



Environmental Report – Grants Homestake Site

Prepared for:

Homestake Mining
Corporation

February 2018

www.erm.com

The business of sustainability



TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
2.0	STUDY AREA DESCRIPTION	2-1
2.1	LAND USE	2-1
2.2	CLIMATE	2-2
3.0	METHODS	3-1
3.1	DATA REVIEW AND PREPARATION	3-1
3.2	FIELD METHODS	3-2
4.0	TERRESTRIAL ECOLOGY	4-1
4.1	VEGETATION COMMUNITIES	4-1
4.1.1	<i>Plant Species of Interest</i>	4-2
4.1.2	<i>Noxious weeds and exotic native plant species</i>	4-3
4.2	WILDLIFE HABITATS AND SPECIES OBSERVED	4-4
4.2.1	<i>Birds</i>	4-4
4.2.2	<i>Game Species</i>	4-6
4.2.3	<i>Furbearers and Nongame Species</i>	4-8
4.2.4	<i>Bats</i>	4-9
4.2.5	<i>Reptiles</i>	4-10
4.2.6	<i>Invertebrates</i>	4-10
5.0	AQUATIC ECOLOGY	5-1
6.0	SOILS	6-1
7.0	RECOMMENDATIONS FOR FURTHER ASSESSMENT	7-1
8.0	REFERENCES	8-1

LIST OF TABLES

Table 4-1	<i>Vegetation Community Descriptions and Photopoint Details</i>
Table 4-2	<i>Plant Species of Interest</i>
Table 4-3	<i>Wildlife Species of Interest</i>
Table 4-4	<i>Birds Observed at the HMC Facility Ponds and in the Study Area</i>
Table 6-1	<i>Soil Profile Data Collected in the Field</i>

LIST OF FIGURES

Figure 2-1	<i>Study Area for the Environmental Survey</i>
Figure 2-2	<i>Land Ownership</i>
Figure 4-1	<i>Vegetation Communities Based on SWReGAP</i>
Figure 4-2	<i>Crucial Mule Deer Habitat</i>
Figure 4-3	<i>Crucial Cougar Habitat</i>
Figure 4-4	<i>Crucial Elk Habitat</i>
Figure 4-5	<i>Meriam's Turkey Range and Game Units</i>
Figure 5-1	<i>Hydrology based on NHD and NWI</i>
Figure 6-1	<i>NRCS Soil Map Units</i>
Figure 6-2	<i>Locations of Soil Pits</i>

LIST OF APPENDICES

Appendix A	<i>Photolog and Locations of PhotoPoints</i>
------------	--

ACRONYMS AND ABBREVIATIONS

<i>amsl</i>	<i>above mean sea level</i>
<i>BCC</i>	<i>Birds of Conservation Concern</i>
<i>BGEPA</i>	<i>Bald and Golden Eagle Protection Act</i>
<i>BISON-M</i>	<i>Biota Information System of New Mexico</i>
<i>BLM</i>	<i>Bureau of Land Management</i>
<i>CERCLA</i>	<i>Comprehensive Environmental Response Compensation and Liability Act</i>
<i>EMNRD</i>	<i>Energy, Minerals, and Natural Resources Department</i>
<i>ERM</i>	<i>Environmental Resources Management</i>
<i>ESA</i>	<i>Endangered Species Act</i>
<i>ft</i>	<i>foot or feet</i>
<i>GPS</i>	<i>Global Positioning System</i>
<i>HMC</i>	<i>Homestake Mining Company</i>
<i>LTA</i>	<i>Land Treatment Areas</i>
<i>MBTA</i>	<i>Migratory Bird Treaty Act</i>
<i>NEPA</i>	<i>National Environmental Policy Act</i>
<i>NHD</i>	<i>National Hydrography Dataset</i>
<i>NMDA</i>	<i>New Mexico Department of Agriculture</i>
<i>NMDGF</i>	<i>New Mexico Department of Game and Fish</i>
<i>NMNH</i>	<i>New Mexico Natural Heritage</i>
<i>NMSWB</i>	<i>New Mexico State Water Board</i>
<i>NRC</i>	<i>Nuclear Regulatory Commission</i>
<i>NRCS</i>	<i>Natural Resource Conservation Service</i>

<i>NWI</i>	<i>National Wetlands Inventory</i>
<i>SWReGAP</i>	<i>Southwest Regional Gap Analysis</i>
<i>USNVCS</i>	<i>United States National Vegetation Classification System</i>
<i>USFS</i>	<i>United States Forest Service</i>
<i>USFWS</i>	<i>United States Fish and Wildlife Service</i>

1.0 INTRODUCTION

This report describes the first phase of baseline studies to inventory and evaluate vegetation, aquatic habitats, soil, and wildlife resources associated with the Homestake Mining Corporation (HMC) Superfund Site (“the Site”). A phased approach was followed in consideration of project schedule needs and current information about the study area.

A U.S. Nuclear Regulatory Commission (NRC) inspection was conducted April 24 through 26, 2017, at the HMC facility in Grants, New Mexico. The NRC identified three, Severity Level IV, violations of NRC requirements during that inspection (NRC 2017). One of the violations involved failure to prepare and record an environmental evaluation of all activities not previously assessed by the NRC. HMC committed to several corrective actions following that violation, including conducting appropriate surveys to fill data gaps in its baseline data.

The purpose of the studies described in this report is to establish baseline data for areas adjacent to the HMC facility that may be affected by future closure activities, such as reclamation. The information collected from this study is intended to support future compliance with National Environmental Policy Act (NEPA) obligations under 10 CFR 51.

2.0 STUDY AREA DESCRIPTION

The Site is located in Cibola County, New Mexico, approximately 5.5 miles north of Milan, New Mexico. The Site is situated in the San Mateo drainage at an elevation of 6,600 feet (1,980 meters) above mean sea level (amsl). The Site is surrounded by mesas ranging in elevation between 7,000 to 8,600 feet (2,100 to 2,580 meters) amsl. The San Mateo drainage is an ephemeral arroyo, which drains an area of approximately 291 square miles (75,369 hectares) and connects with the Rio San Jose near the Village of Milan. Interstate-40 and State Highway 605 are the principal highway access routes near the Site. Access to the Site is from the south via State Highway 605 then traveling west on County Road 63.

HMC, through a variety of partnerships and joint venture associations, operated a uranium milling operation at the Site beginning in 1958, and continuing through 1990. Since 1990, the site has been in reclamation. In 2001, HMC merged with Barrick Gold Corporation. Currently, HMC is a wholly owned subsidiary of Barrick Gold Corporation and owns the Homestake Facility.

Groundwater restoration activities are the primary activity occurring at the Site. The Site is defined as including the former uranium milling operation areas, tailings piles, and facilities used for on-going closure operations (referred to as the Homestake Facility, NRC license SUA-1471); location of releases of hazardous substances and Comprehensive Environmental Response Compensation and Liability Act eligible constituents; and four hay fields, referred to as Land Treatment Areas (LTAs).

The environmental study area referred to in this report includes private land parcels adjacent to the HMC Facility, as shown in Figure 2-1. These survey parcels are located in portions of Sections 02, 03, 04, 14, 21, 22, 25, 28, 33, 34, 35, and 36. A one-mile buffer was applied to the survey parcels for purposes of this environmental analysis.

2.1 LAND USE

Land ownership in and surrounding the study area is shown in Figure 2-2. The survey parcels are privately owned by HMC. These parcels have been, and are continuing to be, utilized for livestock grazing on a

lessor/lessee tenant arrangement (NRC 2008). Portions of these parcels were used as LTAs between 2000 and 2012 (HDR 2016). The LTAs were irrigated with groundwater extracted as part of on-going remediation activities at the Site. Land treatment occurred at two fields using flood irrigation (120 and 24 acres) and two fields using center pivot units (100 and 150 acres). The LTAs are shown in Figure 2-1. Several residential lots held by HMC in surrounding subdivisions and in the general area of the Site are idle and are essentially not in use, except in certain instances where fresh water injection and water collection are underway as part of the ongoing groundwater restoration program (NRC 2008).

Large portions of land surrounding the Site are used for grazing or residential development located in the Pleasant Valley Estates, Murray Acres, Broadview Acres, Valle Verde, and Felice Acres residential subdivisions. Based on a study in 2005 (HMC 2006, as cited in NRC 2008), these subdivisions and immediate adjacent areas contain permanent residential homes, modular homes and mobile homes, as would typify a rural residential neighborhood. A number of lots remain vacant, or are utilized for horse barns, corrals, and/or equipment storage. In some cases, dwellings are present on several lots throughout the subdivisions, but are currently vacant or have been permanently abandoned.

Some land surrounding the Site is owned by New Mexico State Water Board or Bureau of Land Management. United States Forest Service national forests are located approximately two to three miles west and east of the study area.

2.2 *CLIMATE*

Based on data summaries reported in NRC (2008), monthly average temperatures in Grants, New Mexico, range from the low thirties (degrees Fahrenheit) during the winter, to the low seventies in the summer. Maximum summer temperatures reach into the low nineties, while minimum winter temperatures fall in the low teens.

Precipitation received in the area averages approximately 12 inches per year with the maximum monthly totals received during the summer months accounting for nearly half of the annual total. Summer precipitation is usually associated with thunderstorms, which form with the arrival of warm, moist air from the Gulf of Mexico. Winter

precipitation is derived mainly from storms from the Pacific Ocean, although the amounts received are much less than during summer months.

Relative humidity in the area averages near 60 percent with the highest monthly average in December and the lowest in May. Annual evaporation for the area is estimated at approximately 78-to-94 percent of the annual precipitation, or 9-to-11 inches per year.

HMC (2007, as reported in NRC 2008) reports the predominant wind direction is from the southwest. While the prevailing wind direction is from the southwest, there is a significant westerly and northwesterly component (Cox 2007, as cited in NRC 2008). Average wind speed is estimated to be five miles per hour with a prevailing wind speed of five miles per hour.

3.0 *METHODS*

Baseline study and scope incorporated as applicable guidance from the New Mexico Department of Game and Fish (NMDGF); NMDGF (2010) and NMDGF (2004), and consideration NRC Regulatory Guide 3.8 (NRC 1982) and NUREG-1748 (NRC 2003). In consideration of Project schedule needs and information currently available, the approach to inventory and evaluate vegetation, soil, and wildlife resources in the study area was planned in a phased manner. The first phase includes a desktop assessment of resources, field-based habitat mapping and a general wildlife survey, and species screening.

3.1 *DATA REVIEW AND PREPARATION*

Prior to field work, ERM synthesized available information on vegetation and wildlife habitats, land uses, and species of interest to screen for potential presence. Species of interest for purposes of this report includes all species that have federal or state protection; sensitive wildlife species listed by NMDGF; and rare plants listed by the New Mexico Natural Heritage program for Cibola county (<http://nmrareplants.unm.edu/rarelist.php>).

The United States Fish and Wildlife Service (USFWS) maintains a listing of plant and animal species that are listed as endangered or threatened, or are proposed or candidates for listing, under the Endangered Species Act (ESA). The State of New Mexico maintains a list of sensitive species and other species with special designations in the Biota Information System of New Mexico (BISON-M) database. The New Mexico Endangered Plants Act directs the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) to create a list of endangered plants within the state. This act prohibits activities including the taking, possession, transportation, exportation, processing, or sale of listed plants, except those authorized by permits. Following the site visit and data review, the potential for occurrence of these species within the study area was screened against using the following criteria:

- None/Low -The study area is well outside the known geographic and elevational range, or lacks suitable habitat necessary for the species, or both. Plants with highly restricted ranges are considered to have no potential to occur if the study area is outside its known

range, even if the required habitat characteristics are present in the study area.

- Medium – The study area is within the geographic and elevational range and has suitable habitat for the species.
- High/Confirmed – The species was observed during the site visit or by bird monitoring data, and/or habitat is prevalent, and of high quality in the study area.

Sources of information included publically available spatial data layers from state and federal agencies, and relevant, recent, existing reports. A series of maps was created showing land use, soil, hydrology, and species distributions within and adjacent to the study area. A list of species of interest was compiled from federal and state agencies showing federal and state protected, rare, and sensitive species in Cibola County.

Reviews of previous studies for the Site were also completed. Limited environmental studies within the past 15 years have been conducted previously, largely in adjacent areas. These included site visits by Salter (1990), and incidental wildlife observations recorded by Bridges and Meyer (2007). Desktop-level reviews were completed for several reports, including ARCADIS (2013) and HDR (2016). Migratory bird surveys are also conducted monthly by Homestake for ponds associated with the Homestake Facility, and these data were included in the assessment of findings.

3.2 FIELD METHODS

ERM conducted site visits between January 10 and 12, 2018, and January 23 through 25, 2018, to complete vegetation community mapping of the study area and to ground truth presence and quality of wildlife habitat, and map other features of importance to species of interest. Vegetation data, general soil characteristics, and a reconnaissance level wildlife survey were completed during the visits.

As described in Section 2.0, the study area includes private land parcels as shown in Figure 2-1. The survey parcels were numbered 1 through 8 to facilitate data collection. Field reconnaissance included portions of the buffer area around the survey parcels.

Meandering pedestrian surveys were completed within each parcel, recording vegetation, soil and wildlife data, and collecting photographs. ERM used a global positioning system (GPS)-enabled, electronic data collection system to record all data collected in the field.

Vegetation data collected included identifying the vegetation communities in each parcel, and recording corresponding dominant grasses, shrubs, and tree(s) present in the parcel, as applicable. Forb species were generally not discernable during the site visit due to seasonality of these species, but some life forms were positively identified and recorded at this time. Representative vegetation system photographs were collected. Any noxious or invasive weed species encountered during the survey were recorded and GPS locations collected. Presence of any micro-habitats or general habitat conditions where plant species of interest could be found were noted in the field.

Wildlife habitats and species data collected included photographs of habitat features of note (e.g., outcrops, woody structures, burrows, nests) and notations of any wildlife observed or their secondary sign. Presence of any habitats where wildlife species of interest could be found were also noted.

A reconnaissance level aquatic and riparian habitat survey was conducted in the parcels as well as in portions of the buffer area where national hydrography dataset (NHD) data indicated potential wash or ponding features. Photographs of hydrology features, as applicable, was recorded during the visit.

Soil data collected in each parcel included descriptions of surface soil color, texture, presence of rock fragments, evidence of flooding and/or ponding, and soil consistency. Shallow soil pits (~6 inches) were dug to determine presence or absence of O or E horizons and any restrictive layers, which were found to be absent in all pits sampled. Field data was coupled with desktop-based soil series data, which included land cover, position, drainage class, moisture class, erosion, surface fragment class, and restriction for each parcel.

4.0 TERRESTRIAL ECOLOGY

4.1 VEGETATION COMMUNITIES

The US National Vegetation Classification System (USNVC) is used by NMDGF to develop a standardized system for grouping vegetation by shared floristic or physiognomic characteristics (NMDGF 2016). Within these habitats, land cover classes from the Southwest Regional Gap Analysis (SWReGAP) were used to further develop vegetation class information.

The study area in general consists of desert and semi-desert habitat. Site visits confirmed that the vegetation communities are predominately Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Semi-Desert Grasslands, with smaller, patchy areas of Inter-Mountain Basins Semi-Desert Shrub Steppe. Distinct areas of cultivated croplands, or other developed/disturbed areas, are also present in the study area (Figure 4-1), reflecting LTA and other land uses as described in Section 2.1.

Though patchy areas along the northern end of the study area were mapped as Inter-Mountain Basins Greasewood Flat in the SWReGAP dataset, greasewood communities were not found in the survey parcels; these areas instead tended to be dominated by four-wing saltbush (*Atriplex canescens*) and other shrub species. Survey parcel 4, mapped as Inter-Mountain Basins Mixed Salt Desert Scrub, was found to be a shortgrass steppe grassland.

Grassland communities encountered included a blue gramma (*Bouteloua gracilis*) dominated shortgrass steppe (primarily in survey parcel 4), or other semi-arid grasslands. Clay-dominated soils tended to be associated with black or hairy gramma and/or muhly species (as identified at the time of survey), while sand-dominated soils tended to be dominated by Indian rice grass (*Achnatherum hymenoides*), alkali sacaton (*Sporobolus airoides*), or other bunch grasses. Mixed desert scrub communities were typically dominated by four-wing saltbush, sometimes interspersed with shadscale and/or winterfat. Mixed sagebrush-grassland communities were dominated by sand sage sagebrush (*Artemisia filifolia*), with an understory of gramma grass species, Indian rice grass, and other grass

species. All of these communities contained varying densities of broom snakeweed (*Gutierrezia sarothrae*) and rabbitbrush species (*Chrysothamnus* spp.). Vegetation community details by survey parcel are summarized in Table 4-1, and a corresponding photolog with specific locations where data was collected is provided in Appendix A.

Areas observed as disturbed or developed largely included cultivated croplands. Other areas showed minor disturbances associated with the groundwater remediation system, such as wells or piping. Cultivated areas were generally sparsely vegetated, while localized areas surrounding injection wells and in some cases, piping, were saturated and able to support thick cattail growth (see for example Appendix A, Photos 1-4, 2-5, 2-8, 6-2).

4.1.1 Plant Species of Interest

Plant species of interest includes 2 USFWS listed plants, 1 state listed threatened plant, and six additional New Mexico rare plants (Table 4-2). Habitat for most plant species of interest was absent from the study area, and therefore were ranked as having a low or no likelihood of occurrence in the study area (see Table 4-2). There is habitat present, and therefore some potential, for three plant species of interest to be present in the survey parcels: Zuni milkvetch (*Astragalus missouriensis* var. *accumbens*), Pecos sunflower (*Helianthus paradoxus*), and Parish's alkali grass (*Puccinellia parishii*).

Zuni milkvetch could occur on clay banks and knolls associated with dry, alkaline soils derived from sandstone. These types of soils are present in the study area and clay banks and knolls, though not observed during the site visit, could be present in survey areas.

Pecos sunflower is listed by USFWS as threatened, and Parish's alkali grass is considered listed as endangered in New Mexico. Both Pecos Sunflower and Parish's alkali grass is associated with alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages, or in modified springs. Critical habitat for Pecos sunflower occurs in Cibola County, however it is outside the study area. In the survey parcels, the small areas surrounding groundwater infrastructure that exhibited saturated soils were generally heavily covered by cattails. However, there

is a small probability that these species of interest could be associated with these created wetted areas.

The only other federally protected species included as a plant species of interest was Zuni fleabane (*Erigeron acomanus*), listed as federally threatened and state listed as endangered. However, this species was considered unlikely to occur in the study area. This species is known to occur on sandy slopes and benches beneath sandstone cliffs of the Entrada Sandstone Formation, which is not present in the study area. The Cibola county sub-population at Blue Water Canyon is largely restricted to north facing slopes where it occurs primarily under the shade of pinions on soils derived from Entrada sandstone (New Mexico Rare Plant Technical Council 1999).

4.1.2 Noxious weeds and exotic native plant species

The State of New Mexico defines noxious weeds as “any foreign plant (not native to the U.S.) that has the potential to be harmful to crops, livestock, other useful plants and animals, agricultural interests, or public health” to be targeted as noxious weeds for control or eradication pursuant to the Noxious Weed Control Act of 1998. The New Mexico Department of Agriculture (NMDA) developed lists of species that are considered noxious weeds (NDMA 2016).

The NMDA separates noxious weeds into three categories. Class A species are either not currently present in New Mexico or they have limited distribution. Preventing new infestations and eradicating existing infestations is the highest priority for this class of species. Class B species are limited to portions of the State. In areas with severe infestations, management is encouraged to contain the infestation and prevent further spread. Class C species are widespread in New Mexico, and control measures are encouraged to be undertaken at the local level, based on feasibility and level of infestation. Watch list species are of concern because of their potential to become problematic.

Primary noxious weeds prevalent in the area include African rue (*Peganum harmala*), and yellow starthistle (*Centaurea solstitialis*), though neither of these species was observed during the January site visit. Spotted knapweed (*Centaurea biebersteinii*), a Class A noxious weed, was observed

in the flood irrigated area of survey parcel 1 (see Table 4-1). Exotic invasive species observed in the study area included Russian thistle, kochia, filaree (*Erodium cicutarium*), and mustards (*Brassicaceae* spp.), but these species are not defined as noxious weeds in New Mexico.

4.2 WILDLIFE HABITATS AND SPECIES OBSERVED

The survey parcels include various upland habitats common to northern New Mexico's Semiarid Tablelands ecoregion. The southeastern-most portion of the study area, within the 1 mile buffer area of the survey parcels, is within the Conifer Woodlands and Savannas ecoregion. Desert ecoregions such as these do not contain abundant large mammals but may include species such as mule deer, pronghorn antelope, coyotes, bobcats, and badgers. Smaller mammals are most common in these regions, and include jackrabbits, cottontail rabbits, ground squirrels, kangaroo rats, mice, and bats. Golden eagles, several hawk species, ravens, and sparrows, can also be found in these habitats. Reptiles, including gopher snake, rattlesnake, and horned lizard, may also be found in desert habitats.

A basic screen of wildlife species of interest potential occurrence in the study area is provided in Table 4-3. The discussions below address these species.

4.2.1 Birds

Raptors and other migratory birds are protected under the Migratory Bird Treaty Act (MBTA). Golden and bald eagles are also protected under the Bald and Golden Eagle Protection Act (BGEPA), which protects the birds, their eggs, and their active and inactive nests. Several bird species that have the potential to occur in Cibola County are also federally or state protected, or listed by NMDGF as threatened or endangered, and by USFWS as Birds of Conservation Concern (BCC).

A variety of raptors, waterfowl, and other migratory birds have been observed incidentally in the study area, as reported by Bridges and Meyer (2007), and north of the study area reported by Salter (1990). Nesting habitat for tree and cliff-dwelling raptors is abundant in the surrounding forested mountains, with the study area providing hunting habitat for

these species. Burrowing owls may create nests in the prairie dog colonies within or near the study area.

Bird use of the ponds associated with the HMC Facility were monitored in 2017 (monitoring is ongoing). Although the ponds are adjacent to the survey parcels, these birds may also forage or nest nearby. Birds observed during the monitoring events as well as the January 2018 site visit are summarized in Table 4-4. The majority of birds observed using the ponds included waterfowl species, such as ducks, grebes, coots, and geese. Shorebirds, passerines, and two species of herons have also been observed.

Birds observed during the January site visit include loggerhead shrike (*Lanius ludovicianus*), horned lark (*Eremophila alpestris*), and common ravens (*Corvus corax*). Each of these species is protected under MBTA, and the loggerhead shrike is a BCC. Loggerhead shrikes inhabit semi-open habitats including grasslands or deserts with lookout perches. Horned larks prefer bare, dry ground with areas of short, sparse vegetation, such as in prairies and deserts. Common ravens occur in most of the northern hemisphere in nearly every possible habitat, including sagebrush, desert, chaparral, grasslands, and even near artificial ponds.

Federally listed species for Cibola County includes southwestern willow flycatcher (*Empidonax traillii extimus*), listed as endangered, the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), listed as threatened, and the Mexican spotted owl (*Strix occidentalis lucida*), listed as threatened. None of these species is likely to occur in the study area due to lack of suitable habitat. The Mexican spotted owl inhabits forests and rocky canyons; highest densities of this species is found in mixed-conifer forests with minimal human disturbance. This species may pass through the area or potentially occur near the study area, but likely presence in the study area is low. The flycatcher and cuckoo species are riparian habitat specialists commonly associated with cottonwood and/or dense willow stands. This type of habitat is not present in the study area; hence, these species are unlikely to be present. Critical habitat is identified for the southwestern willow flycatcher, which does not occur in or near the study area.

A state listed species, gray vireo (*Vireo vicinior*), has a medium potential to occur in the study area based on the presence of suitable habitat. Gray vireos are commonly associated with open shrublands and woodlands, on mountain slopes, mesas, and open chaparral. It is found in New Mexico during warmer months (April through September).

4.2.2 *Game Species*

Protected and managed New Mexico game species include big game (bear, bighorn sheep, cougar), upland game (quail, dusky grouse, pheasant, Eurasian collared-doves, squirrels), furbearers (raccoon, badger, weasel, fox, ringtail, bobcat, muskrat, beaver, lynx, nutria, pine marten, river otter, black-footed ferret, coatimundi), game birds (turkey, doves, band-tailed pigeons, Sandhill cranes, ducks, geese, coots, common moorhens, snipes, soras, Virginia rails), and nongame species (porcupine, prairie dogs, rabbits, ground squirrels, Himalayan tahr). Unprotected furbearers include coyote and skunk.

Big Game: The study area is within NMDGF Game Management Unit 9. Based on publically available data from NMDGF, the study area is within general mule deer and cougar habitat, and priority and general elk habitat (Figures 4-2 to 4-4). Personnel at the site have observed both elk and mule deer incidentally, and mule deer tracks were noted during field visits in January 2018.

Mule deer inhabit a variety of habitats in western North America, including the southwest desert ecoregion. Precipitation amounts are the most important factor affecting mule deer populations in this ecoregion. Availability of forbs and other nutritious vegetation during the winter months are also vital to mule deer populations. Population size can be affected by other ungulates in the area, such as elk, sheep, and cattle, which graze heavily on the vegetation reducing the food supply and available cover for the deer. Vegetation and pooling of water found in dry washes play an important role in providing year-round habitat for mule deer (Heffelfinger et al. 2006). Mule deer have been observed in the study area previously, so there is a likelihood of future encounters. The most likely parcels in the study area are those that include plenty of forbs and pooling water.

In New Mexico, elk primarily inhabit the north-central region along the Sangre de Cristo and Jemez Mountain ranges, the southwest region, and the southcentral region near the Sacramento Mountains. Elk typically occur only in high elevation mountains of the desert region, but have expanded into the low deserts in some areas due to increased surface water development for cattle. Elk are primary grazers and are flexible in their consumption of food. Elk prefer grass but can also thrive on forbs and woody plants. The most important habitat feature for elk is available cover for protection from the elements and other species (Heffelfinger et al. 2006). Elk have already been observed in the study area in previous years so it is possible to encounter more elk in the future, especially in parcels containing abundant grasses and forbs or pooling water.

Cougar habitat occurs largely south of the study area, with small areas identified in the NMDGF dataset throughout the study area (Figure 4-3). Though cougars can occur anywhere in New Mexico that has rough terrain and an abundance of prey, cougars prefer vegetation that provides adequate hunting cover, and they prefer to avoid people. None of the habitat in the study area would provide abundant hunting cover, and disturbances due to nearby human activity (residential housing, roads, and Site activities) are likely to discourage cougars. Therefore, the likelihood of cougars occurring in the study area parcels is low.

Upland Game and Game Birds: Most upland game and game birds could use the study area for foraging or denning. A variety of ducks, geese, and coots, have been documented on or near the ponds associated with the HMC Facility (Table 4-4), and the study area is within mapped distribution areas for scaled quails, red squirrels, and Abert's squirrels. Meriam's turkey habitat is located south of the study area (Figure 4-5). Habitat characteristics for the scaled quail are found in the study area, and include semi-arid rangelands with mixed scrub in open habitats. Eurasian collared-doves inhabit urban, suburban, and agricultural areas containing perches, such as telephone poles, wires, and large trees (NMDGF 2016). Upland game species can be found from the mountains to the deserts throughout New Mexico. Abert's squirrels and red squirrels both prefer forested habitats in the mountains and plateaus for both food and shelter (NMDGF 2016). These two species may occur in the forested areas outside of the study area. Dusky grouse are another upland game species in New

Mexico; however, they typically reside in high elevations (above 7,000 feet amsl) in montane forests dominated by pines and aspens. Due to its habitat characteristics, the dusky grouse has a low likelihood of occurring in the study area (NMDGF 2016).

4.2.3 *Furbearers and Nongame Species*

NMDGF protected furbearers that could potentially use the study area for foraging or denning, though none were observed during the January site visit, include pine marten, black-footed ferret, coatimundi, raccoon, badger, weasel, fox, lynx, bobcat, and ringtail. Habitat preferences of lynx, pine marten, and bobcats are associated with woodlands, though these species could potentially hunt within the study area. Nongame species managed by NMDGF observed in the study area or likely to be present include prairie dogs, rabbits, porcupines, skunk, and ground squirrels.

Black-footed ferrets (*Mustela nigripes*) only inhabit prairie dog colonies where they feed on prairie dogs and use their burrows as shelter. Prairie dog colonies were observed in the study area; however, the black-footed ferret is only known to occur in north-central New Mexico in the counties of Colfax and Taos. Therefore, the likelihood of occurrence in the study area is low.

The red fox (*Vulpes vulpes*) and the ringtail (*Bassariscus astutus*) could be present in the study area. These species occupy grasslands and desert habitats, and have the ability to adapt to disturbed areas. Other protected furbearers that are associated with water, and thus are unlikely to be present in the study area, include muskrat, beaver, nutria, and river otter. Unprotected furbearers include coyote and skunk, both of which have the potential to use the study area for hunting.

Prairie dog colonies were observed frequently associated with sandy soils within the study area. Gunnison's prairie dogs (*Cynomys gunnisoni zuniensis*) and black-tailed prairie dogs (*Cynomys ludovicianus*) were previously candidate species under ESA, but in 2009 and 2013, USFWS removed the black-tailed prairie dog and Gunnison's prairie dog, respectively, from candidate listing. Gunnison's prairie dog is considered a sensitive species in New Mexico. Gunnison's prairie dog occur at higher elevations in montane habitats that include grass-shrub in valleys and

mountain meadows in north-central New Mexico, and at lower elevations in shortgrass and mid-grass prairies in northwestern New Mexico (USFWS 2008). The black-tailed prairie dog inhabits grassy plains or prairies, typically at lower elevations than Gunnison's prairie dogs. Neither species has been observed in the study area, though both species could potentially occur based on preferred habitat characteristics.

Prairie dogs provide nesting and foraging habitat for other species, including burrowing owls, mountain plovers, horned larks, and black-footed ferrets, and serve as a food source for predators, including rattlesnakes, badgers, raptors, bobcats, and coyotes (USFWS 2008).

Other nongame species of interest include Cebolleta pocket gopher (*Thomomys bottae paguatae*) and Northern pocket gopher (*Thomomys talpoides taylori*). Cebolleta pocket gophers are documented in a small area of Cibola County, and prefer perennial riparian vegetation. Northern pocket gophers are found in a variety of habitats including sagebrush steppe. Evidence of gophers were observed during the January site visit, and HDR (2016) reported that Botta's pocket gopher had been previously documented at the Site. Northern pocket gophers also have some likelihood to occur in the study area, based on habitat preferences.

Incidental observations of coyote scat, cottontail rabbits, a pack rat and bushy tailed wood rat, and black tailed jackrabbits, which are unprotected and unmanaged species, were documented in January and during other, previous visits by Bridges and Meyer (2007).

4.2.4 Bats

The majority of bat species of interest have no or a low potential to occur within the study area, with two exceptions. The Western small-footed myotis (a NM sensitive species) are commonly found in semiarid, open grassland habitats at moderate elevations up to 9,500 feet amsl. The species may forage in the study area, but roost outside the study area in nearby cracks and crevices in cliffs, behind tree bark, and in mines, caves, and tunnels, none of which was present in the survey parcels.

The Pale Townsend's big-eared bat (a NM sensitive species) also has a medium likelihood of occurrence in the study area. This species occurs

widely in New Mexico in desert scrub habitats during the summer months. This species may forage in the study area. The species roosts mostly in caves or mines, but at night it may roost in abandoned buildings. The species will also use rock crevices and hollow trees as roost sites.

The spotted bat (*Euderma maculatum*), is a state listed threatened species. This species roosts and forages primarily in forested areas, but could also forage around perennial water bodies. Presence of this species is highly associated with prominent rock features, which do not occur in the study area but are adjacent to the study area. The likelihood of occurrence of this species was overall ranked as low, based on habitat preferences.

4.2.5 Reptiles

Reptiles have the potential to occur within the study area. Previous observations include western rattlesnake, lesser earless lizard, and the horned lizard (Bridges and Meyer 2007). Southwestern fence lizard is a New Mexico sensitive species and also has the potential to occur within the study area. This species occurs in a variety of habitats including semi-desert grasslands in sunlit areas containing basking sites.

4.2.6 Invertebrates

The Socorro mountain snail (*Oreohelix neomexicana*), a NM sensitive species, has no likelihood of occurrence within the study area due to lack of suitable habitat, which typically includes lush, forested canyons and rich leaf litter.

5.0 *AQUATIC ECOLOGY*

Surface water bodies within or in the vicinity of the study area include stock ponds, ponds associated with the HMC facility, and ephemeral washes, canals, and small ephemeral wetted areas. Figure 5-1 shows datasets from NHD and the National Wetlands Inventory (NWI). along the northeast portion of the study area (east of survey parcels 3 and 4), small “ponds” as indicated in the NWI dataset correspond to ephemeral to seasonally wetted, localized areas created by the groundwater recovery system at HMC.

There are two canals that pass through survey parcel 1, both of which were dry at the time of survey (Appendix A, Photo 1-5). The canals are unvegetated, and a colony of prairie dogs were observed along the bottom of some portions of the canals.

Biologists visited area the northwest portion of the study area where NHD data indicates potential ephemeral water bodies may occur. During the site visit, water was not present in the majority of the NWI areas visited (a small wetted area persisted nearest the HMC Facility). No riparian habitat was observed in these dry areas. There is evidence of ephemeral dry washes along the northeast portion of the study area (Appendix A, Photo B-1, B-2), as well as throughout survey parcel 7 (Appendix A, Photo 7-1, 7-3, 7-9), but no water or riparian vegetation was observed and all washes were dry at the time of survey.

Small areas of saturated soils were observed in several of the parcels during the site visit, as discussed in Section 4.1. These areas contained a dense growth of cattails, but were generally too small to provide adequate habitat for riparian specialists or fish.

Within the HMC Facility, three ponds are maintained by HMC as part of their groundwater recovery system. These ponds can provide a resting substrate and drinking water source for birds, although the ponds are fenced and maintained, which includes prohibiting vegetation growth at the edges of the ponds, and a monitoring program is in place which drives birds away from the ponds when observed. Thus, the habitat and use of these areas by wildlife is limited.

Due to the lack of aquatic or diverse riparian habitat, associated aquatic species, and riparian specialist species, would not therefore be present in the study area.

6.0 SOILS

Twenty-one Natural Resource Conservation Service (NRCS) soil map units are distributed within the study areas and buffer (Figure 6-1). Based on NRCS data, the majority of the study area contains soils of the Sparank-San Mateo complex. Sparank and San Mateo soils are well drained and moderately alkaline. Sparank soils are comprised of clay loam overlying silty clay loam. San Mateo soils are loams.

Shallow pits, up to 10 inches deep, were dug in areas of the survey parcels corresponding to the NRCS soil map units (Figure 6-2). Survey parcel 1 includes several soil units, ranging from clay loams to loamy sands. Some of the clay loams have a sandy substratum. The pits along the western and northern parts of the parcel were primarily dug in the clay loam units, but soil texture was more consistent with sandy loam or sandy clay. Toward the eastern portion of the parcel, soil textures were more clayey.

Soil texture in remaining soil parcels was more or less consistent with NRCS soil units. Soils were generally friable to very friable, and contained few rock fragments in the upper soil horizon. The organic (O) horizon layer was generally very thin to absent, and E horizons were absent. Duripan was encountered at shallow depths in some areas. Table 6-1 includes a summary of soil information collected in each survey parcel.

7.0 *RECOMMENDATIONS FOR FURTHER ASSESSMENT*

This first phase of baseline studies sought to map vegetation and aquatic habitats, ground-truth soil units, and complete a basic wildlife survey. Species of interest were screened for their potential to occur in the study area. This information can be used to focus further field data collection.

Additional baseline data collection should support closure objectives and NEPA requirements. Closure objectives may include, but may not be limited to, reclamation activities in the survey parcels themselves, or using resources in these parcels to support closure activities elsewhere. Other NEPA requirements as they pertain to baseline biology and soil include describing the presence/abundance of species of interest, determining presence of waters of the U.S., and gathering sufficient data with which to evaluate ecological impacts to wildlife, plants, and aquatic resources.

In terms of reclamation, reference vegetation plots should be established, and multiple years of monitoring is ideal, to evaluate closure progress against reclamation goals. Special habitat values or features should of reclaimed areas should be identified for replacement during reclamation. NMDGF encourages incorporation of topographic variability reflecting the natural site surroundings and fluvial geomorphology where feasible. Growth medium data, such as soil salinity and organic matter content, may be helpful to collect in reference areas and areas to be used for borrow to determine success parameters. Additionally, as the first site visit was conducted in January, supplemental vegetation community characterization is recommended during the growing season to supplement the basic vegetation community descriptions. This can be conducted in conjunction with establishing reference plots.

Potential effects on species of interest should be identified and, if needed, mitigated. The screening level analysis identified species of interest birds, plants, mammals, and a reptile, as potentially occurring in the study area. Seasonal bird surveys for raptors and MBTA species, and plant species surveys in areas that may be disturbed, should be completed during the appropriate survey window times. Consultation with relevant agencies (e.g., NRC, NMDGF) is recommended to identify any further assessment needs of mammal species or reptile presence.

Other impact assessment considerations include ensuring that soil chemical data relevant to each ecological unit is adequately characterized.

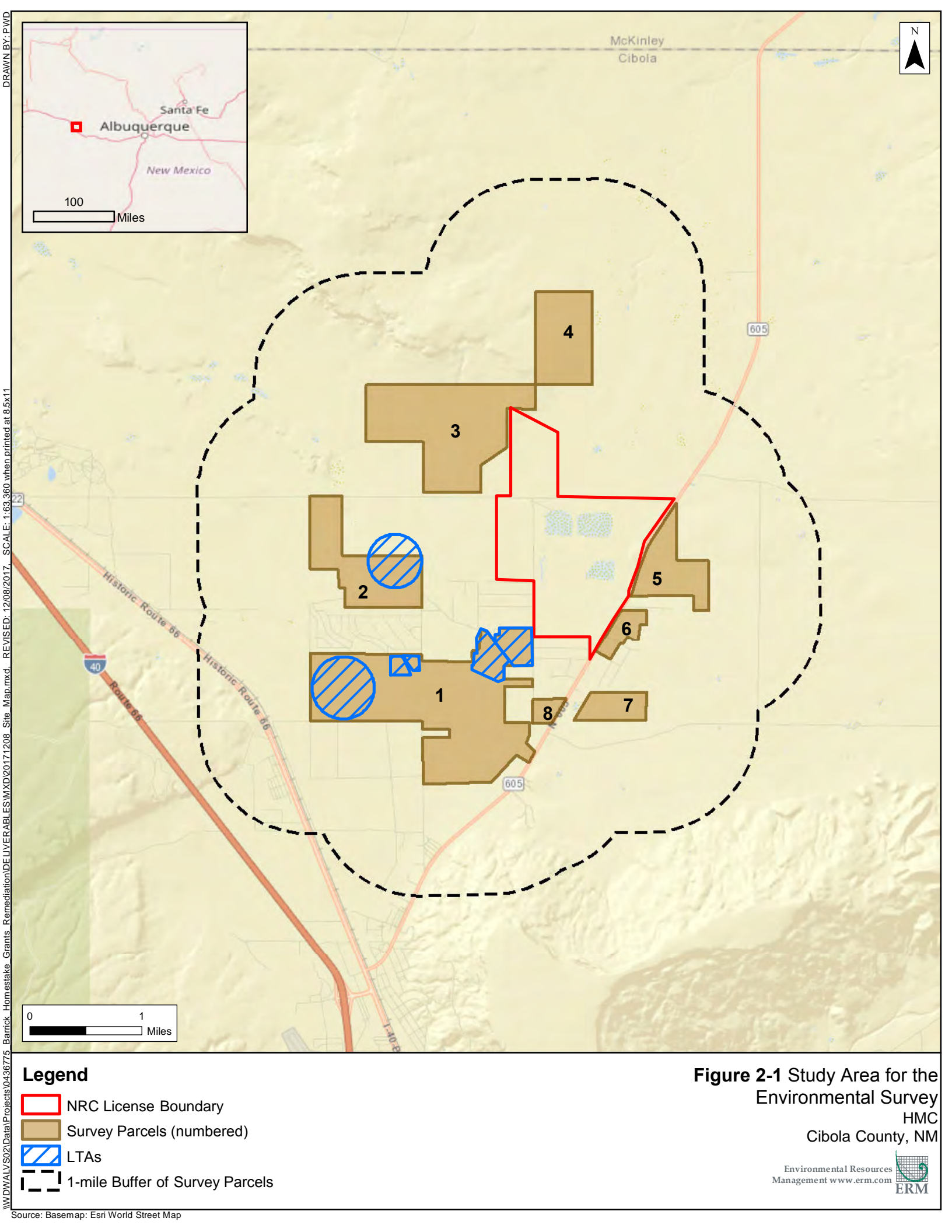
Surface water bodies within the study area include small wetted areas associated with the groundwater recovery system, ephemeral washes, stock tanks, and canals. Due to the lack of aquatic or diverse riparian habitat associated with these features, associated aquatic species, and riparian specialist species, would not therefore be present in the study area. If the canals or ephemeral washes will be disturbed or indirect impacts are expected to these features, then a determination of waters of the U.S. would be warranted to determine appropriate permitting or mitigation needs. Additionally, connectivity between the wetted areas created from the groundwater recovery system to washes or other water bodies should be assessed to confirm jurisdictional scope.

8.0 REFERENCES

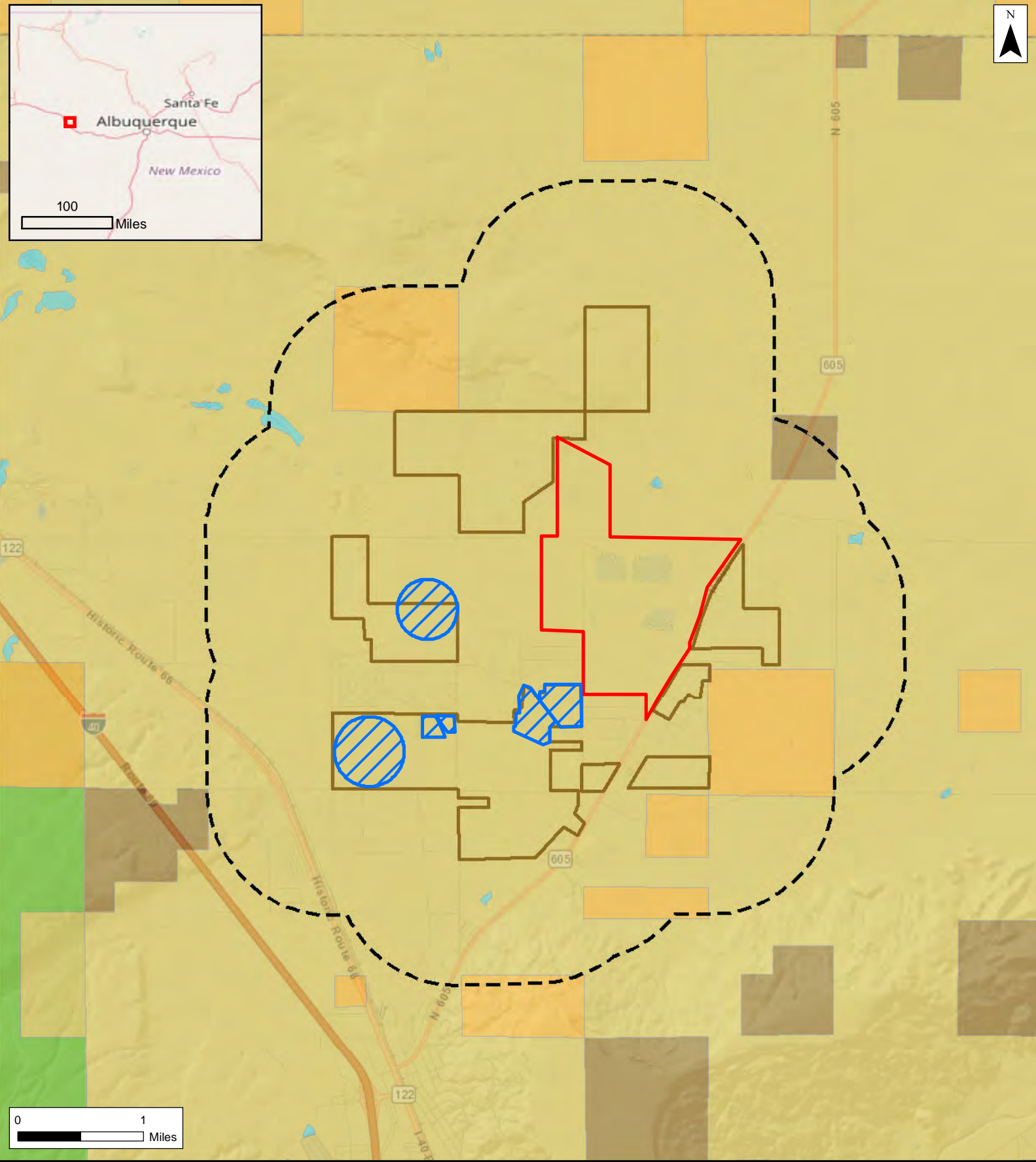
- ARCADIS. 2013. Decommissioning and Reclamation Plan Update 2013. SUA-1471. April.
- Bridges, L.L. and J. Meyer. 2007. Environmental Report for the Construction of Evaporation Pond #3 (EP3) and Associated Operations Boundary Expansion. License SUA-1470, Docket no. 040-08903. January 30.
- Cox. 2007. Email Cox to Linton, October 22, 2007. (USNRC ADAMS Accession Number ML073410400).
- HDR. 2016. Draft Remedial Investigation Report Homestake Mining Company Superfund Site, Operable Unit 1: Tailings Seepage Contamination of Groundwater Aquifers, and Operable Unit 2: Long-Term Tailings Stabilization, Surface Reclamation and Site Closure. June 21.
- Heffelfinger, J. R., C. Brewer, C. H. Alcalá-Galván, B. Hale, D. L. Weybright, B. F. Wakeling, L. H. Carpenter, and N. L. Dodd. 2006. Habitat Guidelines for Mule Deer: Southwest Deserts Ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.
- HMC. 2006. Grants Reclamation Project Engineering Design Package and Environmental Report for Proposed Evaporation Pond and Request for Radioactive Materials License Amendment, October (USNRC ADAMS Accession Number ML 0630506411).
- HMC. 2007. Semi-Annual Monitoring Report: Period B January - June 2007. U.S. Nuclear Regulatory Commission License SUA-1471, State of New Mexico DP-200, August 20 (USNRC ADAMS Accession Number ML072470533).
- New Mexico Noxious Weed List Update. Memorandum from New Mexico Department of Agriculture. October 19.
<http://www.nmda.nmsu.edu/wp-content/uploads/2016/11/Weed-List-memo-and-weed-list-2016.pdf>
- New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page.
<http://nmrareplants.unm.edu> (Latest update: 31 January 2018).

- NMDGF. 2004. Habitat Guidelines for Mine Operations and Reclamation. December.
- NMDGF. 2010. Baseline Wildlife Study Guideline. June. Found at:
<http://www.wildlife.state.nm.us/download/conservation/habitat-handbook/project-guidelines/Wildlife-Baseline-Study-Guidelines-and-Appendix.pdf>
- NMDGF. 2016. State Wildlife Action Plan for New Mexico. New Mexico Department of Game and Fish, Santa Fe, New Mexico, USA.
- NRC. 1982. Preparation of Environmental Reports for Uranium Mills. Regulatory Guide 3.8. Revision 2. October.
- NRC. 2003. Environmental Review Guidance for Licensing Actions Associated with NMSS Programs. NUREG-1748. Office of Nuclear Material Safety and Safeguards. August.
- NRC. 2008. Environmental Assessment Related to the Issuance of a Licence Amendment for Construction of a Third Evaporation Pond. Homestake Mining Company of California, Grants, New Mexico. Source Material License SUA-1471. Docket No. 040-08903. Prepared by U.S. Nuclear Regulatory Commission Office of Federal and State Materials and Environmental Management Programs Division of Waste Management and Environmental Protection, July.
- NRC. 2017. NRC Inspection Report 040-08903/2017-001: Violation of License Condition 16, environmental evaluation of actions not previously assessed by NRC; VIO 040-0890311701-02.
- Salter, R.B. 1990. Wildlife Resources in the Proposed Homestake Mining Company New Tailings Disposal Area. April 9.
- USFWS. 2008. Gunnison's prairie dog populations in portions of Colorado and New Mexico warranted for listing under the Endangered Species Act. February 1, 2008 News Release, Office of External Affairs, Mountain-Prairie Region. Available online at <http://www.fws.gov/mountain-prairie/PRESSREL/08-09.htm>.

Figures



DRAWN BY: P.W. SCALE: 1:63,360 when printed at 8.5x11



Legend

Land Ownership	
	Bureau of Land Management (BLM)
	US Forest Service (USFS)
	Private Land
	State Land Board
	Water

	NRC License Boundary
	Survey Areas
	LTAs
	1-mile Buffer of Survey Areas

Figure 2-2 Land Ownership

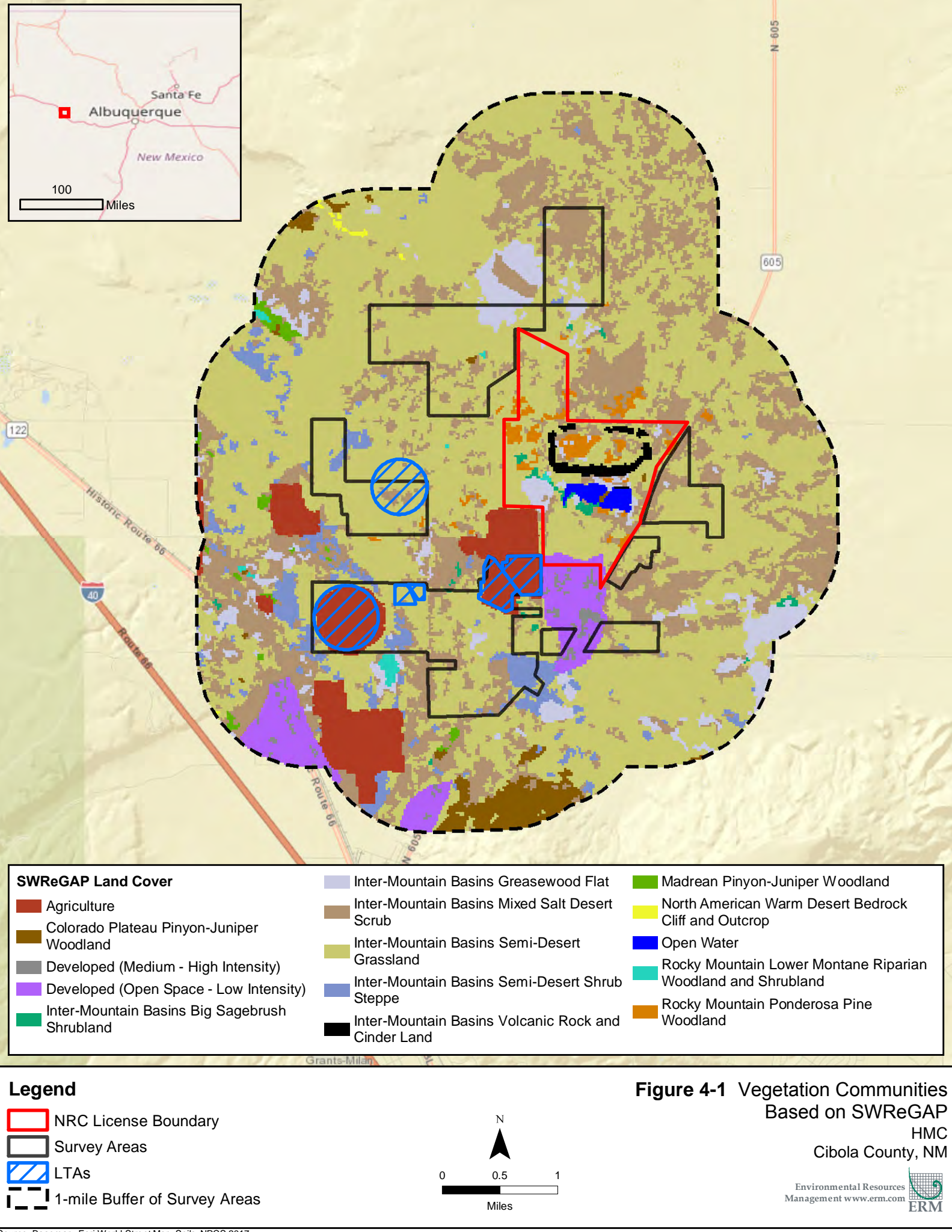
HMC

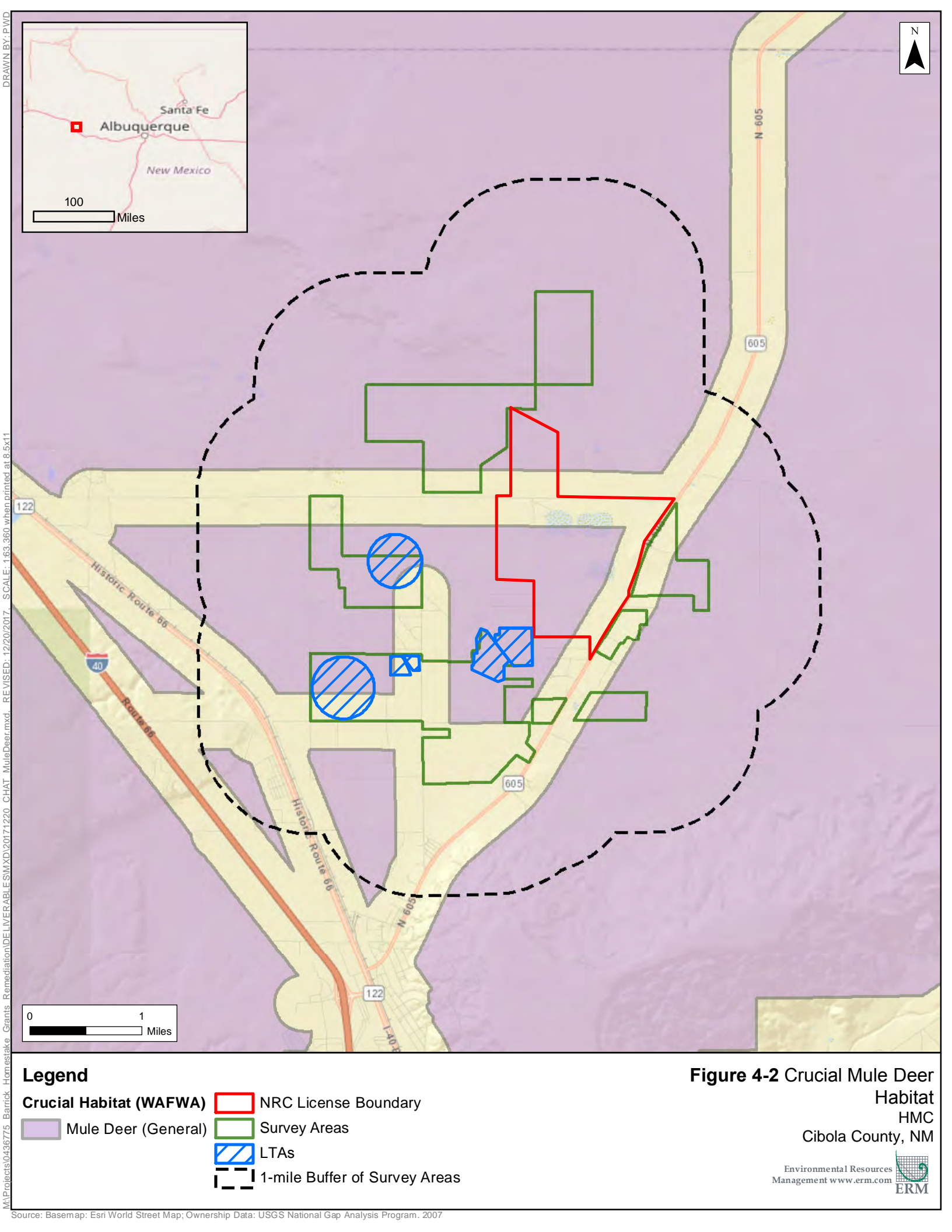
Cibola County, NM

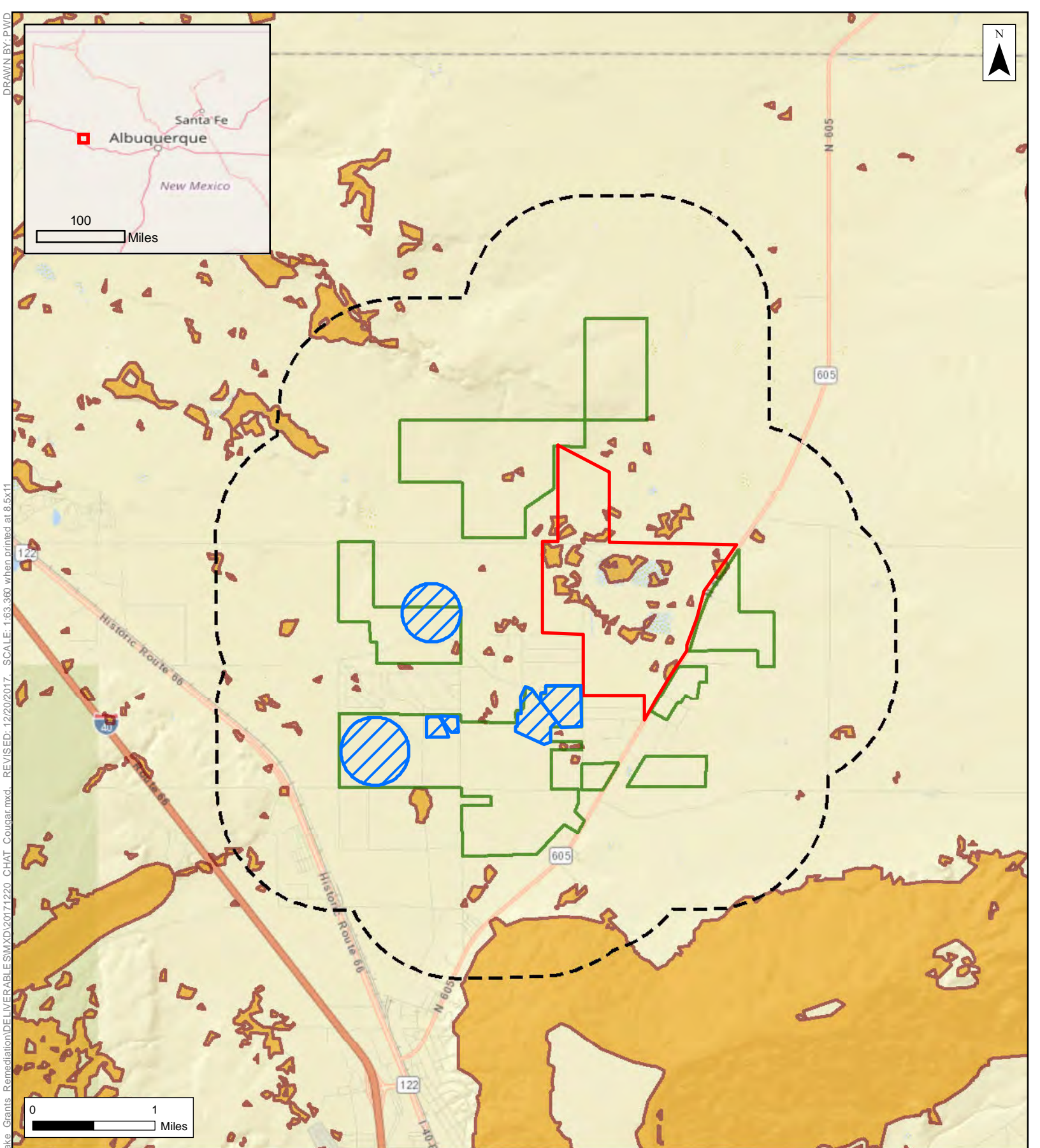
Environmental Resources Management www.erm.com

ERM

DRAWN BY: P.W. \\WDW\ALVS02\Data\Projects\0436775 Barrick Homestake Grants Remediation\DELIVERABLES\MXD\20180214 SWReGAP LC.mxd, REVISED: 02/14/2018, SCALE: 1:63,360 when printed at 8.5x11



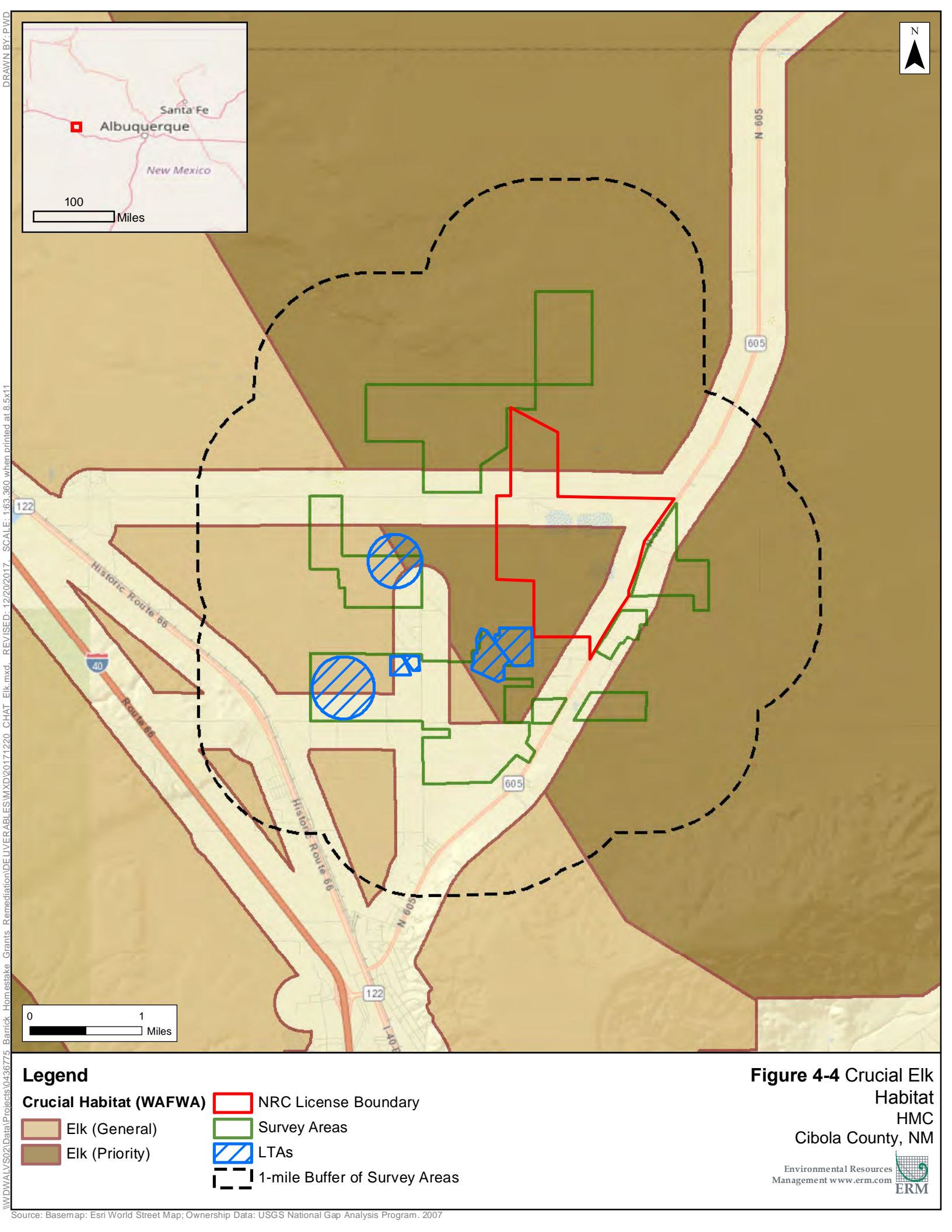


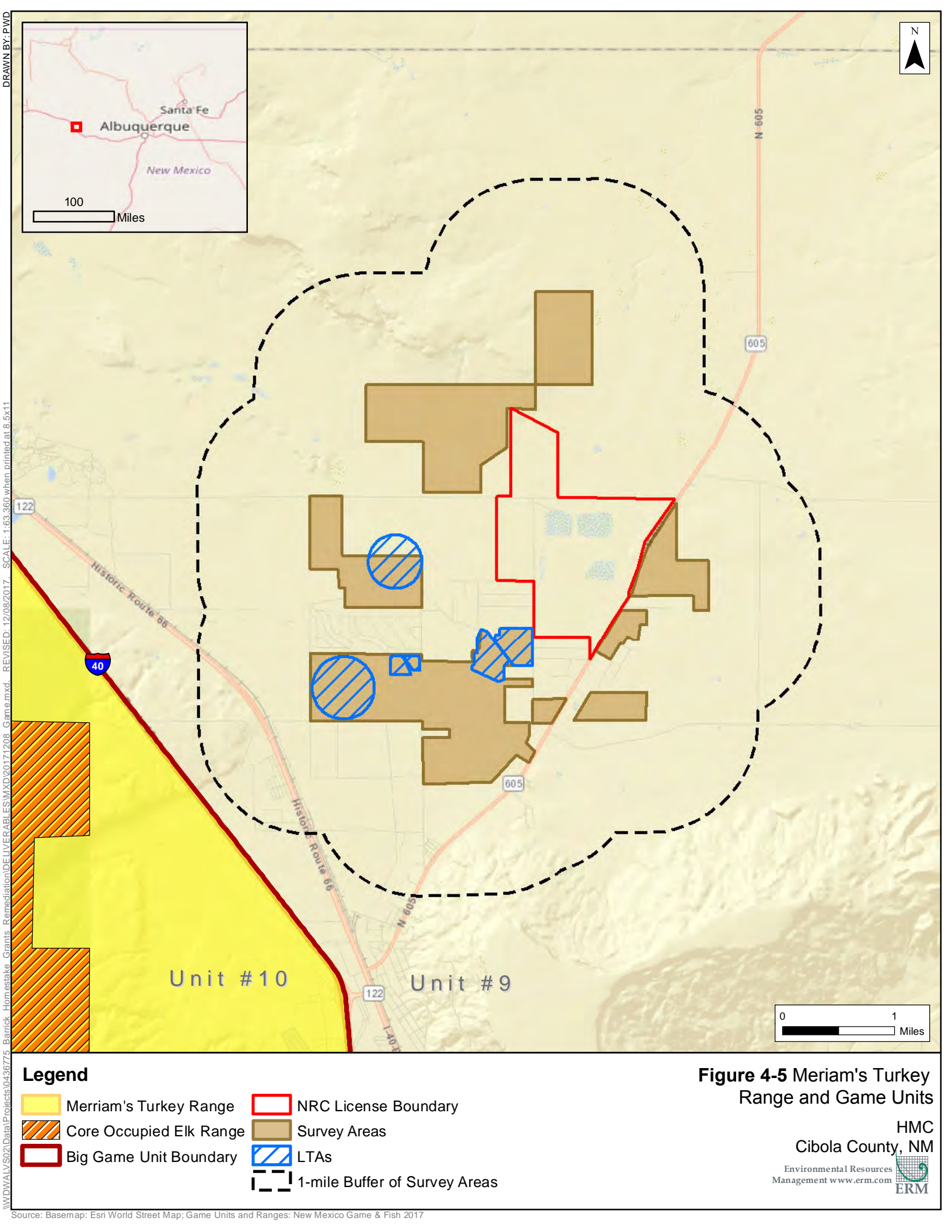


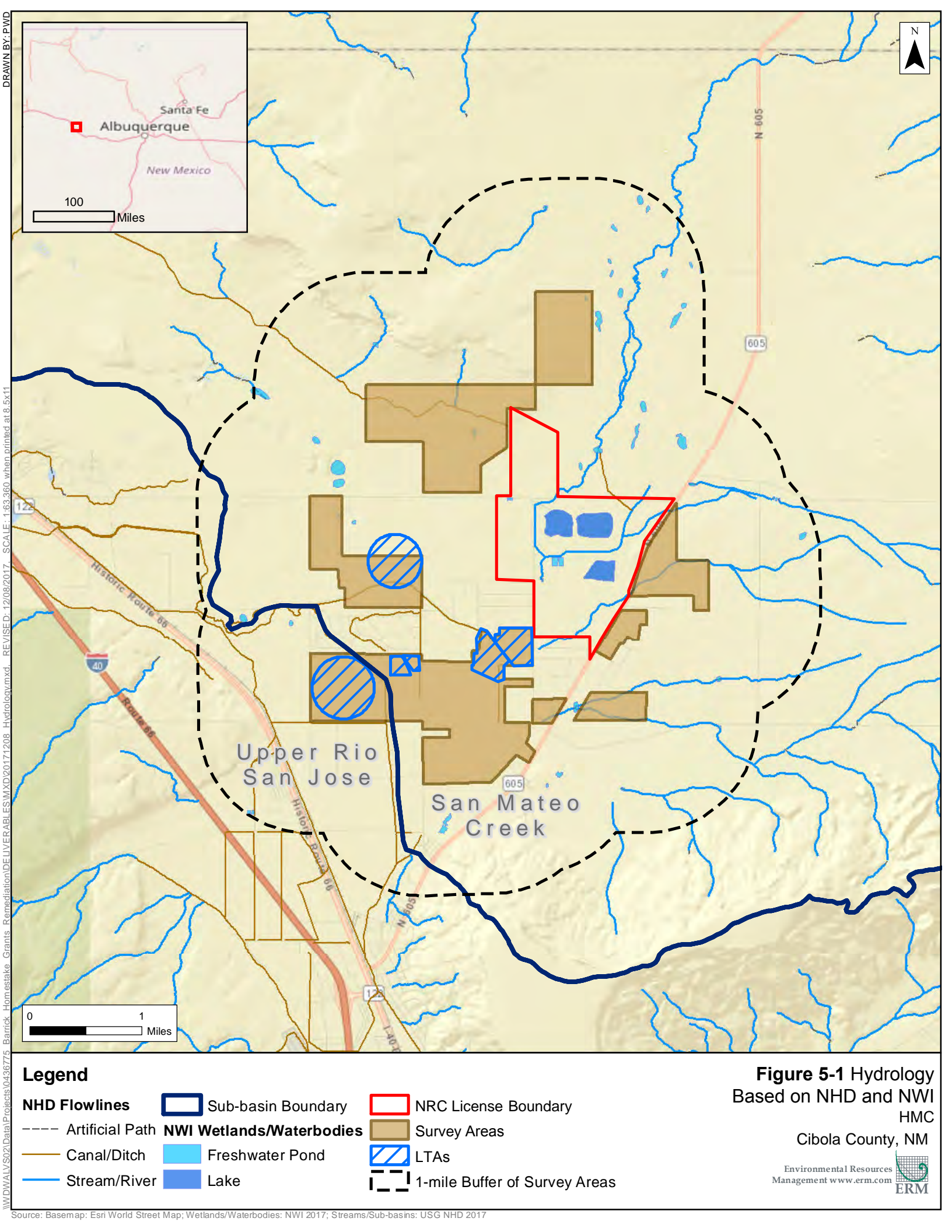
Legend

- Crucial Habitat (WAFWA)**
- Cougar (General)
 - Survey Areas
 - LTAs
 - 1-mile Buffer of Survey Areas
 - NRC License Boundary

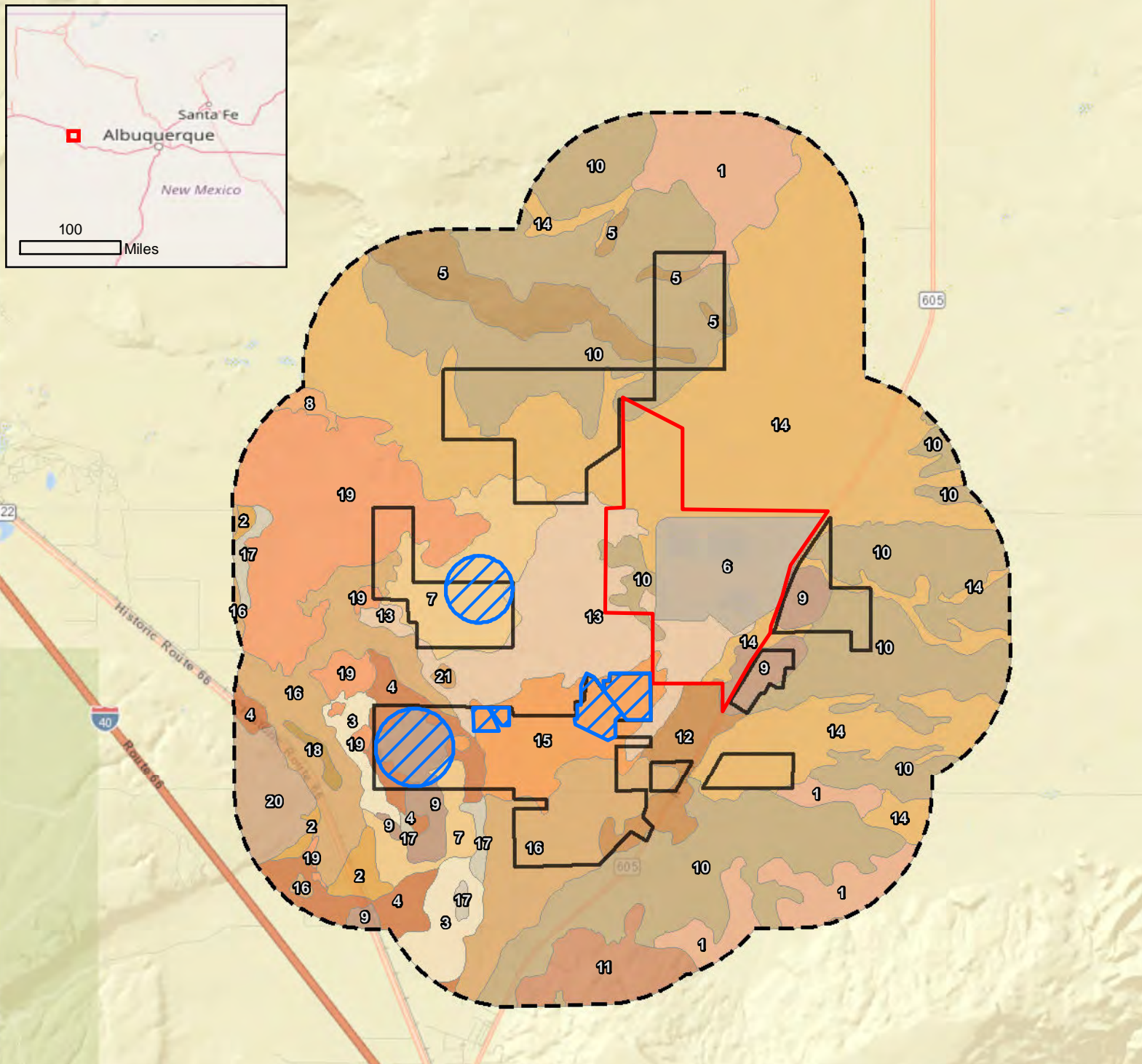
Figure 4-3 Crucial Cougar Habitat
HMC
Cibola County, NM







DRAWN BY: P.W. 11/20/2017 1:03:36 PM when printed at 8.5x11. REVISED: 12/08/2017. SCALE: 1:63,360. Barrick Homestake Grants Remediation/DELIVERABLES/MXD20171208 Soils.mxd. \\D:\WALV\S02\Data\Projects\0436775



1 - Aparejo-Venadito Complex	8 - Lava Flows	15 - Sparank Clay Loam
2 - Aparejo Clay	9 - Mespun Loamy Sand	16 - Venadito Clay Loam
3 - Aparejo Clay Loam	10 - Penistaja Fine Sandy Loam	17 - Venadito Sandy Clay Loam
4 - Aparejo Clay Loam, Sandy Substratum	11 - Poley-Rock Outcrop Complex	18 - Venadito Variant Clay Loam
5 - Bond-Penistaja-Rock Outcrop Complex	12 - San Mateo Clay Loam	19 - Viuda-Penistaja-Rock Outcrop Complex
6 - Dumps-Pits Complex	13 - San Mateo Sandy Clay Loam	20 - Winona-Rock Outcrop Complex
7 - Glenberg-San Mateo Complex	14 - Sparank-San Mateo Complex	21 - Zia Sandy Loam

Legend

- NRC License Boundary
- Survey Areas
- LTAs
- 1-mile Buffer of Survey Areas

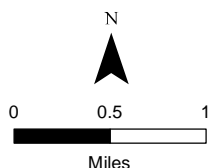
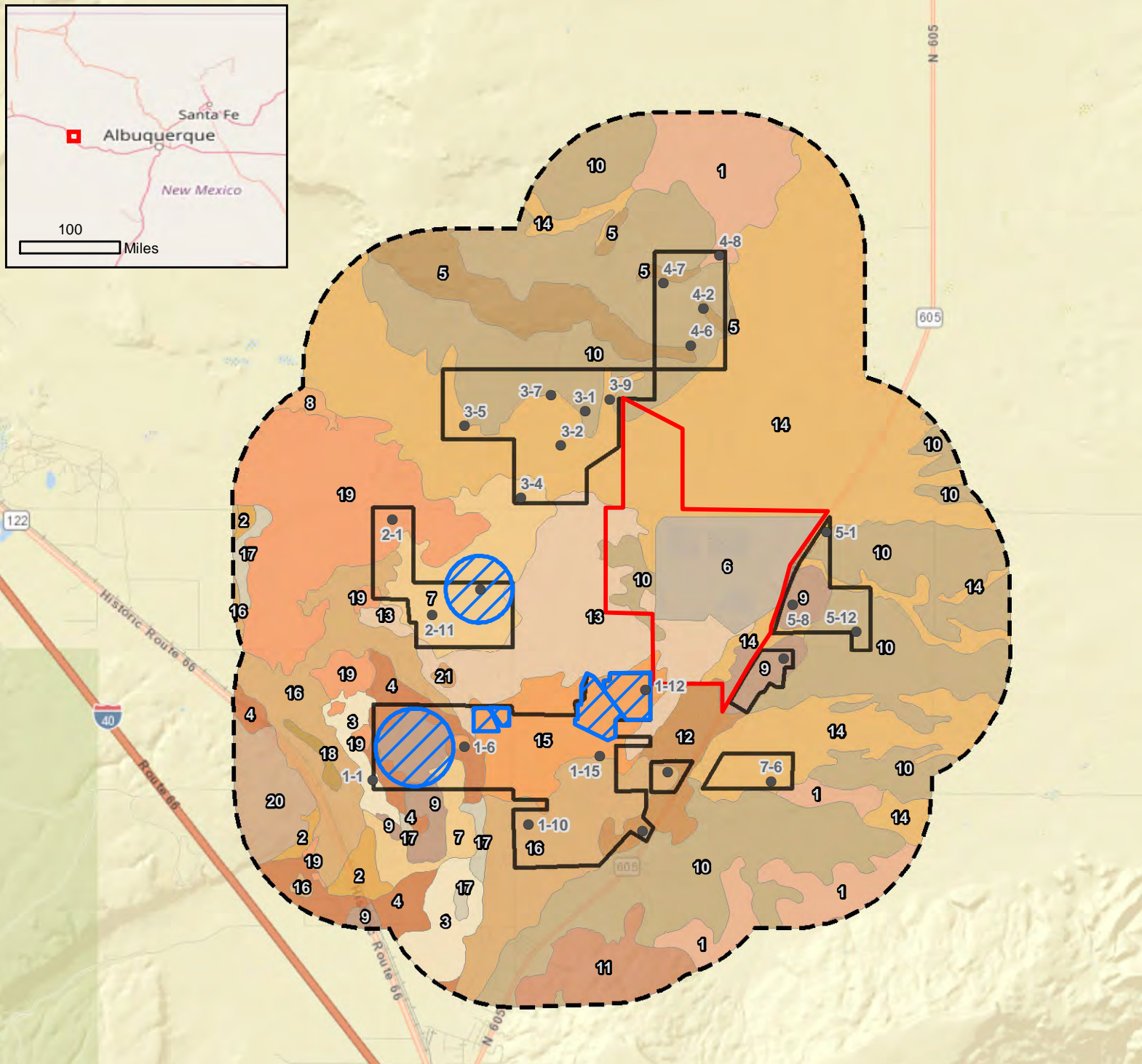


Figure 6-1 NRCS Soil Map
Units
HMC
Cibola County, NM



1 - Aparejo-Venadito Complex	8 - Lava Flows	15 - Sparank Clay Loam
2 - Aparejo Clay	9 - Mespun Loamy Sand	16 - Venadito Clay Loam
3 - Aparejo Clay Loam	10 - Penistaja Fine Sandy Loam	17 - Venadito Sandy Clay Loam
4 - Aparejo Clay Loam, Sandy Substratum	11 - Poley-Rock Outcrop Complex	18 - Venadito Variant Clay Loam
5 - Bond-Penistaja-Rock Outcrop Complex	12 - San Mateo Clay Loam	19 - Viuda-Penistaja-Rock Outcrop Complex
6 - Dumps-Pits Complex	13 - San Mateo Sandy Clay Loam	20 - Winona-Rock Outcrop Complex
7 - Glenberg-San Mateo Complex	14 - Sparank-San Mateo Complex	21 - Zia Sandy Loam

Legend

- Photo Points
- ▭ NRC License Boundary
- ▭ Survey Parcels
- ▨ LTAs
- ▭ 1-mile Buffer of Survey Parcels

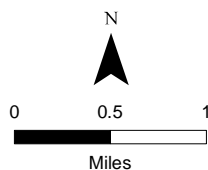


Figure 6-2 Locations of Soil Pits
HMC
Cibola County, NM

Tables

Table 4-1. Vegetation Community Descriptions and Photopoint Details

Survey Parcel 1	Natural vegetation communities consisted of a mix of salt desert scrub and grasslands, with some sandsage dominated sagebrush areas along edges of the polygon. Soils were sandy along the western end, trending toward clayey on eastern/southern portions. This area also contains agricultural communities (former irrigation LTAs), including flood and pivot, with varying vegetation cover within each.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
1-1	Agriculture	Winter fat and saltbush (sparse)	bunch grasses (sparse)	none	N/ A	26-50%	Pivot irrigation area, previously cleared and mostly bare ground.	x
1-2	Mixed sagebrush-grassland	Sandsage Sagebrush	Indian Ricegrass	Juniper (1, isolated tree)	N/ A	51-75%		x
1-6	Mixed Salt Desert Scrub	Four-wing saltbush, broom snakeweed	Grama	none	N/ A	26-50%		x
1-10	Mixed Salt Desert Scrub	Four-wing saltbush	Bunch grasses	none	N/ A	26-50%	Very barren area formerly flood irrigated. Spotted knapweed noted to be establishing in the area.	
1-11	Semi-desert grassland	Four-wing saltbush	Mat or ring muhly	none	N/ A	26-50%		
1-12	Agriculture	none	none	none	none	100%		x
1-15	Mixed Salt Desert Scrub	Four-wing saltbush	Alkalia saccator	none	Spotted Knapweed	26-50%		x
Survey Parcel 2	Natural vegetation communities consist largely of four-wing saltbush or sand sage shrubland, with an understory of mixed grasses (gramma and Indian ricegrass common). Slight topographic lows along the southwest corner of the parcel show a transition to a grassland dominated community. Localized establishment of cattails was noted in two small areas where surface depressions were intentionally created or else water pumping resulted in a perpetually wetted area. An old ditch or irrigation trench was noted in the northeast portion of the parcel, densely vegetated but species were not identifiable at time of survey. This area also contains agricultural communities (former irrigation LTAs), which are largely bare ground.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
2-1	Semi-desert grassland	Rabbitbrush	Grama	none	Thistle species	26-50%	Highly variable area, with patches of grasslands, shrubs, and some sagebrush noted. Thistle species noted sporadically, associated with ground disturbances (unknown if natural or human-made).	x
2-2	Semi-desert grassland	Rabbitbrush	Grama	none	N/ A	26-50%		x
2-3	Semi-desert grassland	none noted	Grama	none	Knapweed, thistle	50-75%	Area of knapweed and russian thistle establishment.	
2-4	Mixed Salt Desert Scrub	Shadscale	Curlleaf muhly	none	N/ A	50-75%	Ground shows signs of disturbance and shrubs look damaged.	x

Table 4-1. Vegetation Community Descriptions and Photopoint Details

Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
2-5	Small ponded area	---	---	---	---	---	Small ponded area created by a pump system that has resulted in perpetually wetted area. Thick cattails surround the wetted area.	x
2-6	Semi-desert grassland	Rabbitbrush/saltbush	Grama and other grasses	none	N/A	26-50%		
2-8	Agriculture	---	---	---	---	50-75%	Pivot LTA, remnant hay covering the ground.	x
2-9	Agriculture / grassland	none	Side oats gramma big bluestem	none	N/A	1-25%	Plant community at the edge of the pivot irrigation field consists of mixed grasses.	
2-10	Small ponded area	---	---	---	---	---	Small ponded area created by depression in the soil. Thick cattails surround the wetted area.	x
2-11	Mixed sagebrush-grassland	Sandsage Sagebrush	Grama and other grasses	none	Russian Thistle / Mustard spp.	26-50%	Scattered rabbitbrush also occurs in this area.	x
2-13	Vegetated ditch	Sandsage Sagebrush	Grama and other grasses	1 or 2 willows in distance	N/A	26-50%	Sand sage community bisected by what appears to be an old ditch or pipeline area. Individual willow trees noted in distance along the ditch edge.	x
2-14	Vegetated ditch	Sandsage Sagebrush	Grama and other grasses	none	N/A	26-50%	Wash or ditch area, ground cover includes a relatively dense layer of unknown grasses, surrounded by sand sage.	x
Survey Parcel 3	Portions of this area show heavier livestock use than others, with thistle patches present in portions of the parcel. It is possible shrubs have been trampled to the point where a grassland system dominates by default. Some irrigation equipment was left in this area, with the southern end of the polygon looking more mesic, either naturally or due to human activity (irrigation). A small area with scant scattered willows was present associated with a dry wash.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
3-1	Semi-desert Grassland	Four-wing saltbush / rabbit brush (scarce)	Grama and other grasses	none	Thistle species	25-50%	Heavy livestock use evident.	
3-2	Dry wash	---	---	willows	Thistle species	25-50%	Signs of a dry wash, heavily impacted by livestock use, noted in this area, with scattered willow trees along some portions.	x
3-3	Mixed Salt Desert Scrub	Shadscale	Grama and other grasses	none	Thistle species	26-50%		
3-4	Mixed sagebrush-grassland	Sandsage Sagebrush	Grama and other grasses	none	Thistle species	0-25%		x

Table 4-1. Vegetation Community Descriptions and Photopoint Details.

Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
3-5	Semi-desert Grassland	Four-wing saltbush	Grama and other grasses	none	Thistle species	26-50%	Appears to be a ditch near a wash area. Heavy livestock trampling possible in this area.	
3-6	Semi-desert Grassland	Four-wing saltbush	Grama and other grasses	none	Thistle species	26-50%		x
3-7	Area of disturbance	Four-wing saltbush	Alkalia saccator	none	Thistle species	26-50%		x
3-8	Semi-desert Grassland	Four-wing saltbush	Grama and other grasses	none	N/A	26-50%		x
3-9	Semi-desert Grassland	Four-wing saltbush	Grama and other grasses	none	N/A	26-50%		Ground disturbance by heavy machinery apparent.
Survey Parcel 4	Shortgrass steppe prairie vegetation community, with the occasional juniper tree or granite outcrop noted throughout the area generally. Livestock use evident but typical for this area. A stock tank is located north of the parcel where cattle appear to congregate.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
4-2	Shortgrass steppe grassland	Snakeweed (scant)	Blue grama	Juniper (1-2 individuals)	N/A	0-25%	Stock tank and surrounding area. Thistle species noted.	x
4-3	Stock tank	---	---	---	---	---		
4-6	Shortgrass steppe grassland	Snakeweed (scant)	Blue grama	Cholo in distance	N/A	26-50%	Area of livestock concentration noted. Shortgrass steppe grassland with some influence of saltbush. Heavily grazed or disturbed.	
4-7	Shortgrass steppe grassland	Snakeweed (scant)	Blue grama	Juniper (1-2 individuals)	N/A	26-50%		x
4-9	Shortgrass steppe grassland	Four-wing saltbush	Blue grama	none	N/A	26-50%		x
Survey Parcel 5	The area generally reflects a mix of sagebrush and grassland dominated vegetation communities. Grasses are abundant and more diverse than noted in parcels along the north or west sides. Some disturbances are noted along the north end, such as earth moving or piping.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
5-1	Evidence of water movement	---	---	Small elm	Unknown forbs prevalent in area	26-50%	This area features a slight depression in the land surface that looks to have held water relatively recently. A small elm tree was the only woody structure noted in the vicinity.	x

Table 4-1. Vegetation Community Descriptions and Photopoint Details.

Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
5-2	Semi-desert Grassland	Four-wing saltbush, sandsage sagebrush, rabbitbrush	Grama, bunch grasses	none	Aster spp.	26-50%		x
5-3	Mixed sagebrush-grassland	Sandsage Sagebrush	Big bluestem, grama, bunch grasses	none	N/A	26-50%		
5-4	Semi-desert Grassland	Four-wing saltbush, sandsage sagebrush, rabbitbrush	Grama, bunch grasses	Siberian elms, scattered	Kochia	26-50%	Area generally exhibits patches of disturbance. Elms may have been planted in the past.	
5-7	Mixed sagebrush-grassland	Big sagebrush or sandsage sagebrush	Bunch grasses	none	N/A	51-75%		
5-8	Shrub steppe	Snakeweed	few grasses, not identifiable	none	N/A	26-50%		x
5-9	Semi-desert Grassland or sagebrush-grassland mix	Rabbitbrush, snakeweed, sandsage, four-wing saltbush	Ring muhly, indian ricegrass, other grasses	none	N/A	26-50%		
5-10	Mixed sagebrush-grassland	Sandsage Sagebrush	Mixed grasses, includes grama, three-awn and/or fescue, possibly bluestem	none	N/A	0-25%	Area generally transitions from sagebrush to grassland system	x
5-11	Mixed sagebrush-grassland	Sandsage Sagebrush, rabbitbrush	Mixed grasses, includes grama and other species.	none	N/A	0-25%		
5-12	Mixed sagebrush-grassland	Sandsage Sagebrush	Indian rice grass	none	Mustard spp., prickly pear	26-50%	Small cactus species noted spordically.	x
5-13	Mixed salt desert scrub	Four-wing saltbush, minor sandsage	Gramma, Indian rice grass, other grasses	none	N/A	26-50%		

Table 4-1. Vegetation Community Descriptions and Photopoint Details.

Survey Parcel 6	The area is generally shrub dominated (both sagebrush and saltbush dominated shrublands persist), with varying amounts of mixed grass species. Piping and other ground disturbances noted in some areas.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
6-2	Small ponded area	---	---	none	Cattails	---	Cattails surrounding a small ponded area created by water infrastructure.	x
6-3	Mixed sagebrush-grassland	Sandsage Sagebrush, minor amounts of four-wing saltbush, rabbitbrush	Galleta, big bluestem, other grasses	none	N/A	25-50%		x
6-4	Small ponded area	---	---	none	Cattails	---	Cattails surrounding water infrastructure.	x
6-5	Mixed sagebrush-grassland	Sandsage Sagebrush, minor amounts of four-wing saltbush	Mixed grasses, sparse	none	N/A	25-50%		
6-6	Mixed sagebrush-grassland	Sandsage Sagebrush, minor amounts of four-wing saltbush, rabbitbrush	Mixed grasses, sparse	none	N/A	25-50%	Minor disturbances noted.	x
6-7	Mixed salt desert scrub	Four-wing saltbush	Mixed grasses, sparse	none	N/A	25-50%	Piping and other disturbances noted in area. Water leaks through pipe seals have created localized wetted areas.	x
6-8	Mixed salt desert scrub	Four-wing saltbush	Mixed bunch grasses	none	N/A	0-25%		
6-9	Mixed salt desert scrub	Four-wing saltbush	Galleta, big bluestem, other grasses	Siberian elm (2 individuals)	Mustard spp.	50-75%	Marks a transitional area between shrubland and grassland. Some large bare ground patches.	x
Survey Parcel 7	This parcel consists of mixed salt desert scrub vegetation to the north. Bordering a dry wash area, more mesic conditions seem to persist, supporting tallgrass species in some areas. The dry wash (indicated in NHD dataset) may have been modified and is more deeply insiced than expected.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
7-1	Grassland	Four-wing saltbush (sparse)	Big bluestem	none	N/A	26-50%	Mesic area containing tallgrass species.	
7-2	Grassland	Sandsage Sagebrush	Indian ricegrass, big bluestem, grama	none	N/A	26-50%	Grassland area overall, but some patches of dense sandsage sagebrush are apparent.	

Table 4-1. Vegetation Community Descriptions and Photopoint Details.

Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
7-3	Ditch	---	---	---	---	---	Small ditch or dry wash. No water present.	
7-4	Mixed Salt Desert Scrub	Four-wing saltbush	Bunch grass	none	N/A	50-75%	Vegetation community that borders the ditch or dry wash.	
7-5	Volcanic outcrop	---	---	---	---	---	Volcanic outcrop seen sporadically throughout many of the parcels.	
7-6	Mixed Salt Desert Scrub	Four-wing saltbush	none noted	none	Aster spp.	50-75%	No understory, atypical for this area in general. Possible livestock use or high salinity soils.	x
7-7	Mixed Salt Desert Scrub	Four-wing saltbush	Sparse grasses	none	N/A	50-75%	Very scant understory of grasses.	
7-10	Mixed Salt Desert Scrub	Four-wing saltbush	Sparse grasses	none	N/A	50-75%	Very scant understory of grasses.	x
Survey Parcel 8	This parcel generally is characterized as a generally uniform, mixed salt desert scrub community, but areas of disturbance are noted throughout. Grasses appear to have been grazed and are missing most seedheads.							
Photopoint	Vegetation Community or Feature	Dominate shrubs	Dominate grasses	Trees	Forbs/ Succulants [1]	Bare ground	General Description and Notes	Location included in Photolog
8-1	Mixed Salt Desert Scrub	Four-wing saltbush	Grama, indian ricegrass, other grasses	none	Thistle species, mustard	26-50%	Road and exposed/buried piping throughout area.	x
8-2	Mixed Salt Desert Scrub	Four-wing saltbush	Grama, indian ricegrass, other grasses	none	N/A	26-50%	Area appears disturbed or recently regraded.	x

Notes: All data reflects surveys conducted January, 2018.

[1] N/A - Forb species were generally not identifiable at the time of survey.

Table 4-2. Plant Species of Interest

Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Flowering Period	Likelihood of Occurrence
Cinder Phacelia	<i>Phacelia serrata</i>		NM rare	Primarily in deep volcanic cinders associated with volcanic cones, but also roadcuts and abandoned quarries in open, exposed, sunny locations; near ponderosa pine and piñon-juniper woodlands; 1,800-2,200 m (5,900-7,200 ft).	Flowers July to October, primarily late August and early September.	Low - More typical of coarse, rocky, highly well drained substrates; though limited potential may occur in areas of roadcuts, presence is unlikely in survey parcels.
Laguna Fame Flower	<i>Talinum brachypodium</i>		NM rare	Very shallow pockets of calcareous silt to clay soils overlying limestone or travertine, or fine silty sand overlying calcareous sandstones; open piñon-juniper woodland with little understory and scattered cacti and shrubs or Chihuahuan desert scrub. Preference for substrates of fine-grained non-calcareous iron rich red sandstone of the "Rimrock Country" of the Colorado Plateau.	Flowers June to August.	Low - Iron rich red sandstone typical of habitat areas not present, and vegetation associations are lacking (Chihuahuan desert scrub and cacti areas lacking).
New Mexico Sunflower	<i>Helianthus praetermissus</i>		NM rare	This species is known only from the type specimen collected in 1851. The locality was the head of the Rio Laguna (now Rio San Jose) at Ojo de la Gallina, on the north side of the Zuni Mountains. This species may have been named from a depauperate specimen of <i>Helianthus paradoxus</i> . Based on limited information, habitats may include perhaps wet ground.	Flowers in September.	Low - Species has not been observed since 1851.
Parish's Alkali Grass	<i>Puccinellia parishii</i>		E	Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 800-2,200 m (2,600-7,200 ft) range-wide. The species requires continuously damp soils during its late winter to spring growing period. It frequently grows with <i>Distichlis stricta</i> (salt grass), <i>Sporobolus airoides</i> (alkali sacaton), <i>Carex</i> spp. (sedges), <i>Scirpus</i> spp. (bulrushes), <i>Juncus</i> spp. (rushes), <i>Eleocharis</i> spp. (spike rushes), and <i>Anemopsis californica</i> (yerba mansa).	Flowers May to June.	Low to Medium - Localized areas of wetted soils occur where piping and pumping persists and contain similar plant associations.
Pecos Sunflower (Puzzle Sunflower)	<i>Helianthus paradoxus</i>	T	E	Saturated saline soils of desert wetlands. Usually associated with desert springs (ciénegas) or the wetlands created from modifying desert springs; 1,000-2,000 m (3,300-6,600 ft). <i>Helianthus paradoxus</i> is a true wetland species that requires saturated soils; adult plants still grow well when inundated	Flowers August to October.	Low to Medium - Localized areas of wetted soils occur where piping and pumping persists; however, likelihood of occurrence even in these areas is extremely low due to dominance of thick cattails.

Table 4-2. Plant Species of Interest

Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Flowering Period	Likelihood of Occurrence
Todilto Stickleaf	<i>Mentzelia todiltoensis</i>		NM rare	Outcrops of gypsum in the Todilto Formation; 1,700-1,910 m (5,600-5,840 ft).	Flowers open in the evening hours, late June through September.	Low - No gypsum outcrops occur in the study area.
Yeso Twinpod	<i>Physaria newberryi</i> var. <i>yesicola</i>		NM rare	The habitat is nearly barren badlands and canyon sides of various slopes and exposures between the elevations of 1700 and 2100 m. It occurs on sandy gypsum and other silty strata in short grass steppe and juniper savanna; in the Permian age Yeso Formation. The Yeso formation is comprised of a soft, silty sandstone interbedded with gypsum, limestone, shale and siltstone strata of various thickness.	Flowers April and May.	Low - May occur in shortgrass steppe, however Yeso formation not known to occur underlying area. Other ecological information indicates this species occurs in barren badlands and canyon sides.
Zuni Fleabane (Acoma Fleabane)	<i>Erigeron acomanus</i>	T	E	Steep, sandy slopes and benches beneath sandstone cliffs of the Entrada Sandstone Formation in piñon-juniper woodland; 2,100-2,170 m (6,900-7,100 ft). Vegetation cover is usually high; prefers north facing slopes. Typical of high selenium soils.	Flowers in July.	Low - No suitable habitat in survey areas.
Zuni Milkvetch	<i>Astragalus missouriensis</i> var. <i>accumbens</i>		NM rare	Habitats include gravelly clay banks and knolls, in dry, alkaline soils derived from sandstone, in piñon-juniper woodlands; 1,890-2,410 m (6,200-7,900 ft).	Flowers (March) May through June (August).	Medium - May be locally abundant within its limited range. Alkaline soils derived from sandstone occur in study area parcels.

Notes: Queried from NMNHP, <http://nmrareplants.unm.edu/rarelist.php>, January 2018, and USFWS IPAC for Cibola County, <https://ecos.fws.gov/ipac/>, January 2018.

T = threatened; E = endangered; NM = New Mexico

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Big Free-tailed Bat	<i>Nyctinomops macrotis</i>		NM sensitive	Seasonal migrant through much of its range. Found in urban areas, dry forests, and pine forests.	Low - May forage or pass through on a seasonal basis, but no suitable habitat is present.
Bat	Fringed Myotis	<i>Myotis thysanodes</i>		NM sensitive	Found at middle elevations of 1,200-2,150 m in desert, grassland, and woodland habitats. Roosts in caves, mines, rock crevices, buildings, and other protected sites.	Low - Study area is outside species elevation range.
Bat	Long-eared Myotis	<i>Myotis evotis</i>		NM sensitive	Widespread throughout the western U.S. in a wide range of habitats but most commonly found in coniferous forests. Prefer snags that reach high into or above the forest canopy and roost in crevices of sandstone boulders, stumps of clear-cut stands, abandoned buildings, cracks in the ground, caves, mines, and loose bark on living and dead trees.	Low - May forage or pass through on a seasonal basis.
Bat	Long-legged Myotis	<i>Myotis volans</i>		NM sensitive	Found in forested regions and roost in trees, rock crevices, fissures in stream banks, and buildings.	Low - May forage or pass through, but no suitable habitat in the study area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Pale Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>		NM sensitive	Occurs in semi-desert shrublands, desert scrub, sagebrush, chaparral, piñon-juniper woodlands, and open montane forests. Roosts mostly in caves or mines; at night may roost in abandoned buildings. Will also use rock crevices and hollow trees as roost sites. In summer, this species occurs widely across the state.	Medium - Suitable habitat within study area. Species occurs widely in New Mexico during summer months over desert scrub and other habitats.
Bat	Southwestern Little Brown Myotis	<i>Myotis occultus</i>		NM sensitive	Found in a variety of habitats including urban and agricultural areas, riparian habitats, grasslands, and forests. Hibernates in caves and mines, and roosts in buildings in New Mexico. Typically found near lakes or streams as they prefer to forage over water, but will also forage among trees in open areas.	Low - May forage over ponds or roost in abandoned structures near study area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Spotted Bat	<i>Euderma maculatum</i>		T	Forages in forest openings, piñon-juniper woodlands, riparian habitats, meadows, and agricultural fields. It is a broad-ranging species; however, its distribution is highly associated with prominent rock features. Rocky cliffs with suitable roosting substrate (e.g., crevices, cracks) are critical to this species. Perennial water sources also are important for this species.	Low - No suitable habitat in study area. May be found in forests or rocky cliffs outside study area.
Bat	Western Small-footed Myotis	<i>Myotis ciliolabrum</i>		NM sensitive	Common in arid desert, badland, and semiarid habitats. Occurs at low to moderate elevations as high as 9,500 ft in New Mexico. Wide ecological range from rock outcrops in open grasslands to canyons and woodlands. Roosts include cracks and crevices in cliffs, behind tree bark, mines, caves, tunnels, and other man-made structures.	Medium - Potential habitat for foraging within study area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Yuma Myotis	<i>Myotis yumanensis</i>		NM sensitive	Found in a variety of habitats from juniper and riparian woodlands to desert regions near open water. Almost guaranteed to find near rivers, streams, ponds, and lakes. Roost in caves, attics, buildings, mines, underneath bridges, and other similar structures.	Low - No suitable aquatic habitat present. May roost in abandoned structures near study area.
Bird - MBTA	Bendire's Thrasher	<i>Toxostoma bendirei</i>	BCC		Desert species found in various dry, semi-open habitats, particularly areas of tall vegetation, cholla cactus, creosote bush and yucca, and in juniper woodlands.	Medium - Potential for breeding and foraging habitat to be present.
Bird - MBTA	Black-chinned Sparrow	<i>Spizella atrogularis</i>	BCC		Occupies brushy mountain slopes, open chaparral, and sagebrush habitats. Found mostly in arid scrub on hillsides from low foothills to 7,000 ft elevation.	Medium - Potential for breeding and foraging habitat to be present.
Bird - MBTA	Brewer's Sparrow	<i>Spizella breweri</i>	BCC		Occurs in the arid intermountain western U.S. Breeds on sagebrush flats and open scrubby areas. Sometimes found in stands of saltbush, on open prairie, or in pinyon-juniper woodland.	High - Suitable habitat present and within the common breeding range of the species.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Chestnut-collared Longspur	<i>Calcarius ornatus</i>	BCC		Found along the plains and prairies, breeding in shortgrass prairies containing slightly longer grass and scattered taller weeds. Overwinters in shortgrass prairies and fields.	Medium - Habitat present for overwintering and migration route.
Bird - MBTA	Grace's Warbler	<i>Dendroica graciae</i>	BCC		Occupies pine-oak forests of mountain regions. Breeds in the tops of pine trees, spruce, fir, and oak thickets. Overwinters in pine-oak woodlands in the mountains.	Low - Potential to occur in nearby forests, not likely within project area due to lack of suitable habitat in the study area.
Bird - MBTA	Gray Vireo	<i>Vireo vicinior</i>	BCC	T	Open woodlands/shrublands, mountain slopes, mesas, open chaparral, scrub oak, and junipers; occurs in New Mexico only in warmer months (April-September). Found in elevations between 3,000 to 6,500 ft.	Medium - Habitat present for breeding during spring and summer.
Bird - MBTA	Lesser Yellowlegs	<i>Tringa flavipes</i>	BCC		Migrates through New Mexico and found in marshes, mudflats, shores, ponds, and open boreal woods.	Medium - Potential to pass through during migration.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Lewis's Woodpecker	<i>Melanerpes lewis</i>	BCC		Prefers scattered or logged forests, river groves, burns, and foothills. During the summer requires open country for foraging so is often found in Cottonwood groves, open pine-oak woods, burned or cut-over woods. Overwinters in oak groves and orchards.	Low - No suitable habitat present within the study area. Likely present in forests outside the study area so may pass through incidentally.
Bird - MBTA	Loggerhead Shrike	<i>Lanius ludovicianus</i>	BCC	NM sensitive	Found in semi-open country with lookout posts, wires, trees, and scrub. Breeds in semi-open terrain from large clearings in wooded regions to open grasslands or desert with a few scattered trees or large shrubs.	High/Confirmed - Species observed and identified within the study area.
Bird - MBTA	Long-billed Curlew	<i>Numenius americanus</i>	BCC		Migrates through New Mexico and breeds only in the northeastern corner of New Mexico. Found on the high plains, and breeds in native dry grassland and sagebrush prairie.	Medium - Potential to pass through during migration.
Bird - MBTA	Marbled Godwit	<i>Limosa fedoa</i>	BCC		Migrates through New Mexico. Found in prairies, pools, shores, and tideflats. Breeds in the northern Great Plains in native prairies containing marshes or ponds.	Low - Potential for species to occur within the study area during migration.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Mountain Plover	<i>Charadrius montanus</i>		NM sensitive	This species is a native of the short-grass prairie. Breeds on open plains at moderate elevations and overwinters in short-grass plains and fields, plowed fields, and sandy deserts.	Medium - Suitable habitat present for breeding and overwintering.
Bird - MBTA	Olive-sided Flycatcher	<i>Contopus cooperi</i>	BCC		Occupies coniferous forests, burns, and clearings. Breeds in coniferous forests in the mountains, particularly around the edges of open areas including bogs, ponds, and clearings.	None - No suitable habitat within the study area. Only suitable habitat is in the nearby forests.
Bird - MBTA	Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	BCC		Found in New Mexico year-round in pinyon pines and junipers. Seldom found outside of pinyon pines in pinyon-juniper woods, but may be seen in streamside groves, oak woods, or other habitats if the pinyon cone crop fails.	None - No suitable habitat within the study area. Only suitable habitat is in the forests outside the study area.
Bird - MBTA	Rufous Hummingbird	<i>Selasphorus rufus</i>	BCC		Migrates through New Mexico. Found along forest edges, streamsides, and mountain meadows. Occur at all elevations but more common in lowlands during spring, and mountain meadows during late summer and fall.	Medium - Potential to pass through during migration.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	E	Riparian habitat consisting primarily of native trees such as willow; nest in shrubs and small trees in willow thickets, shrubby mountain meadows and deciduous woodlands along streams. Habitat patches must be at least 0.25 acres in size and at least 30 ft wide (USFWS 2014).	Low - No suitable riparian habitat is present for nesting or foraging. However, species known to use habitat patches so area containing willows should be assessed.
Bird - MBTA	Virginia's Warbler	<i>Vermivora virginiae</i>	BCC		Occupies oak canyons, brushy slopes, and pinyons. Breeds in New Mexico in dry mountainsides in scrub oak, chaparral, pinyon-juniper woods, or other low brushy habitats.	Medium - Suitable habitat present and project area within common breeding range for species.
Bird - MBTA	Yellow-billed Cuckoo (western pop)	<i>Coccyzus americanus occidentalis</i>	T	T	Mature riparian habitats most commonly associated with cottonwood or other native forests; associated with lowland deciduous woodlands, willow and alder thickets, second-growth woods, deserted farmlands and orchards.	None - No suitable riparian habitat is present within the study area.
Bird - Raptor	Arctic Peregrine Falcon	<i>Falco peregrinus tundrius</i>		T	Hunting habitats include croplands, meadows, riverbottoms, marshes and lakes; breeds in the Arctic tundra.	Low - Hunting habitat may be present during migration.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Bald Eagle	<i>Haliaeetus leucocephalus</i>		T	Forested areas along coasts, large lakes, and rivers. Year-round occurrence	Low - May hunt or pass through incidentally, but study area does not contain suitable aquatic habitat preferred by species.
Bird - Raptor	Burrowing Owl	<i>Athene cunicularia</i>	BCC		Found in open grasslands, prairies, farmland, deserts, steppe environments, and airfields. Favors areas of flat, open ground with very short grass or bare soil. Most often associated with high densities of burrowing mammals, such as prairie dogs, but also airports, golf courses, vacant lots, industrial parks, and other open areas when prairie dog colonies are not present.	High - Suitable habitat present in prairie dog colonies within the study area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Golden Eagle	<i>Aquila chrysaetos</i>	BCC		Found in open mountains, foothills, plains, and open country. Require open terrain for hunting. Avoid developed areas and primarily found in the mountains up to 12,000 ft, canyonlands, rimrock terrain, and riverside cliffs and bluffs. Nest on cliffs and steep escarpments near open grasslands, chaparral, shrubland, and forests.	High/Confirmed - Suitable hunting habitat present within the study area, and nesting habitat present along cliffs outside of the study area. Incidental observations of this species have were noted previously.
Bird - Raptor	Long-eared Owl	<i>Asio otus</i>	BCC		Inhabit woodlands and conifer groves, favoring dense trees for nesting and roosting, and open country for hunting. Found in forests with extensive meadows, groves of conifers or deciduous trees in prairie country, or streamside groves in the desert. Typically avoids unbroken forests.	Low - May hunt or pass through, but will predominately nest and hunt outside study area in forested areas.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	T		Inhabits canyon and montane forests and rocky canyons from southern Utah, Colorado, Arizona, New Mexico, and western Texas. The highest densities of this species occur in mixed-conifer forests with minimal human disturbance.	Low - May hunt or pass through, but will predominately nest and hunt outside study area in forested, undisturbed areas.
Bird - Raptor	Northern Goshawk	<i>Accipiter gentilis</i>			Occupy coniferous and mixed forests, and are generally restricted to wooded areas but may also be found in open woods or edges. In the western U.S. they are found in the forest along riparian corridors and in more open habitat such as sagebrush steppes. Nest in mature, old-growth forests with more than 60% closed canopy throughout their entire range.	Low - May hunt or pass through incidentally, but will predominately nest and hunt outside study area in dense, forested areas.
Bird - Raptor	Peregrine Falcon	<i>Falco peregrinus</i>		T	Breeding territories located on cliffs in wooded/forested habitats; hunting habitats include croplands, meadows, riverbottoms, marshes and lakes.	High - Suitable hunting habitat present within the study area, and nesting habitat present along cliffs outside of the study area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Fish	Rio Grande Chub	<i>Gila pandora</i>		NM sensitive	Most commonly found in flowing pools of headwaters, creeks, and small rivers near inflow of riffles, undercut banks, aquatic vegetation, and plant debris. Can also occur in impoundments.	None - No suitable habitat present within the study area.
Fish	Zuni Bluehead Sucker	<i>Catostomus discobolus yarrowi</i>	E	E	Most frequently occurs in stream reaches with cobble and bedrock substrates with slow- to moderate-velocity water. In New Mexico, the sucker currently is limited to the headwaters of the Zuni River drainage.	None - No suitable habitat present within the study area.
Invertebrate	Socorro Mountainsnail	<i>Oreohelix neomexicana</i>		NM sensitive	Occupies a variety of habitats from lush forested canyons to extreme conditions. Found in New Mexico in scant cover under loose stones, limestone rocks, and other single stones in areas of rich leaf litter.	None - No suitable habitat present within the study area.
Mammal	Cebolleta Pocket Gopher	<i>Thomomys bottae paguatae</i>		NM sensitive	Currently known only from a small area in Cibola County. Prefers perennial riparian vegetation including willow, cottonwood, alder, and maple. Surrounding uplands in known locality include large sandstone cliffs with juniper, piñon, and sage.	Low - Evidence of gophers identified in the project area, but unlikely this species due to its preference for riparian habitat.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Mammal	Common Hog-nosed Skunk	<i>Conepatus leuconotus</i>		NM sensitive	Inhabits a variety of habitats including sycamore, cottonwood, and rabbitbrush riparian habitats, pinion-juniper woodlands, and montane shrublands. Prefers rocky areas. Uses rock crevices, hollow logs, underground burrows, caves, mines, woodrat houses, or buildings as dens.	Medium - Potential for habitat to be present.
Mammal	Gunnison's prairie dog (prairie subspecies)	<i>Cynomys gunnisoni zuniensis</i>		NM sensitive	Found in plains and desert grassland, and to a lesser extent the Great Basin desert scrub. Occurs in low valleys, but also is common in parks and meadows in the montane forests up to at least 10,000 feet.	Medium - Potential for habitat to be present as there are numerous prairie dog colonies. Species needs to be confirmed.
Mammal	Northern Pocket Gopher	<i>Thomomys talpoides taylori</i>		NM sensitive	Found in a wide variety of habitats ranging from sagebrush steppe, mountain meadows, tundra, agricultural fields, grasslands, and gardens or lawns. Prefer deep soils along streams, meadows, and cultivated fields. Also found in rocky soils and clay.	High - Evidence of gophers identified in the project area.

Table 4-3. Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Mammal	Red Fox	<i>Vulpes vulpes</i>		NM sensitive	Occupies a wide range of habitats including grasslands, deserts, mountains, forests, and suburban areas. Prefer wooded areas but can adapt to different environments.	Medium - Potential for habitat to be present.
Mammal	Ringtail	<i>Bassariscus astutus</i>		NM sensitive	Found in a variety of habitats such as semi-arid oak forests, pinyon pine or juniper woodlands, montane conifer forests, chaparral, desert, dry tropical habitats, and rocky or cliff areas. This species adapts well to disturbed areas and frequently found in human populated areas.	Medium - Potential for habitat to be present.
Reptile	Southwestern Fence Lizard	<i>Sceloporus cowlesi</i>		NM sensitive	Found in a variety of habitats including semidesert grasslands, woodlands, rocky canyons, and forested slopes. Usually encountered in open, sunlit areas with plenty of basking sites such as rock piles, wood piles, and fallen logs.	Medium - Potential for habitat to be present.

Notes: Queried from Bison-M, <http://bison-m.org/index.aspx>, January 2018, and USFWS IPAC for Cibola County, <https://ecos.fws.gov/ipac/>, January 2018.

T = threatened; E = endangered; BCC= bird of conservation concern; NM = New Mexico

Table 4-4. Birds Observed at the HMC Facility Ponds and in the Study Area

Common Name	Species Name	HMC Pond Monitoring [1]	Observed During Site Visit (January 2018)
Passerines			
Common raven	<i>Corvus corax</i>		x
Horned lark	<i>Eremophila alpestris</i>		x
Loggerhead shrike	<i>Lanius ludovicianus</i>		x
Ducks			
Northern pintail	<i>Anas acuta</i>	x	
Cinnamon teal	<i>Anas cyanoptera</i>	x	
Blue-winged teal	<i>Anas discors</i>	x	
Mallard	<i>Anas platyrhynchos</i>	x	
Gadwall	<i>Anas strepera</i>	x	
Redhead	<i>Aythya americana</i>	x	
Bufflehead	<i>Bucephala albeola</i>	x	
Common merganser	<i>Mergus merganser</i>	x	
Grebes			
Clark's grebe	<i>Aechmophorus clarkii</i>	x	
Eared grebe	<i>Podiceps nigricollis</i>	x	
Shorebirds, Stilts, and Wading Birds			
Spotted sandpiper	<i>Actitis macularius</i>	x	
Killdeer	<i>Charadrius vociferus</i>	x	
Common snipe	<i>Gallinago gallinago</i>	x	
Black-necked stilt	<i>Himantopus mexicanus</i>	x	
White-faced ibis	<i>Plegadis chihi</i>	x	
American avocet	<i>Recurvirostra americana</i>	x	
Hérons			
Great blue heron	<i>Ardea herodias</i>	x	
Cattle egret	<i>Bubulcus ibis</i>	x	
Little blue heron	<i>Egretta caerulea</i>	x	
Other Waterfowl			
American coot	<i>Fulica americana</i>	x	

[1] Data reflects monitoring records between July and November 2017.

Table 6-1. Soil Profile Data Collected in the Field

Photopoint/L ocation	NRCS unit	Pit Depth (in.)	Horizon	Matrix Color [1]		Texture
				YR	fraction	
Survey Parcel 1						
1-1	Aparejo Clay Loam	5	A	5YR	4/4	Sandy Loam
1-6	Sparank Clay Loam	5	A	5YR	5/4	Sandy Loam
1-10	Venadito Clay Loam	2	A	5YR	4/4	Sandy Loam
1-11	San Mateo Clay Loam	5	A	2.5YR	4/4	Sandy Loam
1-12	Sparank Clay Loam	12	A	5YR	5/3	Clay Loam
Survey Parcel 2						
2-1	Viuda-Penistaja-Rock Outcrop Complex	8	A	2.5YR	3/4	Sandy Clay Loam
2-8	Glenberg-San Mateo Complex	8	A	7.5YR	4/3	Loamy Sand
2-11	Glenberg-San Mateo Complex	8	A	7.5YR	4/4	Sandy Clay Loam
Survey Parcel 3						
3-1	Penistaja Fine Sandy Loam	10	A	2.5YR	4/4	Very fine Sandy Loam
3-2	Sparank-San Mateo Complex	10	A	7.5YR	4/4	Sandy Clay Loam
3-4	Glenberg-San Mateo Complex	5	A	7.5YR	4/3	Loamy Sand
3-5	Sparank-San Mateo Complex	8	A	5YR	4/3	Sandy Loam
3-7	Sparank-San Mateo Complex	2	A	5YR	4/3	Sand Loam

Table 6-1. Soil Profile Data Collected in the Field.

Photopoint/L ocation	NRCS unit	Pit Depth (in.)	Horizon	Matrix Color [1]		Texture
				YR	fraction	
3-9	Sparank-San Mateo Complex	6	A	5YR	4/4	Sand Loam
Survey Parcel 4						
4-2	Bond-Penistaja-Rock Outcrop Complex	6	A	5YR	4/4	Sandy Clay
4-6	Penistaja Fine Sandy Loam	8	A	5YR	4/4	Sandy Clay Loam
4-7	Penistaja Fine Sandy Loam	8	A	5YR	4/4	Sandy Clay Loam
4-8	Aparejo-Venadito Complex	6	A	7.5YR	3/4	Loam fine sand
Survey Parcel 5						
5-1	Penistaja Fine Sandy Loam	8	A	2.5YR	4/3	Loamy Sand
5-8	Mespun Loamy Sand	2	A	5YR	4/4	Sandy Loam
5-12	Penistaja Fine Sandy Loam	8	A	5YR	4/4	Loamy Sand
Survey Parcel 6						
6-4	Mespun Loamy Sand	8	A	5YR	4/4	Loamy Sand
Survey Parcel 7						
7-6	Sparank-San Mateo Complex	8	A	5YR	4/3	Loamy Sand
7-6 (stream)	Sparank-San Mateo Complex	4	A	2.5YR	4/4	Clay Loam
Survey Parcel 8						
8-1	Venadito Clay Loam	8	A	5YR	4/3	Clay loam

Table 6-1. Soil Profile Data Collected in the Field

Photopoint/ Location	Rock Frags			Consistence [1]	Notes
	Kind	Size	%		
Survey Parcel 1					
1-1	None	--	--	Very friable	Volcanic rock outcrops in the area
1-6	None	--	--	Very friable	
1-10	None	--	--	Very friable	thin layer of clay hard bake
1-11	None	--	--	Very friable	
1-12	None	--	--	Very friable	
Survey Parcel 2					
2-1	Volcanic	gravel to cobble	0-25%	Very friable	slight cementing at 2 inches
2-8	Volcanic	Cobble	<5%	Very friable	
2-11	None	--	--	Very friable	
Survey Parcel 3					
3-1	None	--	--	Very friable	
3-2	None	--	--	Friably	Slightly cemented
3-4	None	--	--	Very friable	
3-5	Sedimentary	Pebble	<5%	Very friable	
3-7	Sedimentary	Pebble	<5%	Very friable	Duripan after 3 inches

Table 6-1. Soil Profile Data Collected in the Field

Photopoint/ Location	Rock Frags			Consistence [1]	Notes
	Kind	Size	%		
3-9	Sedimentary	Pebble	<5%	Very friable	Duripan after 3 inches
Survey Parcel 4					
4-2	Metamorphic	Boulder	<5%	Very friable	
4-6	Sedimentary	Pebble	10%	Very friable	Spade couldn't dig past 8
4-7	Sedimentary	Pebble	10%	Very friable	
4-8	None	--	--	Very friable	
Survey Parcel 5					
5-1	Sedimentary	Pebble	<5%	Very friable	Duripan after 3 inches, obsidian
5-8	Sedimentary	Large pebble	<5%	Very friable	Duripan after 3 inches, obsidian
5-12	None	--	--	Very friable	
Survey Parcel 6					
6-4	None	--	--	Very friable	
Survey Parcel 7					
7-6	None	--	--	Very friable	
7-6 (stream)	None	--	--	Very friable	Duripan in stream bed
Survey Parcel 8					
8-1	Sedimentary	Pebble	<1%	Very friable	

Notes:

[1] soils were usually moist in the field and color/consistency reflects moist conditions.