2017-00731-1

VERDE VALLEY AMERICAN VITICULTURAL AREA PETITION

Verde Valley Wine Consortium
P.O. BOX 2584, COTTONWOOD, AZ 86326-2584

June 30, 2017

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INTRODUCTION AND BACKGROUND

The following is a submission for the establishment of the Verde Valley American Viticultural Area located within the boundaries of Yavapai County in central Arizona. This petition is being submitted by the Verde Valley Wine Consortium, an industry group representing and on behalf of the commercial vineyards and licensed and bonded wineries located in the Verde Valley. A copy of the Verde Valley Wine Consortium Mission Statement is included as part of this petition (Appendix A).

This petition contains Name Evidence, Boundary Evidence, Distinguishing Features and Maps and Boundary Description in accordance with the parameters set forth in the Alcohol and Tobacco Tax and Trade Bureau (TTB) American Viticultural Area (AVA) Manual for Petitioners (TTB P 5120.4 09/2012) and specifically detailed in § 9.12. There are also several appendices included to provide further evidence and clarification.

Grape growing and winemaking in the Verde Valley and Arizona in general is a relatively new industry, less than 40 years old. As with many areas in the United States, vineyards and wineries were prevalent in Arizona and the Verde Valley prior to Prohibition. Arizona actually enacted Prohibition in 1914, five years before the Federal Government passed the Volstead Act. It was illegal to make wine in Arizona from 1914 until new legislation was passed in 1982 making it legal once again. Since the passing of the new legislation, the number of wineries and vineyards has grown steadily. The first vineyard planted in the Verde Valley post-Prohibition was in 1995. As late as 2000, there were only nine bonded wineries in the entire State of Arizona. Legislation, further defining Arizona laws regarding winery, vineyard and tasting room licensing and bringing the state into compliance with the U.S. Supreme Court's 2005 ruling in Granholm v. Heald, was passed in 2006. This new legislation jump started the wine industry and today there are 84 licensed and bonded commercial wineries in Arizona, eleven of which are located within the proposed boundary of the Verde Valley AVA.

Located within the proposed AVA boundary is an accredited educational institution, Yavapai College, which offers classes and degrees in both viticulture and enology. Yavapai College also features a commercial, licensed and bonded teaching winery, a teaching vineyard and a tasting room, collectively known as the Southwest Wine Center. Enrollment in the viticulture and enology programs has risen steadily since its inception in 2009.

Thank you for your consideration of this petition to establish the Verde Valley AVA. Questions or further information requests regarding this petition should be sent to:

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NAME EVIDENCE

The Verde Valley in Yavapai County, Arizona has been referred to as the "Verde Valley" as long as there has been recorded history. There are recorded references to the Verde Valley as far back as 1583 when Spanish explorer Antonio de Espejo recorded his travels in the area while scouting with Zuni and Hopi guides for silver mines. There are numerous references of the "Espejo Expedition" including the *Colonization of the New Mexico in the 16th Century* by Robert Torrez, and in the original *Catholic Encyclopedia* published in 1907 by the Robert Appleton Company. There were many other recorded visits by Spanish Explorers between 1598 and 1744.

Recorded history – and reference to the Verde Valley - resumes with visits from fur trappers and other explorers of European origin in the early 1800s. In 1862 the Homestead Act of the U.S. Congress included giving 160-acre tracts of public land in the Verde Valley to citizens who would "settle on the land and use it productively." Soon after, pioneers began pushing into the Verde Valley where they generally became farmers and cattle ranchers. In 1865 Fort Verde was founded in Camp Verde when the settlers appealed for military protection from Native Americans who had called this area home for centuries.

The book *Verde Valley*, published in 2011 by Arcadia Publishing, written and researched by William L. Cowan, chronicles and celebrates the history of the Verde Valley, Arizona. This book makes note of the Verde River that runs through the Verde Valley and causes the reader to wonder which name came first the Verde Valley or the Verde River. Both were called their current names starting hundreds of years ago when explorers found the Verde Valley and the Verde River, an oasis in the high desert.

The United States Department of the Interior, under Secretary Stewart L. Udall and Director Thomas B. Nolan, began fieldwork in 1957 of the *Geology and Ground Water in the Verde Valley, the Mogollon Rim Region, Arizona*. The findings were published in a book of the same name in 1963 by the U.S Government Printing Office in Washington, D.C. This book is authored by F.R. Twenter and D. G. Metzger.

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

The U.S. Geological Survey Library has cataloged this publication as follows:

Twenter, Floyd R., 1928–

Geology and ground water in Verde Valley—the Mogollon Rim region, Arizona, by F. R. Twenter and D. G. Metzger. Washington, U.S. Govt. Print. Off., 1963.

vi, 131 p. illus., maps (1 fold. col. in pocket) diagrs., tables. 24 cm. (U.S. Geological Survey. Bulletin 1177)
Bibliography: p. 128–129.

1. Geology—Arizona—Verde Valley. 2. Water, Underground—Arizona—Verde Valley. 3. Water supply—Arizona—Verde Valley. I. Metzger, Donald George, 1922– joint author. II. Title: Mogollon Rim region, Arizona. (Series)

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402

GEOLOGY AND GROUND WATER IN VERDE VALLEY—THE MOGOLLON RIM REGION, ARIZONA

By F. R. Twenter and D. G. Metzger

ABSTRACT

Verde Valley is in central Arizona and is a part of the Mogollon Rim region, a mountainous region that forms the transition zone between the Colorado Plateaus and Basin and Range physiographic provinces. Flowing through the valley is the Verde River, which, together with the Salt River, is the chief source of surface water used to support the agricultural economy of central Arizona. The flow in both rivers is perennial and is sustained by ground water from numerous springs.

The average flow in the Verde River near its point of exit from Verde Valley is 470 cubic feet per second. Runoff from precipitation is a major contributor of water to the river, supplying more than half the average flow; but precipitation generally is sporadic, and many weeks may pass without the addition of water from this source. Thus, perennial flow in the river is maintained by ground water that issues either directly to the river or to its tributary streams—West Clear, Beaver, Oak, and Sycamore Creeks. Base flow in the Verde River south of Camp Verde, as measured during the winter, is 225 cubic feet per second.

In Verde Valley, ground water occurs in rocks of Precambrian, Paleozoic, and Cenozoic ages. The Precambrian rocks are chiefly metamorphic and intrusive, the Paleozoic rocks are all sedimentary, and the Cenozoic rocks are chiefly volcanic and sedimentary.

The text references other Government geology research material from 1890 where "the Verde Valley, Arizona Territory" is referenced (see map with notations on next page). As applicants of the Verde Valley AVA, we believe this U.S. Government reference to the Verde Valley dating back 53 years and 126 years respectively is conclusive evidence of the Name Evidence of the Verde Valley.

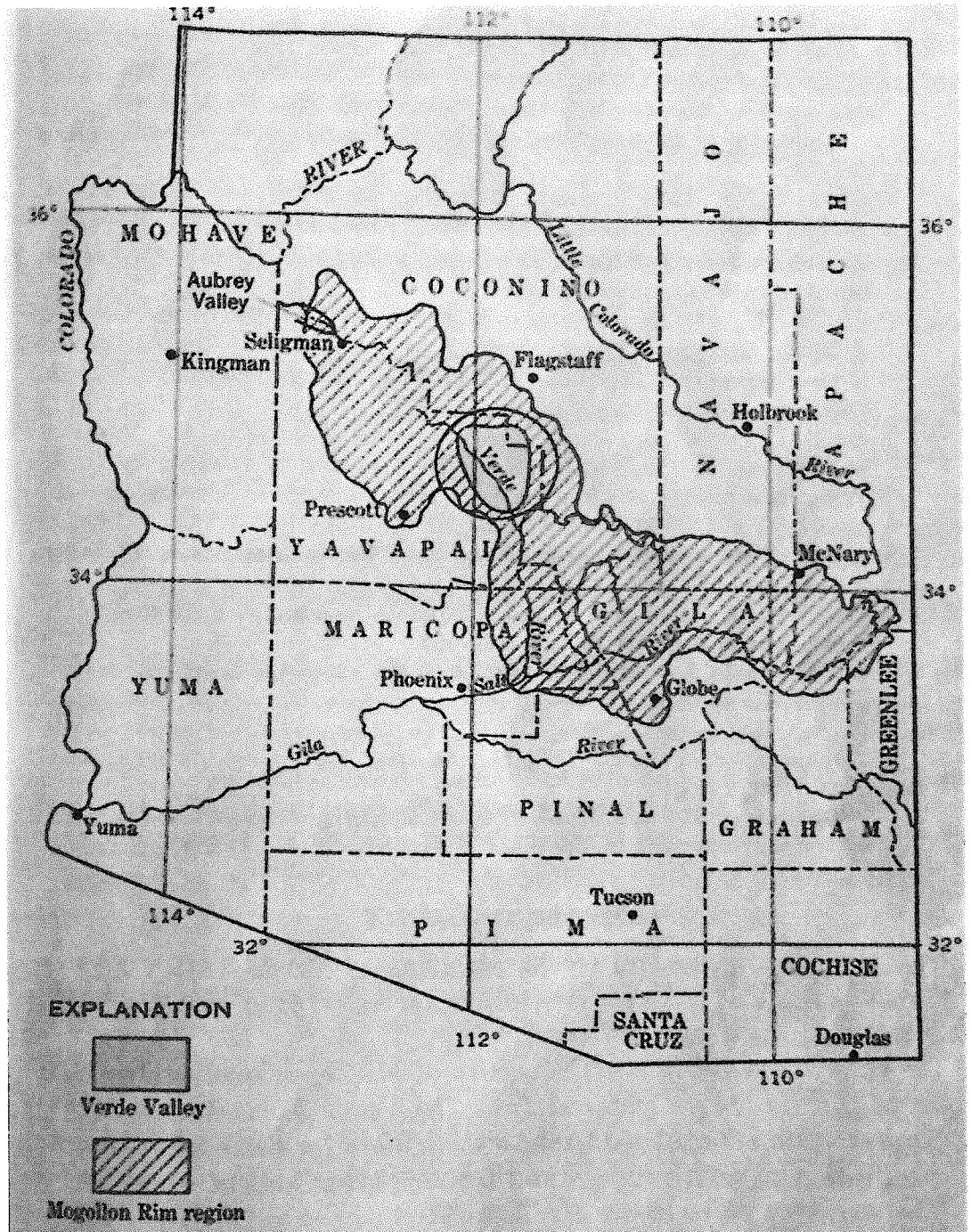


FIGURE 1.—Map of Arizona showing position of Verde Valley in the Mogollon Rim region.

1890. Blake, W. P., Thenardite, mirabilite, glauberite, halite, and associates, of the Verde Valley, Arizona Territory: Am. Jour. Sci., 3d ser., v. 39, no. 229, p. 43–45.

Description of evaporite minerals from the Verde Formation south of Camp Verde.

1922. Reber, L. E., Jr., Geology and ore deposits of Jerome district: Am. Inst. Mining Metall. Engineers Trans., v. 66, p. 3–26.

Good description of the geology and ore deposits in the Jerome area.

There are additional, more modern references for the thriving Verde Valley that includes the Lonely Planet's: "Top 10 US travel destinations for 2013" where they awarded: #9 to Verde Valley, Arizona

https://www.lonelyplanet.com/travel-tips-and-articles/77583

Phoenix New Times Lonely Planet Names Wine centric Verde Valley One of the Top 10 U.S. Travel Destinations for 2013

Monday, December 10, 2012 at 11 a.m.
By Dominique Chatterjee

Caduceus Cellars

The Verde Valley -- encompassing Sedona, Jerome, Cottonwood, and Camp Verde -- is going to experience an influx of visitors in the next year because Lonely Planet just named the Arizona vacation spot as one of the Top 10 U.S. Travel Destinations for 2013. The big draw? Not only are the red rocks beautiful, but the wine country is gaining national attention. Other locales to make the list are Louisville, Philadelphia, American Samoa, and Glacier National Park, Montana.

As Lonely Planet describes, "The Verde Valley region is beautiful, with green canyons rimmed by red rocks, and towns like Cottonwood, Jerome, and Sedona that have long drawn visitors for good food, art, and mining lore. But the Verde boost is all about wine." The publications specifically pointed to Alcantara Vineyards as a destination that can be reached in a unique way: by kayak.

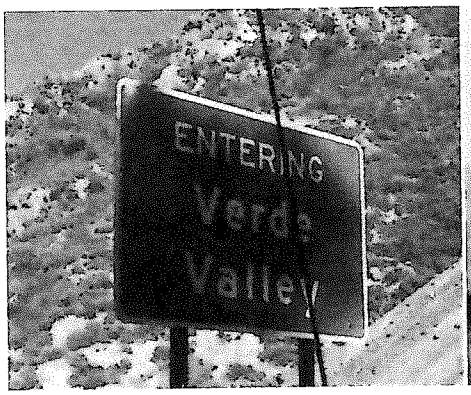
Other wineries on the Verde Valley Wine Trail are Page Springs Cellars, Oak Creek Vineyards, and Javelina Leap Vineyards, each with its own tasting room. Other places to stop, enjoy a glass of wine, and take in the scenery include Dionysian Cellars, Arizona Stronghold Vineyards, and Jerome Winery.

If you're in the area, look out for Caduceus Cellars, the wine label owned by Maynard Keenan of TOOL. The musician worked with Eric Glomski of Page Springs to create a film titled Blood into Wine that documents the process and passion that goes into producing each bottle of wine.

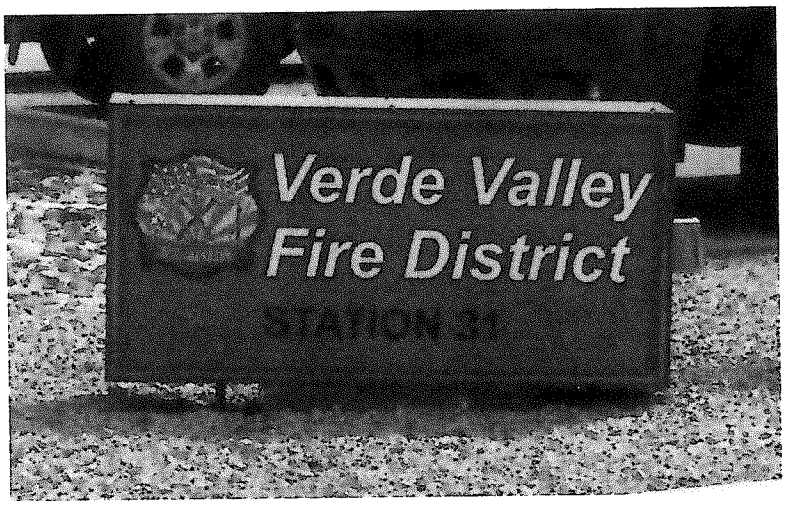
There are reasons to visit the Verde Valley aside from wine, including outdoor activities such as hiking, horseback riding, mountain biking, and kayaking. With the region's temperate climate -- not too cold, but not too hot -- it can be a great destination throughout the year and makes a perfect daytrip from Phoenix.

Finally, we would like to demonstrate with a series of pictures a few samples of how and where the name Verde Valley is used to describe this growing wine region.

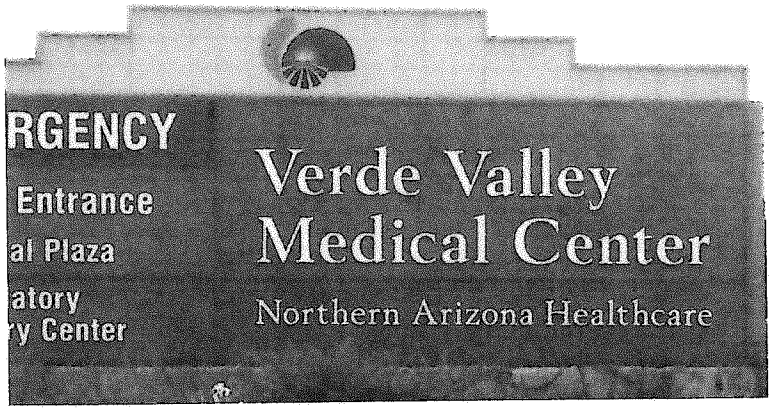
Freeway Signs on Northbound I-17 (left) and Southbound I-17 (right)



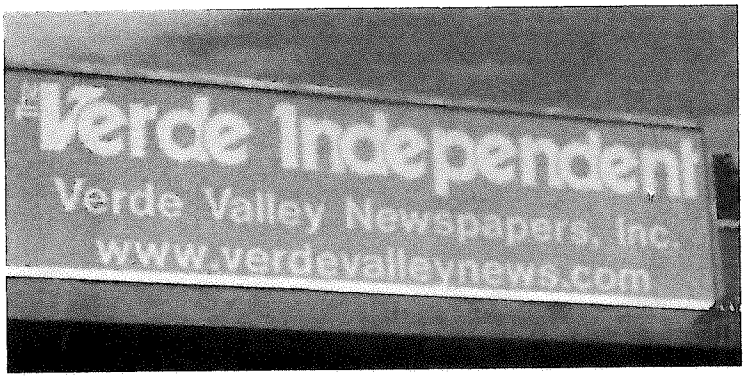
Verde Valley Fire District



The Verde Valley Medical Center



A local newspaper

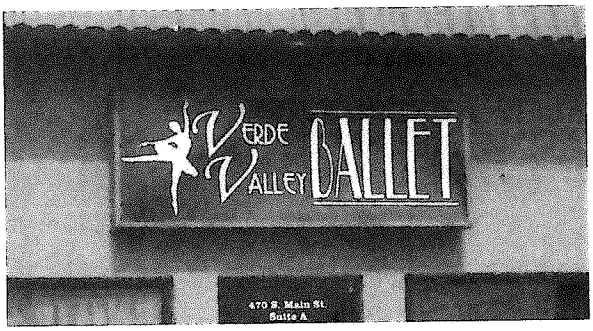


One of the local schools

One of the local inns

One of the local phone books

Even the local ballet company



Please also see attached exhibits:

1) Appendix B: The Economic Contributions of Verde Valley Winemaking dated April 10, 2011 as prepared by Eric Glenn, Yavapai County Cooperative Extension for and in conjunction with the Verde Valley Wine Consortium
2) Appendix C: About the Verde Valley by the Cottonwood Chamber of Commerce
3) Appendix D: Arizona's Growing Wine Industry article, by Alison Stanton, in the Greater Phoenix In-Business Magazine, October 2013.

BOUNDARY EVIDENCE

The proposed Verde Valley AVA boundary lies within an area widely and historically referred to as the Verde Valley, as demonstrated in the Name Evidence section of this petition. The Verde Valley is bordered on the west by the Black Hills Mountain Range and on the eastern side by the Mogollon Rim. The Verde River runs generally through the center, from northwest to southeast, of the Verde Valley. Oak Creek flows south from the northern edge of the proposed AVA boundary and confluences with the Verde River, near the center of the proposed AVA area. The proposed boundary does not include the entire area referred to as the Verde Valley. The boundary was drawn to include only areas deemed likely to be used for viticulture. Being a valley, the Verde Valley has a very definable area, with steep foothills leading up on both sides. Geological and climate data collected and included in the Distinguishing Features portion of this petition was also taken into account when determining the proposed Verde Valley AVA boundary.

The proposed Verde Valley AVA boundary encompasses approximately 130,000 acres (roughly 200 square miles). The entire area referred to as the Verde Valley is about 450,000 acres (714 square miles). As of February 2017, within the proposed AVA boundary, there are 24 commercial vineyards and 125 acres of grapes. The vineyards are fairly evenly distributed across the entire proposed AVA. Included in the Appendices is a map showing the locations of the vineyards throughout the proposed AVA boundary, in addition to the locations of production facilities and tasting rooms (Appendix E). The distribution map (Appendix E) shows more than 24 vineyard locations, as some of the vineyard owners have multiple locations. There are over forty different varieties of wine grapes planted within the proposed AVA boundary. The top five red grape varieties planted in the Verde Valley are Syrah, Petite Sirah, Cabernet Sauvignon, Sangiovese and Zinfandel. The top five white grape varieties planted in the Verde Valley are Malvasia Bianca, Viognier, Chardonnay, Vermentino and Seyval Blanc. Red grapes comprise 81% of the total planted acreage, while white grapes account for 19% of the total planted acreage. In addition to the vineyard acreage, there are eleven licensed and bonded wine production facilities and five additional tasting rooms, some of which utilize custom crush for their production, within the proposed AVA boundary. Total case production in the proposed AVA boundary is currently estimated to be 42,000 cases per annum, some of which utilizes grapes grown outside of the proposed Verde Valley AVA boundary, particularly from vineyards located in the southern Arizona grape growing regions of Sonoita, Willcox and Elgin. An estimated 40 acres of additional vineyards within the proposed Verde Valley AVA boundary are in planning and/or development stage and are expected to be planted within the next five years. There are also several new production facilities in the initial planning stage. In April 2011, a report entitled "The Economic Impact of Verde Valley Winemaking" was published by the University of Arizona, College of Agriculture and Life Science's Yavapai County Cooperative Extension, in conjunction with the Verde Valley Wine Consortium.

In this report, utilizing data collected during 2009 and 2010, they reported 14 commercial vineyards and 78 acres of wine grapes planted. Over the past six years, the number of commercial vineyards has increased by 64% and the total acres planted increased by 54%. A copy of the report is included in the Appendices (Appendix B).

Being a fairly rural area and having vast areas with no usable features on the USGS maps (such as roads, rivers, consistent contours lines, etc.) it became necessary to utilize some of the Section, Range and Township Lines when drawing the proposed AVA boundary. All attempts were made to minimize the use of such lines.

There is quite a lot of National Forest land, both the Prescott and Coconino National Forests, included within the proposed AVA boundary. Due to the preponderance of National Forest land in the Verde Valley, it wasn't practical to draw the boundary to exclude all of the National Forest land. Some of the vineyards within the proposed boundary are actually "islands" of privately owned land surrounded on all sides by National Forest land. Obviously the National Forest land will never be planted with vineyards, but practicality precluded excluding much of the National Forest land when drawing the boundary. It is estimated that 80% of the entire area referred to as the Verde Valley is National Forest land. Since the entire area referred to as the Verde Valley is not included in the proposed AVA boundary, it is estimated that 33% of the land in the proposed AVA boundary is National Forest land. Efforts were also made to exclude the areas of two of the National Monuments (Montezuma Castle and Montezuma Well) located in the Verde Valley, near the proposed AVA boundary. There is still plenty of privately owned, plantable acreage available within the proposed AVA boundary, in spite of the amount of National Forest land.

The northern edge of the proposed AVA boundary is very well defined. A short stretch of Section line was required to be used on the western portion of the northern boundary before using the Verde River, the 3,800 foot contour line, and several roads (including Bill Gray Road). The 3,800 foot contour line was chosen for as much of the northern boundary as possible. Above 3,800 feet, the land becomes very steep, much of it is uninhabited and is part of the Coconino National Forest.

The eastern edge of the proposed AVA boundary is somewhat more complicated. There are no consistent contour lines or features that run the entire length of the proposed AVA boundary. The lower and middle portions of the eastern boundary follow both the 3,300 and 3,600 foot contour lines for part of its length. Above these elevations the land is mostly uninhabited and part of the Coconino National Forest. Efforts were made to exclude the two Montezuma Castle National Monuments (a.k.a. Montezuma Castle and Montezuma Well). The middle portion of the eastern boundary relies on a short stretch of road (Cornville Road) to make up the boundary, before returning to and heading north along the 3,800 foot contour line. Above this section of the 3,800 foot contour line, the land is mostly uninhabited, National Forest land and extremely steep.

The southern edge of the proposed AVA area primarily runs along Section Lines, as there are no consistent features on the USGS map. This area was chosen as the southern boundary because as most areas south of this point are uninhabited and much of it is Coconino National Forest land.

The western edge of the proposed AVA boundary is very well defined and runs along the 3,800 foot contour line in the foothills of the Black Hills mountain range for a majority of its length, beginning in the Camp Verde Quadrangle and ending in the Cottonwood Quadrangle (south to north). The 3,800 foot contour line was chosen, because above this elevation the terrain becomes very steep and rocky. Also most of the land above the 3,800 foot contour line is uninhabited and part of the Prescott National Forest. The one exception is in the northern portion of the western boundary. The boundary heads northwest up the slope to the 5,000 foot contour line near the Town of Jerome, in the Cottonwood Quadrangle and passing into the Clarkdale Quadrangle, and then heads north and eventually in an easterly direction back to the 3,800 foot contour line.

DISTINGUISHING FEATURES

(i) Climate, temperature, precipitation, wind, fog, solar orientation and radiation, and other climate information;

Precipitation within the proposed Verde Valley AVA is approximately 14 inches a year (see table 1). This is a significant decrease in moisture compared to the surrounding areas. The lower rainfall creates a warm and dry climate appropriately suited for wine grape production. Verde Valley vineyards must supplement the natural precipitation with irrigation. In an effort to promote sustainable agriculture in a high desert climate, vineyards are developing and employing water conservation practices. Examples of the low water use practices that are implemented in the Verde Valley are drip irrigation, water deficit farming post anthesis, and the use of agriculturally approved reclaimed water. As discussed in the Elevation section (v) of this petition, the high elevation areas adjacent to the proposed AVA are not suitable for agriculture because of the lack of available ground water. The rainy season, which provides much of the region's moisture, occurs near the end of the growing season (July-August.) These rains can provide relief from the high summertime temperatures found within the Verde Valley basin. The decrease in average daily temperature provided by the rains can extend the ripening period of grapes, provide better flavor development, and promote the retention of acid.

The high elevation desert climate of the Verde Valley experiences large diurnal temperature swings. Within the proposed AVA, the difference between daytime high temperatures and nighttime low temperatures exceed well over 30°F (see table 2). This is in contrast to the areas around the Verde Valley, which are even higher in elevation and do not experience the warm daytime temperatures adequate for grape production. In fact, the neighboring high elevation geographic features increase the diurnal temperature swings by providing a cool nighttime airflow that drains into the Verde Valley moving in from the north and exiting out of the southeastern edge. The valley's warm daily temperatures provide suitable heat and sunlight for photosynthesis. However, the cooling effect provided by the higher elevations, which delays grape ripening, lessens the respiration of acids, and increases phenolic development is imperative to the exceptional character of the region's wine grapes.

The warm temperatures within the Verde Valley are evident by assessing the average annual growing degree-days (GDD) of the region. Over a 5-year period (April 1, 2012 – April 1, 2017), the average GDD of the Verde Valley was 5,580 (see table 1). This is considerably higher than the areas immediately adjacent to the valley. Growing degree-days is a heat index scale, which takes in to account the summation of daily high and low temperatures above the base of 50°F, and predicts which varieties are appropriate for a particular growing zone. Based in part on the GDD of the area, Verde Valley vineyards have focused on varieties such as Syrah, Cabernet Sauvignon, Petite Sirah, Zinfandel, Malvasia Bianca, and Viognier. These fuller bodied grapes, which are historically grown in warmer climates, like the high temperatures and inland climate found within the proposed AVA. Appendix G to this petition shows the current varietal breakdown of wine grape plantings in the area. The data from this recent vineyard study quantifiably shows a preference for grape varieties that grow well in the warmer climates. Many of the wine grape varieties found in the Verde Valley are native to inland areas of southern Europe. Verde Valley wines made from these varietals have assertive flavors and complex textures that are unique to the region.

Table 1:

Climate Data (2012-2017)					
Features	**Within the proposed Verde Valley AVA**	**Fry** North of the proposed AVA	**Bar M** East of the proposed AVA	**Baker Butte** South of the proposed AVA	**Prescott** West of the proposed AVA
Elevation	3470 ft.	7200 ft.	6393 ft.	7300 ft.	5205 ft.
Annual Mean Temperature (Average over 5 year period)	64.1°F	49.0°F	50.4°F	53.3°F	57.7°F
Max Temperature	117°F	94°F	98°F	94°F	104°F
Minimum Temperature	12°F	-11°F	-10°F	6°F	2°F
Annual Growing Degree Days (Average over 5 year period)	5,580	1,797	1,727	2,668	3,544
Annual Precipitation (Average over 5 year period)	13.83"	29.4"	26.86"	27.88"	18.1"

Table 2:

2014-2016 Growing Season Mean Diurnal Temperature (°F)																		
	April			May			June			July			August			September		
	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016
Within the proposed Verde Valley AVA	37.7	37.3	35.4	38.8	33	36	41.3	38	39.5	32.1	32.2	36.8	29.5	34.4	29.8	31	33.9	32.2
Fry (North of the proposed AVA)	28.3	26.6	24.9	30	22.7	26.6	35.4	30.4	32.7	27.7	25.1	29.2	23.7	26.5	24.4	24.1	26.3	25
Bar M (East of the proposed AVA)	31.7	33	28.7	32.9	30.6	30.6	38.7	35.7	37	30	28	32.3	26.8	29.4	27.2	27.3	30.4	28.9
Baker Butte (South of the proposed AVA)	19.7	19.9	18.5	20.9	18.7	19.5	23.2	20.8	23.1	21.9	19.6	22.1	18.7	20.5	18	16.2	18.4	16.7
Prescott (West of the proposed AVA)	30.3	30.2	27.6	30.5	26.1	28.1	33.3	31.2	31.1	25.8	24.6	28.1	25	26.1	24.4	26.6	28.7	26.3

(ii) Geology. Underlying formations, landforms, and such geophysical events as earthquakes, eruptions, and major floods;

The proposed Verde Valley AVA is located in the Verde River basin of central Arizona in an area categorized as a Basin and Range physiographic province.

The structural features belong to two general periods; an early period (late Triassic, Cretaceous, or early Tertiary age) which predates the Hickey formation (Pliocene), and a late period (late Tertiary or Quaternary) which postdates the Hickey.

The geological formation of the Verde Valley, as we know it today, probably began when the early lava flows of the Hickey formation were extruded throughout most of the area. After this extrusion, the latest and strongest deformation occurred; which consisted principally of normal faults accompanied by slight rotation of the individual fault blocks and uplift of the Colorado Plateau. Additional local monoclinal folding took place. About this time, the Black Hills were blocked out by marginal northward and northwestward trending faults. This late faulting also caused the reversal of the drainage, which previously had been to the north. The Verde formation, which comprises lava, lakebeds, and gravel, accumulated in a basin on the east side of the Black Hills. The Verde Valley was born.

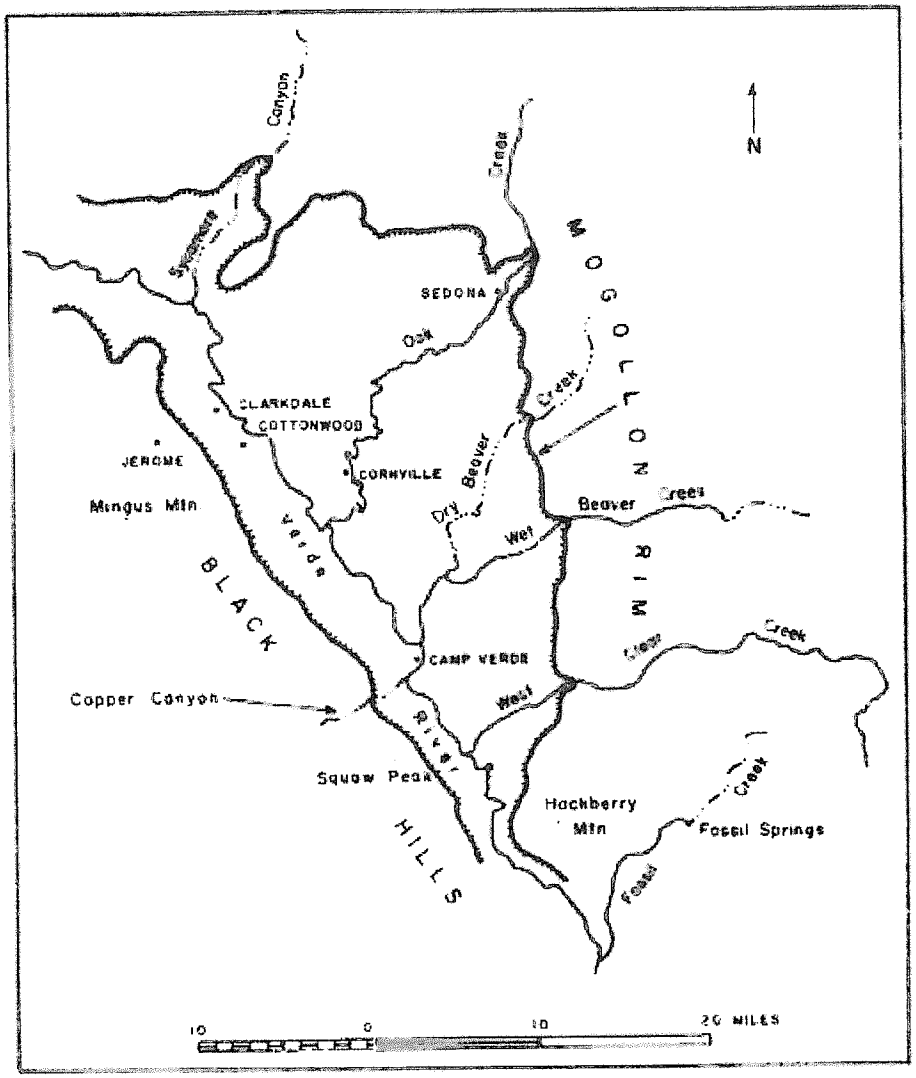


Figure 1 - Map of the Verde Valley [1]

(iii) Soils. Soil series or phases of a soil series, denoting parent material, texture, slope, permeability, soil reaction, drainage, and fertility;

The alluvial soil formations found throughout the proposed Verde Valley AVA are mainly of the Altar, Mule, Cornville, Anthony, Retriever, House Mountain, Cowan and Arizo soil series. The compositions of soils range from very fine sandy loam to gravelly loam with silt and limestone appearing at sections along the Verde River. Over the course of geologic history, the Verde River and Oak Creek are responsible for a distribution of sediment from many of the rock formations through which they pass within the Verde Valley. Traces of the Supai, Verde, and Martin Limestone formations can be found throughout the proposed AVA.

These diverse soil deposits are a unique feature to the Verde Valley that is not found in the surrounding higher elevations. For example, the Bar M weather station alluded to above in the Climate Data, located East of the proposed AVA, is mostly stony rough land, basalt and cinders with lesser amounts of Brolliar stony clay loam, (0 to 10 percent slopes) and a lesser amount of Brolliar cobbly loam and alluvial land. To the South, the Baker Butte station has mostly Brolliar very stony clay loam (0 to 10 percent slopes) with the remainder split between Soldier cobbly loam (0 to 10 percent slopes) and Soldier cobbly loam (20 to 45 percent slopes). Finally, to the west of the proposed AVA, the Prescott weather station has substantial amounts of Lonti-Wineg complex soil (3 to 15 percent slopes) along with Lynx soils. This data was derived from the USDA Online Web Soil Survey. Soil data for the Fry weather station disposed in a mountainous region North of the proposed AVA was not available from the USDA Soil Survey.

Today the greater Verde Valley is geographically not just a valley, it is essentially a bowl with a crack in it to the south where the rivers flow out of the valley, as does I-17 (see Figure 1 – map, above). To the north and east is the "abrupt cliff" of the Mogollon Rim, an escarpment that forms the southern edge of the Colorado Plateau. Here the elevations rise quickly 3000 to 4000 feet to approximately 8000 feet. This significant elevation change results in dramatic changes to the soils and the vegetation (primarily Pondersoa Pine on the Rim). The soils outside of the proposed AVA, and just outside the Verde Valley – on the Mogollon rim, are defined as "stoney" with "Brolliar[2] stoney loam" making up about 40% of the soil, and "Siesta stony slit loam" about 10%. The remaining 50% is a variety of about 22 other defined soils with many having the term "very stony" or "stony" in their name. Additionally, in many places, the Rim is capped by extensive basaltic lava flows. Suffice it to say these soils are stony, typical with a dramatic elevation climb and are not suitable for any crop.

To the west and the southwest is Mingus mountain as part of the Black Hills mountain rage (see Figure 1 – map, above). Where the Mogollon Rim is more of a curved side of the Verde Valley "bowl" to the north and east, in contrast the Black Hills Mountain range is more of a straight side running diagonally from the south to the northwest giving the Verde Valley "bowl" a lopsided straight edge on that side. Here the elevation also climbs quickly to approximately 7800 feet. This mountain range, as is typical, is not defined by soil types, but by rock layers defined by geological layers representing millions of years. This mountain range that helps define the Verde Valley "bowl" is also not suitable for any crops.

Within the Verde Valley "bowl," fossils occur in many of the soil beds in the northern part of the valley. The fossils are gastropods, pelecypods, ostracods, charophyte, vertebrate teeth and bones, and plant fragments. The soils within the proposed Verde Valley AVA have a positive influence on viticulture. Broadly speaking, the loamy composition of most soil structures provides appropriate water drainage. The nutrient levels tend to be above a moderate level. However, low calcium and magnesium levels are common. High bicarbonate levels found in groundwater have been found to increase soil pH and inhibit nutrient uptake of vines. These conditions can be mitigated and even enhanced with rootstock, varietal and clonal selections that can tolerate and even benefit from these conditions. Ultimately the rootstock-varietal-soil-climate combinations would potentially produce wine with characteristics unique to our proposed AVA.

(iv) Physical features. Flat, hilly, or mountainous topography, geographical formations, bodies of water, watersheds, irrigation resources, and other physical features; and

The lower elevations of the Verde Valley near Oak Creek and the Verde River can be classified as hilly. The edges of the proposed Verde Valley AVA slope down towards the valley floor from a 2 to 15 percent slope. At the valley floor, ledge-and-slope topography can be found. Air flow through the valley creates the potential for damaging low temperatures in the spring. Lower elevations adjacent to the river are at a higher risk for frost damage. Verde Valley vineyards use an assortment of methods to mitigate this threat including the use of inversion fans, late budding varieties, vineyard placement and orientation, and protective sprays.

The aquifers in the Verde Valley are the chief source of water used to support the agricultural economy of central Arizona. The Verde River, which flows through the proposed Verde Valley AVA, is sustained by groundwater from numerous springs and as well as runoff from precipitation. The high elevation features which surround the Verde valley provide much of the run-off which feeds the Verde River. The Mogollon Rim to the north and east of the proposed AVA provides the majority of this surface water flow. However, precipitation in this high desert environment can be sporadic and many weeks may pass without the addition of water from this source. The perennial flow in the river is maintained by groundwater from a number of aquifers that are found within the Verde Valley. A tributary of the Verde River is Oak Creek which provides water for some of the vineyards on the eastern edge of the proposed AVA. The major aquifers are the Verde Formation, Supai Formation, Redwall Limestone, and Coconino Sandstone. Wells provide access to water for many of the vineyards.

(v) Elevation. Minimum and maximum elevations.

The elevation range of the proposed Verde Valley AVA is between 3,200 and 5,000 feet. The western and eastern edges of the AVA are the highest points at 5,000 and 3,900 feet respectively. From these boundaries, the elevation is sloped down to the Verde River which itself drops in elevation to the south and east. The relatively high elevation of the Verde Valley creates a unique climate zone which is largely responsible for the character found in the wine grapes grown in the region. The areas adjacently surrounding the proposed Verde Valley AVA provide dramatic elevation gains which play an important factor in the weather patterns that are experienced by vineyards within the Verde Valley. The high elevations areas adjacent to the Verde Valley are inhospitable for viticulture because of cold temperatures, an inaccessibility of ground water, restrictions on the use of federal lands and an absence of suitable soil.

[1] Twenter, F.R. (1962). *Rocks and water in Verde Valley, Arizona*, (pp. 135-1390). Iowa City, IA: U.S. Geological Survey.

[2] The Brolliar series consists of moderately deep, well drained soils that formed in material weathered from basalt. Brolliar soils are on hillslopes and have slopes of l to 30 percent.

Ref: https://soilseries.sc.egov.usda.gov/OSD_Docs/B/BROLLIAR.html
and https://pubs.usgs.gov/bul/1021n/report.pdf

MAPS AND BOUNDARY DESCRIPTION

Proposed Name: Verde Valley AVA

Approved maps: The following nine United States Geological Survey (USGS) 1:24,000 scale topographic maps used to determine the boundary of the Verde Valley viticultural area are included with this petition and are titled:

1. Camp Verde, Ariz., 1969;
2. Clarkdale, Ariz., 1973;
3. Cornville, Ariz., 1968;
4. Cottonwood, Ariz., 1973;
5. Lake Montezuma, Ariz., 1969;
6. Middle Verde, Ariz., 1969;
7. Munds Draw, Ariz., 1973;
8. Page Springs, Ariz., 1969; and
9. Sedona, Ariz., 1969.

In the Appendices Section, there is a chart (Appendix F) which shows the orientation of the USGS Topographic Maps used for the proposed AVA boundary.

Proposed Boundary: The Verde Valley AVA would be located entirely within the boundaries of Yavapai County, Arizona and is not part of nor does it overlap any other existing viticultural area. There are no other active AVA petitions, either inside of the proposed boundary or overlapping the proposed viticultural area, for any part of the proposed Verde Valley AVA at this time. There is no known area within the United States utilizing the name "Verde Valley". Additionally, there are no known bonded, licensed, commercial wineries within the proposed AVA boundary or outside of the proposed AVA boundary using "Verde Valley" as all or part of a brand name at this time.

The proposed boundary, described in a clock-wise direction, for the Verde Valley AVA is as follows:

1. The beginning point of the boundary is the intersection of the 3,800-foot contour line and the northern Section Line of Section 32, R. 3 E./T. 17 N. in the Clarkdale Quadrangle (northwesterly corner of the proposed viticultural area), marked on the map with a star and labeled "Starting Point";
2. The boundary heads a short distance east along the northern Section Line of Section 32, R. 3 E./T. 17 N. until it intersects with the Verde River, still on the northern side of Section 32, R. 3 E./T. 17 N. in the Clarkdale Quadrangle;

3. The boundary then follows the Verde River in a northerly direction to its intersection with the western Section Line of Section 21, R. 3 E./T. 17 N.;
4. The boundary heads north along the western Section Line of Section 21, R. 3 E./T. 17 N. and Section 16, R. 3 E./T. 17 N. to its intersection with the 3,800 foot contour line;
5. The boundary follows the 3,800-foot contour line in a southeasterly and then an easterly direction, passing out of the Clarkdale Quadrangle and into the Page Springs Quadrangle until it intersects with a Light-duty road, all weather, improved surface (marked as Bill Gray Road) in Section 18, R. 4 E./T. 16 N. in the Page Springs Quadrangle;
6. The boundary follows north along the Light-duty road, all weather, improved surface (marked as Bill Gray Road) until it intersects with the an unnamed, unimproved road (known as Forest 761B Road) in Section 32, R. 4 E./T. 17 N. still in the Page Springs Quadrangle;
7. The boundary heads east and then northeast along the unnamed, unimproved road (Forest 761B Road) to its intersection with a light duty, all weather, improved surface road, marked as Red Canyon Road, in Section 26, R. 4 E./T. 17 N. in the Page Springs Quadrangle;
8. The boundary turns south and follows the light duty, all weather, improved surface road, marked as Red Canyon Road, to its intersection with a primary highway, all weather, improved surface road (marked as ALT 89) in Section 35, R. 4 E./T. 17 N.;
9. The boundary crosses over the primary highway, all weather, improved surface road (marked as ALT 89) to an unnamed, unimproved road which becomes a light duty, all weather, improved surface road, known as Angel Valley Road, in Section 35, R. 4 E./T. 17 N.;
10. The boundary follows the light duty, all weather, improved surface road, known as Angel Valley Road, in a southeasterly direction, crossing Oak Creek, until it intersects with the 3,800 foot contour line near a feature marked as Deer Pass Ranch in Section 12, R. 4 E./T. 16 N. on the eastern side of the Page Springs Quadrangle;
11. The boundary line follows the 3,800 foot contour line in south/southeasterly direction passing out of the Page Springs Quadrangle, briefly into the extreme southwestern corner of the Sedona Quadrangle and into the Lake Montezuma Quadrangle until it in intersects with an unnamed creek in Section 6, R. 5 E./T. 15 N.;
12. The boundary follows the unnamed creek in a southwesterly direction until it intersects with the 3,600 foot contour line in Section 1, R. 4 E./T. 15 N. on the western edge of the Lake Montezuma Quadrangle;
13. The boundary proceeds southerly along the 3,600 foot contour line until its intersection with an unnamed Secondary highway, all weather, hard surface (known as Cornville Road) still in Section 7, R. 5 E./T. 15 N. in the Lake Montezuma Quadrangle;
14. The boundary heads southeasterly along the unnamed, secondary highway, all weather, hard surface (known as Cornville Road) until its intersection with 3,600 foot Contour Line in Section 20, R. 5 E./T. 15 N. in the Lake Montezuma Quadrangle;
15. Moving in an easterly and then southerly direction, the boundary follows the 3,600 foot contour line until it intersects with the northern border of the Montezuma Castle National Monument (a.k.a. Montezuma Well) in Section 36, R. 5 E./T. 15 N.;

16. The boundary travels west along the northern border, south along the western border and east along the southern border of the Montezuma Castle National Monument (a.k.a. Montezuma Well) in Section 36, R. 5 E./T. 15 N. until its intersection with the Range Line separating R. 5 E. and R. 6 E.;
17. The boundary follows the Range Line separating R. 5 E. and R. 6 E. south, passing out of the Lake Montezuma Quadrangle and into the Camp Verde Quadrangle, until its intersection with the Section Lines at the four corner intersection of Sections 12 and 13 in R. 5 E./T. 14 N. and Sections 7 and 18 in R. 6 E./T. 14 N.;
18. The boundary then travels due west along the Section Lines separating Sections 12, 11, 10 and 9 on the northern side and Sections 13, 14, 15, 16 on the southern side (all in R. 5 E./T. 14 N.) until it intersects with the northeastern corner of the border of the Montezuma Castle National Monument (the one with the Cliff Dwelling, a. k. a. Montezuma Castle) in Section 8, R. 5 E./T. 14 N. in the northern portion of the Camp Verde Quadrangle;
19. The boundary travels west along the northern border, south along the western border and east along the southern border of the Montezuma Castle National Monument (Cliff Dwelling, a. k. a. Montezuma Castle) until it intersects with the 3,300 foot contour line in Section 16, R. 5 E./T. 14 N.;
20. The boundary proceeds along the 3,300 foot contour line south/southwesterly through the Camp Verde Quadrangle until its intersection with the eastern Section Line of Section 18, R. 6 E./T. 13 N. just north of Clear Creek in the southwestern corner of Camp Verde Quadrangle;
21. The boundary travels briefly south along the eastern Section Line of Section 18, R. 6 E./T. 13 N. until it intersection with the eastern side of the Section Line that separates Section 18, R. 6 E./T. 13 N. to the north and Section 19, R. 6 E./T. 13 N. to the south, just north of a Light-duty road, all weather, improved surface (marked on the USGS map as Toms Creek Road) on the southeastern edge of the Camp Verde Quadrangle;
22. The boundary proceeds west in the Camp Verde Quadrangle along the line which bisects Sections 18 through 13 in R. 5 E./T. 13 N. plus Section 18, R. 6 E./T. 13 N. on the northern side and Sections 19 through 24 plus Section 19, R. 6 E./T. 13 N. on the southern side until it intersects with the 3,800 foot contour line between Section 13, R. 4 E./T. 13 N. on the north and Section 24, R. 4 E./T. 13 N. on the south;
23. The boundary follows the 3,800 foot contour line in a northwesterly direction passing into and through the Middle Verde Quadrangle and into the Cottonwood Quadrangle until its intersection with an unnamed creek (located in Del Monte Gulch) in Section 5, R. 3 E./T. 15 N.;
24. The boundary follows the unnamed creek in Del Monte Gulch in a westerly direction to its intersection with the 5,000 foot Contour Line in Section 26, R. 2 E./T. 16 N. still within the Cottonwood Quadrangle;
25. Moving in a generally northerly direction, the boundary follows the 5,000 foot Contour Line passing out of the Cottonwood Quadrangle, into and out of the Clarkdale Quadrangle and into the Munds Draw Quadrangle until its intersection with a dotted line marked "Pipeline" on the map in Section 4, R. 2 E./T. 16 N. in the Munds Draw Quadrangle;

26. The boundary travels at first in a southeasterly direction along the dotted line marked "Pipeline" on the map passing out of the Munds Draw Quadrangle and into the Clarkdale Quadrangle before turning to the northeast until its intersection with the 3,800 foot Contour Line in Section 32, R. 3 E./T. 17 N. still in the Clarkdale Quadrangle;
27. The boundary follows the 3,800 foot Contour Line in a northerly direction until it intersects with the northern Section Line of Section 32, R. 3 E./T. 17 N. in the Clarkdale Quadrangle to return to the beginning point.