeconomic Data for La Cienega CDP

Label	Population Estimate
Total Population	3,885
Total Population: American Indian or Alaska Native alone	85
Total Population: Asian Alone	30
Total Population: Black or African American alone	17
Total Population: Native Hawaiian and Other Pacific Islander alone	1
Total Population: White alone	1,623
Total Population: Some Other Race alone	906
Total Population: Two more races	1,195

U.S. Census, 2020

11. Hydrologic Sensitivity Analysis

Hydrologic sensitivity involves forecasting how a water supply may be impacted by anthropogenic and natural causes. Anthropogenic, or man-made, activities are causing climate change and altering the chemical composition of the atmosphere, and these changes are predicted to increase temperatures across the globe. Climatologists use numerical models to predict how the temperature increase will affect weather patterns and the magnitude of these changes. In New Mexico, scientists predict that surface water supplies will decrease due to an increase in temperature and more variability in the timing and intensity of precipitation (Llewellyn et al., 2015; Tetra Tech, 2019; Dunbar et al., 2022).

Water supply will be adversely affected by climate change, but population growth and water management also play a role in the available supply (Llewellyn et al., 2015). Population growth will increase water demand for surface water and groundwater supplies unless management decisions and conservation are able to decrease the water demand.

The predicted impacts to water resources are presented in Section 11.1. Conceptual surface water and groundwater budgets and how changes may affect the future water supply are discussed in Section 11.2. Potential ways to address hydrologic resilience are considered in Section 11.3.

11.1 Impacts to Future Water Supply

Several studies have been completed to predict climate changes and how these changes may impact the availability of future water supply. For New Mexico, these studies indicate a shift toward a more arid, or drier, climate over the next 50 years (Dunbar et al., 2022). The increasingly arid climate will impact surface water and groundwater supplies.

The New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) prepared a document summarizing climate change projections for New Mexico in collaboration with the University of Arizona and New Mexico State University (EMNRD, 2023).

The U.S. Bureau of Reclamation, in conjunction with the City of Santa Fe and Santa Fe County, evaluated the Santa Fe River Basin (Llewellyn et al., 2015). The basin study was updated by Tetra Tech (2019).

The New Mexico Bureau of Geology and Mineral Resources, in conjunction with the New Mexico Interstate Stream Commission and researchers across the state, evaluated impacts to water supply over the next 50 years (Dunbar et al., 2022).

The precipitation volume is predicted to be about the same, but the timing of storms will shift. The precipitation patterns will change, with later monsoons, less spring rain, and more higher-elevation snow.

Temperature increases will raise the low, average, and high temperatures. Over the next 50 years, current models predict an increase ranging from 4 to 8°F across New Mexico (EMNRD, 2023; Dunbar et al., 2022).

The changes in precipitation and temperature will impact surface water and groundwater supplies. According to Dunbar et al. (2022), New Mexico precipitation currently partitions as follows:

- Runoff to surface water: 1.6 percent
- Infiltration and recharge to groundwater aquifers: 1.8 percent
- Evaporation: 17.7 percent
- Transpiration by plants: 78.9 percent

In a more arid climate, the partitioning will likely shift, with increasing evaporation and transpiration, and corresponding decreases in runoff and groundwater recharge. Water supplies will be impacted by immediate decreases in surface water supply and long-term decreases in groundwater supply due to diminished recharge.

11.1.1 Precipitation

Precipitation patterns will also be altered, but the amount of precipitation is expected to remain fairly similar. Over the next 50 years, the timing or seasonality of precipitation is likely to shift, with more snow in the northern mountains and less in southern mountains, monsoons increasing but shifting to later in the summer, and a decrease in spring precipitation (Dunbar et al., 2022).

As the climate becomes more arid, droughts are likely to occur more frequently and for longer durations. Historically, climate research shows that the 1950s and 2000s droughts have been among the most extreme droughts of the last 700 years; however, droughts are expected to occur more frequently due to climate change (Johnson et al., 2016). As a result of drought and climate change, groundwater levels in shallow aquifers are expected to decrease due to increased evaporation, groundwater withdrawals, and reduced recharge.

Precipitation is an important portion of the water balance that creates surface water runoff and groundwater recharge. Johnson et al. (2016) analyzed available precipitation data from three National Oceanic and Atmospheric Administration (NOAA) weather stations located near the study area (Table 12):

- Santa Fe 2 in Arroyo Hondo, east of the study area
- Santa Fe County Municipal Airport (SFCMA)
- Turquoise Bonanza Creek (TCB), located south of the state penitentiary

The area experiences wet summers and dry winters, with annual variability. The majority of precipitation occurs during the summer monsoon season from July to mid-September. At the Arroyo Hondo station, data showed a significant decline in annual mean precipitation for 1998–2013 compared to 1973–1997 (Johnson et al., 2016).

Table 12. Historical Annual Precipitation Data near Santa Fe, New Mexico

NOAA Site	Period	Precipitation (inches)		
		Annual Mean	Minimum	Maximum
Santa Fe 2-Arroyo Hondo	1972-2013	13.2	6.4	19.5
Santa Fe County Municipal Airport	1942-1957	9.6	3.1	14.8
	1998-2013	10.1	6.7	14.2
Turquoise Bonanza Creek	1953-1996	12.7	4.5	29.6

11.1.2 Temperature

In Santa Fe, annual average maximum temperatures increased by 4.2°F during the latter half of the 20th century, and maximum temperatures are projected to continue increasing by an additional 4.2 to 5.3°F by 2060, and to increase by 4.9 to 8.1°F by 2080 (EMNRD, 2023). In Santa Fe, annual average temperatures are expected to increase by 3.8 to 4.9°F by 2060, and to increase by 4.5 to 7.4°F by 2080. The number of days below freezing are projected to decrease, and the number of days with temperatures above 90°F are projected to increase (EMNRD, 2023). Annual precipitation is projected to slightly increase and change by +0.0 to +0.9 percent by 2060, and by +2.2 to +4.0 percent by 2080 (EMNRD, 2023).

11.1.3 Surface Water Flows

Considering surface water supplies in La Cienega, La Cieneguilla, and the surrounding areas, increases in temperature will increase evaporation and transpiration or evapotranspiration (ET) rates. The increased ET rates will affect surface water like wetlands, spring pools, and surface water flow in creeks and the Santa Fe River.

Data are limited, but Cienega Creek flow has decreased over time. Johnson et al. (2016) estimate that Cienega Creek streamflow at the Cienega head gate may have decreased by approximately 1 cfs, or 64 percent, since 1966, indicating that groundwater discharge to the wetlands has decreased from historical levels (Johnson et al., 2016).

The Santa Fe River is already considered an impaired stream (Figure 20). The hydrograph for the Santa Fe River (Figure 15) indicates an overall decrease in mean annual discharge since the mid-1990s.

Surface water flow is predicted to decrease by 22 percent and 66 percent, respectively, for the low- and high-impact scenarios (Llewellyn et al., 2015). The potential changes in mean annual discharge values are shown on the Santa Fe River hydrograph for historical streamflow (Figure 15). The historical mean annual flow is 9.1 cfs, with future mean annual flows projected to decrease to 7.1 cfs for the low-impact scenario or 3.1 cfs for the high-impact scenario. The high-impact scenario predicts flow near the lowest historically observed flow rates (Figure 15).

11.1.4 Groundwater Conditions

Groundwater recharge is expected to decrease and demands (especially groundwater pumping) are likely to increase, which will lower the water table and decrease the volume of groundwater in storage.

For the planning area, the Ancha Formation (Figure 9) is the primary geologic unit and aquifer that stores groundwater and provides water to wells and surface water features. When the water table intersects the land surface, groundwater discharges will support springs, gaining stream reaches, wetlands, and riparian vegetation. Any changes to the water table will affect discharge rates and locations. For example, if the water table is lowered near a gaining stream reach, flow into the channel will decrease, perhaps ceasing to discharge or moving to a lower elevation discharge location downstream (Figure 16).

Groundwater levels in the Ancha Formation have decreased steadily since at least the 1970s as a result of long-term groundwater depletion by pumping wells that are located east and upgradient of the wetlands (Figure 21). The pumping impacts are increased during droughts, when pumping continues and groundwater recharge is limited.

Based on climate predictions that forecast changes in temperature and precipitation patterns, the surface water and groundwater supplies are expected to be impacted, causing an overall decrease in supply. Mechanisms include increased ET at wetlands, stream corridors, and springs at the expense of runoff and recharge. Droughts decrease the surface water supply through greater evaporation and increased groundwater pumping. Lowering of the water table in the Ancha Formation will impact the flow and location of gaining and losing reaches of streams and flow to springs and wetlands.

11.1.5 Water Demand

For the planning area, DBS&A calculated water demand for domestic and other uses based on existing water rights; because the majority of wells do not have meters, water use could only be estimated (DBS&A, 2023). Domestic water demand would generally be projected using per capita water demand multiplied by population growth estimates. However, because per capita water use is not known, a range of potential domestic water demand volumes were projected from a range of estimated current domestic water demand volumes.

Based on OSE records, the permitted water diversions totaled 2,682.34 ac-ft/yr, including 2,332.00 ac-ft/yr in permitted groundwater diversions (Table 8) (DBS&A, 2023). Domestic well water use was presented as a range based on potential annual demands from 0.16 to 1.0 ac-ft/yr per well or household. The estimated water use was calculated as follows:

- Domestic wells: 150 to 1,000 ac-ft/yr
- Community water system, irrigation, and livestock (assumed at permitted diversion): 315.5 ac-ft/yr
- Total estimated use: 465.5 to 1,315.5 ac-ft/yr

Based on the estimated water demand for domestic uses, the future groundwater demand was based on increasing population assuming a 5 to 15 percent population growth rate per decade. Domestic water demand is expected to increase as follows:

- At 5 percent growth, ranging from 150 to 1,275 ac-ft/yr
- At 15 percent growth, ranging from 300 to 2,000 ac-ft/yr

When the permitted groundwater diversion volumes for the other sectors were added to the projected domestic demand, assuming that they total 315.5 ac-ft/yr, the projected totals are 465.5 to 2,315.5 ac-ft/yr.

11.2 Surface Water and Groundwater Budgets

Surface water and groundwater budgets account for the inputs and outputs to the hydrologic system. Inputs may be runoff to surface water or recharge to groundwater. Outputs may be evaporation, transpiration, and irrigation for surface water and spring discharge or well pumping for groundwater. The budget calculates the state of the system, whether it is balanced with outputs and inputs being equal or in deficit with outputs exceeding inputs. Today, most water budgets in New Mexico are probably in deficit, with future demands and climate change increasing the deficit amount. Water budget components and their trends are presented in Table 13.

With the predicted climate changes, increasing population growth, and changing water demand, the available water supply to support springs and surface water features is expected to decrease. As discussed in the next section, water management decisions and implementing managed aquifer recharge can augment the supply and help maintain surface water features.

Table 13. Water Budget Components

Component	Trend	Reason
Inputs		
Groundwater recharge	Decreasing	Less precipitation
Water levels	Decreasing	Greater pumping
Stormwater runoff	Decreasing	Higher temperatures and evaporation
Streamflow	Decreasing	Less precipitation
Outputs		
Irrigation	Increasing	Higher temperatures
Domestic supply	Increasing	Greater population
Evapotranspiration	Increasing	Higher temperatures
Wetlands storage	Decreasing	Higher temperatures and evaporation

11.3 Creating Hydrologic Resilience

To create hydrologic resilience in the La Cienega wetlands, Johnson et al. (2016) list the following possible solutions to reduce groundwater depletions in the Ancha Formation and support a positive water balance:

- Eliminate groundwater withdrawals from areas near the ancestral Santa Fe River and El Dorado buried valleys
- Manage the timing and location of groundwater withdrawals from the Ancha Formation saturation zone to eliminate or reverse further losses to the Ancha aquifer near the wetlands
- Use the natural recharge capabilities of buried-valley aquifers in the Ancha saturation zone and develop effective aquifer storage projects where opportunities exist
- Manage overgrowth of unwanted invasive vegetation in the wetland riparian zones to minimize summer losses to evapotranspiration

Based on these recommendations, the ability to control the volume and timing of groundwater pumping by others is not feasible at this time. DBS&A recommends evaluating potential projects for the La Cienega, La Cieneguilla, and surrounding areas including the following:

- Recharge using treated wastewater provided by Santa Fe County to improve surface water and spring flows and increase groundwater recharge
  - ◇ Select areas near springs where water may be recharged to increase flow at selected springs. Recharge projects would need to be located near a spring to have noticeable results within a reasonable amount of time, and recharged water would not be recovered. Aquifer characteristics would be evaluated to determine flow characteristics and travel times between the recharge site(s) and springs.
  - ◇ Surface water flows may be augmented in gaining stream reaches by locating recharge projects upgradient of the selected stream reach.
  - ◇ Recharge for improving the groundwater resource would be at upgradient site(s), preferably in the Ancha Formation. Water would be injected directly into the aquifer using wells completed in the Ancha Formation. The system could be operated during periods of low water demand when water is available for recharge.
  - Riparian areas along streams and wetlands should be managed over the long-term to provide habitat and maintain the appropriate water temperatures. The goal is to

manage ET losses by maintaining a healthy bosque while removing some of the vegetation. Management would include removal of invasive species and keeping native species, as well as balancing the quantity of vegetation with in-stream flows.

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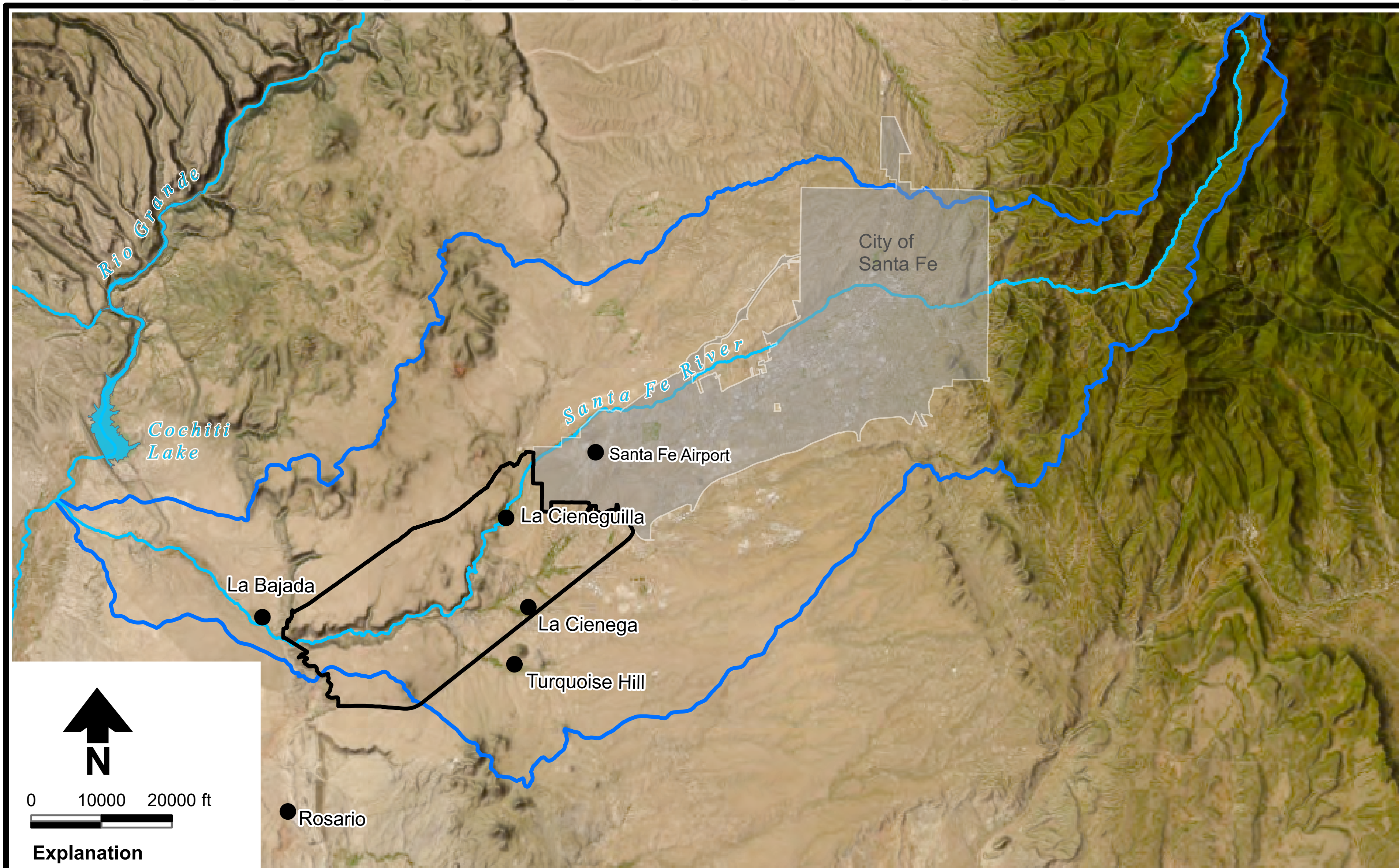
Figures



Explanation

River
LCLC planning area
SantaFe Watershed boundary

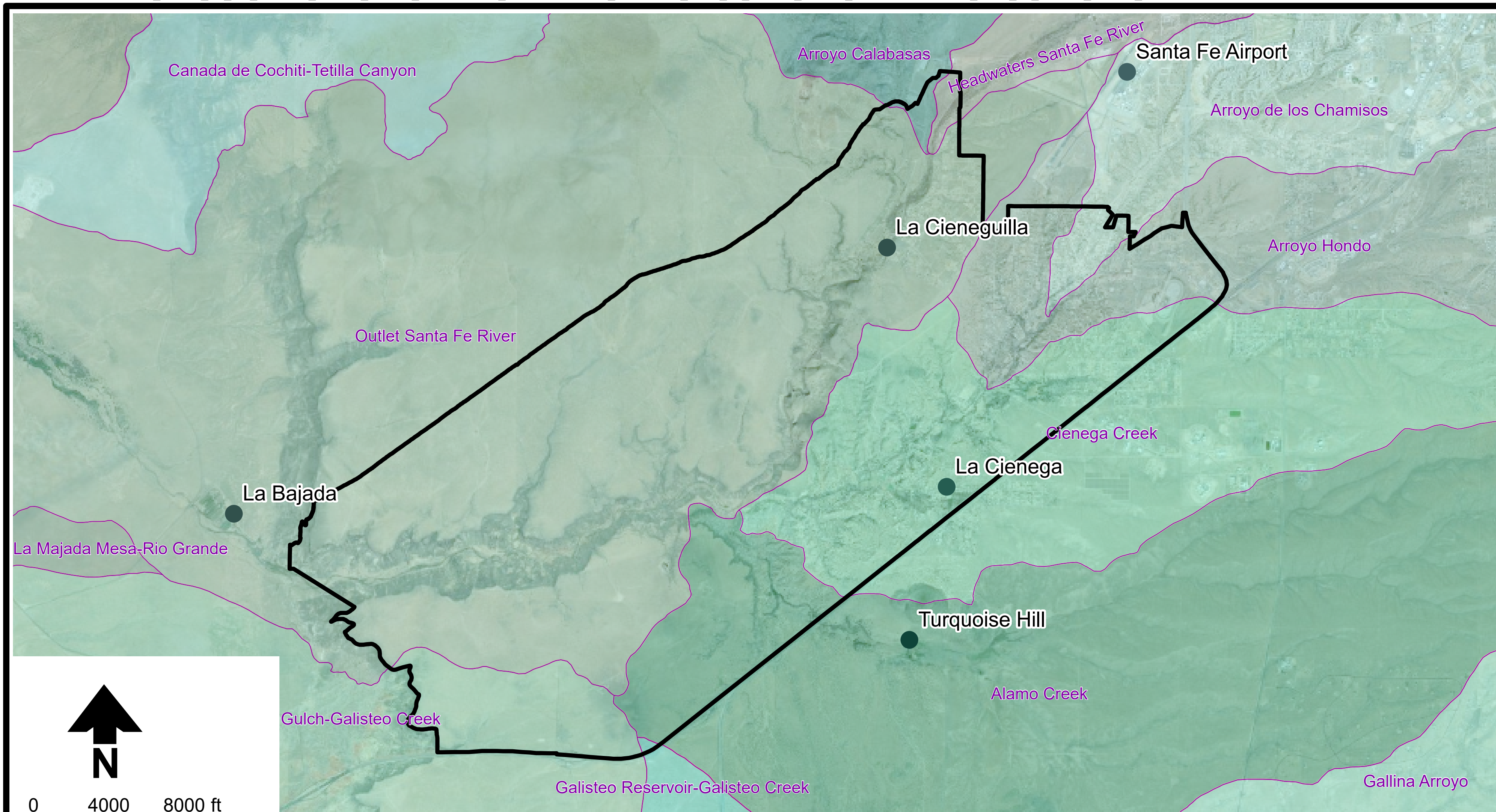
Sources: Esri et al., base imagery;
U.S. Geological Survey, National Hydrography Dataset (NHD).
Accessed May 14, 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Santa Fe River Watershed

DBS&A
a Geo-Logic Company
10/3/2025 DB25.1140

Figure 1

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX • FIG 02 SUBWATERSHEDS



Explanation

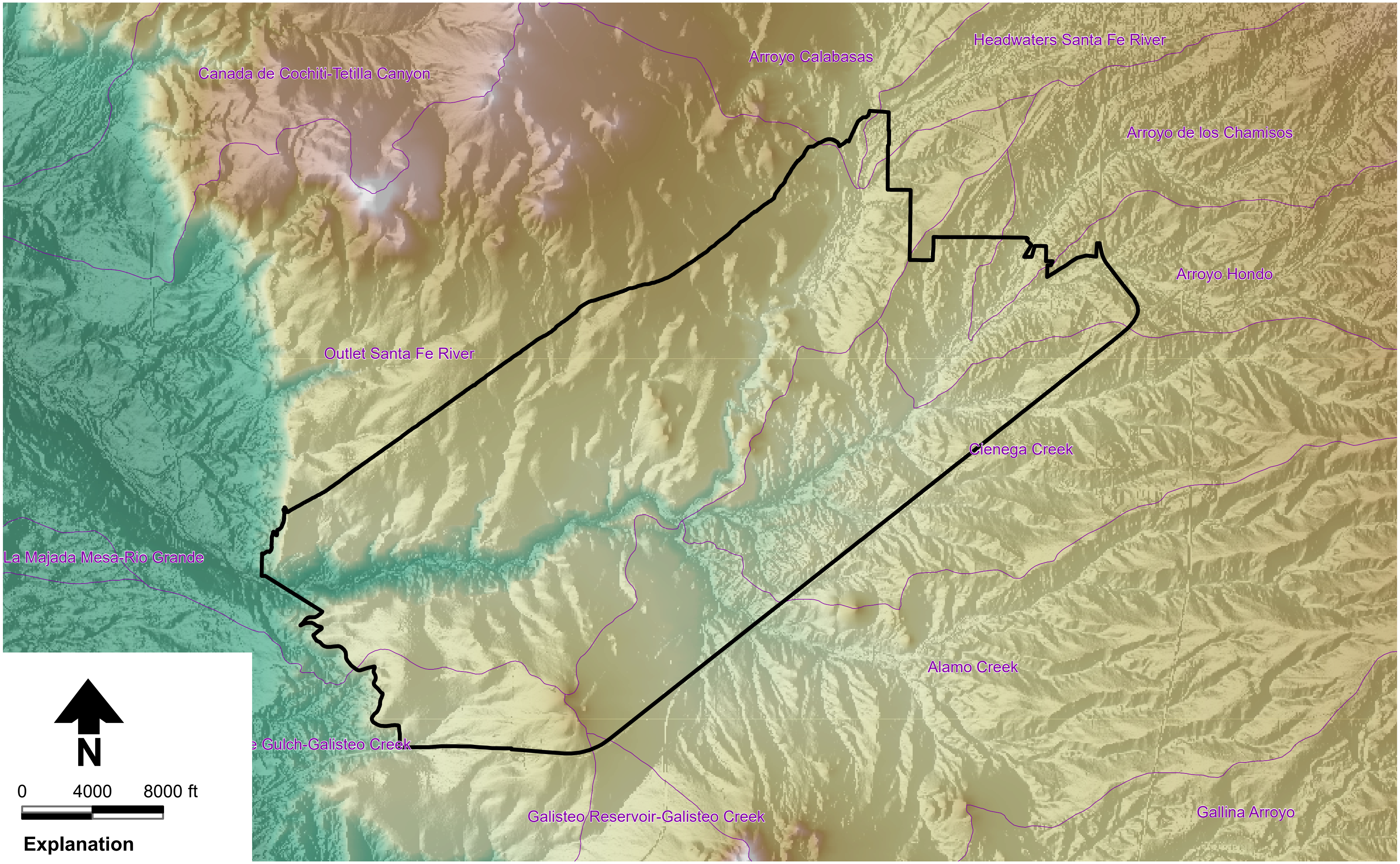
- Alamo Creek
- Arroyo Calabasas
- Arroyo Hondo
- Arroyo de los Chamisos
- Canada de Cochiti-Rio Grande
- Canada de Cochiti-Tetilla Canyon
- Cienega Creek
- Galisteo Reservoir-Galisteo Creek
- Gallina Arroyo
- Headwaters Santa Fe River
- La Majada Mesa-Rio Grande
- Outlet Santa Fe River
- Tom Payne Gulch-Galisteo Creek
- LCLC planning area

Base image source: ESRI et al.
Watersheds: National Hydrography Dataset (NHD)
https://www.usgs.gov/
Accessed: May 14, 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Subwatersheds

Figure 2

DBS&A
a Geo-Logic Company
6/19/2025 DB25.1140



N

0 4000 8000 ft

Explanation

Elevation (feet)

7316.77

5200.27

LCLC planning area

Watershed source: National Hydrography Dataset (NHD). Accessed May 14, 2025.
Hillshade and Elevation: U.S. Geological Survey,

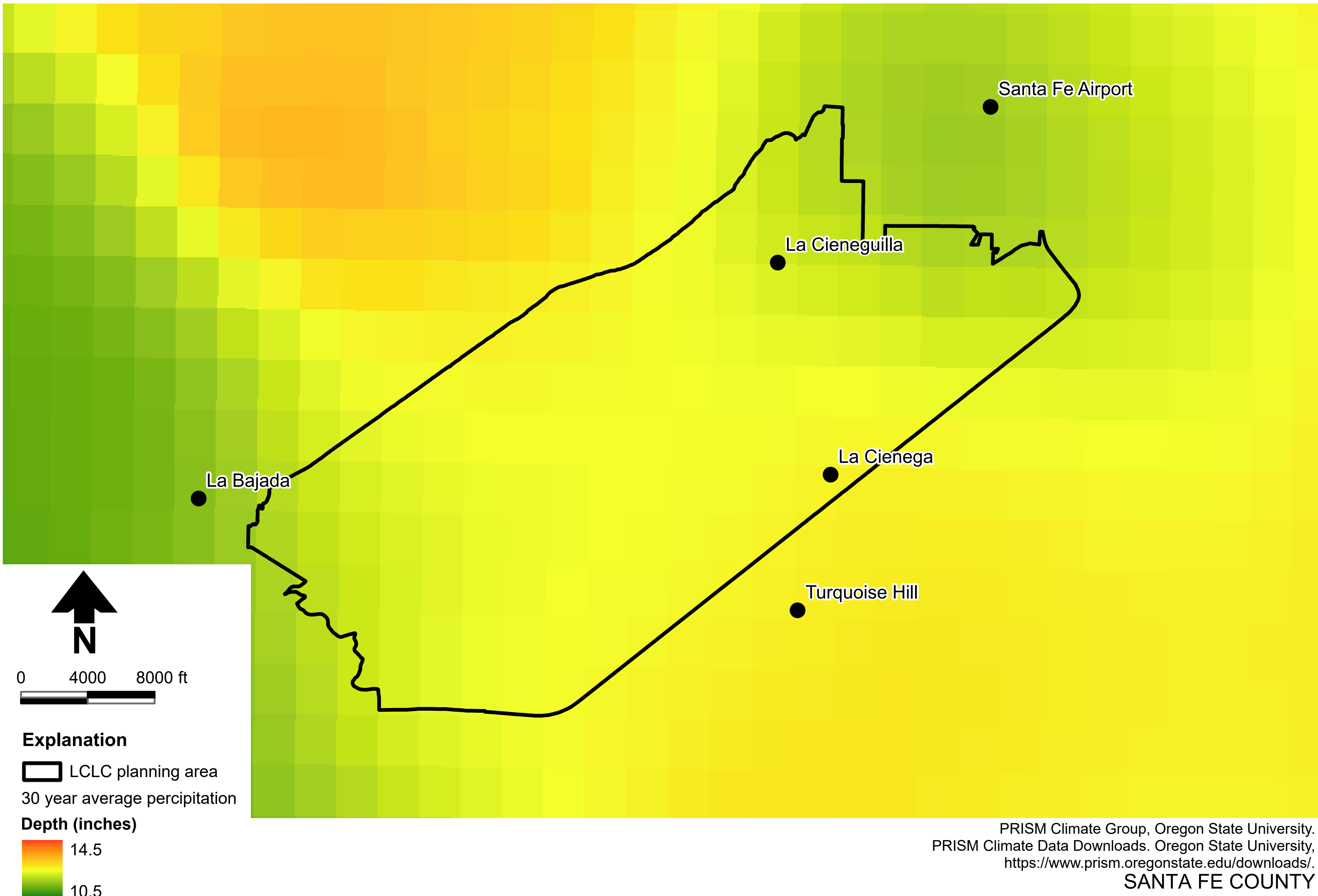
SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Elevation

DBS&A a Geo-Logic Company

6/19/2025 DB25.1140

Figure 3

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 04 WATERSHED ANNUAL PRECIP



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SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
PRISM 30 Year Average Precipitation

DBS&A
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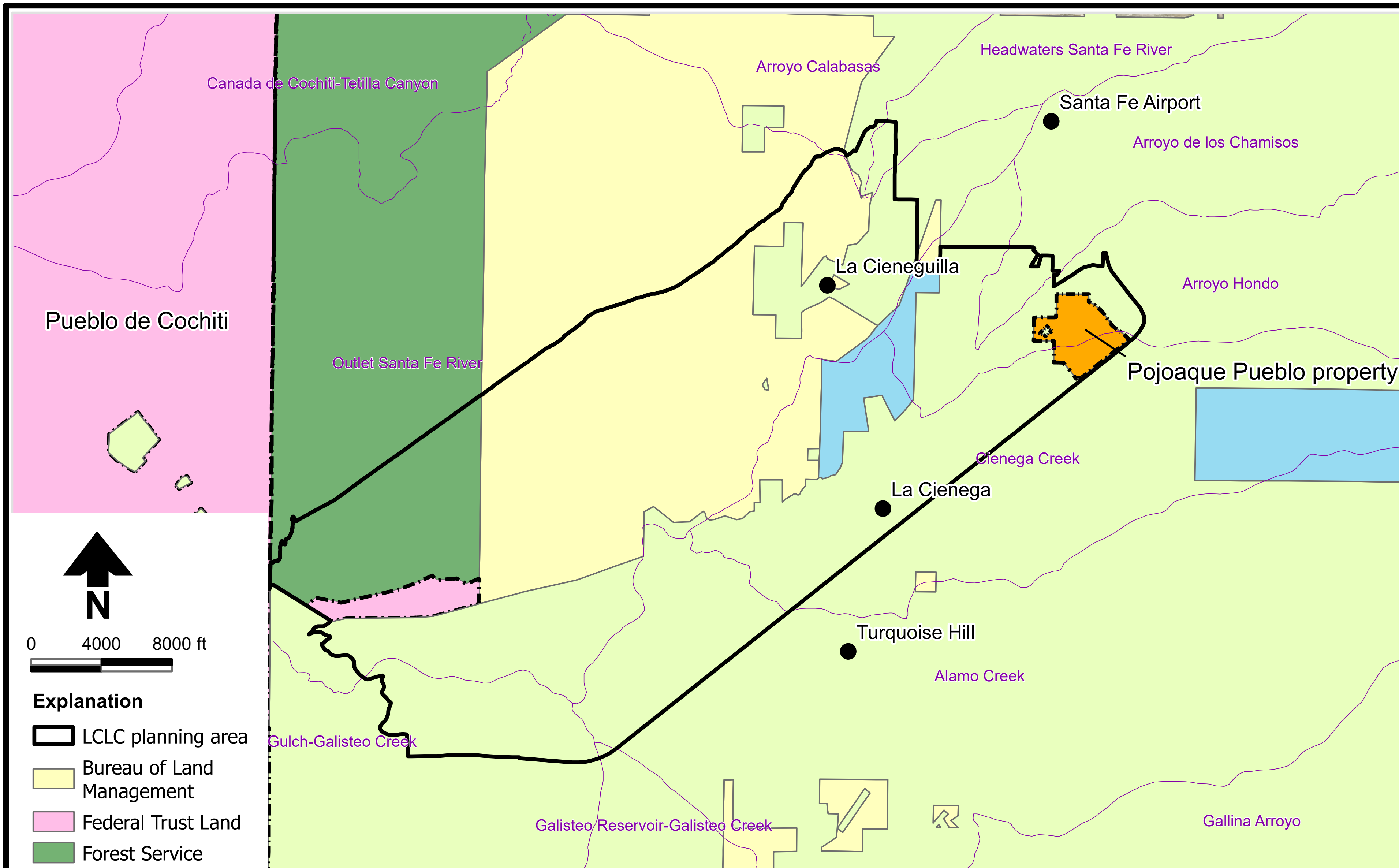
6/19/2025
DB25.1140

Figure 4



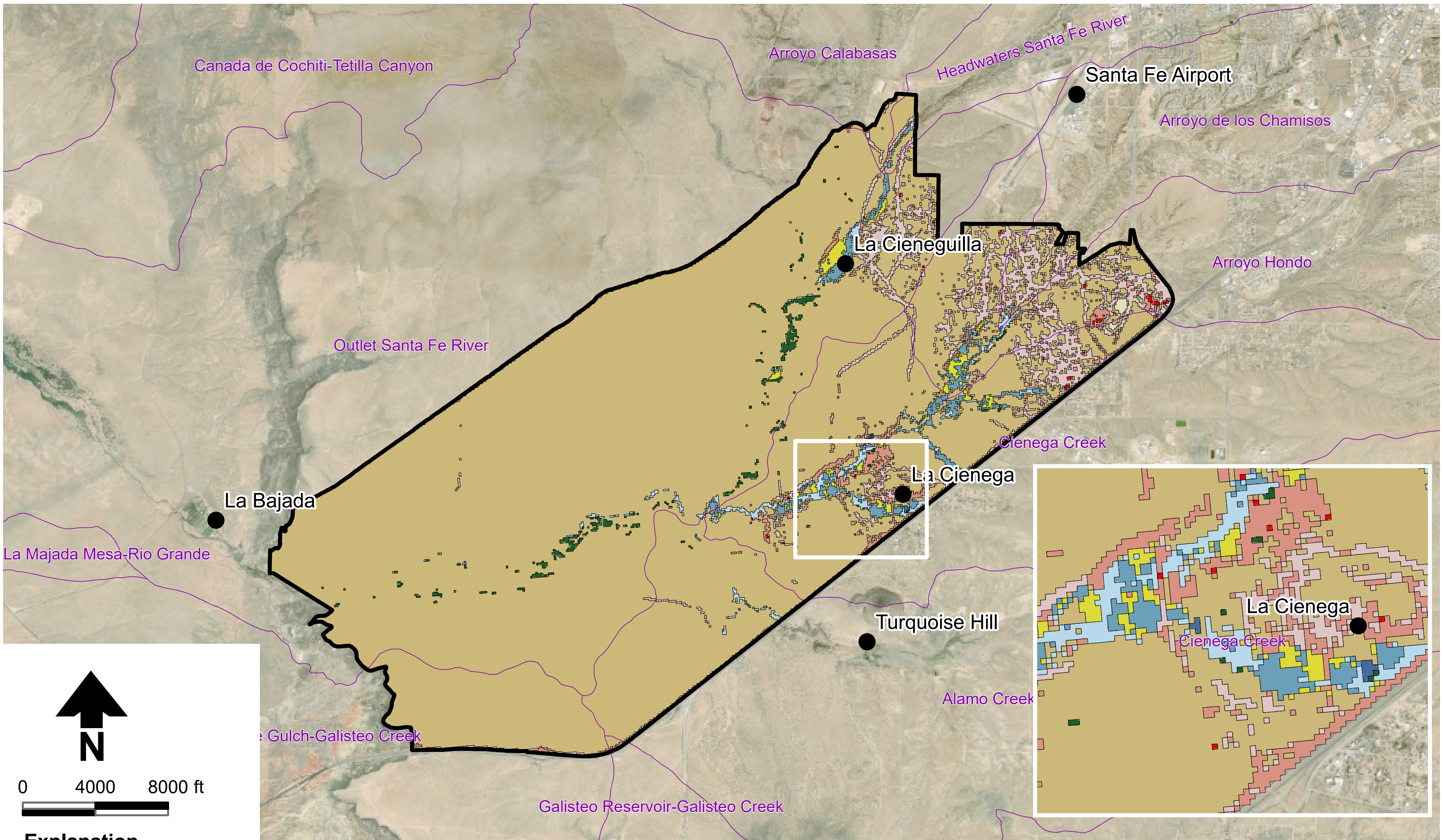
Land Ownership source:
U.S. Department of Interior, Bureau of Land Management (BLM)
Published: 20120131

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Land Ownership

Figure 5

DBS&A
a Geo-Logic Company
10/3/2025 DB25.1140

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 06 LAND COVER



Explanation

- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Emergent Herbaceous Wetlands
- Evergreen Forest
- Grassland/Herbaceous
- Open Water
- Pasture/Hay
- Shrub/Scrub
- Woody Wetlands
- LCLC planning area

Landcover source: United States Geological Survey(USGS)
Annual National Land Cover Database (NLCD)
https://www.mrlc.gov/data
Accessed: April 22, 2025

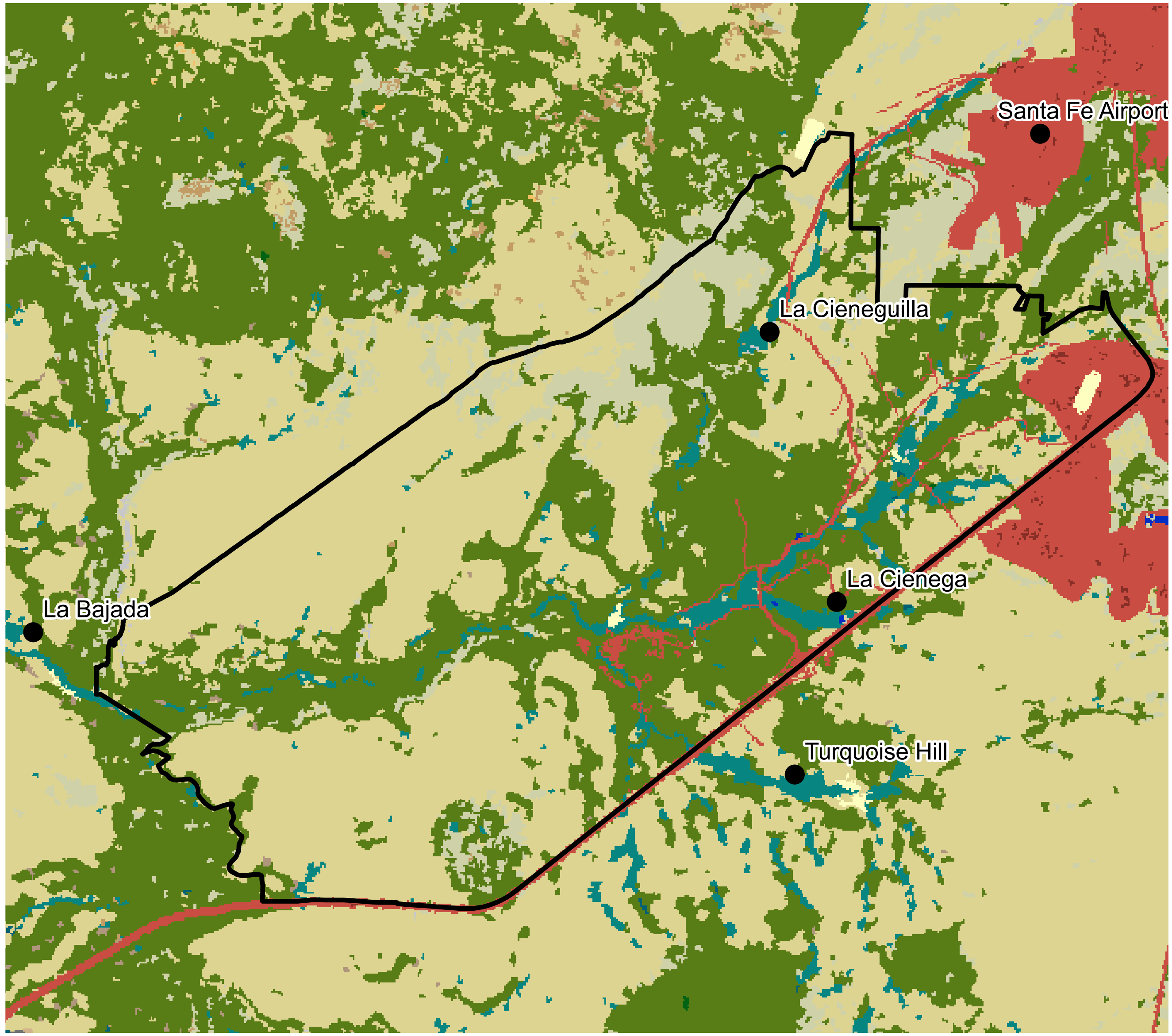
SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Land Cover

Figure 6

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

Explanation

- Southern Rocky Mountain Ponderosa Pine Woodland
- Colorado Plateau Pinyon-Juniper Shrubland
- Southern Rocky Mountain Juniper Woodland and Savanna
- Southern Rocky Mountain Pinyon-Juniper Woodland
- Western Great Plains Riparian Woodland and Shrubland
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland
- Western Great Plains Foothill and Piedmont Grassland
- Inter-Mountain Basins Mat Saltbush Shrubland
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Montane Sagebrush Steppe
- Inter-Mountain Basins Semi-Desert Grassland
- Rocky Mountain Cliff, Canyon and Massive Bedrock
- Cultivated Cropland
- Pasture/Hay
- Disturbed/Successional - Grass/Forb Regeneration
- Open Water (Fresh)
- Developed
- LCLC planning area



Landcover source: United States Geological Survey(USGS) Gap Analysis Project https://www.usgs.gov/programs/gap-analysis-project/science Accessed: April 21, 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Dominant Ecosystems

Figure 7

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

Explanation

CerrosDelRio
- Nb
- Nd
- Qb

LaBajadaEscarp
- NPEim
- Ncb

LowSFJemez
- Nab

MesozoicSeds
- Jb
- Jmb
- Jmw
- KJj
- Kd
- Kmgr
- Kmj
- Kmn

PaleogSeds
- PEg

QSurficialDeposits
- Qal
- Qalm
- Qam
- Qc
- Qdf
- Qls
- Qsw
- Qt2
- Qt3
- Qt5
- af

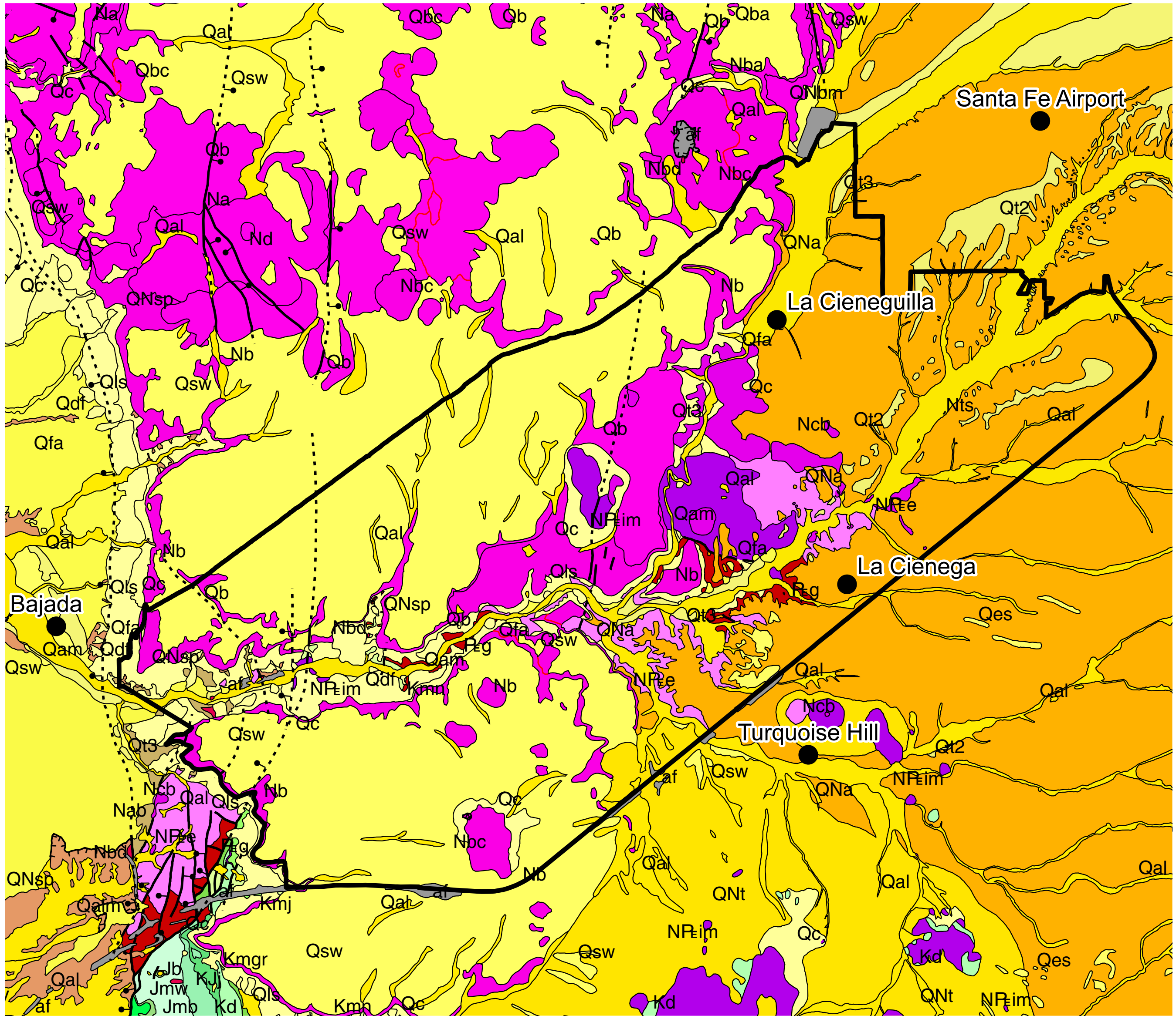
UpSFEspañola
- QNa
- QNt

UpSFSanDom
- QNsp

LCLC planning area

N

0 4000 8000 ft



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SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Geology

Figure 8

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

unit01—af—Artificial fill (Holocene)—Areas associated with urban development or construction

(Holocene–Pleistocene)—Unconsolidated sediment deposited in active alluvial channels, on floodplains, and in Holocene terraces generally within 10 m of current channel.

unit01—Qsw—Sheetwash deposits (Holocene to Middle? Pleistocene)

(Holocene–Pleistocene)—Hillslope regolith composed of locally derived, poorly sorted silty, sandy gravel that may be clast- or matrix-supported.

unit01—Qls—Landslide deposits (Holocene–Early Pleistocene)—Locally-derived cohesive blocks of bedrock or unsorted and unstratified rock debris and sediment, characterized by hummocky topography.

unit01—Qdf—Debris-flow depostis (Holocene–Middle (?) Pleistocene)—Lobate and fan-shaped masses of locally-derived debris deposited by sediment-charged streams at the base of steep escarpments.

unit02—Qt5—Terrace deposit (Late Pleistocene)—Cobble gravel and sand underlying a terrace tread that is typically 5–10m above modern stream grade.

unit02—Qt3—Terrace deposit (Middle Pleistocene)—Cobble gravel and sand underlying a terrace tread that is typically 30–60m above modern stream grade.

unit02—Qt2—Terrace deposit (Middle Pleistocene)—Cobble gravel and sand underlying a terrace tread and overlying a basal strath that is typically 50–85m above modern stream grade.

unit01—Qalm—Alluvium of La Majada Mesa (Middle Pleistocene)—Alluvial and eolian deposits underlying an extensive geomorphic surface extending from Galisteo Creek to near the base of La Bajada Mesa.

unit01—Qb—Basalt (Early Pleistocene)—Basalt erupted from Hill 7033, Tetilla Hole, Colorado Peak, Hill 6929 (two centers), and Cañada Ancha.

Oligocene)—porphyritic, mafic volcanic rocks that include basanite, nephelinite, and basalt that typically have moderate to abundant amounts of olivine (10–15%), and lesser clinopyroxene (5%) phenocrysts; sparse, small plagioclase phenocrysts occur in the basalt.

unit01-Nab—Abiquiu Formation (Late Oligocene–Early Miocene)—White to gray, very fine- to medium-grained, arkosic sandstone and primary ash-fall beds 20–50 cm thick are exposed in the cliffs.

unit01—QNa—Ancha Formation (Early Pleistocene– Late Pliocene)—Alluvial slope deposits are pink to brownish-yellow to light-yellowish-brown to yellowish-brown, and contain two distinct types of intercalated sediment: 1) silty-clayey sand that is mostly very fine to medium grained with subordinate coarse- to very coarse-grained sand, containing a few scattered pebbles, and 2) coarse channel fills of gravelly sand, sandy gravel, and medium- to very coarse-grained sand

Pliocene)—Sand interbedded with sandy gravel and Yellowish-brown to light-yellowish-brown to tan to brownish-yellow, silty-clayey sand interbedded with coarse channel fills of sandy gravel and gravelly sand derived from the Cerrillos Hills (Koning and Hallett, 2000)

unit01—QNsp—Sierra Ladrones Formation, eastern piedmont-stream deposits (Early Pleistocene–Late Miocene)—Tan, pink, and red lithic-arkosic sand, mud, and gravel deposited Tan, pink, and redlithic-arkosic sand, mud, and gravel deposited by west and southwest flowing streams in the eastern Santo Domingo basin.

unit02—Kmn—Niobrara Member (Late Cretaceous)—Shale, calcareous shale, and mudstones, intercalated with thin sands.

unit02—Kmj—Juana Lopez, Carlile Shale, and Semilla Sandstone members of the Mancos Shale, undivided (Late Cretaceous)—combined unit includes the Juana Lopez Member, the underlying calcareous shale and clay shale members of the lower Carlile Shale (Blue Hill and Fairport members), and the Semilla Sandsto Member.

unit02—Kmgr—Bridge Creek Limestone and Graneros Members, undivided (Late Cretaceous)—Includes limestone (Bridge Creek Limestone), and calcareous shale (Graneros Member) with thin bentonite beds.

unit01—Kd—Dakota Formation (Late Cretaceous)—Fluvial to marine quartz sandstone with feldspar, intercalated with marine tongues of Mancos Shale.

unit01—KJj—Jackpile Sandstone (Late Jurassic to Early Cretaceous)—Kaolinitic, predominantly fine- to medium-grained, massive to cross-bedded fluvial sandstone.

unit01—Jmb—Brushy Basin Member (Late Jurassic)—Variegated mudstone, silty mudstone, and minor subarkosic sandstone.

unit01—Jmw—Westwater Canyon Member (Late Jurassic)—Fluvial sandstone and subordinate interbedded pale-brown to pale-olive mudstone.

unit01—Jb—Beclabito Formation (Late Jurassic)—Thin beds of variegated sandstone interbedded with gypsiferous siltstone, sandy siltstone, or mudstone.

unit01—Pg—Glorieta Sandstone (middle Permian)—well sorted quartz arenite.

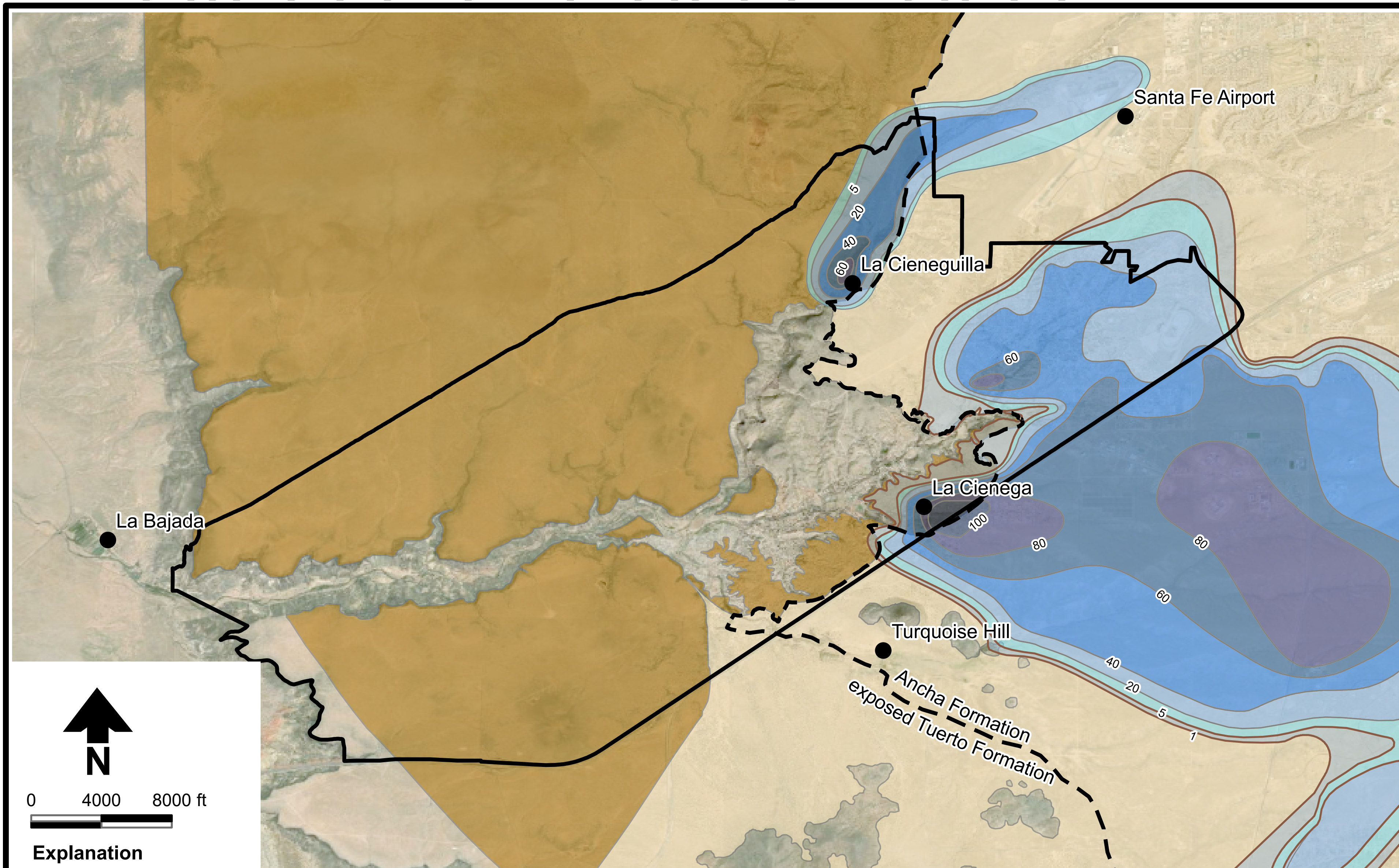
Kelley, Shari A., et al. Geology of the Los Alamos 30 x 60-Minute Quadrangle Study Area, Los Alamos, Santa Fe, and Sandoval Counties, New Mexico. Open-file Geologic Map 298, 2023.

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Geology

Figure 8a

DBS&A
a Geo-Logic Company
6/19/2025 DB25.1140

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX • FIG 09 ANCHA FORMATION EXTENT



Johnson, Peggy S., et al. Geology and Hydrology of Groundwater-Fed Springs and Wetlands at La Cienega, Santa Fe County, New Mexico. Bulletin 161, 2016

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Ancha Formation Extent and Saturated Thickness

Figure 9

DBS&A
a Geo-Logic Company
6/19/2025
DB25.1140

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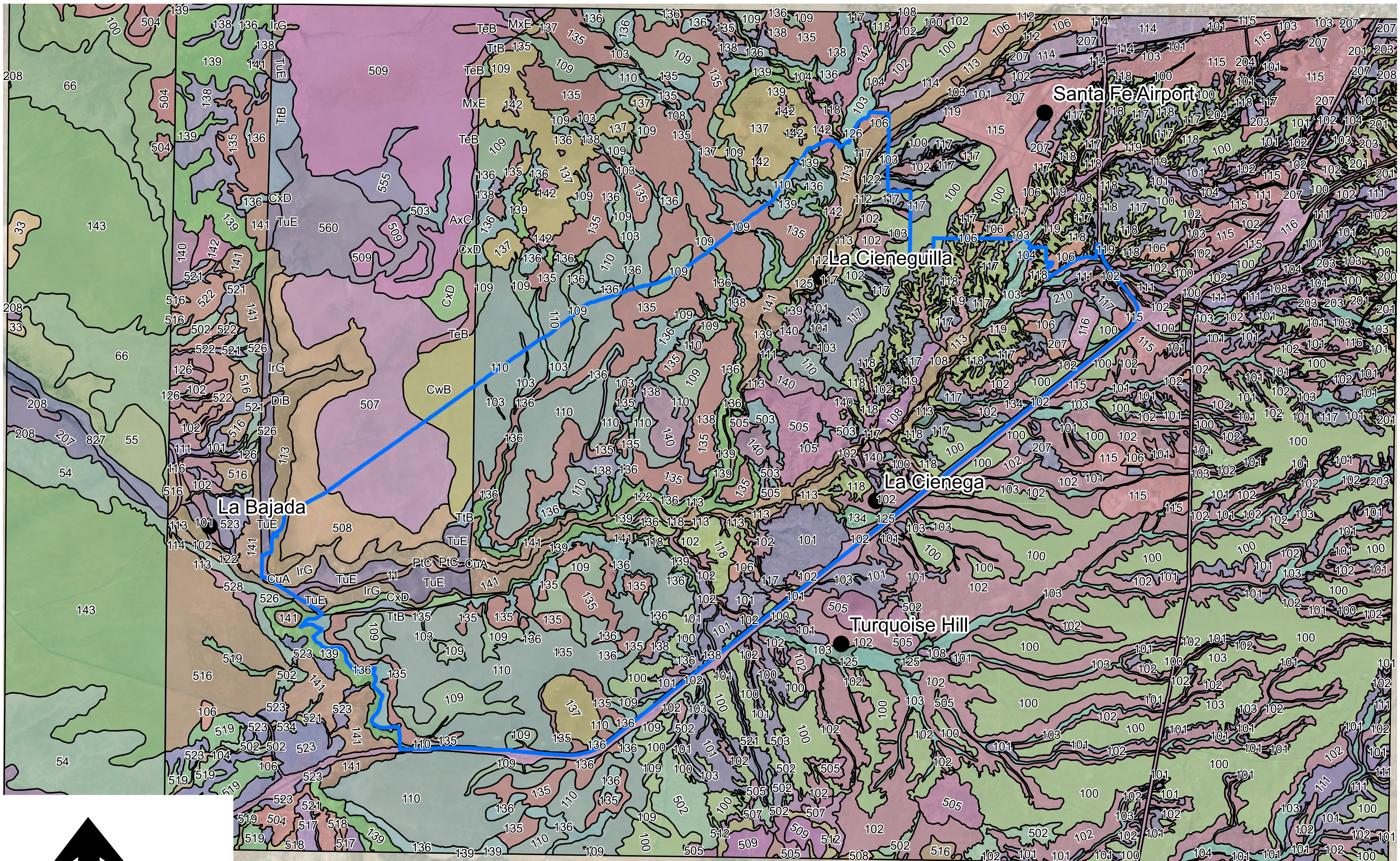


N

0 4000 8000 ft

Explanation

LCLC planning area

Soil Data Source: USDA, SSURGO, SSA version est.: 09/03/2024
https://websoilsurvey.sc.egov.usda.gov/
Accessed: 22 May 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Soils

DBS&A
a Geo-Logic Company
6/19/2025
DB25.1140

Figure 10

Explanation

- LCLC planning area
- 100 - Orejas-Rock outcrop complex, 15 to 40 percent slopes
- 101 - Zozobra-Jaconita complex, 5 to 25 percent slopes
- 102 - Khapo sandy loam, 3 to 8 percent slopes
- 103 - Zepol silt loam, 0 to 2 percent slopes, flooded
- 104 - Chupe-Riverwash complex, 1 to 3 percent slopes, flooded
- 105 - Dumps, sanitary landfill
- 106 - Pits
- 108 - Zia fine sandy loam, 0 to 2 percent slopes
- 109 - Tetilla loam, 1 to 5 percent slopes
- 11 - Abiquiu, occasionaly flooded-Els families complex, 0 to 15 percent slopes
- 110 - Calabasas loam, 1 to 3 percent slopes
- 111 - Khapo fine sandy loam, 0 to 2 percent slopes
- 112 - Riovista gravelly loamy sand, 0 to 1 percent slopes
- 113 - Delvalle-Urban land complex, 0 to 2 percent slopes
- 114 - Devargas-Urban land complex, 1 to 3 percent slopes
- 115 - Panky-Urban land complex, 1 to 4 percent slopes
- 116 - Arents-Urban land-Orthents complex, 1 to 60 percent slopes
- 117 - Agua Fria-Paraje complex, 1 to 8 percent slopes
- 118 - Golondrina-Paraje complex, 8 to 45 percent slopes
- 119 - Vitrina-Haozous complex, 5 to 15 percent slopes, flooded
- 122 - Cuyamungue-Riverwash complex, 0 to 2 percent slopes, flooded
- 125 - Mirada-Bosquecito complex, 0 to 2 percent slopes, flooded
- 126 - Walkibout-Innacutt complex, 2 to 80 percent slopes, flooded
- 134 - Bosquecito fine sandy loam, 0 to 2 percent slopes, flooded
- 135 - Tsinat gravelly loam, 1 to 6 percent slopes
- 136 - Churipa very cobbly sandy loam, 5 to 15 percent slopes
- 137 - Medrano extremely gravelly loam, 5 to 65 percent slopes
- 138 - Andanada very gravelly loam, 5 to 15 percent slopes
- 139 - Ildefonso-Rock outcrop-Rubble land complex, 30 to 70 percent slopes
- 140 - Truehill very cobbly loam, 25 to 45 percent slopes
- 141 - Truehill-Penistaja family-Rock outcrop complex, 4 to 50 percent slopes
- 142 - Parida gravelly loam, 3 to 10 percent slopes
- 143 - Clovis fine sandy loam, 1 to 4 percent slopes
- 200 - Predawn loam, 1 to 4 percent slopes
- 201 - Tanoan-Encantado complex, 5 to 25 percent slopes
- 202 - Alire loam, 2 to 6 percent slopes
- 203 - Buckhorse-Altazano complex, 2 to 8 percent slopes, flooded
- 204 - Altazano loamy sand, 0 to 2 percent slopes, flooded
- 207 - Penistaja-Zia complex, 1 to 8 percent slopes
- 208 - Sedillo very gravelly fine sandy loam, 25 to 55 percent slopes
- 210 - Urban land-Buckhorse-Altazano complex, 2 to 8 percent slopes
- 213 - Levante-Riverwash complex, 1 to 3 percent slopes, flooded
- 216 - Dondiego loam, 1 to 3 percent slopes
- 217 - Ohke sandy loam, 1 to 3 percent slopes
- 33 - Pits
- 502 - Khapo fine sandy loam, 1 to 3 percent slopes
- 503 - Espinos very gravelly coarse sandy loam, 5 to 40 percent slopes
- 504 - Orejas-Guaje complex, 1 to 15 percent slopes
- 505 - Puertecito-Paraje complex, 15 to 50 percent slopes
- 507 - Ildefonso extremely gravelly sandy loam, 5 to 15 percent slopes
- 508 - Charalito-Riverwash complex, 1 to 3 percent slopes, flooded
- 509 - Puertecito-Wandurn-Rock outcrop complex, 30 to 60 percent slopes
- 516 - Cerrillos fine sandy loam, 1 to 4 percent slopes
- 517 - Puertecito extremely gravelly fine sandy loam, 15 to 25 percent slopes
- 519 - Cumacho fine sandy loam, 2 to 8 percent slopes
- 521 - Devargas-Riovista-Riverwash complex, 0 to 5 percent slopes, flooded
- 522 - Penistaja family fine sandy loam, 1 to 3 percent slopes
- 523 - Kech-Cerropelon-Rock outcrop complex, 5 to 50 percent slopes
- 526 - Penistaja family-Truehill complex, 3 to 15 percent slopes
- 528 - Penistaja family loam, 3 to 8 percent slopes
- 531 - Sena very fine sandy loam, 0 to 2 percent slopes
- 534 - Oelop-Charalito complex, 1 to 3 percent slopes
- 54 - Harvey-Cascajo association, 5 to 15 percent slopes
- 55 - La Fonda loam, 1 to 5 percent slopes
- 555 - Ortega Peak-Orejas, extremely stony families complex, 15 to 80 percent slopes
- 560 - Barranca, moderately deep, dry-Orejas families complex, 15 to 80 percent slopes, very stony
- 66 - Zia sandy loam, 3 to 6 percent slopes
- 827 - Aga loam, 1 to 3 percent slopes, unprotected
- AxC - Andanada very gravelly loam, 5 to 15 percent slopes, stony
- CuA - Cuyamungue-Riverwash complex, 0 to 2 percent slopes, frequently flooded
- CwB - Calabasas loam, 1 to 3 percent slopes
- CxD - Churipa very cobbly loam, 5 to 15 percent slopes, very stony
- DiB - Devargas-Riovista, very stony-Riverwash complex, 0 to 5 percent slopes
- IrG - Ildefonso-Rock outcrop-Rubble land complex, 30 to 70 percent slopes, extremely bouldery
- MxE - Medrano extremely gravelly loam, 5 to 65 percent slopes, stony
- PtC - Penistaja family-Truehill, very stony complex, 3 to 15 percent slopes
- TeB - Tetilla loam, 1 to 5 percent slopes
- TtB - Tsinat gravelly loam, 1 to 6 percent slopes
- TuE - Truehill-Penistaja family-Rock outcrop complex, 4 to 50 percent slopes, extremely bouldery

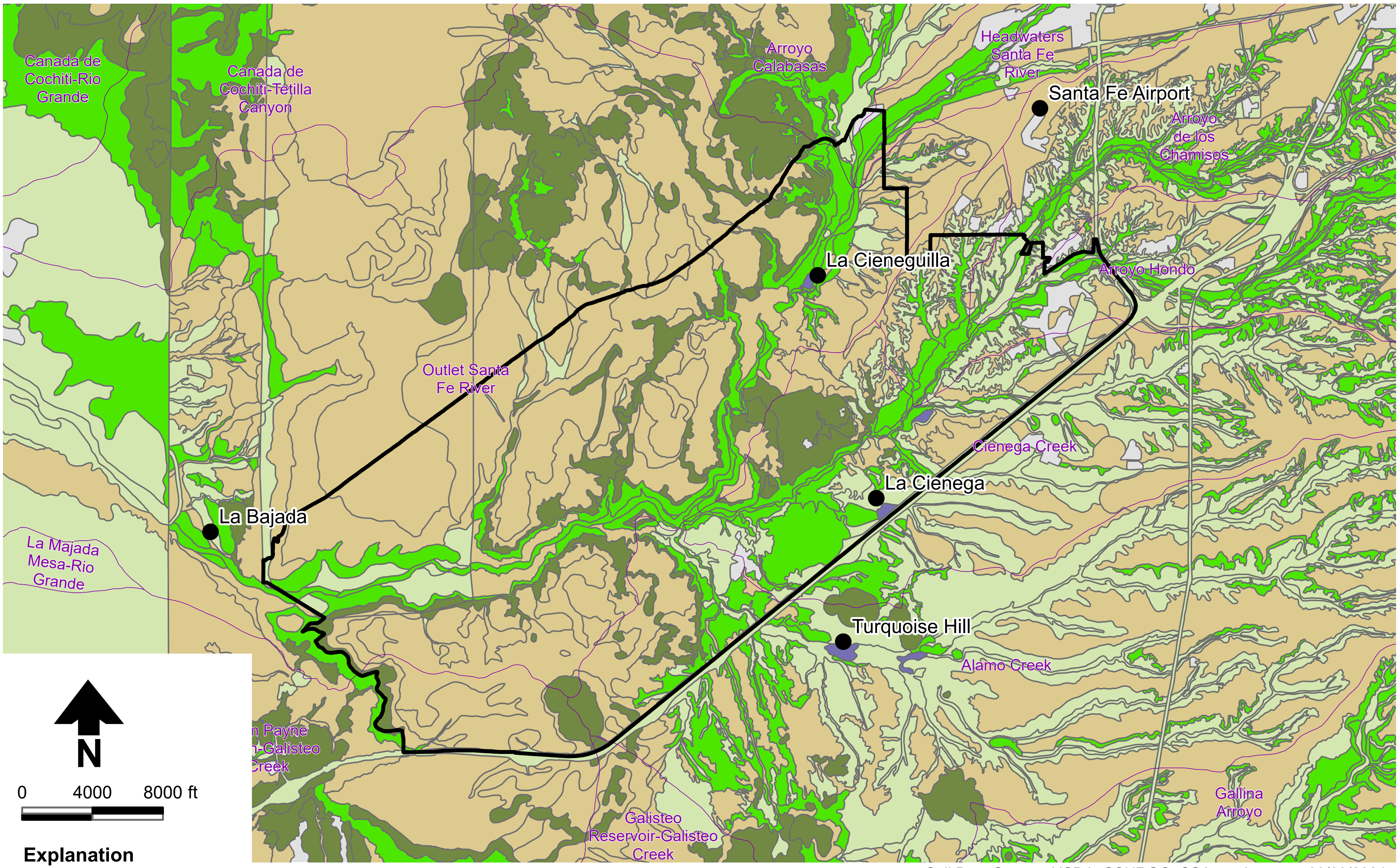
Soil Data Source: USDA, SSURGO
SSA version est.: 09/03/2024
https://websoilsurvey.sc.egov.usda.gov/
Accessed: 22 May 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Soils

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

Figure 10a

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX • FIG 10A SOILS



Explanation

- LCLC planning area
- Group A
- Group B
- Group C
- Group D
- Group A/D
- Group B/D
- Group C/D

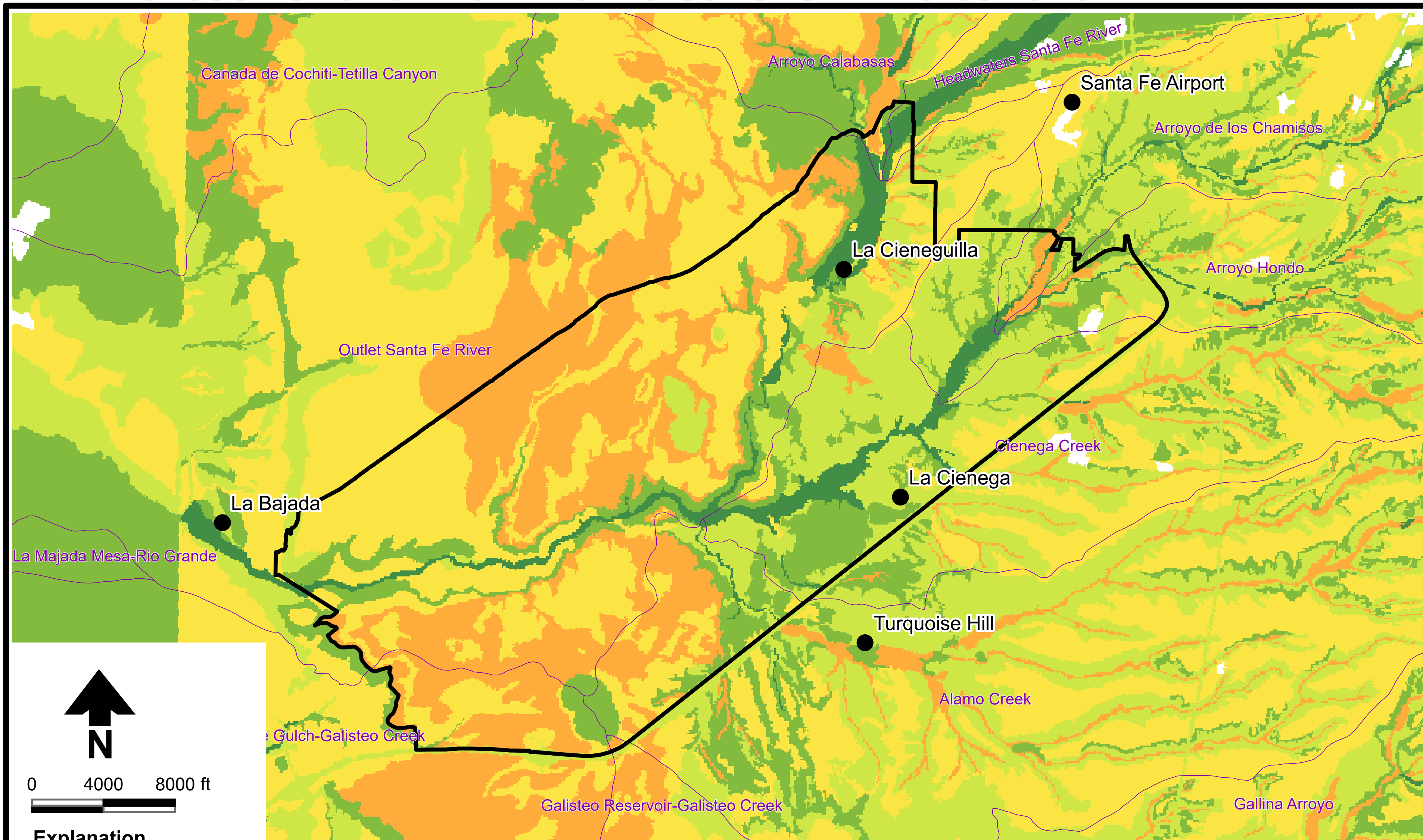
Soil Data Source: USDA, SSURGO, SSA version est.: 09/03/2024
https://websoilsurvey.sc.egov.usda.gov/
Accessed: 22 May 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Hydrologic Soil Group

Figure 11

DBS&A
a Geo-Logic Company

6/19/2025 DB25.1140



Explanation

USA SSURGO - Erodibility Factor

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- 0.51 - 0.64

LCLC planning area

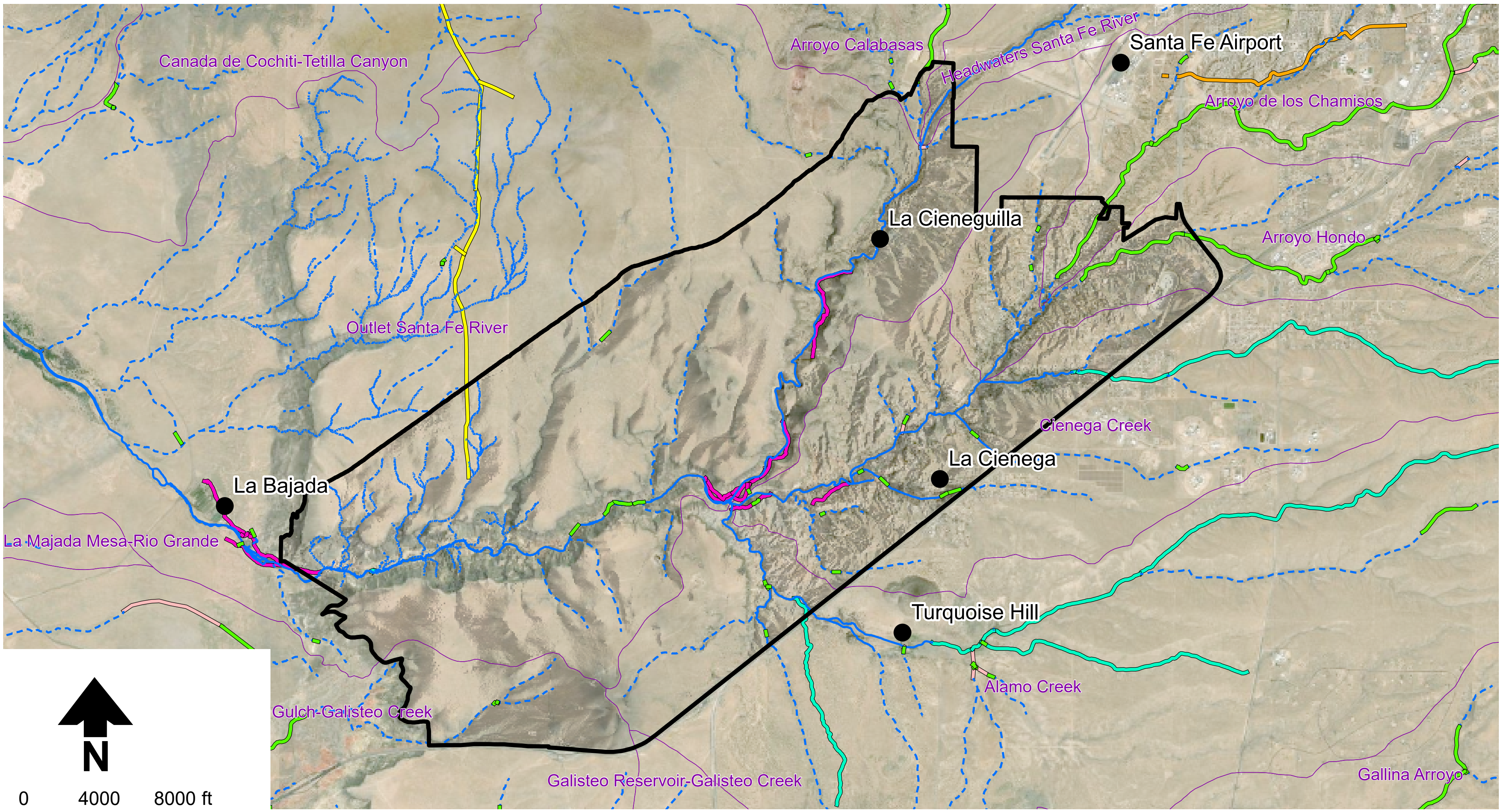
Soil Survey Staff, Natural Resources Conservation Service, U.S. Department of Agriculture. Soil Erodibility Factor Dataset. Dec. 2024

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Watershed Erosion Potential

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

Figure 12

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 13 SURFACE WATER FEATURES



Sources: Esri et al., base imagery; U.S. Geological Survey, National Hydrography Dataset (NHD). Accessed April 22 and May 14, 2025. https://www.usgs.gov/

Explanation

- Connector
- Canal ditch
- Pipeline
- Underground pipeline
- Stream/river
- Intermittent stream/river
- Perennial stream/river
- Ephemeral stream/river
- Artificial path
- Watershed boundary
- LCLC planning area

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Surface Water Features

Figure 13

DBS&A
a Geo-Logic Company
6/19/2025
DB25.1140

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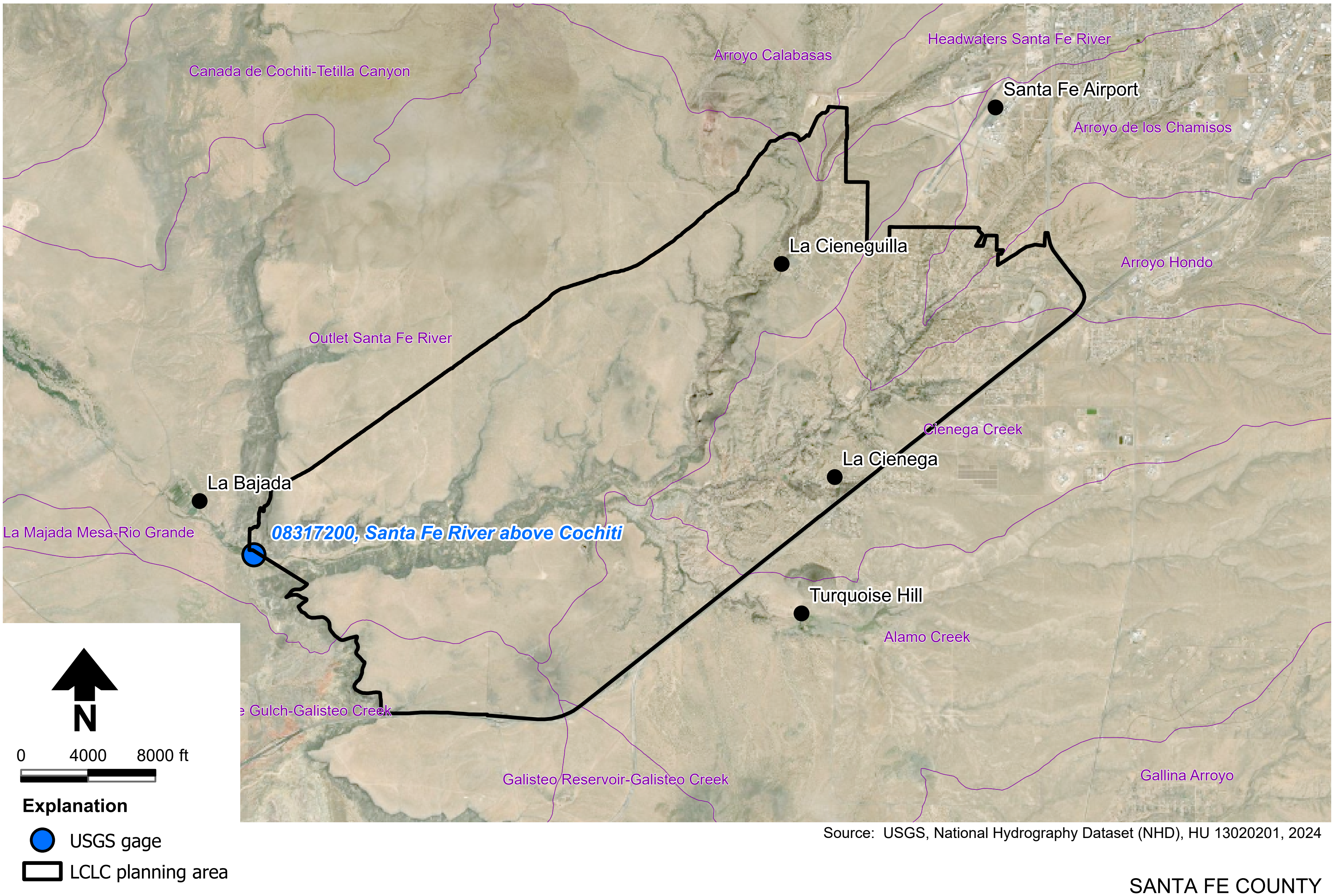
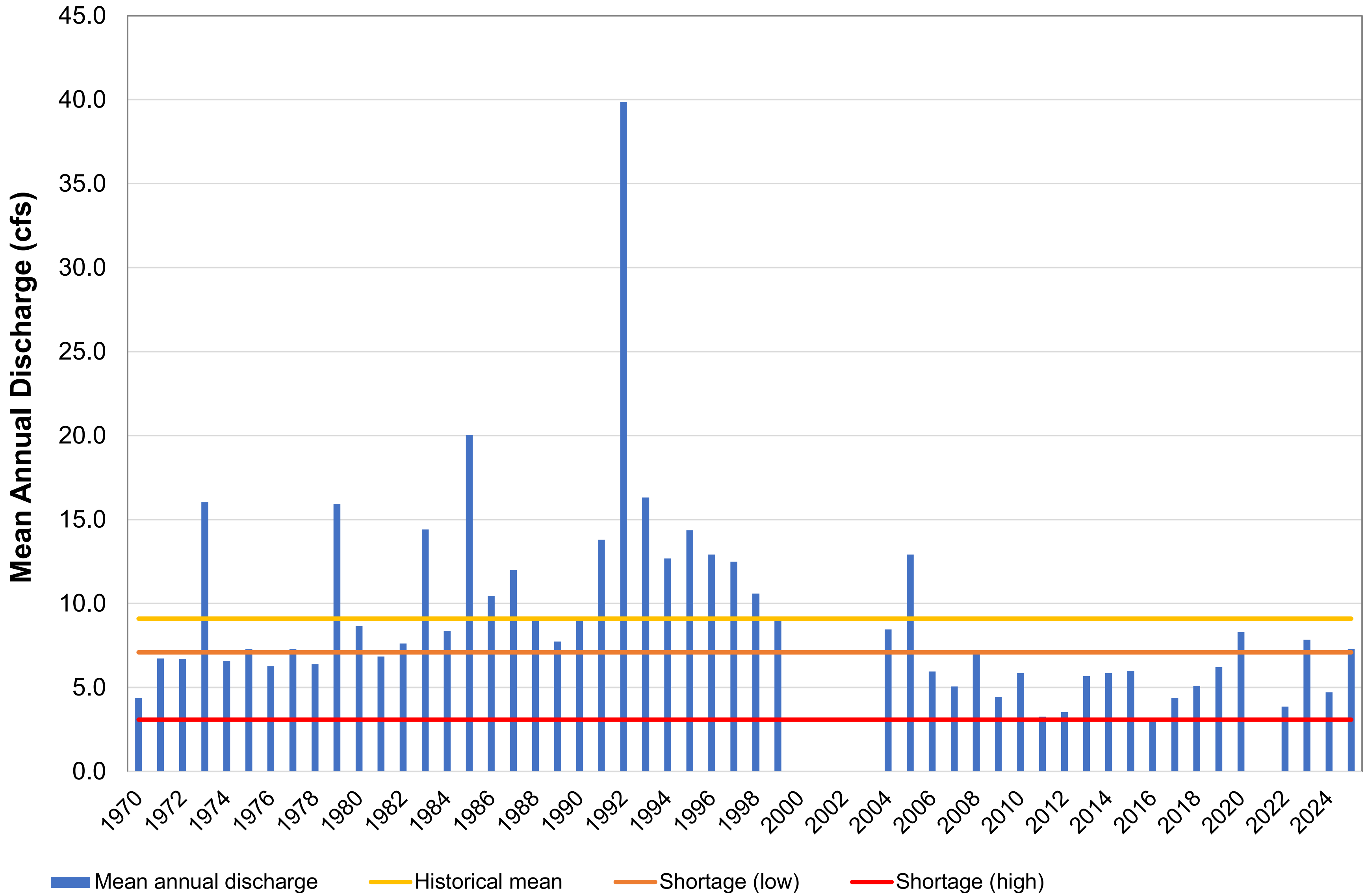


Source: USGS, National Hydrography Dataset (NHD), HU 13020201, 2024

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Gaging Stations

Figure 14

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140



SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Mean Annual Discharge
USGS Gage 08317200

Figure 15

DBS&A
a Geo-Logic Company

6/20/2025 DB25.1140

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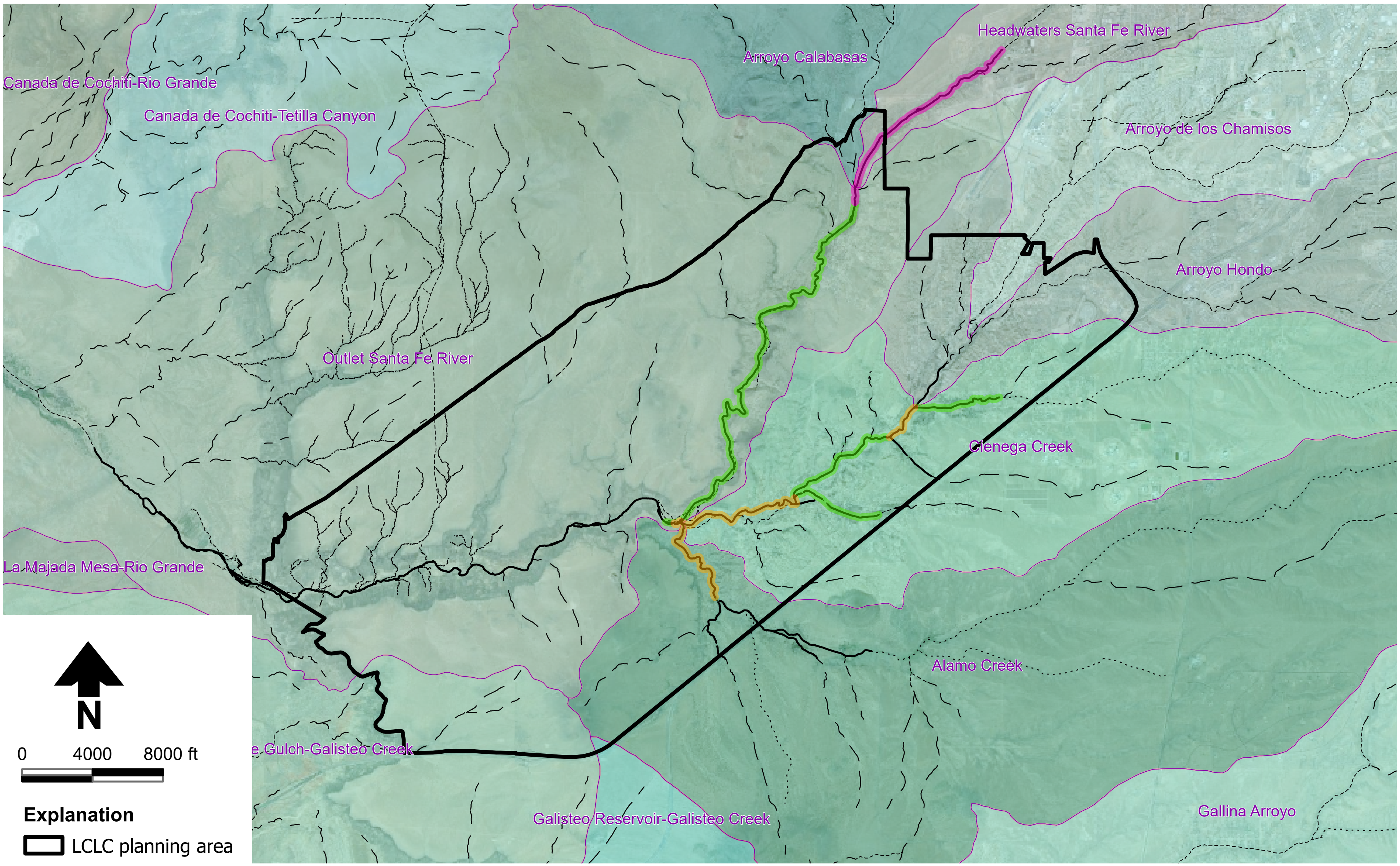


Explanation

- LCLC planning area
- Gaining
- Losing
- Neutral
- Stream/River: Hydrographic Category = Intermittent
- Stream/River: Hydrographic Category = Perennial
- Stream/River: Hydrographic Category = Ephemeral

Johnson, Peggy S., et al. Geology and Hydrology of Groundwater-Fed Springs and Wetlands at La Cienega, Santa Fe County, New Mexico. Bulletin 161, 2016

Watershed and streams source: National Hydrography Dataset (NHD). Accessed May 14, 2025.

SANTA FE COUNTY

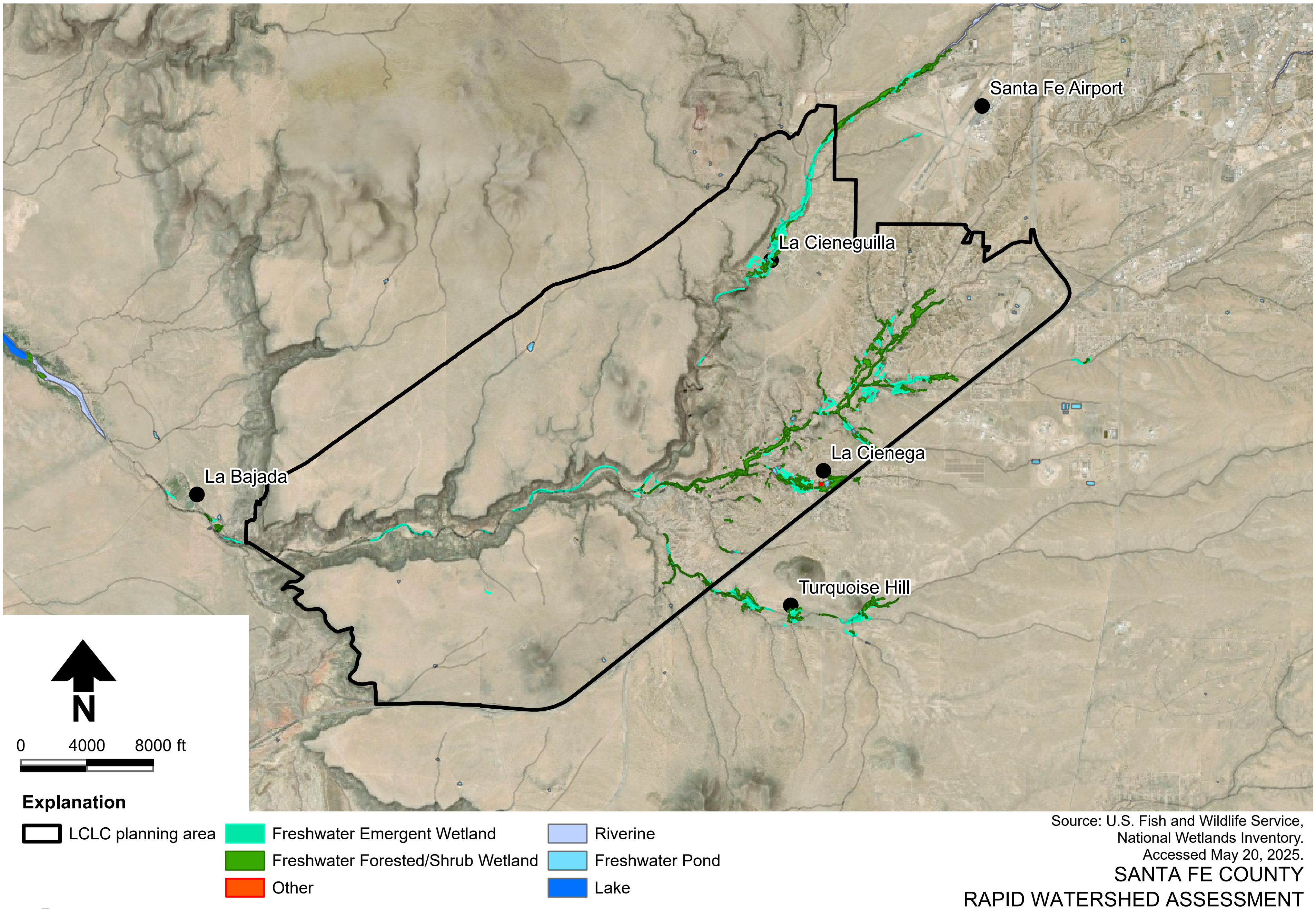
RAPID WATERSHED ASSESSMENT

Gaining, Losing, and Neutral Stream Reaches

Figure 16

DBS&A a Geo-Logic Company

6/19/2025 DB25.1140



Source: U.S. Fish and Wildlife Service, National Wetlands Inventory. Accessed May 20, 2025.

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Wetland and Riparian Areas

Figure 17

DBS&A a Geo-Logic Company
6/19/2025 DB25.1140

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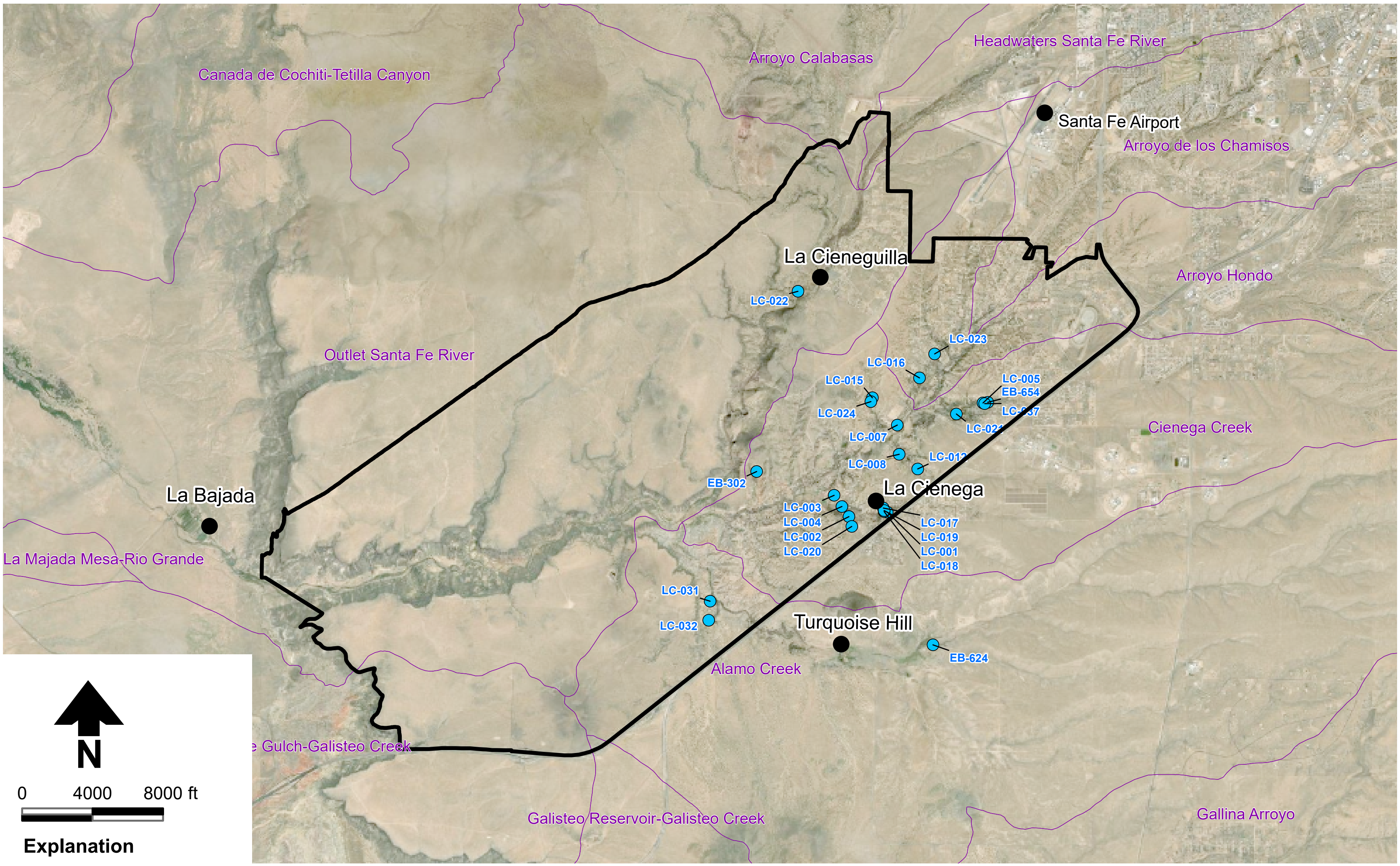


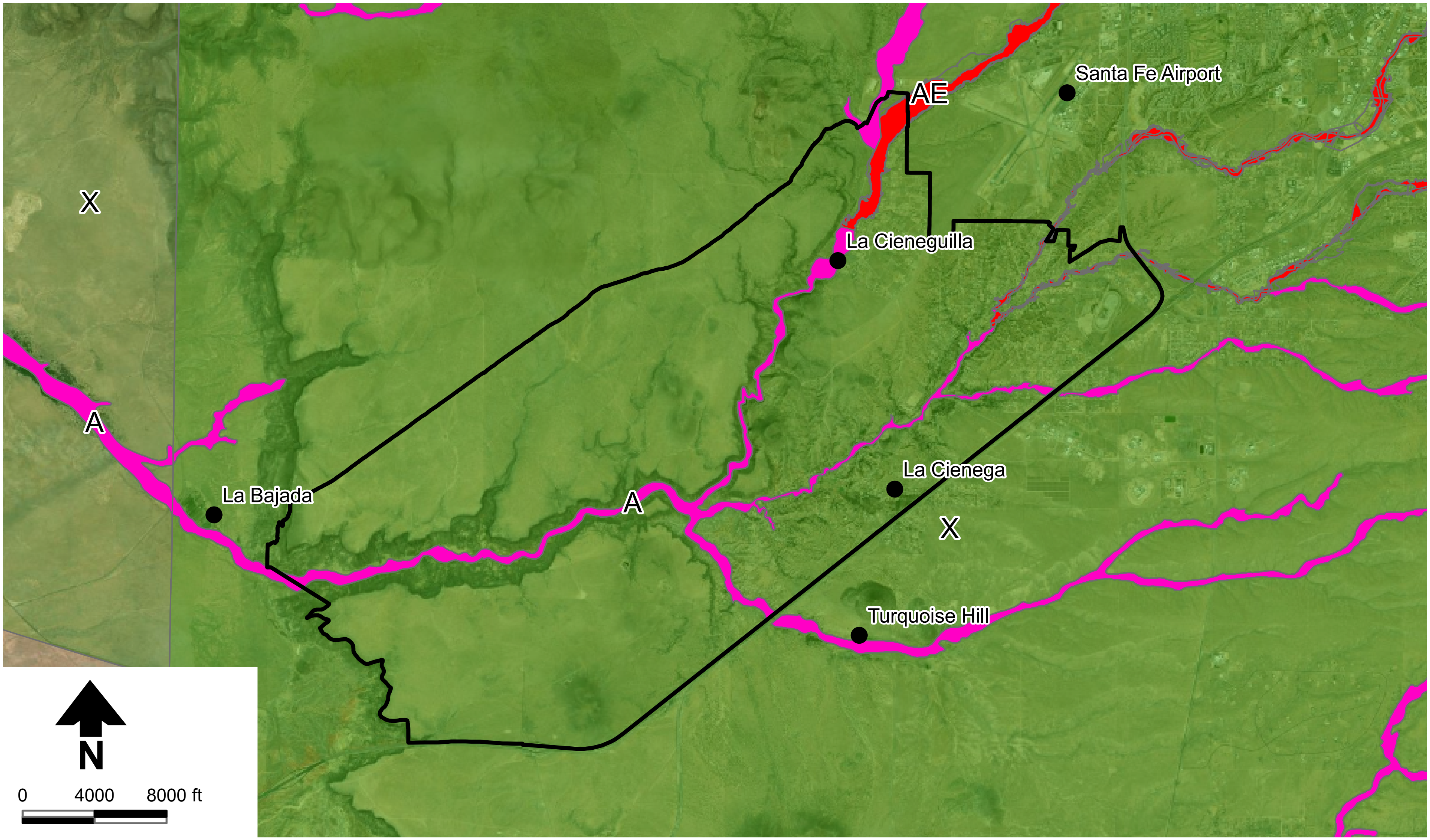
Johnson, Peggy S., et al. Geology and Hydrology of Groundwater-Fed Springs and Wetlands at La Cienega, Santa Fe County, New Mexico. Bulletin 161, 2016

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Spring Locations

Figure 18

DBS&A
a Geo-Logic Company
6/19/2025 DB25.1140

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 19 FEMA FLOOD MAP



Explanation

Zone A – Areas subject to 1% annual chance flooding (100-year flood). No base flood elevations determined

Zone AE: High risk, Base Flood Elevation determined

Zone X: Outside 0.2% annual chance floodplain

LCLC planning area

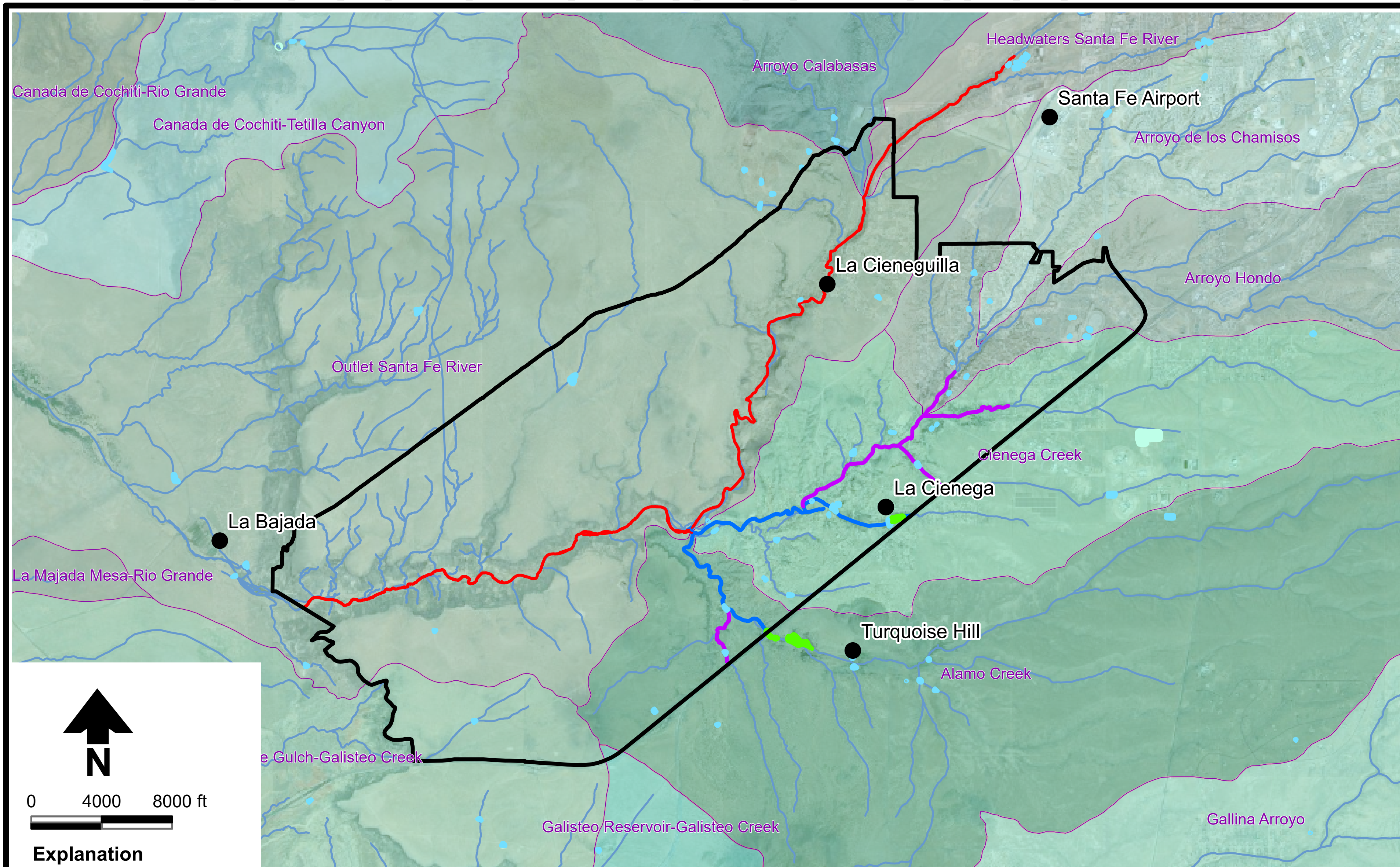
FEMA National Flood Hazard Layer
https://www.fema.gov/flood-maps/national-flood-hazard-layer
Accessed May 16, 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
FEMA Flood Map

a Geo-Logic Company
6/19/2025 DB25.1140

Figure 19

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 20 IMPAIRED WATERS



Explanation

- Waterway condition good
- Waterway condition impaired
- Waterway condition unknown
- Lake/pond
- Reservoir
- Swamp\marsh
- LCLC planning area

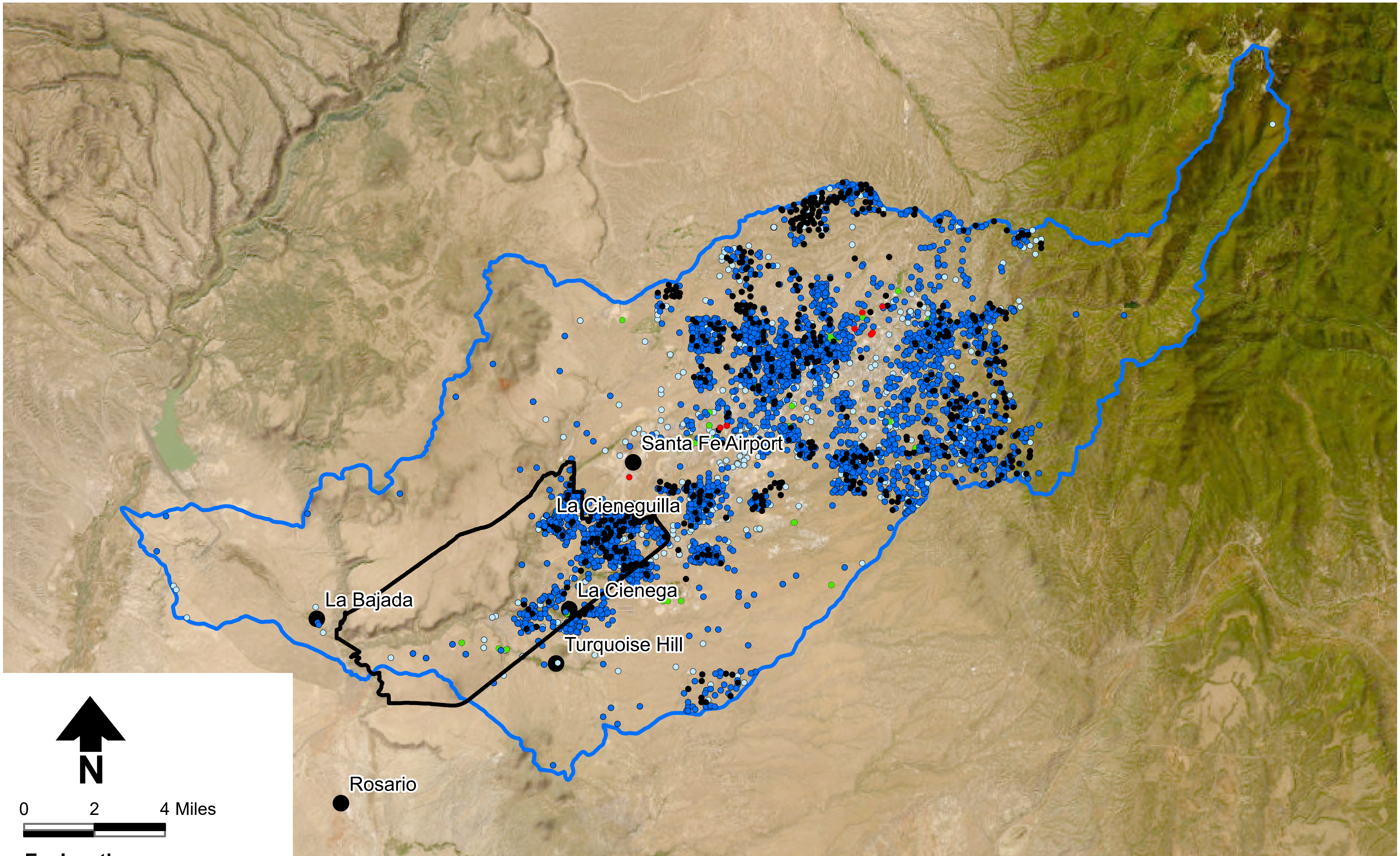
Waterway condition data: United States Environmental Protection Agency
https://mywaterway.epa.gov/community/130202010107/overview
Accessed May 5, 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Impaired Waters

Figure 20

DBS&A
a Geo-Logic Company
6/19/2025
DB25.1140

S:\PROJECTS\DB25.1140_SANTA_FE_CO_LCLC-EL_CANON_WATER_RESOURCES_PER\GIS\ARCGIS_PRO\SFCO_LCLC_EL_CANON_WATER_RESOURCES\SFCO_LCLC_EL_CANON_WATER_RESOURCES.APRX ● FIG 21 PERMITTED WELLS ALT



Explanation

LCLC planning area

Santa Fe Watershed boundary

Well use

- Irrigation well
- Domestic well
- Multiple domestic households
- Municipal well
- Other

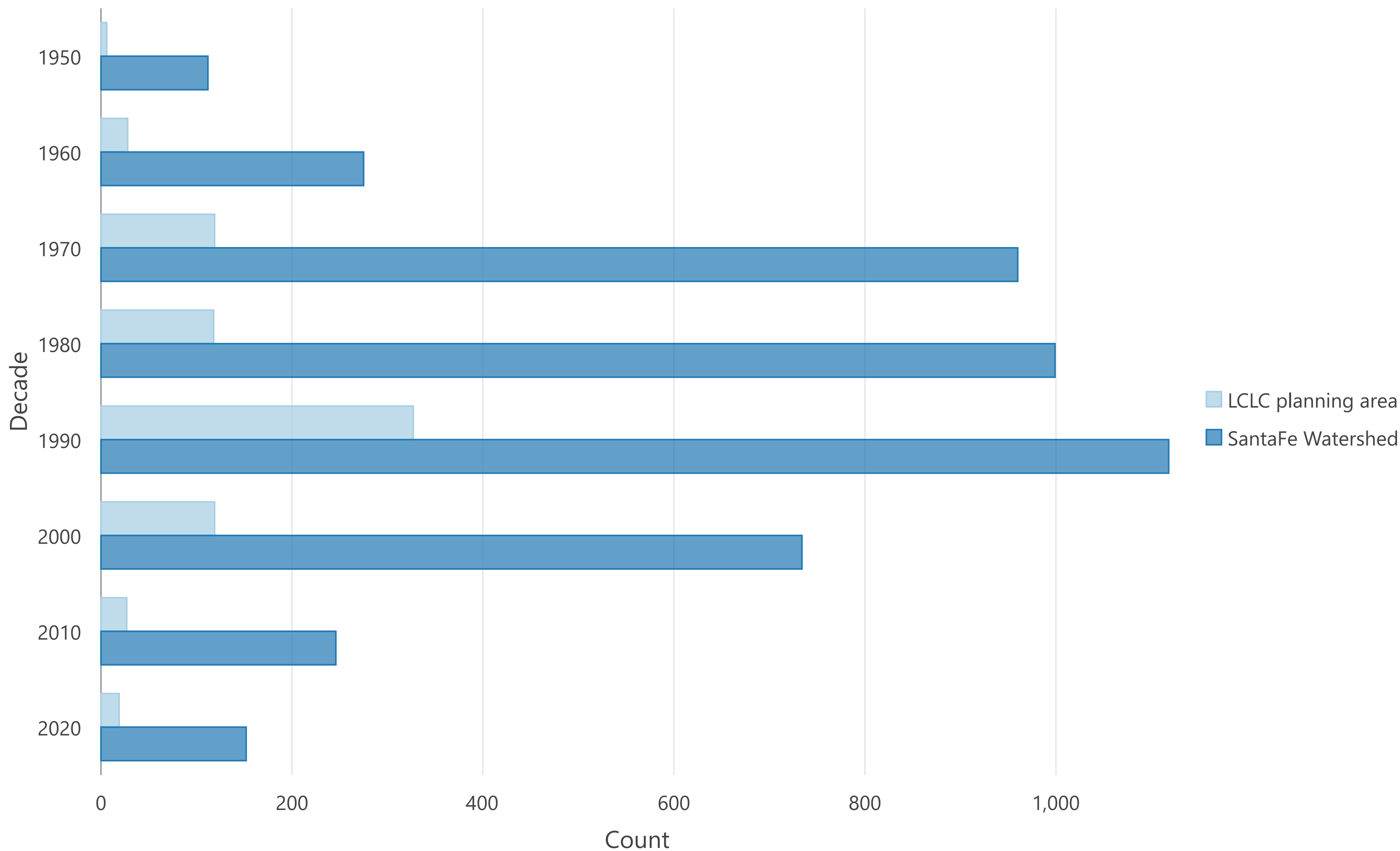
Well data: Apr 5, 2022, New Mexico Office of the State Engineer
Accessed May 27, 2022

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Permitted Wells

Figure 21

DBS&A a Geo-Logic Company

6/19/2025 DB25.1140



Note: LCLC planning area wells are a subset of the watershed totals

Source: New Mexico Office of the State Engineer
Start Date
Accessed, 2 June 2025

SANTA FE COUNTY
RAPID WATERSHED ASSESSMENT
Number of Wells Added Each Decade

Figure 22

DBS&A
a Geo-Logic Company
6/19/2025 DB25.1140