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February 23, 2015

California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.ca.gov

Re: The DRECP and the Amargosa Watershed

On behalf of the members and Board of Directors of the Amargosa Conservancy, please accept our comments herein on the Desert Renewable Energy Conservation Plan. Please refer to our second comment letter, dated February 23, 2015, for our comments on National Conservation Lands and Special Recreation Management Areas. Please also refer to the letter from Kevin Emmerich and Laura Cunningham, dated January 30, 2015, which the Amargosa Conservancy is signatory to. This letter details the need for a new program alternative in the DRECP which properly evaluates rooftop solar.

To sum the key points of this letter:

- No groundwater pumping should be permissible in the Amargosa Watershed, including Charleston View, Silurian Valley, and Stewart Valley. Such activities would cause direct mortality of endangered species such as the Amargosa vole. USFWS take permits should be required for any groundwater pumping, and such permits should not be issued given the precarious conservation status of the vole.
- No mitigation can adequately compensate the ecosystem for the damage done by groundwater withdrawal. Retirement of water rights is not sufficient, and monitoring and triggering schemes are completely inadequate to protect the resources of the Amargosa Wild and Scenic River.
- Due to numerous biological, cultural, and social resource conflicts, Charleston View is not an appropriate place for utility-scale solar, should not be designated as a Development Focus Area (DFA).
- We defer to the National Park Conservation Association's comments for Silurian Valley. Silurian Valley is not an appropriate place for utility-scale solar. The Special Assessment Area should be eliminated, and all Public Lands in Silurian Valley should be designated as National Conservation Lands.
- The DRECP variance lands in Stewart Valley should be eliminated, and the land should be designated National Conservation Lands.

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Groundwater Pumping and Endangered Species in the Amargosa Watershed

The Amargosa Watershed and Groundwater

The Amargosa Watershed is one of the most unique hydrological systems in the world. From its beginnings in the Oasis Valley north of Beatty to its ultimate evaporation on the salt flats of Badwater Basin, the Amargosa River's water provides the vital resource which sustains life throughout the Watershed. But the Watershed must be defined more broadly than simply the surface runoff patterns. Complex subterranean carbonate and alluvial fill aquifers transmit water from self-contained basins to the north and east of the Amargosa River's surface watershed into the basin itself, emerging at the many springs which constitute the Amargosa's surface flow.

The interconnectedness of this system is only now being fully understood. The State of the Basin Report- 2014 (SBR), a report written by Andy Zdon & Associates, Inc. with support from the Amargosa Conservancy, the Nature Conservancy, and the Bureau of Land Management (BLM), adds significantly to our knowledge the system. The SBR itself, included with this comment as Attachment A, is vital for planners to read and be familiar with. It outlines an extremely complicated hydrological system which relies on subsurface groundwater flows from a variety of sources.

Perhaps most pertinent to our current discussion, the SBR makes clear that a substantial portion of the water in the Amargosa system comes from the Pahrump Valley aquifer. This water flows through carbonate bedrock and alluvial fill aquifers, moving along multiple flowpaths into the springs of the Amargosa River. One flow path goes beneath the Nopah Range, entering into the Amargosa surface watershed in Chicago Valley, and flowing thence both downward to Resting Spring and Tecopa Marsh and underneath the Resting Spring Range to Shoshone. Another flow path runs under and around the southern Nopah Range, flowing through the Charleston View area and California Valley, collecting water from the Kingston Range and emerging to the surface at Willow Spring. Yet another flowpath moves to the north, emerging at Ash Meadows and Carson Slough. The interconnectedness of this system is beyond dispute, based on the latest trace mineral and isotopic analysis included in the SBR.

Additionally, there is a secondary flowpath which enters the Amargosa River from Salt Creek. Salt Creek is the hydrologic system which drains Silurian Valley. While it does not contribute a large proportion of the overall water budget of the Amargosa, the abundance of water apparent at Salt Springs just above the confluence with the Amargosa River indicates that there is a substantial volume of groundwater flowing through Silurian Valley and into the Amargosa.

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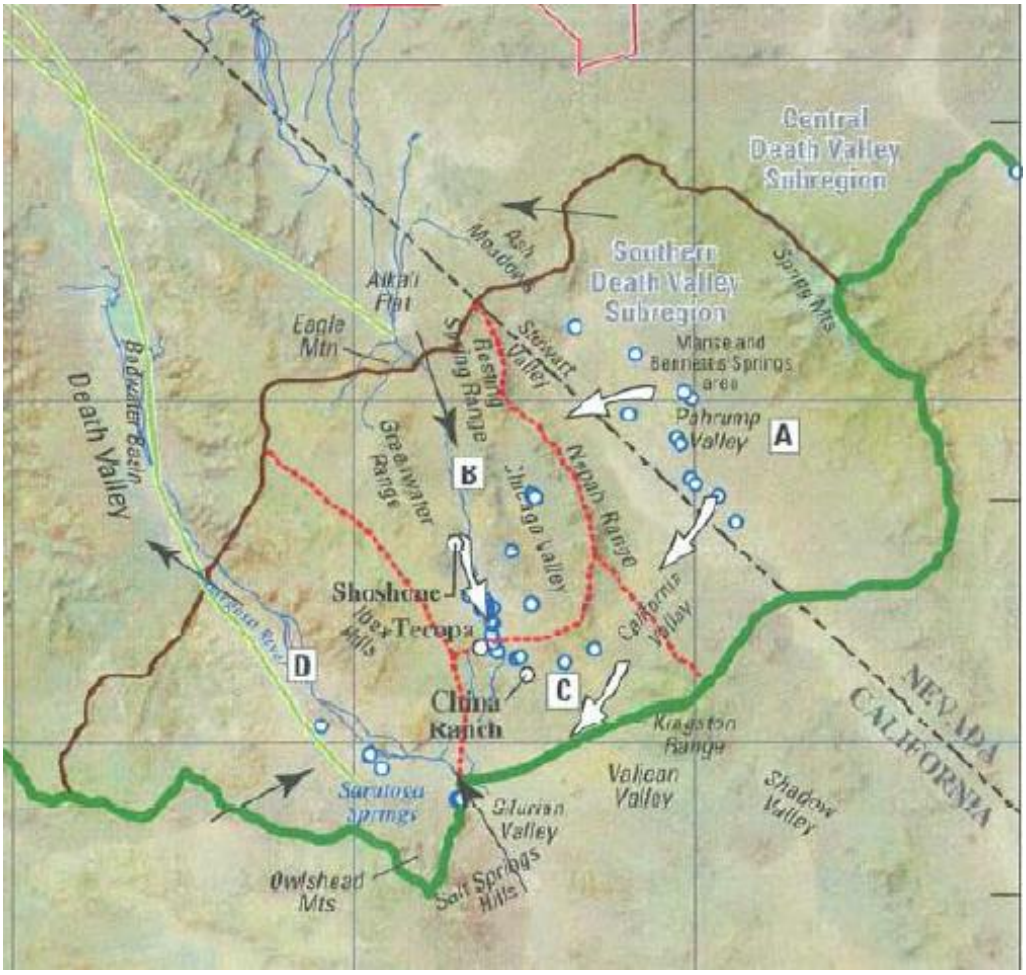

Figure 1: The complex flowpaths of the Middle Amargosa Basin. Zdon, 2014.

This information needs to be specifically considered when evaluating the proposed DFA in Charleston View, the Special Analysis Area in Silurian Valley, and DRECP variance lands in Stewart Valley. Any groundwater withdrawals for utility-scale solar within the Pahrump Valley or Silurian Valley aquifers, which are an integral part of our unique watershed, could have detrimental effects on groundwater flows within the Amargosa River system itself. Given the complex and somewhat paradoxical nature of the system, the exact effects of such withdrawals cannot be accurately predicted. But down-flowpath effects are a certainty.

Take Permits for the Amargosa Vole and Other Species

The Amargosa vole *(Microtus californicus scirpensis)* is considered potentially the most endangered mammal in North America, and was listed federally in 1984. Its sole remaining habitat is the bulrush marshes of Tecopa Hot Springs, where the Amargosa bubbles to the surface

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at a series of watering holes. Voles rely on bulrush to make their nests, take cover from predators, and as their primary food source. Groundwater pumping in the Pahrump Valley has decreased the amount of water emerging from these springs, thereby lowering the water level in the marsh. This has, in turn, dried out portions of the marsh, eliminating bulrush and decreasing the connectivity between vole habitat patches. This increased fragmentation has only been exacerbated by the limited development present in Tecopa, and decreasing precipitation in the desert as a whole.

As a result, the vole sits precariously on the brink of extinction. There are fewer than 200 individuals left in the wild, all within a few square miles of Tecopa Marsh. A single cataclysmic event, such as a lowering of water levels secondary to groundwater pumping, could wipe out the species. This was evidenced in recent history, when a small alteration to the drainage system across the Tecopa Road caused a drop in water levels, which dried up much of the bulrush and precipitated a population crash. By late 2013, there were fewer than 36 individuals left. That a slight adjustment in the drainage system which caused the water level to rise by several inches has begun to reverse this damage is further evidence as to just how sensitive of a balance exists between water output from the springs, bulrush, and the vole. [1]

Thus it is incumbent upon the REAT to examine the potential effects of groundwater pumping of any kind in the Charleston View DFA, Stewart Valley, or Silurian Valley on the Amargosa River and the species which depend on its water. Due to the critically endangered nature of the Amargosa vole, solar development in these areas should require take permits from the US Fish and Wildlife Service. Such permits should not be issued by FWS, because the vole exists in too precarious a position to allow even one take.

The Amargosa vole is not the only endangered, threatened, or otherwise special status species which relies on consistent groundwater flows in the Amargosa Watershed. Two halophytic plants, the federally endangered Amargosa niterwort *(Nitrophila mohavensis)* and the federally threatened Ash Meadows gumplant *(Grendelia fraxino-pratensis)*, exist in California only in the Carson Slough area east of Death Valley Junction. These species have extremely limited distributions, living only on seasonally inundated alkali flat habitat with specific soil densities and characteristics.[2] Any alteration to the flow regime and groundwater level in Carson Slough has the potential to wipe out these species completely. This is especially of concern with regard to variance lands in Stewart Valley. No groundwater pumping of any kind should be permitted

[1] Klinger, Cleaver, Anderson, Maier, & Clark. 2015. "Implications of scale-independent habitat specialization on persistence of a rare small mammal." Global Ecology and Conservation 3, 100-114.
[2] San Diego State University Soil Ecology and Research Group, 2004. Demographics and Ecology of the Amargosa Niterwort (Nitrophila mohavensis) and Ash Meadows Gumplant (Grendelia fraxino- pratensis) of the Carson Slough Area. http://www.sci.sdsu.edu/SERG/restorationproj/mojave%20desert/deathvalleyfinal.htm

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on these variance lands by BLM, nor on adjacent private lands by CEC, as these plants are protected under the Endangered Species Act.

Mesquite bosque is considered a special status natural community by CDFW. This habitat is rich in wildlife habitat, important to migratory and resident birds, and holds a treasure trove of archaeological resources. They are considered "very threatened" by the state, and the Draft PEIR itself describes it as a habitat type that is "extremely restricted in California." Mesquite is dependent on reliable and shallow groundwater, and can thrive even in the absence of surface water, as in the Chicago Valley. Of critical importance is that the mesquite bosque of the Shoshone Wetlands, Willow Creek, and the Amargosa Canyon provide the most important breeding grounds for the least Bell's vireo *(Vireo bellii pusillus)* in the Death Valley region, and potentially amongst the most important for the species as a whole. Vireos make their nests in the deepest part of the mesquite thicket, providing cover from predators, safety for the chicks, and food in the form of mistletoe berries. Any groundwater pumping in the Pahrump Valley aquifer could potentially drawdown groundwater levels along the Amargosa, killing off the mesquite bosque habitat and impacting the vireo's recovery.[3] Therefore, such pumping should require a take permit from USFWS.

Pupfish *(Cyprinodon nevadensis spp.)* are animals uniquely adapted to living in isolated watering holes in the desert. From Ash Meadows to Shoshone to Saratoga Springs to Death Valley itself, numerous species of pupfish rely on consistent groundwater flows in the Amargosa Watershed for their existence. These species include: the Amargosa pupfish (*Cyprinodon nevadensis amargosae*), the Saratoga Springs pupfish (*Cyprinodon nevadensis nevadensis*), the Shoshone pupfish *(Cyprinodon nevadensis shoshone*), the Devil's Hole pupfish *(Cyprinodon nevadensis diabolis)*, the Ash Meadows pupfish (*Cyprinodon nevadensis mionectes*), and the Warm Springs pupfish (*Cyprinodon nevadensis pectoralis*), among others. Groundwater pumping in Charleston View and Stewart Valley should be regarded as having the potential to lower spring flows at the habitat for these species, and developers should be required to obtain USFWS take permits. Groundwater pumping in the Silurian Valley has the distinct potential to lower spring output at Saratoga Springs, affecting the pupfish there.

Mitigation of Groundwater Pumping is Not Possible

There is no mitigation which will adequately compensate the ecosystem for a loss in groundwater flow. The ecological system which supports the aforementioned species operates in

[3] Chris McCreedy, 2013. "Amargosa Canyon Songbird Project 2013 Least Bell's Vireo and Southwestern Willow Flycatcher Report." Point Blue Conservation Science No. 1951. http://www.prbo.org/refs/files/12300_ChrisMcCreedy2013.pdf

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a very delicate balance, and even the slightest perturbation in the system could have catastrophic consequences. No amount of mitigation would properly compensate the ecosystem for water loss, and no possible mitigation measures would effectively replace the lost water. Groundwater pumping associated with utility-scale solar is simply not appropriate in Charleston View or Stewart Valley, and should not be allowed because of the inevitable impacts to the most sensitive of endangered species.

As is demonstrated in the SBR, the patterns of groundwater flow feeding the Amargosa River are complex and at times paradoxical. The amount of overall water in the system is important, but equally so are the flowpaths through which water travels. Typical mitigation for groundwater withdrawal might involve with acquirement and retiring of existing water rights. More robust mitigation might also require that these water rights be currently exercised, and acquiring them in a 2:1 or 3:1 ratio. The strongest possible mitigation measure would require retirement of these rights along the same flowpath. But such mitigation would not be possible at Charleston View. There are no major existing water developments along the flowpath between Charleston View and the Amargosa River. There is practically no water development at all in the area, outside of a few dozen residential wells. Thus there is no possible way to mitigate the loss of water to Tecopa Marsh, the Amargosa vole, and the Watershed as a whole from groundwater pumping in Charleston View. While opportunities for in-flowpath water right acquisition may exist in Stewart Valley, the aforementioned complexity of the system means that there can be no certainty as to the effectiveness of such mitigation at maintaining groundwater flow levels at down-flowpath springs.

It cannot be emphasized enough: monitoring is not mitigation, and “trigger”-type schemes are not effective mitigation. By the time a change in groundwater levels is detected by monitoring wells, a cascading chain of events has already been set into action, and it is likely too late to prevent decreases in water availability along the Amargosa River. It is inadequate mitigation for plans to contain triggering schemes, as they suppose that there is a certain level of groundwater decline which is acceptable. No decline in groundwater levels in the Amargosa Watershed is acceptable.

The impacts of groundwater pumping on critically endangered species such as the Amargosa vole are clear. Groundwater pumping in Charleston View, Silurian Valley, or Stewart Valley will directly result in the mortality of federally and state protected species along the Amargosa River. No amount of groundwater pumping for utility-scale solar is acceptable, and no possible mitigation will be able to compensate the ecosystem for the damage done by groundwater withdrawal. It is incumbent upon the REAT to evaluate the previously described impacts in the DRECP, and a supplement should be prepared to address these impacts.

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Charleston View DFA

Charleston View has been in the cross-hairs of utility-scale solar developers and planners for years, as evidenced by Bright Source Energy's Hidden Hills SEGS proposal, and Inyo County's proposed Renewable Energy General Plan Amendment (REGPA). There are numerous reasons Charleston View is inappropriate for utility-scale solar development, as will be enumerated here.

Desert Tortoise

The desert tortoise *(Gopherus agassizi)* is a federally and state listed threatened species which has been the focus of extensive conservation efforts over the past four decades. Direct impacts to individual desert tortoises by construction of solar energy facilities are obvious and unmitigatable. In Charleston View in particular, solar energy development will result in negative impacts to the species as a whole. Charleston View contains lands which that have been designated by FWS as priority 1 and 2 desert tortoise connectivity corridors. These designations mean that these areas have "the best chance of sustaining connectivity," and should be considered "priority areas for conservation of desert tortoise population connectivity."[4] While some biological surveys have reported minimal tortoise activity in the area, this directly contradicts the lived experience of residents there. Tortoise sightings are common, and after just a few minutes walking around in the desert, one begins to see tortoise burrows in the hummocks and washes. Some nationwide environmental groups have taken it upon themselves to be the arbiters of "high quality" desert, saying that Charleston View is not good tortoise habitat. This is *post hoc* justification of their capitulation on solar in the area, rather than based on sound science. Charleston View is excellent tortoise habitat.

There is no mitigation which will adequately compensate the ecosystem or the species as a whole for the direct mortality entailed by utility-scale solar development. Translocation has been proven to be an ineffective form of mitigation, often resulting in mortality and potentially reduced fertility. No mitigation measures will spare those tortoises found on-site, and FWS should require take permits for any tortoises located on-site, regardless of whether they are translocated or not, since their ultimate fate is likely already sealed. Additionally, purchasing habitat in areas extremely remote to the site of development (for instance, in a different ecoregion or different county) does nothing to compensate the local ecosystem, and should not be considered an acceptable form of mitigation.

[4] Programmatic Environmental Impact Statement for Solar Energy in the Six Southwestern States (2011)- http://solareis.anl.gov/documents/fpeis/maps/FWS_Connectivity_Explanation.pdf

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Avian Impacts

There are several emergent concerns about birds and utility-scale solar. The first is the lethal effects of an encounter with the solar flux. Solar flux can reach temperatures of thousands of degrees Fahrenheit. Birds may simply incinerate in the flux, but a potentially more common occurrence is for them to be severely injured by the concentrated light, and then to die off-site. As a result, it is unlikely that surveys for injured and deceased birds at Ivanpah or other power tower sites have accurately reflected the level of mortality that is occurring. Recent testing at the Crescent Dunes solar project in Nevada revealed one hundred and thirty birds being vaporized in the flux in just six hours.[5] The Amargosa Watershed is a critically important bird area, providing a key stopover point on the Pacific Flyway and harboring a vast diversity of resident and migratory birds. Project developments with the potential to kill tens or hundreds of thousands of birds per year are not appropriate for such a special bird area. Indeed, much of the area has been designated an Audubon Important Bird Area. Southern Inyo County is world renowned for its birds, and any project which poses such a threat should not be permitted here.

The second emergent concern is about the "lake effect." Shimmering mirrors on the ground give a very similar appearance to a body of water in the desert. Migrating or resident birds come in for a landing on what appears to be a refreshing lake, and collide with the panels, usually killing the birds. It is unknown if proposed remedies, such as UV-reflective coating or solid contrasting bands, would mitigate the "lake effect." Until such remedies can be fully tested and determined to be effective, these impacts should be considered significant and unmitigable. The "lake effect" has already caused direct mortality of threatened and endangered birds at Genesis Solar. This impact is so severe, and Inyo County is such an important bird area, that the "lake effect" alone should disqualify most of the county from consideration for solar development. In particular, given their proximity to the critically important bird area of the Amargosa River, the Charleston View, Stewart Valley, and Silurian Valley should be eliminated from any designation which may permit utility-scale solar due to the "lake effect."

Finally, the matter of toxic evaporation ponds is important to address. These have been documented to kill birds at Genesis Solar, and neither Genesis nor any other facility in the desert has installed the netting which many mitigation plans suggest. The REAT must take strong steps to insure that netting requirements are rigorously composed and stringently adhered to.

Special Status Plants

[5] http://www.kcet.org/news/redefine/rewire/solar/concentrating-solar/scores-of-birds-killed-during-test-of-solar-project-in-nevada.html

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Prior to the environmental surveys associated with the Hidden Hills proposal, few people knew the extent of Charleston View's rare plant communities. With what we know now though, it can be said with certainty that Charleston View is a place of rare botanical diversity and uniqueness. Seventeen special status plants exist on site. Of these seventeen, ten are known to occur in California only in the southern portion of the Amargosa Watershed. Of these ten, three are known to occur in California only in the Charleston View SEDA, and one only in the Charleston View and Sandy Valley SEDAs. This is clearly not an appropriate place for utility-scale solar development. The wholesale grading of these lands for construction and installation will forever alter the only habitat in California for these plants, decreasing the chance of species survival in California long-term. Indeed, based on botanical diversity, it seems that Charleston View may be one of the least appropriate places one could possibly put a utility-scale solar facility.

Plants unique in California to the southern Amargosa Watershed:
desert wing-fruit - *Acleisanthes nevadensis*
Tidestrom's milk-vetch - *Astragalus tidestromii*
Ash Meadows buckwheat - *Eriogonum contiguum*
wing-seed blazing star - *Mentzelia pterosperma*
Goodding's phacelia - *Phacelia pulchella* var. *gooddingii*
Johnson's beehive cactus - *Sclerocactus johnsonii*

Plants unique in California to Charleston View:
Nye milk-vetch - *Astragalus nyensis*
Preuss' milkvetch - *Astragalus preussii* var. *preussii*
Torrey's Mormon-tea - *Ephedra torreyana*
spine-noded milk-vetch - *Peteria thompsoniae*

We have included rough distribution maps pulled from the CalFlora database for most of the special status species in Charleston View in Attachment B.

The impacts to native, rare, and regionally endemic plants from the proposed REGPA are so severe that they are unmitigable. The mitigation measures proposed in the DRECP are completely inadequate to the type of damage that a project such as one in Charleston View might do to the botanical diversity of the southern Amargosa Watershed. Transplanting native plants, particularly wildflowers (which most of these plants are), has an extremely low success rate and is not a viable method of species conservation. Additionally, environmentally sensitive area fencing on-site is not a viable form of mitigation. These plants are left stranded in the middle of the industrial energy production zone will never reach their biological potential, and their ability to reproduce will be significantly impaired by the lack of suitable nearby habitat. Therefore,

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every plant occurrence within any proposed project needs to be mitigated for, regardless of its ultimate fate. Given the extremely sensitive nature of these rare plant species, mitigation should involve the acquisition of five off-site occurrences of each impacted special status plant for every one occurrence on the project site *whether it is destroyed by construction of the facility or not*.

Bighorn Sheep Connectivity

Charleston View provides a migratory corridor for bighorn sheep, traversing between the Kingston Range and the Nopah Range. This connectivity is essential to maintaining genetic variability and adequate forage for these animals. Industrial-scale solar development in Charleston View will disrupt migratory patterns and hamper connectivity. Given the declining number of bighorn across the Mojave Desert, this is an unacceptable impact.

Impacts to Cultural Resources

The cultural impacts of potential development in Charleston View are well documented in the Hidden Hills Solar Electric Generating Systems – California Energy Commission Ethnographic Report by Thomas Gates, which is included with this comment as Attachment C. The report makes clear that Charleston View is a vital component of three ethnographic landscapes: the Salt Song Landscape, of central spiritual and cultural importance to all Southern Paiute peoples; the Pahrump Paiute Home Landscape; and the Ma-have Landscape. The report concludes that the Hidden Hills proposal would have significant and unmitigable impacts on the Pahrump Paiute. The fact that the Pahrump Paiute remain federally unrecognized only exacerbates these impacts, as they enjoy no statutory protection against the destruction of their cultural landscapes. These impacts are unacceptable, and alone should be cause enough to remove Charleston View as a DFA.

The subject of tribal consultation on utility-scale solar projects has recently been the subject of much rancor across the California desert. Several lawsuits in recent years have alleged that the federal government has done an inadequate job of engaging tribes in government-to-government consultation, and in consulting tribes upon the location of significant artifacts or human remains. Most recently, the Colorado River Indian Tribes (CRIT) filed a lawsuit against BLM (among others), criticizing the degree and form of tribal consultation in the permitting of the Blythe Solar Power Project. It is important that Inyo County develop a tribal consultation protocol for any projects under the REGPA which satisfies the legal and ethical obligations the state and federal government have toward Indian Tribes, particularly under CEQA and NHPA. The CRIT complaint can be used as a guideline, as it specifically delineates the ways in which existing consultation practices on utility-scale solar projects fall short of those obligations.

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Finally, the cultural impacts of utility-scale solar development in Southern Inyo County would not be limited to impacts to Native Americans. The Old Spanish Trail, a federally protected National Historic Trail, runs directly through the Charleston View DFA. Development of any kind within this SEDA would likely obliterate historic tracks or other archaeological records of the earliest Europeans to visit the area. Even if such tracks and records were scrupulously avoided, the landscape-level impacts which would result from development in the DFA would irreparably change the cultural landscape through which the Old Spanish Trail runs. Visitors would no longer be able to envisage the courageous journey of early explorers and emigrants; instead this historic cultural area would be converted into an industrial energy production zone. Impacts to the Old Spanish Trail would be impossible to mitigate, and form yet another argument in favor of eliminating the Charleston View DFA.

Impacts to Human Communities

The economy of Southern Inyo County is almost entirely reliant on tourism. Gas stations, motels, restaurants, hot spring resorts, general stores- they all depend on the tourists that come to visit our region from around California, the United States, and the world. Many of these tourists come seeking an escape from their normal lives and routine, and are attracted to the wide open spaces and undeveloped nature of Southern Inyo County. If portions of the region were turned into industrialized energy production zones, there may be a negative effect on the experience of the tourists, who in turn may choose to take their vacations elsewhere. Business owners throughout the Amargosa River valley have expressed concern about solar energy facilities in the area for this very reason.

The foregoing obviously entails a good deal of conjecture. Because the reality is: nobody knows if tourism would be negatively affected. But it would be a dangerous experiment to conduct, with the economy of Southern Inyo County hanging in the balance. As a result of this potential impact, a full economic study should be conducted before any solar development is approved in the Charleston View or Silurian Valley.

Business owners and residents of Southern Inyo County are concerned about the impacts of utility-scale solar development on the local economy. Please refer to Attachment D, a comment letter on the Inyo County REGPA from local business owners expressing concern about development in Charleston View. Please also refer to Attachment E, a petition signed by local residents expressing similar concern. Finally, tourists have also made their voices heard, that utility-scale solar development would affect their experience in Southern Inyo County, and their willingness to return. Please refer to Attachment F, which is a petition from change.org signed by 377 concerned citizens. Please also refer to Attachment G, which is individual comments from

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over 100 of these signatories. While they were intending to comment on the Inyo County REGPA, their concern over development in Charleston View should be considered in your deliberations on the Charleston View DFA.

In the areas both within and surrounding the Charleston View DFA, property value is low. Water and power are expensive to acquire, and prospects for development are limited. As a result, what property value does exist is largely determined by the remote setting and pastoral views. If solar energy development were to occur in these areas, property values would likely fall. The pastoral views would change to views of an industrialized landscape, thereby bringing down property values.

Of paramount concern to local citizens is be the effects of blowing dust. Blowing dust is a broader issue, which affects air quality metrics and the lives of people for tens or even hundreds of miles downwind. Charleston View residents' lives could be drastically affected by a reduction in air quality and an increase in fine particulate matter. Please refer to the Morongo Basin Conservation Association's comments for more detail on problems with dust during utility-scale solar facility construction and operation.

Stewart Valley variance lands

Stewart Valley is an ecologically intact area with minimal development. It provides connectivity between the mountain ranges surrounding Ash Meadows and the Resting Spring and Nopah Ranges. It is also situated at a key point in the flowpath between the Pahrump Valley and the Amargosa River, as enumerated above. Utility-scale solar development there is not appropriate because it would fundamentally alter the character of the landscape, severing biological connectivity and impacting the local economy by detracting from tourists' experience. We recommend elimination of the Stewart Valley variance lands, and designation of those lands as National Conservation Lands.

Conclusion

We thank you for the opportunity to comment on the DRECP.

Respectfully submitted,

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Attachment List:

Attachment A: State of the Basin Report 2014, Andy Zdon
Attachment B: Charleston View Rare Plant Distribution Maps
Attachment C: Hidden Hills Ethnographic Report, Thomas Gates
Attachment D: Eastern Inyo County business owners REGPA comment letter
Attachment E: Tecopa resident REGPA petition
Attachment F: List of signatories to change.org petition
Attachment G: Text of change.org petition and individual comments from signatories

ANDY ZDON &
ASSOCIATES, INC.

2014 STATE OF THE BASIN REPORT
AMARGOSA RIVER BASIN,
Inyo and San Bernardino Counties, California
& Nye County, Nevada
June 28, 2014

Prepared For:
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The Nature Conservancy
Protecting nature. Preserving life.™

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2014 STATE OF THE BASIN REPORT; AMARGOSA RIVER BASIN

Inyo and San Bernardino Counties, California & Nye County, Nevada

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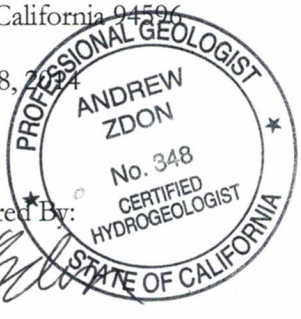
June 28, 2014



Prepared By:

Andrew Zdon, P.G., C.E.G., C.Hg.

President, Principal Hydrogeologist

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EXECUTIVE SUMMARY

In 2009, the Amargosa River between Shoshone and the terminus of the Amargosa Canyon received Wild and Scenic status through an act of Congress. As a result, the BLM is charged with developing a management plan for the Wild and Scenic portion of the River. It is essential that hydrogeologic characterization of the California portion of the basin take place in order for that management plan, and its associated management recommendations, to have a firm basis, and to assure that monitoring is conducted in a meaningful way to identify potential impacts to the river and its feeder springs before potential irreversible impacts from future groundwater development occur.

This 2014 State of the Basin Report (SOBR) was prepared by Andy Zdon & Associates, Inc. (AZI) on behalf of The Nature Conservancy (TNC) as part of a much larger effort that is conducted cooperatively between the TNC, U.S. Bureau of Land Management (BLM), U.S. Geological Survey (USGS), Amargosa Conservancy (AC), and Nye and Inyo Counties. It provides an update of work conducted since the last State of the Basin Report produced in early 2012. The goal of the overall project is to improve the understanding of the water that sustains the Amargosa River and the desert ecosystems that flourish along the river and its adjoining springs, and to provide the knowledge necessary to identify and avert impacts to those water sources. The information herein also provides the basis for recommendations provided for inclusion into a management plan for the Amargosa Wild & Scenic River (WSR). The purpose of the work conducted as part of the current scope is to provide important new information and conduct continuing baseline spring and groundwater-level monitoring, and prepare this SOBR.

In addition to the WSR, the area contains many small springs that provide important watering sources for wildlife. These types of watering holes frequently get overlooked in regional hydrologic investigations because they represent such a small portion of the overall water budget. This is unfortunate as these sensitive receptors are critically important resources for vegetation and resident and migratory wildlife. Identification and monitoring of these watering holes is important in order for future land and water resource management in the area to have a firm ecological basis.

The principal surface water body in the region, the Amargosa River, is an intermittent river with headwaters issuing from springs northeast of Beatty, Nevada, and extending approximately 180 miles to the river's terminus at the playa in Death Valley. Except for portions of the river in the Amargosa Canyon area in California, and near Beatty, Nevada, the Amargosa River typically flows only after periodic storms. In those areas where the river is usually dry, the flow of water, where present, is in the subsurface. In areas where surface flow is more constant, or perennial, the flow is the result of groundwater underflow reaching bedrock or other relatively impermeable constrictions and being driven to the surface. This results in a flow regime highly sensitive to groundwater level changes. Given this condition, it appears that a considerable portion of the underflow moving through the Middle Amargosa system can be accounted for by the flow observed at the surface, for example, in the Amargosa River canyon plus spring

discharge and any pumping. This does not result in a substantial amount of underflow, and further highlights the sensitive nature of the river system.

The principal tasks during this recent phase of this project were isotope sampling of selected springs in the Tecopa area, and the continued monitoring of spring flow, river flow and groundwater levels in the Middle Amargosa River Basin, an area encompassing nearly 1,000 square miles. Among the results of the current geochemical work were indications that spring sources within the study area are complex and from multiple sources. Groundwater from Ash Meadows, along with recharge from the Spring Mountains and the Kingston Range all contribute to the groundwater and river system. Flow paths likely include one or more of the following:

- Spring Mountain recharge moving toward Ash Meadows through carbonate rocks and basin fill, then southward toward the Shoshone-Tecopa area;
- Via carbonate rocks at the north end of the Nopah Range into Chicago Valley then toward the Amargosa Valley; and ,
- From Pahrump Valley via the shallow divide into California Valley then toward the Amargosa River.

Among the findings are that the source of heat in the local thermal springs is likely deep circulation of water along deep-seated faults as opposed to the presence of a shallow heat source (e.g. magmatic). The heat associated with this deep groundwater movement likely effects groundwater chemistry as could the surficial deposits from which the springs discharge.

This SOBR closes with technical recommendations for:

- Monitoring (hydrologic, visual, and monitoring current and potential water use):
- Future investigative work (including new monitoring wells, geophysics and additional geochemical studies);
- The development of a management tool (i.e. groundwater flow model); and,
- Recommendations for an adaptive approach to management of the Amargosa WSR that is flexible enough to evolve with our ever-growing knowledge of the Amargosa River and the groundwater system that feeds it.

1.0 INTRODUCTION

This State of the Basin Report (SOBR) was prepared by Andy Zdon & Associates, Inc. (AZI) on behalf of The Nature Conservancy (TNC) as part of a much larger effort that is being conducted between TNC, Amargosa Conservancy (AC), U.S. Bureau of Land Management (BLM), the U.S. Geological Survey (USGS) and Nye and Inyo Counties. The goals of the overall project are to improve the understanding of the water that sustains the Amargosa River and the desert ecosystems that flourish along the river, and its adjoining springs, and to provide the knowledge necessary to identify and avert impacts to those water sources. The purpose of the work conducted as part of the current scope is to improve our understanding of the groundwater flow paths to the Amargosa River and surrounding springs, and to continue to develop baseline spring, river flow, and groundwater-level monitoring, and to prepare a SOBR.

In 2009, the Amargosa River between Shoshone and the terminus of the Amargosa Canyon received Wild and Scenic status through an act of Congress. As a result, the BLM is charged with developing a management plan for the Wild and Scenic portion of the River. It is essential that hydrogeologic characterization of the California portion of the basin take place in order for that management plan, and its associated management recommendations, to have firm basis, and to assure that monitoring is conducted in a meaningful way to identify potential impacts to the river and its feeder springs before potential irreversible impacts from future groundwater development occur.

Many of the springs that feed the Amargosa River are relatively small springs that individually are not significant components to the overall area water budget. Additionally, other small springs and watering holes are present away from the Amargosa River. All of these springs, regardless of size and/or location, are important ecological resources. This SOBR provides up-to-date hydrologic information and a current, real-time snapshot of water resource conditions in the Middle Amargosa Basin area. As mentioned above, springs and watering holes such as those identified in this SOBR are frequently overlooked in hydrologic investigations since their discharges are frequently inconsequential to the overall water budget of the area being studied. This is unfortunate as these sensitive receptors are critically important resources for vegetation, and wildlife (both resident and migratory). It is essential that baseline hydrologic characterization of the region take place in order for future land and water resource management to have a firm basis.

This project is an important starting point into the investigation of the hydrogeology of the Amargosa Basin south of the Nevada state line. Prior to the initial reconnaissance work conducted by the Source Group, Inc. (SGI) during 2010-2011 (SGI, 2011), regional hydrogeologic investigations in the California portion of the basin have been virtually non-existent. The discussions regarding the California portion of the basin therefore have been more conceptual in nature than those regarding the Nevada portion of the basin.

The objectives of the current project described in this report were to:

- Conduct new groundwater geochemical analyses to evaluate potential groundwater flow paths;
- Enhance previous reconnaissance-level information on the springs of the southern half of the Amargosa Basin, generally between Death Valley Junction and Saratoga Spring;
- Continue to develop an understanding of Amargosa River conditions in the southern half of the basin;
- Describe the results of groundwater-level monitoring and evaluate potential future monitoring locations; and,
- Continue to enhance the conceptual model of the Amargosa Basin with an emphasis on the southern half of the basin.

1.1 Current Scope of Work

The current scope of work included the following tasks:

- Task 1 – Comprehensive monitoring of springs, groundwater levels and river flow;
- Task 2 – Sampling and analysis of water from selected springs and one well in the study area; and,
- Task 3 – Data analysis and preparation of this SOBR.

1.1.1 Discharge, Groundwater Level, and Seepage Run Monitoring

Flow discharge and groundwater elevation measurements have been collected on a periodic basis from a select group of springs and wells within the southern Amargosa River area since November 2010 as part of studies conducted by the AC and TNC. The current scope included seepage run monitoring on the stretch of the Amargosa River from Tecopa to the Dumont Dunes area and consisted of five distinct monitoring locations (including the two USGS gauges, and three manual monitoring points). Basic water quality data were also collected at all discharge, elevation and seepage run monitoring points.

1.1.2 Water Chemistry Data Collection

Water samples from four springs, and one well were collected and analyzed for a specific suite of constituents. Noble gas analyses were conducted on water samples from Thom Spring, Tecopa Hot Springs, Borehole Spring, Wild Bath Spring and Monitoring Well ARHS-01. Noble gas laboratory analysis was conducted by the University of Utah. Water samples were collected from ARHS-01, Twelvemile Spring and Dodge City Spring for stable isotope analyses. Stable isotope analyses were conducted by Isotech Laboratories, Inc. A water sample from Dodge City Spring was sampled for general minerals and metals analysis, and was analyzed by Silver State Analytical, Inc., in Las Vegas, Nevada. M.L. Davisson & Associates was retained to provide high-level expert analysis and interpretation.

1.1.3 Data Assessment and Reporting

This task included the time required to analyze the data obtained from the springs and wells, along with the newly collected data from AZI and other sources to be compiled in this updated SOBR. This included updating and expanding the existing "Catalog of Springs" provided in Appendix A.

1.2 Location and Physiographic Setting

The Amargosa River Basin covers an area of 3,124 square miles in east-central California and west-central Nevada (Figure 1-1). The Amargosa River Basin can be subdivided into three basin areas:

- Northern Amargosa Groundwater Basin (Nevada portion of the Basin also referred to as the Amargosa Desert Hydrographic Basin by the Nevada Department of Water Resources);
- Middle Amargosa Valley Groundwater Basin (California); and
- Death Valley Groundwater Basin (California –Nevada).

The Northern Amargosa Valley Groundwater Basin is comprised of the Amargosa River Valley from the river's headwaters northwest of Beatty, Nevada, to the California-Nevada state line. Elevations in this portion of the Amargosa River Basin range from 6,317 feet above mean sea level (ft msl) at Bare Mountain south of Beatty and east of the Amargosa River, to about 2,300 ft msl at the California-Nevada state line near Death Valley Junction, California. The basin is bounded by consolidated rocks of the Yucca Mountain/Pahute Mesa area to the northeast, Bare Mountain on the east, and the Funeral Range to the west. The Northern Amargosa River Basin as defined covers 896 square miles.

The Middle Amargosa Valley Groundwater Basin (Groundwater Basin #6-20 as designated by the California Department of Water Resources) is comprised of the Amargosa River Valley along with Chicago Valley and parts of Greenwater Valley within Inyo and San Bernardino Counties, California. The California-Nevada state line is considered the northern boundary of the Middle Amargosa Valley Groundwater Basin. The elevation of the valley floor generally ranges from about 400 ft msl near Salt Creek in the southern portion of the valley to about 2,300 ft msl at the California-Nevada state line near Death Valley Junction. The basin is bounded by consolidated rocks of the Resting Springs and Nopah Ranges on the east, the Dumont Hills on the south, and the Greenwater Range and Ibex, Black, and Funeral Mountains (collectively known as the Amargosa Range) on the west. The surrounding mountains range in elevation up to 7,335 ft msl at Kingston Peak (within San Bernardino County along the southeast edge of the Basin) and up to 6,725 ft msl at Pyramid Peak, the high point of the Funeral Range to the west. The Middle Amargosa River Basin covers an area of 609 square miles.

The Death Valley Groundwater Basin (Groundwater Basin #6-18 as designated by the California Department of Water Resources) is comprised of the Amargosa River Valley from the Salt Creek area to the sink at Badwater in Death Valley, and northward to the northern physical terminus of Death Valley in Nevada (Oriental Wash Area of the Death Valley Basin as designated by the Nevada State Engineer). Elevations in this portion of the Amargosa River Basin range from -282 ft msl at Badwater, to 11,049 ft

msl at Telescope Peak, the highpoint of the Panamint Range along the west side of Death Valley. The combined area of the California and Nevada portions of this lower part of the Amargosa River basin is 1,622 square miles.

1.3 Climate

The climate of the area is arid with low precipitation and high mean annual temperatures and evaporation rates. Summer temperatures can exceed 120 degrees Fahrenheit while winter temperatures can fall below freezing. The average annual precipitation at Shoshone, California is 4.81 inches based on a record from 1972 through 2011 (Western Regional Climate Center, 2014). The average maximum high temperature is 83.2 degrees Fahrenheit and the average minimum is 58.8 degrees Fahrenheit. Mean monthly high temperatures at Shoshone range from 58.8 degrees Fahrenheit in December to 108.7 degrees Fahrenheit in July. Mean monthly low temperatures in Shoshone range from 38.0 degrees Fahrenheit in December to 78.3 degrees Fahrenheit in July.

1.4 Land Use

The principal land uses (not including open space and wild lands) in the project area are agricultural, recreational, wildlife, livestock and domestic/municipal uses. With increasing solar development, industrial use is expected to increase in the future. Agricultural and domestic water is generally supplied with groundwater from private wells. Water for the town of Shoshone, California is supplied by Shoshone Spring. The town of Beatty, Nevada derives its water from groundwater wells. However, some residents obtain their water solely from spring water. Sewage is generally treated by individual septic systems with the exception of at the communities of Beatty, Nevada, and Shoshone and Tecopa (both in California) where sewage systems are present serving some areas. Agricultural land use is primarily crops such as alfalfa (Nevada) and to a much lesser extent dates (California). Recreational uses include the use of spring water at the hot springs in Tecopa, California, and the hot springs northeast of Beatty, Nevada along U.S. Highway 95.

1.4.1 Water Rights

Water rights summaries for California and Nevada are provided in Appendices B and C, respectively. Additional discussion regarding permitted rights, water usage, and estimated recharge for the Amargosa Basin are provided in Section 3.0. In California, there has been no change in the status of water rights in the Middle Amargosa Basin since 2011.

Changes in Nevada water rights for the Amargosa Desert (Nevada Basin #230) during the past three years (since 2011) were a net decrease of approximately 570 acre-feet per year (afy) in annual duty (underground). However, of significance was a net increase of approximately 2,050 afy in permitted and certified groundwater rights and associated decrease in rights with a "ready for action" status (the later resulting in the net loss of annual duty), indicative of further development of those groundwater rights.

A ruling in 2012 (6169) by the Nevada State Engineer included the denial of two applications filed by Rockview Dairies, Inc. Those two applications were to change the manner and place of use of irrigation water previously applied for under applications filed in 2003 and 2006. The denial of those two applications was on the grounds that the water right filings that formed the basis of the changes were no longer in good standing and could not be used to support the applications.

A second ruling during 2012 (6172) by the Nevada State Engineer included the denial of an application by LCF Horticulture, LLC to change the point of diversion and manner of use previously appropriated for commercial purposes. Over time, land use had changed from commercial to residential and change applications transferred water to the residential land owners from the LCF Horticulture permit. Therefore, the Nevada State Engineer denied the application because the application requested a change of an existing groundwater permit than no longer existed. Copies of the two rulings are provided in Appendix C.

Water rights information for Pahrump Valley, Nevada (Groundwater Basin #162) are also provided in Appendix C.

1.4.1.1 Devil's Hole

In 2008, the Nevada State Engineer issued Order 1197 concerning applications to appropriate additional groundwater from the Devil's Hole area. This order stated that:

"…with the following exceptions, any applications to appropriate additional underground water and any application to change the point of diversion of an existing ground-water right to a point of diversion closer to Devil's Hole, described as being within a 25 mile radius from Devil's Hole within the Amargosa Desert Hydrographic Basin, will be denied:

- *Any application within the described area that seeks to change and existing point of diversion closer to Devil's Hole but remains within its existing place of use and is no more than ½ mile from its original point of diversion;*
- *Those applications filed which seek to appropriate 2.0 acre-feet per year or less, may be considered and shall be processed subject to Nevada Revised Statutes (NRS) 533 and 534;*
- *For projects that require changes of multiple existing rights, the State Engineer may compare the net impact to Devil's Hole of the proposed changes to the impacts to Devil's Hole of the base rights. If the net impact of the proposed changes is the same or less than its base right impacts, as determined by the State Engineer, such change applications may be considered and shall be processed subject to NRS 533 and 534. In no such case shall new points of diversion be allowed within ten (10) miles of Devil's Hole.*
- *Those applications for environmental permits filed pursuant to NRS 533.437 and 533.4377, inclusive; and,*
- *Those applications filed pursuant to NRS 533.371.*

For point of reference, NRS 533 and 534 are the chapters of Nevada water law that pertain to adjudication of vested water rights/appropriation of public water and underground water and wells, respectively.

Environmental permits referenced in NRS 533.437 and 533.4377 are temporary permits for wells used for avoidance of groundwater contamination (e.g. remediation wells). A copy of this ruling is also provided in Appendix C.

1.5 Groundwater Management

Groundwater quality issues in the California portion of the basin are regulated by the California State Water Resources Control Board – Lahontan Region (CRWQCB-Lahontan). Within Inyo County, California portion of the Amargosa River Basin, the county conducts water-related activities such as issuing well permits through the Inyo County Environmental Health Department, and water-quality functions such as monitoring groundwater conditions and quality at the Tecopa and Shoshone landfills through the Inyo County Waste Management Department. Other community planning and environmental review activities are conducted through the Inyo County Planning Department. Currently, there is little to no development in the San Bernardino County, California portion of the basin, however similar functions within San Bernardino County's departments exist should development occur in the future.

In Nevada, the Nevada Division of Water Resources (NDWR) manages Nevada's water resources through the appropriation and reallocation of the public waters. In addition, the NDWR is responsible for quantifying existing water rights; monitoring water use; distributing water in accordance with court decrees; licensing and regulating well drillers and water rights surveyors; reviewing flood control projects; monitoring water resource data and records; and providing technical assistance to the public and governmental agencies. The Nevada State Engineer determines the limit and extent of water rights and establishes conditions regarding those rights. The Nevada Department of Environmental Protection manages Nevada's storm water pollution program. Within Nye County, Nevada, the Nye County Water District was established in 2007 to develop sustainable water development planning, characterize the groundwater resource, and to evaluate and mitigate impacts caused by groundwater use. Nye County's Water Resources Plan (Buqo, 2004) provides guidance for ensuring adequate supplies of water remain available in Nye County for the benefit of the county's residents and environment.

Death Valley National Park oversees water-related issues within the Death Valley National Park inclusive of the Devil's Hole section of the park in Nevada. Currently, Death Valley National Park staff monitor selected springs throughout the park, with an emphasis on Saratoga Spring at the south end of Death Valley adjacent to the Amargosa River. Likewise, the BLM oversees water-related issues on BLM lands. As part of those responsibilities, the BLM is also charged with developing a management plan for the wild and scenic portion of the Amargosa River.

1.6 Sources of Information

Information gathered by AZI and used in this report were from the archives and reports by the of the USGS, NDWR, CRWQCB-Lahontan, Nye County Water District, Nevada Bureau of Mines and

Geology, AC, Death Valley National Park, BLM, California Department of Water Resources, and groundwater level and spring data collected by AZI and within AZI's water resources library.

1.6.1 Death Valley Regional Flow System Report

A key foundational document for this effort is the report "Death Valley Regional Ground-Water Flow System, Nevada and California – Hydrogeologic Framework and Transient Ground-Water Flow Model" (Belcher, 2004). This comprehensive volume describes the conceptual model, and numerical modeling of, the Amargosa Groundwater Flow System in its entirety, however with a focus on the Northern Amargosa River Basin. The description of the conceptual model for the Amargosa Basin in this report is largely distilled from this extensive report. The USGS conducted the modeling and prepared the associated report bringing together data collected over decades for the U.S. Department of Energy programs at the Nevada Test Site and at Yucca Mountain. The purposes of the USGS work described in the report were to:

- Provide boundary conditions for site scale models at the Yucca Mountain and Underground Test Area Corrective Action Units on the Nevada Test Site;
- Evaluate the impacts of changes in groundwater flux;
- Provide a decision-making tool with respect to groundwater for defense and economic development on the Nevada Test Site;
- Evaluate potential effects to the Nevada Test Site due to off-site groundwater development;
- Provide a framework for identifying an effective groundwater quality monitoring network; and
- Facilitate the development of a cooperative, regional Death Valley groundwater management district.

1.6.2 Hydrologic Activities – Amargosa River Hydrologic Survey

A considerable amount of hydrologic work has been conducted since the initial baseline hydrologic investigations (SGI, 2011 and 2012) that were sponsored by the AC. That work included geochemical analysis (anions, cations, and metals along with stable and unstable (uranium and strontium) isotopes on two wells, the Amargosa River, and 16 springs. Since that time the following tasks have been completed:

- Periodic river gaging at several locations along the Amargosa River;
- Periodic spring flow and groundwater level measurements at springs and wells throughout the Middle Amargosa River Basin;
- Installation of four shallow monitoring wells 1) north of Shoshone along the Amargosa River, 2) along Willow Creek, 3) at Twelvemile Spring, and 4) at "Married Man's Camp" between Willow Creek and California Valley. This work included sampling and analyzing waters from those wells

and outfitting those wells with transducer/data logger installations and periodic groundwater level data downloading (JWI, 2012 and JWI, 2013a);

- Refined geologic mapping being conducted by the USGS (in progress);
- Geophysical surveys by the USGS at selected locations throughout the Middle Amargosa Basin area (in progress);
- An in depth canvassing of the flow in the Amargosa River by the USGS to evaluate gaining and losing character of the River (conducted in February, 2014);
- Initiation of evapotranspiration studies along the Amargosa River in the Shoshone – Tecopa area (USGS – in progress).

In addition, additional sampling and analysis was conducted to evaluate a source of water for potable water and fire suppression for the Tecopa – Tecopa Hot Springs community (JWI, 2013c).

2.0 CURRENT FIELD AND LABORATORY METHODS

The field activities performed during this project were designed following the previous reconnaissance and cataloging of all of the known springs and wells in and beyond the Middle Amargosa River Basin, an area encompassing nearly 1,000 square miles. The results of the initial reconnaissance published in the 2011 State of the Basin Report (SGI, 2011), were used as the foundation for the design and implementation of more detailed hydrogeologic investigations. Additionally, methodologies for describing spring conditions developed for other areas (Sada & Pohlmann, 2002, and Sky Island Alliance, 2012) formed the basis of field descriptions of springs. The field work for this more detailed hydrogeologic investigation was conducted during May 2014 and included the collection of water chemistry samples at four springs and one well, flow volumes, water levels, and ongoing field water quality monitoring for a select group of springs, wells and points along the Amargosa River. The results from this investigation as described in the following sections will serve to assist in the identification of regional and local groundwater flow paths, and enable the development of an efficient, focused and sustainable groundwater monitoring effort that will be protective of the environmental and cultural resources of the basin. The locations of all points monitored or reconnoitered during this work are shown on Figures 2-1 through 2-3.

2.1 Spring Discharge, Groundwater Level and River Surface Flow Monitoring

During May 2014, spring flow discharge and groundwater elevation data were gathered from springs and wells in the Middle Amargosa River Basin. This work supplements similar data collection efforts that have occurred as part of efforts sponsored by the AC and TNC since 2010. Seepage run monitoring (i.e. the measurement of flow at several distinct locations) was conducted by AZI along the stretch of river from Tecopa to below the Dumont Dunes area where the River crosses California Route 127. The seepage runs were conducted at five distinct monitoring locations along the Amargosa River, including two USGS gauge locations and three manual monitoring points as measured during previous monitoring events. Additional monitoring included following the movement (progression and regression) of the leading edge of the River near the Dumont Dunes area and seepage run monitoring of Willow Creek just upstream of the confluence with the Amargosa River.

The three goals of the ongoing discharge, water level and seepage run monitoring are as follows:

- To quantify spring discharge rates, groundwater elevations, and river surface flow which will provide estimates of seasonal variations;
- To establish a record of discharge from the springs and wells selected for monitoring, including seasonal trend information in order to provide a more robust baseline for future comparisons, and

- To establish flow gains and losses along the perennially flowing portion of the Amargosa River, including seasonal trend information in order to provide a more robust baseline for future comparisons.

2.1.1 Spring Discharge Monitoring

For the current monitoring event, springs not previously visited since the initial baseline work in 2011 were revisited to evaluate changes over the past three years. Previously, springs designated for ongoing quantifiable discharge measurement included Amargosa Canyon Spring 1, Amargosa Canyon Spring 4, Borax Spring, Borehole Spring, Crystal Spring, Horse Thief Spring, Tecopa Hot Spring (as measured near the Amargosa Conservancy trailer), and Willow Spring. Data from other springs were collected as practical, including Resting Spring, Shoshone Spring, Thom Spring and Five Springs. These springs were chosen for long-term monitoring as they were the springs from which reliable water samples could be obtained as opposed to the remaining springs where conditions were such that sampling was not practicable at the time of the initial work (SGI, 2011).

The primary method used to quantify spring discharge was measuring the time it takes for spring flow to fill a bucket of a known volume. In some cases, such as Borax Spring and Tecopa Hot Spring, the spring discharged over a lip or out a pipe which enabled direct measurement of spring flow. At other locations, such as at Crystal Spring and Amargosa Canyon Spring #4, spring discharge was temporarily captured and channeled into a pipe or a flume to facilitate direct measurement using the bucket filling technique. A secondary method used to quantify spring discharge was direct measurement using a Marsh-McBirney Flo-Mate solid-state flow meter placed in a flowing channel of water. Measurements from the flow meter are combined with cross-sectional dimensions of the flow channel to yield spring discharge. This measurement technique was used at Amargosa Canyon Spring #1 and Borehole Spring. All of the spring flow measurements recorded starting with the initial spring survey (including visual estimations of flow) are summarized on Table 1. Spring flow measurements are also found in the Catalog of Springs (Appendix A) and on the individual field reconnaissance data sheets (Appendix D).

There are compromises in the use of both spring flow measurement options that can result in under-estimation or over-estimation of free-flowing discharge. Ideally, all of the flow from a spring would be fully captured and channeled into a pipe or flume, allowing for much greater accuracy in measurement of flow. This is the case for Borax Spring and Tecopa Hot Spring at the Nature Conservancy trailer. Temporarily channeling the spring using a pipe and other non-permanent materials such as mud and rocks can capture most of the flow, but not all, which can lead to inaccuracies in measurement. Measurement of flow using the solid-state flow meter requires estimates of cross-sectional area and the use of one to two flow measurement points as the meter is often large relative to the width of the channel. Ultimately, all of the spring flow measurements within this report should be seen as an estimate for the range of flows emanating from each spring. Significant alteration to spring discharge locations would be required to achieve the accuracy needed to resolve fine, seasonal changes in spring discharge.

2.1.2 Groundwater Level Monitoring

The wells designated for ongoing groundwater elevation measurement include those wells previously installed as part of the Amargosa Hydrologic Survey (wells ARHS-01 through ARHS-04); the Eagle Mountain Well and Cynthia's Well. None of these wells have a surveyed mark for ground level, thus surface elevation has been estimated using USGS topographic maps. Depth to water was measured from the same point during each monitoring event so accurate comparisons between events can be made. All of the depth to water measurements recorded starting with the initial well survey are summarized on Table 2-1. Depth to water measurements are also found in the individual well data sheets included in Appendix D. The four ARHS wells have been outfitted with In-Situ transducer / data-logger set-ups, and collect groundwater level measurements at one-hour intervals. The results of the groundwater level monitoring are discussed later in this report.

2.1.3 Amargosa River Flow Monitoring

River flow was measured at five locations along the Amargosa River from the town of Tecopa south to the California Route 127 undercrossing near Dumont Dunes. Two of the measurement points were flow gauges established by the USGS. The first is the USGS gauging station located in the town of Tecopa, California (station no. 10251300) and the second is located near China Ranch, just above the confluence with Willow Creek (station no. 10251330). The three manual flow measurement stations were located at the intersection with Sperry Wash, the crossing of Dumont Dunes Road and the undercrossing of California Route 127. As the project has progressed, additional measurements have been obtained from the Amargosa River just below the confluence with Willow Creek, and along Willow Creek just upstream of the Amargosa River.

A Marsh-McBirney Flo-Mate electromagnetic velocity meter and associated equipment was used to gauge river flow at each measurement location along the Amargosa River. Surface water flow velocity was measured and recorded at 0.5-foot intervals across the width of the Amargosa River along a measurement transect oriented perpendicular to the direction of river flow. Concurrent with each velocity measurement, depth to river bottom was recorded. The full profile of river velocities and depths for the complete cross-section of the river could then be aggregated to determine total river volumetric flow at the measurement location. Each measurement transect location was recorded using a hand held GPS receiver so subsequent measurements were performed approximately along the same river cross-section.

During the spring reconnaissance field activities conducted during November 2010 and January 2011, the leading edge of the Amargosa River extended to an indeterminate point downstream of the California Route 127 undercrossing. This was also the case during the May 2014 monitoring event. The initial visit to this section of the River in late April 2011 showed that the leading edge had retreated to a point between the California Route 127 undercrossing and the crossing of Dumont Dunes Road. A subsequent visit a week later (early May, 2011) showed the retreat of the River continued such that the leading edge was approximately 1,000 feet upstream of the Dumont Dunes Road crossing. The visit in September 2011

showed the leading edge of the River in approximately the same place. During the December visit, the leading edge of the River had advanced beyond the Dumont Dunes Road crossing, but did not extend as far as the California Route 127 undercrossing. This data, along consistent later observations and with visual observations by long-time residents, provides strong indications that flow in the Amargosa River is generally controlled by evapotranspiration. The increase in evapotranspiration that occurs during the longer, hotter summer days reduces water availability for surface flow resulting in the retreat of the River. The reduction in evapotransipration that occurs during the shorter and cooler winter days increases the water available for surface flow, thus the leading edge of the River advances independent of precipitation. The management of non-native vegetation along the Amargosa River (i.e. tamarisk removal) will likely have a significant effect on the flow of water in the River. Hydrographs of the Amargosa River based on the periodic monitoring events are presented on Figure 2-4.

2.2 Water Quality Analyses

As a continuing step to determine relationships between waters found in the Middle Amargosa River Basin, water samples were collected from a select group of spring and wells, including the following:

- Noble Gas Isotopes (e.g. Helium isotopes) at Thom Spring, Tecopa Hot Springs, Borehole Spring, Wild Bath Spring and well ARHS-01;
- Stable Isotopes at Wells ARHS-01, ARHS-03 (Twelvemile Spring), and at Dodge City Spring; and,
- General minerals and metals at Dodge City Spring.

The noble gas analyses were conducted at the University of Utah. Stable isotope analysis was conducted by Isochem Analytical in Champaign, Illinois. Interpretative work was conducted M. Lee Davisson & Associates, Inc.

2.2.1 Previous Isotope Investigations

A number of previous reports have been published on groundwater geochemistry and isotope abundances in southern Nevada and southeastern California. Notable reports relevant to the Amargosa River area include those of Winograd and Thordarson (1975), Thomas et al. (1996), Davisson et al. (1999), and Larsen et al. (2001). Additional studies that include directly related data can be found in Thomas et al. (2003a) and Hurst (2012).

Winograd and Thordarson (1975) developed one of the early frameworks for groundwater flow in southern Nevada related to the Nevada Test Site, and that included extensive discussion of the Ash Meadows springs discharge area. Based on earlier work, they also summarized types groundwater hydrochemistry that showed calcium magnesium bicarbonate groundwater associated with both the carbonate rock of the Spring Mts. and adjacent Pahrump Valley. In contrast, sodium potassium bicarbonate groundwater drains the largely volcanic rock areas south of the Nevada Test Site (e.g., Oasis

Valley and Jackass Flats). Ash Meadows spring discharge consequently has calcium magnesium sodium bicarbonate water that Winograd and Thordarson inferred as a mixture of recharge of the two latter water types.

Thomas et al. (1996) also compiled and summarized groundwater chemistry types as well as isotope abundances in areas that included groundwater throughout southern Nevada and southeastern California with a focus on the regional carbonate aquifers. They concluded from isotope results that the calcium magnesium sodium bicarbonate water discharging from Ash Meadows springs comprised 60 percent Spring Mountains recharge and 40 percent from Pahranagat Valley to the east. They also argue from radiocarbon data that groundwater velocities ranged approximately from 10 to 144 feet per year.

Davisson et al. (1999) showed that radiocarbon was not a reliable method for age dating groundwater in the regional carbonate aquifer due to continual isotope exchange reactions combined with mixing of local recharge sources during long-range transport. They further showed that stable isotopes of oxygen-18 and deuterium measured in southern Nevada groundwater had been previously evaporated during its original recharge as melted snow in central Nevada (Rose et al., 1999). By applying a methodology that removed the effects of evaporation on oxygen-18 and deuterium they showed a systematic decrease in their abundances with increasing latitude and local elevation throughout southern Nevada, a result inconsistent with previous studies purporting Pleistocene age groundwater recharge during the last glacial period (Claassen et al., 1986).

Larsen et al. (2001) studied the water quality and stable isotope abundances of groundwater in the Tecopa and Death Valley regions of the Amargosa River and related them to groundwater of southern Nevada to delineate potential recharge sources. They recognized three water types comprising a Spring Mountains recharge source, a deep regional groundwater derived from fracture flow of southern Nevada, and groundwater derived from basin-filled groundwater of the Amargosa Desert.

Additional studies providing a greater variety of isotope measurement types have been reported by Thomas et al. (2003a) and Hurst (2012). Thomas et al. (2003a) focused specifically on Oasis Valley and its hydraulic connection to Pahute Mesa, showing that Oasis Valley groundwater is replenished by groundwater flow through Pahute Mesa that was ultimately derived further north. The Oasis Valley groundwater ultimately replenishes the Amargosa Desert basin fill aquifers. Hurst (2012) specifically focused on tritium, oxygen-18, deuterium, strontium isotopes, and uranium isotopes in regions along the Amargosa River. He showed that spring samples are largely tritium absent, the oxygen-18 and deuterium show only limited evaporation, and that strontium and uranium isotopes show mixing along the entire length of the Amargosa River.

Lastly, one study reported by Thomas et al. (2003b) measured dissolved noble gases in the regional carbonate aquifer of southern Nevada. They showed that noble gas abundances that are typically incorporated in recharging groundwater and reflect the local recharge temperature were systematically

being lost during long-range transport from Pahrangat Valley in east-central Nevada towards Ash Meadows at its terminal discharge point. They concluded this loss of dissolved gas was due to fault barriers and cavities in the regional carbonate aquifer that forces groundwater to migrate upward and encounter gas loss in air pockets. This subsequently masked the calculated recharge temperatures derived from the noble gases.

2.2.2 Field Methods

Stable Isotopes

Samples for oxygen ($\delta^{18}O$) and deuterium (δD) were collected in 60 milliliter glass bottles equipped with a conical shaped insert inside the cap that forms an airtight seal when the bottle is closed. Samples were shipped to Isotech Laboratories in Champaign, Illinois where the 18O/16O and D/H ratios were measured as a gas using standardized mass spectrometry methods. Results are reported as a normalization to Standard Mean Ocean Water (SMOW), which is an internationally recognized standard in stable isotope analysis. The normalization converted to standard δ ("del") notation following the convention:

$$\delta = \left(\frac{R}{R_{std}} - 1\right) 1000$$

Where R is the isotope ratio of the sample and R_{std} is the ratio of the standard.

Noble Gas

Noble gas samples were collected in passive diffusion samplers comprising two sections of 1/4" copper tubing attached by a small section of semipermeable silicon tubing (Figure 2-5). The terminal ends of the copper tubes were pinched closed gas-tight with cold seal. The samplers were placed in the water to be sampled for 24 hours. During this equilibration period, gases dissolved in the water diffused through the semipermeable tube and came into an equilibrium concentration in the tube proportional to that of the water. At the same time, a special meter was used to measure the total dissolved gas in the water. After 24 hours, the sampler was crimped to a cold seal on the semipermeable tube end of the copper to form two separate gas samples. These two samples were then labeled, the end protected with electrical tape and placed into a plastic bag. Samples from five sample sites were collected by this method. All samples were sent to the noble gas laboratory at the University of Utah. The copper tubes were vacuum fitted to an evacuated container, the copper cold seal was uncrimped to release the gas, followed by cryogenic isolation of noble gases of interest. Noble gas abundances and the $^3He/^4He$ ratios were measured on a VG-5400 noble gas mass spectrometer. Results are reported as gas volume per milliliter of water.

2.2.3 Results - Geochemistry

A detailed description of the investigative results and associated laboratory data reports are provided in the report prepared by M.L. Davisson & Associates, Inc., and provided in Appendix E. What follows is a summary of the conclusions of that report.

Stable isotope and other geochemical data indicate that Middle Amargosa River area groundwater appears to be a mixture of Ash Meadows, Spring Mountains and Kingston Range sources (Figures 2-6 and 2-7). The pathways for that groundwater to reach the area probably consist of one or a combination of:

- Water that moves through carbonate rocks from the Spring Mountains to the Ash Meadows and then southward toward the Shoshone-Tecopa area;
- Water that moves through carbonate rocks beneath the northern portion of the Nopah Range into Chicago Valley, then toward the Amargosa River; and,
- Water that moves from Pahrump Valley through the low, faulted divide into California Valley then towards the River.

Most of the spring/groundwater samples have characteristics indicative of having been influenced by Spring Mountain recharge by some route. Most of the mixing is probably occurring via fractured rock at depth, and less so in the alluvium. Water quality in the springs in the Shoshone-Tecopa area likely evolves from a mixture of regional carbonate and Tertiary volcanic rock influences, but acquires increased chloride and sulfate possibly from the Tecopa lake bed deposits. Additionally, regional subsurface heat flow increases groundwater temperature and contributes to increased dissolved silica, decreased bicarbonate, and possibly increased pH, with the latter resulting in the high arsenic concentrations. The source of the arsenic could be from multiple sources, but as pH increases the solubility increases to significantly high levels as presented on Figure 2-8.

Noble gas concentrations of the water in the Shoshone-Tecopa area are strongly similar to those measured in the regional carbonate – Ash Meadows (of southern Nevada) groundwater noted by Thomas, et.al. (2003b). Their conclusions were that dissolved gas loss occurred during subsurface transport across faulted boundaries and compromised recharge temperature/elevation calculations. The noble gas recharge temperatures/elevation calculations for Amargosa River Valley groundwater mostly support the conclusions of Thomas, et.al. (2003b).

The $^{3}He/^{4}He$ ratios for the four measured springs (Thom, Wild Bath, Tecopa and Borehole) were unusually low, indicating old groundwater ages. The values were 5 to 10 times lower than measured groundwater under the Nevada Test Site. These low ratios could be due to high influx of ^{4}He from the Earth's crust caused by deep faults. Otherwise, if the low ratio is due to steady-state accumulation from local deposits, then groundwater ages greater than 100,000 years would be required. Additionally, the helium ratios did not suggest the presence of a shallow magmatic heat source for the Tecopa Hot Springs area, and indicate that the heat source is via deep circulation, probably along the faults that run through the area. The elevated temperature of the Tecopa Hot Spring water is not unusual since similar temperatures are seen at depth under the Nevada Test Site. However, at Tecopa, the warm water is driven to the surface probably by some structural control.

Several recommendations for future work are derived from the results of this work and provided in Section 4.0.

3.0 GROUNDWATER SYSTEM – CONCEPTUAL MODEL

The conceptual model of a groundwater system is the foundation of any analysis of a groundwater basin. The conceptual model describes groundwater occurrence, groundwater movement, hydraulic properties of aquifer materials, and groundwater inflow and outflow components. As described in the previous SOBRs, as new data are gathered in the Middle Amargosa Basin, the conceptual model for the area would be updated as appropriate to reflect those data. This section of the SOBR, provides an updated overview of the conceptual model reflecting the results of new geochemical data, groundwater level data, and river gauging results.

3.1 Regional Setting and Geologic Conditions

The Amargosa River Basin is located in Inyo and San Bernardino Counties, California, and Nye County, Nevada within the Basin and Range geomorphic province. The Basin and Range region is characterized by basins of internal drainage with considerable topographic relief, alternating between narrow faulted mountain chains and flat arid valleys or basins. The ranges generally trend north-northwest parallel to the regional structural regime. The geology of the Amargosa Basin is very diverse containing Precambrian, Paleozoic and Mesozoic metamorphic and sedimentary rocks, Mesozoic-aged igneous rocks, Tertiary and Quaternary-aged volcanic rocks, and playa, fluvial and alluvial deposits (Planert and Williams, 1995). A regional geologic map is provided on Figure 3-1.

The valley areas are covered by coalescing alluvial fans forming broad slopes between the surrounding mountains and the valley floors. The regional gradient of the Northern Amargosa River Basin is generally to the south-southeast with gradients that typically range from five to 15 feet per mile. The basin fill deposits are interpreted to be underlain primarily by Paleozoic sediments although in the central portion of the basin floors, the basin fill sediments have not been fully penetrated by drilling. Generally, the Middle Amargosa Basin is marked by several unique features including the badland-type topography of the Tecopa lakebed deposits and the Amargosa River Canyon. Between Shoshone and Tecopa the slope of the valley floor flattens among the lakebed deposits, and then steepens as the river flows through the Amargosa River Canyon. Downstream of the canyon, the topography reverts to an area of broad, coalescing alluvial fans, eventually reaching the flat playa in Death Valley.

3.2 Hydrogeologic Units

In the Amargosa River Basin, the principal hydrogeologic units consist of unconsolidated basin fill materials, volcanic rocks (primarily in Nevada), and the carbonate rock aquifer. The following provides a summary of these three hydrogeologic units.

3.2.1 Basin Fill

Tertiary and Quaternary-aged basin fill deposits are present throughout the basin as alluvial, fluvial and lacustrine (lakebed) deposits. Coarse-grained deposits (primarily sand and gravel) within the basin fill are responsible for transmitting the greatest quantities of groundwater and are most relied upon for groundwater production in the region. The basin fill is generally unconsolidated, moderately to well-sorted sand, gravel, silt and clay, and wells completed in the basin fill can yield several hundred gallons per minute (Walker and Eakin, 1963). As the axes of the valleys are reached, the sorting of the sediments will increase which can serve to significantly increase the permeability of the sediments. With increasing depth, groundwater production can be expected to decrease in these deposits as increasing lithostatic pressure and infilling of pores coincident with their greater age may occur reducing permeability.

Within the basin fill, the fine-grained (clay and silt) deposits that largely comprise the lakebed deposits (for example in the Shoshone – Tecopa area) serve as aquitards. Aquitards are low permeability geologic units that inhibit groundwater flow and can serve as confining units. Wells and boreholes that are completed in aquifer materials underlying these aquitards may exhibit artesian conditions such as those observed from flowing wells and borings such as at Borehole Spring and Borax Spring in the Shoshone-Tecopa area.

3.2.2 Volcanic Rocks

Tertiary and Quaternary-aged volcanic rocks are present within the Amargosa River Basin particularly in the area of the headwaters of the Amargosa River in the Beatty area of Nevada, and in the Greenwater Mountains immediately west of Shoshone, California. In the California portion of the basin, the volcanic rocks are generally of lesser importance to the overall groundwater system as opposed to the northern portion of the basin in Nevada. Locally, volcanic rocks can be of importance, for example, at the Shoshone Spring area where a basalt flow crossing the Amargosa River course may be driving water to the surface in the river bed and the spring. This will be discussed further in Section 3.3.

3.2.3 Bedrock Units

Bedrock units underlying the alluvial valleys and generally comprising ranges such as the Nopah and Resting Spring Ranges, and portions of the Amargosa Range, consist of Precambrian to Mesozoic-aged metamorphic and sedimentary rocks. These geologic units consist of Paleozoic-age carbonate rocks (the "carbonate rock aquifer"); quartzite, and shale which have been folded and faulted (Figure 3-1). Generally, bedrock units such as these produce little water except where they are fractured and faulted, providing pathways for groundwater movement. Other bedrock units consist of the Mesozoic-aged granitic rocks as found in the Kingston Range. Within the granitic rocks, groundwater flow can be assumed to be negligible except where fracturing is present yielding modest quantities of groundwater.

Where carbonate rocks are present, greater movement of groundwater can occur due to the unique depositional and erosional characteristics of those rocks. Fractures and secondary solution openings

along bedding planes can transmit considerable quantities of groundwater. Groundwater that discharges from the springs at Ash Meadows largely involves groundwater moving through these secondary openings in the carbonate rocks. Within the basin, significant groundwater flow through the carbonate rock aquifer occurs within the lower to middle Paleozoic-age carbonate rocks that comprise a package of rocks approximately 26,000 feet thick (Sweetkind, Belcher, et.al., 2004).

Groundwater flow in carbonate rocks can be very complex. Carbonate rocks with extensive solution channels or fractures primarily developed in one direction will have permeabilities that are highly oriented in specific directions. Therefore, the groundwater flow may not be predictable simply by drawing flow lines perpendicular to regional groundwater surface contours representative of the regional carbonate aquifer (Davis & DeWiest, 1966). Although the carbonate rock aquifer likely transmits large volumes of groundwater in the region, permeability is limited to areas of fracturing which proportionally makes up a small portion of the carbonate rock volume. Therefore, despite the potential for wells to obtain large yields from the carbonate rocks, that success is dependent on intersecting those fractured zones.

3.2.4 **Geologic Structure**

The rocks in the Amargosa River Basin have been extensively deformed by a variety of fault types that have occurred in the distant past as well as the present. These fault types include:

- Normal faulting typical to the Basin and Range with vertical displacement being dominant;
- Strike-slip faulting (lateral displacement dominant) typical of larger-scale regional fault systems such as the Furnace Creek – Fish Lake Valley Fault and Las Vegas Valley Shear Zones; and
- Thrust faults (low angle faults) that during the Paleozoic and Mesozoic resulted in displacing rock units in a manner that can affect groundwater movement in the present.

Springs may issue from the locations of faults due to either the lower fracture permeability of the fault in rock, or the displacement of permeable basin fill or rock adjacent to relatively impermeable materials. For example, The Tecopa Hot Springs rise along a fault (Waring, 1915) that runs north-northwest through the basin (Figure 3-2). Shoshone Spring also rises along the northward extension of the same fault that passes through Tecopa, part of the Furnace Creek Fault Zone (California Division of Mines, 1954). The Death Valley – Furnace Creek Fault System (inclusive of the Furnace Creek Fault Zone) is part of a large, currently active, northwest directed pull-apart zone. Movement along the Furnace Creek Fault Zone is primarily strike-slip (Brogan, Kellog, Slemmons and Terhune, 1991). The Death Valley – Furnace Creek Fault System is the second longest fault system in California (the San Andreas Fault System being the longest).

Thrust faults are present throughout the region, however given their age, in many areas their presence is concealed by overlying volcanic or basin fill deposits. Fracture permeabilities along thrust faults are insignificant due to the age of the structures and fracture filling and the low angle nature of the faulting not supporting fractures with significant apertures. However, in areas where impermeable rocks are

thrust against more permeable rock in the subsurface (e.g., quartzite thrust against carbonate rocks), those faults may also serve as a barrier to groundwater flow. This can be seen along the base of the Nopah and Resting Spring Ranges where the carbonate rock sequence outcrops in the upper portions of the ranges and underlying Lower Cambrian and Precambrian clastic rocks outcrop along the base of each of these ranges. A notable exception is north of the Nopah Thrust in the northern portion of the Nopah Range. North of this fault, the carbonate-rock sequence is down-dropped relative to the carbonate rocks south of the thrust fault resulting in a potential pathway for an undetermined amount of water to seep from Pahrump Valley into Chicago Valley. Of note is the presence of Twelvemile Spring situated approximately west of this thrust fault, and an absence of springs along the west base of the Nopah Range further south.

3.3 Surface Water

The principal surface water body in the region is the Amargosa River, an intermittent river with headwaters issuing from springs northeast of Beatty, Nevada, and extending approximately 180 miles to the river's terminus at the playa in Death Valley. Except for portions of the river in the Amargosa Canyon area in California, and near Beatty, Nevada, the Amargosa River typically flows only after periodic storms. In those areas where the river is usually dry, the flow of water is in the subsurface. The perennial reach of the Amargosa River between Shoshone and Dumont Dunes was designated as a National Wild and Scenic River in 2009. Except during runoff events from rainstorms, the perennial flow in the Wild and Scenic section of the river is completely supplied by groundwater.

The Amargosa River rises as spring flow from the southwest side of Pahute Mesa in Nevada. From here, the river flows generally southwest toward Beatty, Nevada, and after passing through the Amargosa Narrows where water is forced to the surface, enters the Amargosa Desert. After crossing the border into California, the river generally runs southward along a valley that follows the trend of the Furnace Creek Fault Zone, adjacent to California State Highway 127 near Death Valley Junction. Here, the river meets with Carson Slough (which drains Ash Meadows and is the chief tributary to the Amargosa River in Nevada), and continues its southward route passing to the east of the community of Shoshone and on to Tecopa. South of Tecopa, the river enters the Amargosa Canyon, being augmented by spring flow on its course. South of the Amargosa Canyon, the river flows by Dumont Dunes, and then heads west and then northward, rounding the Amargosa Range on the south and flowing into Death Valley.

A series of conceptual cross-sections following the course of the Amargosa River from near Oasis Mountain northeast of Beatty, Nevada, to Sperry below the Amargosa River Canyon in California are provided in Appendix F. As can be seen, areas with continual flow are typically where rock units create constrictions to flow, and that flow is driven to the surface. Beyond the constrictions, the flows typically percolate into the subsurface some distance downgradient. This occurs at the narrows southeast of Oasis Mountain, at the Amargosa Narrows south of Beatty, Nevada, at the Shoshone Spring area, and at the Amargosa River Canyon. Between Shoshone and Tecopa, the river can also rise to the surface, most

likely the result of permeable zones intersecting clayey, Tecopa lake bed deposits causing flow to surface. As can also be seen in the cross-sections (Appendix F), the groundwater surface tends to flatten upgradient of these constrictions, then steepens once past them, as would be anticipated.

This condition also emphasizes the sensitivity of the relatively constant, or perennial reaches of the Amargosa River to changes in groundwater level. Additionally, given this condition, it appears that a considerable portion of the underflow moving through the Middle Amargosa system can be accounted for by the flow observed at the surface for example in the Amargosa River canyon plus spring discharge and any pumping. This does not result in a substantial amount of underflow, and further highlights the sensitive nature of the river system. More about this is discussed in Section 4.1.

The USGS monitors the flow of the Amargosa River (USGS, 2013) at a gage 0.2 miles west (Gauge no. 10251300) of Tecopa. The USGS has monitored Amargosa River flow intermittently at other locations along the river over the past 50 years, but given the spotty nature of those records, they are of limited utility. The average flow of the river at this station based on 39 full years of data between 1962 and 2013 (some years missing) is 3.44 cubic feet per second (cfs), though is skewed high as a result of flood flows. The maximum mean annual flow recorded there was 14.9 cfs in 1983 when the record peak flow of 10,600 cfs was recorded on August 16, 1983. At times the river has been dry at this station. Mean annual flows at the Tecopa station along with the other stations mentioned are summarized on Table 3-1.

AZI conducted flow measurements at three locations along the river which are provided on the Field Activities Data Summary table (Table 2-1). Field water quality parameters collected by AZI indicated that Amargosa River waters are somewhat intermediate in chemistry between the more saline hot spring waters at Tecopa, and the fresh water springs identified in the area. This monitoring has provided strong indications that the extent of flow in the Amargosa River is significantly controlled by evapotranspiration. The increase in evapotranspiration that occurs during the longer, hotter summer days reduces water availability for surface flow resulting in the retreat of the River. The reduction in evapotransipration that occurs during the shorter and cooler winter days increases the water available for surface flow, thus the leading edge of the River advances independent of precipitation. The management of non-native vegetation along the Amargosa River (i.e. tamarisk removal) will likely have a significant effect on the flow of water in the River.

Other surface water bodies in the area consist of spring-fed ponds in the Ash Meadows area (Nevada), spring-fed Grimshaw Lake in the Tecopa area, and streams that issue from springs only to end where either that flow is utilized by vegetation, or it percolates back into the subsurface. One exception to this is Willow Creek, a significant spring-fed stream that rises northeast of China Ranch (south of Tecopa), and flows into the Amargosa River within the Amargosa River Canyon.

3.4 Regional Groundwater System

The regional groundwater flow system is considerably more extensive than the Amargosa River Basin watershed (Figure 3-3). The reason for this is the extensive area beyond the watershed boundary

underlain by the carbonate rock aquifer that drains toward Death Valley. In this large flow system, groundwater recharge results from precipitation in the form of snowmelt and rainfall that falls within the mountains of southern and central Nevada, and reaches the Amargosa River Basin where it is discharged (Planert and Williams, 1995).

The Northern Amargosa River Basin appears to receive much of its carbonate-rock aquifer underflow from central Nevada. As shown on Figure 3-4, groundwater moves southward through Lincoln County, Nevada where it splits with a portion of that flow heading southwest toward the Amargosa Desert and Ash Meadows. The remainder of the flow moves southeast toward Muddy Spring and the Colorado River area.

Within the Middle Amargosa River Basin (between the California-Nevada state line and Salt Creek), it has long been postulated that groundwater moves directly through the carbonate aquifer southwest from the Spring Mountains and beneath Pahrump Valley toward the Tecopa – Shoshone – Chicago Valley – California Valley areas (Faunt, D'Agnese and O'Brien, 2004). However, based on the results of the current geochemical analyses and more recent detailed mapping by the USGS (Workman, et.al., 2002), it appears that the mechanism by which groundwater moves from the Spring Mountains/Pahrump Valley area toward the Shoshone-Tecopa area may be more complicated. Figures 3-5, 3-5a and 3-5b present a portion of the 2002 geologic map indicating that Precambrian to Cambrian bedrock units underlying the carbonate rock units outcrop along the western base of the Resting Spring Range and the portion of the Nopah Range south of the Nopah Peak Thrust. This would indicate that the saturated rocks beneath these ranges are primarily comprised of quartizite, shale, siltstone and dolomite of lesser permeability than would be expected of the Paleozoic-age carbonate rocks. Alternative flow paths likely include one or more of the following:

- Spring Mountain recharge moving toward Ash Meadows through carbonate rocks and basin fill, then southward toward the Shoshone-Tecopa area;
- Via carbonate rocks at the north end of the Nopah Range into Chicago Valley then toward the Amargosa Valley; and ,
- From Pahrump Valley via the shallow divide into California Valley then toward the Amargosa River.

These deeper flowpaths are most likely influential on the spring flows and discharge to the alluvium. The deeper flowpath beneath the northern Nopah Range was previously discussed (JWI, 2013a) as a potential source for Twelvemile Spring. These flowpaths are consistent with that previously proposed by others (Figure 3-6). Beyond the Middle Amargosa River Basin, groundwater moves west in the Death Valley Basin, then north augmented by underflow from the Owlshead Mountains area, to the Death Valley Playa.

The regional groundwater flow system covers an area of nearly 40,000 square miles. The following sections describe the occurrence and movement of groundwater, the aquifer characteristics of the basin fill and carbonate rock aquifers, and groundwater basin inflow and outflow components.

3.4.1 Groundwater Occurrence and Movement

Within the Amargosa River Basin, groundwater occurs primarily within the basin fill deposits and carbonate rock aquifer. Although groundwater occurs with significance in the volcanic rocks in the northern portion of the basin, the focus of this report is the basin south of the Death Valley Junction area (Middle Amargosa River Basin), and therefore is not discussed here. The only materials from which groundwater can be extracted for significant use is within the coarse-grained deposits of the unconsolidated basin fill and within the fractured carbonate rocks (Walker and Eakin, 1963). Volcanic rocks and other bedrock units can generally be assumed to be relatively impermeable except where locally fractured and minor yields can be achieved. As described in Section 3.3., underflow in the basin fill contributes to surface flow in the Amargosa River where constrictions occur due to the presence of less permeable bedrock or other lower permeability deposits. Based on this condition, in the Middle Amargosa River Basin, the amount of underflow moving through the system may largely be represented by the sum of Amargosa River flow (as observed in the Amargosa River Canyon), underflow in river channel deposits, spring discharge and evapotranspiration, and the limited pumping in the area.

In the Northern Amargosa River Basin, groundwater is generally found within the basin fill from which most of the groundwater pumping in the Amargosa River Basin is concentrated. In the Ash Meadows area, the primary aquifer is the carbonate rock aquifer system. Groundwater within the carbonate rocks flows laterally across basins as interbasinal flow as described earlier.

The direction of groundwater movement usually parallels the slope of the ground surface, from points of recharge in the higher elevations to points of discharge such as springs or the Amargosa River in the valley. Within the basin fill aquifer, groundwater movement is from north to south from the northern portion of the basin toward Shoshone and Tecopa. A potentiometric surface map of the shallow basin fill aquifer based on the groundwater levels collected by the USGS, AZI, AC, Nye County and Inyo County (by TEAM Engineering & Management, Inc.) during the 4th Quarter of 2010 is provided on Figure 3-7. This is the same map that was provided in the 2011 SOBR. Based on the continued monitoring of groundwater levels in the area since that time, and the little change observed south of Death Valley Junction, this map is likely still consistent with existing conditions.

Precipitation and snowmelt runoff from the mountains surrounding the Middle Amargosa River Basin collect in the thick packages of alluvium that fill the valleys. The water percolates through the alluvium under the force of gravity, flowing downhill towards the lowest point in the Basin, the Amargosa River. Figure 3-8 shows the conceptualized flow paths of groundwater flowing in the alluvial valleys within the Middle Amargosa River Basin. North of Shoshone, groundwater flows south around Eagle Mountain in the alluvium that forms the floor of the valley through which runs the Amargosa River.

The valley and the Amargosa River are additionally fed from runoff from the east slope of the Amargosa Range and the west slope of the Resting Spring Range. Water from the east slope of the Resting Spring Range and the west slope of the Nopah Range flow into Chicago Valley, following the slope of the valley floor to the south. At the south end of the Resting Spring Range, the alluvial valley turns southwest towards Tecopa and the Amargosa River. Right at this bend is Resting Spring, which likely exists as a result of the change in valley direction and the constriction in the width of the alluvium in the valley between the Resting Spring Range and the Nopah Range, forcing groundwater to the surface at the spring location. Water from the southeastern slope of the Nopah Range and the western slope of the Kingston Range flows into California Valley and west around the southern tip of the Nopah Range. Some of this water likely flows down China Ranch Wash, which in turn is the source of the water from Willow Spring and Willow Creek.

Runoff from the eastern Ibex Hills flows into Greenwater Valley toward the Amargosa River. South of the Sperry Hills, runoff from the north facing slope of the Avawatz Mountains, along with the Salt Spring Hills, Saddle Peak Hills and the Ibex Hills flows into the basin fill of Southern Death Valley, down the middle of which runs the Amargosa River.

Based on the results of AZI's spring reconnaissance, it is clear that a number of distinct spring sources are represented in this concentrated part of the Amargosa River Basin. Based on the current isotopic work, the elevated temperatures of the hot springs around Tecopa indicate that the spring water has most likely been at great depth. This is similar to warm springs in the Furnace Creek area of Death Valley National Park (Pistrang and Kunkel, 1964). The Furnace Creek area warm springs are also present along the Furnace Creek Fault Zone where deep circulation is postulated. This indicates that absent shallow heated igneous rocks, those waters moved at considerable depth (in the range of thousands of feet below ground surface) only to move upward along fractures or faults to the surface where it is discharged. In other springs, field water quality parameters are suggestive of groundwater flow of a more local nature such as at Crystal Spring (Kingston Range source) or Sheep Creek Spring (Avawatz Mountains source).

3.4.2 Aquifer Characteristics

Groundwater within the basin is held within the sand, gravel, silt and clay that make up the valley fill aquifer. Within the Northern Amargosa River Basin, hydraulic conductivity (the ability for a geologic material to transmit water) in the basin fill can range from 0.02 feet per day (f/d) in the low permeability clayey deposits, to 140 f/d in the coarse-grained sands and gravels (Belcher, 2004). AZI is unaware of any aquifer testing that has occurred within the basin fill in the Middle Amargosa River Basin or the Death Valley Basin, but it is likely that hydraulic conductivities generally fall within the same range as those described above.

The aquifer characteristics of the carbonate rock aquifer can be highly variable. Where fractures and solution openings exist, these rocks can be the most permeable materials in the basin. Absent fracturing,

hydraulic conductivities can be extremely low. Carbonate rock hydraulic conductivities can range from 30 f/d or greater to much less than 0.001 f/d (Spitz & Moreno, 1996).

3.4.3 Groundwater Basin Inflow Components

Groundwater inflow components within the Amargosa River Basin include recharge from precipitation that falls within the drainage basin and groundwater underflow into the basin, primarily through the carbonate rock aquifer. In this area, large uncertainties exist regarding recharge rates, and currently, groundwater pathways for underflow into the basin. Therefore, best estimates of recharge are probably most available by evaluating groundwater discharge and changes in storage/changing groundwater levels in the area.

3.4.3.1 Recharge

Walker & Eakin (1963) estimated recharge to the Northern Amargosa River Basin from precipitation within the basin plus recharge from precipitation on the northern and western slopes of the Spring Mountains to be approximately 5,000 acre-feet per year (AFY). Within the California portion of the basin, the Middle Amargosa Basin and Death Valley Basin do not have specific recharge estimates associated with them (California Department of Water Resources, 2003).

As part of the water-supply feasibility study for a potable water source for Tecopa, JWI (2013c) estimated a recharge of approximately 700 afy from the Kingston Range using the Maxey-Eakin Method.

3.4.3.2 Groundwater Underflow

Walker & Eakin (1963) estimated that of the 17,000 AFY discharged from the springs at Ash Meadows on an annual basis; approximately 13,000 AFY might be the result of groundwater underflow through the carbonate rocks from the Spring Mountains to the east. The remaining 4,000 AFY being supplied by underflow from areas to the northeast in central Nevada. South of Death Valley Junction, the general absence of previous hydrogeologic investigations in the Shoshone – Tecopa region results in more generalized assumptions regarding underflow. As shown in Figure 3-6, regional groundwater flow enters the California portion of the basin from Ash Meadows and from recharge in the Spring Mountains via various potential routes. Additional underflow from the south from the Silurian Valley area enters the system between the Amargosa River Canyon and Saratoga Springs (Faunt, D'Agnese and O'Brien, 2004).

With respect to the Middle Amargosa River Basin, the existing Death Valley Regional Flow System model could be used to evaluate the groundwater budgets for specific zones in this part of the groundwater system, therefore extracting underflow estimates for each of these areas. However, there would be significant uncertainty associated with them, as the model was developed without the benefit of the data collection effort that has been ongoing for the last three years. With the existing data and proposed data collection and analysis, refinement to that groundwater model, or a new groundwater flow model focused

on the Middle Amargosa River Basin, will be an essential management tool and will likely provide additional insight into the dynamics of regional flow in the area.

3.4.4 Groundwater Basin Outflow Components

3.4.4.1 Spring Flow & Evapotranspiration

Spring flow and evapotranspiration have been combined as a basin outflow component in this basin as in this area as they are unavoidably linked. Groundwater-dependent vegetation (phreatophytes) are present along the Amargosa River and in spring areas. Springs discharge water from the groundwater system, but in nearly all cases within the basin, that flow either evaporates, is used by plants, or percolates back to the groundwater system within a relatively short distance. One of the few exceptions to this is Willow Creek south of Tecopa which rises from spring flow within China Ranch, and generally maintains surface flow to its confluence with the Amargosa River. In the Nevada portion of the basin, the discharge from spring flow and evapotranspiration has been estimated at 23,500 AFY (Walker & Eakin, 1963).

In the Shoshone - Tecopa - Chicago Valley - California Valley area, the combined spring flow and evapotranspiration has been estimated at approximately 8,900 AFY. In the Death Valley Basin, combined spring flow and evapotranspiration has been estimated at approximately 35,000 AFY (San Juan, Belcher, et.al, 2004).

Based on the field reconnaissance activities, it is clear that the springs in the California portion of the basin emanate from a variety of sources. These sources appear to range from those with deep circulation paths (such as Tecopa Hot Springs), and those with shallow and potentially more local circulation paths (such as at Willow Creek). With respect to specific spring flow (not including evapotranspiration or Amargosa River flow), AZI's total field estimated spring flow has typically been approximately 1.8 cfs during the spring reconnaissance activities (approximately 1,300 AFY).

3.4.4.2 Pumpage

Within the Amargosa River Basin, pumpage is primarily within the Northern Amargosa River Basin. This water is largely used for irrigation. Table 3-2 summarizes groundwater pumping from the Northern Amargosa River Basin since 1983 (NDWR, 2012a). This represents the most up to date pumping data available from the Nevada Division of Water Resources at the time of this report. Total pumping over time is also represented on Figure 3-9. Average annual pumping since 1983 has been 12,153 AFY. In 2012, a total of 17,622 AFY was pumped from the basin. As can be seen, over the 27 years of pumping records, the Northern Amargosa River Basin has seen a steady increase in pumping. For comparison purposes the annual duty for the Northern Amargosa River Basin is 27,336.86 AFY (includes certificate, permit, and ready for action) as of February 21, 2012 compared to the estimated annual perennial yield of the basin of 24,000 AFY (Walker and Eakin, 1963). This updated annual duty is a reduction of approximately 1,700 AFY since first reported in the 2011 SOBR (SGI, 2011).

In the Middle Amargosa River Basin and Death Valley Basin, water supplies are more reliant on spring flow, and groundwater pumping is relatively insignificant in comparison to the Nevada portion of the basin. Groundwater pumpage for domestic or public use is probably on the order of less than 100 AFY (San Juan, Belcher, et.al., in Belcher, 2004). Water used for irrigation of date palms is supplied by spring water. It is unlikely that water use in the Shoshone-Tecopa area has changed significantly since the last State of the Basin Report (SGI, 2012). Furthermore, any additional water usage resulting from the proposed new potable water supply for Tecopa will be insignificant to the overall water budget of the area.

Outside of the Amargosa River Basin, pumpage in the Pahrump Valley is of most significance to the Amargosa groundwater system. Pumping records available since 1959 (NDWR, 2012b) indicate that beginning with initial groundwater usage of 1,159 AFY in 1959, groundwater pumping in the Pahrump Valley rapidly increased to a maximum pumpage of 47,950 AFY in 1968 (Figure 3-10. During the period of 1964 through 1978, pumping in the Pahrump Valley averaged more than 37,000 AFY. Since that time, groundwater pumping in the Pahrump Valley has gradually decreased to the point that in 2011, total groundwater pumping in the Pahrump Valley was 13,352 AFY, the lowest pumpage since the initial record in 1959. The 2011 pumping rate (which also represents a 2739 AFY reduction in pumping since 2009) is likely attributable to economic conditions and may represent a temporary decrease from the 20,000 to 25,000 AFY of pumping that has been characteristic of the Pahrump Valley since 1980. In 2012, total pumping in Pahrump Valley was 14,136 AFY, an increase of 784 AFY from 2011.

Groundwater levels in the Pahrump Valley were noted to have declined steadily over the period of record, but of note is that impacts to springs in the Middle Amargosa Basin, particularly in the Shoshone – Tecopa area have not been reported. However, Thompson (1929) referred to a site called Yeoman Spring that had at the time an estimated flow of 90 gpm. Although there is no spring currently called Yeoman Spring, this appears to be the same spring now referred to as Chappo Spring. The only surface expression of flow at Chappo Spring is a "puddle" surrounded by trees (including non-native palms) and shrubs. Additionally, early reports indicated that Resting Springs had flows of substantially more than 200 gpm (up to 250 gpm). Both of these springs flow at rates lower than those reported in the first half of the 1900's. While this may be the result of spring modification and additional vegetation uptake, it is possible then, that spring flow in the Middle Amargosa Basin may have been effected by past pumping in the Nevada portion of the basin.

Recently, localized stabilization and recovery has been reported in selected areas of Pahrump Valley indicative of a basin beginning to come closer to balance with recently reduced pumping rates.

3.4.5 **Groundwater Quality**

Groundwater quality in the Amargosa River Basin is highly variable. In recharge areas, the concentrations of dissolved solids in groundwater are low. However dissolved solids will increase as the groundwater moves through the groundwater system and is in contact with the rock materials present. For example,

in the area of Willow Creek, dissolved solids may be high due to the presence of gypsum deposits in the geologic materials through which groundwater in that area is flowing. In the Northern Amargosa River Basin where groundwater pumping is focused, much of the water present is suitable for irrigation (not all of which is suitable for domestic use), however water of medium to high salinity is locally present. Existing groundwater quality data along with those of new wells ARHS-01 through ARHS-04 (and associated well logs) are provided in Appendix G.

3.5 Groundwater in Storage

The volume of groundwater in storage within the basin fill is a function of the area of the aquifer material, a selected saturated thickness, and specific yield (ratio of the volume of water that the aquifer will yield due to gravity to the aquifer's volume) of aquifer material. For the purposes of this report, estimates of groundwater in storage are based on the existing literature. In the Amargosa Basin, the volume of groundwater in storage is orders of magnitude greater than the volume of recharge that occurs on an annual basis representing a groundwater accumulation over thousands of years. Storage calculations are rough estimates as the parameters described above are subject to significant variation.

In the Northern Amargosa River Basin, the volume of groundwater in storage for the Amargosa Desert has been estimated at 1.4 million acre-feet within the upper 100 feet of the saturated basin fill (Walker & Eakin, 1963). Estimates of the volume of groundwater in storage within the Middle Amargosa and Death Valley Basins have not been developed by the State of California.

3.6 Groundwater Levels and Discussion of Inflow and Outflow Components

The volume of groundwater in storage is an important aspect of the groundwater system. Changes in storage are identified in the field by changes in groundwater levels. A fundamental groundwater equation and the basis for evaluations of groundwater budgets (inflow vs. outflow estimates) is:

Inflow – Outflow = Change in Storage

When outflow exceeds inflow, there is a negative change in groundwater in storage and groundwater levels can be expected to decline. When inflow exceeds outflow, the reverse is true. When the system is in equilibrium, water levels will generally remain relatively constant despite short-term fluctuations. Long-term groundwater level declines are a clear indication that outflow has been exceeding inflow for an extended period of time. It should also be noted that in many areas, the recovery of groundwater levels due to groundwater being removed from storage can take longer than the period to remove it depending on the volume removed from storage, precipitation trends and the geology of the basin.

Taking this one step further, under predevelopment conditions, a groundwater system is in equilibrium, a condition where inflow equals outflow. Groundwater pumping causes a disruption in this equilibrium, and recharge amounts and patterns can change. More often, discharge amounts and patterns are impacted. This includes the loss of phreatophytic vegetation (vegetation whose water requirements are

met by roots tapping groundwater such as in the area of springs) and reduction or elimination of spring flow. All pumped water must be supplied by one or more of the following:

- Decreases in groundwater storage;
- Increased or induced recharge; and
- Decreased discharge either in the form of reduced subsurface outflow or decreases in natural forms of discharge such as evapotranspiration, spring flow or river base flow.

Regardless of the amount of groundwater pumped, there will always be groundwater drawdown (and the removal of water from storage) in the vicinity of pumping wells, a necessity to induce the flow of groundwater to said wells. For most groundwater systems, the change in storage in response to pumping is a transient phenomenon that occurs as the system readjusts to the pumping stress. The relative contributions of changes in storage, increases in recharge, and decreases in natural discharges evolve over time. As an example, upward leakage from the carbonate rock aquifer to the basin fill aquifer has been postulated as early as the 1960's (Walker & Eakin, 1963). Elevated pumping in the basin fill aquifer could induce greater upward leakage from the carbonate rock aquifer that correspondingly could result in reduced spring flow from those carbonate rocks.

If the system can come to a new equilibrium (i.e., a combination of increased recharge and/or decreased discharge), the storage decreases will stop, and inflow will again equal outflow. The amount of groundwater "available" for a future groundwater development project is therefore dependent on what these long-term changes are, and how these changes affect the environmental resources of the area. Numerical models are ideal tools to evaluate these issues in that the complexities of the groundwater system can be evaluated in detail, and assumptions of how the groundwater system works can be tested for internal consistency. Further, with advances in software available to the groundwater professional, the efficiency and associated costs of groundwater modeling have significantly decreased over the last two decades.

Groundwater inflow, outflow and storage estimates were provided where available in the previous sections. Based on a review of limited shallow groundwater levels in the Shoshone – Tecopa area, the groundwater system in the Shoshone and Tecopa area appears stable.

3.7 Future Groundwater Use and Discussion of Groundwater Availability

As shown in Table 3-2 and Figure 3-9, there has been an increased use of groundwater in the Nevada portion of the Amargosa Basin over the past 25 years. The potential for future development will be limited by both quantity and quality of water. However, as can be seen by the active duty for the Northern Amargosa River Basin, there is significant potential for pumping to increase considerably should water rights holders fully exercise their water rights. Given the over-allocated nature of the Northern Amargosa River Basin, significant impacts to the groundwater resource could result if that condition occurred. These uses are anticipated to increase due to future population growth, and the likely future addition of

groundwater usage for solar energy development. Although wet cooling solar projects are not anticipated, groundwater usage for processes such as mirror washing will still be needed.

The incremental increase of solar projects within the region could result in a significant steepening of the increased trend in groundwater usage. The competing demands for renewable energy and protection of the Amargosa River point to the need for increased knowledge and baseline hydrologic data in the Middle Amargosa River Basin. Recommendations for future investigations are provided in Section 4.0 of this report.

4.0 RECOMMENDATIONS FOR WILD & SCENIC RIVER MANAGEMENT

Given the regional nature of the groundwater source that feeds the Wild and Scenic Amargosa River, it is clear that an effective monitoring program for the WSR will include sites well away from the River. Although the management plan will be for a specific water course, the unique hydrology and the expansive area that contributes to the river through complex groundwater flowpaths would make purely river-centric monitoring of limited value. Based on the results of current and past work, decreases in groundwater level and associated underflow in the northern Amargosa basin and Pahrump Valley (both in Nevada) could affect springs in the Middle Amargosa Basin and the Amargosa River fed by those springs.

The Amargosa River Basin, which spans two states, three counties and one National Park, exists as one of the most important desert waterways in the southwestern United States. Both the groundwater and surface water in the basin support a unique and diverse ecosystem, while also supporting human needs through domestic, agricultural, wildlife, stock-watering, mining and other industrial uses. As the river is a groundwater-fed surface water body, relatively small variations in the groundwater surface elevation can have considerable effects on the ability for the river to maintain surface flow. While the Nevada portion of the basin has been well-studied, primarily as a result of hydrologic studies centered on the Nevada Test Site and the Yucca Mountain Project, until recently the California portion of the basin has seen little in the way of regional hydrogeologic investigations. Therefore, it is essential that a monitoring program be incorporated into management of the WSR that identifies changes in the groundwater system, prior to the Amargosa River being impacted.

In the Northern Amargosa River Basin groundwater is already over-allocated. Although pumping does not currently take place at the full amount entitled to by water rights holders, considerable impacts to the groundwater reservoir and associated springs could occur should those holders eventually fully exercise their water rights. Groundwater usage within the Northern Amargosa River Basin has steadily increased over the past 25 years, and the addition of a new industry to the area (solar) will likely provide additional pressure on the groundwater resource. Also as groundwater usage increases in the Northern Amargosa River Basin, it is conceivable then that groundwater flow into the Middle Amargosa River Basin could decrease. Given the importance of the alluvial aquifer to many of the springs in the Middle Amargosa River Basin, this issue is of key importance to sustaining the Amargosa River.

In 2009, the Amargosa River between Shoshone and the terminus of the Amargosa Canyon received Wild and Scenic status through an act of Congress. As a result, the BLM is charged with developing a management plan for the Wild and Scenic portion of the River. It is essential that hydrogeologic characterization of the California portion of the basin continue to take place in order for that management plan, and its associated management recommendations, to have a firm basis, and to assure that monitoring is conducted in a meaningful way to identify potential impacts to the river and its feeder springs before irreversible impacts from future groundwater development occur. Based on the results of the current

and past hydrologic work along the Amargosa River, the following sections highlight technical needs that should be incorporated into a management plan for the Amargosa WSR.

4.1 Monitoring

Monitoring forms the basis for any water management activities in that it is impossible to manage any resource without a basis for what that resource comprises. The recommendations provided below contain provisions for both automated monitoring techniques and regular field monitoring. In desert areas where river channel or spring conditions can radically change as the result of one summer thunderstorm, having regular field observations taking place is key to not only monitor the resource, but to assure that automated data collection devices are working correctly (and to perform maintenance) and that physical conditions on the ground have not changed to the extent that automated data collection is compromised (e.g. river changing course and stream gage station no longer accurately measuring flow).

As described in Section 3.0, flow along the Amargosa River will be highly sensitive to changes in groundwater level. Generally, water rises to the surface of the river channel where constrictions are encountered forcing water to the surface. Groundwater monitoring will therefore be an essential component to river management. Additionally, infestation of non-native vegetation such as tamarisk will also have a negative effect on river flow and spring flow where it is present at spring discharge points. Visual monitoring of vegetation, particularly for the presence of tamarisk or other water-using, non-native vegetation will be a key component of river management.

AZI makes the following monitoring recommendations:

- **Spring Discharge, Water Level, Precipitation and Seepage Run Monitoring** - Flow discharge and groundwater elevation measurements should continue and be collected on a regular basis from the existing suite of springs and wells being monitored in addition to new wells. Seepage run monitoring should continue to be conducted periodically (at least three times per year) on the stretch of River from Tecopa to the Dumont Dunes area and should continue to consist of the existing five distinct monitoring locations (including the two USGS gauges, and three manual monitoring points). Basic field water quality data should be collected at all discharge, elevation and seepage run monitoring points.
- **Groundwater Level Measurements** should be collected regularly, preferably with pressure transducer/data logger installations at all existing (currently in place) and future monitoring wells. The existing monitoring wells (ARHS-01 through ARSH-04) should continue to be monitored as part of the Wild and Scenic Monitoring Program for the following reasons:
    - ARHS-01- North of Shoshone – identification of changes in groundwater level north of Shoshone Spring area resulting from pumping in northern part of basin;
    - ARHS-02- Willow Creek – identification of changes in groundwater level that may affect the most important tributary to the Wild and Scenic Amargosa River;

- ARHS-03 – Twelvemile Spring – Identification of changes in groundwater level that may indicate reduced movement of groundwater from Pahrump Valley beneath northern portion of Nopah Range; and,
- ARHS-04 – "Married Man's Camp" - identification of changes in groundwater level that may affect Willow Creek above the Willow Creek station.

Other wells to be monitored will include those new wells listed for future installation in Section 4.2.

- **Visual Monitoring** – Photographic and video (where applicable) documentation should be collected from specific locations to identify noticeable changes in the spring and river environments. This will assist in identification of tamarisk or other non-native vegetation encroachment that could affect river and spring flows. Additionally, periodic cross-checking with aerial imagery should be conducted to identify changes to areas not specific to monitoring sites.
- **Groundwater Usage** – Monitoring existing and proposed groundwater usage throughout the basin both in Nevada and California will be a key monitoring component protective of the WSR.

4.2 Additional Investigation

Currently, there is insufficient information to develop a groundwater budget for the Middle Amargosa River Basin or for that matter to specifically identify recharge locations for specific springs. Attempting to evaluate groundwater recharge and groundwater underflow into the basin will be difficult both from a technical standpoint and in funding what would be a major investigative endeavor. Therefore, the most logical means to evaluate the groundwater budget for the Middle Amargosa River Basin will be to develop a firm understanding of the various groundwater discharge components including evapotranspiration (including spring flow), subsurface underflow beyond Salt Creek and analyzing associated groundwater level trends. The recommendations for additional investigations are based on AZI's experience in the Amargosa Basin and elsewhere, from M.L. Davisson & Associates, Inc., and from the USGS (2013, 2014).

Based in the results of current investigative work, and in order to accomplish the larger goals of the project, the following lines of investigation to refine the conceptual model for the Middle Amargosa Basin should be considered fall into three categories including; 1) monitoring well installation to improve our understanding of the system and provide protective monitoring points; 2) additional investigation for sourcing of springs and the river; and 3) additional investigations to better understand the overall system.

- **Additional Piezometer/Monitoring Well Installation** – Up to 13 piezometers/monitoring wells (wells) should be installed to further evaluate the conceptual model of this part of the Amargosa Basin with an emphasis on understanding groundwater flow paths; and for supplemental monitoring to evaluate baseline groundwater conditions and identification of impacts to groundwater levels in the future should they occur. AZI anticipates the wells would

consist of both shallow (assumed depth of 25 feet below ground surface (ft bgs)) and deep (assumed depth of up to 200 ft bgs) wells. We anticipate wells in the following general locations:

- One deep well in the alluvial aquifer between Eagle Mountain and Shoshone (anticipated depth to groundwater in this area is approximately 200 ft bgs);
- Two shallow wells along the Amargosa River between Shoshone and Tecopa;
- Two monitoring wells along the Amargosa River south of the Amargosa River Canyon (one near the site of Sperry and the other at the end of the graded dirt road north of Dumont Dunes);
- One shallow well along the Amargosa River near Tecopa and the USGS Amargosa River gaging station there;
- Four deep wells in the area northeast, east and southeast of Tecopa to evaluate flow coming from Chicago Valley and the Kingston Range, and,
- Up to three monitoring wells in California Valley / Southwest Pahrump Valley to evaluate connectivity between the two valleys.

Deep monitoring wells in the carbonate rock aquifer would be particularly helpful in evaluating flow paths and refining the conceptual model. However, they would also be costly. At this time, as it is anticipated that most future groundwater production will occur in the basin fill aquifer, a focus on monitoring wells in the basin fill is recommended here. Should sufficient funding become available for the installation of deep monitoring wells that could penetrate the carbonate rock aquifer in a meaningful way, locations that should be considered would be at Twelvemile Spring; ARHS-01 north of Shoshone, and in the Death Valley Junction/Eagle Mountain area.

- **Geochemical Sampling of New Piezometers/Monitoring Wells** - Water samples should be collected from new wells and analyzed for a specific suite of constituents, including field parameters, general chemistry, anions, cations, a comprehensive suite of trace metals, and selected stable/non-stable isotopes as presently being conducted with the exception of tritium which would no longer be analyzed.

- **Low-levels Metals Analysis** – Although metals analysis has been conducted at springs in the Middle Amargosa Basin, many of the metals are not detectable at standard laboratory detection limits. Metals suites can be quite informative to understanding the relationship between waters, so this would entail specialized analysis to obtain metals concentration information at substantially lower detection limits than typically conducted.

- **Radiocarbon Dating and Chlorofluorocarbons (CFCs) Analysis** – Carbon-13 and Carbon-14 analysis along with CFCs to age date waters, particularly in light of the results of the current analysis. Measuring radiocarbon abundance of spring water in the Amargosa River Valley with

the lowest helium ratios would indicate either high flux along faults or whether waters are very old.

- **Measure additional $^{3}He/^{4}He$ ratios –** Between Ash Meadows and Tecopa area to provide a continuum of ratios with downgradient distance and would facilitate the development of a groundwater age model.
- **Analysis of Salts in Discharge Areas** – To identify elements in discharge areas that may be introduced into spring waters at specific discharge points and their solubilities that may alter the chemical makeup of waters. This would provide comparative data to spring water containing high concentrations of total dissolved solids to determine if this is a viable mechanism to explain spring water compositions.
- **Geophysical Investigations** – Geophysical surveys in the vicinity of Tecopa to evaluate faulting in the vicinity of the thermal springs. Additional surveys north of ARHS-01 to evaluate the geologic connectivity between the northern portion of the basin and the area south of Eagle Mountain. This would also help inform our understanding of monitoring results in that area.
- **Installation of Four Precipitation Stations** – To evaluate areal and elevation variations in precipitation in the area (for greater understanding of the water budget of the area and to provide information useful in distributing recharge in the numerical groundwater flow model) and to refine our understanding of recharge sources and the effects of precipitation events on groundwater-level fluctuations, four precipitation stations should be installed at the following locations:
    - The south flank of Eagle Mountain;
    - Twelvemile Spring;
    - Saratoga Spring; and
    - Horsethief Spring (in the Kingston Range).

  Precipitation samples could be collected from these stations (particularly the Kingston Range station) to evaluate recharge sources. These precipitation stations would also provide key data for any future investigations on effects of climate change on the Amargosa River and its feeder springs. These locations (along with the existing station in Tecopa) provide good areal coverage and spanning a wide elevation range (from approximately 200 ft msl to 4,600 ft msl). Permitting would be required by the BLM and Death Valley National Park (for Saratoga Spring). At this time, it is planned that data downloading would be accomplished during quarterly events as part of the hydrologic monitoring. It is anticipated that NOAA-II precipitation gages would be installed, manually serviced, and fitted with data loggers and flash memory data collection modules. The stations would be able to account for snow water content which would be of

particular importance at the Kingston Range location (Horsethief Spring area). Precipitation stations would be secured by fencing.

4.3 Development of River Management Tool

The development of a refined numerical groundwater flow model for the Middle Amargosa Basin area should be developed as a management tool upon which to base future water management decisions. Ideally, the model would be created using the industry standard program MODFLOW originally developed by the USGS. The model should be developed in a means (e.g., using standard format files) that allows such a tool to be used efficiently and cost-effectively by groundwater professionals fluent in groundwater flow modeling representing governmental, non-profit and for profit private sector constituents and stakeholders. This will enable all future projects to be evaluated using the same tool which is useable in a timely, cost effective manner.

4.4 Periodic Updating of Technical Requirements

Best Management Practices (BMPs) for future groundwater development projects in the Amargosa River region should be established that are focused on protection of the Wild and Scenic Amargosa River. The monitoring proposed is a starting point. With additional monitoring wells as listed in Section 4.2 and additional investigations being conducted, the monitoring program will likely need to adapt to meet our growing knowledge of how the Amargosa River system works. The Wild & Scenic management plan then will need to be a dynamic plan, able to guide the management of the river with our ever growing knowledge of how it works and sustains its fragile ecology.

5.0 CONDITIONS AND LIMITATIONS

This report has been prepared according to generally accepted standards of hydrogeologic practice in California at the time this report was prepared. Findings, conclusions, and recommendations contained in this report represent our professional opinion and are based, in part, on information developed by other individuals, corporations, and government agencies. The opinions presented herein are based on currently available information and developed according to the accepted standards of hydrogeologic practice in California. Other than this, no warranty is implied or intended.

6.0 REFERENCES

Bedinger, M.S., and J.R. Harrill, 2004. *Regional Potential for Interbasin Flow of Ground Water.* Appendix 1 of (Belcher, 2004).

Belcher, Wayne, ed., 2004. *Death Valley Regional Ground-Water Flow System, Nevada and California – Hydrogeologic Framework and Transient Ground-Water Flow Model.* U.S. Geological Survey Scientific Investigations Report 2004-5205.

Brogan, George E., Karl S. Kellog, D. Burton Slemmons, and Christina L. Terhune, 1991. *Late Quaternary Faulting Along the Death Valley – Furnace Creek Fault System, California and Nevada.* U.S. Geological Survey Bulletin 1991.

Buqo, Thomas S., (2004); *Nye County Water Resources Plan.*

Bushman, Michelle, Stephen T. Nelson, David Tingey and Dennis Eggett, 2010. Regional Groundwater Flow in Structurally Complex Extended Terranes: An Evaluation of The Sources of Discharge at Ash Meadows, Nevada. Journal of Hydrology 386 (2010). Pp. 118-129.

California Department of Water Resources, 2003 – California's Groundwater – Update. Department of Water Resources Bulletin No. 118.

California Department of Water Resources, Division of Water Rights, 2014. Water rights abstract for Middle Amargosa Basin and Death Valley Basin, California.

California Division of Mines, 1954. *Geology of Southern California.* California Division of Mines Bulletin 170.

California Geologic Survey, 2002. California Geomorphic Provinces. California Geologic Survey Note 36. 4 pp.

Carroll, D., 1962. *Rainwater as a Chemical Agent of Geologic Processes – A Review.* U.S. Geological Survey Water-Supply Paper 520-F.

Classen, H.C., 1986. Late Wisconsin paleohydrology of the west-central Amargosa Valley, Nevada, USA. Chem. Geol., 58, p. 311-323.

Davisson, M.L., Smith, D.K., Keneally, J., Rose, T.P., 1999. Isotope hydrology of southern Nevada groundwater: stable isotopes and radiocarbon. *Water Resources Research* 35, p. 279-294.

EPG, Inc., 2010. *Draft Environmental Impact Statement for the Amargosa Farm Road Solar Energy Project (NVN-084359).* March 19.

Faunt, Claudia C., Frank D'Agnese, and Grady M. O'Brien, 2004. *Hydrology.* Chapter D of (Belcher, 2004).

Faunt, Claudia C., Joan B. Blainey, Mary C. Hill, Frank D'Agnese, and Grady M. O'Brien, 2004. *Transient Numerical Model.* Chapter F of (Belcher, 2004).

Garside, Larry J., and John H. Schilling, 1979. *Thermal Waters of Nevada.* Nevada Bureau of Mines and Geology Bulletin 91.

Hurst, R.W., 2012. A Multiple Isotopic Investigation of the Amargosa River: Inyo-San Bernardino Counties, CA and Nye County, NV. 25 pp.

Johnson Wright, Inc., 2012. Additional Hydrologic Investigations and Data Collection Results for Amargosa River Hydrologic Study. June 22.

Johnson Wright, Inc., 2013a. Additional Hydrologic Investigations and Data Collection Results for Amargosa River Hydrologic Study. June 22.

Johnson Wright, Inc., 2013b. Periodic Data Collection Results for Amargosa River Hydrologic Study. October 28.

Johnson Wright, Inc., 2013c. Tecopa Safe Drinking Water and Fire Water Supply Feasibility Study. November 12.

Larsen, D., Swihart, G.H., Xiao, Y., 2001. Hydrochemistry and isotope composition of springs in the Tecopa basin, southeastern California, USA. Chem. Geol., 179, p. 17-35.

Malmberg, G.T., 1967. *Hydrology of the Valley-Fill and Carbonate Rock Reservoirs, Pahrump Valley, Nevada-California.* U.S. Geological Survey Water-Supply Paper 1832.

Mendenhall, W.C., 1909. *Some Desert Watering Places in Southeastern California and Southwestern Nevada.* U.S. Geological Survey Water-Supply Paper 22.

Nevada Department of Water Resources, 2011a. Website, summaries of pumpage, Amargosa Desert.

Nevada Department of Water Resources, 2011b. Website, summaries of pumpage, Pahrump Valley.

Nevada Department of Water Resources, 2014. Water rights Abstract, Basin 162 – Pahrump Valley.

Nevada Department of Water Resources, 2014. Water rights Abstract, Basin 230 – Amargosa Desert.

Nye County Water District, 2011. Website; Hydrologic data including well construction, and groundwater level data.

Pistrang, M.A. and Fred Kunkel, 1964. *A Brief Geologic and Hydrologic Reconnaissance of the Furnace Creek Wash Area, Death Valley National Monument, California.* U.S. Geological Survey Water-Supply Paper 1779-Y.

Planert, Michael and John S. Williams, 1995. *Ground Water Atlas of the United States, Segment 1, California Nevada.* U.S. Geological Survey Hydrologic Investigations Atlas 730-B.

Rose, T.P., M.L. Davisson, R.E. Criss, D.K. Smith, 1999. Isotopic Investigation of Recharge to a Regional Groundwater Flow System, Great Basin, Nevada, USA. International Atomic Energy Agency Symposium on Isotope Hydrology in Water Resources Management, May 1999. Vienna.

Rose, T.P., Kenneally, J.M., Smith, D.K., Davisson, M.L., Hudson, G.B. and Rego, J.H., 1998. Chemical and Isotopic Data for Groundwater in Southern Nevada. Lawrence Livermore National Laboratory, UCRL-ID-128000. 38 pp.

San Juan, Carma A., Wayne R. Belcher, Randell J. Laczniak and Heather M. Putnam, 2004. *Hydrologic Components for Model.* Chapter C of (Belcher, 2004).

Serpico, Phil, 2013. *Tonopah & Tidewater Railroad: The Nevada Short Line.* Omni Publications, Palmdale, Ca. 296 pp.

Spitz, Karlheinz and Joanna Moreno, 1996. *A Practical Guide to Groundwater and Solute Transport Modeling.* Wiley, New York. 461 p.

SGI, 2011. 2011 State of the Basin Report; Amargosa River Basin – Inyo and San Bernardino Counties, California & Nye County, Nevada. April 29.

Sweetkind, Donald S., Wayne R. Belcher, Claudia C. Faunt and Christopher J. Potter, 2004. *Geology and Hydrogeology: Chapter B of (Belcher, 2004).*

Thomas, J.M., Welch, A.H., Dettinger, M.D., 1996. Geochemistry and isotope hydrology of representative aquifers in the Great Basin region, Nevada, Utah and adjacent states. U.S. Geological Survey Professional Paper 1409-C, 100 pp.

Thomas, J.M., Benedict Jr., F.C., Rose, T.P., Hershey, R.L., Paces, J.B., Peterman, Z.E., Farnham, I.M., Johannsen, K.H., Singh, A.K., Stetzenbach, K.J., Hudson, G.B., Kenneally, J.M., Eaton, G.F., and Smith, D.K., 2003a. Geochemical and Isotopic Interpretations of Groundwater Flow in Oasis Valley Flow System, Southern Nevada. Department of Energy, Nevada operations office, DOE/NV/11508-56. Publ. No. 45190, 113 pp.

Thomas, J.M., Hudson, G.B., Stute, M., Clark, J.F., 2003b. Noble gas loss may indicate groundwater flow across flow barriers in southern Nevada. Environ. Geol., 43, p. 568-579.

Thompson, David G., 1921. *Routes to Desert Watering Places in the Mohave Desert Region, California.* U.S. Geological Survey Water-Supply Paper 490-B.

Thompson, David G., 1929. *The Mohave Desert Region, California: A Geographic, Geological, and Hydrologic Reconnaissance.* U.S. Geological Survey Water-Supply Paper 578. 759 pp.

U.S. Geological Survey, 2011. USGS National Water Information System Database. Streamflow records for Amargosa River near Beatty, Nevada; Amagosa River at Highway 95 below Beatty, Nevada; Amargosa River at Highway 127 near Nevada State Line, Inyo County, California; Amargosa River at Tecopa, California; Amargosa River at Dumont Dunes, San Bernardino County, California.

U.S. Geological Survey, 2013. Wayne Belcher, personal communication (regarding well locations south of Eagle Mountain and in California Valley).

U.S. Geological Survey, 2014. Candice Hopkins, personal communication (regarding geochemical investigations).

Walker, George E., and Eakin, Thomas E., 1963. *Geology and Ground Water of Amargosa Desert, Nevada-California.* State of Nevada Department of Conservation and Natural Resources Ground-water Reconnaissance Series Report 14. March.

Waring, Gerald A., 1915. *Springs of California.* U.S. Geological Survey Water-Supply Paper 338.

Western Regional Climate Center, 2014. Precipitation and Temperature Record, Shoshone Station.

Winograd, I.J., Thordarson, 1975. Hydrogeologic and hydrochemical framework, south-central Great Basin, Nevada-California with special reference to the Nevada Test Site. U.S. Geological Survey Professional Paper 712-C, 126 pp.

Workman, Jeremiah B., Christopher M. Menges, William R. Page, Emily M. Taylor, E. Bartlett Ekren, Peter D. Rowley, Gary L. Dixon, Ren A. Thompson, and Lauren A. Wright, 2002. *Geologic Map of*

the Death Valley ground-water model area, Nevada and California. U.S. Geological Survey Miscellaneous Field Studies MF-2381.

FIGURES

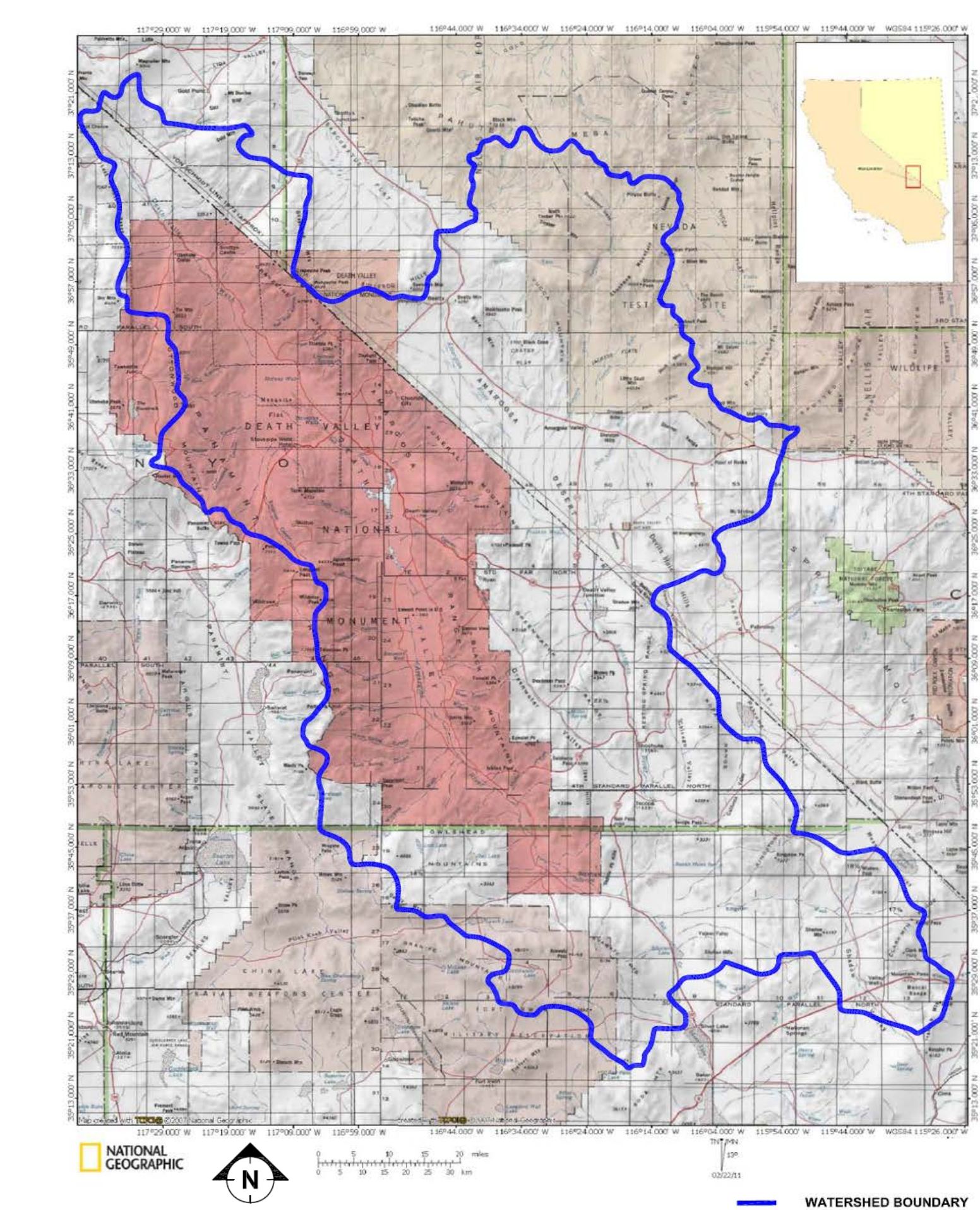

Figure 1-1. Location of Amargosa River Drainage Basin

ANDY ZDON & ASSOCIATES, INC.

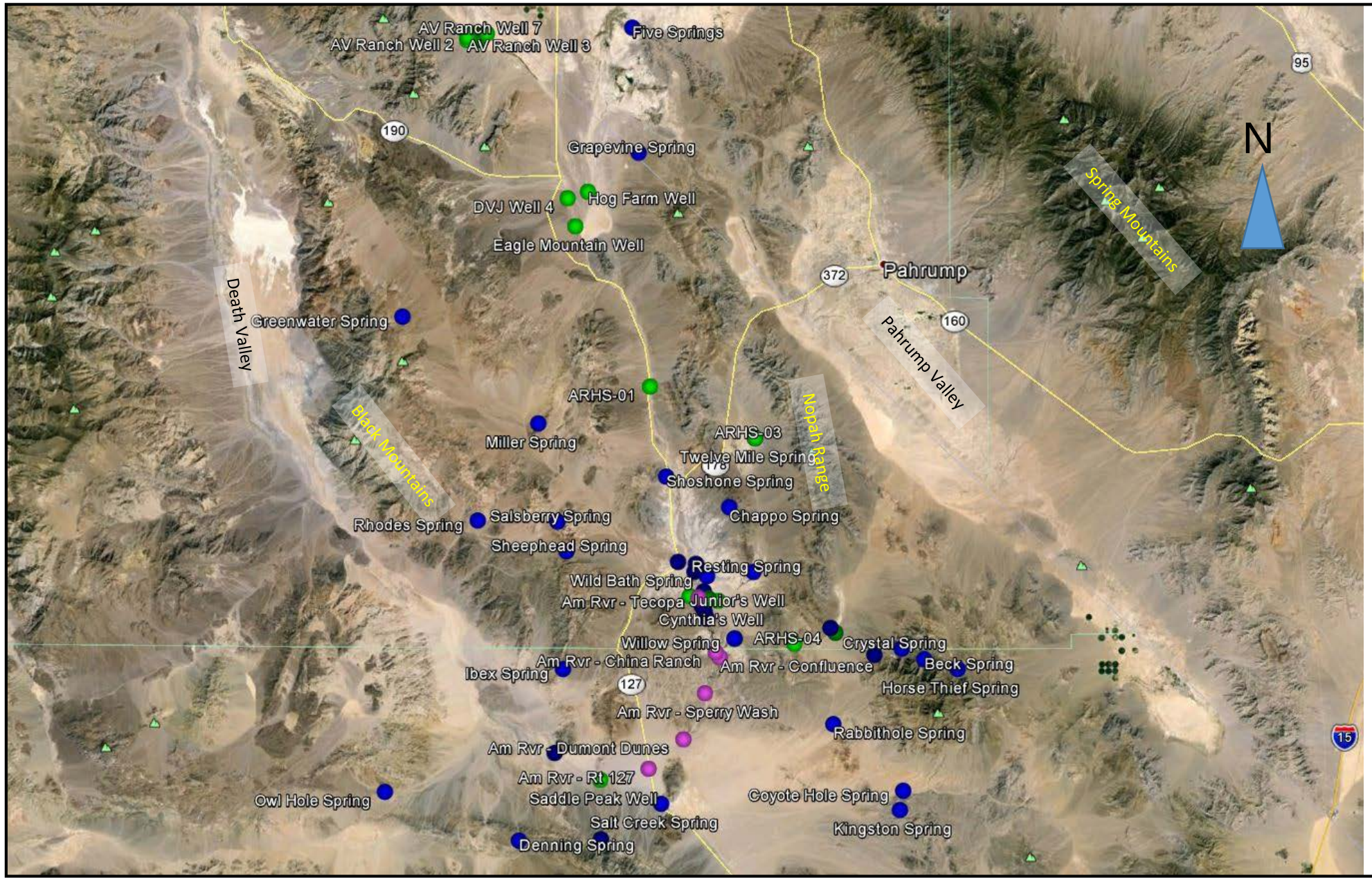

Figure 2-1

Data Collection Locations Map

Legend

- River Location
- Well Location
- Spring Location

Scale: 1" = ~10 miles

Date: June 10, 2014
Project: TNC – Amargosa
Image Source: Google Earth

ANDY ZDON & ASSOCIATES, INC.

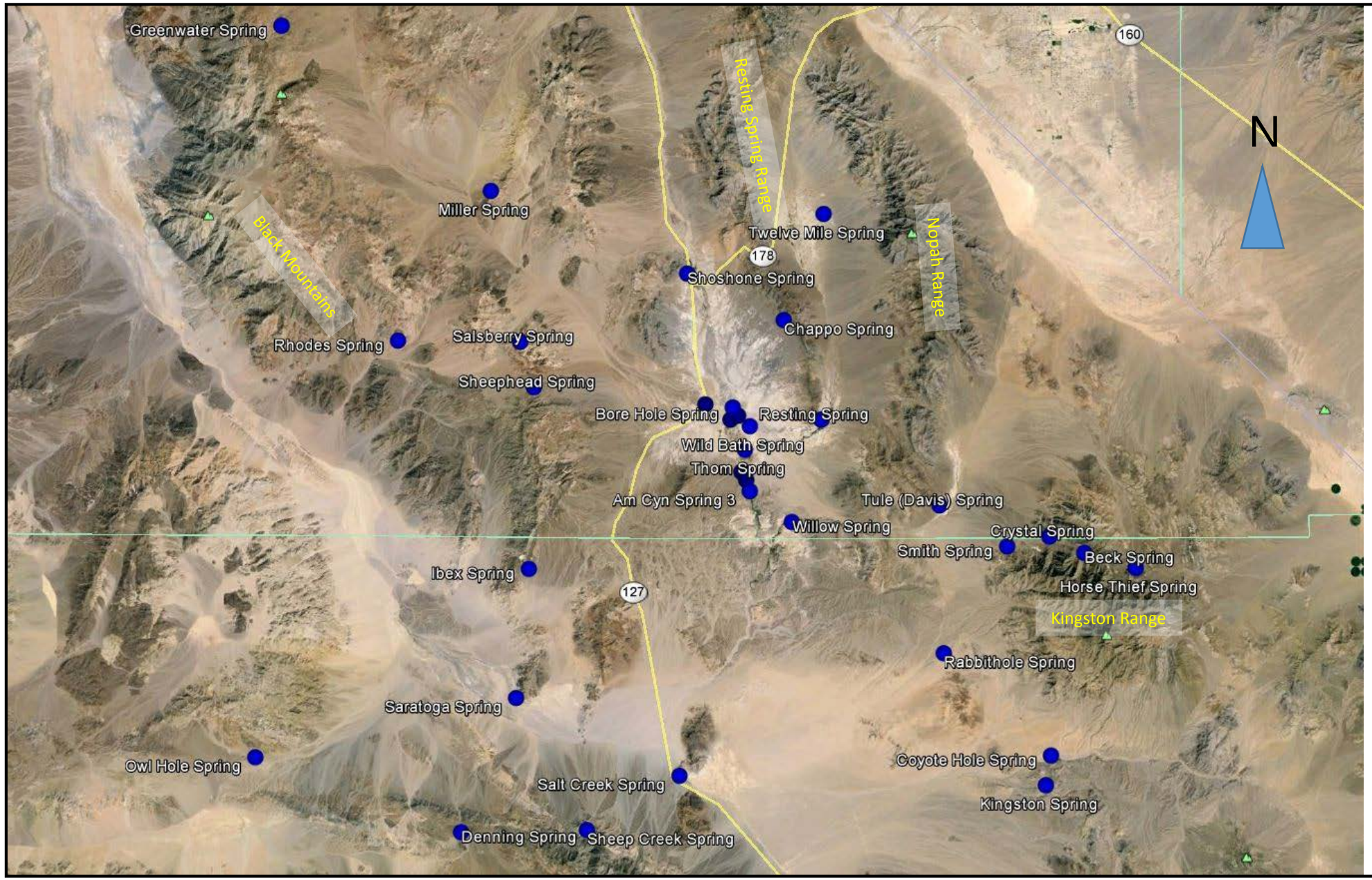

Figure 2-2

Spring Location Map

Legend

Spring Location

Scale: 1” = ~6 miles

Date: June 3, 2014
Project: TNC – Amargosa
Image Source: Google Earth

ANDY ZDON & ASSOCIATES, INC.

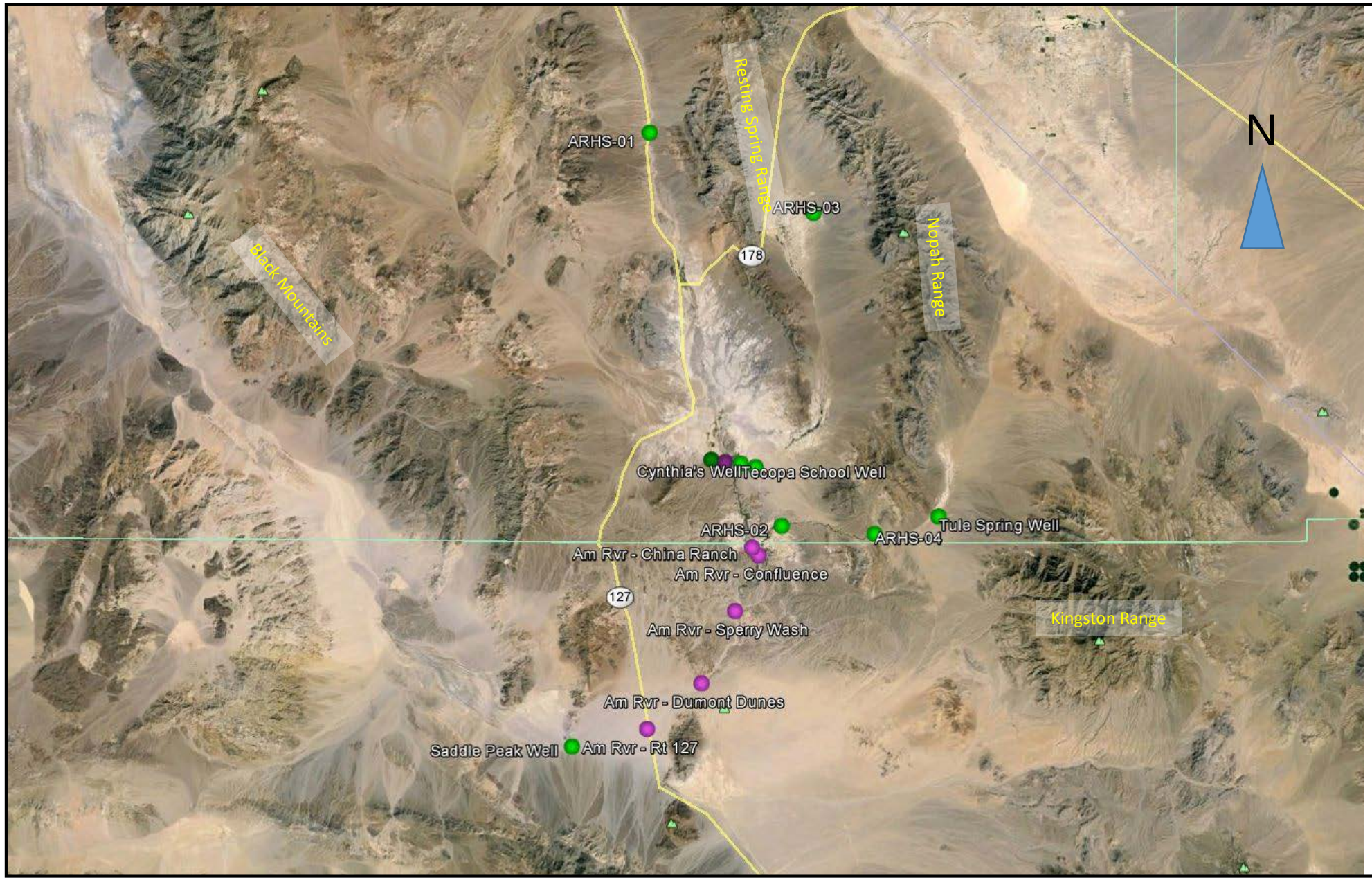

Figure 2-3

River and Well Location Map

Legend

- River Location
- Well Location

Scale: 1” = ~6 miles

Date: June 3, 2014
Project: TNC – Amargosa
Image Source: Google Earth

ANDY ZDON & ASSOCIATES, INC.

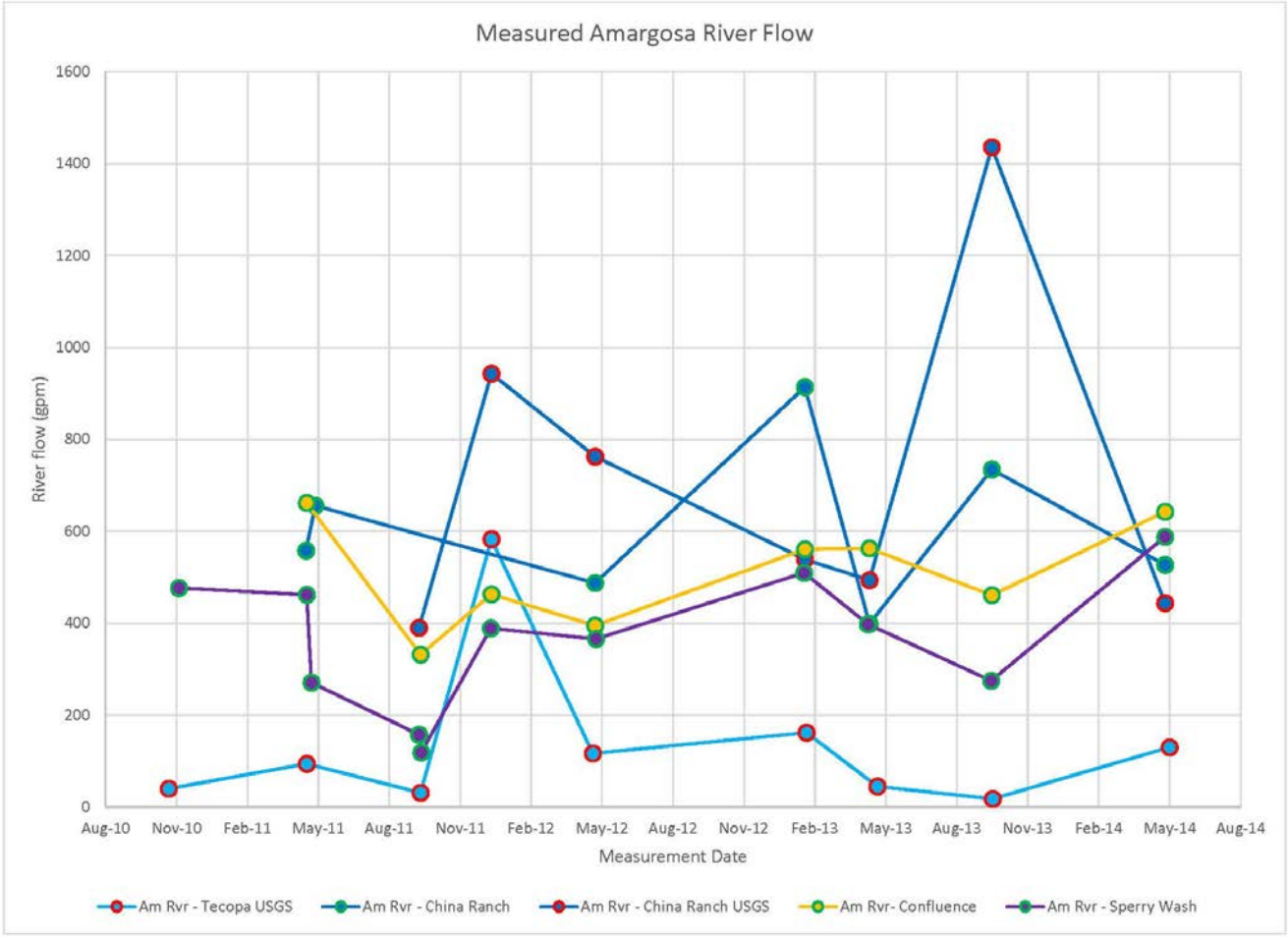

Figure 2-4

Amargosa River Hydrographs
Periodic Monitoring Data

Date: June 23, 2014
Project: TNC – Amargosa

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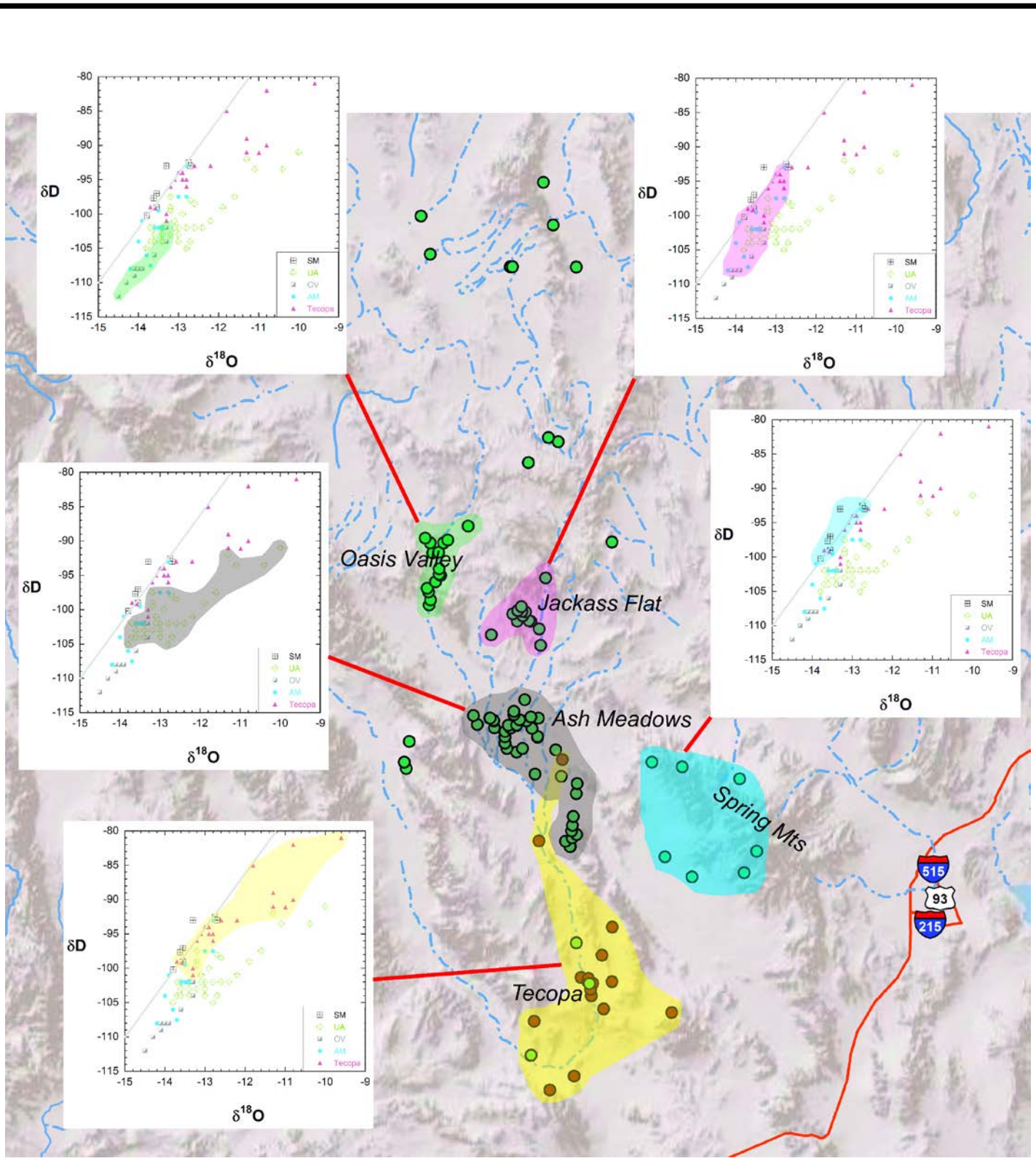
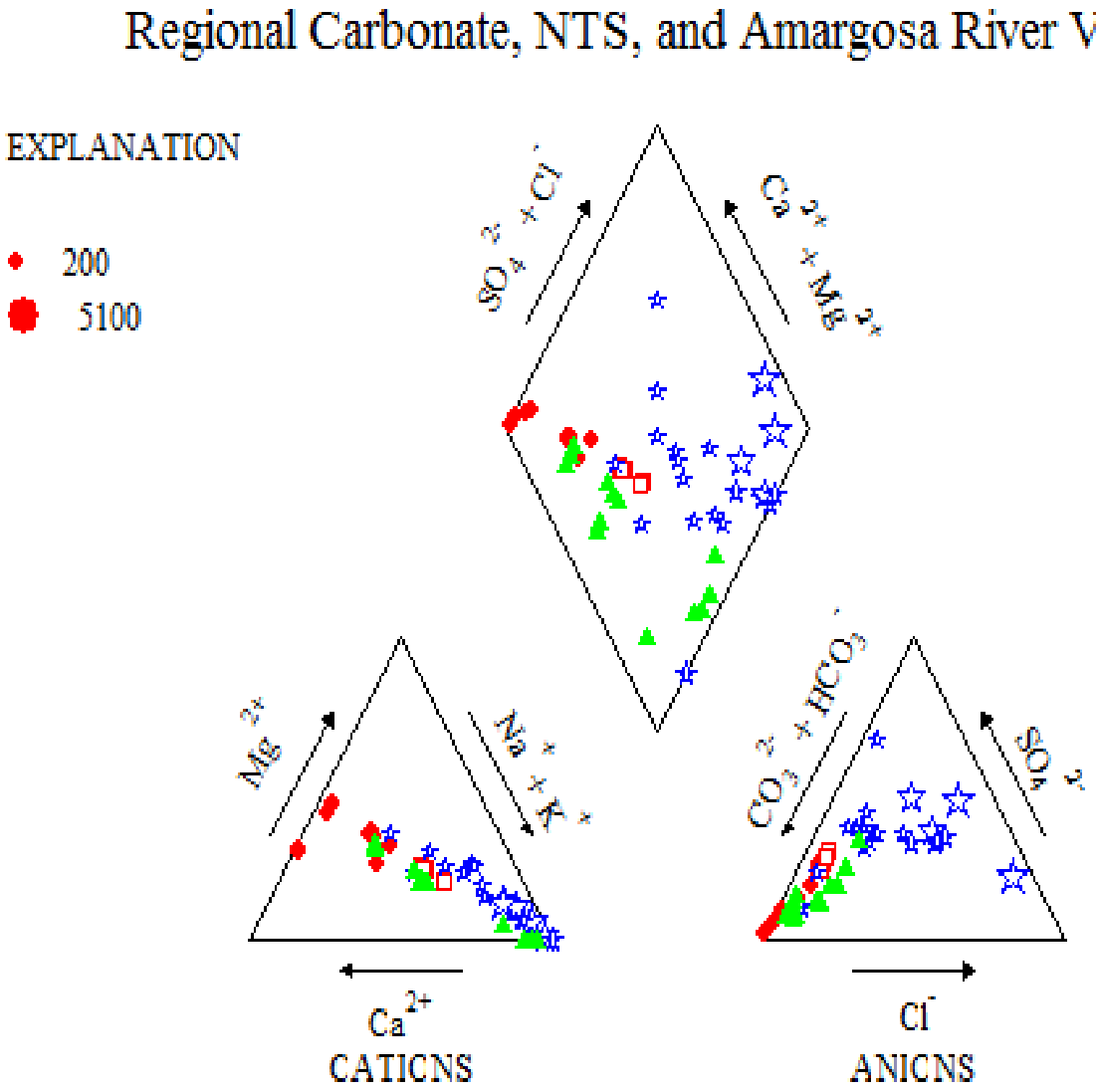
Figure 2-5 Passive Diffusion Sampler
Used for Noble Gas Sampling



δD-$\delta^{18}O$ plots are compared as regional groupings in this map view. Note that the range in δD and $\delta^{18}O$ values decreases in general from north to south and that the Tecopa region groundwater overlaps most with Spring Mts. and Ash Meadows. This suggests that either are potential sources for Tecopa groundwater, although for the latter mixing with Spring Mts. or possibly Kingston Range recharge would be required.

Figure 2-6 Regional Stable Isotope Groupings



Piper plot comparing cation and anion relative concentrations in groundwater of the regional carbonate aquifer (red circles), Ash Meadows (open red squares), Nevada Test Site (green triangles), and Amargosa River Valley (open blue stars). Note that between the regional carbonate aquifer and the Amargosa River Valley groundwater, water quality changes from Ca-Mg-HCO_3 type toward Na-K-HCO_3-Cl-SO_4 type accompanied by increased salinity.

Figure 2-7 Piper Plot for Amargosa Region Waters

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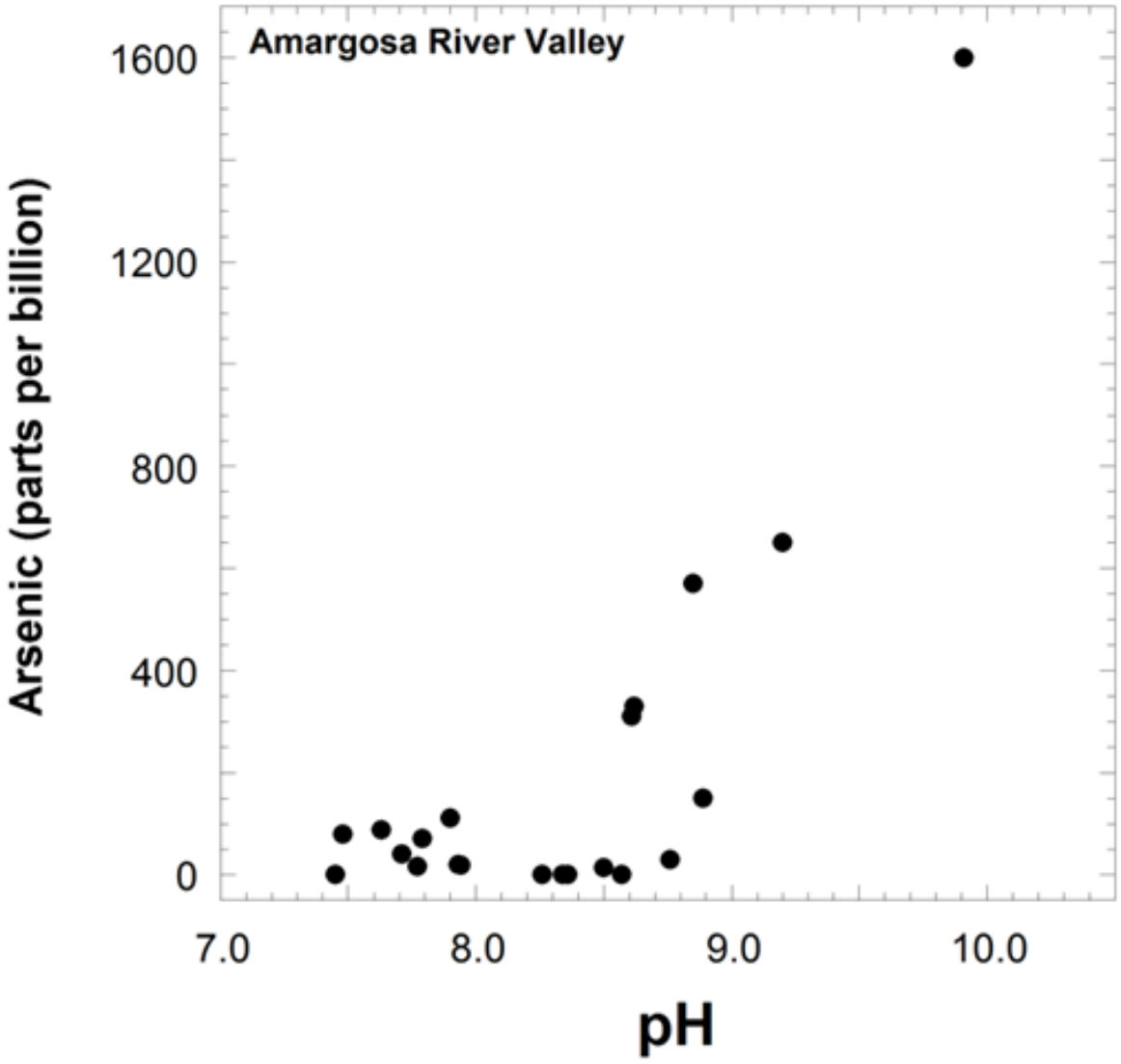


Arsenic solubility increases with increasing pH as illustrated by groundwater in the Amargosa River Valley region. The ultimate source of arsenic is not known but could be associated with the Tecopa lake beds deposits.

Figure 2-8 Arsenic and pH Relationships, Middle Amargosa Waters

EXPLANATION

Basin-fill deposits

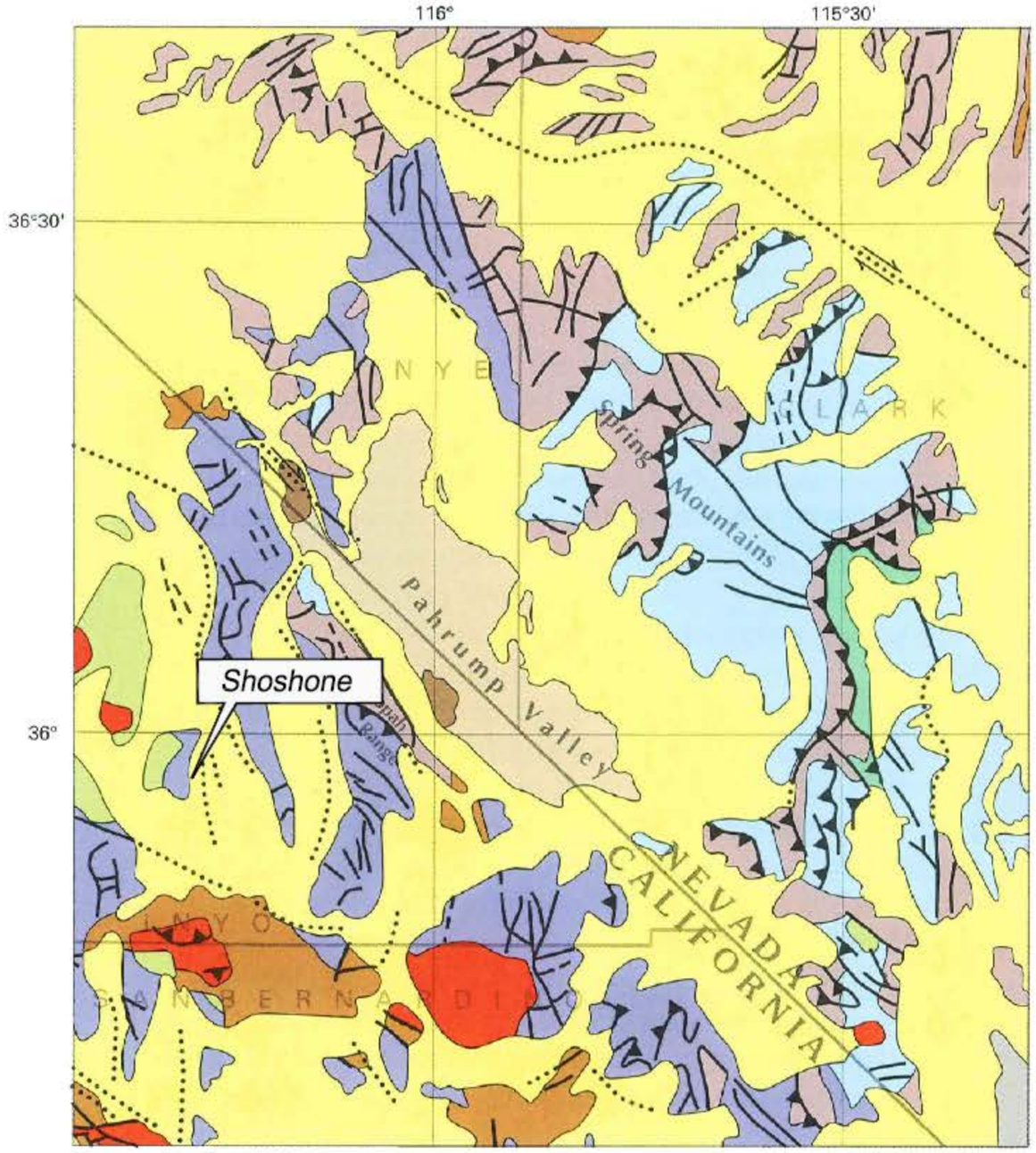
- Quaternary playa deposits
- Quaternary and Tertiary unconsolidated coarse-grained deposits
- Quaternary and Tertiary lacustrine and associated fine-grained deposits

Consolidated rocks

- Tertiary consolidated deposits
- Tertiary to Triassic marine and continental rocks
- Triassic to Mississippian carbonate rocks
- Devonian to Cambrian carbonate and clastic rocks
- Cambrian and Precambrian clastic rocks
- Quaternary and Tertiary volcanic rocks
- Miocene to Triassic intrusive rocks
- Precambrian basement rocks

Fault—Dashed where approximately located. Dotted where concealed. Arrows show relative movement

Thrust fault—Sawteeth on upper plate

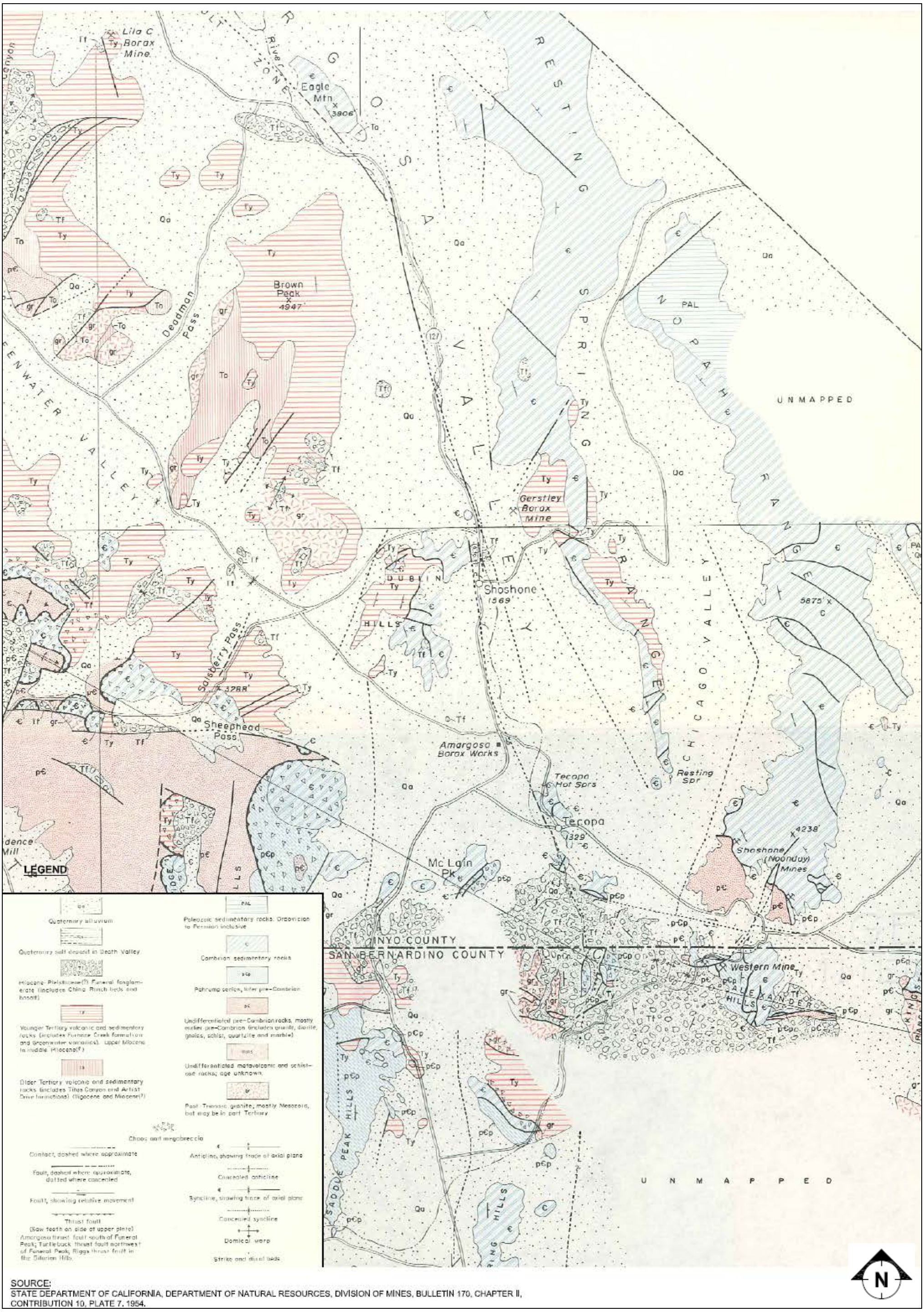


Base modified from U.S. Bureau of the Census TIGER/Line files, 1:100,000, 1990

Modified from Plume and Carlton, 1988 and Harrill, 1986

Source: Planert and Williams, 1995

Figure 3-1. Regional Geologic Map



SOURCE:
STATE DEPARTMENT OF CALIFORNIA, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF MINES, BULLETIN 170, CHAPTER II, CONTRIBUTION 10, PLATE 7, 1954.

Figure 3-2. Geology of the Shoshone-Tecopa Area

ANDY ZDON & ASSOCIATES, INC.

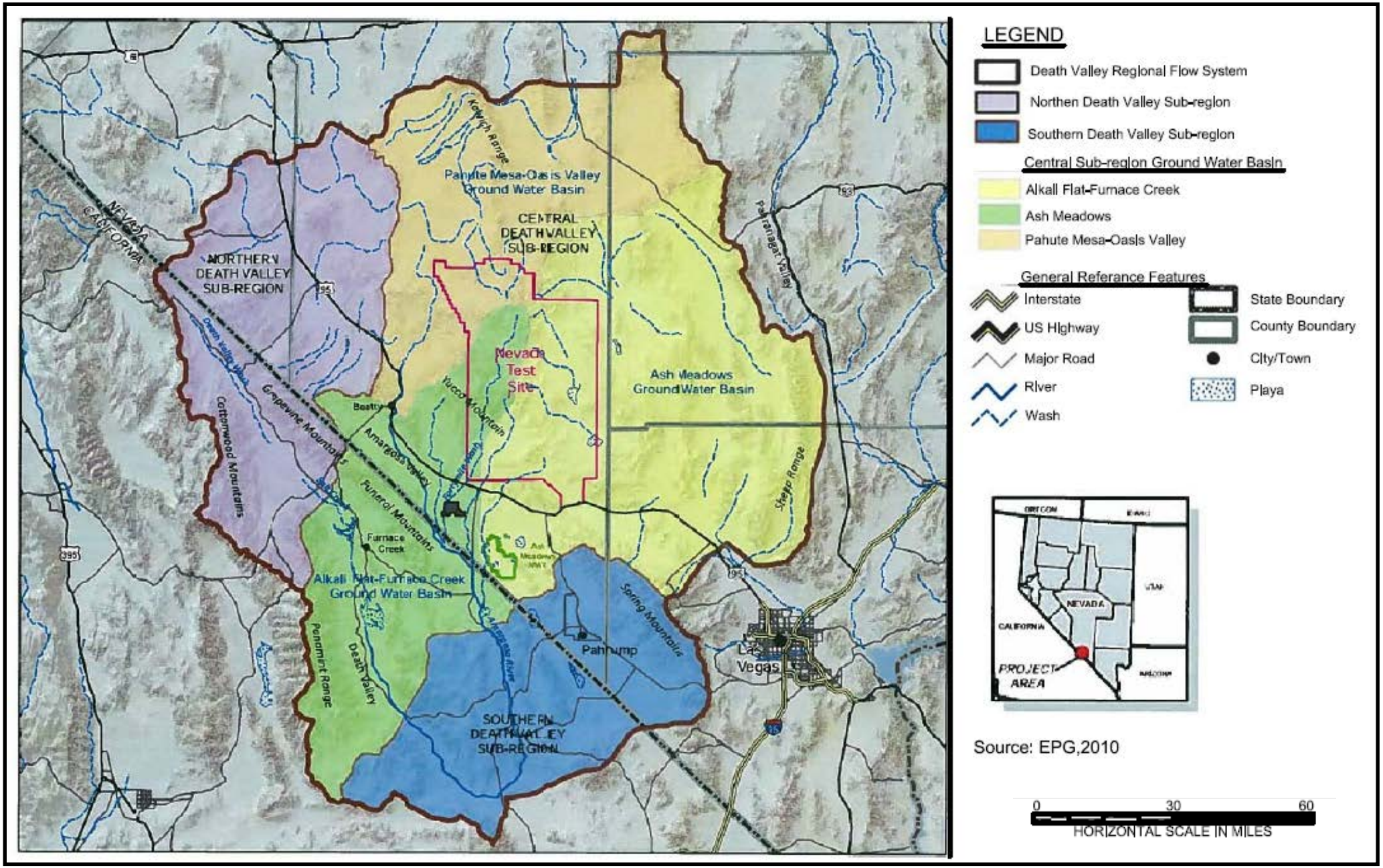


Figure 3-3. Extent of the Death Valley Regional Flow System

ANDY ZDON & ASSOCIATES, INC.

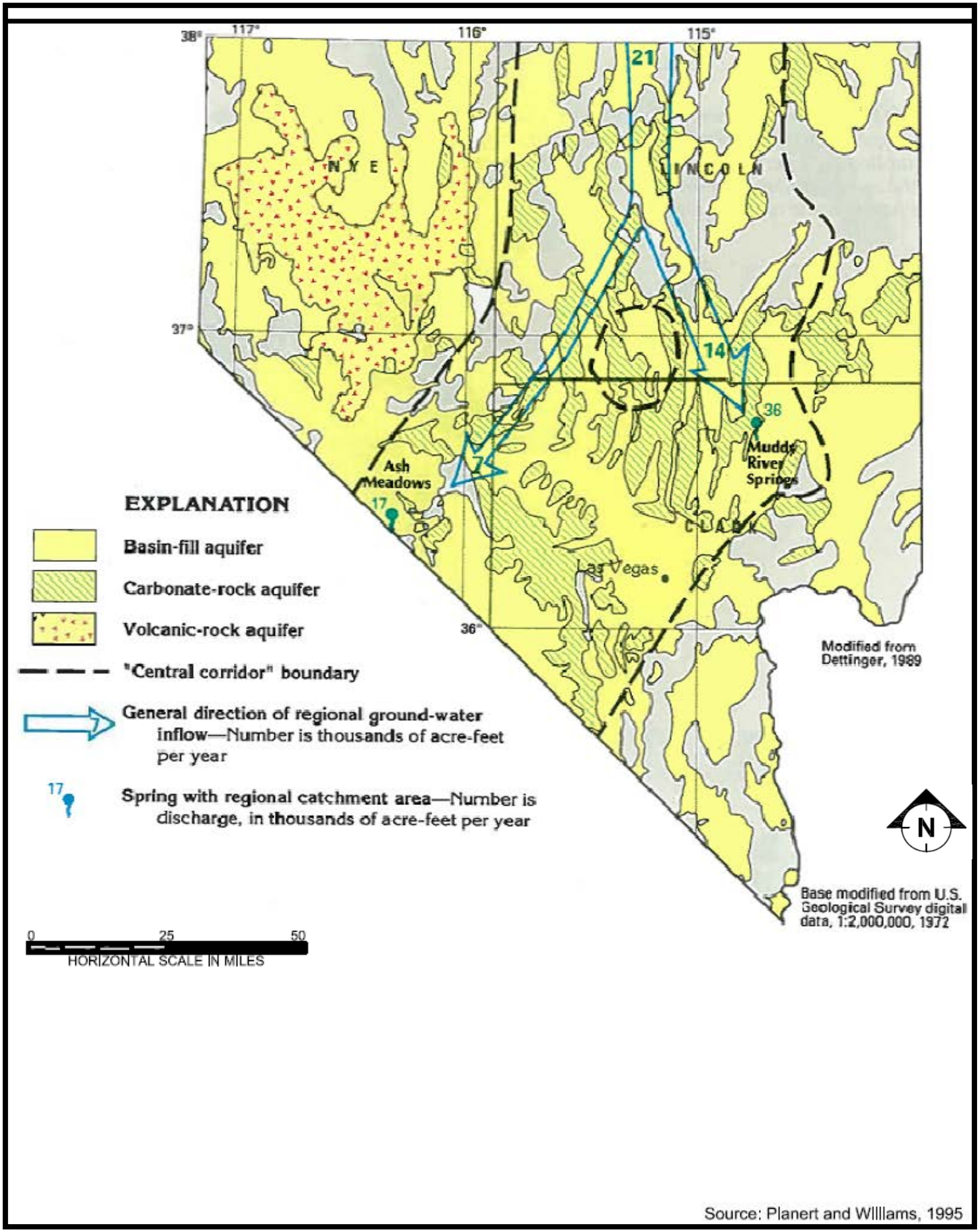


Figure 3-4. Paths for Regional Groundwater Flow – Nevada Portion of Basin

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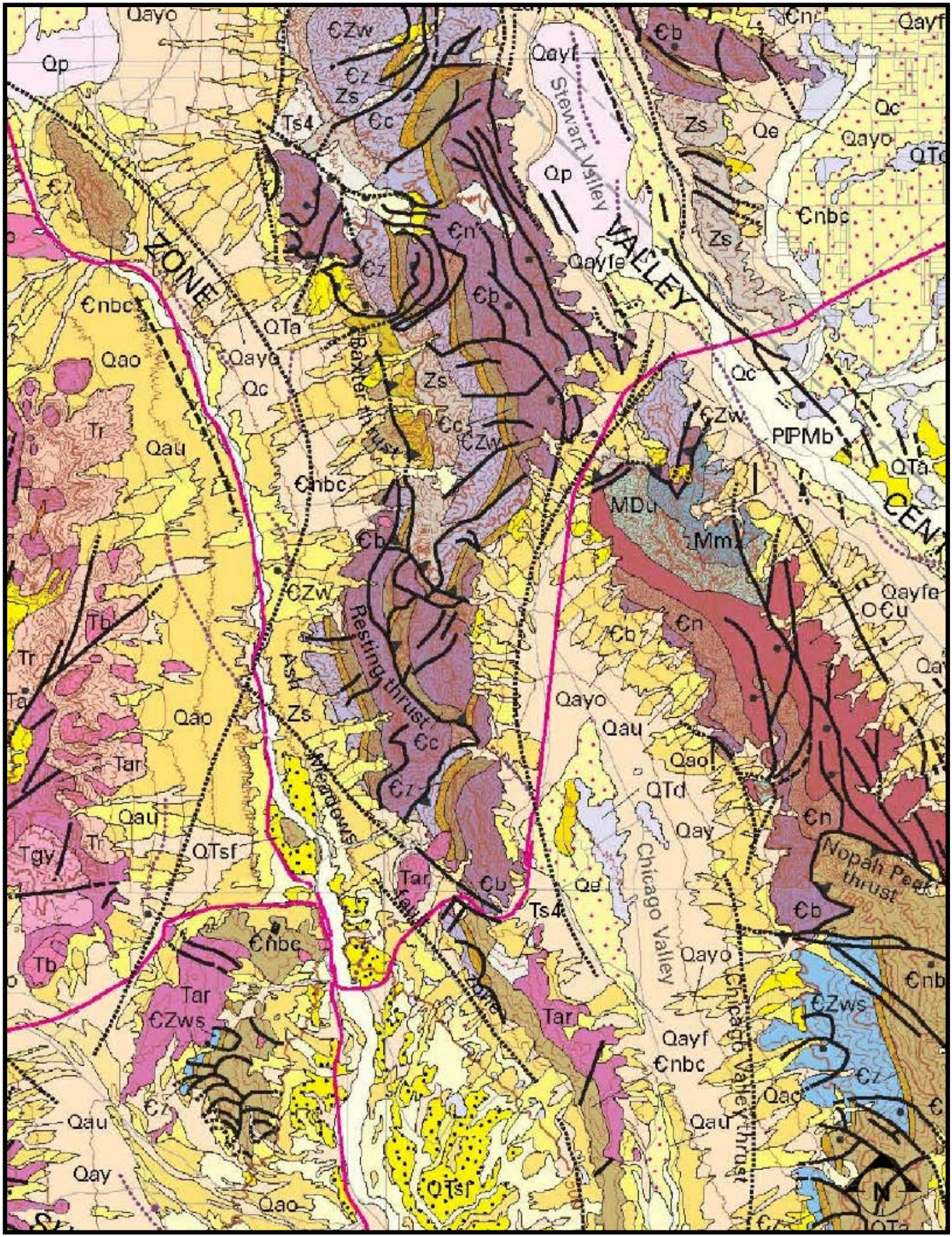

Figure 3-5. Geology of Chicago Valley Area (Workman 2002)

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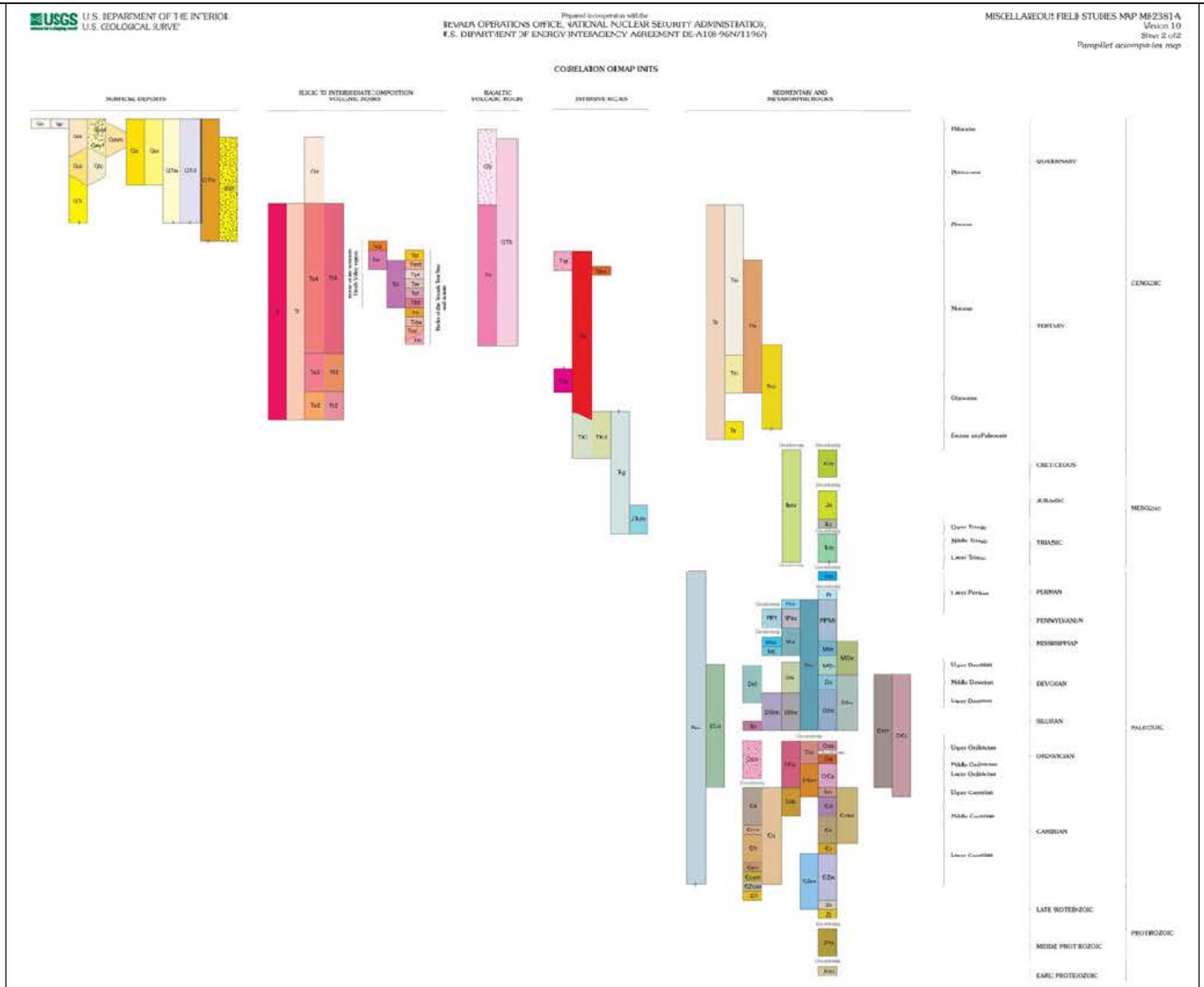

Figure 3-5A. Geology of Chicago Valley Area, Stratigraphy Section (Workman 2002)

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Figure 3-5B. Geology of Chicago Valley Area, Map Key

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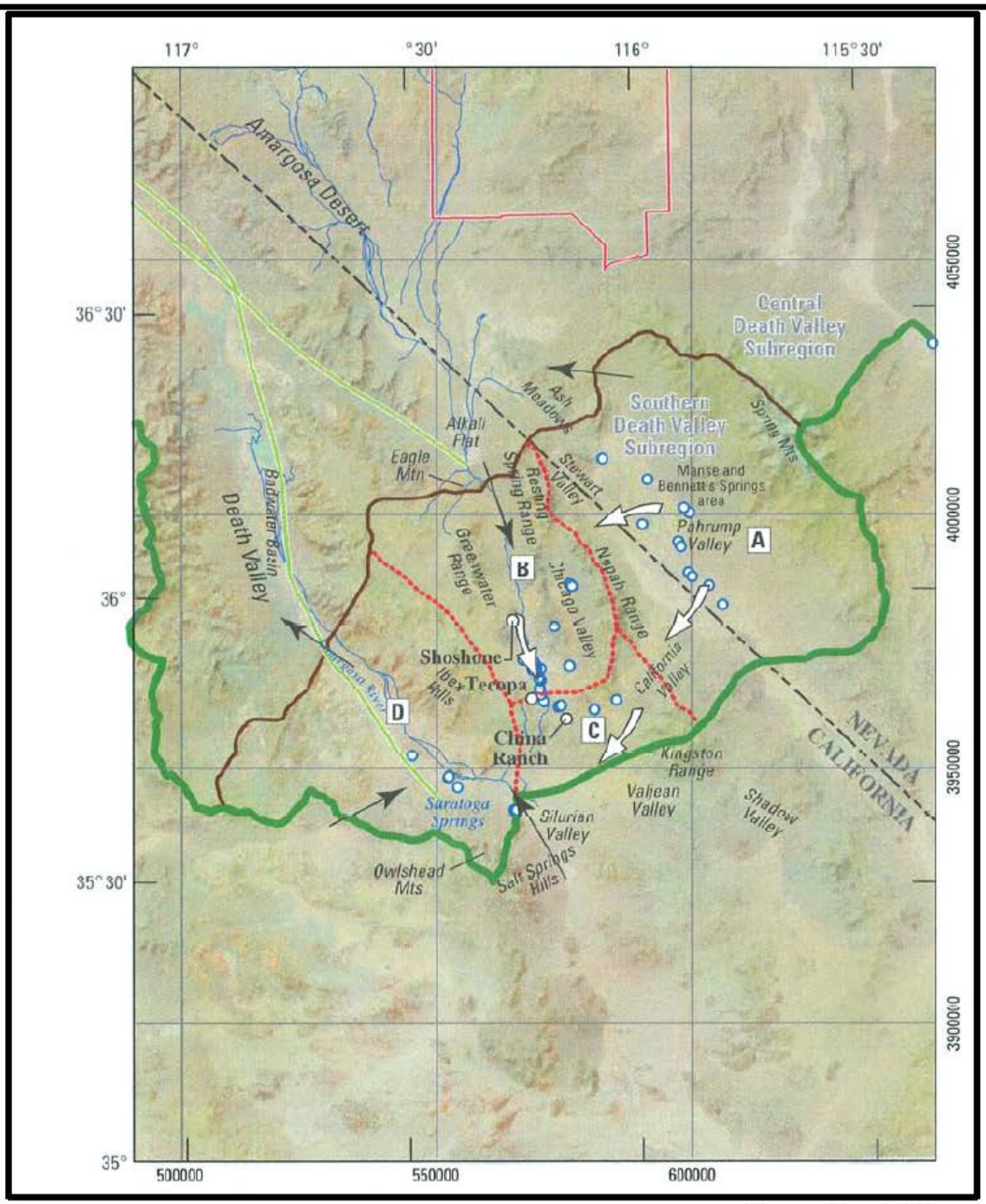

Source: Faunt, D'Agnese, O'Brian, 2004

EXPLANATION

- Death Valley regional ground-water flow system model boundary
- Subregion boundary (Within model domain)
- Ground-water section boundary and name
  - A Pahrump Valley
  - B Shoshone-Tecopa
  - C California Valley
  - D Ibex Hills
- Nevada Test Site boundary
- Potential flow into or between subregions
- General direction of ground-water flow associated with ground-water section
- Death Valley fault zone
- Regional springs
- Populated place

0 25 50
HORIZONTAL SCALE IN MILES

N

Figure 3-6. Paths for Regional Groundwater Flow – Middle Amargosa River and Death Valley Basins

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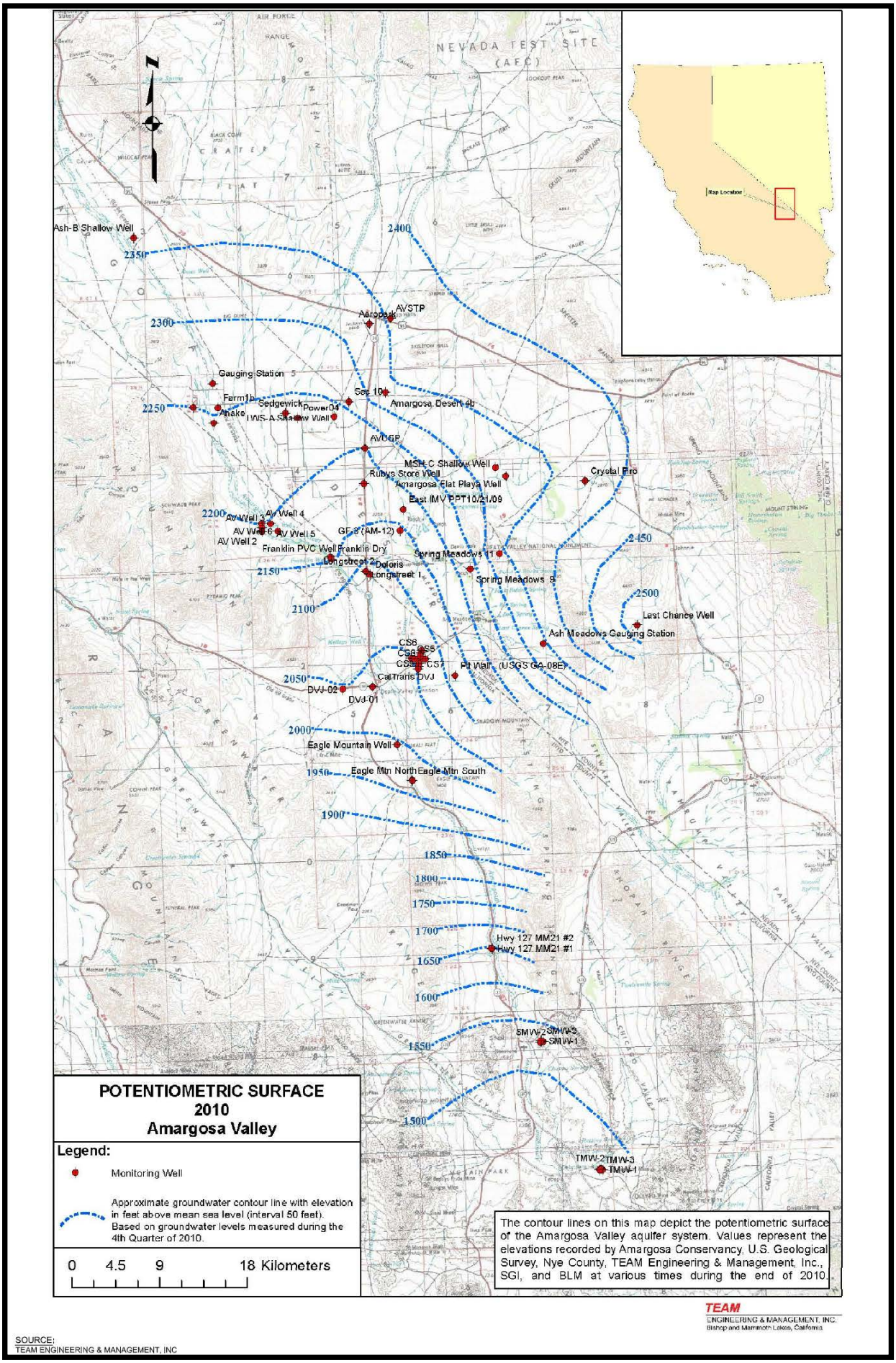

Figure 3-7. Potentiometric Surface Map – 4th Quarter 2010

ANDY ZDON & ASSOCIATES, INC.

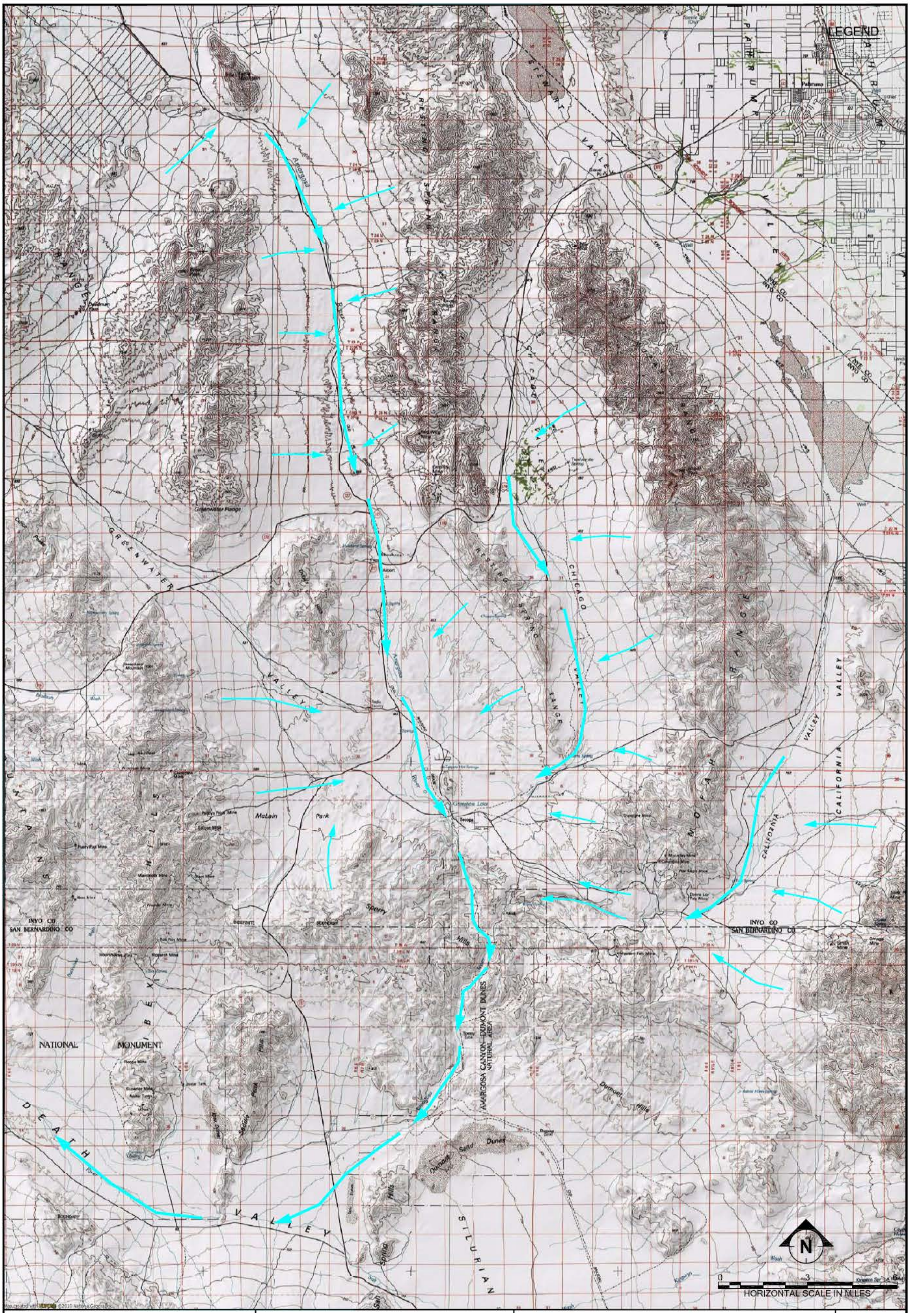

Figure 3-8. Conceptual Shallow Alluvium Flow Paths Within the Middle Amargosa River Basin

ANDY ZDON & ASSOCIATES, INC.

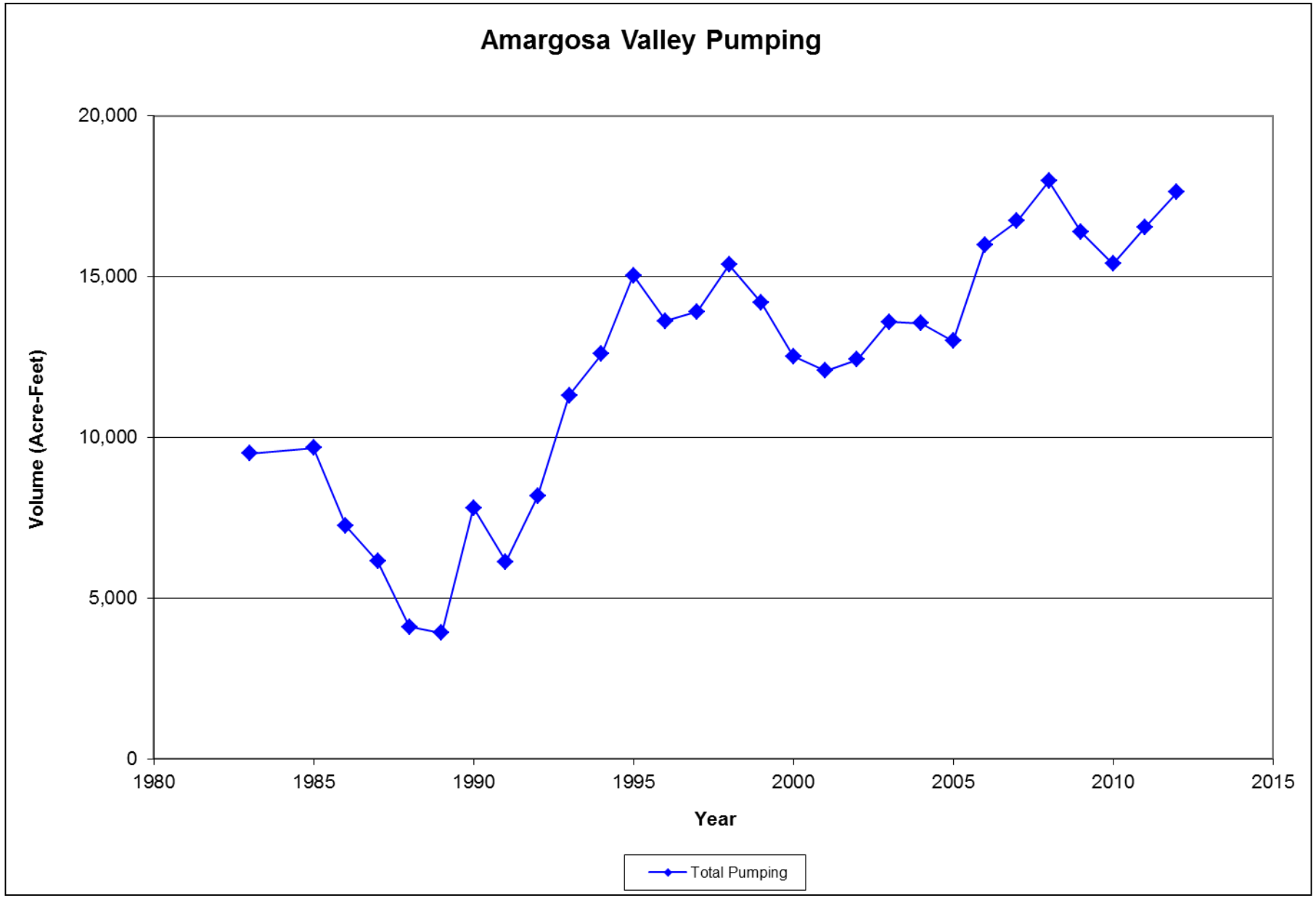

Figure 3-9. Pumping vs. Time, Amargosa Desert Area, Nevada

ANDY ZDON & ASSOCIATES, INC.

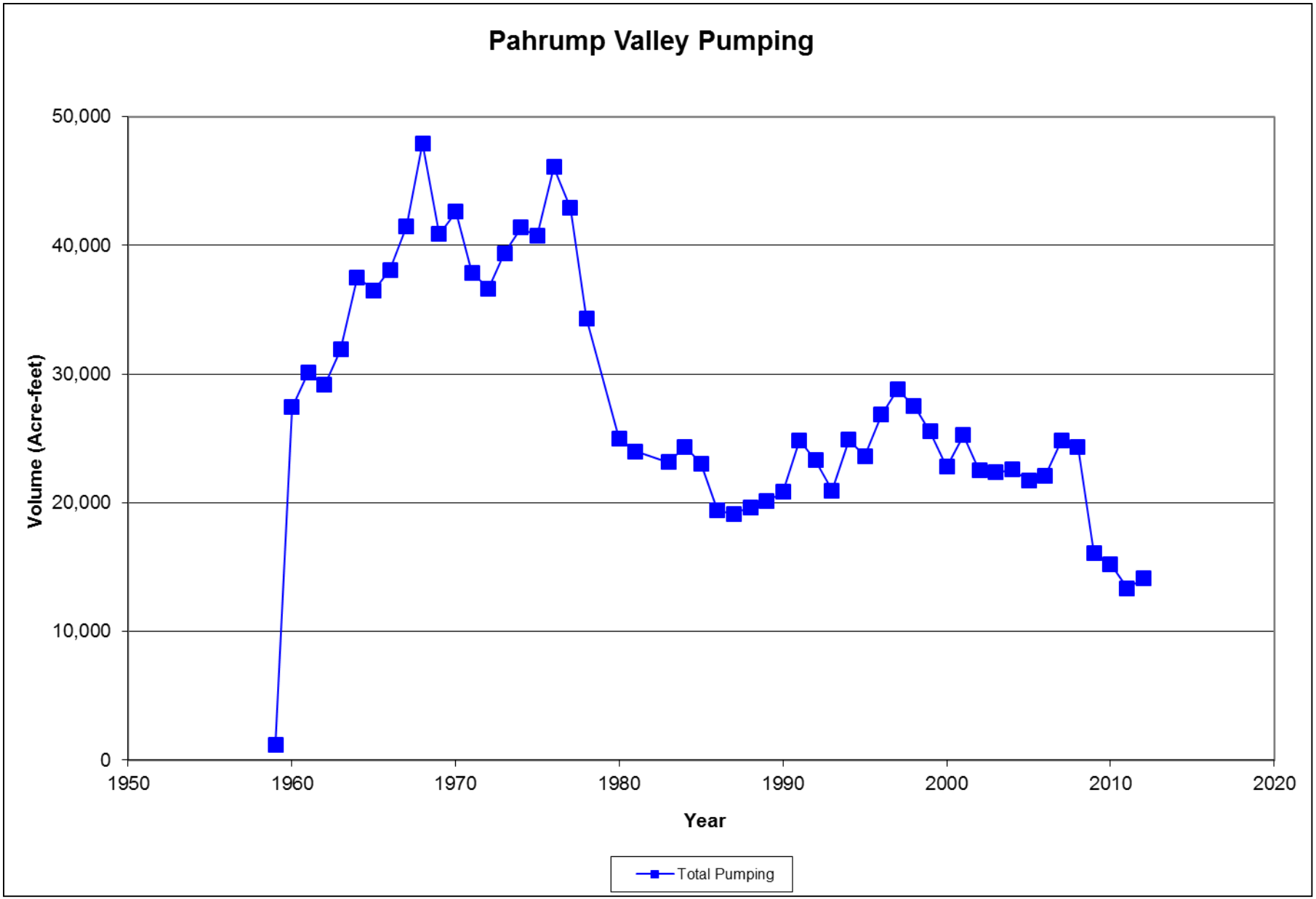

Figure 3-10. Pumping vs. Time, Pahrump Valley, Nevada

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TABLES

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes
Springs													
Amargosa Canyon Spring 1	11/17/2010	35.83937	116.22399	1,294	38	meter	23.22	1.053	685	7.42	7.93	105.3	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	4/25/2011	35.83937	116.22399	1,294	--	--	22.46	1.029	669	8.62	7.94	253.5	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	5/11/2011	35.83937	116.22399	1,294	66.1	bucket	--	--	--	--	--	--	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	9/21/2011	35.83937	116.22399	1,294	40.5	bucket	25.79	1.076	700	7.74	8.12	-42.4	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	12/22/2011	35.83937	116.22399	1,294	78	meter	18.73	1.009	656	7.96	8.22	77.4	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	5/1/2012	35.83937	116.22399	1,294	67.7	bucket	23.27	0.573	363	9.28	8.33	18.7	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	1/26/2013	35.83937	116.22399	1,294	80.2	bucket	21	1.274	828	12.32	8	61.7	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	4/19/2013	35.83937	116.22399	1,294	83.4	bucket	22.44	1.02	663	8.4	7.67	-106.5	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	9/25/2013	35.83937	116.22399	1,294	61	bucket	23.74	0.886	576	5.09	7.85	-180.4	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 1	5/6/2014	35.83937	116.22399	1,294	72.4	bucket	22.3	1.348	878	7.29	8.17	68.2	North end of Amargosa Canyon in burned area
Amargosa Canyon Spring 3	1/12/2011	35.82701	116.21942	1,262	30	visual	16.74	1.698	1104	9.68	8.51	186.4	Southern most Amargosa Canyon spring
Amargosa Canyon Spring 3	4/25/2011	35.82701	116.21942	1,262	25-30	visual	21.1	1.506	979	9.51	8.37	261.8	Southern most Amargosa Canyon spring
Amargosa Canyon Spring 3	9/21/2011	35.82701	116.21942	1,262	16	meter	25.79	1.597	1035	8.57	8.26	-17.8	Southern most Amargosa Canyon spring
Amargosa Canyon Spring 3	5/6/2014	35.82701	116.21942	1,262	10.4	bucket	20.9	1.861	1229	8.88	8.55	58.5	Southern most Amargosa Canyon spring
Amargosa Canyon Spring 4	1/12/2011	35.8348	116.2226	1,382	25	visual	26.05	0.915	596	8.07	8.34	182.2	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	4/25/2011	35.8348	116.2226	1,382	--	--	26.25	1.24	809	8.63	8.13	242.1	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	5/11/2011	35.8348	116.2226	1,382	7.7	bucket	--	--	--	--	--	--	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	9/21/2011	35.8348	116.2226	1,382	8.1	bucket	28.2	1.347	876	7.32	8.16	-18	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	12/22/2011	35.8348	116.2226	1,382	9.1	bucket	26.15	1.273	828	7.34	8.33	111.3	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	5/1/2012	35.8348	116.2226	1,382	7	bucket	26.11	1.22	795	9.93	8.6	28.4	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	1/26/2013	35.8348	116.2226	1,382	7.9	bucket	26.39	1.537	999	9.42	8.31	55.2	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	4/19/2013	35.8348	116.2226	1,382	7	bucket	26.64	1.333	867	8.4	7.86	-106.1	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	9/25/2013	35.8348	116.2226	1,382	7	bucket	27.73	1.1	714	5.44	8.16	-168.5	Amargosa Canyon spring eminating from east canyon wall
Amargosa Canyon Spring 4	5/6/2014	35.8348	116.2226	1,382	~10	visual	26.4	1.64	1066	7.04	8.52	38.1	Amargosa Canyon spring eminating from east canyon wall
Beck Spring	11/19/2010	35.78359	115.9322	4,439	5	visual	17.91	0.54	351	3.97	7.14	161.6	Located in the Kingston Range
Borax Spring	1/12/2011	35.88804	116.25789	1,342	6.8	bucket	30.53	3.019	1963	0.61	9.91	-296.7	
Borax Spring	5/5/2011	35.88804	116.25789	1,342	6.9	bucket	--	--	--	--	--	--	
Borax Spring	9/21/2011	35.88804	116.25789	1,342	5.9	bucket	30.51	2.981	1938	1.71	10.14	-404.7	
Borax Spring	4/30/2012	35.88804	116.25789	1,342	5.7	bucket	30.52	2.74	1781	3.2	10.31	-217.1	pipe cracked on casing
Borax Spring	1/28/2013	35.88804	116.25789	1,342	5.8	bucket	30.02	3.451	2242	0.99	10.08	-107.5	pipe cracked on casing
Borax Spring	4/18/2013	35.88804	116.25789	1,342	6.1	bucket	30.44	2.985	1940	0.49	9.45	-307.2	pipe cracked on casing
Borax Spring	9/23/2013	35.88804	116.25789	1,342	6.1	bucket	30.14	2.498	1624	0.07	9.74	-324.8	pipe cracked on casing
Borax Spring	5/12/2014	35.88804	116.25789	1,342	8.1	bucket	29.8	3.234	2100	0.27	10.02	-260.2	pipe cracked on casing
Bore Hole Spring	11/11/2010	35.88608	116.23416	1,356	20	visual	47.77	4.156	2704	2.28	8.62	141.4	Likely part of Tecopa Hot Spring system
Bore Hole Spring	5/2/2011	35.88608	116.23416	1,356	20	visual	43.98	4.176	2711	1.95	8.71	109.5	Likely part of Tecopa Hot Spring system
Bore Hole Spring	9/21/2011	35.88608	116.23416	1,356	26.2	meter	47.48	4.202	2731	1.31	8.68	-74.6	Likely part of Tecopa Hot Spring system
Bore Hole Spring	4/30/2012	35.88608	116.23416	1,356	90	bucket	47.68	3.89	2529	0.16	8.93	-13.3	Likely part of Tecopa Hot Spring system
Bore Hole Spring	1/25/2013	35.88608	116.23416	1,356	105	meter/visual	46.83	4.852	3157	1.62	8.85	29.6	Likely part of Tecopa Hot Spring system
Bore Hole Spring	4/18/2013	35.88608	116.23416	1,356	81	meter/visual	47.75	4.202	2731	0.35	8.47	-143.3	Likely part of Tecopa Hot Spring system
Bore Hole Spring	9/24/2013	35.88608	116.23416	1,356	105.2	meter	46.59	3.571	2323	0.46	8.48	-240	Likely part of Tecopa Hot Spring system
Bore Hole Spring	5/10/2014	35.88608	116.23416	1,356	148	USGS+	46.3	4.453	2899	1.1	8.71	44.5	Likely part of Tecopa Hot Spring system
Chappo Spring	11/12/2010	35.94723	116.18992	1,989	<5	visual	24.52	0.782	508	0.92	7.48	48.9	
Chappo Spring	5/1/2011	35.94723	116.18992	1,989	<5	visual	23.23	0.755	491	3.81	7.81	82.6	
Chappo Spring	5/9/2014	35.94723	116.18992	1,989	<5	visual	26.6	0.996	650	0.83	7.47	82.7	
Crystal Spring	11/19/2010	35.79503	115.96176	3,808	5	visual	21.09	0.632	411	4.23	7.45	165.6	Located in the Kingston Range
Crystal Spring	4/26/2011	35.79503	115.96176	3,808	13.5	bucket	21.18	0.61	397	5.73	7.52	257.5	Located in the Kingston Range
Crystal Spring	9/22/2011	35.79503	115.96176	3,808	9.5	bucket	21.38	0.637	414	5.12	7.29	-0.4	Located in the Kingston Range
Crystal Spring	12/22/2011	35.79503	115.96176	3,808	8.3	bucket	21.3	0.607	395	4.26	7.45	153.1	Located in the Kingston Range
Crystal Spring	4/30/2012	35.79503	115.96176	3,808	5.9	bucket	21.19	0.586	381	6.06	7.61	34.2	Located in the Kingston Range
Crystal Spring	1/25/2013	35.79503	115.96176	3,808	6.8	bucket	20.86	0.732	476	5.68	7.43	50.1	Located in the Kingston Range
Crystal Spring	4/21/2013	35.79503	115.96176	3,808	5.4	bucket	21.19	0.638	415	5.26	6.93	-100.5	Located in the Kingston Range

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes
Crystal Spring	9/24/2013	35.79503	115.96176	3,808	7.1	bucket	21.52	0.538	349	3.51	7.3	-192.7	Located in the Kingston Range
Crystal Spring	5/4/2014	35.79503	115.96176	3,808	4.3	bucket	21.2	0.949	--	3.54	7.43	--	Located in the Kingston Range
Dodge City Spring	5/4/2014	35.88018	116.22955	1,387	~20	visual	23	4.302	2795	8.2	8.79	80.4	Located near Tecopa Hot Springs
Five Springs	1/18/2011	36.46457	116.3193	2,349	30	bucket	34.44	0.523	336	3.96	7.77	107.1	Located in Ash Meadows
Five Springs	5/1/2011	36.46457	116.3193	2,349	28.6	bucket	34.24	0.693	454	4.44	7.6	179.3	Located in Ash Meadows
Five Springs	5/4/2012	36.46457	116.3193	2,349	22.1	bucket	34.52	0.664	432	5.26	7.68	30.1	Located in Ash Meadows
Five Springs	1/24/2013	36.46457	116.3193	2,349	23.8	bucket	34.18	0.826	536	4.68	7.69	38.6	Located in Ash Meadows
Five Springs	4/24/2013	36.46457	116.3193	2,349	23.8	bucket	34.41	0.718	467	4.18	7.25	-105.3	Located in Ash Meadows
Five Springs	9/23/2013	36.46457	116.3193	2,349	21	bucket	34.55	0.607	395	2.83	7.31	-195.6	Located in Ash Meadows
Five Springs	5/5/2014	36.46457	116.3193	2,349	23.5	bucket	34.3	0.873	566	3.83	7.59	97.3	Located in Ash Meadows
Horse Thief Spring	11/19/2010	35.77294	115.88824	4,637	5	visual	16.04	0.444	288	2.86	6.94	158.1	Located in the Kingston Range
Horse Thief Spring	4/26/2011	35.77294	115.88824	4,637	10.1	bucket	15.31	0.436	284	6.91	7.37	269	Located in the Kingston Range
Horse Thief Spring	9/22/2011	35.77294	115.88824	4,637	7.9	bucket	17.61	0.473	308	2.26	7.04	22.8	Located in the Kingston Range
Horse Thief Spring	12/22/2011	35.77294	115.88824	4,637	8	bucket	17.26	0.441	287	3.53	6.96	124.6	Located in the Kingston Range
Horse Thief Spring	4/30/2012	35.77294	115.88824	4,637	8.8	bucket	16.72	0.429	279	3.96	7.2	62	Located in the Kingston Range
Horse Thief Spring	1/25/2013	35.77294	115.88824	4,637	--	--	16.71	0.54	351	<4	6.7	60	Located in the Kingston Range
Horse Thief Spring	4/18/2013	35.77294	115.88824	4,637	--	--	16.64	0.5	326	2.54	6.47	-108.6	Located in the Kingston Range
Horse Thief Spring	9/24/2013	35.77294	115.88824	4,637	--	--	17.86	0.401	261	1.69	6.84	-218.4	Located in the Kingston Range
Horse Thief Spring	5/4/2013	35.77294	115.88824	4,637	10	visual	16.8	0.573	--	1.7	6.95	--	Located in the Kingston Range
Ibex Spring	11/4/2010	35.77211	116.4111	1,133	no flow	visual	18.78	2.486	1617	0.98	8.76	30.5	
Ibex Spring	4/24/2011	35.77211	116.4111	1,133	no flow	visual	16.35	2.234	1452	2.99	7.98	114.4	
Ibex Spring	5/11/2014	35.77211	116.4111	1,133	no flow	visual	16.7	2.327	1515	2.4	8.44	108.3	
Owl Hole Spring	11/16/2010	35.63931	116.64766	1,911	no flow	visual	17.01	4.098	2664	0.29	6.86	-73	
Owl Hole Spring	5/11/2014	35.63931	116.64766	1,911	no flow	visual	13.7	7.543	4901	1.06	7.49	116.2	
Resting Spring	1/23/2011	35.87728	116.15757	1,767	150	bucket	26.84	0.923	600	5.62	8.36	157.8	
Salsberry Spring	1/10/2011	35.93162	116.4182	3,410	5	visual	2.35	0.595	386	13.01	8.24	181.8	Spring water mixed with runoff from melting snow and ice
Salt Spring	11/5/2010	35.62622	116.28041	550	<5	visual	20.48	6.514	4235	0.74	7.94	-176.9	
Salt Spring	5/10/2011	35.62622	116.28041	550	<5	visual	19.46	8.944	5814	5.79	7.7	196.2	
Salt Spring	5/11/2014	35.62622	116.28041	550	<5	visual	26.3	10.429	6793	8.34	8.3	124.5	
Saratoga Spring	11/4/2010	35.6809	116.42254	207	unknown	visual	28.8	4.73	3075	2.49	7.71	259.1	
Sheep Creek Spring	11/5/2010	35.58863	116.36047	1,719	5	visual	23.1	0.614	400	8.57	9.02	62.5	
Sheep Creek Spring	4/24/2011	35.58863	116.36047	1,719	5	visual	21.4	1.216	789	7.67	7.78	188.2	
Sheephead Spring	1/17/2011	35.89979	116.40629	3,253	2	visual	11.58	0.818	531	8.59	8.22	169.8	
Shoshone Spring	1/23/2011	35.98056	116.27384	1,611	250+	meter	33.54	1.624	1056	3.75	7.79	162.7	This is from the Shoshone Spring source
Shoshone Spring	4/27/2011	35.98056	116.27384	1,611	250+	meter	--	--	--	--	--	--	This is from the Shoshone Spring source
Shoshone Spring	5/1/2012	35.98056	116.27384	1,611	104***	bucket	33.51	1.477	960	6.77	7.68	16.7	This is from the Shoshone Spring source
Shoshone Spring	1/29/2013	35.98056	116.27384	1,611	--	--	33.31	1.847	1201	5.85	7.66	30.7	This is from the Shoshone Spring source
Shoshone Spring	5/2/2013	35.98056	116.27384	1,611	--	--	33.47	1.601	1040	4.5	7.41	-97.1	This is from the Shoshone Spring source
Shoshone Spring	9/25/2013	35.98056	116.27384	1,611	--	--	33.62	1.35	878	2.55	7.23	-182.1	This is from the Shoshone Spring source
Shoshone Spring	5/12/2014	35.98056	116.27384	1,611	--	--	32.3	1.831	1190	2.99	7.51	149.4	This is from the Shoshone Spring source
Smith Spring	11/19/2010	35.78814	115.99752	3,066	~1	visual	21.41	0.451	293	5.36	7.81	86.9	Data from flow out of spring box
Smith Spring	4/26/2011	35.78814	115.99752	3,066	2-3	visual	--	--	--	--	--	--	Data from flow out of spring box
Smith Spring	5/9/2014	35.78814	115.99752	3,066	dry	visual	--	--	--	--	--	--	Data from flow out of spring box
Tecopa Hot Spring	11/11/2010	35.8789	116.23812	1,332	6**	bucket	40.76	4.306	2799	0.84	8.61	120.7	Sample from Amargosa Conservancy Trailer spring outlet
Tecopa Hot Spring	9/21/2011	35.8789	116.23812	1,332	5.1**	bucket	38.85	6.4	4100	2.74	9.18	-71.1	Sample from Amargosa Conservancy Trailer spring outlet
Tecopa Hot Spring	4/30/2012	35.8789	116.23812	1,332	4.9**	bucket	41.2	3.525	2311	3.54	8.96	20	Sample from Amargosa Conservancy Trailer spring outlet
Tecopa Hot Spring	1/29/2013	35.8789	116.23812	1,332	5.4**	bucket	38.02	5	3250	3.48	8.87	32.9	Sample from Amargosa Conservancy Trailer spring outlet
Tecopa Hot Spring	9/23/2013	35.8789	116.23812	1,332	5.3**	bucket	41.38	3.675	2389	1.7	8.43	-237.4	Sample from Amargosa Conservancy Trailer spring outlet
Tecopa Hot Spring	5/10/2014	35.8789	116.23812	1,332	~5	visual	40.6	4.598	2990	0.23	8.71	60.7	Sample from Amargosa Conservancy Trailer spring outlet
Thom Spring	11/11/2010	35.85661	116.22677	1,408	5	visual	24.81	1.571	1021	2.77	7.63	148.3	Data from flowing water within the vegetation
Thom Spring	4/30/2012	35.85661	116.22677	1,408	~2	visual	24.9	1.478	960	3.66	6.79	74.9	Data from flowing water within the vegetation
Thom Spring	1/28/2013	35.85661	116.22677	1,408	<5	visual	28.63	1.819	1182	2.8	7.73	32.9	Data obtained near modified outflow

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes
Thom Spring	4/30/2013	35.85661	116.22677	1,408	<5	visual	27.96	1.601	1.04	1.83	7.2	-141.5	Data obtained near modified outflow
Thom Spring	9/25/2013	35.85661	116.22677	1,408	<5	visual	29.09	1.34	871	1.13	7.35	-209.9	Data obtained near modified outflow
Thom Spring	5/5/2014	35.85661	116.22677	1,408	<5	visual	27.8	1.889	1229	0.93	7.55	83	Data obtained near modified outflow
Twelvemile Spring	11/14/2010	36.02172	116.15531	2,240	no flow	visual	19.23	0.8	520	1.38	7.66	-141	Data from shallow puddle
Wild Bath Spring	11/11/2010	35.87277	116.21932	1,424	1.7	bucket	29.88	1.642	1067	4.69	7.9	165.5	Tub located off Furnace Creek Road behind Tecopa Hot Springs
Wild Bath Spring	9/21/2011	35.87277	116.21932	1,424	1.9	bucket	37.99	1.664	1083	5.59	7.83	-2.2	Tub located off Furnace Creek Road behind Tecopa Hot Springs
Wild Bath Spring	5/5/2012	35.87277	116.21932	1,424	1.3	bucket	34.89	1.559	1012	5.64	8.37	16.2	Tub located off Furnace Creek Road behind Tecopa Hot Springs
Wild Bath Spring	1/25/2013	35.87277	116.21932	1,424	<2	visual	36.53	1.906	1024	4.52	7.94	52.8	Tub covered with plastic tarp
Wild Bath Spring	5/4/2013	35.87277	116.21932	1,424	<2	visual	33.83	1.633	1061	3.97	7.81	-99.8	Tub located off Furnace Creek Road behind Tecopa Hot Springs
Wild Bath Spring	9/25/2013	35.87277	116.21932	1,424	<2	visual	30.76	1.403	911	5	8.07	-178.5	Tub located off Furnace Creek Road behind Tecopa Hot Springs
Wild Bath Spring	5/10/2014	35.87277	116.21932	1,424	<2	visual	35.5	1.872	1216	3.85	8.2	85.5	Tub located off Furnace Creek Road behind Tecopa Hot Springs
China Ranch Cyn Spring 1	1/13/2011	35.80335	116.14099	1,770	10	visual	13.94	1.215	789	9.34	8.5	44.5	a.k.a. Willow Canyon 1 spring
China Ranch Cyn Spring 2	1/13/2011	35.80445	116.14235	1,767	20+	visual	21.28	0.931	606	6.22	8.17	46.6	a.k.a. Willow Canyon 3 spring
Willow Spring 1	11/3/2010	35.80556	116.18284	1,420	28	bucket	23.73	1.502	958	5.72	8.26	3.4	Junction of spring water capture piping (above pond)
Willow Spring 1	4/26/2011	35.80556	116.18284	1,420	--	--	21.92	1.141	737	6.21	7.29	93.1	Junction of spring water capture piping (above pond)
Willow Spring 1	9/23/2011	35.80556	116.18284	1,420	20	bucket	--	--	--	--	--	--	Combined pond outflow and spring box
Willow Spring 2	1/18/2011	35.80098	116.19449	1,235	120-130	meter	17.98	1.91	1241	8.34	8.18	-31.1	Measurement taken at culvert
Willow Spring 2	9/23/2011	35.80098	116.19449	1,235	52.9	meter	24.16	1.028	668	8.08	8.14	-29.2	Measurement taken at culvert
Willow Spring 2	5/1/2012	35.80098	116.19449	1,235	--	--	22.33	1.164	756	8.95	8.09	16.2	Measurement taken at culvert
Willow Spring 2	4/30/2013	35.80098	116.19449	1,235	--	--	22.99	1.154	750	7.12	7.24	-116.8	Measurement taken at culvert
Willow Spring 2	9/25/20123	35.80098	116.19449	1,235	37	meter	23.64	0.837	544	5.6	8	-169.4	Measurement taken at culvert
Willow Spring 2	9/25/20123	35.80098	116.19449	1,235	4.5	USGS	--	--	--	--	--	--	Measurement taken at culvert
Amargosa River													
Amargosa River/USGS 1	11/3/2010	35.84954	116.23081	1,325	40	USGS	--	--	--	--	--	--	At the Tecopa USGS flow station
Amargosa River/USGS 1	4/29/2011	35.84954	116.23081	1,325	94	USGS	--	--	--	--	--	--	At the Tecopa USGS flow station
Amargosa River/USGS 1	9/22/2011	35.84954	116.23081	1,325	31	USGS	--	--	--	--	--	--	At the Tecopa USGS flow station
Amargosa River/USGS 1	12/22/2011	35.84954	116.23081	1,325	583	USGS	--	--	--	--	--	--	At the Tecopa USGS flow station
Amargosa River/USGS 1	4/30/2012	35.84954	116.23081	1,325	117	USGS	17.97	10.806	7024	10.28	9.36	36.3	At the Tecopa USGS flow station
Amargosa River/USGS 1	1/29/2013	35.84954	116.23081	1,325	162	USGS	5.99	14.25	9264	17.48	8.71	57.4	At the Tecopa USGS flow station
Amargosa River/USGS 1	4/30/2013	35.84954	116.23081	1,325	45	USGS	17.52	9.69	6303	10.14	8.34	-172.8	At the Tecopa USGS flow station
Amargosa River/USGS 1	9/25/2013	35.84954	116.23081	1,325	18	USGS	19.4	5.659	3681	5.4	8.58	-207	At the Tecopa USGS flow station
Amargosa River/USGS 1	5/10/2014	35.84954	116.23081	1,325	130	USGS	19.5	9.499	6142	7.98	9.2	23.5	At the Tecopa USGS flow station
Amargosa River/USGS 2	4/28/2011	35.79042	116.20777	1,094	558	meter	18.13	3.876	2520	12.65	8.52	152	At China Ranch USGS flow station
Amargosa River/USGS 2	5/10/2011	35.79042	116.20777	1,094	656	meter	15.9	3.481	2263	11.45	8.46	189.6	At China Ranch USGS flow station
Amargosa River/USGS 2	9/20/2011	35.79042	116.20777	1,094	390	USGS	23.05	3.658	2378	10.22	8.53	-33.4	At China Ranch USGS flow station
Amargosa River/USGS 2	12/22/2011	35.79042	116.20777	1,094	943	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Amargosa River/USGS 2	5/3/2012	35.79042	116.20777	1,094	487.9	meter	19.07	3.899	2534	12.03	8.69	51.8	At China Ranch USGS flow station
Amargosa River/USGS 2	5/3/2012	35.79042	116.20777	1,094	763	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Amargosa River/USGS 2	1/27/2013	35.79042	116.20777	1,094	914	meter	11.33	10.56	6863	15.83	8.57	86	At China Ranch USGS flow station
Amargosa River/USGS 2	1/27/2013	35.79042	116.20777	1,094	539	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Amargosa River/USGS 2	4/20/2013	35.79042	116.20777	1,094	399	meter	15.96	4.634	3012	14.04	8	-104.8	At China Ranch USGS flow station
Amargosa River/USGS 2	4/20/2013	35.79042	116.20777	1,094	494	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Amargosa River/USGS 2	9/24/2013	35.79042	116.20777	1,094	735	meter	15.1	3.263	2121	6.95	8.32	-184.4	At China Ranch USGS flow station
Amargosa River/USGS 2	9/24/2013	35.79042	116.20777	1,094	1436	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Amargosa River/USGS 2	5/4/2014	35.79042	116.20777	1,094	527	meter	17.8	4.443	2886	9.83	8.61	84.4	At China Ranch USGS flow station
Amargosa River/USGS 2	5/4/2014	35.79042	116.20777	1,094	444	USGS	--	--	--	--	--	--	At China Ranch USGS flow station
Willow Creek	4/29/2011	35.78757	116.20039	1,107	42.9	bucket	20.75	1.474	954	9.4	8.42	190.6	Above confluence with Amargosa River
Willow Creek	12/22/2011	35.78757	116.20039	1,107	dry	bucket	--	--	--	--	--	--	Above confluence with Amargosa River
Willow Creek	5/3/2012	35.78757	116.20039	1,107	37.7	bucket	20.53	1.357	882	10.89	8.8	25.4	Above confluence with Amargosa River
Willow Creek	1/27/2013	35.78757	116.20039	1,107	33	meter/visual	14.28	1.651	1073	15.49	8.38	69.3	Above confluence with Amargosa River
Willow Creek	4/20/2013	35.78757	116.20039	1,107	47	meter	27.07	1.414	919	9.28	8.15	-107.1	Above confluence with Amargosa River
Willow Creek	9/24/2013	35.78757	116.20039	1,107	dry	visual	--	--	--	--	--	--	Above confluence with Amargosa River

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes
Willow Creek	5/4/2014	35.78757	116.20039	1,107	25	meter/visual	18.1	1.421	923	10.1	8.61	106.1	Above confluence with Amargosa River
Amargosa River Confluence	4/29/2011	35.785	116.2023	1,053	662	meter	20.23	3.88	2523	9.25	8.64	205	Confluence with Willow Creek
Amargosa River Confluence	9/22/2011	35.785	116.2023	1,053	332	meter	19.24	4.226	2748	9.5	8.48	-7.2	Confluence with Willow Creek
Amargosa River Confluence	12/22/2011	35.785	116.2023	1,053	463	meter	3.77	5.657	3677	11.7	8.38	63.6	Confluence with Willow Creek
Amargosa River Confluence	5/3/2012	35.785	116.2023	1,053	395	meter	17.88	4.262	2770	10.26	8.59	32.2	Confluence with Willow Creek
Amargosa River Confluence	1/27/2013	35.785	116.2023	1,053	561	meter	10.51	7.547	4905	15.62	7.94	89.9	Confluence with Willow Creek
Amargosa River Confluence	4/20/2013	35.785	116.2023	1,053	563	meter	14.05	5.004	3253	11.48	8.02	-111.9	Confluence with Willow Creek
Amargosa River Confluence	9/24/2013	35.785	116.2023	1,053	461	meter	14.61	3.54	2301	7.04	8.43	-147.5	Confluence with Willow Creek
Amargosa River Confluence	5/4/2014	35.785	116.2023	1,053	643	meter	17.3	4.786	3114	9.21	8.63	111.4	Confluence with Willow Creek
Amargosa River 3	11/16/2010	35.74637	116.22219	846	477	meter	19.08	4.015	2610	10.89	8.79	172.1	At Sperry Wash
Amargosa River 3	4/29/2011	35.74637	116.22219	846	462	meter	19.67	4.225	2745	10.08	8.6	202.3	At Sperry Wash
Amargosa River 3	5/5/2011	35.74637	116.22219	846	271	meter	19.4	4.198	2728	10.81	8.64	190.4	At Sperry Wash
Amargosa River 3	9/20/2011	35.74637	116.22219	846	158	meter	26.58	4.429	2879	10.18	8.91	-11.8	At Sperry Wash
Amargosa River 3	9/23/2011	35.74637	116.22219	846	119	meter	17	4.321	2809	11.03	8.6	-10.5	At Sperry Wash
Amargosa River 3	12/21/2011	35.74637	116.22219	846	389	meter	9.33	5.179	3366	11.3	8.6	130.7	At Sperry Wash
Amargosa River 3	5/4/2012	35.74637	116.22219	846	366	meter	24.22	4.388	2852	11.75	9.02	22.4	At Sperry Wash
Amargosa River 3	1/26/2013	35.74637	116.22219	846	510	meter	13.02	6.656	4326	16.55	8.32	76.2	At Sperry Wash
Amargosa River 3	4/18/2013	35.74637	116.22219	846	398	meter	25.66	5.223	3395	12.37	8.4	-102	At Sperry Wash
Amargosa River 3	9/23/2013	35.74637	116.22219	846	275	meter	22.71	4.171	2711	8.34	8.69	-157.7	At Sperry Wash
Amargosa River 3	5/4/2014	35.74637	116.22219	846	588	meter	26.2	4.831	3140	12.72	8.93	29.8	At Sperry Wash
Amargosa River 4	4/29/2011	35.69609	116.25082	649	70	meter	15.67	4.472	2904	11.88	8.93	206.3	At crossing of Dumont Dunes Road
Amargosa River 4	5/5/2011	35.69609	116.25082	649	dry	meter	--	--	--	--	--	--	At crossing of Dumont Dunes Road
Amargosa River 4	9/23/2011	35.69609	116.25082	649	dry	meter	--	--	--	--	--	--	At crossing of Dumont Dunes Road
Amargosa River 4	12/21/2011	35.69609	116.25082	649	136	meter	3.79	4.727	3073	12.35	8.6	214.1	At crossing of Dumont Dunes Road
Amargosa River 4	5/4/2012	35.69609	116.25082	649	44	meter	27.23	4.617	3003	9.07	9.22	22.5	At crossing of Dumont Dunes Road
Amargosa River 4	1/26/2013	35.69609	116.25082	649	171	meter	12.06	6.025	3916	15.34	8.49	76.4	At crossing of Dumont Dunes Road
Amargosa River 4	4/18/2013	35.69609	116.25082	649	dry	meter	--	--	--	--	--	--	At crossing of Dumont Dunes Road
Amargosa River 4	9/23/2013	35.69609	116.25082	649	<50	visual	16.54	5.134	3338	6.8	8.95	-195.2	At crossing of Dumont Dunes Road
Amargosa River 4	5/4/2014	35.69609	116.25082	649	<50	visual	25.4	5.926	3854	7.9	9.15	79.1	At crossing of Dumont Dunes Road
Amargosa River 2	11/16/2010	35.66418	116.29722	443	256	meter	21.4	4.295	2793	8.64	8.89	126.7	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	4/29/2011	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	5/5/2011	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	9/23/2011	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	12/21/2011	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	5/4/2012	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	1/26/2013	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	4/18/2013	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	9/23/2013	35.66418	116.29722	443	dry	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes
Amargosa River 2	5/4/2013	35.66418	116.29722	443	<50	visual	--	--	--	--	--	--	At rt 127 crossing south of Dumont Dunes

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes
Wells					Depth to Water (ft from top of casing)								
ARHS-1	5/25/2012	36.0773	116.2953	1,780	111.72	dtw meter	35	2.941	1910	2.04	8.26	107.3	At rt 127, 6 miles north of Shoshone, CA
ARHS-1	4/24/2013	36.0773	116.2953	1,780	111.88	dtw meter	--	--	--	--	--	--	At rt 127, 6 miles north of Shoshone, CA
ARHS-2	5/25/2012	35.8054	116.1825	1,430	5.79	dtw meter	24.36	0.912	593	4.2	7.54	129.8	At China Ranch
ARHS-2	1/25/2013	35.8054	116.1825	1,430	5.94	dtw meter	23.73	1.095	714	5.52	7.6	36.9	At China Ranch
ARHS-2	4/30/2013	35.8054	116.1825	1,430	6.83	dtw meter	--	--	--	--	--	--	At China Ranch
ARHS-2	9/24/2013	35.8054	116.1825	1,430	6.39	dtw meter	25.73	0.798	519	3.41	7.25	-178.8	At China Ranch
ARHS-2	5/9/2014	35.8054	116.1825	1,430	5.69	dtw meter	24.5	1.27	826	3.86	7.46	178.4	At China Ranch
ARHS-3	4/24/2013	36.0216	116.1554	2,205	18.64	dtw meter	24.6	0.77	500	5.48	6.86	-101.2	Located adjacent to 12 Mile Spring
ARHS-3	9/24/2013	36.0216	116.1554	2,205	19.34	dtw meter	24.63	0.647	421	3.72	7.42	-182.7	Located adjacent to 12 Mile Spring
ARHS-3	5/5/2014	36.0216	116.1554	2,205	19.13	dtw meter	24.3	1.087	709	5.5	7.68	81.1	Located adjacent to 12 Mile Spring
ARHS-4	9/24/2013	35.7999	116.1035	2,072	12.5	dtw meter	24.08	0.656	427	4.1	7.5	-171.6	Located adjacent to Married Man's Camp
ARHS-4	5/9/2014	35.7999	116.1035	2,072	11.94	dtw meter	22.6	1.106	722	4.96	7.52	149.6	Located adjacent to Married Man's Camp
Cynthia's Well	1/16/2011	35.8461	116.20478	1,447	38.87	dtw meter	20.61	0.898	584	7.1	8.5	110.4	Located in Tecopa Heights
Cynthia's Well	5/12/2011	35.8461	116.20478	1,447	40.51	dtw meter	--	--	--	--	--	--	Located in Tecopa Heights
Cynthia's Well	9/23/2011	35.8461	116.20478	1,447	42.75	dtw meter	--	--	--	--	--	--	Located in Tecopa Heights
Cynthia's Well	5/5/2012	35.8461	116.20478	1,447	40.22	dtw meter	22.31	1.163	756	3	8.36	33.9	Located in Tecopa Heights
Cynthia's Well	1/27/2013	35.8461	116.20478	1,447	39	dtw meter	--	--	--	--	--	--	Located in Tecopa Heights
Cynthia's Well	4/25/2013	35.8461	116.20478	1,447	40.95	dtw meter	23.06	1.251	813	2.75	7.36	-113.8	Located in Tecopa Heights
Cynthia's Well	5/12/2014	35.8461	116.20478	1,447	41.16	dtw meter	23.8	1.151	748	6.2	7.86	76	Located in Tecopa Heights
Eagle Mountain Well	11/4/2010	36.24987	116.3953	2,007	14.82	dtw meter	22.76	3.35	2177	4.25	8.85	54.4	Located west of Eagle Mountain
Eagle Mountain Well	5/1/2011	36.24987	116.3953	2,007	14.78	dtw meter	--	--	--	--	--	--	Located west of Eagle Mountain
Eagle Mountain Well	9/21/2011	36.24987	116.3953	2,007	14.77	dtw meter	--	--	--	--	--	--	Located west of Eagle Mountain
Eagle Mountain Well	4/30/2012	36.24987	116.3953	2,007	14.94	dtw meter	19.79	3.251	2112	7.39	8.42	36.5	Located west of Eagle Mountain
Eagle Mountain Well	1/24/2013	36.24987	116.3953	2,007	15	dtw meter	21.23	4.043	2628	7.98	8.45	41.1	Located west of Eagle Mountain
Eagle Mountain Well	4/24/2013	36.24987	116.3953	2,007	14.97	dtw meter	20.08	3.487	2267	7.05	7.93	-112.4	Located west of Eagle Mountain
Eagle Mountain Well	9/23/2013	36.24987	116.3953	2,007	14.75	dtw meter	22.8	2.984	1938	5.9	8.09	-181.4	Located west of Eagle Mountain
Eagle Mountain Well	5/9/2014	36.24987	116.3953	2,007	14.92	dtw meter	20	3.864	--	6.6	8.56	--	Located west of Eagle Mountain
Married Man's Well	11/19/2011	35.80038	116.10177	2,096	25.82	dtw meter	--	--	--	--	--	--	Locate at head of Willow Creek Wash
Married Man's Well	4/30/2012	35.80038	116.10177	2,096	25.49	dtw meter	23.96	1.255	816	3.61	7.59	-114.5	Locate at head of Willow Creek Wash
Married Man's Well	1/25/2013	35.80038	116.10177	2,096	25.51	dtw meter	--	--	--	--	--	--	Locate at head of Willow Creek Wash
Junior's Well	1/16/2011	35.8512	116.24252	1,346	NA	NA	24.29	2.04	1326	6.63	8.33	69	Located west of Amargosa River (opposite of Tecopa)
Hog Farm Well	1/28/2013	36.28748	116.37854	2,017	<5	visual	21.17	1.653	1074	0.97	8.66	39.9	Located southeast of Death Valley Junction
Hog Farm Well	4/24/2013	36.28748	116.37854	2,017	<5	visual	21.56	1.432	930	<1	7.67	-180.7	Located southeast of Death Valley Junction
Hog Farm Well	9/23/2013	36.28748	116.37854	2,017	<5	visual	21.94	1.219	792	0.4	8.48	-258	Located southeast of Death Valley Junction
Hog Farm Well	5/5/2014	36.28748	116.37854	2,017	<5	visual	21.6	1.74	1131	0.14	8.74	31.3	Located southeast of Death Valley Junction
Tecopa School Well	11/11/2010	35.84854	116.21743	1,372	NA	NA	20.06	1.372	892	4.59	7.6	161.2	Sample from spigot adjacent to well head
Tule Spring Well	11/13/2010	35.81178	116.04909	1,989	10.4	dtw meter	18.85	0.855	556	0.23	7.42	-54.8	Data from well. Strong odor of decay
Tule Spring Well	4/30/2012	35.81178	116.04909	1,989	10.01	dtw meter	19.37	0.827	537	1.76	7.87	26.8	Data from well. No smell from well.
Tule Spring Well	1/25/2013	35.81178	116.04909	1,989	10	dtw meter	17.44	0.981	638	<2.5	7.35	66.5	Data from well. No smell from well.
Tule Spring Well	4/21/2013	35.81178	116.04909	1,989	9.83	dtw meter	17.38	0.91	591	1.35	6.9	-160.6	Data from well. Moderate odor of decay
Tule Spring Well	9/24/2013	35.81178	116.04909	1,989	10.8	dtw meter	20.91	0.728	473	0.37	7.42	-272.3	Data from well. Moderate odor of decay
Tule Spring Well	5/9/2014	35.81178	116.04909	1,989	9.98	dtw meter	19.2	1.234	800	0.5	7.4	59.9	Data from well. Moderate odor of decay

Notes:
ft amsl = feet above mean sea level
gpm = gallons per minute
Temp. = temperature
deg C = degrees Celcius
mS/cm-deg C = milliSiemans per centimeter degrees Celcius
Spec. Cond. = specific conductivity

Table 2-1
Field Reconnaissance Data Summary
Amargosa Basin
California/Nevada

Name	Date of Visit	Latitude	Longitude	Elevation (ft amsl)	Flow (gpm)	Flow Measurement Method*	Temp. (deg C)	Spec. Cond. (mS/cm-deg C)	TDS (mg/L)	DO (mg/L)	pH	ORP (mV)	Notes

TDS = total dissolved solids
mg/L = milligrams per liter
DO = dissolved oxygen
ORP = oxidation-reduction potential
mV = millivolts

*Flow Measurement Method = spring and river flow were measured either directly with a solid state meter (meter), indirectly using time to fill a 5-gallon bucket (bucket), or using visual estimation techniques (visual).

Table 3-1
Mean Annual Flow
Amargosa River
California/Nevada

Year	**Discharge** (cfs)				
	Station 1	**Station 2**	**Station 3**	**Station 4**	**Station 5**
1962	ND	1.04	ND	ND	ND
1963	ND	2.54	ND	ND	ND
1964	ND	0.786	ND	ND	0.011
1965	ND	1.03	ND	ND	0.019
1966	ND	7.67	ND	ND	0.000
1967	ND	0.736	ND	ND	0.776
1968	ND	1.68	ND	ND	0.249
1969	ND	9.19	ND	ND	ND
1970	ND	1.36	ND	ND	ND
1971	ND	0.648	ND	ND	ND
1972	ND	0.626	ND	ND	ND
1973	ND	ND	ND	ND	ND
1974	ND	0.596	ND	ND	ND
1975	ND	0.722	ND	ND	ND
1976	ND	9.93	ND	ND	ND
1977	ND	8.80	ND	ND	ND
1978	ND	8.59	ND	ND	ND
1979	ND	0.567	ND	ND	ND
1980	ND	4.86	ND	ND	ND
1981	ND	1.06	ND	ND	ND
1982	ND	0.948	ND	ND	ND
1983	ND	14.9	ND	ND	ND
1984	ND	ND	ND	ND	ND
1985	ND	ND	ND	ND	ND
1986	ND	ND	ND	ND	ND
1987	ND	ND	ND	ND	ND
1988	ND	ND	ND	ND	ND
1989	ND	ND	ND	ND	ND
1990	ND	ND	ND	ND	ND
1991	ND	ND	ND	ND	ND
1992	ND	3.38	ND	0.046	ND
1993	ND	11.70	ND	0.095	ND
1994	ND	0.222	0.014	0.000	ND
1995	ND	6.36	0.220	1.72	ND
1996	ND	ND	ND	ND	ND
1997	ND	ND	ND	ND	ND
1998	ND	ND	ND	ND	ND
1999	ND	ND	ND	ND	ND
2000	1.82	0.726	ND	ND	ND
2001	1.14	0.864	ND	ND	ND
2002	ND	0.724	ND	ND	ND
2003	ND	5.23	ND	ND	ND
2004	ND	1.26	ND	ND	ND
2005	ND	11.1	ND	ND	ND

Table 3-1
Mean Annual Flow
Amargosa River
California/Nevada

Year	**Discharge** (cfs)				
	Station 1	**Station 2**	**Station 3**	**Station 4**	**Station 5**
2006	ND	0.629	ND	ND	ND
2007	ND	4.89	ND	ND	ND
2008	ND	0.512	ND	ND	ND
2009	ND	0.531	ND	ND	ND
2010	ND	1.52	ND	ND	ND
2011	ND	5.04	ND	ND	ND
2012	ND	0.370	ND	ND	ND
2013	ND	0.688	ND	ND	ND

Notes:

Station 1 = USGS 10251375 Amargosa River at Dumont Dunes near Death Valley, San Bernardino County, California (Latitude 35º41'45", Longitude 116º15'02" NAD27).

Station 2 = USGS 10251300 Amargosa River at Tecopa, Inyo County, California (Latitude 35º50'45", Longitude 116º13'45" NAD27).

Station 3 = USGS 10251259 Amargosa River at Hwy 127 near Nevada State Line, Inyo County, California (Latitude 36º23'12", Longitude 116º25'22" NAD27).

Station 4 = USGS 10251218 Amargosa River at Hwy 95 below Beatty, Nevada, Nye County, Nevada (Latitude 36º52'52", Longitude 116º45'04" NAD27).

Station 5 = USGS 10251220 Amargosa River near Beatty, Nevada, Nye County, Nevada (Latitude 36º52'01.76", Longitude 116º45'37.53" NAD83).

ND = No Data

Complete Annual Data Sets Only.

Table 3-2
Summary of Pumping
Amargosa Desert
Nevada

Year	Pumping (AFY)					
	Irrigation	Mining	Commercial	Quasi Municipal & Domestic	Other	Total Pumping
1983	9,105	125	20	250	NA	**9,500**
1985	8,472	950	20	230	NA	**9,672**
1986	6,553	550	10	125	NA	**7,238**
1987	5,700	302	10	125	NA	**6,137**
1988	2,978	996	10	125	NA	**4,109**
1989	1,566	2,220	10	125	NA	**3,921**
1990	4,953	2,720	10	125	NA	**7,807**
1991	4,942	1,070	10	100	NA	**6,122**
1992	5,761	2,293	10	100	NA	**8,164**
1993	8,709	2,481	10	100	NA	**11,300**
1994	9,977	2,508	10	100	NA	**12,595**
1995	12,354	2,571	10	100	NA	**15,035**
1996	11,043	2,285	205	50	30	**13,613**
1997	10,454	2,506	576	366	0	**13,902**
1998	12,040	2,417	537	382	0	**15,376**
1999	10,835	2,389	593	364	0	**14,181**
2000	9,711	1,366	1,057	378	10	**12,522**
2001	9,407	1,187	1,067	396	10	**12,067**
2002	9,576	1,302	1,128	415	0	**12,421**
2003	10,471	1,356	1,324	437	0	**13,588**
2004	10,603	1,169	1,319	453	0	**13,544**
2005	10,764	438	1,332	466	4	**13,004**
2006	13,124	527	1,844	491	2	**15,988**
2007	14,059	377	1,793	505	2	**16,736**
2008	12,356	1,108	3,984	517	2	**17,967**
2009	11,477	510	3,905	487	1	**16,380**
2010	9,898	313	4,683	498	1	**15,393**
2011	11,258	321	4,458	499	0	**16,536**
2012	13,190	174	3,756	502	0	**17,622**

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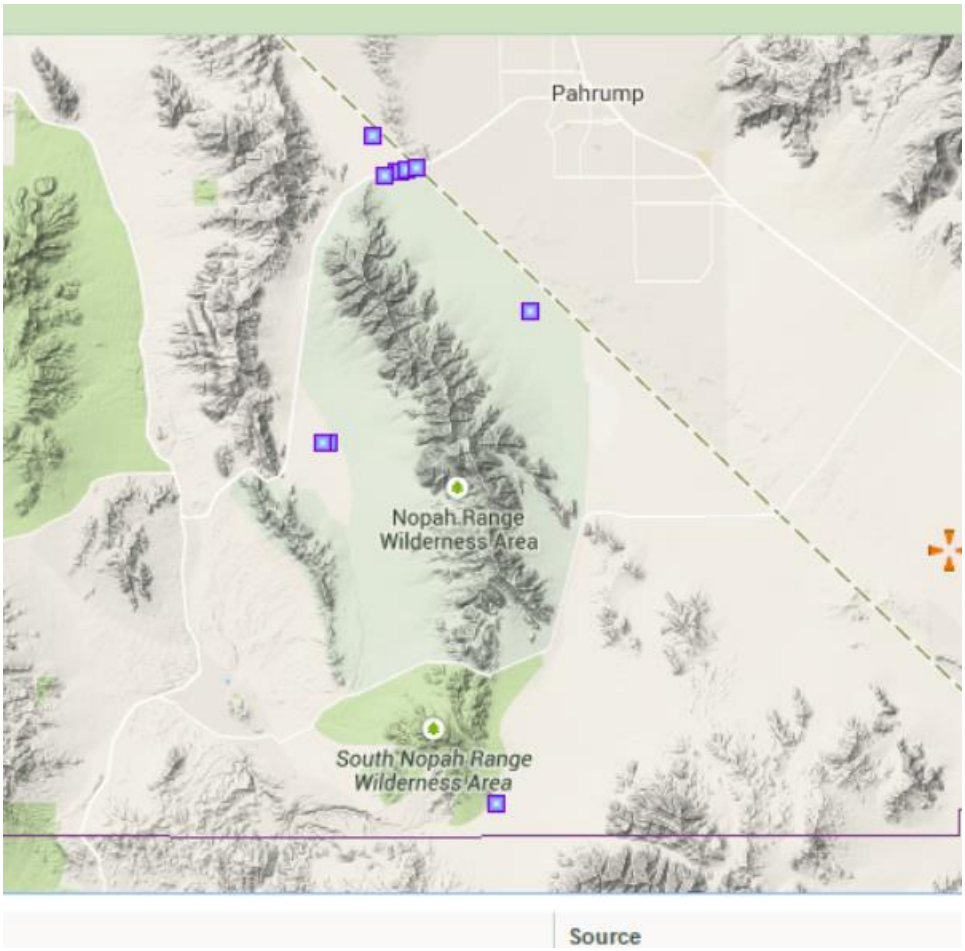
Amargosa Conservancy comment on the Inyo REGPA PEIR

Attachment A:
Rare Plant distribution maps in the Eastern Solar Energy Group of the Inyo County REGPA

These are the only known instances of these plants in California, per the CalFlora database. The squares indicate known occurrences- the closer the color is to red, the more occurrences. This is not meant to be a scientific assessment, but rather an illustration of the botanical uniqueness of Eastern Inyo County.

**Atriplex argentea* var. *longitrichoma*- Pahrump orache*



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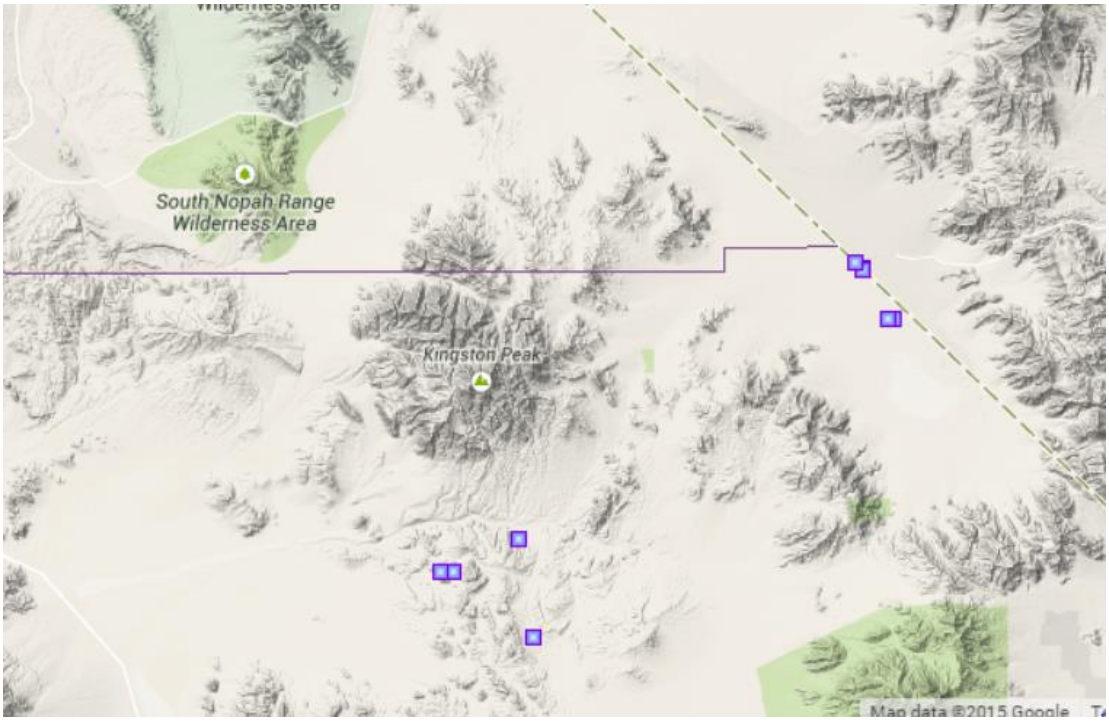
Eriogonum bifurcatum- Forked buckwheat



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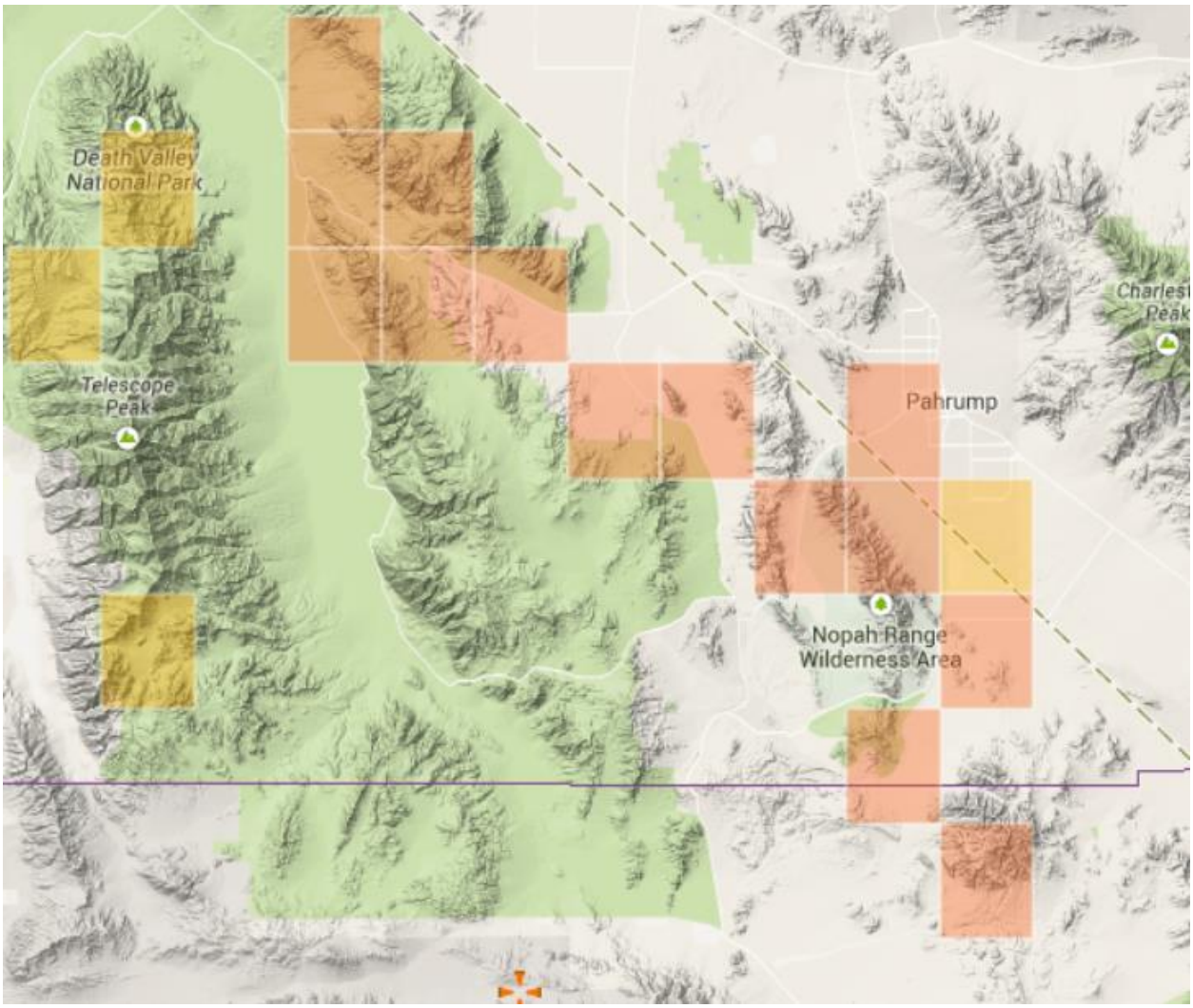
Eriogonum contiguum- Ash Meadows buckwheat



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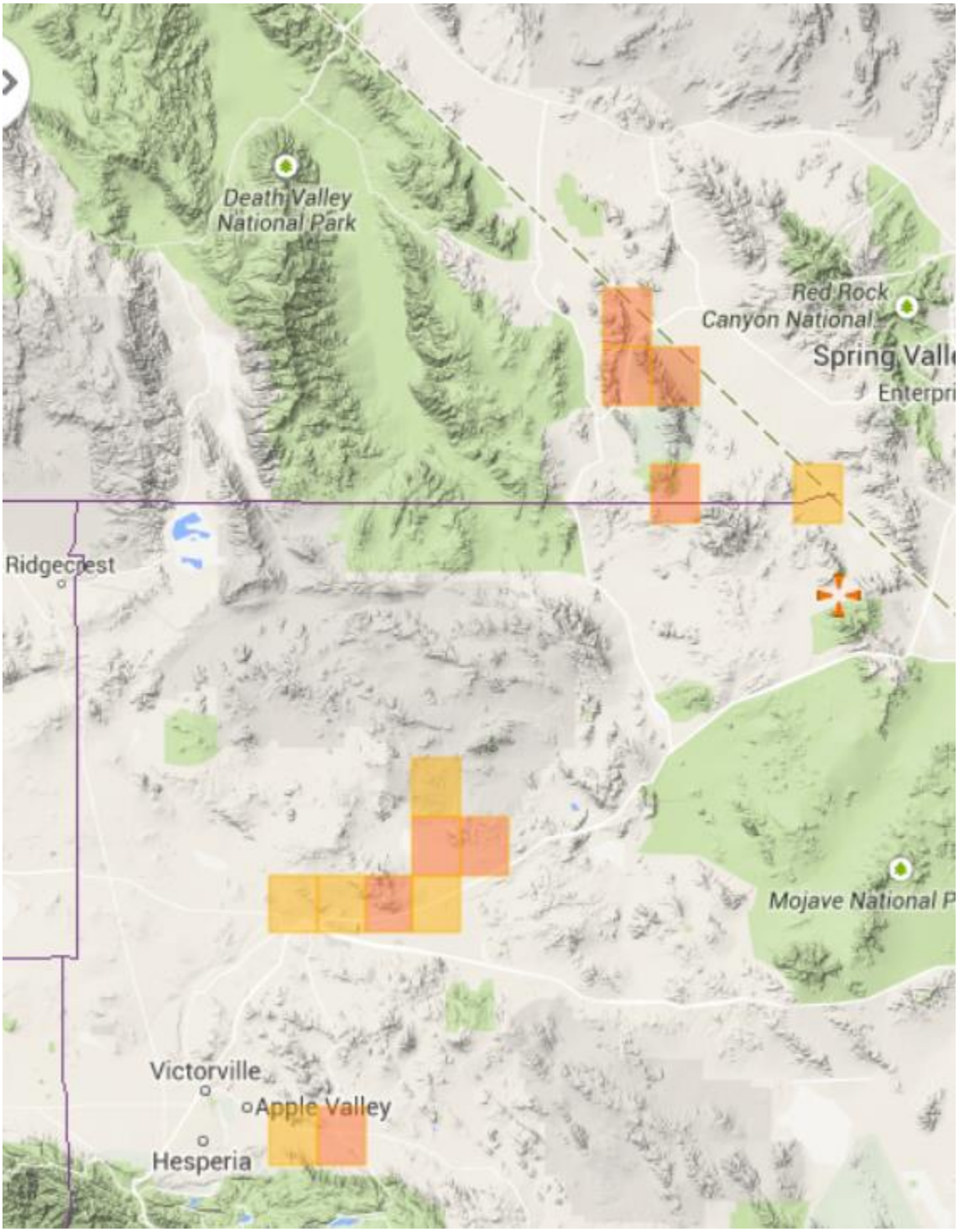
**Phacelia parishii*- Parish's phacelia



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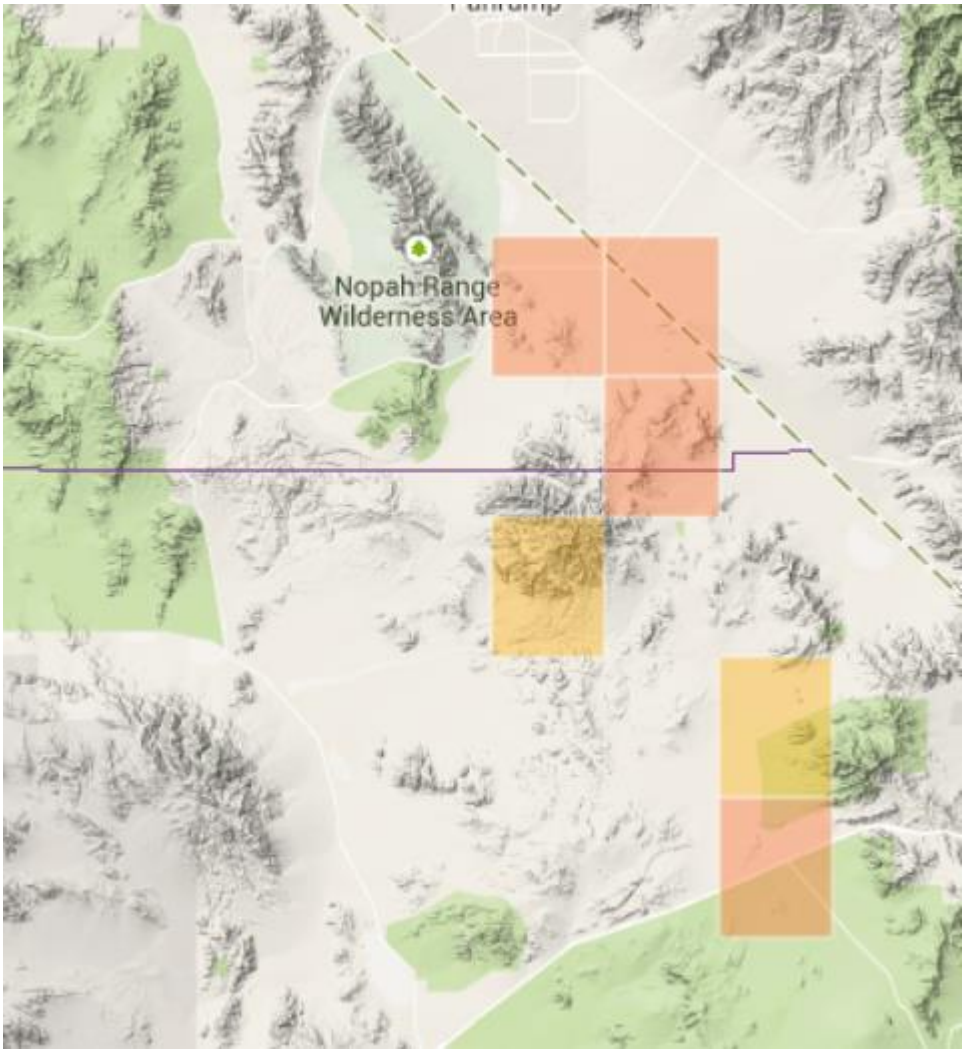
Acleisanthes nevadensis- desert wing-fruit



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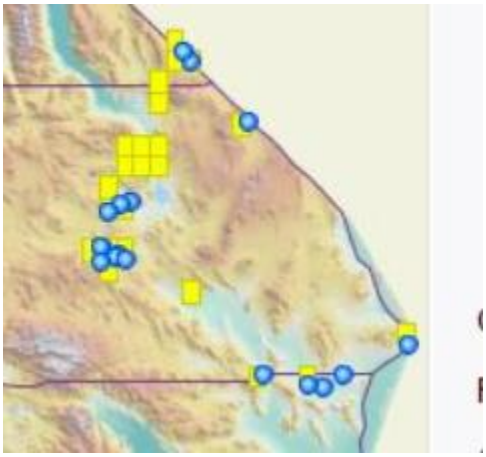
Androstephium breviflorum- small-flowered androstephium



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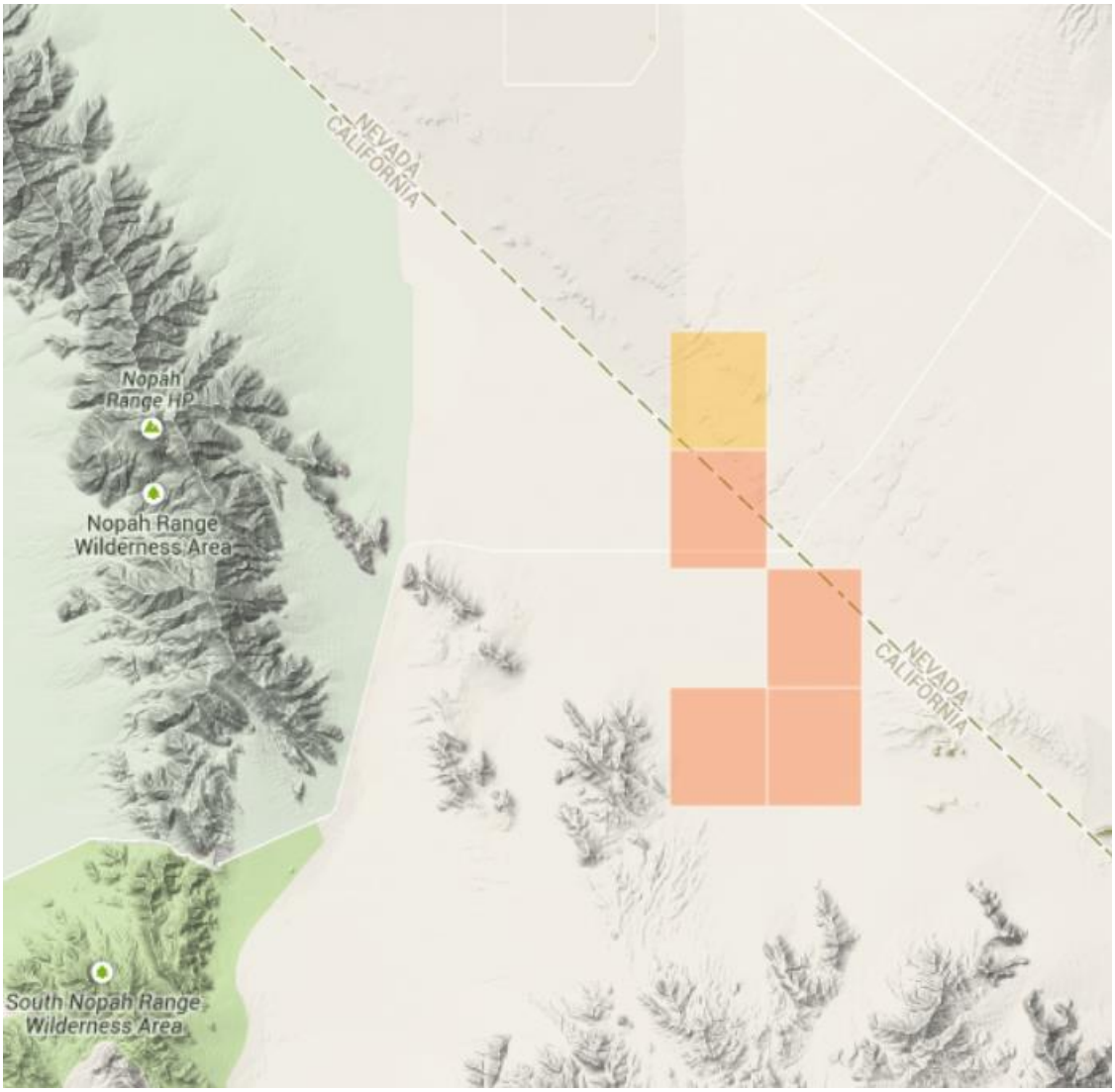
**Astragalus nyensis*- Nye milk-vetch



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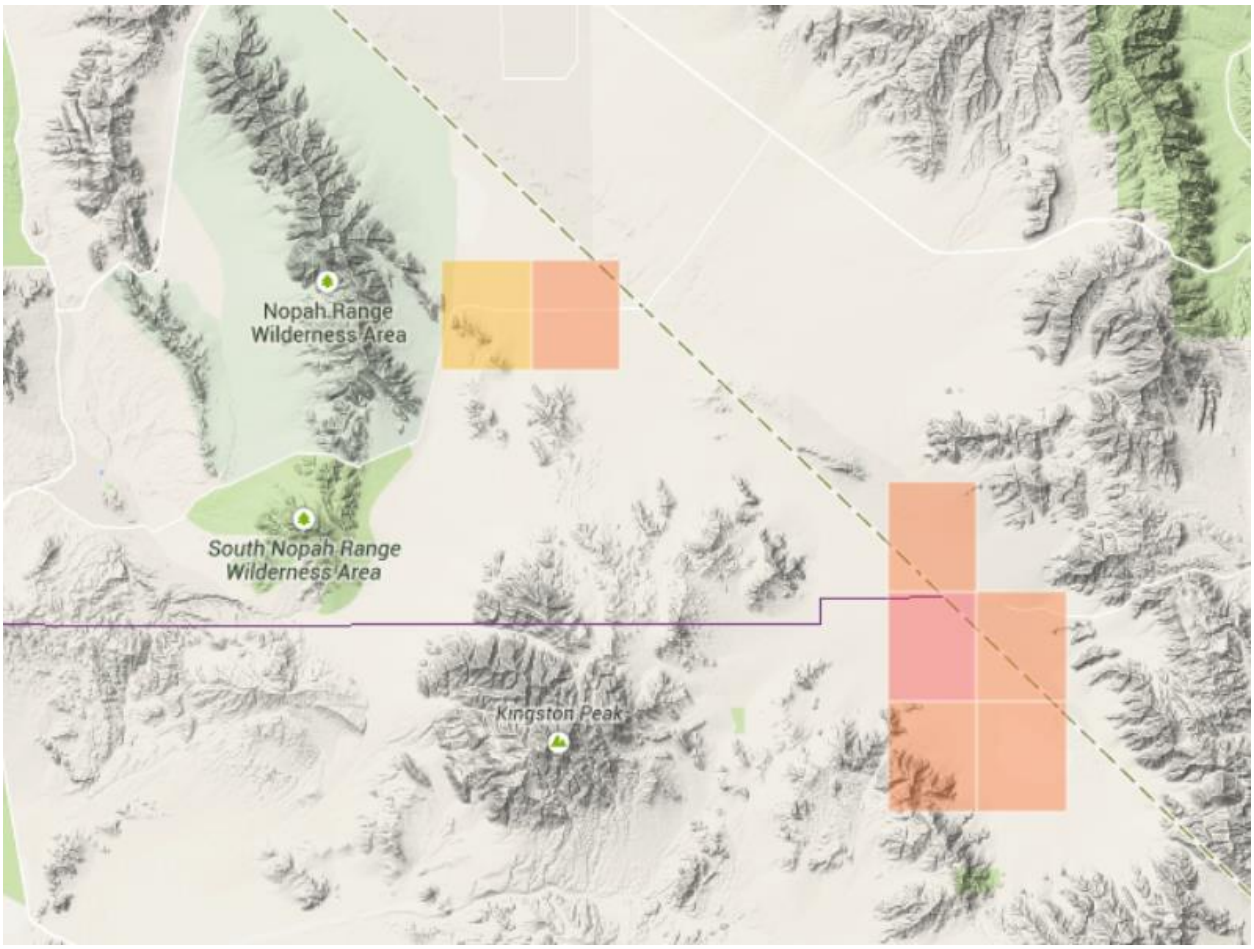
Astragalus preussii var. *preussii*- Preuss' milkvetch



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Astragalus sabulonum- gravel milk-vetch

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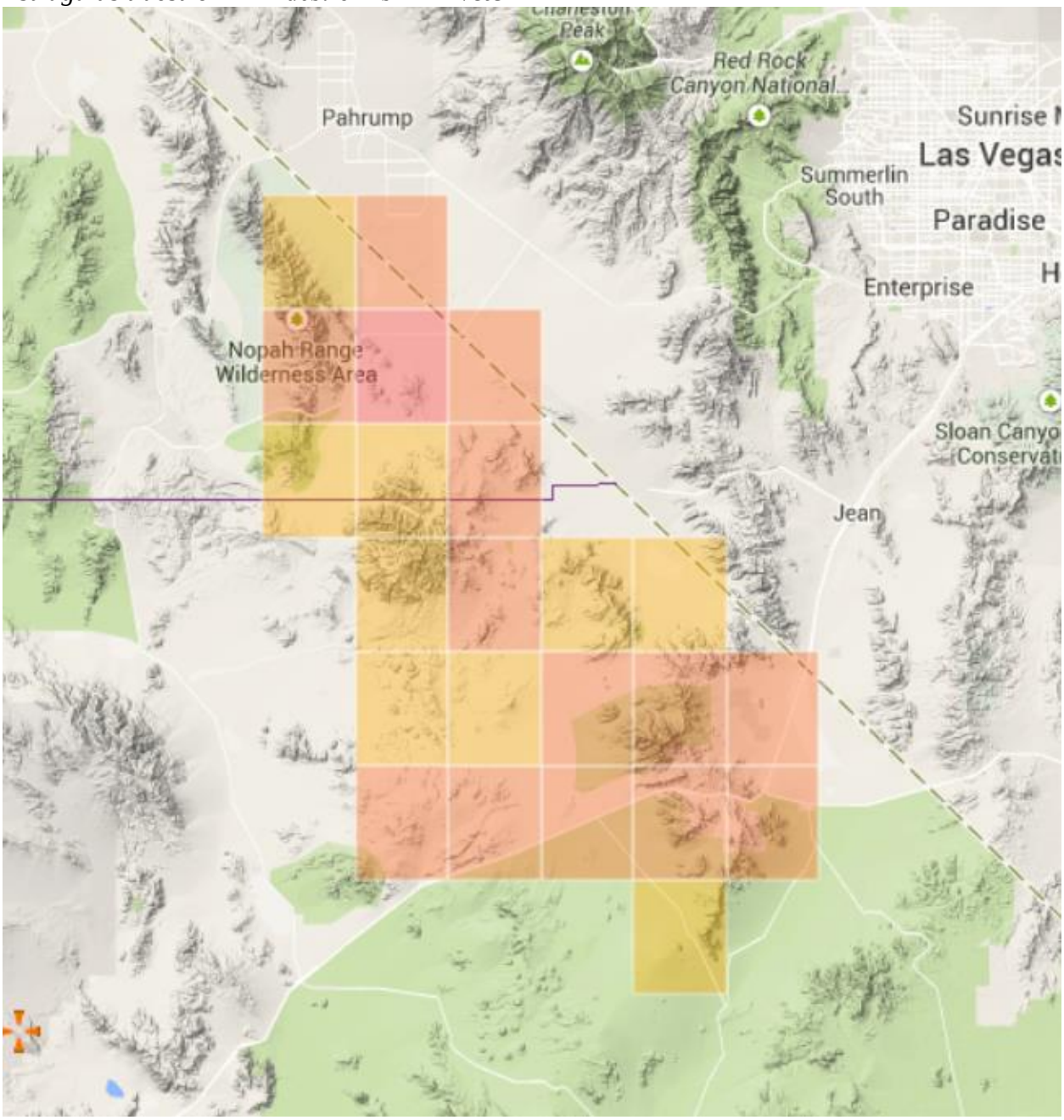
Astragalus tidestromii- Tidestrom's milk-vetch



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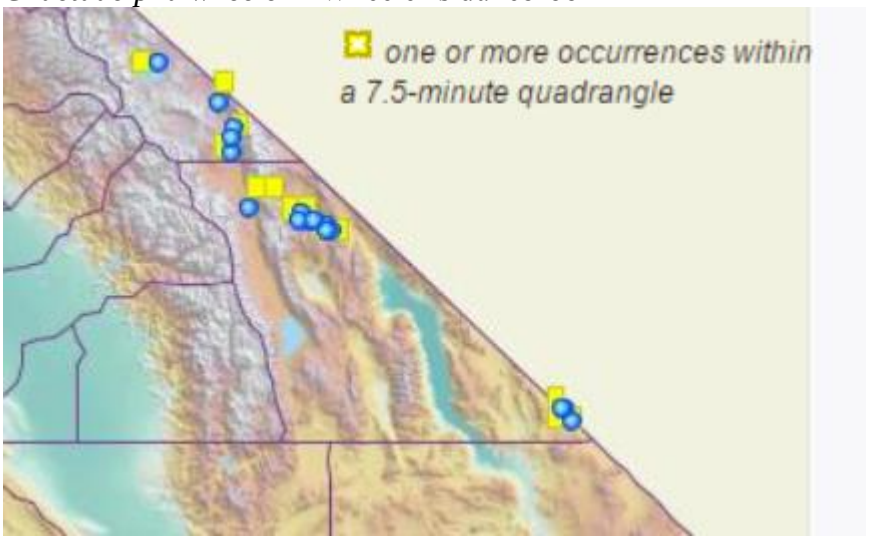
Chaetadelpha wheeleri- Wheeler's dunebroom



Cymopterus multinervatus- purple-nerve cymopterus

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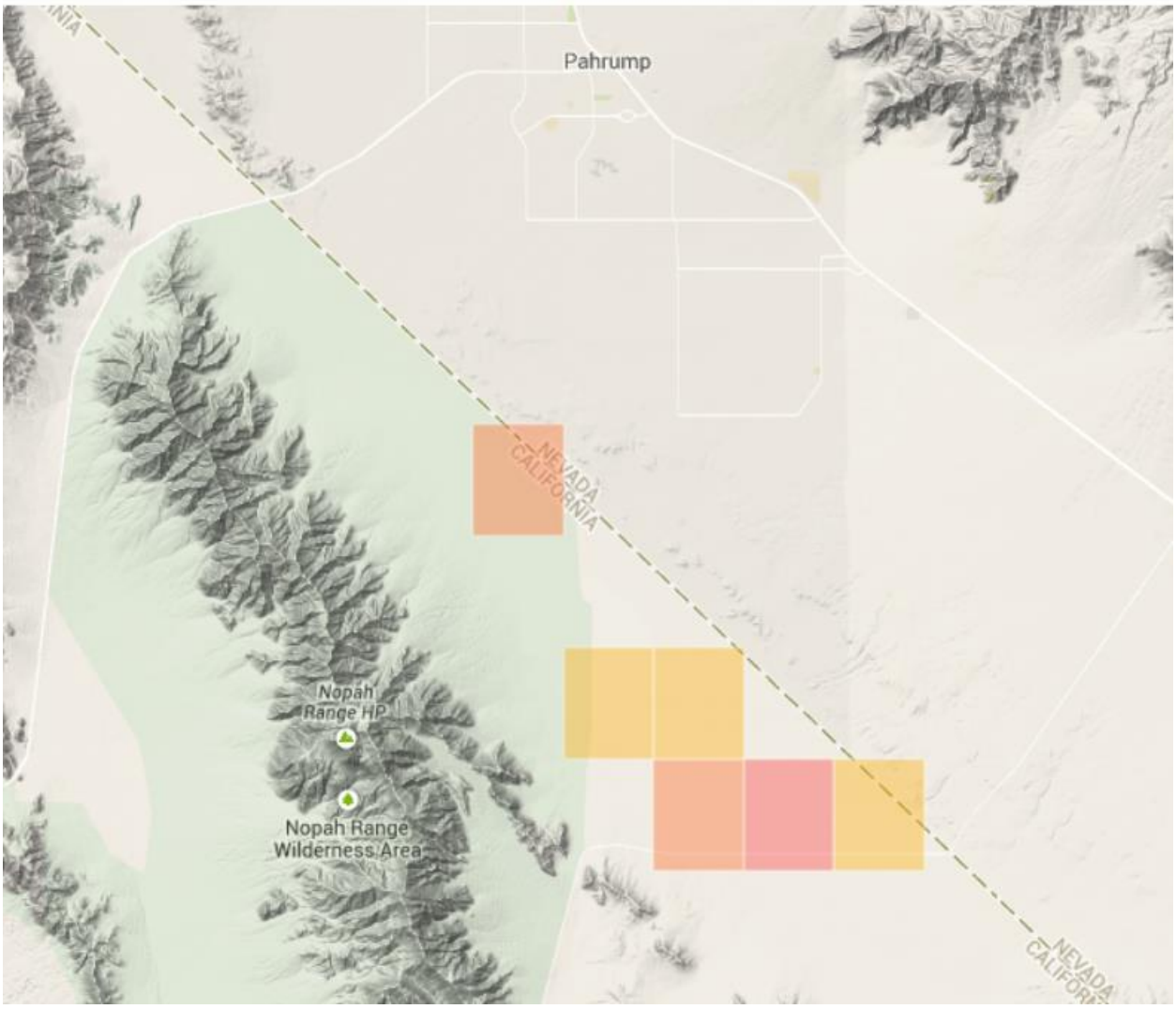
Ephedra torreyana- Torrey's Mormon-tea



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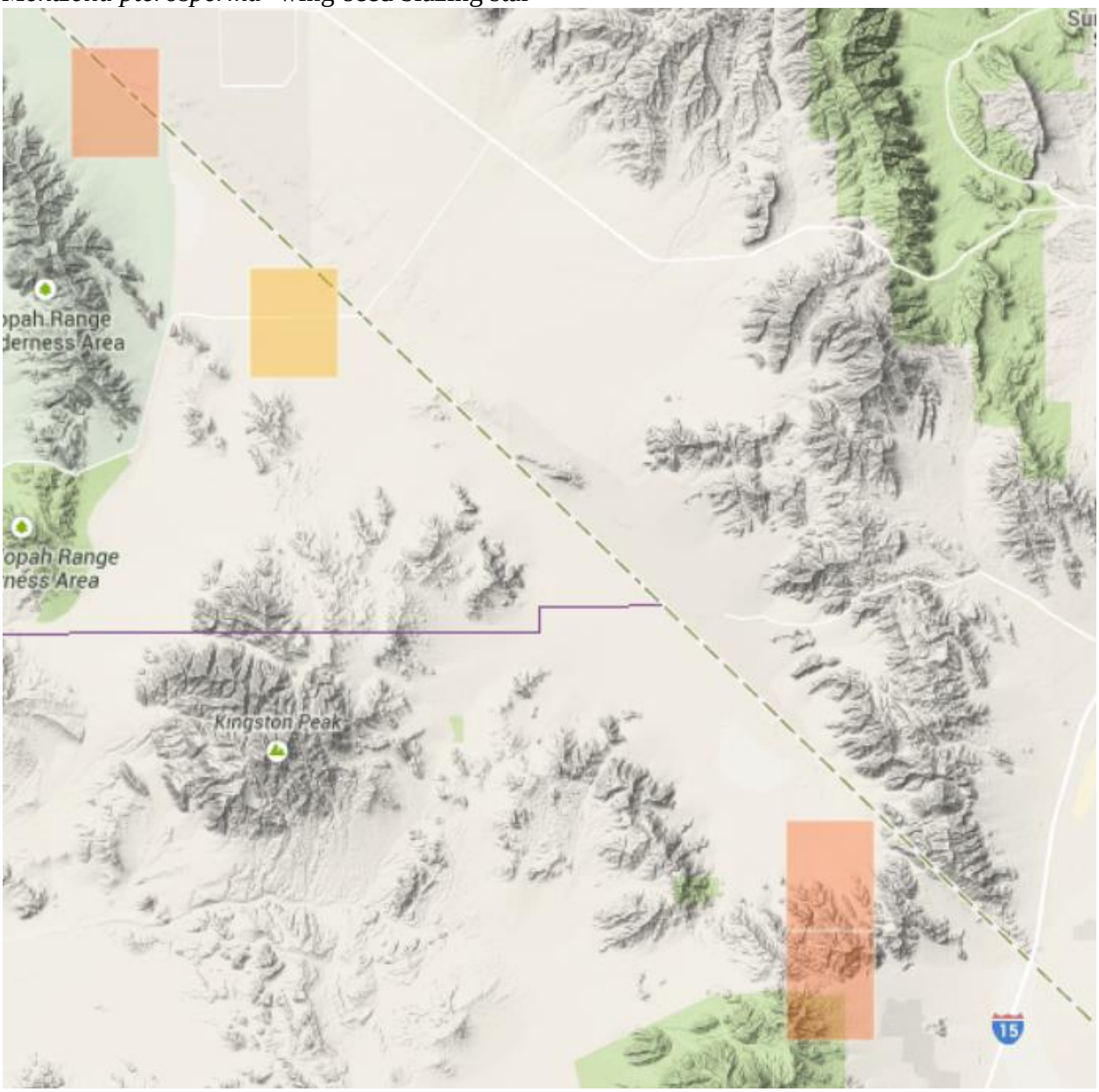
Mentzelia pterosperma- wing-seed blazing star



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Peteria thompsoniae- spine-noded milk-vetch

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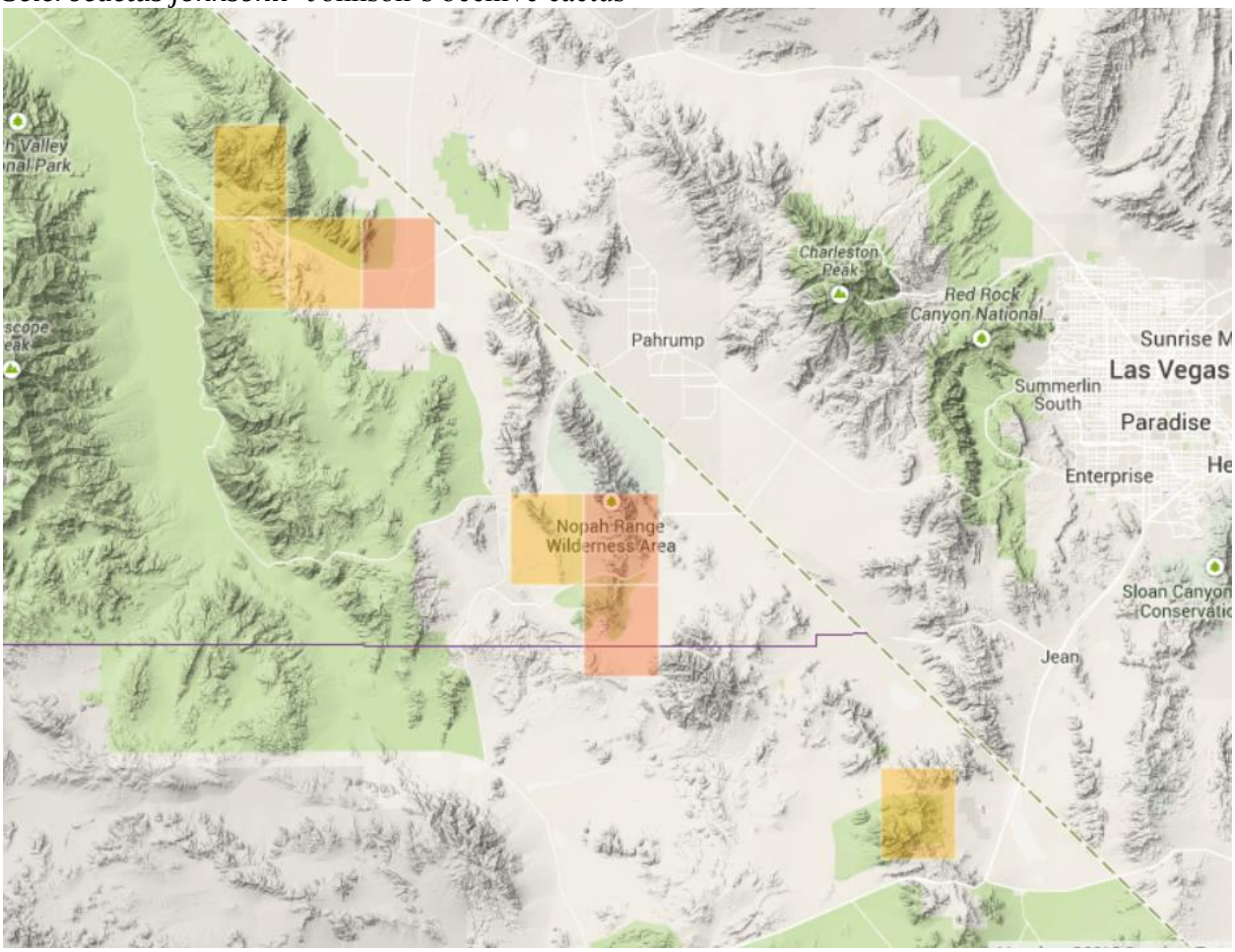
Sclerocactus johnsonii- Johnson's beehive cactus



PO Box 63
Shoshone, CA 92384
760.852.4339
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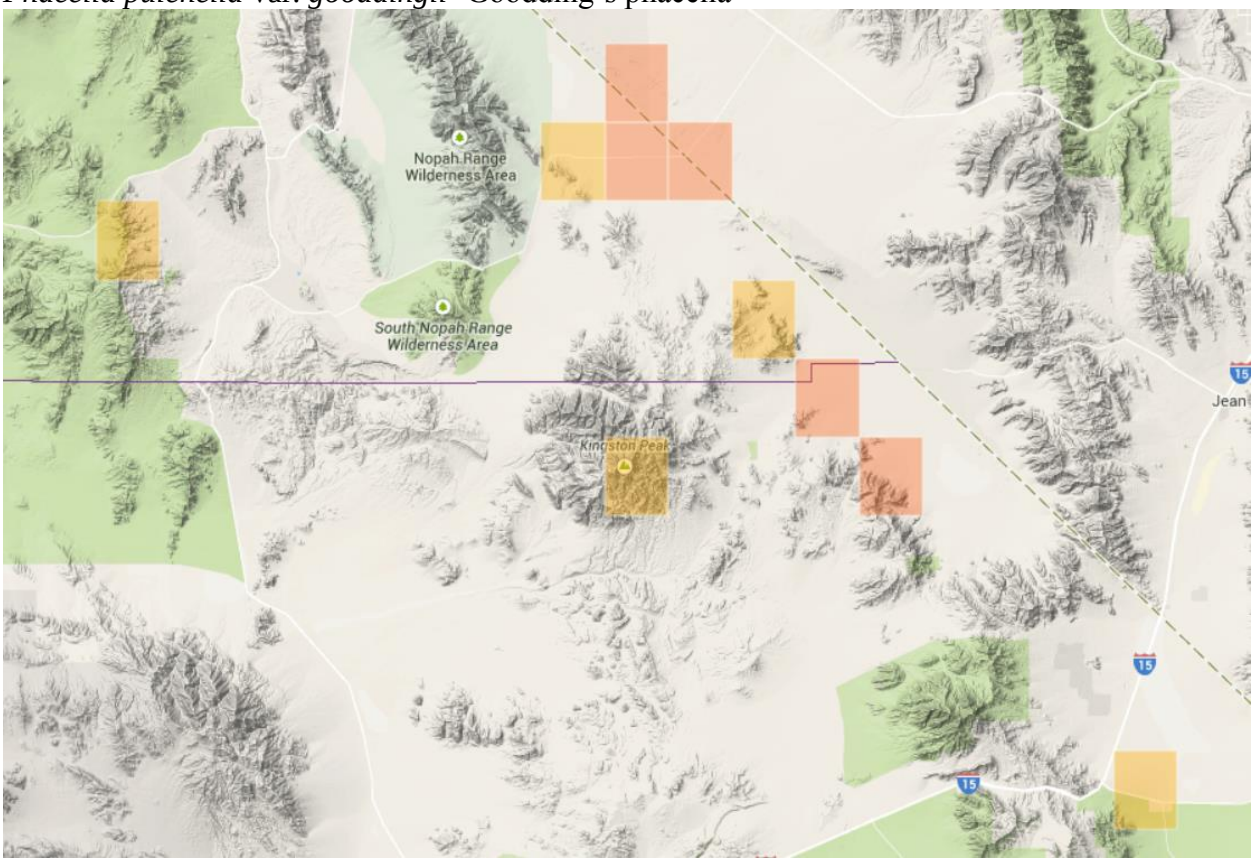
Phacelia pulchella var. *gooddingii*- Goodding's phacelia



A portion of the information in this document has been redacted (information related to sensitive historical resource information) as it is exempt from public disclosure as set forth in the Energy Commission's statutes and regulations (Pub. Resources Code, sec. 25300 et seq., Cal. Code Regs., Title 20 secs. 1361 et seq., 2501 et seq. and 2505 et seq.), and the California Public Records Act (Gov. Code, sec. 6250 et seq.)

Redactions have been blocked out where they appear in the document.

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Hidden Hills Solar Energy Generating Systems

Ethnographic Report

This Report is subject to the confidentiality restrictions and informed consent provisions provided at:

Section 304 of the National Historic Preservation Act [16 U.S.C. 470w-3(a-c)],

Section 6254.10 of the California Public Records Act,

46 CFR 101 Use of Human Subjects, and

Section 1798.24 of California Civil Code.

August 2012

BY:

Thomas Gates, Ph.D.
Ethnographer

FOR:

California Energy Commission

EXECUTIVE SUMMARY

This report provides documentation concerning Native American ethnographic resources that could be impacted by the Hidden Hills Solar Electric Generating Systems (HHSEGS) energy generation project, proposed to be developed on 3276 acres of land in the southeastern corner of Inyo County, California. This report provides: 1) a brief description of the project; 2) an explanation of ethnography and the types of resources that ethnographic methods can explain ; 3) a review of the ethnographic methods employed for this study; 4) background information on the Paiute tribal governments and other Native Americans that participated in the study; and 5) analysis, findings of fact, and recommendation for seven broad resource categories (including the Sandy Valley Alternative) that contribute to one or several cultural landscapes.

This report's analysis has divided some of the Pahrump Paiute Tribe life-ways, and how those life-ways are intertwined with the surrounding landscape, into seven attributes: water, plants, animals, horticulture, trails, landforms, and ceremonies.

This analysis leads the report author to conclude that there are three ethnographic landscapes that, to varying proximity, are in the vicinity of the project:

1. Salt Song Landscape
2. Pahrump Paiute Home Landscape
3. Ma-hav Landscape

This report documents each of these landscapes' periods of significance, analysis of integrity, and are all found eligible to the California Register of Historical Resources per various criteria.

The impacts of the proposed Hidden Hills Solar Energy Generating Facility project on the three ethnographic landscapes, should it be approved, are anticipated to not be able to be reduced to less than significant. However, California Energy Commission Staff continue to seek ways to lessen impacts in consultation with Native American Tribes affiliated with the proposed project area and the surrounding landscapes.

Table of Contents

INTRODUCTION

This report provides documentation concerning Native American ethnographic resources that could be impacted by the Hidden Hills Solar Electric Generating Systems Solar energy generation project, proposed to be developed on 3276 acres of land in the southeastern corner of Inyo County, California. This report provides: 1) a brief description of the project; 2) an explanation of ethnography and the types of resources that ethnographic methods can explain; 3) a review of the ethnographic methods employed for this study; 4) background information on the Paiute tribal governments and other Native Americans that participated in the study; and 5) analysis, findings of fact, and recommendation for seven broad resource categories (including the Sandy Valley Alternative) that contribute to one or several ethnographic landscapes.

Description of Project

The following project description is adapted from the Hidden Hills Solar Electric Generating Systems Application for Certification (AFC), Chapter 2.0 Project Description.

The Hidden Hills Solar Electric Generating System (HHSEGS) project (Project) is proposed within Inyo County, California, adjacent to the Nevada border, and approximately 18 miles south of Pahrump, Nevada. Pahrump is located about 45 miles west of Las Vegas, Nevada. The proposed project site is located on privately owned land. The land is owned by The Roland John Wiley Trust, The Mary Wiley Trust, and Section 20 LLC, and is currently under options to lease to BrightSource. Specifically, the Project is located within Township 22 North, Range 10 East, Sections 16, 21, 22, 26, 27, and 28 of the San Bernardino Base Meridian.

The HHSEGS, as proposed, would comprise two solar fields. Each solar field would be operated by a separate subsidiary of BrightSource (Hidden Hills Solar I, LLC and Hidden Hills Solar II, LLC, collectively the "Applicant"), and associated facilities would be shared in common by the two subsidiaries. Each solar plant would generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1, proposed to be located on the northern solar field, would occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2, proposed to be located on the southern solar field, would occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area would be established on the southeastern corner of the site to accommodate an administration warehouse, maintenance complex and onsite switchyard substation, a parking area, and miscellaneous landscaped areas. A temporary construction laydown area and parking area is proposed to be located on the west side of the project site and would occupy approximately 180 acres. The total proposed project area is 3276 acres.

Each solar plant would use 85,000 heliostats – elevated mirrors (each mirror approximately 12 feet high by 8.5 feet wide), guided by a tracking system, with two heliostats mounted on one pylon – to focus the sun's rays on a solar receiver steam generator (SRSG) that is approximately 130 feet tall and placed atop a 620 foot solar power tower (for a total height of 750 Feet) near the center of each solar field. In each solar plant, one Rankine-cycle steam turbine would receive super heated and pressurized steam (1,085 degrees Fahrenheit) from the solar boiler to generate electricity. As the steam makes its way through a

series of turbines, the pressure and temperature are reduced to a level where it can be converted back to water form and then recycled back up to the SRSG. The solar field and power generation equipment would start each morning after sunrise and, unless augmented, would shut down when insolation (solar radiation received) drops below the level required to keep the turbine on-line. Each plant would include a natural gas fired auxiliary boiler, used to augment the solar operation when the solar energy diminishes; a start-up boiler used during the morning start-up cycle; and a night-time preservation boiler, used to maintain system temperatures overnight. During operation, each plant would use a dry-cooling system. Raw water, up to 90 gallons per minute or 140 acre feet per year, would be drawn daily from onsite wells located in each power block and at the administrative complex. However, during construction, 288 acre feet per year would be needed. Each solar field and the common administrative area would have a primary water well and a back-up well, for a total of 6 wells proposed for the entire project. Groundwater would be treated at an on-site treatment system for use as boiler make-up water and to wash the heliostats.

There are two location options for the transmission lines; both options are located in Nevada and outside of the California Energy Commission (Energy Commission) jurisdiction. The project would also require 35.3 miles of 12-16 inch-diameter natural gas pipeline, which will also be located in Nevada and outside of Energy Commission jurisdiction. The transmission and gas lines would be located primarily on Bureau of Land Management (BLM) lands. The BLM is preparing an environmental Impact analysis for those portions of the project proposed within BLM's regulatory jurisdiction.

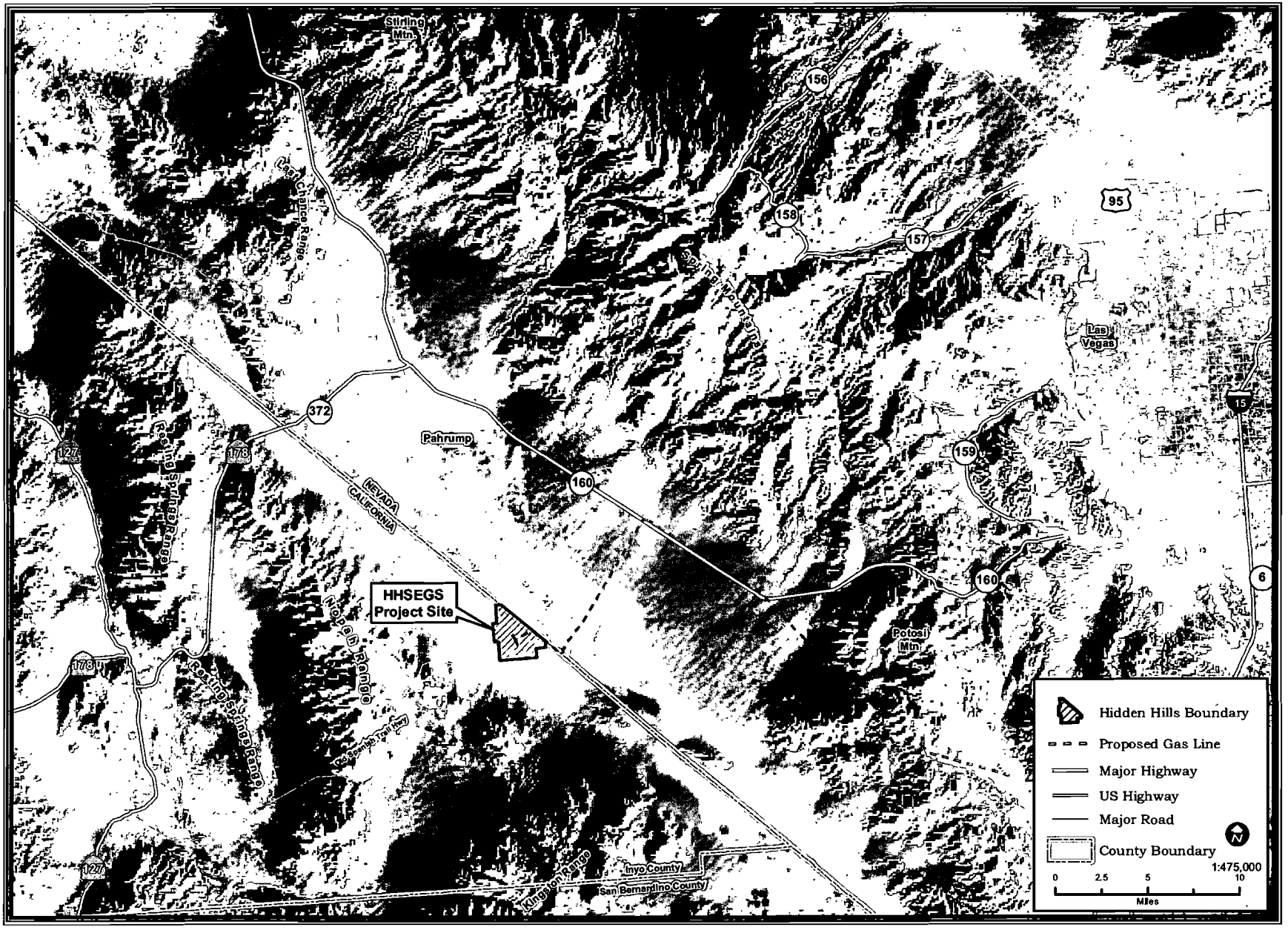
Vegetation clearing, grubbing, and contour smoothing in the heliostat fields would occur where necessary to allow for equipment access and storm-water management. In areas where these activities are not required for access or construction, the vegetation would not be removed, but would be mowed to a height of approximately 12 to 18 inches. Areas for roads and perimeter fencing would also be cleared and graded.

Several project alternative sites have been proposed, with one of those alternatives, Sandy Valley, perhaps the most viable. This report does not aggressively pursue analysis and findings for the Sandy Valley alternative site. However a specific section, entitled Sandy Valley Alternative, can be found in the Analysis section – Landforms subsection and provides cursory information concerning Pahrump and Moapa ethnographic resource areas and values that relate to the Sandy Valley area.

The project, as proposed, would require between 634 and 1033 employees during construction and up to 120 employees for on-going facility operations. Project maps that portray the project vicinity, site plan, and a diagram of a solar power tower are provided on the next three pages as Figure 1, Figure 2 and Figure 3.

CULTURAL RESOUCES - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Vicinity Map



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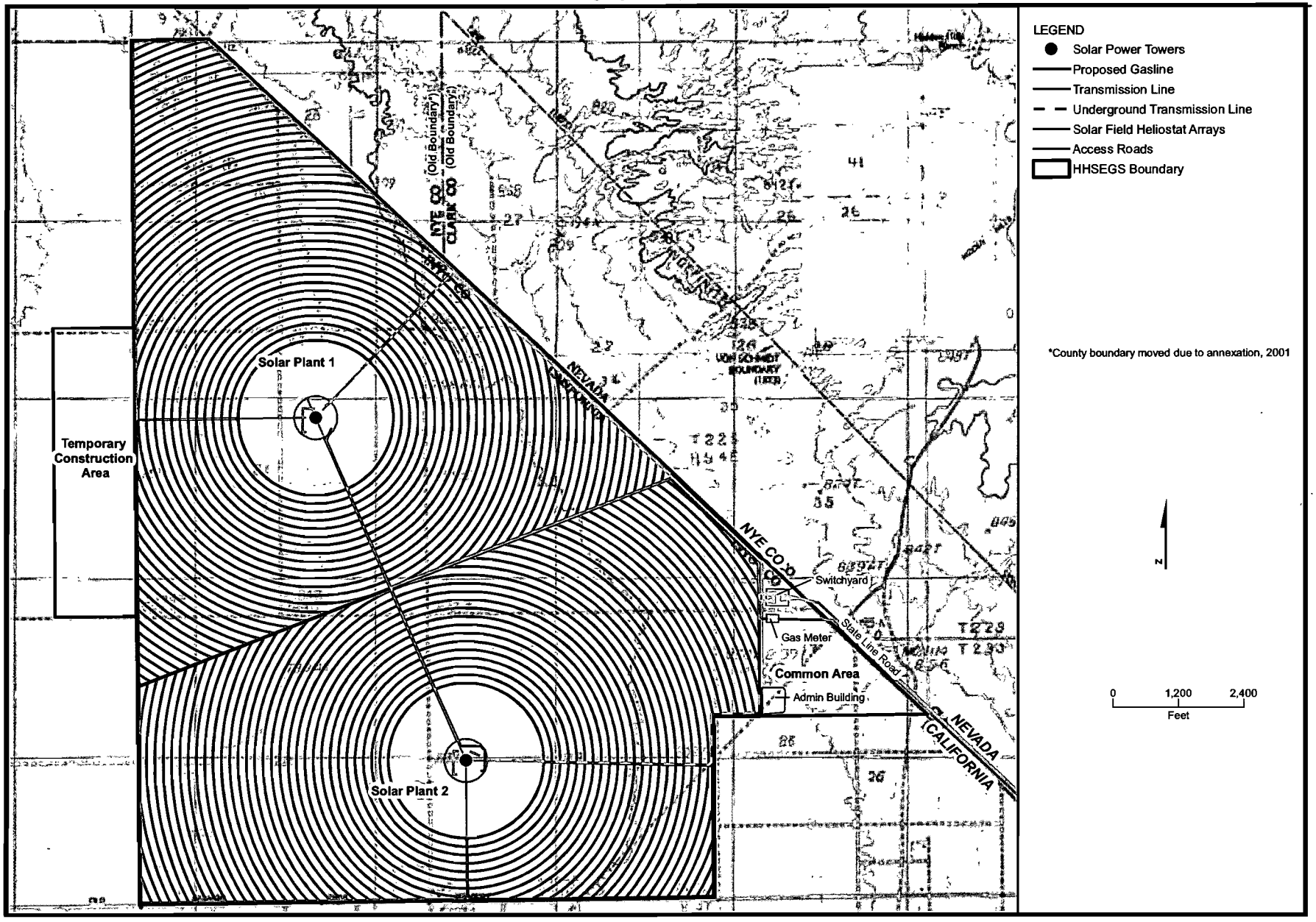
SOURCE: Landsat - NASA (2002), SRTM Shaded Relief - USGS (2005), US Major Highway - Tele Atlas North America, Inc (2010).

CULTURAL RESOUCES - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Site Plan and Linear Facilities



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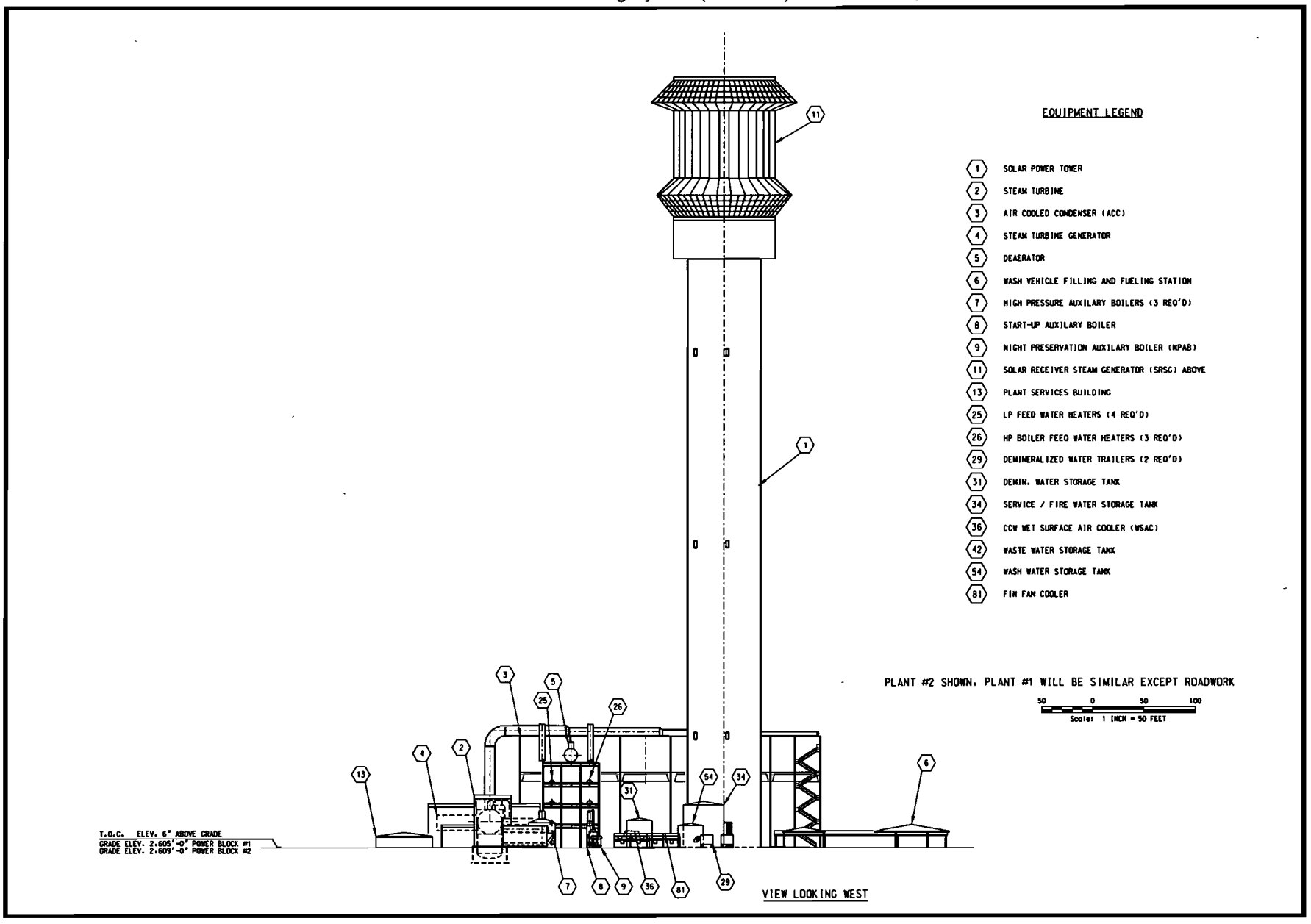
SOURCE: AFC, August 2011,Figure 2.1-2, CH2MHILL

CULTURAL RESOUCES - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Solar Plant 2, Elevation



CULTURAL RESOUCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC, August 2011,Figure 2.2-2b, CH2MHILL

What is Ethnography?

Ethnography is a discipline, a method, and a type of document. As a discipline, ethnography is the prime focus of cultural anthropology. As a method, ethnography is an endeavor to understand other cultural groups from their point of view. In order to understand other cultural groups, ethnographers must first understand their own cultural assumptions, biases, and ways of understanding the world. Cultural self-awareness allows an ethnographer to understand other cultures from the other's point of view. Ethnocentrism is the practice of assessing others only in terms of what we know from our own culture. While most human beings are hardwired to think about the world and others in terms of their own cultural experiences, as one conducts ethnographic investigations, ethnocentrism is to be avoided. As a type of document, ethnography provides readers with a written account that presents an understanding of another culture as the ethnographer came to understand that other culture from its people's perspectives or world view. Ethnology is the comparison of multiple ethnographies either of disparate cultures located throughout the world or located in geographic proximity to one another.

Ethnographers employ some of the following methods to understand other cultures:

- **Ethnographic research**: review of previous ethnographies concerning the culture to be understood
- **Historic research**: a review of historic literature about the people, events, and places of cultural importance
- **Kinship charts**: a method for charting human relations among a culture, clan, community, or family
- **Extended interviews**: representative individual and group interviews that seek responses to a number of research questions concerning the culture as a whole or sub areas of the culture
- **Life history interviews**: documentation of the events that chronicle a person's life story as that person presents their personal history within a broader cultural context.
- **Participant observation**: participating in and observing cultural events as if one were from the culture that one is studying.
- **Journalistic witnessing**: witnessing and documenting a cultural event at face value in descriptive terms without interpretation.

Ethnography fulfills a supporting role for other anthropological disciplines as well as contributions on its own merits. Ethnography provides a supporting role to the discipline of archaeology by providing a cultural and historic context for understanding the people that are associated with the material remains of the past. By understanding the cultural milieu in which archaeological sites and artifacts were manufactured, utilized, or cherished, this additional information can provide greater understanding for identification efforts, making significance determinations per the National Historic Preservation Act (NHPA) or the California Environmental Quality Act (CEQA); eligibility determinations for the National Register of Historic Places (NRHR) or California Register of Historical Resources (CRHR); and for assessing if and how artifacts are subject to other cultural resources laws, such as the Native American Graves Protection and Repatriation Act.

In addition, ethnography has merits of its own by providing information concerning ethnographic resources that tend to encompass physical places, areas, or elements or attributes of a place or area. Ethnographic resources have overlap and affinity to historic property types referred to as cultural landscapes, traditional cultural properties, sacred sites, and heritage resources. Studies that focus on specific ethnographic resource types may also take on names such as ethno-geography, ethno-botany, ethno-zoology, ethno-semantics, ethno-musicology, etc. In general, the ethnographic endeavor attempts to minimize human conflict by facilitating an iterative cross cultural understandings and, by extension, self awareness.

Ethnographic Resources

While several definitions of ethnographic resources can be found in historic preservation literature, the National Park Service provides the most succinct and commonly used definition:

> Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their life-ways.
> http://www.cr.nps.gov/history/online_books/nps28/28chap10.htm

The term ethnographic resources can include resources that are also referred to as traditional cultural properties, sacred sites, cultural landscapes, heritage resources, historic properties, or historical resources that are areas or places.

What are Traditional Cultural Properties?

Traditional Cultural Properties, often referred to as "TCPs", were defined in order to provide a layer of meaning, relevancy, or significance from a communal or localized perspective to the cultural resources profession that is otherwise dominated by archaeology and the knowledge and perspectives that archaeologists promote (King 2003:21-33). Thomas King and Patricia Parker authored an innovative and influential National Park Service Bulletin (NPS Bulletin 38) that defined what TCPs are; how to understand, locate and document TCPS; and how to ethnographically interact with communities that wish to see their special places protected. An explanation of "traditional cultural significance" is provided in the following quote from NPS Bulletin 38:

> One kind of cultural significance a property may possess, and that may make it eligible for inclusion in the Register, is traditional cultural significance. "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices.

Examples of properties possessing such significance include:

- a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world;
- a rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents;
- an urban neighborhood that is the traditional home of a particular cultural group, and that reflects its beliefs and practices;
- a location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; and
- a location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity.

NPS Bulletin 38 provides the following definition of a TCP:

> A traditional cultural property, then, can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. (King 1998: 1) http://www.nps.gov/nr/publications/bulletins/nrb38/nrb38%20introduction.htm#tcp

While the TCP definition provided in NPS Bulletin 38 addresses many types of special places and for diverse communities or ethnicities, some confusion exists with language added during the 1992 amendments to the National Historic Preservation Act at Section 101(d)6 that particularly calls out "properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined eligible for inclusion on the National Register." The section further extols agencies to consult with Indian tribes and Native Hawaiians concerning the importance and values that their communities may attach to special places. This has led some to erroneously interpret the Act's Section 101 language to limit TCPs to only Native Americans and Native Hawaiians. However the specific language of the Act does not prohibit diversity beyond the two specific ethnicities called out; but merely affirms that Native Americans asserting TCPs during the Section 106 process must be considered.

What are Sacred Sites?

The term "Sacred Site" is often used interchangeably and sometimes erroneously with the term Traditional Cultural Property. Sacred Site language stems from the American Indian Religious Freedom Act, the Religious Freedom Restoration Act, and Executive Order 13007. Without providing further information concerning the history and resulting inter-relation of the acts and the order, suffice to say that Executive Order 13007 provides the best guidance and definition. The definition is as follows:

> "...any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or

> appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."

Therefore, despite the common practice of failing to differentiate between the two terms, and while there is some overlap between what are called TCPs and what are called sacred sites, the two terms actually have less in common, because sacred sites can only be located on federal lands and the definition calls out the limited geographic extent of sacred sites as "specific, discrete [and] narrowly delineated". However, TCPs are identified as a result of federal undertakings and tend to be geographically more expansive than "specific, discrete and narrowly delineated sacred sites."

Executive Order 13007 calls for the federal government to accommodate access to, and ceremonial use of, sacred sites by Indian religious practitioners and to avoid adversely affecting the integrity of sacred sites through federal land manager actions. (http://www.achp.gov/eo13007-106.html)

Cultural Landscapes and Ethnographic Landscapes

TCPs and sacred sites language is often used in overlapping ways that lead to confusion during regulatory processes. Cultural landscapes are another constellation of concepts and historic property types defined prior to the coinage of the term TCP. (See King 2003:39 and Stoffle et al 2005:165-167, for a dialogue on the merits of TCPs versus cultural landscapes as it relates particularly to area size and methods of bounding an area.) The National Park Service Brief 36 provides the following definition of a cultural landscape and its four types. A Cultural Landscape is

> "...a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes." (NPS Brief 36 1996: 1)

The four types of cultural landscapes are further defined as follows:

Historic Site: a landscape significant for its association with a historic event, activity, or person. Examples include battlefields and president's house properties.

Historic Designed Landscape: a landscape that was consciously designed or laid out by a landscape architect, master gardener, architect, or horticulturist according to design principles, or an amateur gardener working in a recognized style or tradition. The landscape may be associated with a significant person(s), trend, or event in landscape architecture; or illustrate an important development in the theory and practice of landscape architecture. Aesthetic values play a significant role in designed landscapes. Examples include parks, campuses, and estates.

Historic vernacular landscape: a landscape that evolved through use by the people whose activities or occupancy shaped it. Through social or cultural attitudes of an individual, a family, or a community, the landscape reflects the physical, biological, and cultural character of everyday lives. Function plays a significant role in vernacular landscapes. Examples include mining or ranching complexes.

Ethnographic landscape: a landscape containing a variety of natural and cultural resources that associated people define as heritage resources. Examples are contemporary settlements, religious sacred sites and massive geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components. Examples include a section of a river where a Native American culture lives, travels, and fishes; or an upland mountain area where tribal people hunt, gather, camp and travel extensively during part of the year.

Landscapes are understood and documented by conducting ethnographic research that identifies the contributing elements or attributes of the landscape. Contributing elements can include both cultural and biological resources, climate and landforms, subsistence, religion, economy and the built environment.

For the purposes of this study, the resource focus is with Native American places and areas otherwise referred to as ethnographic resources and how those resources contribute to a cultural or ethnographic landscape located in and around the proposed project area. Having said this and based upon the discussion provided above, the reader should be aware that there are multiple overlaps of terminology: Traditional Cultural Properties, Sacred sites, Cultural or Ethnographic Landscapes, and specific historic property or historical resources types of sites, objects, buildings, structures, districts, areas or places.

GENERAL TRIBAL GOVERNMENT BACKGROUND

Nine distinct tribal governments were consulted regarding this ethnographic study. Tribes were invited to participate based upon a list of affiliated tribes provided by the Native American Heritage Commission. The nine invited tribal governments represent four different cultural affiliations. From west to east, these affiliations are: Owens Valley Paiute, Timbisha Shoshone, Pahrump Southern Paiute, Las Vegas Southern Paiute, and Moapa Southern Paiute. Of the nine tribal governments, one Tribe participated fully, two tribes participated in supporting roles, and the remaining six tribes provided limited input due to their greater distances and relationships to the project area. Figure 4, located at the end of this section, is a map of the general locations and territories of the participating tribes. The map also includes a historic journey taken by a Pahrump Paiute leader and his son that, in part, helps to define Pahrump Paiute ancestral territory.

Table 1 provides a summary of tribal participation in this ethnographic study.

Table 1. A Summary of Tribal Participation for this Study

TRIBE	CULTURAL AFFILIATION	STUDY PARTICIPATION
Pahrump Paiute Tribe	Southern Paiute (Pahrump Band)	Full
Moapa Tribe	Southern Paiute (Pahrump Band, Las Vegas Band, Moapa Band)	Support
Las Vegas Paiute Tribe	Southern Paiute (Pahrump Band, Las Vegas Band, Moapa Band)	Limited
Timbisha Shoshone Tribe	Western Shoshone (Panamint and Timbisha)	Support
Lone Pine Paiute and Shoshone	Owens Valley Paiute and Western Shoshone	Limited
Fort Independence Paiute	Owens Valley Paiute	Limited
Big Pine Paiute	Owens Valley Paiute	Limited
Bishop Paiute Tribe	Owens Valley Paiute	Limited
Uta Uta Gwaitu Paiute Tribe (Benton)	Owens Valley Paiute	Limited

Southern Paiute

The "Southern Paiute" represents a population of people that traditionally reside in a large swath of land that has as its general boundaries the eastern side of the Black Mountains and the eastern Mojave Desert as the western end. The Colorado River and the Grand Canyon form the southern extent of Southern Paiute and the southeastern plateaus of the Rocky Mountains form the eastern extent of the Southern Paiute territory. The northern boundary of Southern Paiute territory takes in the southern third of present day Utah and the lower quarter of present day Nevada. The Pahrump and Moapa Tribes are the Southern Paiute residing in the western extent of Southern Paiute territory. The Chemehuevi people to the immediate south of Pahrump and living along the lower Colorado River are also Southern

Paiute and share many cultural traits with those Southern Paiute to the north and east. Chemehuevi did not participate in this ethnographic study because they were not listed by the Native American Heritage Commission and therefore were not invited to participate in this study. In addition, the more eastern Southern Paiute Tribes located in Utah and Northern Arizona were not invited to participate although they recognize the Spring Mountains as their common place of origin and participate in some of the ceremonial practices in common with the Moapa and Pahrump Southern Paiute.

In the Fall of 1873, Major John Wesley Powell and G. W. Ingalls were commissioned by the United States Department of the Interior to determine the extent of Paiute Indians (Numic) dwelling throughout the Great Basin and that had not yet been moved to reservations (Fowler 1971: 97-120). In all, the two commissioners documented 83 separate tribes. Powell made one trip to as far as Las Vegas where he collected information on the Paiutes of that area. Powell documented a "Chief of Alliance", named To-ko'-pur (Chief Tecopa) who represented one tribe as well as the alliance of seven additional Tribes. Each of the additional tribes had "Chiefs." The following table provides Powell's grouping of seven tribes, into one alliance. Powell suggested that all Southern Paiute of Southeastern California, Southern Nevada, Northwestern Arizona and Southern Utah be relocated to the Moapa Reservation (Ibid:116).

Table 2: Seven Tribes Allied Under Chief Tecopa

TRIBE	LOCALITY	CHIEF
No-gwats	Vicinity of Potosi	To-ko'-pur
Pa-room'-pats	Pa-room Springs	Ho-wi'-a-gunt
Mo-quats	Kingston Mountains	Hu-nu'-na-wa
Ho-kwaits	Vicinity of Ivanspaw	Ko-tsi'-an
Tim-pa-shau'-wa-go-tsis	Providence Mountains	Wa-gu'-up
Kau-yai'-chits	Ash Meadows	Nu-a'-rung
Ya'-gats	Armagoza	Ni-a-pa'-ga-rats

Powell' 1873 Las Vegas journey report counted a total of 240 individual Southern Paiute within the alliance lead by Chief Tecopa (Ibid:104-105). Powell provides further clarification by stating that a number of Indians that acknowledge a common authority and encamp together is a "Tribe" (Ibid: 50). Powell also adds that any collection of "tribes" that acknowledge allegiance to a head chief would be designated as a "nation" (Ibid). Hence, all of the seven tribes with allegiance to Chief Tecopa were considered a nation.

Today, the terminology has changed, with the alliance or nation, now called a "Tribe" and each of the contributing localities referred to as "districts." The entire alliance is now referred to as the Pahrump Tribe. The nomenclature has been partly confused when anthropologist Isabel Kelly chose to combine the above Tecopa alliance with four other localities, (Las Vegas, Colville, Indian Spring, and Cottonwood Island) and then choose to call the entire group the "Las Vegas Tribe" (Kelly 1964). Some ethnographers have then come to falsely associate the currently recognized Las Vegas Tribe with this larger conglomerate or to consider Pahrump Paiute as Las Vegas Paiute.

That the Pahrump and Las Vegas Southern Paiute are two distinct groups is further confirmed by a document produced by the Inter-Tribal Council of Nevada:

> Centered around Las Vegas, Red Rock, and Mt. Charleston were the Pegesits who lived as far east as present-day Hoover Dam. On the western edge of Nevada were the Pahrumpits. They lived in Pahrump Valley and on the western slopes of the Spring Mountains (Inter-tribal 1976:11).

Pahrump Paiute Tribe

The Pahrump Paiute Tribe, located in Pahrump, Nevada, is not a federally recognized tribe, but is recognized as an established tribal entity by the State of California and is informally recognized by federal land managing agencies that operate within the Tribe's traditional territory. Over the years, Pahrump Paiute individuals have been intermittently recognized by the federal government. The Tribe currently consists of approximately 100 tribal members. The membership generally resides in the nearby Las Vegas, Pahrump, Charleston View, and Tecopa/Shoshone areas, although some tribal members live considerable distance beyond the tribal territory. The tribe is lead by a chairperson and is based in Pahrump, Nevada. While the Pahrump Paiute Tribe has no reservation, they do assert an ancestral territory. They are the primary tribe affiliated with the area in which the project is proposed. The tribe's primary focuses are maintaining their unique cultural identity, protecting important cultural resources that are in harm's way of various federal, state and local projects and attaining federal recognition. The Tribe's cultural expertise resides within its membership.

Moapa Paiute Tribe

The Moapa Band of Paiute Indians, located in Moapa, Nevada, is a federally recognized tribe. It currently consists of approximately 300 members. Some tribal members are closely related to Pahrump tribal members or are from the Pahrump Valley and continue to bury those members in the Chief Tecopa Cemetery (formerly known of as the Pahrump Indian Cemetery). The tribe occupies a 71,954 acre reservation near Moapa, Nevada. A reservation of 2 million acres was originally established in 1874. However, two years later, the reservation was reduced to 1000 acres. In the 1980s, the reservation was expanded by an additional 70,000 acres. The reservation is located along the lower flood plains of the Muddy River. The tribe governs per a constitution that was adopted in 1942. An elected tribal council presides over several tribal businesses (travel center, fireworks store and a tribal farm) and various tribal departments and committees, including a cultural committee. The Tribe has been impacted by surrounding development, such as the nearby coal fired Reid Gardner Power Station. Tribal elders and cultural staff also assert that decades of bomb testing at Nellis Air Force Range immediately to the west and northwest of the reservation have contaminated their reservation and ancestral lands (Interviewee – Personal Communication).

(http://www.moapapaiutes.com/about_us.htm)

Las Vegas Paiute Tribe

The Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony is a federally recognized tribe. It consists of approximately 71 members who occupy a 3,800 acre reservation generally referred to as "Snow Mountain" and located several miles north of Las Vegas. Pahrump Paiute and Las Vegas Paiute are closely related to one another and to some of the Moapa Tribe membership. Isabel Kelly identified both Pahrump and Las Vegas under the Las Vegas Paiute Tribe, however, each tribe has continuously maintained their distinct identities and function independently. The tribe's original reservation was a 10 acre plot of land located in downtown Las Vegas and deeded to the tribe in 1911 by a private ranch owner. The 10 acre plot is still part of the reservation. The tribe has a constitution adopted in 1970, and is governed by a tribal council. The tribe has several businesses, including an extensive golf resort, gas station, and two smoke shops. Recent issues that involve the Tribe concern on-going desecration of tribal cultural sites, including graffiti of sacred sites in the Red Rock area, a popular tourist destination for visitors to Las Vegas. The tribal staff cultural expertise resides within the Tribal Environmental Protection Office. (http://lvpaiutetribe.com , http://en.wikipedia.org/wiki/Las_Vegas_Tribe_of_Paiute_Indians_of_the_Las_Vegas_Indian_Colony)

Shoshone

The Shoshone people reside in swath of land as extent as, and immediately north of, the Southern Paiute territory. Their western-most boundaries are in the Coso Mountains and on the eastern slope of the Inyo Mountains in California. The eastern end of their territories is in the areas of northwestern Utah and southern Idaho. The Shoshone in the western side of this swath of land are referred to as Western Shoshone.

Timbisha Shoshone Tribe

The Timbisha Shoshone Tribe, California, is a federally recognized tribe. It currently has approximately 306 tribal members and occupies a 7,914.0 acre reservation, comprised of several parcels in and around Death Valley National Park, including a 314 acre parcel near Furnace Creek, California. Some reservation parcels are located in Nevada near Lida, Scotty's Junction and Death Valley Junction. The tribe also has several areas that are co-managed with the National Park Service or the Bureau of Land Management. The tribe's main office is in Bishop, California. The tribe was originally represented in the 1863 treaty of Ruby Valley. However, that treaty did not result in any specific representation for the Timbisha Shoshone, who fought for and eventually achieved federal recognition in 1983. However, the tribe did not receive a land base until 2000 with the passage of the Timbisha Homeland Act. The tribe holds general elections; it is lead by a chairperson and holds monthly meetings. The Tribe's cultural programs are managed by a Tribal Historic Preservation Office. The Timbisha's ancestral territory abuts the Pahrump Paiute Tribe's ancestral territory in the vicinity of Ash Meadows, Eagle Mountain, and the Black Mountains. (Field Directory, 2004, page 156, http://www.timbisha.org/index.htm , Interviewee - Personal Communication).

Owens Valley Paiute

The Owens Valley Paiute are a distinct group of Paiute that reside in the Owens Valley and have the Owens Valley as an ancestral territory, including the valley's defining flanks, the eastern flanks of the Sierra Nevada and the western flanks of the Inyo and White Mountains. The Mono Lake area provides the northern boundary of their territory. The Owens Valley Paiute are represented by five separate tribes. All of the tribes are members of the Owens Valley Indian Water Commission. Of the five tribes, two (Lone Pine and Big Pine) have some tribal members with cultural affiliation to the Timbisha Shoshone and Pahrump Paiute people that historically co-existed in the Ash Meadows area.

Lone Pine Paiute Shoshone Tribe

The Lone Pine Paiute Tribe of Lone Pine, California, is a federally recognized tribe. It currently has approximately 425 tribal members and occupies a 237 acre reservation near Lone Pine, California. The tribe is governed by a general council and holds monthly meetings. Some Lone Pine Paiute Tribal members are of Timbisha Shoshone descent. Cultural Resources affairs are provided by the tribal Environmental Protection Program. (Field Directory 2004: 111, http://lppsr.org/)

Fort Independence Paiute Tribe

The Fort Independence Paiute Tribe is a federally recognized tribe. It consists of approximately 136 tribal members and occupies a 580 acre reservation near Independence, California. The Tribe has recently attained tribal historic preservation status. (Field Directory 2004: 94, http://www.fortindependence.com/native.aspx)

Big Pine Paiute Tribe

The Big Pine Paiute Tribe of the Owens Valley is a federally recognized tribe. It consists of approximately 403 tribal members and occupies a 279 acre reservation near Big Pine, California. The tribe has a constitution and is governed by a Tribal Council and a General Council. The Tribal Council holds monthly meetings; the General Council meets quarterly. At least one Big Pine Paiute Tribe family shares a tribal affiliation with the Pahrump Paiute. The Big Pine Tribe's cultural resources program is maintained through a Tribal Historic Preservation Office (Field Directory, 2004: 66, http://www.bigpinepaiute.org, Interviewee - Personal communication).

Bishop Paiute Tribe

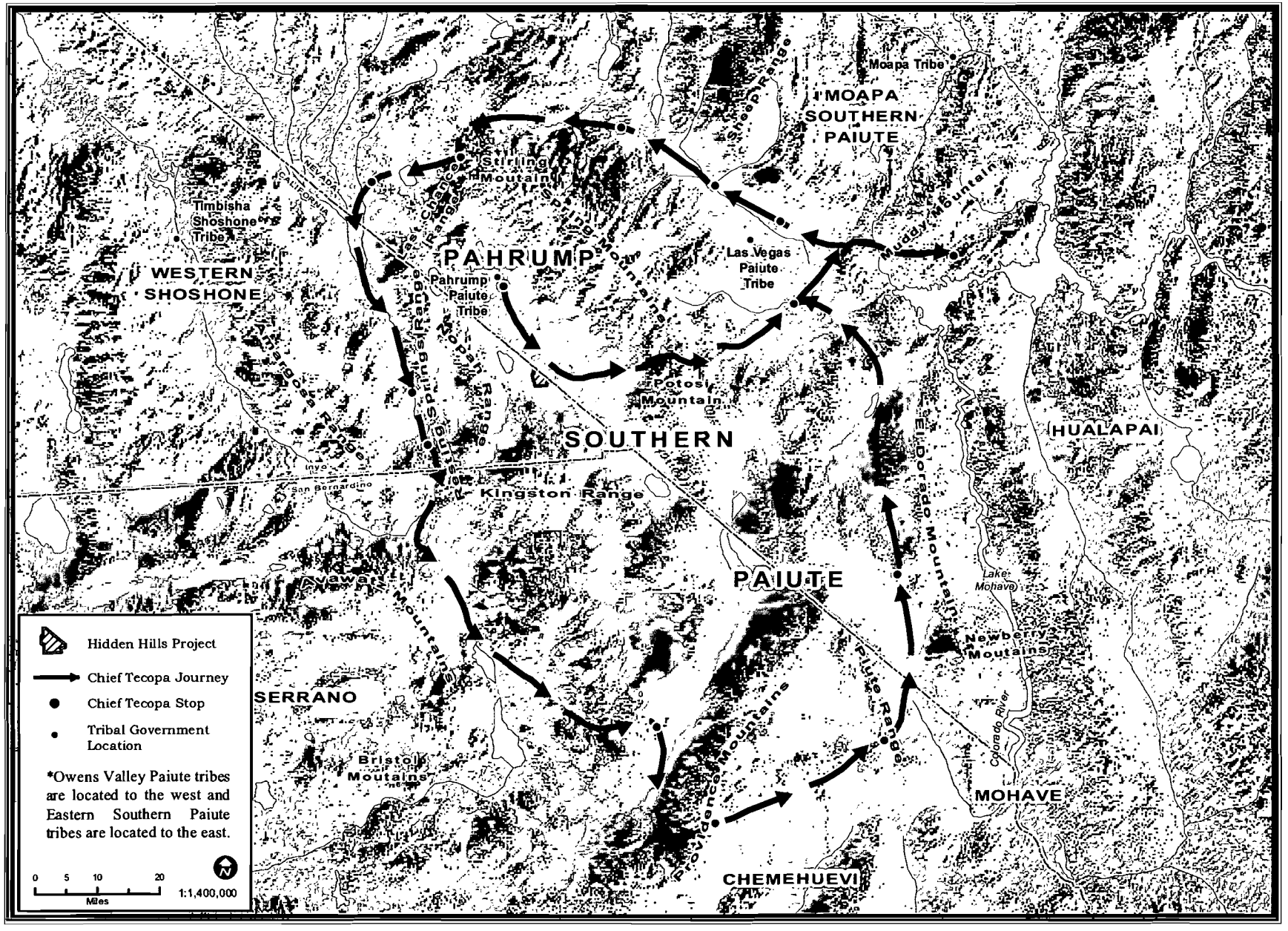
The Paiute-Shoshone Indians of the Bishop Community is a federally recognized tribe. It consists of approximately 1040 tribal members and occupies an 875 acre reservation near Bishop, California. The tribe meets bi-monthly and is governed by the Bishop Indian Tribal Council. The Paiute-Shoshone Indians of the Bishop Community share a tribal affiliation with the Paiute-Shoshone. The Bishop Tribe's cultural resources program is maintained through a Tribal Historic Preservation Office. (Field Directory, 2004: 69, http://www.bishoppaiutetribe.com/)

Utu Utu Gwaitu Paiute Tribe

The Utu Utu Gwaitu Paiute Tribe (formerly the Benton Paiute Tribe), is a federally recognized tribe. It consists of approximately 138 tribal members and occupies a 162 acre reservation near Benton, California. The tribe has a constitution and is governed by the Utu Utu Tribal council. The Tribal Council holds monthly meetings; the General Council meets annually. The Utu Utu Gwaitu Paiute shares a tribal affiliation with the Paiute. (Field Directory, 2004, page 63)

CULTURAL RESOUCES - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Tribal Ancestral Territories and Tribal Government Locations in and around Pahrump Valley



CULTURAL RESOUCES

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Adapted from *Handbook of North American Indian* Volumes 8 and 11, and *Chief Tecopa and The Hikos* by Celeste Lowe.

METHODS

General Description of Ethnographic Methods and "REAP"

Ethnography at its best takes years to complete. Ethnographers can spend a lifetime studying another culture and still find that their cross-cultural knowledge of their "second" culture is incomplete. Minimally, it is advised to spend at least one year in studying another culture so that one can learn about the various seasonal variations and adaptations. Academic and self-funded anthropologists may have such luxury. However, the merits of ethnography, when employed to understand project impacts to ethnographic resources, often require less than optimal study durations. One method, called Rapid Cultural Assessment" was developed in the 1930s to assists sociologists' understanding of American rural agricultural community responses to socioeconomic impacts ensuing from evolving environmental conditions. (http://www.iisd.org/casl/caslguide/rapidruralappraisal.htm) The National Park Service (NPS) has developed similar methods for understanding ethnographic resources within the shortened time frames related to project review. The NPS method, called Rapid Ethnographic Assessment Procedures (REAP), was generally followed for this project-related ethnographic study.

REAP consists of a selection of ethnographic methods that relies on interview, observation, and research techniques to describe a way of life common to a group of people, that can include their knowledge, customs, beliefs, social habits, technology, arts, values, and institutions. REAP involves active participation of people in a cultural group to render representations of a way of life from a community's point of view. Unlike traditional ethnography, REAP focuses investigations and resultant descriptions on solving specific problems or issues that may arise as a result of proceeding with a development project.

REAP's truncated methods are:

1. Group meetings/interviews where the ethnographer explains the project to the group, answers general questions and solicits immediate responses, fears, apprehensions, benefits, or other general perceptions from the participants concerning the project, the area where the project is being proposed, and the general connections of traditional people to the project area. Often issues of confidentiality are discussed. Surmounting the issues of confidentiality, the ethnographer may be successful in scheduling follow-up activities with specific individuals to increase ethnographic understanding.

2. Areas worth further ethnographic inquiry are identified; a research design, including research/interview questions, is developed; and specific people are scheduled by the ethnographer and the group for follow-up interviews. Follow-up interviews should be conducted according to the protocols of documentation and confidentiality identified during the group meeting/interview. Interview notes, however recorded, should be vetted with the source individuals to verify accuracy and to gather additional nuanced information.

3. Follow-up interviews with the same or additional people often occur while both the ethnographer and the community begin to further think about the project, the project effects,

and additional information that is necessary for fully identifying, evaluating, assessing effects, or otherwise considering impacts to ethnographic resources.

4. As Steps 1 through 3 are being conducted, a parallel archival "search, retrieve, and assess" process should be undertaken to provide supporting or conflicting information to what is being discovered through the interview process. In addition to archive, book store, and other informational repositories (e.g., the internet), the people themselves or other ethnographers with previous experiences with the same people, may provide source materials.

5. Field visits will help the ethnographer triangulate between what people currently say, what people have written in the past, and what is actually or perceived to be in the project area as a potential ethnographic resource.

http://www.nps.gov/ethnography/training/elcamino/phase1.htm#reap

HHSEGS Ethnographic Study - General Meetings

Several meetings were held to exchange general information with affiliated tribes and to gauge tribal interest in participating in further project-related ethnographic studies. Specific Tribal government representatives and individual traditional Native American practitioners were contacted for initial invitation, based upon a May 2011 listing provided by the Native American Heritage Commission (NAHC) to Energy Commission staff.

General Meeting 1 was held on January 19, 2012 in Shoshone, California and was attended by various Energy Commission staff technical experts in the areas of water, biology, cultural resources, and planning, as well as representatives of upper management. Participating tribes included: Pahrump Paiute Tribe, Moapa Paiute Tribe, Las Vegas Paiute Tribe, Timbisha Shoshone Tribe, and the Lone Pine Tribe of Paiute and Shoshone. The tribal attendees were a combination of tribal cultural resources and environmental protection staff and several tribal elders. Energy Commission staff provided the tribes with an overview of the proposed project and updates on how various natural and cultural resources studies were proceeding. Tribal attendees asked general and clarifying questions and made statements that expressed their concerns for how the project might impact their life-ways. Specific concerns were expressed regarding the proposed project's water use, impacts to the water-related biomes, such as the local springs that support plants and animals in the nearby coppice dunes mesquite grove complexes, and mention was made that Paiute ceremonies, generally referred to as "Salt Song Trails," are in, around, and run through the project area. Additional concern was expressed regarding impacts to Indian trails, including the Old Spanish Trail, and possible impacts to on-site plants, animals, and cultural resources, including possible burial or cremation sites. Energy Commission Cultural Resources staff proposed that an ethnographic study be conducted. Tribes agreed that an ethnographic study would be one desired method to pursue and further identified that the Pahrump Paiute Tribe should be central to that study and that the other tribes could provide support to the Pahrump Paiute Tribe. However,

participating tribes also requested exclusive follow-up meetings with Energy Commission cultural resources staff.

General Meetings 2 was held on February 11, 2012 at the Hidden Hills project site and in Pahrump, Nevada. An ethnographer, who is the author of this report, met with various Pahrump tribal members as a group near the project site. The membership had assembled to get clarification and a better general understanding of the proposed project parameters. The ethnographic study and confidentiality of information that the tribe might provide were two topics discussed. Several off-project cultural resource areas were visited, including a looted Pahrump Paiute cemetery.

General Meeting 3 was held on February 12, 2012 at the Hidden Hills project site and at Sandy Valley (an alternative project site). The Energy Commission ethnographer met with the Moapa Tribe cultural resources staff and committee members. One Moapa tribal council person also attended, as did Pahrump tribal representatives. General project parameters were discussed. Some Moapa participants are descendants of Paiute families that originated from the Pahrump Valley vicinity. Cultural values attached to the Sandy Valley area were discussed. Moapa Tribe staff has reiterated their previous statements that the Moapa Tribe would support the Pahrump Tribe and are interested in reviewing the ethnographic report prior to finalization. They also reiterated concerns voiced at the first general meeting about impacts to water, springs, plants and animals, and the salt song ceremonies.

General Meeting 4 was held on February 14, 2012 with the Owens Valley Indian Water Commission. Representatives from the Utu Utu Gwaitu Paiute Tribe, Bishop Paiute Tribe, Big Pine Paiute Tribe, Fort Independence Paiute Tribe, Lone Pine Paiute and Shoshone Tribe, and Timbisha Shoshone Tribe participated. The general project, as proposed, was discussed and the ethnographic study concept was presented. Participants agreed that the project area was within Southern Paiute Territory (as contrasted with Owens Valley Paiute territory) and that the Pahrump Tribe was the most affiliated tribe to work with, but that some Southern Paiute families had ended up as tribal members in Owens Valley Paiute Tribes. Individual families were identified.

General Meeting 5 was held on May 12, 2012 with the Pahrump Paiute Tribe. A draft of this report was generally reviewed and the CEC project review process was discussed.

General Meeting 6 was held on July 14, 2012 with the Pahrump Paiute Tribe. Issues related to confidentiality of sensitive cultural resources information was discussed and an initial review of the report, to identify proposed redactions, was conducted.

Research Design

Based upon these general meetings, an abbreviated research design was developed that generated various research questions or directives. The following research design provided general guidance for preliminary archival research and allowed the ethnographer to prepare for interviews.

- Research specific Pahrump Valley Native American history and culture beyond what is generally provided in the CH2MHill Cultural Resources report prepared for the HHSEGS AFC.

- Determine what plants and animals that have Southern Paiute cultural significance are or may be located in the project area. Plants and animals determined to have attached Southern Paiute cultural values should be further studied to understand ethno-botanical and ethno-zoological details.
- Research the general Southern Paiute cultural relevance and history of Southern Paiute water knowledge and use in the Pahrump Valley and surrounding mountains.
- Research and understand the importance of springs, mesquite groves, and the surrounding coppice dune environs in the project area for the continuance of Southern Paiute life-ways.
- Research and understand the Round dance, Harvest dance, and Cry ceremonies performed in the Pahrump Valley and specifically the ceremony held in 1933 at Hidden Springs Ranch. Determine to what extent these ceremonies are still practiced today and to what extent the proposed project would impact such ceremonies.
- Research and further understand the history, practices, and meaning of the salt song trail; deer and big horn sheep mourning songs; and Coyote and Wolf legends, with emphasis on ethno-geography and specific attention paid to the nature of the trail aspects of these songs and related ceremonies.
- Research the history of Southern Paiute horticulture in the project area from pre-contact to current times.
- Research and map, to the extent feasible, Native American Trails located in and near the project area that are not necessarily "Salt Song Trails"
- Understand to what extent the Old Spanish Trail is also a Native American trail.
- Particularly research the Native American slave traffic that occurred along the Old Spanish Trail
- Inquire and document the importance of Charleston Peak, Spring Mountains, Kingston Mountains, No Pah Mountains, the Last Chance Mountains, and other surrounding landforms in general and as view/auditory sheds in relation to the project area and to other landforms.
- Research traditional and current Southern Paiute burial practices, including cremation.
- Inquire as to the interrelation of Paiute and Shoshone culture in general and specifically in project area.
- Research the history of tribal governments: Moapa, Las Vegas, Pahrump, Timbisha Shoshone, Lone Pine, Independence, Big Pine, Bishop and Benton.

Interviews

It was determined by the Energy Commission ethnographer, based upon limited time, budget constraints, and the general attitude of most Native Americans that participated in the general meetings that an opened question/answer dialogue style of interviewing would be more effective than a formal interview style that would require protracted review of the research questions, the possible need to develop a formal questionnaire, and other methods of recordation. Instead, hand-written notes were taken by the ethnographer. These notes were then typed up within a few days and returned to the person interviewed for further review with instructions to make changes including deletions and additions. The ethnographer also asked interviewees to identify what information in the interviews should remain confidential.

Interviews were conducted with the following Southern Paiute and Shoshone individuals:

Clarabelle Jim, Elder Pahrump Paiute Tribe
Lorraine Jim, Elder Pahrump Paiute Tribe

Cynthia Lynch, Elder Pahrump Paiute Tribe
Richard Arnold, Traditional Religious Practitioner Pahrump Paiute Tribe
George Ross, Elder Pahrump Tribal Member
Vernon Lee, Moapa Tribal Member of Pahrump Paiute ancestry
Juanita Kinlichine, Elder Moapa Tribal Member of Pahrump Paiute ancestry
Lalovi Miller, Elder Moapa Tribal Member of Pahrump Paiute ancestry
Philbert Swain, Elder Moapa Tribal Member
Barbara Durham, Tribal Historic Preservation Officer for the Timbisha Shoshone Tribe and Timbisha Shoshone Tribal member

Follow-up interviews were conducted with Clarabelle Jim, Cynthia Lynch, and Richard Arnold.

Archival Research

Effort was expended to seek, obtain, and assess culturally relevant information from various archival and other sources.

- Documents were obtained via various internet searches and subsequent downloads.
- Books were obtained from used book stores in the project area and from on-line book purchasing venues.
- Books were purchased from the Shoshone Museum and a Nevada Historical Society Museum located in Tonopah.
- Books and manuscripts on file at the Pahrump Public Library were reviewed.
- Books and manuscripts from the California State Archives were obtained and reviewed.
- Books and manuscripts from the Sacramento State University Library were obtained and reviewed.
- Books and manuscripts from the University of California at Berkeley Bancroft Library were obtained and reviewed.
- Historic Photographs from the University of Nevada Las Vegas were obtained and reviewed.
- Photocopied and original documents were provided by the Pahrump Paiute Tribe.

An interview with Don Hendricks was conducted on May 8, 2012 in Pahrump. Don is a retired nuclear physicist, formerly employed by the Atomic Energy Commission and the Environmental Protection Agency. Mr. Hendricks is also a respected local historian, archaeologist and member of various local and state historic societies and associations. The purpose of this interview was to triangulate among conflicting written and oral history dates, people and events.

Ethnographic Method Constraints

There were identified constraints to the ethnographic methods described above. Five constraints are listed and further described:

1. Confidentiality of Sensitive Information
2. Not enough time to conduct thorough ethnography
3. Language barriers in expressing and understanding information
4. Seasonal prohibitions against divulging certain types of information
5. Some seminal archival information not obtainable (Isabel Kelley's 1934 field notes).

Confidentiality of Native American sensitive cultural information, in the absence of clear Energy Commission policy that is specific to Native American concerns, initially inhibited the author's ability to collect pertinent information.

The Southern Paiute culture, and particularly traditional cultural practices related to epistemology (belief systems), world view, and religion, are too complex to understand within the limits of a three month study. One Pahrump Paiute stated:

> Admittedly and with all due respect, the abbreviated ethnographic approach being used in this project appears to be designed to collect only a limited amount of information. The open-ended interviews are good for collecting certain kinds of general data, but cause concern when trying to synthesize the data. (Interviewee - Personal Communication)

Another Moapa Paiute stated a broader concern with language barriers to cross cultural understanding:

> English language will never get to the bottom of such things like Salt Song Trails. When we speak our language to one another, we automatically know what the other is saying. Paiute Language gets right to it. In English, we have to say it a bunch of different ways and we still are not sure if the other person understands. With Paiute, it is either yes or no, do or not do. There is no ambiguity. (Interviewee – Personal Communication)

Well documented in the literature and re-stated for this study by various interviewees is a general cultural prohibition against telling culturally significant and traditional stories outside of the winter period (Fowler 1971: 21, Kelly 1964:120, interviewee – Personal Communication, interviewee – Personal Communication). The Pahrump Paiute winter time is generally defined as the months of November, December, and January. Interviews were conducted between the months of February and May of 2012.

Finally, it was determined early in this study that Isabel Kelly conducted ethnographic research among the Southern Paiute in 1932. Her research was partially recorded in her personal field notes. However, only the eastern Southern Paiute, those Paiute residing in Utah and northern Arizona, were discussed in Kelly's seminal work *Southern Paiute Ethnography* published in 1964. While the author was able to incorporate some comparative information from that ethnography into this report; Kelly's information for the western Southern Paiute was not obtainable although effort was expended by Energy Commission staff to obtain copies of her field notes.

Constraints were *surmountable, partially surmountable,* or *not surmountable* as described below.

1. A personal confidentiality agreement was struck between the Ethnographer and the Pahrump Paiute Tribe representatives that guaranteed confidentiality of information provided. Confidential information included in this report is marked accordingly. *Constraint Surmounted.*

2. The Rapid Ethnographic Assessment Procedures were adapted to this ethnographic study. While REAP cannot replace the quality of long-term ethnography, it does provide some ability to include ethnographic resources in the Energy Commission facility siting process; a process that

only affords Energy Commission staff with a few months, at most, to conduct independent research. *Constraint Partially Surmounted.*

3. The author does not speak or understand Southern Paiute and there are few other non-Southern Paiute that speak the language. Four of the Southern Paiute interviewees spoke English as a second language. However, their English language skills were proficient enough to convey partial understanding and some interviews were followed up with second interviews to verify previously recorded information. However, information conveyed in this report is provided in the English written language only. *Constraint Not Surmountable*.

4. A prohibition prevents traditional stories, many of the stories holding embedded information sought for this study, from being told in entirety during the months that this research was conducted. Interviewees could tell pieces of stories or otherwise provide specific information without breaking the prohibition. In addition, some literature discovered through archival research further substantiated the fragments that were provided through interview. However, an exhaustive review of significant oral history was not obtainable. *Constraint Partially Surmounted.*

5. While previously recorded seminal ethnographic information was not obtained from Kelly's field notes, similar information was gathered from other sources, including a Southern Paiute section included in the Smithsonian Handbook of North American Indians Volume 11 and written by Kelly and Fowler (Kelly 1982: 368-397) that did rely on the field notes in question. *Constraint Partially Surmounted.*

ANALYSIS

Based upon the interview responses and what could be found through archival research, the various themes of the research questions were condensed and reduced to seven broad attribute categories as follows:

- Water
- Plants
- Animals
- Horticulture
- Trails
- Landforms
- Ceremonies

An analysis of Pahrump and Moapa cultural areas and related values concerning the Sandy Valley area is located in the Landforms section.

The following analysis provides what was discovered through archival research and interviews. Document or personal communications citations will cue the reader as to the source that substantiates a statement or assertion.

Water

Water is critical to all life forms; particularly in the desert. Without water, life would not be possible. In fact, the opening statement of Robert McCraken's *Pahrump; A Valley Waiting to Become a City*, exclaims:

> "The availability of water has always determined the possibility of life in the arid American West. For untold thousands of years, the magnificent springs located in the Pahrump Valley of Nevada have formed the basis of a community consisting of numerous plant and animal species. For what might be as much as 12,000 years, the springs have served to sustain a variety of cultures and ways of life." (McCracken1992:1).

In a 1909 United States Geological Services (USGS) sponsored survey, 320 desert watering locations were described and mapped throughout southwestern Nevada and southeastern California. The springs of Pahrump Valley – and between Las Vegas and Tecopa - were particularly known for the "remarkable volume and purity of the water they yield" (Mendenhall 1997:92). A second government sponsored water survey expedition was conducted in 1916 to further ascertain the characteristics of water sources in a number of valleys, including Pahrump Valley, along the California – Nevada border (Waring 1920). The John Yount Ranch was documented as having a spring, a deep well, three shallower wells each pumped by a windmill. The depth of water was variable (Ibid: 65, 77). A Pahrump Paiute Elder exclaimed, "Hidden Hills Spring had the best tasting water" (Interviewee – Personal Communication).

Because water is a life-providing force, Southern Paiute attribute more than mere physicality to water. As an Elder of the Pahrump Paiute Tribe states,

> "*Pah* means water. Water is everything, it is the main thing. Every living being drinks water. Without it we would not be alive. Water is alive. It is a spirit no matter where it is or how it comes to us." (Interviewee - Personal Communication)

Prior to mechanically dug wells and pipelines for transporting water, springs, seeps, and "tanks" guided how people traveled and, therefore, how trails traversed the desert and provided connectivity among these vital water locales. The historian Richard Lingenfelter writes:

> "Actual boundaries in this barren land were ill-defined at best; all that mattered was who held the springs... and even these distinctions were blurred by inter-tribal marriages." (Lingenfelter 1986:16)

For newcomers, the priest, trappers, explorers, military, Mormon settlers, and others, water places are wayward markers of trails and places to pass through on a journey. For the Southern Paiute, water places are also locales for long term or seasonal habitation. In fact, the etymology of the word Pahrump is explained by a Pahrump Paiute elder: "the original word for this place was *Pah-thuh-uhmp* which was the name of a little spring that is now dried up. The word got converted by white men to "Pahrump". When asked where the spring that Pahrump derived its name from was located, participating Pahrump Paiute elders became very animated.

> "It was located on the south end of our old family allotment. Hundreds of acres. They took that from us. They got a gas station, a library, banks and a Walgreens, etc... built on it – where Highway 160 and 372 intersection is. The spring doesn't run anymore – sometimes in the winter you see a little wet come out from under the parking lot." (Interviewee – Personal Communication).

Springs with long term habitation tend to have occupational features such as mounds that contain numerous artifacts of daily life, including clay pot fragments used for transporting or storing water in earlier times, and abundant lithic "scatters" (Roberts, et.al 2007:vii). For example, Stump Spring was named after a Pahrump Paiute medicine man named John "Stumper" Pete who got his special powers from the resources and grounds of that area (interviewee - Personal Communication). Stumper had a peculiar method of stomping when he made his medicine and doctored people (Interviewee – Personal Communication). He was a respected medicine man – in the time of my grandmother (circa 1840 – 90's); he was old so his face was all scrunched up. "Looked like he had a pig face so they called him by Paiute name for pig: *ping-eets*" (Interviewee – Personal Communication). Stump Spring was a major stopping place for the travelers of the Old Spanish Trail. When its waters and the surrounding grass were depleted, travelers went northwest to other springs for respite and to gather resources for the next leg of the journey (Pritchett and Smith 2012, Pritchett 2012:44). Springs throughout the Pahrump Valley were known, named, and occupied. For example, "Manse Spring was originally called *Ma-hanse* which translates as bushes" (Interviewee - Personal Communication). Other Pahrump Valley springs noted as

inhabitation sites are Bolling Mound Springs, Pahrump Springs, Mound Spring, Browns Spring, Hidden Hills Spring, and Stump Spring. The last three mentioned springs were collectively referred to as *Ma-hav,* which translates as "tall brushy area". Other springs in the vicinity and adjacent to the Pahrump Valley and of importance to the Pahrump Paiute Tribe are numerous springs in Ash Meadows area, including Devils Hole, a spring on the north side of Lizard Mountain (Last Chance Range) named *Poo-bit-si* by the Pahrump Paiute; numerous springs along the flanks of the Spring Mountains, including Horseshutem Springs, Crystal Spring, Wood Canyon Spring, Santa Cruz Spring, Horse Spring, Younts Spring, and Mule Springs; Horse Thief Spring and Beck Spring in the Kingston Range; and Tule Springs, Resting Springs and Tecopa Springs located near the No Pah Range and Resting Spring Ranges. A Shoshone person stated, "We are very concerned about the springs, we have been monitoring a spring called Devils Hole, it has some little fish in it that need water to stay there. That place is very important to us" (Interviewee – Personal Communication, Ash Meadows National Wildlife Refuge Visitor Brochure). A list of all springs that are culturally significant to the Pahrump Paiute can be found at Appendix 1 of this report.

The Pahrump Paiute are knowledgeable of where good springs, medicinal springs, hot springs, and poisonous or bitter tasting springs are located. They are also keenly aware of where springs have dried up or diminished since the 1940s, including but not limited to: Six-mile Springs (*Pah suits*), Pahrump Ranch Spring (used to have pool fish), Brown Spring, Mason Spring, Manse Spring (used to have pool fish), (comes back in the winter), Greasy Wood Springs, Kellog Ranch Springs (located above the Hidden Hills Ranch), Chu Chep Springs ([redacted]) (Interviewees - Personal Communication). "We use to swim in some of those springs – not anymore," said one Pahrump Paiute Elder. The historic trend of springs drying up is attributed by the Pahrump Paiute people to the increased farming, industrial, and residential growth in the valley over the last 70 years.

It is not just springs that are drying up, claim Southern Paiute interviewees, but the entire water cycle. The water cycle is a traditional Southern Paiute concept with words for the various aspects of water. Table 3 provides a list of Southern Paiute words for various forms of water and a translation of the Southern Paiute word into English. The reader should note that the following word list has not been checked for phonetic exactness. Some translations were not provided. This list is derived from Pahrump Paiute personal communications and Powell's "Las Vegas Vocabulary and Grammatical Notes" located on pages 152 -160 of the Fowlers' 1971 edited version of Powell's report.

Table 3. Ethno-semantics: Paiute Words for the Various Forms of Water
Capitalized words are from Powell's collected vocabulary and notes.

Southern Paiute Word	Translation
pah	means "water"and is used in combination with other Paiute words to convey either Paiute place names or other forms of water
pah ce pets *Pa-a-tum-pai-a*	means "spring" as in water spring... not "spring time" or "seed germination" and translates as "coming out of the ground"
pah ta bi yah	means "spring opening" or hole from which water wells up
ta ma nu gwitch	means "spring" but specifically refers to a spring that is running well
P-ka-vu	means water pocket or "tank"
Pa-akwi-tu-a	means Sink but translates as "where water disappears"

pah who weech *Pa-no'-kwint*	means "creek" but translates as "water flowing or running".
Pa-a'-na-vat'-so-na'-kwin	mountain stream junction or confluence
Kaivw-o-nu-kwint	mountain stream
ko sah lo wala	Steam rising from rocks after a brief rain when the rocks have been warmed by sun
Pa-gu'-na-ka	Fog
Hu-u'-nu-vwav-l	Frost
Nu wav	Snow
pah la ship *Pa-ru'-s-shup*	means "ice" but translates as "water turning to ice" or the act of freezing"
pah homp	means "hail"
ho un na va havi	means "dew" but translates as "moisture laying"
Hu-u'-nu-vwav-l	means "frost"
pah sa ta ga	water dripping from roof, tree,
Pa-wu'-mi-ots	water that is whirling
owh la *U' wai*	means "rain"
pah uv ceah	means "sprinkle"
pah gid	means "flood" but translates as "water moving by fast"
Pa-ro-wa'-tsu-wu-nu-ti-l	Rainbow
o wa pul	means "rainbow" but relates to rainbows considered the canes of Wolf and Coyote. When there is a double rainbow, it is thought that the bottom and brighter rainbow is the cane of Wolf. The upper rainbow, somewhat dimmer than the bottom rainbow, is considered the cane of Coyote, Wolf's younger brother.
pah ga din *Pa-ka-riv*	means "lake" or "puddle" but refers to water that is still or "resting"
Pa'-pa-gu-ri-nok	Marsh
Pai-hu'-yu	canyon with water
Kai-va'ho-yu	canyon, dry
Pi-ka-vu	cave with water
Tun-kon'	Cave

Since the early 1900s, linguistic anthropologists have understood that there are correlations between language, ways of understanding natural phenomena, and resultant cultural values. Ethno-semantics is one method for assessing another divergent linguistic speaker's cultural world view and associated values. In Western culture and particularly for English speakers, water and its various forms are named as distinct and separate entities. For example 'ice', 'rain', and 'lake' - all words for describing natural variations of water, do not share an etymological linkage, nor do the words have any linkage back to the common factor which is water. Therefore English speakers can easily conceptualize the quantification of water. For example springs are typified as "pool", "barrel" or "bucket" based upon the amount of daily flow. Pool springs can support larger ranches, barrel springs support smaller farms and a bucket spring

may be sufficient for watering a horse or getting a quick drink. Southern Paiute Language tends to preserve the root word *'pah'* in other words that describe watery aspects of the world. The various iterations of watery aspects often take the word *'pah'* and attach a descriptive string of words that often describe the movement or other active qualities of water. Therefore Paiute speakers when conversing or thinking in their own language, often are much more adept at understanding water as an inter-connected phenomenon with varying qualities, and have a more difficult ability to conceive of, or describe the quantification of water. Often times, languages that are robust for describing the qualities of the world, tend to be spoken by people that focus less on ownership (which requires quantification) and focus more on the nuances of rights (which are qualifying human behaviors towards one another, and the natural phenomena). Often non-Indian owners, upon acquiring property with a spring set about "improving" it; which means manipulation in order to get more water from the source. "Farmers often screw it up in the attempt to improve [a spring]. They blast it, or dig it out, or try to connect two nearby springs into one," exclaimed a local historian (Interviewee – Personal Communication).

The Southern Paiute right to inhabit a spring is attributed to specific families. Springs tend to cluster at the base, mid slope, and in the upper reaches of mountains. Likewise, Paiute families who clustered around one or several springs tended to act as economic units in coordinated efforts to hunt, gather, and migrate about a territory that encompasses the extents of all three zones. This is a pan-Southern Paiute practice (Kelly 1964:6-7). Often various families that shared a single water source would not camp exactly on the spring but at a polite distance so that other families would be able to have unfettered access to the common source. Paiute "ownership" of a spring is better described as usufructuary rights; rights that are exercised for the benefits of the user, but that do not convey any ownership precedent (Kelly 1982: 380, Roberts 2007: 93, Jim 2012). There are several Southern Paiute stories of people getting too near to water sources due to greed or carelessness and drowning. When family leaders passed away, the rest of the family might avoid frequenting the spring for up to a year. Characteristically, Southern Paiute consider "resources" to be a function of creation and brought about by events of the creator. Sometimes, with the family departure of a spring, either because of seasonal migration or because of a significant family death, during a family absence, other tribal families may respect the departure and anticipate the grieving family's return. However non-Indians often interpreted the family departure to mean that the family had ceded ownership. There is extensive Southern Paiute knowledge about how to maintain a spring or revive a spring should such a place become overgrown or otherwise cease flowing. The Southern Paiute word *Tong-ai,* expresses the act of cleaning out a spring (Fowler 1971: 158).

As agricultural practices were developed by Paiute, spring water became controlled through ditches and intense management. In some tribal areas, such as the Owens Valley, Paiutes coordinated water use through "irrigation chiefs" (Lawton et.al. 1976). With the rise of Paiute horticulture, there was also a rise in clay storage containers. Particularly interesting is the rise of clay water pots used for household storage and for travel (Kelly 1962:77).

In the Pahrump Valley, it is not just a matter of water availability versus water demand that has resulted in less water, but also, as a Pahrump Paiute explains, the disrespectful manner by which the water is taken:

> Water is a spirit or being and it is alive throughout its cycle. The being travels through the cycle... the cycle is a journey or travel circuit. Rain to soil or rock, then to seeps, to springs, to creeks, to basins above or below ground, that collect water. The Paiute story of World Creation concerns water. The world was flooded and Charleston Peak was an island where animals congregated. Animal deities were responsible for how waterways are shaped. Some beings are hiding and waiting for water to provide for a re-emergence. All things have spirits that need to be talked to/listened to. Plants and animals, just like humans, have feelings and emotions. Water also has feelings and emotions: One should not be loud when approaching water. Water needs to be awakened. One takes a stick and gently stirs the surface to wake it up. It is important how one approaches and leaves water. These beings are responsible for keeping balance in the environment and can cause havoc if disrespected or if they anticipate impending harm. Further, the beings are identified in certain prayers and songs that cannot be adjusted (Interviewee - Personal Communication).

Further Pahrump Paiute explain that the mountains are responsible for "calling" the rains. Knowledgeable Paiute can also call the rain through prayer. When a calling is successful, the playa comes to life. While playas are considered by non-Paiute to be places devoid of water, the water spirits are considered by Southern Paiute to be ever present, and therefore require similar consideration and respect as Paiute would require of any users of spring areas.

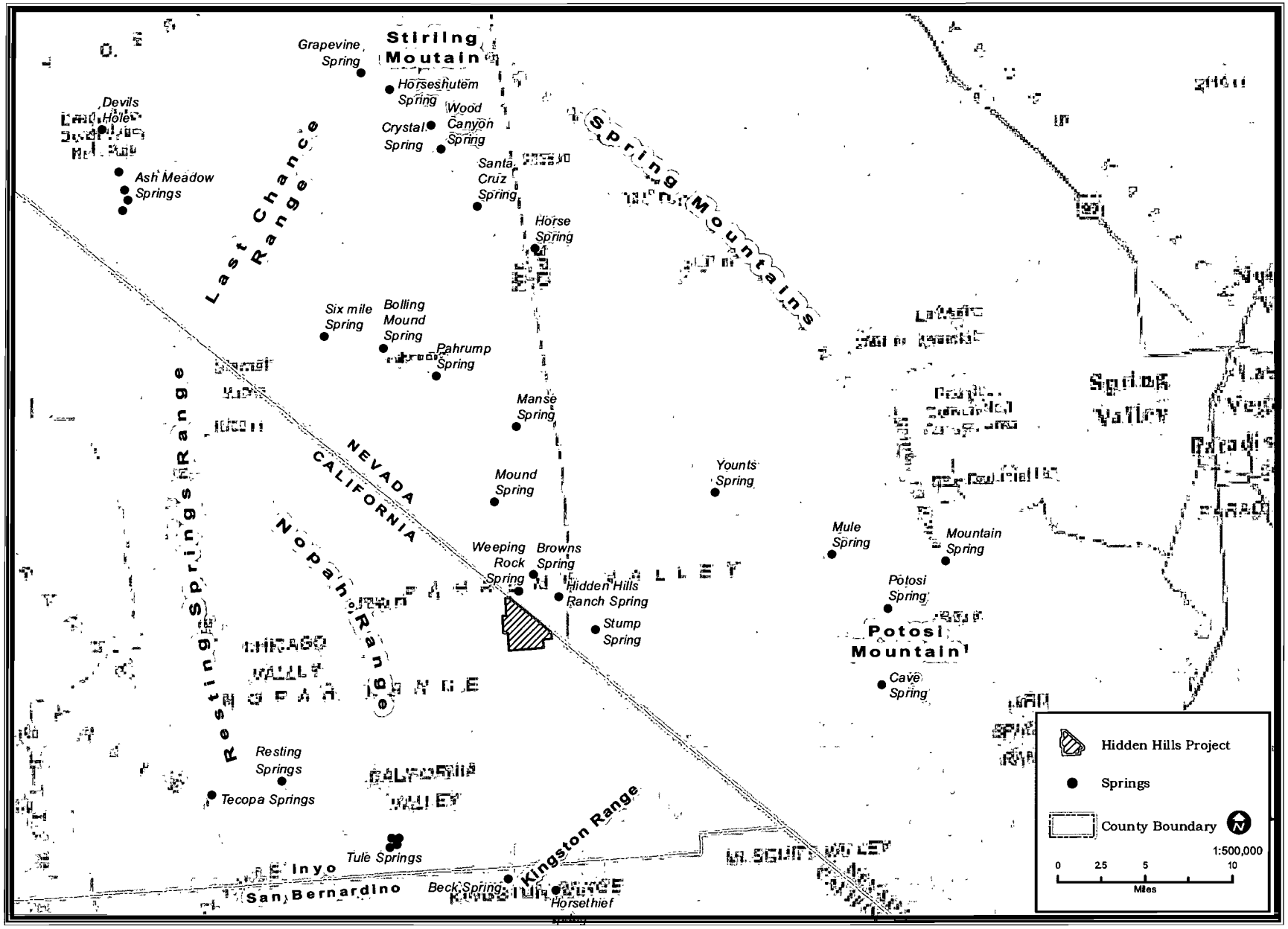
Likewise there are prayers for calling the wind. For example one Pahrump Paiute Elder recounted praying for the wind to blow the mushroom cloud, arising from the first atomic bomb tested at the atomic testing site to the north of Pahrump Valley, to blow away (Interviewee – Personal Communication).

Sufficient ethnographic literature documents that water spirits, are entities deeply entrenched in Paiute springs, (and other places where water can be found or appears), and ways of thinking. Water spirits are small beings that reside in the water ways and can entice careless humans to come too close to springs. Water spirits are thought to pull unwary humans into springs where they are later found drowned (Kelly 1964:138, Interviewee - Personal Communication). Underground water ways are interconnected. This is conveyed with stories of a person who placed a barrel cactus in a spring in Ash Meadows. Some days later the same barrel cactus appeared in a spring in Furnace Creek located some 35 miles away (Interviewee – Personal Communication). A recent substantiation of the Southern Paiute understanding of interconnectivity of distant places, including springs, was documented in a recent Pahrump newspaper article that discussed a 7.4 magnitude earthquake in Oaxaca Mexico that caused significant sloshing of water at Devils Hole in Ash Meadows. The distance between the two places is 1700 miles (Pahrump Valley Times April 13, 2012).

A Moapa Tribal Elder simply stated, "springs are very special places." (Interviewee – Personal Communication). Another Tribal Elder said, "The project will use water. We people of the desert do not have more water to give, what will we do with less water?" (Interviewee – Personal Communication).

CULTURAL RESOUCES - FIGURE 5

Hidden Hills Solar Electric Generating System (HHSEGS) - Some Springs in the Pahrump Valley and Vicinity that are Culturally Important to Pahrump Paiute



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Topographic Maps - USGS, National Geographic (2002), California Atlas & Gazetteer - De Lorme (2010), Nevada Atlas & Gazetteer - De Lorme (2010).

Plants

The western portion of the project area is comprised of Shadscale Scrub. The eastern portion of the project area is comprised of Mojave Desert Scrub. Within a mile to the east of the project area are mesquite thickets or "groves," that provide some anchoring for the coppice dunes that parallel the project boundary. While many culturally sensitive plant types are associated with mesquite thickets, this section is not intended to list those plant types. The plant types found on the project site are further analyzed below.

A comparison of the plants documented in the project AFC as "[O]bserved within the HHSEGS Site and 250-foot Buffer during 2011 Surveys" (AFC 5.2-73 – 79) and a list of culturally important plant species of the Southern Paiute, derived from David Rhode's *Native Plants of Southern Nevada: An Ethnobotany,* and a list of species provided by the Pahrump Paiute Tribe (Jim 2012), has resulted in the following list of cultural use plants known to occur in the project area. Of the 139 plant species identified in the project area, 30 (or approximately one-fifth) of the identified plant types are culturally significant for cultural use. While other tribal representatives have identified more, of the approximately 100 known plant species documented as used by the Southern Paiute people, 30 (or approximately one-fourth) grow in the project area. An exhaustive ethno-botanical study is more likely to identify several hundred plants types that are known by Pahrump Paiute. While many of the plants identified have multiple uses, most informants intentionally chose not to identify those plants that are used for medicinal purposes. Table 4 provides a list of some culturally important plant species in the project area.

Table 4 Hidden Hills Solar Electric Generating System (HHSEGS)
Some Plant Species Occurring in Project Area per the Project Area 2011 surveys that Pahrump Paiute (personal communication) or ethno botanist Rhode (2002) have identified as culturally significant

Common English Name	Scientific Name	Pahrump Paiute Uses
Annual Turtleback	*Psathyrotes*	[redacted]
Ash	*Fraxinus sp.*	[redacted]
Beavertail cactus	*Opuntia basilaris* var. *basilaris*	[redacted]
Broom Snakeweed (resin weed', 'turpentine weed' and 'matchweed)	*Gutierrezia sarothrae*	[redacted]
Creosote bush	*Larrea tridentata*	[redacted]
Datura, Thornapple, Jimson Weed, Devil's Trumpet	*Datura Wrightii*	[redacted]
Desert larkspur	*Delphinium parishii* var. *parishii*	[redacted]
Desert globe mallow	*Sphaeralcea ambigua*	[redacted]
Desert milkweed	*Asclepias erosa*	[redacted]

Desert needlegrass	*Achnatherum speciosum*	
Desert paintbrush	*Castilleja angustifolia*	
Desert trumpet	*Eriogonum inflatum* var. *inflatum*	
Four wing saltbrush	*Atriplex Canescens*	
Fiddleneck (Bristly)	*Amsinckia tessellata*	
Goodding Phacelia	*Phacelia pulchella* var. *gooddingii*	
Honey mesquite	*Prosopis glanulosa*, var. *torreyan*	
Indian ricegrass	*Oryzopsis hymenoides*	
Nevada Ephedra, Jointfir	*Ephedra Nevadensis*	
Pahrump Valley buckwheat	*Eriogonum bifurcatum*	
Pima Ratany (Littleleaf ratany)	*Krameria erecta*	
Primrose (yellow)	*Oenothera primiveras*	
Princes plume (Cabbage Desert Plume, Indian Cabbage, Sentinel of the Plains)	*Stanleya pinnata*	
Purplenerve springparsley	*Cymopterus multineratus*	
Rattlesnake weed (White margin Sandmat)	*Chamaesyce albomarginata*	
Rubber rabbitbrush	*Chrysothamnus nauseosus*	
Shadscale	*Atriplex Confertifola*	
Silver Cholla (Golden Cholla)	*Opuntia echinocarpa*	
Tansy mustard	*Descurainia pinnata* ssp. *glabra*	
Wire-lettuce	*Stephanomeria pauciflora*	
Winter fat	*Kraschenninikovia lanata*	
Winding Mariposa Lily	*Calochortus flexuosus*	
Wooly Plantain	*Plantago ovate*	

The above list represents some of what is known, or used today by the several Pahrump Paiute that participated in this study. Paiutes did not have time to finish the list. Some of the traditional knowledge base has been lost because elders have passed away without passing on the information and some plants are now extinct and, therefore, the knowledge has also been forgotten. While some of the plants in the project area may not have a known use, the plants may still have a Southern Paiute name and some indigenous knowledge may be known about the plant because it is to be avoided, or because a

plant may function in some other ecological way, or because there is a free association between the plant and some otherwise unrelated ecological function.

Creosote

The creosote bush, predominate in the lower desert floors and in the project area, provides numerous uses, such as [redacted] There are many other uses of the creosote sap. For example it can be used as [redacted]. Creosote branches are used to [redacted]. Creosote is also an [redacted]. There is even more contemporary knowledge of creosote characteristics, such as a warning from one elderly Pahrump Paiute, "do not back-up over creosote. Its branches can poke through the thickest tires just like a nail." (Interviewee - Personal Communication).

Seed, Root, Leaf, and Basketry Material Gathering

Five listed plants provide seeds as a food source. Seeds are gathered using a fan or wand-shaped seed beater and basket tray. Gathered seeds are winnowed, sometimes parched, and stored. There are various methods and utensils used for storage. Some of these utensils are woven from other plant materials. Seed gathering is very labor intensive and requires in-depth ethno-botanical knowledge, but has been a mainstay of the Southern Paiute diet for thousands of years (Anderson 2005).

Many plants that are not used directly can otherwise be useful to traditional knowledge because the plants are indicator species. When certain plants change (e.g., bloom, emit sap, drop leaves), such plants indicate that something else is likely to occur. For example, when [redacted] on the valley floor, the plant indicates [redacted] in the mountains. Humans, plants, and animals are interrelated. Plants have feelings and emotions and need to be talked to and listened to in order to live co-harmoniously. Many plants will go dormant or will appear non-existent for years and then will suddenly spring up in an area (Interviewee – Personal Communication).

In addition, some plants may not have specified cultural uses, but are still considered culturally significant because such plants may provide vital ecological roles that support the continuance of culturally used plants and animals.

As one Pahrump tribal representative wrote:

> "The fact that we co-existed with plants and have such a deep knowledge of plant uses proves that we have an intimate relationship with the landscape surrounding them. We never exploited this resource or looked to destroy or waste the plants, rather we used only what is needed and are mindful of the future. Plants provided materials for homes, ceremonies, medicines, food, and practical uses. Plants must be collected from particular areas or at specific

> times of the season. A system of traditional beliefs and methods attend the collection and use of plants, traditions that involve elements of respect, approach, preparation, dosage, administration, and/or consumption of foods or medicines. We know that plants are found in certain areas for reasons explained in our traditional stories or beliefs. Many plant species are rare and should be protected, not picked. Care should be exercised to avoid damaging plants in certain areas, even though they may appear to be abundant." (Jim 2012).

Plant knowledge can often come from observing animal relations to plants. Seeds, including gathering, processing, storing, and consumption, are a resource type critical to the Paiute people for desert survival. In fact, the Paiute people call themselves *Pi Yates*, which is the Paiute word for the kangaroo rat. The Paiute people think of themselves as thrifty seed gatherers, similar to the Kangaroo rat that exists almost exclusively on seeds gathered from the desert scrub plant populations (Interviewee - Personal Communication).

For example, a Paiute baby girl's dried umbilical cord is placed in the hole of an anthill, a gopher hole, or Kangaroo rat hole so that the baby would grow up to be an industrious gatherer like the animals that exhibited similar seed-gathering activities (Kelly and Fowler 1982: 379).

Moapa Paiute mentioned that they cherish gathering in the Pahrump Valley because they feel that the Pahrump Valley environment has not been contaminated as much as Las Vegas Valley and valleys east of Las Vegas. They blame the higher level of environmental contamination in their local area and gathering areas to the north and south of the Moapa Reservation on the testing of bombs at nearby military bases during the Cold War and also the smoke that comes out of a nearby coal power plant (Interviewee – Personal Communication). Very preliminary research indicates that contamination impacts to Moapa lands, plants, animals and membership have never been investigated or mitigated (Titus 1986, Interviewee – Personal Communication). Pahrump Paiute acknowledge that Paiute from other areas gather in Pahrump Valley but do so acknowledging that Pahrump Paiute are hosts, and that permission should be asked and granted before outside gathering commences. Pahrump Paiute also acknowledge that this is placing increased use on their local sources of sustenance and puts them in the role of attempting to balance their needs, their neighboring Southern Paiute's requests and the sustainability of the plant communities that are traditionally gathered. Plants are very important to many Paiutes and must be protected from threats so they have enough for all to use.

Animals

Insects, birds, reptiles, and mammals, that are considered by Pahrump Paiute as culturally significant animals, occur, inhabit, forage, or otherwise pass through the project area. No threatened or endangered arthropods (what the Pahrump Paiute Tribe calls "insects") are known to occur on the project site; however, one federally listed species, Carole's silverspot, may occur within the greater vicinity of the proposed project site. Insect surveys are not required unless a threatened or endangered insect is known to occur on the site, or is reasonably likely to occur on the site. Table 5 provides a list of insect types identified by the Pahrump Tribe as culturally important. It is not known by the author whether or not these insects occur on or near the project site. There are antidotal reports of tarantulas crossing the roads near the project site (Interviewee – Personal Communication).

Table 5. Some Culturally Important Insects and Pahrump Paiute Uses	
Bumble bee	
Butterfly	
Centipede	
Grasshopper	
Inch Worm	
Louse	
Red Ant	
Stink Bug Beetle	
Tarantula	
Tiger Swallowtail Butterfly	

Table 6 provides a list of culturally important animal species in the project area

Table 6 Hidden Hills Solar Electric Generating System (HHSEGS)
Animal Species Occurring in Project Area per the Project Area 2011 surveys that Pahrump Paiute (personal communication) or ethno- biologist Cornet (2000), anthropologist Kelly (1982) have identified as culturally significant

Common English Name	Scientific Name	Pahrump Paiute Uses
BIRDS		
American crow	*Corvus brachyrhynchos*	
Anna's hummingbird	*Calypte anna*	
Barn owl	*Tyto Alba*	
Black phoebe	*Sayornis nigricans*	
Common raven	*Corvus corax*	
Common poorwill	*Phalaenoptilus nuttalli*	
Cooper's hawk	*Accipiter cooperii*	
Costa's hummingbird	*Calyptecostae*	
Eurasian collard-dove	*Streptopelia decaocto*	
Gambel's Quail	*Callipepla gambelli*	
Greater roadrunner	*Geococcyx californianus*	
Golden eagle	*Aquila chrysaetos*	
Mourning dove	*Zenaida macroura*	
Northern flicker	*Colaptes auratus*	
Red-tailed hawk	*Buteo jamaicensis*	
Rock pigeon	*Columba livia*	
Tree swallow	*Tachycineta bicolor*	
Turkey vulture	*Cathartes aura*	
Western burrowing owl	*Athene cunicularia hypugaea*	

White-crowned sparrow	*Zonotrichia leucophrys*	
REPTILES		
Chuckwalla	*Sauromalus ater*	
Common collard lizard	*Crotophytus callarus*	
Desert tortoise	*Gopherus agassizii*	
Long-nosed leopard lizard	*Gambelia wisiizenii*	
Northern Mojave Rattlesnake	*Crotalus scutulatus scutulatus*	
Side-blotched lizard	*Uta stansburiana stejnegeri*	
Sidewinder	*Crotalus cerastes*	
Southern desert horned lizard	*Phrynosoma platyrhinos calidiarium*	
Speckled rattlesnake	*Crotalus mitchellii*	
Western fence lizard	*Sceloporous occidentalis*	
Western whiptail	*Aspidoscelis tigris* ssp. *Togris*	
Zebra-tailed lizard	*Callisaurus draconoides*	
MAMMALS		
American badger	*Taxidea taxus*	
Audobon's cottontail	*Sylvilagus audobonii*	
Black-tailed deer	*Odocoileus hemionus*	
Black-tailed jackrabbit	*Lepus californicus*	
Botta pocket gopher	*Thomomys bottae*	
Coyote	*Canis latrans*	
Deer mouse	*Peromyscus* sp. *Maniculatus*	
Desert kit-fox	*Vulpes macrotis*	
Merriam kangaroo rat	*Dipodomys merriami*	
Nelson's bighorn sheep	*Ovis Canadensis* ssp. nelsoni	
Pocket mouse	*Perognathus longimembris*	
Whitetail antelope squirrel	*Ammospermophilus leucurus*	

Animals provide Pahrump Paiute with nutritional sustenance, materials for utensils, clothes, housing, and other adornment, and also provide mental and spiritual guidance. Some animals provide role models. At the time of creation and immediately afterward, and before humans were introduced by the creator, animals (including insects), played a key role in managing the world, preparing it for Southern Paiute, and providing aboriginal inhabitants with the knowledge of how to live in the desert environment. A few species are highlighted next, to illustrate the extensive symbiotic relationship that Pahrump Paiutes and animals maintain. A more comprehensive list of all culturally important species is provided at Appendix 3.

Desert Tortoise

The Desert Tortoise is [redacted] (Interviewee – Personal Communication). However, the tribe has refrained from consuming tortoises since the species has been deemed endangered. The tortoise is a role model for going the long distance, for being capable of a living a long life and therefore is a conveyor of good luck.

Flicker

Flicker brought light to the world. [redacted] (Interviewee – Personal Communication). The Pahrump Tribe finds it ironic that the bird attributed with bringing light to the people may now be harmed by people trying to harness the sunlight.

Rabbit, Deer, and Mountain Sheep Hunting

Sources of animal protein are critical for a diet that otherwise consists of roots, greens, berries, nuts and horticultural produce. Hunting is primarily men's activity and young boys are initiated at an early age to begin to learn to hunt. In the selection of mates, Southern Paiute placed high priority on those males that were proficient hunters. In fact, a baby boy's dried umbilical cord is taken to the mountains by the father and placed on the trail of a mountain big horn sheep to petition for good luck in hunting (Kelly 1982: 379).

Hunters [redacted] on the dry lake bed. [redacted] (Jim – 2012:3).

While deer and mountain sheep hunting is an individual activity or done with a few male cohorts, rabbit hunting is both an individual and a communal pursuit. There is much description in the literature about how rabbit hunts are communally conducted. Long nets are set up and rabbits are then driven into nets where they are then clubbed. Rabbit furs are utilized to make rabbit blankets and robes. Hunting, although currently conducted by means of a rifle, is an ongoing tribal activity in the project area (Interviewee – Personal Communication, Interviewee– Personal Communication).

Horticulture

Pahrump Paiute were dependent on three broad sources of food: 1) Wild plants that were gathered in their natural condition or with some manipulation, such as pruning; 2) animals that were hunted or gathered; and 3) horticulture. These activities occurred at specific times within a seasonal migration (Kelly 1982: 371).

The anthropological and archaeological literature documents that Southern Paiute, including Pahrump and Las Vegas Paiute, farmed prior to contact with the Spanish (circa 1775). While it is suggested that the eastern Southern Paiute obtained horticultural knowledge from the Pueblo and Hopi people to the east and south; and the Western Southern Paiute are thought to have obtained the knowledge from the Mohave via the Chemehuevi (Kelly 1964: 40, Kelly 1982: 371), Southern Paiute representatives believe their traditional ecological knowledge has been practiced for thousands of years. The Owens Valley Paiute seemed to have adapted a different set of cultigens (cultivated species) and some have suggested that they did this in isolation from their Paiute neighbors to the east (Lawton et al 1976). While some literature suggests that perhaps the spread of horticulture occurred sometime around 1850 and was introduced by Mormon settlers, there are conflicting reports of farming occurring in the lower Colorado Basin at least 25 to 75 years earlier (Inter-Tribal 1976:24, 31).

One Pahrump Paiute informed the author of a Southern Paiute understanding that the Big Horn Sheep provided Paiute with the knowledge and seeds for horticulture. This understanding would place horticultural practices back to the creation and animal instruction times (Interviewee – Personal Communication). A more Eastern Southern Paiute account of the origins of corn seed relate a story of a young Paiute boy who goes on a quest for a better food source for his people. His travels take him to the sky where he encounters the creator who after a series of tests sends him back to his people with corn seeds (Inter-tribal 1976:3-4).

Mexicans traveling along the Old Spanish Trail between Mountain Springs and Good Springs or Resting Springs were aware of a Paiute man that extensively gardened out on the flats below Mule Springs and just north of the present highway. (Interviewee – Personal communication) What is documented is that particularly Mormon settlers usurped Southern Paiute springs and garden plots (Roberts 2007: 89-90). For example, it is not clear how Mormon Charlie's ranch at Manse Spring was acquired by the Jordan brothers, Mormons who sold the ranch to Joseph Yount, after less than a year of ownership. One source says the ranch was "taken over" by the Jordan brothers (McCraken 2009: 4, Lingenfelter 1986: 167).

Corn, squash, gourds, pumpkins, melons, sunflower, amaranth, winter wheat, various beans (including chickpeas - an old world cultigen), and Devil's claw were some of the cultigens (Kelly 1982: 371). George Wheeler, U.S. Army expedition leader, notes in 1872, that the Pahrump Paiute cultivated "corn, melons, squashes, [and] great quantities of wild grapes" around the springs (McCraken 2009:3). Southern Paiute gardens were planted near springs and along the Colorado River floodplain. In the Pahrump Valley, gardens were known to have been planted at most of the springs immediately east of the project area, including Stump Springs. A garden could consist of from one to several acres. Extended or cohort (two or more brothers) families might cultivate several acres. The area was cleared and leveled as best as possible and berms were placed around garden plots. Irrigation ditches were dug from water sources to the nearby plots. Where there were multiple plots, a main ditch was dug and lateral ditches extended off of the main ditch. Where multiple families used the same water sources, a watering schedule was established. Where the spring was too far for a ditch, sometimes the water was carried from the source to the garden plot. Plots were used for several years until productivity diminished and then plots were rotated allowing old plots to go fallow. (Ibid, Roberts 2007: 95).

Garden plots were prepared in early winter and were thoroughly soaked before planting in the early spring. Plants were planted from sprouts and from seed. After planting, most Southern Paiute migrated to higher terrain to avoid the heat and to hunt and gather as the weather permitted. The elderly were left to attend to the gardens. People that had seasonally migrated to higher elevations would periodically return to make sure the garden was progressing through the growing season and to assist the elderly with some of the more physical tasks of gardening. As harvest time approached, most of the families returned from the high country. As the harvest and procurement activities neared completion, some would return to the high country to harvest pine nuts and hunt. This usually occurred in the middle to late fall (Ibid).

The earliest farms in the Pahrump Valley were established by Pahrump Paiute at places such as Hidden Hills Spring, Mound Spring, Manse Spring, Pahrump Springs and Bolling Mound Spring. These farms were taken by the earliest non-Indian settlers that arrived in the valley circa 1875 (McCracken 1992: 11, 31). Pahrump Paiute maintain that the word "taken" is a polite substitute word for "stolen," regardless of whether or not a patent was filed for homestead lands.

Within 50 to 75 years (circa 1925 -1950), the Pahrump Valley area and its lush springs were owned by non-Indians and mass cultivation was the farming method of choice. Cotton, originally a plant domesticated by Native Americans to the south, became a lucrative "cash crop." Wells were established for the watering of vast fields and local Paiute became the laborers. For example, the Manse Ranch had an "Indian Rancheria" for housing Indian laborers (Interviewee – Personal Communication, Interviewee – Personal Communication). A Pahrump Paiute Elder recalled the family's labors:

> "My two sisters were the best cotton pickers in the family and would average 400 pounds of cotton per day. One time my sister picked 500 pounds in one day. The hardest part of picking cotton was that the cone where the cotton grew out had sharp stickers on it that would cut up the fingers. They picked cotton at the Pahrump Ranch

> that was established by John Hughes in 1936. They picked cotton the next year in 1937." (Interviewees – Personal Communication)

Pahrump Paiute continue to garden today. However, because they have been pushed off of their spring areas, gardening occurs in backyards and often is watered with hoses and municipal or well source water. (Interviewees – Personal Communication)

Trails

Early Spanish explorers, including some of the first to enter Southern Paiute territory, relied on Native American guides to find their way around the southern Great Basin and Mojave Desert (Kessell 2002:273, 279; Steiner: 1999:11, 14, Reeder 1966: 6-7). Inevitably, the routes "discovered" were Indian trails. In the desert, with the crucial role that springs played in long distant travel, it was Indian guides who knew of such locations and who showed where these precious locations were tucked away in an otherwise seemingly barren land. When there were decades of non-use of a previously "discovered" trail, and newcomers arrived to re-discover routes, again it was local Indians that informed recent newcomers that foreigners had previously passed through. While the Old Spanish Trail (Trail) is comprised of various tracks and routes, the general corridor, regardless of how various tracks diverged, converged, or paralleled, led the traveler along a string of essential watering stops. Even though some Indian-White first encounters along the trail were amicable, as the non-Indian traffic increased Southern Paiute retreated from their nearby trails, springs, encampments and garden areas. Certain sections were less travelled by newcomers; and during those months when weather prevented travel, Southern Paiute re-frequented their trail-side places and activities (Inter-Tribal 1976: 39). As the Trail became a standardized route between California and New Mexico, its primary purpose was to move commodities from the California seaport of Los Angeles to the Interior Spanish settlements located in New Mexico.

Slave Trails

A commodity traded towards the west was wool products. Horses and mules were traded towards the east. Unfortunately for the Paiute, they were captured by Ute and Navajo Indians and sold to Mexican travelers as slaves and were also directly pursued by Mexicans and were sold/traded in both directions. Descriptions abound of lines of Paiute tied to pack trains and force marched hundreds of miles along the trail system that was originally their own. After establishment of the Old Spanish Trail as Spanish, then Mexican, and finally a Mormon or American trail, Paiute people continued to travel the trail sometimes against their own volition (Reeder, 1966; Inter-Tribal 1976: 22-33, 36-51, Walker 2009: x-xi). One elderly Pahrump Paiute exclaimed, "Hardship, suffering, and fear between watering holes, that's what it was for travelers and the Indians that lived nearby." He also added, "I know this trail, I used to travel it as a boy" (Interviewee – Personal Communication). Suffice to say, the Old Spanish Trail is an Indian trail.

Earlier Old Spanish Trail routes cut either well below or went through the Southern Pahrump Valley. The first documented crossing of the Pahrump Valley along the Old Spanish Trail corridor that intersects the HHSEGS project area, was made by John Fremont. Fremont was travelling from west to east and, while still somewhat south of the northern route, encountered two survivors of a massacre that had

happened at Resting Springs. Indians, perhaps a band of Pahrump Paiute, had killed a large number of Mexican packers and had gone north into the Amargosa Valley with the pack animals. Fremont's men made pursuit and returned with those stolen animals that had not already been butchered by the Indians. Fremont's men killed many of the Indians in the encampment. From Resting Springs, Fremont made his way to Stump Springs and then on to Mountain Springs, just past where the previously followed Armjio route came through the Southern Pahrump Valley. This was in 1844 (Steiner 1999:55, 56). It is suggested that the slave raiding activities forced Paiute that had once resided in proximity to the trail to move to less favorable resource areas which were either of marginal subsistence quality or in neighboring family, band, or tribal areas, creating internal conflict over resource utilization. These events caused tribal people to prey upon the pack trains for trade goods and horse meat (Walker 2009).

At this same time, Chief Tecopa, a famous and early Pahrump Paiute spokesperson, was camping in the Providence Mountains, approximately 100 miles distant, and heard, by means of an Indian "running" messenger, of the massacre. Chief Tecopa made tracks post haste and caught up with the Fremont party at Las Vegas Springs. After ascertaining the facts, Chief Tecopa made his way back to Pahrump where he went about making clear to his people the errors of raiding travel parties (Lowe 1981: 4, 5). Decades later in 1865, despite Chief Tecopa's pleadings, the gold prospector Charles Breyfogle was attacked by Pahrump Paiute at Stump Springs. The attackers were led by Ash Meadow "Mormon" Charlie, the Pahrump Paiute war chief of that time (Lingenfelter 1986: 74). Suffice to say that Pahrump Paiute were well aware of travelers crossing on the Old Spanish Trail network, had a trail network that supported Indian messengers, and could travel expeditiously throughout their traditional trail network.

With increasing pressure on the U.S. military to map and understand the new territories that had been negotiated through the Treaty of Guadalupe Hidalgo and to take stock of what groups were using the Old Spanish Trail and for what purposes, several military mapping expeditions were undertaken. The ensuing journals and related maps make mention of the Pahrump Valley springs and the numerous Paiute Indians residing in the area (McCraken 1990:2; Steiner 1999: 72, 76, 77).

Indian Roads

The Mallory Wood 1877 expedition map shows an expanding network of roads in and around Pahrump Valley. It is likely that these roads are, in part, original Indian trails. For example, Mule Springs is indicated on the Wheeler map of 1869-1873. By 1877, Mule Springs is connected by road to Manse Spring. However, it is documented that the Pahrump Paiute "Ash Meadows" or "Mormon" Charlie was the first (circa 1860) to farm the Manse Spring area (McCraken 1990:11, 2009: 4). Another Pahrump Paiute spring fed garden area had been established at Mule Spring "[S]ince the Mexicans used the Old Spanish Trail" (Interviewee - Personal Communication). Chief Tecopa, possibly born at Manse Spring, established a "rancheria" at Bolling Mound by 1875 (McCraken 1990:11; Interviewee – Personal Communication). It is safe to infer that most, if not all, springs in the Pahrump Valley were connected with an indigenous trail system. Further, it is safe to infer that roads that later connected springs followed Indian trails. The first farmers and ranchers of the valley were Pahrump Paiute and, as the first ranchers began to adapt to the use of the wagon, it is likely that it was Paiute Indians that constructed

the valley's roads, whether or not such roads followed original Indian trails. It is highly likely that the spring areas of the Pahrump Valley that align along the present California-Nevada border were connected by a trail system and that all of these spring areas were connected to other Paiute-occupied springs such as Resting Springs and Tule Springs.

As the agricultural and mineral values of the Pahrump Valley became more apparent and non-Indians began to dominate the Valley, there was a push to remove all Paiute, including Pahrump Paiute, to the Moapa Reservation (established by Executive Order in 1873) located east of Las Vegas. Special Indian Commissioners Wesley Powell and George Ingalls recruited Chief Tecopa to go around Pahrump and Las Vegas Paiute territory to talk his kin and neighbors into participating in the march to Moapa (Lowe 1981). In an article titled *Chief Tecopa and the "Hikos"*, Celesta Lowe documents Chief Tecopa's journey circa 1877. See Figure 4 for a mapping of Chief Tecopa's journey. It takes him from Pahrump, southeast through the villages of the Pahrump Valley Springs, and over Mountain Pass to Las Vegas Springs. From there, the Chief and his son Johnny traveled along the springs north of Las Vegas, Tule Springs, Indian Springs, Johnny, and then Ash Meadows. Talking his fellow Southern Paiute through the inevitable changes to come, the Chief did not reach his first resistance from his own people until after following the Amargosa River south to the area of Shoshone. The Yagats Band felt secure at their springs that provided ample water for acres of vegetable gardens. From there, the Chief and his son continued south into the Mojave desert and to the Providence Mountains and the famous caves that were once occupied by Pahrump Paiute people. From the Providence Mountains, they headed east towards Searchlight and the Newberry Mountains. From the Southern extent of Pahrump Paiute territory, Chief Tecopa traveled north to Las Vegas Springs and then back over Mountain Pass to his home at Pahrump Springs. This journey indicates the extent of Pahrump Paiute territory. It also shows the extent of wagon roads established by the 1870's, since the article describes Chief Tecopa and his son Johnny taking the circular journey in a buckboard wagon. It also indicates a Pahrump Paiute leader's knowledge of his homeland and the people that inhabited Tecopa's circular journey. Subsequently many Pahrump Paiute were forced to leave their homes in Pahrump Valley with the only viable option being to relocate to the Moapa Reservation. Some Pahrump Paiute stayed behind and some Pahrump Paiute returned after a few years in Moapa as conditions were not good due to poor government management (Zanjani 1994: 33-47). Some of those that stayed behind or returned now comprise the Pahrump Paiute Tribe.

A Moapa Tribal member with ancestral ties to the Pahrump Valley recently exclaimed:

> "An Indian trail isn't just one or two-track like the wagon roads are. Instead, Indian trails are corridors. When it is decided to go from one place to the next, then Indians simply go. If they are in their own lands, they don't get lost because they know where they are. White people are the ones who need trails so they don't get lost. Local Indians sometimes followed paths because, over time, the trail marked the best way to go... but that isn't the only way that Indians would go. The whole spring area [Stump Springs to Pahrump Springs] is an Indian travel and use area. Indians walked all over that project area [Hidden Hills Solar Generation Systems]. I walked all over the project area. I used to hunt rabbit and quail out there in the 50s" (Interviewee – Personal Communication).

Sacred Trails

There is physical and epistemological[1] overlap of trails on and through the landscape regardless of the intent and psychological disposition of the Pahrump Paiute traveler. That is to say, that a trail, a traveler, and the knowledge of the trail (usually encapsulated in a song) are not separate and distinct realities. This is hard to articulate in English. In the words of a Pahrump Paiute tribal representative:

> Song trails that are connected to the Spring Mountains include the Fox Trail and the Mountain Sheep Song. Each trail is connected to powers, as well as the life of the Southern Paiutes. These trails are sacred because of the elements that can be found by following them, or because of their ultimate destination, such as the afterlife. Even song trails that are used to guide people from place to place are connected to power, in that people travel along paths of power. Groups used traveling songs that told of their seasonal rounds. In each of the songs, places are linked together by a mental and/or physical path. All places along the routes are connected with creation (Jim-2012:2).

Landforms

According to the literature, the Southern Paiute, including the Pahrump Paiute, have adapted to their environments over at least the last 500 to 3000 years. Archaeologists have competing date claims and lines of evidence to support various dates (Bettinger 1982: 490). More recent dates, most from archaeological sites located in the Las Vegas Valley, provide dates for Southern Paiute ceramics located near springs that are between 1000 and 500 years ago (Roberts etal. 2007: 46-47).

Pahrump Paiute claim that dates supported by archaeological evidence are arbitrary and the musings of experts from an alternate world view than the world view of traditional Southern Paiute. Regardless of origins, Southern Paiute, (or what archaeologist refer to as a southern extension of the "Numic Spread"), adapted to the desert environment in a lifestyle that relied upon multiple sources of food that required intensive food gathering, hunting, processing, procurement, and storage. The diverse food procurement lifestyle attributed to Southern Paiute, required an intense knowledge of specific territories (Bettinger and Baumhoff 1982: 490-493).

An alternate abbreviated version told by Southern Paiute, insists that they were placed in their various homelands by the creator. For the Pahrump Paiute, the story has the Southern Paiute world flooded with only the highest peaks of Mount Charleston poking above the water as an island. All of the animals, at that time with anthropomorphic characteristics, moved down the flanks of the mountain as the water receded. Significant animals, such as the two brothers Wolf and Coyote, Deer and Mountain Bighorn Sheep, Mouse and Kangaroo Rat, and many birds participate with one another to remake the world as it dried out. Mountain Bluejay is sent to check on the receding waters of the "ocean" several ridges to the west (Badwater, Death Valley). Coyote introduces humans into this world by allowing a basket to open up and the various Southern Paiute spring from this basket. Coyote then instructs humans how to

[1]Epistemology: the branch of philosophy that studies the origin, nature, methods, validity, and limits of human knowledge.

survive within their territories. This story was not provided by Pahrump Paiute to the author due to the seasonal prohibition on telling such stories. However, several Southern Paiute versions of the story exist in the literature and were summarized above. The summarized version above does not provide nuanced meanings and distinctions that are unique to the Pahrump Paiute people who are the Southern Paiute custodians of the Spring Mountains and Mount Charleston where all of the rest of the Southern Paiute attach significance as a common place of creation.

This symbolic, and to the western mind, seemingly fantastic story provides the basis for defining the Pahrump Paiute world as a world that they are entitled to as a birthright and as a pact between them and their creator, somewhat akin to the concept of a "holy land". Further, Stoffle explicates that:

> "For land attachment reasons, most Indian people have two origin places – an origin place for their ethnic group and one for their local group" (Stoffle et al 2009:33).

This explains how two neighboring tribal groups can agree to a common place of origin and simultaneously point to separate places of origin for their own sub-group.

Stoffle goes on to describe that Mount Charleston, *Nuvagantu*, "where snow sits" is one such place of symbolic origin. It is "the" Southern Paiute place of origin, because it is a source of the most abundant water in the entire Southern Great Basin, a place of extreme topography, and a house for numerous animals that figure prominently in Pahrump Paiute story, song, inspiration, and sustenance and that serves to consolidate the various contributing powers that are the Spring Mountain Range (Ibid: 35). It is not the fact that it is the highest peak available within human eyesight that makes the place powerful; rather it is that its body, the mountain in its entirety, holds and is supported by many features that all contribute to its power. As one Pahrump Paiute expressed, "[A] valley is defined from the valley floor up to the tops of mountain ranges and mountain ranges are defined from the tops of mountains down to the valley floor" (Interviewee - Personal Communication).

The interconnections, overlaps, and relations go far beyond what has been documented in the literature or what can be possibly adequately conveyed in one or two interview sessions or in this report. Despite the inadequacies of written English to fully explain the complex relational systems of peoples and places, the following list of mountain ranges are just a few of the places understood, revered, travelled about, or otherwise important in Pahrump life-ways. A complete list of culturally important mountain ranges can be found at Appendix 4.

Potosi Mountain

[redacted]. It is the head of Ocean woman. (Interviewee – Personal Communication)

Sandy Valley

This landform section provides additional information beyond some of the other landforms described in this section because the Sandy Valley area is considered a proposed project alternative.

The Sandy Valley area is within the Pahrump Paiute Tribe's ancestral territory. The valley rests between two tribal districts. To the east of the alternative site rests the Potosi District traditionally represented by Chief To-ko'-pur. Chief To ko'-pur was widely referred to as Chief Tecopa. Chief Tecopa was also the head Chief for the larger seven district ancestral territory of the Pahrump Paiute tribe. Chief Tecopa passed away in 1904. To the west of the project area is the Mo-quats District that was represented by Chief Hu-nu'na-wa. The Sandy Valley study area was a common use area between the two districts. The Potosi District's center is Potosi Mountain and the Mo-quats District's center is Kingston Peak. Several springs exist around the flanks of each mountain. These springs were centers for family units that seasonally traversed the districts' mountains, lower flanks, valley floors and the washes that drain the mountain slopes and eventually lead to Mesquite Dry Lake. Some of the significant springs that anchored family units in the vicinity of the project study area are Potosi Spring, Cave Spring, Horsethief Spring and Beck Spring. While Pahrump tribal families have since moved away from the springs, with many now residing in Pahrump or Las Vegas, the Sandy Valley area and the mountains to the east and west of the valley are still used by Pahrump Paiute for traditional purposes.

Potosi Mountain sits above Sandy Valley and is a vision questing area. There was a large prehistoric bird that had an egg the size of a house. The bird laid the egg in Sandy Valley [redacted] (Interviewee – Personal Communication)

Moapa tribal members related that there are village sites on the [redacted] of the valley [redacted]. These locations were indeterminate (Interviewee – Personal Communication). It is known that Cub Lee, who married a Paiute woman, maintained a well and cattle ranch in the Sandy Valley area (Waring 1920: 70). It is also documented that "Indians dug pits for water" on the east side of the valley in a sandy area (Ibid 78).

The Coyote Trail Song goes through Sandy Valley (Laird 1976).

Kingston Mountains

Home of Owl. A place where pinyon nuts are gathered. Also a hunting area for Bighorn sheep and deer. [redacted]

No Pah Range

A place were Big Horn sheep are found. There is very little water in this range. [redacted] Some Paiute lived at the [redacted]

Resting Springs Range

Indians live at the [redacted]. There were ceremonial bathing places that are now the [redacted].

Lizard Mountain

(also referred to as Last Chance Range (middle and eastern portions), Shadow Mountain (southern portion) and Devils Hole Hills (northern portion))

This is a place for [redacted] and is described in songs and stories that tell of when the sky opened up during the time of Southern Paiute creation. The southern side of the mountain has the mark of a lizard, similar in color to the chuckwalla lizard, across its flanks. [redacted]

Stirling Mountain

This mountain is located at the northern end of the Spring Mountains and is said to be the foot of Ocean Woman. (Interviewee – Personal Communication) It is a place for hunting, gathering, and [redacted].

These mountain ranges provide most of the water that supplies the springs listed in the water section and mapped on Figure 5. The southeast side of Mount Charleston, the highest place in the Spring Mountains and the place of Southern Paiute creation, provides the water that emerges from the springs closest to the project area. Specific Springs will not be further described here.

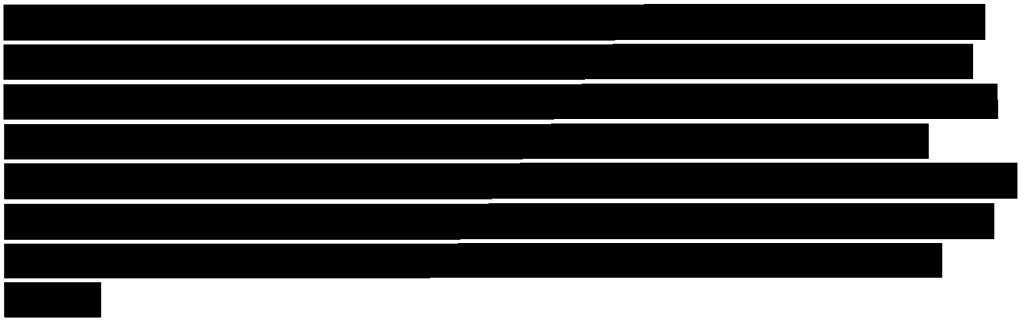
Landform Connectivity

The Southern Paiute People live in a world very alive with spirits and power. Some spirits originate from when the world was new, and some spirits are from a time when animals had power of speech and were defining customs that the people would later follow. Spirits can behave beneficially or malevolently towards people if customs are not followed. Southern Paiute with specific knowledge can interact with spirits by dreaming or singing. The following has been excerpted from a Pahrump Paiute document (Jim 2012: 1).

Earth Spirits

[redacted]

Mountain Spirits



Water Spirits

Other Spirits

Power *Poe-ha-ghun*[2]

A mainstay of Southern Paiute thought and practice, is a "power" or p*oe-ha-ghún* that is synonymous with mountain ranges and interconnected landscapes. *Poe-ha-ghun* is a sustaining and reciprocal power that requires human obligations to their place, as much as the place and its contributing attribute have obligations to provide for its people (ibid: 36). Powers are manifest in many attributes; water, plants, and animals are a few of the inter-connecting attributes. It is said that plants that contain curing properties, the animals that instructed humans concerning the plants curing powers, the humans that dream of, know of, and administer the plants curing properties and the person cured, all participate in a resonance of "power" or *poe-ha-ghun* (Interviewee – Personal Communication, Interviewee – Personal Communication). While *poe-ha-ghun* is a concept that is interconnected and therefore is disperse, it can also be concentrated in various places and particularly mountains and springs. For example, Mount Charleston is an origin or holy place for all Southern Paiute, including the Pahrump Paiute. One of the springs feed by these waters is Stump Spring where John "Stumper" Pete received and administered his powers. In addition, Pahrump Paiute relate to additional places throughout their territory and landscape, which stretch this obligation into one that pervades beyond a place to encompass an entire territory.

Poe-ha-ghun not only emanates from power places like mountains, but also, similar to electricity, resonates between places through conveyances called *poe-ha-ghun* trails. Such trails are physically manifest on and in the land, in the creatures that move about the land, and in human travel that occurs

[2] Some literary sources on the subject of Southern Paiute power refer to power as *puha.* The complete Pahrump Paiute word is *poe-ha-ghun* and is used in this document rather than the abbreviated word *puha.*

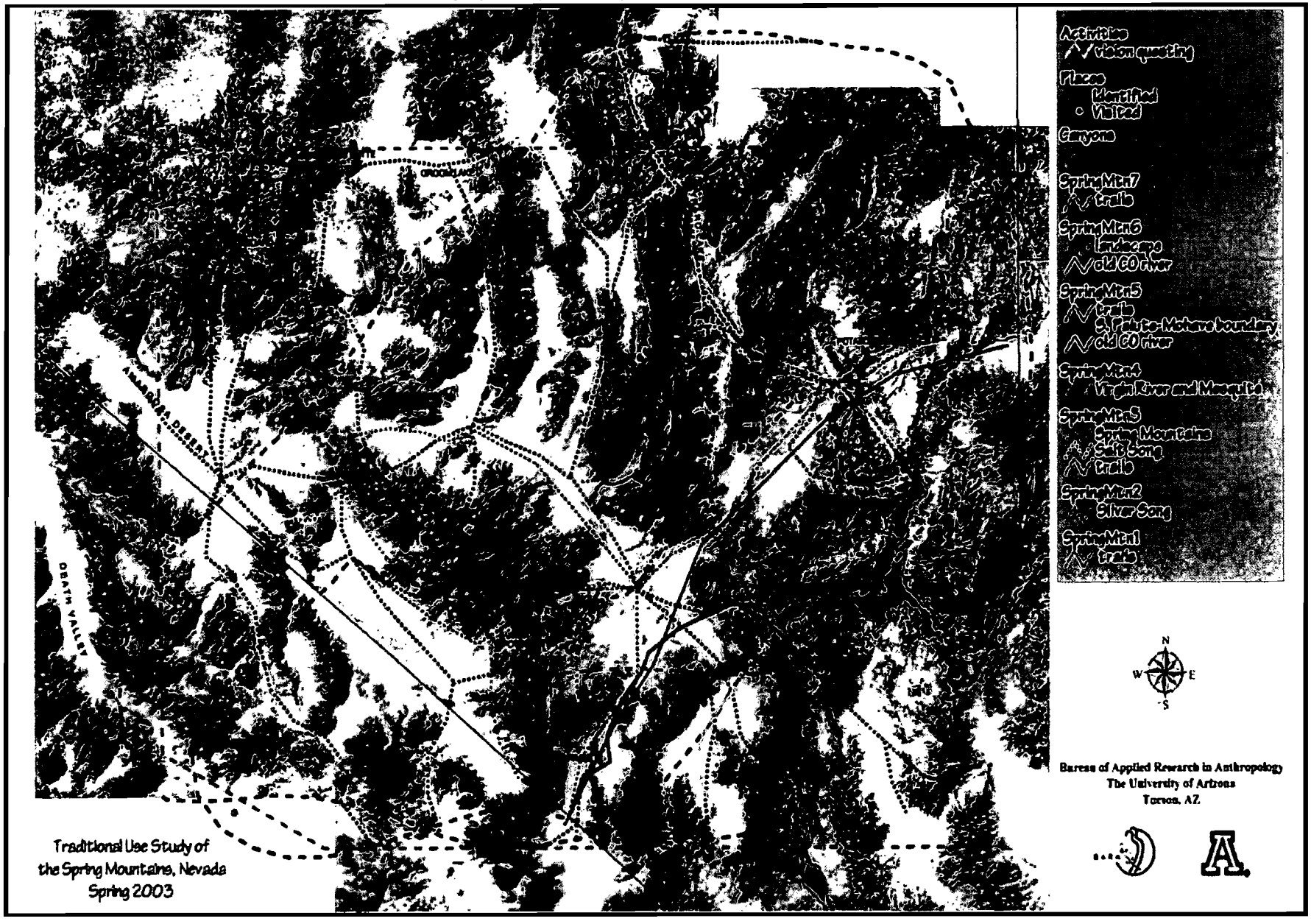
by walking, running, dreaming, or singing. These trails are of a religious nature and are further discussed in the next section. A Pahrump Paiute attempts to express this complex:

> "This is Paiute "Holy Land". The Mountain is a holy place and it extends from the top all the way to the flats. Potosi is the head, Mt. Sterling is the tail. Woman helped create people. You can see her silhouette as she is laying down. Once the land was covered with flood. Then the waters went down and sky opened up. A big bird came down and seized lizard. The bird then threw up lizard. There are three green marks on the mountain up by Lizard Mountain. The Woman is watching over all of this. She will be the one to know of the havoc created." (Interviewee - Personal Communication).

Figure 6 is a map that provides a visual two-dimensional image of how extensively *poe-ha-ghun* trails circulate and emanate from the Spring Mountains. This map is not included to show where precise trails are and by extension are not. Rather it is intended to show how extensive a holy place is for a people's inhabitation of their birthright lands.

CULTURAL RESOUCES - FIGURE 6

Hidden Hills Solar Electric Generating System (HHSEGS) - Puha trails that circulate or emanate from the Spring Mountains



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SOURCE: Publication: Landscapes of Origin in the Americas, Edited by Jessica Joyce Christie, 2009, Fig. 3.2

Ma-hav (Hidden Hills) Landscape

The Hidden Hills area, because of its proximal and encompassing relation with the proposed project site, is culturally described further. Numerous places, stories, and Pahrump practices abound throughout the landscape which will be referred to as Ma-hav, the Pahrump Paiute place name for what is referred to in currently as Hidden Hills. Pahrump Paiute tend to use either place name inter-changeably but in conversation with non-Paiute tend to refer to the place by its more current name.

The Ma-have Landscape, specifically refers to several springs, an intermittent set of creeks that, flowing all of the way from the flanks of Mount Charleston, cut through a coppice dune mesquite bosquet zone and includes the valley floor and the edge of a dry lake bed. This area is rich in prehistoric archaeology, historic archaeology, includes a historic ranch complex and is replete with historic events involving local Pahrump Paiute and later newcomers. Ma-hav is an area of approximately 35 square miles that takes in the southeastern margins of the Pahrump Dry Lake bed, the washes that extend from the alluvial toes of Mt. Charleston down to the Pahrump Dry Lake bed, the spring areas in between that include Browns Spring, Hidden Hills Ranch Spring, Stump Spring, several unnamed spring discharge areas (including Weeping Rock Seep), the various vegetations including the Mojave Scrub, Shadscale Scrub, and the coppice dune mesquite grove areas. The proposed project site, taking its name from the dude ranch established by Roland Wiley, is wholly within the Ma-hav Landscape. It is a place where Pahrump Paiute lived, hunted, gathered, worshipped, were born, gardened, died, and were buried. Figure 7, located at the end of this section, is a vicinity map of the Ma-hav Landscape.

A Pahrump Paiute person provided the following synopsis.

> Many types of clay for pottery come from the Hidden Hills area. Hidden Hills was a caching area. This entire area is extremely important and was the site where Indian families lived. The entire area is a known desert tortoise habitat that was, and is, currently used for the traditional collection/preparation of medicines and foods. This particular location is considered unique and is the home of these resources that can only come from this special area (Interviewee – Personal Communication).

Ma-hav is particularly where females become woman, learn of menstruation, birthing and menopause. Set in the time just after creation when animals were anthropomorphic, it relates the connection between mountains, valleys, springs, creeks, travel and procreation and the role of the creator in teaching humans how to be.

[redacted]

While some of the exact course of events and specific meanings are lost to translation and because of gender specific descriptions that are taboo for mixed audiences, the story attempts to convey that Hidden Hills is a place designated by the creator (coyote) as a place where girls learn to become women.

Before Owl switched the course of the Colorado River, [redacted] (Interviewee – Personal Communication).

There are several burials located throughout Ma-hav, some marked and some no longer locatable due to shifting sand. One such cemetery has some evidence of grave looting. When the Pahrump Paiute took the author to one such cemetery, [redacted], it was noted that within the last month someone had stole the cemetery gate. Two graves sites showed signs of digging, leading some to wonder if the bodies had been taken and who would do such despicable things. Another Pahrump Paiute source suggested that one of the burials was simply a grave dug, but the internment was cancelled for that cemetery and the potential grave was never backfilled (Interviewee – Personal Communication). A local historian suggested that one of the open graves sites was that of John B. Yount, who was buried in the cemetery, but later was moved to the Chief Tecopa Cemetery located in Pahrump where he was buried in the Indian part of the cemetery (Interviewee – Personal Communication, Pahrump Nevada Genealogical Society 1998: 7). Another suggestion is that the open grave was where the Indian Queho was buried by Roland Wiley and then later exhumed by local tribes (MacDonald 2012:1). The Pahrump Paiute vehemently deny these last two suggestions and provide their version of the Queho story.

One Pahrump Paiute relayed the Queho story as follows.

> "Queho Burial/monument – The burial is located [redacted]. In very broad terms, Queho's remains were found in a rock shelter and exhumed circa 1920. The remains were possessed by the El Dorado Elks Club. The Elks had a parade float that had a simulated rock shelter with the actual remains entombed. The float was used in an annual parade into the 1960s. The float commemorated "The Last Indian Renegade." When it was decided that it was not politically correct to parade bones in public, the remains were stored in an Elk member's garage. Roland Wiley (a non-Indian owner of the Hidden Hills area) discovered the bones and took possession of them and then reburied them [redacted]. He wrapped the remains in chain link, encased the remains and chain link in concrete and then buried the entire package under a concrete slab with a memorial plaque that continued the "last renegade" language. The burial sits on [redacted] overlooking the project area" (Interviewee – Personal Communication).

The full story is more telling of a century of Indian and white relations and is pieced together from several sources that include two Pahrump Paiute interviewees, O.J. Fisk Photographic Collection: 0221 0434, and Donna Andress 1997.

Queho was born circa 1880 of a Cocopah mother. His father was a white soldier stationed at Fort Mojave. The mother and child were banished from the tribe and they both moved north to Southern Paiute territory where they were taken in by Moapa Southern Paiute. As a young man, Queho had a

Moapa half brother, Athocwa and was also related to a Moapa Paiute named Archie Kay. Queho's other close Southern Paiute friends were Joe Rudloff, and Jim and Tweed Wilson. The notorious Moapa Paiute "Mouse" was Quehos' mentor and protector. Queho worked as a miner, was a boatman along the Colorado River, was adept at mechanical skills and was known for his hunting and general desert skills. Mouse was legendary for similar skills, considered a "renegade", and routinely evaded law enforcement.

Queho was accused of killing another Paiute in 1910 over a dispute involving a firewood transaction. Apparently this led to lengthy spree of thievery, killings and miraculous escapes. Much of this happened in the Searchlight area. Mouse led a similar lifestyle. However both Indian men were said to have been blamed for more acts then they were physically capable of committing. Posses were established and manhunts were periodically conducted.

In February 1940, two prospectors were exploring the Colorado River five miles upriver from the El Dorado Canyon. They noticed a cave at the foot of a cliff and noticed that the cave opening seemed to be unnaturally chinked with rock. Fulfilling their curiosity they made their way up and into the cave and found the mummified remains of Queho. A loaded rifle lay nearby, as well as a bow and arrows. Cans of food were lying about. The cave had been wired with trip lines attached to a bell. Also found were stolen items from Searchlight including a Gold Bug Mine watchman's badge. One of Queho's legs was deformed from what was speculated to be a snake bite. It was surmised that he died of the snakebite and starvation. Others later mentioned that some Southern Paiute knew of Queho's hideout and delivered groceries to him.

Las Vegas Chief of police, Frank Wait, who had led some of manhunts over the years, claimed the remains as his own property to compensate for all of the times that Queho had eluded him. However the Clark County Sheriff ruled that the remains were the property of the County. Wait, undeterred located Archie Kay, Queho's Moapa relative, and supplying Kay with groceries and money, convinced Kay to claim Queho's body. However by the time the pair had arrived to claim the remains, Sheriff Ward had transferred the body to the Anna and Gene Park's funeral home. A dispute ensued because the Parks would not release the remains unless someone paid the mortuary fees. As Ward and Wait both balked at paying the accumulating bill, the United States Government intervened and made a claim for the remains since the cave was located on federal land. The government refused to pay the bill. This led to a three year stall in determining disposition. In the meantime, the Parks allowed people to view the remains of "The Last Indian Renegade of Nevada". After three years, Wait finally paid the bill and transferred the remains to the Benevolent and Protective Order of Elks, who wished to add the remains to their "Helldorado Collection". The elks built a simulated cave, entombed in glass and placed the remains in the cave and charged admission for viewings. Some of the items found with Queho were also displayed. The exhibit was paraded through the streets of Las Vegas during annual Helldorado Days. A thief shattered the glass and stole the remains in 1956. Another posse was formed by James Cashman, Sr. Because they were thwarted in their search, the posse offered a cash reward. The remains were returned without the thief being exposed. Dick Senever became the guardian of the remains. The remains were stolen and returned a second time. In 1974, Senever donated the remains to the University of Nevada, Las Vegas Museum. Another account states that Senever placed the remains in a

building owned by Dobie Doc Caudill. During the time that Queho's was variously possessed by the Order of Elks, Roland Wiley was the Clark County District Attorney. In 1975, it is said that Wiley purchased the remains from Caudill for $100 dollars. He then reburied the remains near [redacted]. It is said that he felt Queho's journey among the white people should come to a rest. The remains were wrapped in wire, encased in concrete and entombed under a cement block. He was buried with popcorn to "accompany him on his journey," but was commemorated with a placard that labeled Queho "Nevada's Last Renegade Indian - He Survived Alone." However, an alternative story claims that after the 1956 thievery, Cashman was duped and was sold the wrong remains. In 1962, a work crew building the Bonanza Road, discovered the remains which were identified as Queho. However the upper limbs were missing. This version of the story does not provide the rest of the story as to what happened to the roadside discovery remains. One Southern Paiute man from Indian Springs, a place that Mouse and Queho sometimes frequented, claimed that the remains were not Queho's because the mummy's stature was too small. Queho was over six feet tall and had limp because of a deformed broken leg or ankle that had never been properly set. The Pahrump Paiute Tribe asserts that the remains the Elks had named Queho are indeed buried at [redacted]. Some Southern Paiute relatives and friends of Queho, have stated that the Elks did not have the real Queho remains. See Appendix 6.

Formal Traditional Ceremonies and burials are held at Hidden Hills. They may continue to be held here in the future. The cemetery and the ceremonial areas are still visited by members of the Pahrump Paiute Tribe. Another burial was located [redacted] (Jim – Personal Communication). The tribe says there are other burials in the area for which the exact locations are not known. Yet another burial of a young Pahrump Paiute girl was reported buried at the [redacted] (Interviewee – Personal Communication).

Two Pahrump elders recalled an "Indian Powwow" or religious ceremony held at Hidden Hills Ranch in 1933 for Susie Yount, (Wa-sid-ai) a Pahrump Paiute woman who had passed away in 1932. John Yount was reported to have "allowed" this ceremony as Susie was his first wife. The ceremony was hosted by Nancy Johnson, a Pahrump Paiute relative. The two elders were children at the time. They recalled hundreds of people who camped along the creek who had come from long distances to participate in the ceremony. They recall that the ceremony was held near large gardens of corn, pumpkins, and watermelons. They recall the orchard that still stands today. They assert that the creek flowed all the way from Mount Charleston (Interviewees – Personal communication). One source suggests that Chief Tecopa's cry ceremony was held in 1905 somewhere at Ma-hav (McCracken 2009: 27).

Table 7 provides a Ma-hav Landscape chronology of Pahrump Paiute – Non-Indian events and people.

Table 7. Ma-hav Landscape Chronology	
Time	**Specific Places, People and Events**
Beginning of Time	The area is flooded. Primordial animals abide on Mount Charleston to wait out the residing waters. Coyote releases first humans from a basket.
Time of Animal Instruction to First Humans	Coyote provides instruction to his adopted daughter concerning menses, childbirth and becoming a woman at Ma-hav.
Period of Pahrump Paiute occupation	Pahrump Paiute occupy the Springs area as a part of a permanent or seasonal encampment and horticultural place.
1776 - 1830	Pahrump Paiute hear of Spanish, Mexican and early American traders (Escalante, Garces, Armijo, Jedidiah Smith, Peg-leg Smith) that travel, trade, and raid along some of the Paiute trade routes closer to the Colorado River.
1815	Chief Tecopa born at Manse Spring. He will become a leader of various tribes or "districts" that today collectively identify as the Pahrump Paiute.
1829 - 1848	Mexican traders move goods between New Mexico and California and engage in the Indian slave trade. Some travel the old Spanish Trail between Resting Springs and Mountain Springs.
1840s - 1890?	John "Stomper" Pete, a Southern Paiute Medicine Man occupies Stump Springs. There is also anecdotal information of a Southern Paiute family with the last name of Stump that occupied the Stump Springs in subsequent years.
1844	John C. Fremont travels between Resting Springs and Mountain Springs and overnights at or near Stump Springs. Fremont retaliates upon possible Pahrump Paiute for the killing of most of the Hernandez Party.
1849 – 1875	Many emigrants including, gold miners, Mormons and military personnel travel through Stump and other nearby springs, en route to Utah or California. Early homesteaders begin to settle the various valleys by establishing homesteads on or near springs Including springs in Pahrump Valley.
1849 -1930s	Several diseases are introduced into Pahrump Paiutes well as other Native American populations. Many young and old die. Alcohol is introduced to the Pahrump Paiute causing social disarray. There is a time of famine. This

	happens throughout the Pahrump Valley, including Ma-hav.
1860s	Miners pass through the area to begin harvesting timber in the Spring Mountains to be used for the development of mining infrastructure. The first reported mill is established in the Spring Mountains in 1875 by the Brown brothers.
1860 - 72	Charlie, a Pahrump Paiute man and the Tribal War Chief, establishes one of the first Indian Ranches in Pahrump Valley, the Ma-hanse (now named Manse Ranch). He is sometimes referred to as "Mormon Charlie" or "Ash Meadows Charlie". Chief Tecopa also establishes a ranch at Bolling Mound Spring. John B. Yount is born in Oregon. Charlie is involved in the 1865 assault and robbery of gold prospector Charles Breyfogle at Stump Springs.
1872	Wagon roads connect Stump Springs, Mountain Springs, Charlie's Ranch and other Pahrump Valley Springs. One road runs through the Hidden Hills area. Other ranches become established by Indians and whites at some of the larger springs such as Ash meadows, Pahrump, and Manse.
1873	Chief Tecopa is encouraged by the US government to make his circular journey to convince his and neighboring tribes to move to the newly established Moapa Reservation. The Paiute and Shoshone from the Armagosa River refuse to go. Many Pahrump Paiute are enticed or force marched to Moapa reservation. Some hid and remain, others escape and return.
1874 - 1915	Lee brothers move to area and Phi Lee buys the Resting Spring Ranch. Phi marries a Sally "Mopats," Paiute woman and has several children including Dora, Robert, Robert "Bob", Dick, Clara, Gus, Bert and Cub. Phi and Sally have a seasonal camp at Ma-hav. "Bob" Lee resides at an area of Hidden Hills near Weeping Rock Springs and raises his son Robert (1910?). Cub Lee homesteads in Mesquite (Sandy) Valley. Bob Lee is at Hidden Hills as a small boy and sees two Indian-constructed fireplaces at Hidden Hills.
1877	Joseph Yount purchases Manse Ranch from the Jordan brothers.
1880	Queho is born.
1900?	Albert Howell, Pahrump Paiute, and later informant to anthropologist Julian Steward, lives with his Pahrump Paiute wife Mary at Ma-hav where they maintain a small farm. Howell's have a daughter-in-law named Anna Tecopa. Albert is the son of John Howell, the first black to live in the area

	and is a free slave from North Carolina. John works in the mines and marries a Southern Paiute from Las Vegas.
1904	Chief Tecopa dies, the Chief's son, Tecopa Johnny inherits his father's leadership role.
1905	Chief Tecopa's Cry ceremony held at either the Pahrump cemetery or Ma-hav or at both places.
1910's?	Dora marries Gallant Brown and they live at Ma-hav near Dora's brother, Bob Lee's place. Dora and Gallant have several children, (Steve, Earnest, William and Gallant Jr.), who are raised in the Ma-hav area.
1900 - 1920	Many more ranchers and farmers move into the Pahrump Valley and begin to develop large crop lands, which require greater amounts of water. Many Pahrump Paiute provide the labor required for the flourishing ranches of the Valley. Chief Tecopa's son Charlie is killed in 1911 by another ranch hand, Joe Lake while both are working for the Manse Ranch. Pahrump Paiutes claim that Charlie Tecopa (Paiute) was shot by John Yount (east of Manse Ranch) and is buried [redacted]. And John Smith (Paiute) was shot by John Yount [redacted] and was buried where he was shot.
1911	Las Vegas Reservation established through a 10-acre land donation made by Helen Stewart.
1915	John Yount, son of Joseph Yount, sells his Trout Creek Property to Phi Lee, and he and his Pahrump Paiute wife Sally "Mopats," move to Ma-hav and rename the place Charleston View (not the Charleston View of today). John makes improvements.
1916	It is reported that the Yount Ranch (at Ma-hav) was irrigated by means of windmills that pumped from three shallow wells. Water was within 6 to 15 feet below surface.
1921	George Rose receives patent on 179 acres to the east of the Bob Lee homestead and north of the Yount Ranch.
1922	John Yount files fee patent and becomes owner of Yount Ranch at Ma-hav.

1920-31	"Tank" Sharp (Libby Scott's son), whose family is from Mound Spring and Manse Ranch area is ¼ Pahrump Paiute and friend of John Yount. Tank operates a still and bootlegs alcohol from the hills around Yount Ranch. Joe Hudson, a non-Indian killed Tank, and Oscar Bruce a Pahrump Paiute from Mound Spring and perhaps living near Bob Lees place, retaliates by killing Joe Hudson. The still area can still be found at [redacted]. Other bootleggers operate out of the Ma-hav area.
1926	William Wilson receives patent for 160 acres immediately south of the Yount Ranch.
1920's	John Yount purchases Wilson and Roses' properties.
1932-33	Susie Yount, John Yount's first wife dies and a Cry Ceremony is held at Yount Ranch. John Yount allows the ceremony. Hundreds of Indians attend ceremony and camp out at the Yount Ranch near the orchard.
1930's?	Bob Bruce and Susie Howell die and are buried at the Ma-hav cemetery.
1930's to Present	Archaeologists accumulate evidence of southern Great basin/Mojave desert occupations that reach back to 12,000 years B.P. When inland seas covered some of the area. There are numerous archaeological sites throughout the Mesquite dunes including at Hidden Hills Ranch.
1935 – 1940	John Yount has a second common-law wife named Sally Belle, who is white. John dies. Belle attempts to sell property to Roland Wiley and becomes embroiled in estate heir-ship problems with Younts. Eventually Wiley buys out heirs. Before Wiley arrives at property Sally Belle illegally sells property to Louise Kellog. Wiley and Kellogg have a legal battle and Wiley wins. Wiley evicts Kellog.
1940-1990	Wiley buys additional property. Wiley evicts numerous Pahrump Paiute families from his properties. Including Dora Brown. Dora establishes Dora's Place at Browns Spring In 1941. Wiley holdings become the largest private property holdings in Pahrump Valley. Wiley establishes the Hidden Hills Ranch (dude ranch), has guests living in teepees and digging for Indian artifacts, constructs an airplane runway, attempts to grow crops, taps springs and messes up water flow, builds Cathedral Canyon tourist attraction. Wiley hires Al Carpenter as the Hidden Hills caretaker.
1940s to Present	Pahrump Paiute families, Lees, Browns, Weeds, Howells, Bruces and Toms and their descendents continue to live near Hidden Hills after being forced out. These are some of the families that are tribal members of the

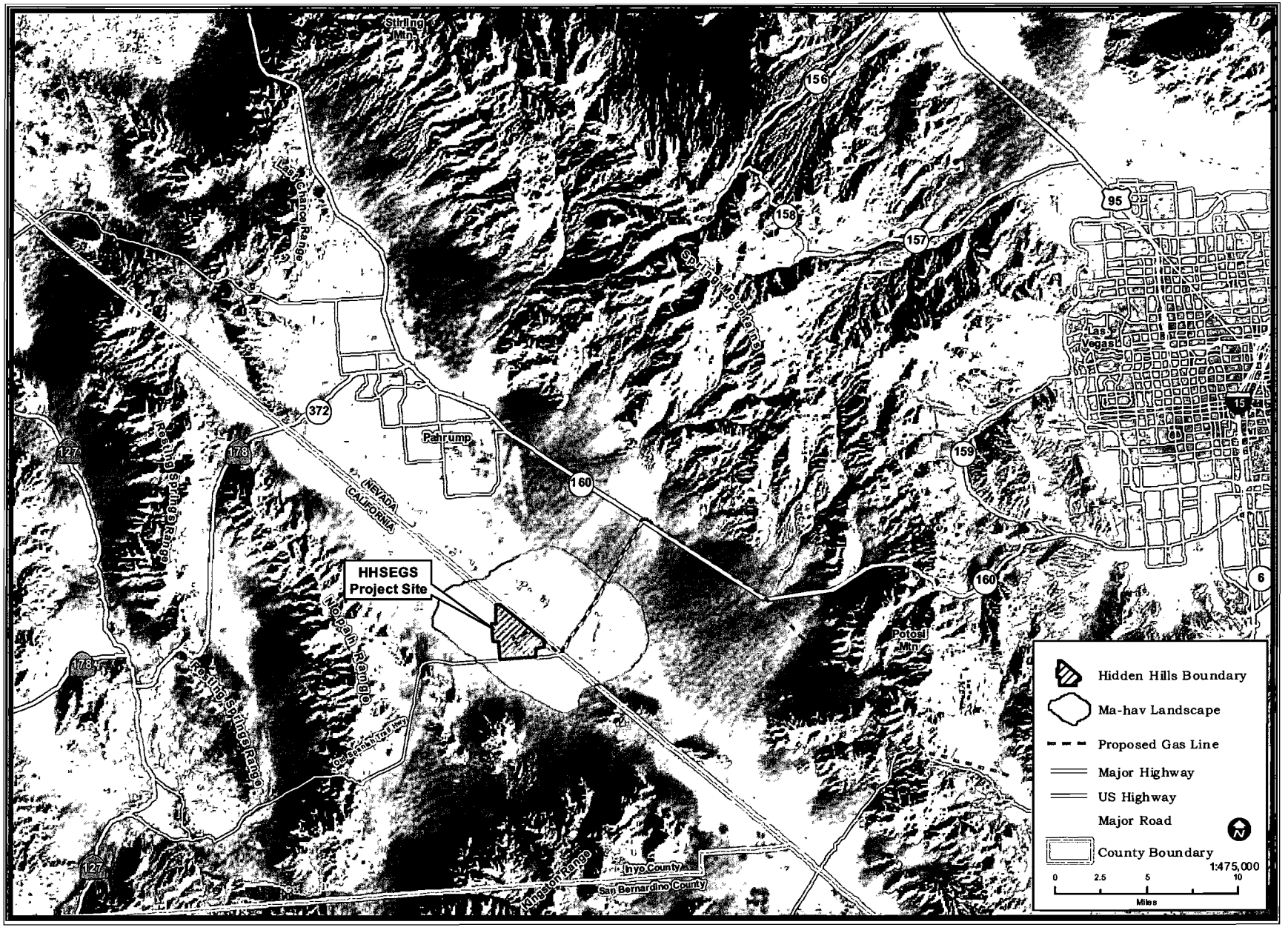
	unrecognized Pahrump Paiute Tribe. The Ma-hav Pahrump Paiute Cemetery continues to be used and maintained by Pahrump Paiute.
1951	The mushroom cloud from the detonation of an atomic bomb can be seen from the Hidden Hills ranch.
1975	Queho is buried at Hidden Hills Ranch.
1987 to Present	Pahrump Tribe files for federal recognition with the U.S. Department of Interior. The filing was posted in the Federal Register on Dec 10 1987. The petition for federal recognition remains pending.
1989	Roland Wiley dies and Wiley estate is established
2006	Hidden Hills Caretaker, Al Carpenter dies. Hidden Hills Ranch is vandalized and looted.
2006	Stump Spring ACEC, established by the BLM for protection of the associated cultural resources located at and near the spring.
2011	Bright Source proposes Hidden Hills Solar Energy Generating Systems on Wiley Property and has lease option with Wiley Estate.

Appendix 6 provides a selection of historic photographs of the Ma-hav Landscape.

Figure 7 provides a vicinity map of the Ma-hav landscape.

CULTURAL RESOUCES - FIGURE 7

Hidden Hills Solar Electric Generating System (HHSEGS) - Ma-hav Landscape Vicinity Map



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SOURCE: Landsat - NASA (2002), SRTM Shaded Relief - USGS (2005), US Major Highway - Tele Atlas North America, Inc (2010).

Burials

The following burial practice description is a combined effort that was provided by Pahrump Tribal representatives.

> "Native Americans are buried in different areas. In the desert, sometimes the deceased were not able to return to villages or their areas to have proper burials. It just depended on the situation. After the person died, they stayed with the body all night, singing the various songs for them and preparing the body for burial. A relative cleansed the body with herbs and soapy water and dressed the body. A long time ago, when the body is buried, it was sometimes [redacted] This practice is still observed. Sometimes the body was put in [redacted]. Burned creosote bush was placed on top, which left an oily film, to keep away the animals. [redacted] People would come from long distances to participate in the traditional religious funeral ceremony. Many time people would speak during the ceremony as they came and encircled it clockwise. Singers would come from all around to sing for days and describe the spiritual journey the deceased would travel. This is different than the Cry Ceremony that is held one year after the death. This ceremony reminds the soul how to travel to get to that place. [redacted]. Some property is burned separately. They do this right away. A long time ago, if the man had dogs or horses, they were taken out and shot by a non-relative. If it was a woman who died, they broke her metate, and destroyed her personal things. Mourners trimmed their hair a little, if distant, or cut their hair short to their neck or ears if close relative, like mom, dad, spouse, child, etc... the day after funeral. The name of deceased is not mentioned again as it will call the spirit back of the deceased. This important ceremony allows the grieving to sing songs and dance.
>
> After the mind leaves the body it turns into the soul. It travels and goes away, but still remains within the homelands. [redacted] to a good place where everything was lush and they saw their relatives who had previously took the journey but they were well again. They saw the land how it once was. All said they had to cross a wash, and if they were bad, they would experience making the journey. Elders scold children for whistling at night because it could call back or confuse the deceased. Today, we still feed the land and spirits by throwing food away at the first meal. It was thrown in all directions, so that they would not get sick from the spirits that might still be in the area." (Jim 2012: 10; Interviewee- Personal Communication)

One elder from Moapa stated, "Suicide was a no-no. That is not right to do that. The Creator has a plan for everyone, so those people are going against the will of the creator; they do not get a Salt Song Ceremony. Their souls wander." (Interviewee – Personal Communication)

Pahrump Paiutes also consider Suicide taboo. (Interviewee – Personal Communication).

There is some uncertainty in the literature as to whether Pahrump Paiute cremated their dead (Kelly and Fowler Vol. 11. 380). Most Pahrump Paiute today say that cremation was not a traditional practice. Others suggest that cremations were rare and conducted when there was strange sickness or the deceased was considered a practitioner of "bad medicine" (Interviewee - Personal Communication). Sometimes, when the ground was to hard dig, the deceased was [redacted], then creosote was burned on top to cover with an oily film to keep animals away, and only their possessions were burned. [redacted]
(Interviewee – Personal Communication

One local archaeologist reports that he has seen Southern Paiute burials in the local area discovered at the bottom of [redacted] (Interviewee – Personal Communication).

Suffice to say that a homeland is a place that one's people are created in, inhabit, die, and are buried in.

Ceremonies and Trail Songs

Pahrump Paiute hosted their own and participated in their neighbors' ceremonial cycles (Kelly and Fowler Vol 11: 383-385). Many and various Paiute from Pahrump, Las Vegas, Moapa, Paiute Springs, Lone Pine, Independence, Big Pine, Bishop, Benton, Needles, and elsewhere still believe in, practice, understand, and educate others concerning their traditional religion. The song trails are for all Southern Paiute. It can be argued that Salt Song trails are the most important of all trails for Southern Paiute because, sooner or later, all Southern Paiute will travel that trail (Stoffle 2009:40).

The various Southern Paiute trail songs and related ceremonies are listed and described. This list was provided by the Pahrump Tribe (Jim 2012: 2-5).

Southern Fox Trail Song

The Paiute stories of the journey of the Southern Fox include references to several places within Pahrump Ancestral Homeland Territory. Southern Fox sets out to visit his brother Blue Jay to the north, meeting various others along the way. He had several adventures with Flicker, Bear, Wasp, and Crow. He starts from [redacted]. Ultimately, he ends his journey at Fire Valley, before returning to his home.

The Fox Trail is a spiritual trail that comes into the vicinity of the Spring Mountains, Nevada Nuclear security site (formerly Nevada test site), Pahrump, etc... It moves in leaps from spring to spring, traveling south. That was Fox's journey down to the southern end. He made the water holes with his arrow. Indians travel this route in ceremony through song to check on the water and bless the water and give thanks for the spring, and this keeps them alive.

Salt Trail Song

This is an important song. It is mostly sung today at Annual Morning Ceremony or Cry Ceremony. The Song is about travels from place to place, naming everything they saw. [redacted] Each place they stopped has its own story and named as you go along [redacted] This song describes where to go and then how to get there and what to do. Paiute people travel on these trails physically across the land, mentally in a dream state, and spiritually after death.

Coyote Trail Song

This is a traveling song. Coyote started in [redacted], went place to place, walking around, telling everything he did, even stealing cantaloupes. [redacted] then back to where he started.

Bear Trail Song

This is done in the spring time to show respect for bears emerging from hibernation. [redacted]

Bird Trail Song

The Bird Song, [redacted] This is sung at harvest time and at Mourning Ceremonies.

Deer Trail Song

The Deer Song tells of the deer's travels around [redacted] naming every place that he stops and everything that he eats.

Mountain Sheep Trail Song

These songs were dreamed and ran in the family [redacted] The song names every place you can find sheep, his travels. Many songs, maybe 200 total. [redacted]

Prophesy Trail Song

Use of a split-stick cane rattle instrument. [redacted], he tells what is happening far away.

Prophesy Ceremony

[redacted] Dance is held outside in the evening at social occasions.

Circle/Round Dance Ceremony

This dance is usually done at any time, social, sometimes funeral, night, harvest time, for rain, and when there is enough food for up to a week. [redacted]

Bear Dance

A Woman's Choice dance [redacted] Ceremony and/or Social Dance.

War Dance

This is an enemy dance to show solidarity during war efforts [redacted]

Bird Dance

[redacted]

Salt Song Dance

[redacted]

Mountain Sheep Dance

[redacted] Dance version was sung at Mourning ceremonies and again for a person who had owned it.

Coyote Dance

[redacted]

Deer Dance

[redacted]

Hunting Deer Dance

Used before a hunt, sung by the man who owned it for the hunters alone, and on their request. [redacted] After that, they went hunting for game.

The following additional information was provided by a Pahrump Paiute traditional singer. This information is provided to summarize what Salt Song trails mean and how they function in the Pahrump Paiute world today.

> Various trail songs are vocal snapshots of the landscape. Various places and geographic features are covered, but that does not mean that a song has less significance for a particular area because a place is not mentioned in a song. However, playas and flat desert areas are mentioned in songs... not just prominent landscape features, such as springs or mountain ranges/peaks. There are 364 plants and 170 animals mentioned in the songs. The vocal snapshot is a total experience; not just a visual experience. It is sung and therefore it is an auditory experience. Therefore, there is a reverberation, resonance quality that rings throughout valley/mountains. For example, Fox songs really hone in on springs/water sources. This is not to say that the other songs ignore water sources.
>
> When something is taken that was not properly requested, then traditional Southern Paiute believe that physical and spiritual imbalance results. Imbalance causes sickness and that increased imbalance places a burden on singers and healers. It is not a matter of whether a traditional system works in the face of incompatible change, but rather the difficulty or additional burden to continue adapting and adjusting to incompatible change.
>
> When singing, the traditional system is very complex and requires cognizance of ten directions: cardinal directions (4), up/down (2), past, present and future (3), and self (1)

> Songs follow a tradition, but also are individual expressions that resonate, reverberate with the land, the songs both re-make the land and are made by the land. Because of individual singers with multiple directions, there are multiple landscape iterations. Songs do not follow linear trails, but fill/make space. Prayers/Songs respond to the land and the land speaks back. This is two way "memory lane." Weather and climate are part of this memory.
>
> Singing requires a visual, auditory, and spiritual solitude. Large land developments in the midst of these song scapes cause havoc or chaos ... not just for the singer, not just for what the singer seeks to balance, but also the entire Paiute world...and the entire world ...cosmos.
>
> Havoc or chaos confuses and angers spirits who are the environment and its constituent plants and animals. Water spirits are one such spirit. Magma is a type of water spirit... just from a lower world. It can be angered.
>
> The land has emotions just like humans: joy, anger, jealousy, confusion, clarity etc. The songs are an antidote to harm. (Interviewee – Personal Communication)

The following information concerning the Salt Song trails is provided by a Moapa Tribal Elder.

> The proposed Power Plant outside of Mesquite, the Toquop Power plant, had Salt Song ceremony issues. Every tribe and practitioner has a different version of the songs so it can be confusing.
>
> Performing the Salt Song ceremony is an obligation.
>
> The grieving family is the host. The singers meet in a common area before entering into the host's place. The host sends a runner to meet the ceremonial singers, who are then ushered into the funeral/ceremonial area. The host then announces to the assembled group who the singers are.
>
> The funeral ceremony can go on for days and in the past it was expected that all attendees were required to stay for the entire duration of the ceremony. Now-a-days, the people come and go to pay respect. But the singers still stay for the whole ceremony. The bird songs and ceremony are for the one-year memorial. Some other tribes sing the bird songs for entertainment. All of these ceremonies are serious matters and should be taken seriously. These are not things to be played with. [this phrase: "the Salt Song trails are very sacred and are to be taken seriously and are not to be played with", was repeated several times throughout the interview]. Larry Eddy is a traditional singer and is related to people in the area. (Interviewee – Personal Communication)

The Salt Songs trails continue to be sung and travelled into the present. The following summary information comes from a publication of the Storyscape Project of The Cultural Conservancy.

> The Salt Songs are the sacred songs of the Nuwuvi people and describe a physical and spiritual landscape spanning ocean and desert, mountains and rivers, life and death. The landmarks

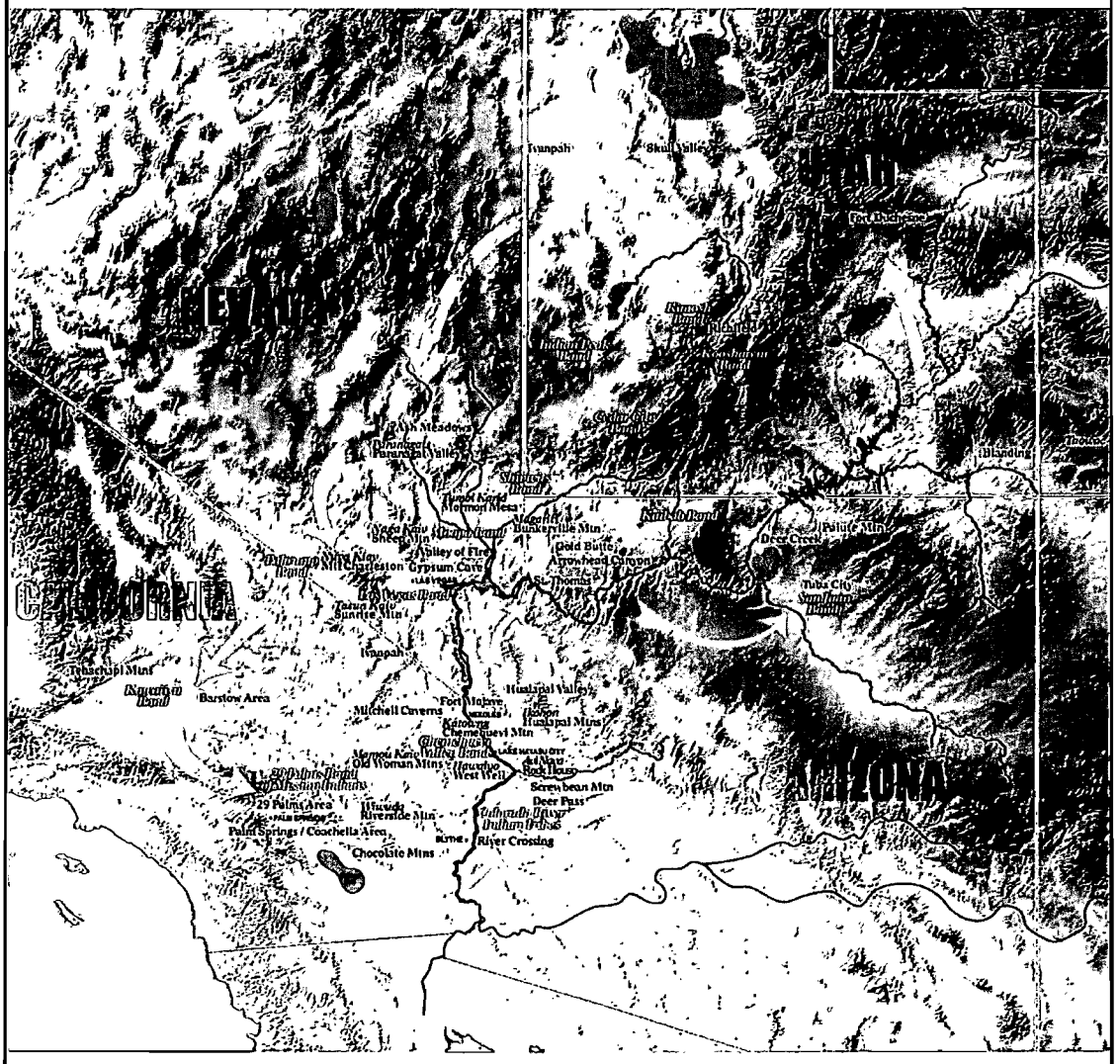
> identified on the map, [see Figure 7], are described by the songs and represent ancient villages, gathering sites for salt and medicinal herbs, including routes, historic events, sacred areas, and cultural landscapes. At memorial ceremonies, Salt Song singers "throwing the gourd" are accompanied by dancers as they perform the 142 song cycle from sunset to sunrise to assist the decreased in their sacred journey. The Salt Songs begin their journey at *AviNava/Ting-ai-ay* (Rock House), a sacred cave at the confluence of the Bill Williams and Colorado Rivers. The songs travel north along the Colorado River to the Kaibab and Colorado Plataeu, into Southern Utah, and then west to the great mountain *Nuva Kaiv* (Mt. Charleston) – the place of origination of the *Nuwuvi* People – and then further west to rise above the Pacific Ocean before arcing back east through the Mojave desert to their origen at *Avi Nava*.
>
> At memorials it is the responsibility of the lead singer to guide the singers across the spiritual landscape to gather at *Nuva Kiav* [Mt. Charleston] at midnight when the mourners assist the deceased in their spiritual crossing. (Klasky 2009: 1-2)
>
> "I am like a bus driver ... making sure that the singers visit all the right stops at the right times along the way," said a lead Salt Song Singer. (Larry Eddy quoted in Klasky: ibid)

The Salt Songs cross, reverberate and provide passage for deceased Southern Paiute in the vicinity of Pahrump Valley including the project site.

CULTURAL RESOURCES - FIGURE 8

Hidden Hills Solar Generating System (HHSEGS) - Salt Song Trail Map of Nuwuvi (Southern Paiute) Sacred Landscapes, Culture Areas and Bands

Salt Song Trail Map of *Nuwuvi* (Southern Paiute) Sacred Landscapes, Culture Areas and Bands



This map shows *Nuwuvi* (Southern Paiute) holy lands spanning ocean and desert, mountains and rivers and across four states. These landmarks are described in the *Nuwuvi* Salt Songs and represent ancient villages, gathering sites for salt and medicinal herbs, trading routes, historic sites, sacred areas, ancestral lands and pilgrimages in a physical and spiritual landscape of stories and songs. The Salt Songs are a cultural and spiritual bond between the *Nuwuvi* and the land, and represent a renewal and healing of a *Nuwuvi*'s spiritual journey.

The Salt Songs are sung at memorial ceremonies and follow a trail that begins at *Avi Nava/Ting-ai-ay* (Rock House), the sacred cave at the Bill Williams River, and travels to the Colorado River north to the Colorado Plateau, west to *Nuva Kaiv* (Mt. Charleston), through mountain passes to the Pacific Ocean and then back east through the desert to the Colorado River and to its place of origin.

The trail visits the fourteen bands of *Nuwuvi* people including: *Cedar City, Chemehuevi Valley, Colorado River Indian Tribes, Indian Peak, Kaibab, Kanosh, Kawaiisu, Kaiparowits, Las Vegas, Moapa, Koosharem, Pahrump, San Juan, Shivwits, and Twentynine Palms Band of Mission Indians.*

For more information, copies of this poster and the film *The Salt Song Trail* contact Philip M. Klasky, director of The Storyscape Project of The Cultural Conservancy at www.nativeland.org, (415) 561-6594, Salt Song Trail directors Matthew Leivas (760) 858-4019 and Vivienne Jake (928) 643-7210.

Source: M. Leivas, Sr. (Cherehevi), V. Jake (Kaibab Paiute), the Salt Song Trail Project, Southern Paiute cultural consultants; P. Klasky and M. Nelson, field research, The Cultural Conservancy, San Francisco State University Department of American Indian Studies; Center for Applied Spatial Analysis (CASA), University of Arizona.

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SOURCE: The Salt Song Trail Project (c) 2009 all rights reserved. Design by Dana F. Smith and Philip M. Klasky

[Figure 8 Salt Song Trail inserted here]

Analysis Summary

This report's analysis has divided some of the Pahrump life-ways, and how those life-ways are intertwined with a landscape, into seven attributes: water, plants, animals, horticulture, trails, landforms, and ceremonies. The reader will note that there is crossover between categories. For example trails are waterways, trails are songs, trails are ceremony, trails are for hunting and gathering, and trails run through all of the landforms that allow Southern Paiute (and others), to travel between the mountains, valleys, gardens, plants and animals and homes and camps. Likewise any of the other attributes can be explained in terms of, or have overlaps with, the other attributes. The Pahrump Paiute world is one holistic phenomenon. This whole is segmented into attributes so that non-Paiute can understand something about the life-ways of a different people.

Paiute and Shoshone people from the various tribes consulted for this study, continue to practice their traditional ways as best they can against the backdrop of modern dominant society and the various developments that come with modern society.

This area is comprised of several overlapping ethnographic landscapes which have as their contributing attributes or elements: water, plants, animals, horticultural gardens, trails, landforms and religious practices. These landscapes encompass the project area.

The following section will evaluate the eligibility of these landscapes to the National or State Registers, per what criteria, for what periods of significance and with what levels of integrity.

PROPOSED FINDINGS OF FACT

Ethnographic Landscapes

Ethnographic landscapes are defined generally in this document's Introduction. Ethnographic landscapes can have considerable overlap with what are called traditional cultural properties. Traditional cultural properties are synonymous with the term "place." Places and areas are types of historical resources that can be synonymous with traditional cultural properties and ethnographic landscapes. The term ethnographic landscape will be used to generally refer to the types of resources that are considered in this report; however the author, by using the term ethnographic landscape also intends that usage to also mean an "area" or "place" per the definition of historical resources.

Southern Paiute, Pahrump Paiute and Ma-hav Ethnographic Landscapes Generally Described

There are three ethnographic landscapes that this report describes and that, to varying proximity, are in the vicinity of the project:

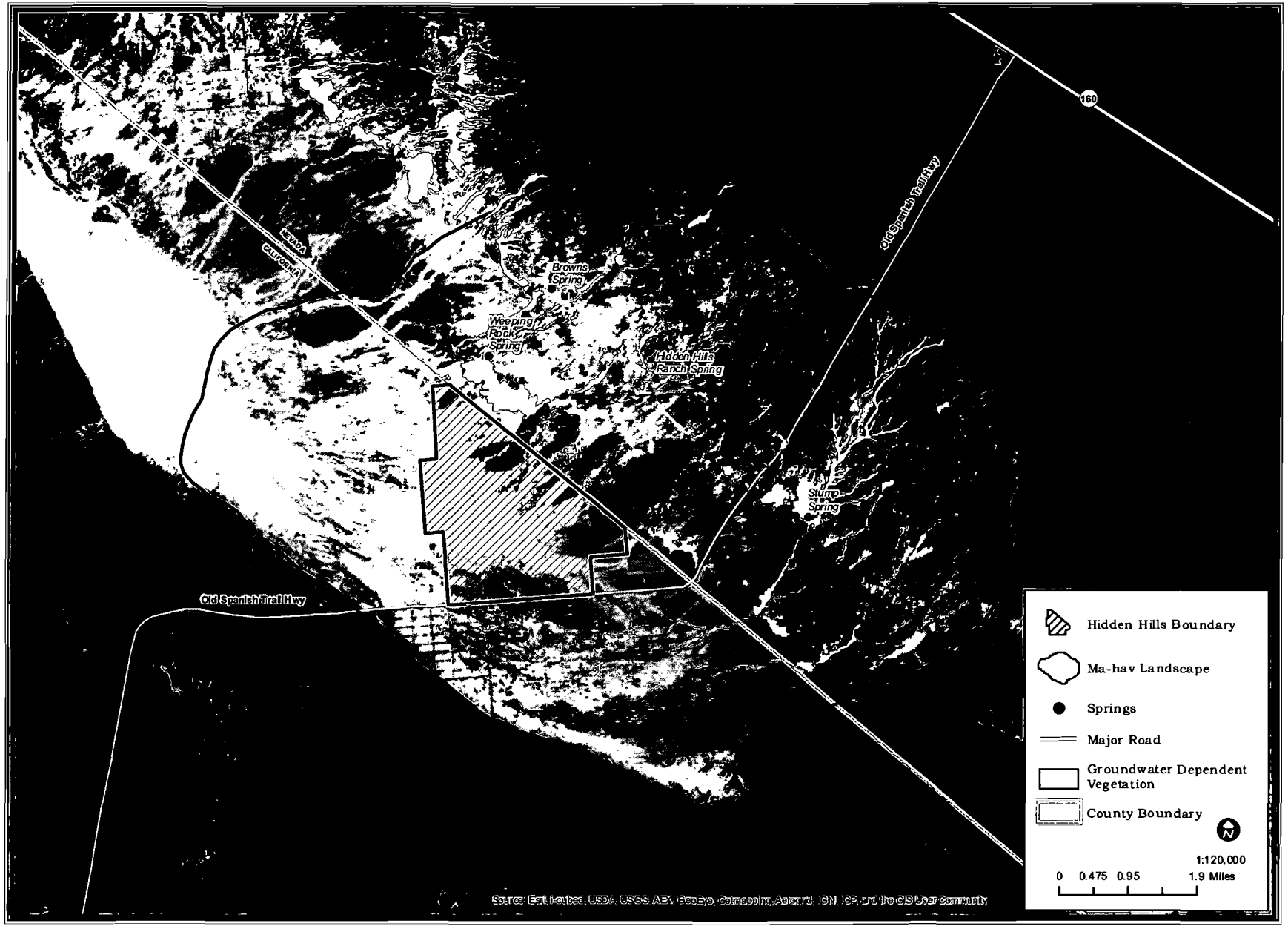
1. Salt Song Landscape
2. Pahrump Paiute Home Landscape
3. Ma-hav Landscape

The Salt Song Landscape is generally described and mapped in the previous section (Figure 8), and encompasses portions of current day Southern California, Southern Nevada, Northeastern Arizona and Southwestern Utah and within which numerous bands of Southern Paiute participate. This ethnographic study does not attempt to fully describe this song and landscape except as such description is relevant for the purposes of assessing affects of the project on the Salt Song Landscape. The Pahrump Paiute Home Landscape is a part of the Salt Song Landscape.

The Pahrump Paiute Home Landscape ensues from and radiates out from and around the Spring Mountains. Its largest extent is slightly larger than the area encircled by Chief Tecopa's 1873 homeland journey. It can be easily asserted that some portion of the eastern side of the Spring Mountains is more directly affiliated with the Las Vegas Southern Paiute. This report does not attempt to specifically delineate the boundaries of the Pahrump Paiute Home Landscape, nor is it necessary that such boundaries are defined. Because the project is on the west side of the Spring Mountains and the west side is more directly affiliated with the Pahrump Paiute homeland. The Pahrump Paiute Home Landscape consists of numerous component landscape areas with multiple contributing attributes. It is not necessary, for the purposes of this document, to further describe and delineate all of the component landscapes and delineated boundaries. However one component landscape, the Ma-hav Landscape is fully described and delineated in a previous section of this report. The proposed project is within the Ma-hav Landscape. See Figure 9 for the extent of the Ma-hav landscape.

CULTURAL RESOUCES - FIGURE 9

Hidden Hills Solar Electric Generating System (HHSEGS) - Ma-hav Landscape Vicinity Map



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: US Major Highway - USDA National Agriculture Imagery Program (NAIP) imagery and USGS Digital Ortho Quarter, Quad, CH2M HILL, Tele Atlas North America, Inc (2010).

Contributing Attributes, Elements or Features

The National Park Service Cultural Landscape guidelines provide various terms for the smallest units that collectively define any landscape. These units are called synonymously, "attributes", "elements" or "features". The following tables, (Tables 8, 9 and 10), provide a features listing, description and other relevant information for understanding the natural and cultural make-up of the three landscapes discussed in this report.

Table 8. Contributing Features of the Salt Song Landscape Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity

FEATURE	DESCRIPTION	ADDITIONAL INFORMATION
Water	*Poe-ha-ghun*, Spirits, Springs, Creeks, Flats, Washes, Creeks	Refer to Table 3
Plants	*Poe-ha-ghun*, Spirits, Plants along the trail and in project vicinity,	Refer to Table 4, There are 364 plants related to the Salt Song Trail
Animals	*Poe-ha-ghun*, Spirits, Animals, Insects	Refer to Table 5 and 6, there are 174 animals related to the Salt Song Trail
Horticulture	*Poe-ha-ghun*, Spirits, Springs	Horticulture is a secondary aspect of the primary aspect of water, specifically springs and the activities that occur near springs.
Trails	*Poe-ha-ghun*, Spirits, Humans, Animals	All Southern Paiute living and deceased participate in the Salt Song Trail. The trail is a path on the ground, a corridor on and above the ground, and an auditory sound-scape.
Ceremony	*Poe-ha-ghun*, various types of ceremonies related to funerals and memorials.	Refer to Ceremony section for list of ceremonies, Ceremonies require aesthetically compatible view-sheds, noise free space and foreign-odor free space. See Figures 6 and 7 for maps of some Salt Song Trail routes.

Table 9. Contributing Features of the Pahrump Home Landscape Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity

FEATURE	DESCRIPTION	ADDITIONAL INFORMATION
Water	From Valley to Mountain Crest: Playa (Pahrump Dry Lake Bed), Washes, Springs and Seeps of the Hidden Hills Landscape, Alluvial washes including creek bed of Trout Canyon Creek and Pahrump Valley Creek, Springs that contribute to the aforementioned Creeks, Rain, Dew, Mist, and the Snow of Mount Charleston	Refer to the Water Section
Plants	Some of the plants listed at Table 4	There are other plants that are not listed at Table 4 that may be dormant, that may have been forgotten

		or not documented in the references used for this report.
Animals	All of the arthropods and animals listed at Tables 5 and 6	Arthropod types at or near the project site are not known.
Horticulture	Corn, squash, gourds, pumpkins, melons, sunflower, amaranth, winter wheat, various beans, and Devil's claw. Irrigation systems Garden plots	
Trails	Lateral trails along the valley floor Lateral trails along the valley spring escarpments Lateral trails along the mountain side Vertical trails that connect the valley floor with the high elevations of the Spring Mountains Trails that connect various districts/tribes and the larger Southern Paiute Nations	These trails include the Old Spanish Trail and the later and overlapping Mormon Road.
Ceremony	All of the ceremonies listed at in this report's Ceremony section	Some ceremonies are site specific and some ceremonies can be held based upon a consensus of the involved practitioners and affiliated families

Table 10. Contributing Features of the Ma-have Landscape Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity

FEATURE	DESCRIPTION	ADDITIONAL INFORMATION
Water	Stump Spring, Hidden Hills Ranch Spring, Browns Spring, Weeping Rock Seep, and other unnamed springs within the Ma-hav Landscape boundaries as depicted on Figure 8. Edge of the Playa (Pahrump Dry lake Bed, washes and creeks within the boundaries of the Hidden Hills landscape	
Plants	Some of the Plants listed at Table 3	
Animals	Arthropods and animals listed at Table 6	
Horticulture	Horticulture gardens at Weeping Rock, Browns, Hidden Hills and Stumps Springs	The garden area at Hidden Hills can still be discerned today. The exact garden locations at the other springs would require further historic and archaeological investigation to determine exact locations
Trails	Trails that connected the springs, and connected the spring areas to other destination points such as the springs to the north (Mound, Manse, Pahrump), Sandy Valley to the south, the playa, Mule Springs to	Tribal members assert that the project area is a traditional hunting and gathering area and that procurement activities do

	the east, the Trout Canyon, and Resting Springs to the west. smaller paths in and around each of the spring areas	not necessarily follow pre-established routes
Ceremony	Hidden Hills Cry ceremony and Salt Song memorial Burials and Pahrump Paiute Cemetery	It is highly probable that similar ceremonies occurred at the other Springs. Also John Stumper, being a renowned medicine man, conducted personal religious activities at or near Stump Spring.
Archaeology	Various resource procurement locations, seasonal occupation, village and homestead sites, including historic sites such as Tank Sharp's still are located throughout the Mo have landscape.	The CEC archaeological report provides additional parameters for considering an archaeological district that encompasses the Mo hav Landscape.

Boundary Justifications

Salt Song Landscape

A precise delineation and boundary justification for the Salt Song Landscape is not necessary for this project because the landscape, extending over a large swath of the Southwest and California, far exceeds the area of the project. Research project time constraints also prohibit such a robust delineation. Figure 8 provides the general parameters of the Salt Song Landscape. Figure 6 provides more precise Salt Song trail areas for the Spring Mountain area. However, suffice to say that the boundaries permeate the Pahrump Valley, and surrounding mountain ranges that collectively form the Pahrump Valley. The Salt Song landscape is ubiquitous throughout, saturates and exceeds the Project Area.

Pahrump Paiute Home Landscape

A precise delineation and boundary justification for the Pahrump Paiute Home Landscape is not necessary for this project because the landscape, extending from the western side of the Spring Mountain Range and including Pahrump Valley, Last Chance Range, No Pah Range and the Kingston Mountains and areas further to the north, west and south, far exceeds the area of the project. Research project time restraints also prohibit such robust delineation. Figure 4 provides a general sense of some of the area mentioned above. However, suffice to say that the boundaries permeate the Pahrump Valley, and surrounding mountain ranges that collectively form the Pahrump Valley. The Pahrump Paiute Home Landscape is ubiquitous throughout, saturates and exceeds the Project Area.

Ma-hav Landscape

Figure 9 provides a precise delineation of the Ma-hav Landscape. There are four specific justifications for the boundary delineations:

1. Geology: The area represents a unique geological surface covering of clay that has uplifted, eroded and flows towards and contributes to the Pahrump Valley Dry Lake bed. The Playa itself is not included because it is formed from other eroded deposits that surround the Playa on all sides. This surface provided for specific plant and animal communities that are hunted and gathered by Pahrump Paiute affiliated with the Ma-hav area.

2. Watershed: The area represents a specific lower portion of the watersheds of the Trout Canyon Creek and its main tributary the Pahrump Valley Creek. These two creeks collectively drain the Southwestern portion of Mount Charleston. These watersheds are separate and distinct from watersheds that drain the northwestern slopes of Mount Charleston and that flow towards the springs north of the Hidden Hills Landscape such as Mound, Manse and Pahrump Springs. These watersheds provided a corridor for travel from the valley floor to the heights of Mount Charleston.

3. People: The area represents the closely related Pahrump Paiute families of the Lees, Weeds, Browns, Howells, Bruces, and Toms. While these families are inter-related to other Pahrump Paiute families, and other none Pahrump Paiute people, they tended to reside, or frequent, in and around the Ma-hav, Hidden Hills, and Charleston View areas.

4. Unique Character: The Hidden Hills springs and surrounding hills tend to have a unique character in that the springs flow less and attracted non-indian development more recently. The larger Pahrump Valley ranches were first established to the north around Ash Meadows, Pahrump Spring, Manse Spring and Mound Spring. As a result the Hidden Hills area was known to have a more unique set of people that differentiated themselves from the larger valley population to the north and near the city of Pahrump. In addition, specific esoteric cultural and religious knowledge was formulated, instructed and practiced within this delineated landscape and nowhere else in the Paiute landscape. Finally this landscape and the Pahrump Paiute people that occupied it during the Spanish Trail and Mormon road periods were subjected to the some of the first contacts and related hostilities ensuing from trail side encounters.

Given that the land is a contiguous whole, this delineation is conservative. The Ma-hav Landscape boundaries could be drawn up to the crest of Mount Charleston by including the Trout Canyon and Pahrump Valley Creeks. However the upper reaches of the aforementioned creeks are included in the Pahrump Paiute Home Landscape.

The Pahrump Paiute Home Landscape is ubiquitous throughout, saturates and exceeds the Project Area.

Periods of Significance

Salt Song Landscape

The period of significance for the Salt Song Landscape spans from the time of primordial instruction, just after the great flood and Coyote's creation of Paiute up to the Present.

Pahrump Paiute Home Landscape

The period of significance for the Pahrump Paiute Home Landscape spans from the time of Coyote's creation of Southern Paiute up to the Present.

From an archaeological perspective the earliest dates would liberally be sometime between 10,000 Before Present to the ethnographic present. A conservative archaeological perspective would be from 600 years before present up to the ethnographic present. A historically documented time period of significance would be from the time of Chief Tecopa's leadership (circa 1840s) to the present. It can be assumed that Chief Tecopa inherited his leadership from one of his male relatives.

Ma-hav Landscape

The period of significance for the Ma-hav Landscape is provided in the timetable found at Table 7.

Archaeological evidence that provides dates for material remains (including dating of artifacts from sites within the Ma-hav landscape) has not been conducted.

A historic time period that can be documented in the literature, including oral histories collected for this ethnographic study, starts with John "Stomper" Pete's occupation of Stump Springs, circa 1840 – 1890, up to the present.

Eligibility Criteria

The California Register maintains four criteria for eligibility to the California Register of Historical Resources. These are provided below.

1. Is associated with the events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. Is associated with the lives of persons important to our past;
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4. Has yielded, or may be likely to yield, information important in prehistory or history.

These criteria are applied to the three landscapes described above.

Salt Song Landscape

This landscape is eligible under Criteria 1 at the regional level for its broad contributions to the unique historic events that shape Southern Paiute understanding of the landscape, its mapping through song and movement and the conveyance of the deep oral tradition through the generations for the unborn, living and deceased.

This landscape is eligible under Criteria 3 for its contributions to the production of the salt songs for which, without the salt songs, the high artistic value of the songs would fall flat. Songs sung during a ceremony that moves a group of living people and the deceased through a landscape is most aesthetic and culturally appropriate when the songs are sung in the landscape, as contrasted with being sung for a studio recording or transcribed into musical notation and then heard, read or duplicated by others.

Pahrump Paiute Home Landscape

This landscape is eligible under criteria 1 at the regional level for the broad contributions to the unique historic events that shape Pahrump understanding of their homeland and their ongoing traditions and history that have allowed them to survive, and during particular periods of their existence, flourish in a place that many non-Pahrump would consider harsh, inhospitable, or vastly in need of improvements.

This landscape is eligible under criteria 2 at the regional level for its association with the life and times of Chief Tecopa the first Pahrump Paiute chief that withstood, translated and guided his people through the pressures of a rapidly changing world brought on by the intrusions of other cultures. This association of a leader, his homeland and his fellow people to endure into modern times was passed on generation to generation and endures into the present.

Ma-hav Landscape

This landscape is eligible under Criteria 1 at the local level for the broad contributions to the unique historic events that this landscape provides to the Pahrump Paiute Home landscape in that it provides a unique marginal cultural milieu that spanned the interaction of the first contacts between Pahrump Paiute and non-Pahrump Paiute foreigners such as the Mexican traders, American explores, trappers, and traders; the American and Mormon miners, homesteaders and later American ranchers and business men that came to call the Pahrump Valley either a wayside curiosity or new home.

This landscape is eligible under Criteria 4 at the local level of significance for the potential to yield ethnographic information important to the prehistory and history of the Ma-hav area and specifically the prehistoric archaeological potential that lays beneath and on the surface of the Ma-hav area including the archaeological remains known to exists or that potentially exist in the Ma-hav Landscape.

The Ma-hav landscape contains burials and at least one known cemetery. Normally cemeteries are not eligible to the National Register. However, the burials and cemetery are considered as contributing features of the Ma-hav landscape and lend a sense of longevity to the landscape and rather than render the landscape ineligible actually increase the merits for eligibility.

Integrity

Salt Song Landscape

The Salt Song Landscape has been visually and physically compromised by significant modern developments such as the presence of numerous large cities, towns, military installations, energy generating facilities, mining infrastructure, and other infrastructure such as transportation and transmission corridors. In addition, auditory, olfactory and nightscape experiences have been compromised. The Spring Mountains are surrounded on several sides with incompatible intrusions to traditional religious and cultural practices. To the east/southeast lies the sprawling Las Vegas metropolis. To the north lies Nellis Air Force base. And to the east/northeast lies the town of Pahrump. Across and through this terrain are several major highway corridors and transmission lines. However one major area, lying to the south/southeast, and where the proposed project and its alternative site are proposed, the landscape is remarkably not marred.

In addition Southern Paiute traditional singers have an obligation to continue this tradition least they void their obligations to the deceased and ultimately to themselves, their yet to be born, and ultimately to their very identity and continuance as a people. No amount of landscape alteration can prevent them from continuing this tradition. However, increased infrastructural intrusions increase the burden and challenges to traditional practitioners to continue traditions vital to their community and related heritage. They consider their landscape to remain aesthetically pleasing despite intrusions due to the beauty, balance and sustenance by which they are provided a unique identity, handed down through generations and originally provided to them in a pact with their creator.

The Salt Song Landscapes maintain integrity of Association, Feeling, Setting, and Location.

Pahrump Paiute Home Landscape

The Pahrump Paiute Home landscape has been compromised by the same modern developments such as the sprawling town of Pahrump. Water from agriculture has significantly lowered the water table resulting in declines of associated plant communities and related animal habitat and population viability. Private property rights have restricted access to important hunting and gathering grounds. The Tribe does not have a land base in order to preserve intact their cultural traditions, and for which they would otherwise be able to take their cultural destiny into their own hands. However sufficient land is in federal ownership, such as the US Forest Service lands in the Spring Mountains, the US Fish and Wildlife Ash Meadows Wildlife Area and designated Bureau of Land Management wilderness areas in the No Pah and Kingston Mountain Ranges, as well as Bureau of Land Management front-country lands that encircle the Pahrump Valley. Because this homeland is intricately tied to Pahrump Paiute identity as a distinct people, no amount of environmental alteration of their lands will deter them from protecting and maintaining their landscape the best that they can. Indeed, one main reason for Pahrump Paiute application for federal recognition is to attain greater leverage in protecting what is their perceived birthright to exist in their homelands, including standing in issues related to the Native American Graves Protection and Repatriation Act.

The Pahrump Paiute Home Landscape maintains integrity of Association, Feeling, Setting, and Location.

Ma-hav Landscape

The Ma-hav landscape has been primarily compromised by the establishment and workings of the Wiley estate and perhaps marginally by the operations of the Front Site Gun Range which sets in the north east portion of the landscape. However these historic and recent alterations are minimal compared to other component landscapes that contribute to the Pahrump Paiute Home Landscape. Areas of the Ma-hav landscape are in Bureau of Land Management ownership and subject to federal management. And one specific area (Stump Springs) is protected as an area of Critical Environmental Concern for its association with Pahrump Paiute cultural values. The Pahrump Paiute People affiliated with the Ma-hav landscape live as close to the property as is possible given that the land is in private ownership by non-Pahrump Paiute people. The Ma-hav Landscape maintains integrity of Association, Feeling, Setting, and Location.

PROJECT MITIGATIONS

Pahrump Paiute feel that their life-ways have been walked upon, stolen, lost, forgotten, rejected, belittled, infringed upon, and otherwise dismissed. In the face of this treatment, Pahrump Paiute also continue to practice as much of their traditional ways as is possible within the current society. They feel like it is still within their reach to maintain their cultural identities and ensuing obligations as traditional Pahrump Paiute while participating in the dominant society. The Pahrump Paiute Tribe continues to seek federal recognition and a tribal land base, including at a minimum, greater tribal involvement in land management planning process, as critical steps to ensure their tribal longevity.

Quotes from recent tribal interviews concerning perceived impacts

The project impact is huge. That does not mean that a traditional ceremony can be held and then the land and spirits will understand once and for all. Confusion will increase and multiply over time and that will accumulate in the burden that the singers and other people will take on year after year. (Interviewee – Personal Communication)

Bomb testing in the area has contaminated a lot of the desert around Moapa. We are at risk if we go gather plants. There is also the local coal plant that causes environmental problems. So we go to Pahrump Valley (and other areas where Southern Paiute are from) to gather because we think that it is a cleaner environment. (Interviewee – Personal Communication)

Area is also important for fox trail songs. Which is a song that follows the fox, who travels from spring to spring. Putting a high tech facility in the midst of the ceremonial song trail is an invasion of Indian religion. The project area is a religious area. There is not only what the project mirrors and towers will do to the salt song prayers and people but also there will be long term impacts from more people and activity over the course of the project. What actual impacts would be to the Salt Song Trail and if those impacts can be mitigated are something that only certain practitioners can answer. Those answers can only be provided by medicine men or song practitioners. It is suggested that the ethnographer talk with Larry Eddy (Chemehuevi Elder) or Richard Arnold (Pahrump Paiute Singer). (Interviewee – Personal Communication)

There is a real concern about environmental justice and how Southern Paiute people are being disproportionately and adversely impacted by the proposed project. When our cultural landscape is impacted significantly such as will happen with the proposed solar project, life-ways are changed forever and does not allow our people to complete their journey to the afterlife as described in our Salt Songs. (Interviewee – Personal Communication)

Clearly, the Commission must give serious consideration to the timing of the ethnographic interviews and our inability to discuss certain things out of season or during the right time of year. A request to

share this information out of season further compounds the environmental justice concerns of our people. (Interviewee – Personal Communication)

An impact to the song trails would impact all Southern Paiute that need or rely on the Salt Songs trails and related ceremonies (Interviewee – Personal Communication).

CEC Staff Preliminary Impact and Mitigation Conclusion

The impacts of the proposed Hidden Hills Solar Energy Generating Facility project on the three ethnographic landscapes, should it be approved, are anticipated to not be able to be reduced to less than significant. However, California Energy Commission Staff continue to seek ways to lessen impacts in consultation with Native American Tribes affiliated with the proposed project area and the surrounding landscapes.

REFERENCES

Anderson, Kat M. 2005. *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources*. University of California Press, Berkeley, California.

Andress, Donna. 1997. *Eldorado Canyon and Nelson Nevada: Historical Documents, Reminiscences, and Commentary.*

Apple, Rebecca M. 2005. "Pathways to the Past". *Proceedings of the Society for California Archaeology, Volume 18*. Society for California Archaeology, Riverside, California.

Arnold, Richard. 2012. Hidden Hills Solar Electric Generating System Ethnographic Study – Pahrump Tribe - Confidential Interview Notes.

Arnold, Richard, Richard Stoffle, Kathleen Van Vlack, Larry Eddy, Betty Cornelius. 2009. "Nuvagantu, 'Where Snow Sits': Origin Mountains of the Southern Paiutes". *Landscapes of Origin in the Americas: Creation Narratives Linking Ancient Places and Present Communities.* Jessica J. Christie. The University of Alabama Press, Tuscaloosa, Alabama.

Bettinger, Robert L., Martin A. Baumhoff. 1982. *The Numic Spread: Great Basin Cultures Competition.* The Society for American Archaeology.

California Indian Assistance Program. 2004. *Field Directory of the California Indian Community.* Department of Housing and Community Development. State of California.

Cleland, James H. 2004. "Ethnographic Trail Systems and Large-Scale Cultural Landscapes: Preservation and Management Issues". *Exploring the Boundaries of Historic Landscape Preservation: Proceedings of the Twenty-ninth Annual Meeting of the Alliance for Historic Landscape Preservation, Athens*. Cari Goetcheus and Eric MacDonald. Clemson University Digital Press, Clemson, South Carolina.

Cornett, James W. 2000. *Indians and Desert Animals.* Nature Trails Press, Palm Springs, California.

Durham, Barabara 2012. Hidden Hills Solar Electric Generating System Ethnographic Study – Timbisha Shoshone Tribe - Confidential Interview Notes

Fowler, Don D. and Cathrine S. Fowler. 1971. *Anthropology of the Numa: John Wesley Powell's manuscripts on the Numic Peoples of Western North America, 1868-1880.* Smithsonian Contributions to Anthropology Number 14. Smithsonian Institute Press. Washington D.C.

Guidelines for Evaluation and Documents Traditional Cultural Properties. 1998. National Register Bulletin. U.S. Department of the Interior.

Hendricks, Don. 2012. Hidden Hills Solar Electric Generating System Ethnographic Study - Pahrump Tribe- Confidential Interview Notes.

http://en.wikipedia.org/wiki/Las_Vegas_Tribe_of_Paiute_Indians_of_the_Las_Vegas_Indian_Colony

http://lvpaiutetribe.com

http://www.cr.nps.gov/history/online_books/nps28/28chap10.htm

http://www.fortindependence.com/native.aspx

http://www.iisd.org/casl/caslguide/rapidruralappraisal.htm

http://www.moapapaiutes.com/about_us.htm

http://www.nps.gov/ethnography/training/elcamino/phase1.htm#reap

http://www.nps.gov/hps/tps/briefs/brief36.htm

http://www.nps.gov/nr/publications/bulletins/nrb38/nrb38%20introduction.htm#tcp

http://www.timbisha.org/index.htm

Inter-Tribal Council of Nevada. 1976. *Nuwuvi: A Southern Paiute History*. Published by the Inter-Tribal Council of Nevada.

Jim. 2012. *Pahrump Paiute Tribe General Natural and Cultural Information*. Confidential manuscript in possession of ENERGY COMMISSION Staff.

Jim, Clarabelle, Lorraine Jim and Cynthia Jim Lynch. 2012. Hidden Hills Solar Electric Generating System Ethnographic Study - Pahrump Tribe- Confidential Interview Notes.

Kelly, Isabel T. 1964. *Southern Paiute Ethnography*. University of Utah Press, Salt Lake City, Utah.

Kelly, Isabel T. and Catherine S. Fowler. 1982. *Southern Paiute*. Handbook of North American Indians, Volume 8. Robert F. Heizer. Smithsonian Institution, Washington.

Kessell, John L. 2002. *Spain in the Southwest: A Narrative History of Colonial New Mexico, Arizona, Texas, and California*. University of Oklahoma Press, Norman, Oklahoma.

King, Thomas F. 2003. *Places That Count: Traditional Cultural Properties in Cultural Resource Management*. AltaMira Press, Walnut Creek, California.

Kinlichine, Juantia B. 2012. *Hidden Hills Solar Electric Generating System Ethnographic Study - Moapa Tribe- Confidential Interview Notes.*

Klasky, Philip M. 2009. *The Salt Song Trail Map: The Sacred Landscape of the Nuwuvi People*. The Storyscape Project of the Cultural Conservatory.

From http: //www.nativeland.org/storyscape.html

Kroeber, A. L. 1925. *Handbook of the Indians of California*. Dover Publications, Inc., New York.

Laird, Carobeth. 1976. *The Chemhuevis.* Banning, CA. Malki Press.

Lawton, Harry W., Philip J. Wilke, Mary DeDecker and William M. Mason. 1976. "Agriculture Among the Paiute of Owens Valley". *The Journal of California Anthropology, Volume 3. Malki Museum Inc., Banning, California.*

Lee, Vernon. 2012. Hidden Hills Solar Electric Generating System Ethnographic Study – Moapa Tribe-Confidential Interview Notes.

Lingenfelter, Richard E. 1986. *Death Valley & The Amargosa: A Land of Illusion*. University of California Press, Berkeley, California.

Lowe, Celeste. 1981. *Chief Tecopa and the "Hikios".* Article in Old West Magazine.

MacDonald, Cindy. 2012. *Native American Cultural Resources.* (11-AFC-2, received April 2, 2012).

McCracken, Robert D. 1992. *Pahrump: A Valley Waiting to Become a City.* Nye County Press, Tonopah, Nevada.

McCracken, Robert D. 2009. *Manse Ranch: Gateway to the Future.* Nye County Press, Tonopah, Nevada.

Mendenhall, W. C. 1997. *320 Desert Watering Places in Southeastern California and Southwestern Nevada*. Second edition. Nevada Publications, Las Vegas, Nevada.

Miller, Lalovi. 2012. Hidden Hills Solar Electric Generating System Ethnographic Study – Moapa Tribe – Confidential Interview Notes.

Nevada Road & Recreation Atlas. 2011. Third Edition. Benchmark Maps, Medford, Oregon.

Pahrump Nevada Genealogical Society. 1998. *Chief Tecopa Cemetery*

Pahrump Valley Times. April 13, 2012) *Mexico quakes makes waves at Devil's Hole.*

Prichett, Jack. 2012. The Old Spanish National Historic Trail: A Report on Cultural and Visual Resources in the Near Vicinity of the Proposed Hidden Hills Solar Energy System Plant, Inyo County, California (DOCKET 11-AFC-2).

Prichett, Jack, Scott Smith. 2012. *The Old Spanish Trail.* Article in Desert Report. Sierra Club of California/Nevada Desert Committee.

Reeder, Ray M. 1966. *The Mormon Trail: A History of the Salt Lake to Los Angeles Route to 1869.* University Microfilms, Inc., Ann Arbor, Michigan.

Rhode, David. 2002. *Native Plants of Southern Nevada: An Ethnobotony.* Third edition. The University of Utah Press, Salt Lake City, Utah.

Roberts, Heidi, Elizabeth von Till Warrne, Suzanne Eskenazi. 2007. *Coyote Named This Place Pakonapanti.* U.S. Fish and Wildlife Service, Desert National Wildlife Refuge.

Ross, George A. 2012. *Hidden Hills Solar Electric Generating System Ethnographic Study -Pahrump Tribe- Confidential Interview Notes*

Ross, George A. 2004. Interview with Harry Ford. *George Andrews Ross: Oral History.* Pahrump Valley Museum and Historical Society.

Southern & Central California Atlas & Gazette. 2000. Fifth Edition. DeLorme, Yarmouth, Maine.

Steiner, Harold A. 1999. *The Old Spanish Trail Across the Mojave Desert.* The Haldor Company, Las Vegas, Nevada.

Stoffle, Richard W., Kathleen Van Vlack, Alex K. Carol, Fletcher Chmara-Huff, and Aja Martinez. 2005. *Yanawant Paiute Places and Landscapes in the Arizona Strip: Volume One of the Arizona Landscapes and Place Name Study.* Bureau of Applied Research in Anthropology, University of Arizona, Tuscon, Arizona.

Swain, Philbert. 2012. *Hidden Hills Solar Electric Generating System Ethnographic Study - Moapa Tribe- Confidential Interview Notes.*

Titus, Constandina A. 1986. *Bombs in the Backyard: Atomic Testing and American Politics.* Second Edition. University of Nevada Press, Reno and Las Vegas.

Toquop Energy 2003 Environmental Impact Statement. 2003. Bureau of Land Management, U.S. Department of the Interior.

U.S. Fish & Wildlife Service. 2011. *Ash Meadows: National Wildlife Refuge.*

Walker, Clifford J. 2009. *Gone the Way of the Earth: Indian Slave Trade in the Old Southwest.* Mojave River Valley Museum Association, Barstow, CA.

Waring, G.A. 1920. *Ground Water in Pahrump, Mesquite, and Ivanpah Valleys, Nevada, and California.* In: *Contributions to the Hydrology of the United States, Water-supply Paper 450.* 1921, United States Geological Survey Department of the Interior. Washington Government Printing Office. Washington DC.

Wheeler, George M. 1876. *Annual Report on the Geographical Surveys West of the One Hundredth Meridian in California, Nevada, Utah, Colorado, Wyoming, New Mexico, Arizona, and Montana: Being Aappendix (sp) JJ of the Annual Report of the Chief Engineer, Atlas Sheet No. 66.* U.S. Government Printing Office, Washington.

Zanjani, Sally S. 1994. *Jack Longstreet: Last of the Desert Frontiersmen.* Nevada Publications, Nevada.

APPENDICES

Appendix 1 - Acronym List

- **AFC** Application for Certification
- **BLM** Bureau of Land Management
- **ENERGY COMMISSION** California Energy Commission
- **CFR** Code of Federal Regulations
- **HHSEGS** Hidden Hills Solar Electric Generating System
- **MW** Megawatts
- **NAHC** Native American Heritage Commission
- **NPS** National Park Service
- **REAP** Rapid Ethnographic Assessment Procedures
- **SRSG** Solar Receiver Steam Generator
- **TCP** Traditional Cultural Properties

Appendix 2 - List of Springs Culturally Important to the Pahrump Paiute Tribe

- Appaloosa Spring
- Ash Meadows (Kooitsi)
- Aztec Tank
- Big Spring
- Big Timber Spring
- Bill Smith Springs
- Bird Spring
- Bitter Springs [Auqa deTomaso by Fremont]
- Bole Spring
- Browns Spring
- Buck Spring
- Cave Spring
- CC Spring
- Chappo Spring
- Coal Spring
- Cold Creek Spring
- Cougar Spring
- Crystal Spring
- Debert Spring
- Deer Creek Spring
- Devil's Hole (Poobitsi)
- Fairbanks Spring
- Gold Spring
- Grapevine Spring
- Greasewood Spring
- Harris Spring
- Horseshutem Spring
- Horse Spring (Padapunitsi)
- Horsethief Spring
- Jack Rabbit Springs
- Jaybird Spring
- Kiup Spring
- Kwichup spring
- Last Cabin Spring
- Last Chance Spring
- Lee Spring
- Longstreet Spring
- Mammy Spring
- Manse Spring
- Mason Spring
- Mazie Spring
- Mexican Spring
- Mound Spring
- Mountain Spring

- Mud Spring
- Mule Spring (Pavis)
- Ninetynine Spring
- Pahrump Spring
- Peak Springs
- Point of Rock Spring
- Potosi Spring
- Prospect Springs
- Rainbow Spring
- Resting Spring (Yaga)
- Rock Spring
- Rogers Spring
- Rose Spring
- Rosebud Spring
- Santa Cruz Spring
- Saratoga Springs
- Shoshone Springs
- Six Mile Spring
- Stanley Springs
- Stump Spring (Tsapingpisa)
- Trout Spring
- Tule Spring (Tisivasi)
- Twelvemile Spring
- Warner Spring
- Wheeler Wells
- Whiskey Spring
- Willow Spring
- Wilson Tank
- Wood Canyon Spring
- Yount Spring

Appendix 3 - List of Plants Culturally Important to the Pahrump Paiute Tribe

Trees

- Curlleaf Mountain Mahogany (Cercocarpus Ledifolius) [dunumbe]
- Gambel's Oak (Quercus Gambelii)
- Goodding's Willow (Salix Gooddingii)
- Sandbar Willow (Salix Exigua) [sa-ga-ve]
- Screwbean Mesquite (Prosopis Pubescens)
- Singleleaf Ash (Fraxinus Anomala) [ya-peep-a]
- Singlelead Pinyon Pine (Pinus Monophylla)
- Utah Juniper (Juniperus Osteosperma)
- Velvet Ash (Fraxinus Velutina)
- Western Honey Mesquite (Prosopis Glandulosa) [o-pimb]

Large Shrubs and Woody Vines

- Anderson's Wolfberry (Lycium Andersonii) [bush-hoop-pi-ve,berries-hupoo]
- Arrowweed (Pluchea Sericea) [sah-wape]
- Big Sagebrush (Artemisia Tridentata) [sa-wa-ve]
- Blue Elderberry (Sambucus Cerulea-Cerulea) [kon-vee]
- Canyon Grape (Vitis Arizonica)
- Creosote Bush (Larrea Tridentata) [yatumbi]
- Desert Bitterbrush (Purshia Glandulosa) [hunupi]
- Desert Snowberry (Symphoricarpos Longiflorus)
- Fourwing Saltbush (Atriplex Canescens) [cha-upive]
- Fremont's Dalea (Psorothamnus Fremontii)
- Gooseberry (Ribes)
- Greasewood (Sarcobatus Vermiculatus)
- Green Mormon Tea (Ephedra Viridis)
- Lemonade Berry (Rhus Trilobata)
- Nevada Smokebush (Psorothamnus Polydenius)
- Nevada Jointfir (Ephedra Nevadensis)
- Rubber Rabbitbrush (Ericameria Nauseosa)
- Shadscale (Atriplex Confertifolia) [kakumba]
- Skunkbush Sumac (Rhus Trilobata) [bush-suh-vamp, berries-eissia]
- Stansbury Cliffrose (Purshia Stansburiana)
- Utah Serviceberry (Amelanchier Utahensis)
- Woods' Rose Rosa Woodsii, Ultramontana)

Small Shrubs and Subshrubs

- Brittlebush (Encelia Farinosa)
- Broom Snakeweed (Gutierrezia Sarothrae)
- Brownplume Wirelettuce (Stephanomeria Paucifloar)
- Desert Globe Mallow (Sphaeralcea Ambigua) [kuku-pa-ni-ve]
- Desert Prince's Plume (Stanleya Pinnata) [tumani] [tumar]
- Devil's Claw
- Littleleaf Ratany (Krameria Erecta) [nagavarodam]

- Mojave Seablite (Suaeda Moquinii)
- Mountain Sagewort (Artemisia Ludoviciana)
- Purple Sage (Salvia Dorrii) [se-gwe-yan]
- Threadleaf Snakeweed (Gutierrezia Microcephala)
- Turpentine Broom (Thamnosma Montana) [moo-ga-hu-pe]
- Winterfat (Krascheninnikovia Lanata)

Yuccas and Agaves

- Banana Yucca (Yucca Baccata) [ochive]
- Joshua Tree (Yucca Brevifolia)
- Mojave Yucca (Yucca Schidigera) [chumba]
- Utah Agave (Agave Utahensis) [yan-da]

Cacti

- Beavertail Pricklypear (Opunita Basilaris) [navumb]
- Cottontop Cactus (Echinocactus Polycephalus) [thamave]
- Golden Cholla (Opuntia Echinocarpa)
- Hedgehog Cactus (Echinocereus Engelmannii) [hu-siv-vich]
- Mojave Pricklypear (Opuntia Erinacea)

Herbaceous Plants

- Annual Turtleback (Psathyrotes Annua)
- Bristly Fiddleneck (Amsinckia Tessellata) [tho-wa-wi-ve]
- Chia (Salvia Columbariae) (pasits)
- Clustered Broomrape (Orobanche Fasciculata)
- Coyote Green Tobacco (Nicotiana Attenuate) [ko-a-pe] [saxwaxoapi]
- Crimson Columbine (Aquilegia Formosa)
- Desert Broomrape (Orobanche Cooperi)
- Desert Larspur (Delphinium Parishii)
- Desert Milkweed (Asclepias Erosa)
- Desert Rockcress (Arabis Pulchra)
- Desert Sand Verbena (Abronia Villosa)
- Desert Tobacco (Nicotiana Obtusifolia)
- Desert Trumpet (Eriogonum Indlatum) [papa-kumba]
- Earth Tobacco (Nicotiana Trigonophylla) [tinkoapi]
- Entireleaved Thelypody (Entireleaved Thelypody) [na-bita]
- Evening Primrose (Oenothera)
- Firecracker Penstemon (Penstemon Eatonii)
- Flatbud Prickly Poppy (Argemone munita) [tu-vi-kai-ve]
- Goosefoot (Chenopodium)
- Hearleaf Twistflower (Streptanthus Cordatus)
- Indian Hemp (Apocynum Cannabinum)
- Indian Paintbrush (Castilleja Angustifolia) [inip-ma-tho-rup]
- Longleaf Phlox (Phlox Longifolia)
- Mexican Whorled Milkweed (Asclepias Fascicularis)

- Mojave Prickly Poppy (Argemone corymbosa)
- Mojave Thistle (Chamaesyce Albomarginata) [chuvia]
- Mojave Woodyaster (Xylorhiza Torifolia)
- New Mexico Thistle (Cirsium Mohavense)
- Palmer's Penstemon (Penstemon Palmeri)
- Peace Tobacco (Nicotiana Quadrivalvis)
- Prairie Flax (Linum Lewisii)
- Showy Milkweed (Asclepias Speciosa)
- Silver Rockcress (Arabis Puberula)
- Skyrocket Gilia (Ipomopsis Aggregata) [shovia navayuna]
- Stinging Nettle (Urtica Dioica)
- Tansy Mustard (Descurainia Pinnata) [akive]
- Thorn Apple (Datura Wrightii)
- Transmontane Sand Verbena (Abronia Turbinata)
- Travel Tobacco (Eriogonum Inflatum) [papakuarimpi]
- Velvet Trutleback (Psathyrotes Ramosissima)
- Whitemargin Sandmat (Chamaesyce albomarginata)
- Whitestem Blazingstar (Mentzelia Albicaulis) [ko-ka]
- Willow Dock (Rumex Salicifolius)
- Woolly Bluestar (Amsonia Tomentosa)
- Yerba Mansa (Anemopsis Californica)

Grasses and Grasslike Plants

- Baltic Rush (Juncus Balticus) [pai'sive]
- Basin Wild Rye (Leymus Cinereus)
- Broadleaf Cattail (Typha Latifolia) [to'awve]
- Common Reed (Phragmites Australis) [pa-wy-um-ba]
- Desert Needlegrass (Achnatherum Speciosum) [howuve]
- Indian Ricegrass (Achnatherum Hymenoides) [wai'wave]
- Inland Saltgrass (Distichlis Spicata)
- Southern Cattail (Typha Latifolia)

Bulb Plants

- Desert Hyacinth (Dichelostemma Pulchellum)
- Nevada Onion (Allium Nevadense) [nin-youg]
- Winding Mariposa Lily (Calochortus Flexuosus) [se-go-a]

Appendix 4 - List of Animals Culturally Important to the Pahrump Paiute Tribe

Mammals

- American Badger (Taxidea Taxus) [huni]
- Antelope Ground Squirrel (Ammospermophilus Leucurus) [tavats]
- Audubon's Desert Cottontail (Sylvilagus Audubonii) (Tavuts)
- Badger (Taxidea) (Tukuputs)
- Black-tailed Deer (Odocoileus Hemionus) (Tuhuee)
- Black-tailed Jack Rabbit (Lepus Californicus) (Kaam)
- Bobcat (Lynx Rufus) [tuki]
- Botta Pocket Gopher (Thomomys Bottae)
- Coyote (Canis Latrans) [Shin-nav] (Sacred)
- Deer Mouse (Peromyscus)
- Desert Big Horn Sheep (Ovis Canadensis Nelsoni)
- Desert Kit Fox (Vulpes Macrotis) [yipats]
- Desert Tortoise
- Desert Woodrat (Neotoma Lepida) [kaatsi]
- Golden Mantled Ground Squirrel (Spermophilus Lateralis) [oitsats]
- Gray Fox (Urocyon) [honsi]
- Kangaroo Rat (Dipodomys) [paii]
- Merriam Kangaroo Rat (Dipodomys Merriami)
- Mountain Lion (Relis Concolor) [tukumumunts]
- Mule Deer
- Muskrat (Ondatra Zibethicus)
- Pocket Gopher (Thomomys) [mii]
- Pocket Mouse (Perognathus Longimembris) [puintcats]
- Porcupine (Erethizon Dorsatum) [yingi]
- Pronghorn, Bear
- Raccoon (Procylon Lotor) [yamasi]
- Red Fox
- Rock Squirrel (Spermophilus Variegatus) [sikuts]
- Skunk (Mephitis) [ponia]
- White-tailed Antelope Squirrel (Ammospermophilus Leucurus)
- Wolf (Canis Iupus) [tiwats] (Sacred) (Indian Legend)
- Woodrat

Birds

- American Crow (Corvus Brachyrhynchos)
- American Kestrel (Falco Sparverius)
- Anna's Hummingbird (Calypte Anna)
- Ash-throated Flycatcher (Myiarchus Cinerascens)
- Bats (Microtus) [patsatsi]
- Barn Owl (Tyto Alba)
- Barn Swallow (Hirundo Rustica)
- Bendire's Thrasher (Toxostoma Bendirei)

- Black-headed Grosbeak (Pheucticus Melonocephalus)
- Black Phoebe (Sayornis Nigricans)
- Black-tailed Gnatcatcher (Polioptila Melaneura)
- Black-throated Sparrow (Amphispiza Bilineata)
- Blue-gray Gnatcatcher (Polioptila Caerulea)
- Brewer's Sparrow (Spizella Breweri)
- Bullock's Oriole (Icterus Bullockii)
- Burrowing Owl (Athene Cunicularia)
- Cactus Wren (Campylorhyncus Brunneicapillus)
- Chipping Sparrow (Spizella Passerina)
- Common Poorwill (Phalaenoptilus Nuttalli)
- Commom Raven (Corvus Corax)
- Cooper's Hawk (Accipiter Cooperii)
- Costa's Hummbingbird (Calypte Costae)
- Dusky Flycatcher (Empidonax Oberholseri)
- Eurasian Collared-Dove (Streptopelia Decaocto)
- European Starling (Sturnus Vulgaris)
- Ferruginous Hawk (Buteo Regalis)
- Gambel's Quail (Callipepla Gambelii)
- Golden Eagle (Aquila Chrysaetos)
- Gray Flycatcher (Empidonax Oberholseri)
- Great Bule Heron
- Great Horned Owl
- Greater Roadrunner (Geococcyx Californianus) (uh-ss)
- Horned Lark (Eremophila Alpestris)
- House Finch (Carpodacus Mexicanus)
- Killdeer
- Lark Sparrow (Chondestes Grammacus)
- LeConte's Thrasher (Toxostoma Lecontei)
- Lesser Goldfinch (Spinus Psaltria)
- Lesser Nighthawk (Chordeiles Acutipennis)
- Loggerhead Kingbird
- Loggerhead Shrike (Lanius Ludovicianus)
- Mountain Bluebird (Sialia Currucoides)
- Mourning Dove (Zenaida Macroura)
- Northern Flicker (Colaptes Auratus)
- Northern Harrier (Circus Cyaneus)
- Northern Mockingbird (Mimus Polyglottos)
- Northern Rough-winged Swallow (Stelgidopteryx Serripennis)
- Pinyon Jay (ahung)
- Phainopepela (Phainopepla Nitens)
- Prairie Falcon (Falco Mixicanus)
- Purple Martin (Progne Subis)
- Red-tailed Hawk (Buteo Jamaicensis)
- Rock Pigeon (Columba Livia)

- Rock Wren (Salpinctes Obsoletus)
- Sage Sparrow (Amphispiza Belli)
- Sage Thrasher (Oreoscoptes Montanus)
- Say's Phoebe (Sayornis Saya)
- Scott's Oriole (Icterus Parisorum)
- Tree Swallow (Tachycineta Bicolor)
- Turkey Vulture (Cathartes Aura)
- Violet-green Swallow (Tachycineta Thalassina)
- Western Kingbird (Tyrannus Verticalis)
- Western Meadowlark (Sturnella Neglecta)
- White-crowned Sparrow (Zonotrichia Leucophrys)
- White-throated Sparrow (Zonatrichia Albicollis)
- White-throated Swift (Aeronautes Saxatalis)
- Yellow-headed Blackbird (Xanthocephalus Xanthocephalus)
- Yellow-rumped Warbler (Dendroica Coronata)

Reptiles

- Chuckwalla (Sauromalus Ater? or Obesus?) [tsawadi]
- Coachwhip Snake (Masticophis Flagellum)
- Common Collared Lizard (Crotophytus Callarus)
- Desert Iguana (Dipsosaurus Dorsalis)
- Desert Tortoise (Gopherus Agassizii) [aiya]
- Glossy Snake (Arizona Elegans)
- Great Basin Gopher Snake (Piturophis Catenifer)
- Horney Toad
- Lizards
- Long-nosed leopard Lizard (Gambelia Wislizenii)
- Long-nosed Snake (Rhinocheilus Lecontei)
- Mojave Western Patch-nosed Snake (Salvadora Hexalepis Mojavensis)
- Northern Mojave Rattlesnake (Crotalus Scutulatus Scutulatus)
- Side-blotched Lizard (Uta Stansburiana Stejnegeri)
- Sidewinder (Crotalus Cerastes)
- Speckled Rattlesnake (Crotalus Mitchellii)
- Southern Desert Horned Lizard (Phrynosoma Platyrhinos Califiarium)
- Western Fence Lizard (Sceloporus Occidentailis)
- Western Whiptain (Aspidoscelis Tigris)
- Zebra-tailed Lizard (Callisaurus Draconoides)

Appendix 5 - List of Mountains Culturally Important to the Pahrump Paiute Tribe

- Avawats Mountains
- Bare Mountains
- Black Mountain South (Tigimi)
- Eagle Mountain (Puuwin)
- Funeral Mountain South (Isigumpi)
- Greenwater Range
- Ivanpah
- Kingston Mountain (Mogwa)
- La Madre Mountain (Soneuwa)
- Lee Canyon (Tinainabi)
- Lizard Mountain
- McCullough Range North (tiniuhubi)
- Mount Charleston Peak (Nivaganti)
- Mount Potosi
- Mount Stirling
- New York Mountain
- Nopah Mountain (Tsungkwapi)
- North Mesquite Mountains
- Old Woman Mountains (Mamapukaib)
- Paiute Range (Ampanikaiva)
- Providence Mountain (Timpisagwats)
- Providence Mountain Middle (Agaisavantakaibi)
- Providence Mountain North (Asoatunukwitsi)
- Resting Spring Mountains
- Sheep Range (Tuhuti)
- Spring Mountain Range
- Sunrise Mountain (Tasiakaib)
- Turtle Mountains (Nantapiaganti)

Appendix 6 – Historic Photographs of Hidden Hills Area

All photo descriptions from University of Nevada Las Vegas Special Collections.

1. Hidden Ranch Camp. n.d.
2. Summer Camp - Man and Woman Standing in front of a brush house, shade shelter at one end. Man probably Chief Tecopa n.d.
3. Two Indian Women seated in wicker chairs. Manse or Hidden Hills. n.d.
4. Four Indian children in front of cottonwood tree, Manse of Hidden Ranch. n.d.
5. Three Indian children, Manse or Hidden Ranch. n.d.
6. Chief Tecopa. n.d.
7. Page 6 of Pahrump Valley Times, "Me Chief Tecopa..." January 1971.
8. John Yount's home on the Hidden Ranch, now known as the Hidden Hills Ranch, about 1917
9. Homestead house constructed on John Yount's homestead located at the south end of Pahrump Valley. The house looked pretty much as it does here when Roland Wiley acquired John Yount's ranch in 1936.
10. In 1941, Roland constructed the airstrip pictured here near his ranch in Pahrump Valley.
11. Aerial view of the Hidden Hills Ranch. 1980.
12. Willow trees bordering both sides of the first road that led to the old Yount Ranch, also known as the Hidden Ranch or Hidden Hills Ranch. 1937.
13. Hoot Gibson, a western cowboy actor, and Mrs. Elderbrook, then crowned Mrs. America, landing on Roland Wiley's Hidden Hills Ranch airstrip, early 1950s.
14. Visitors at the Hidden Hills Ranch. Hoot Gibson is standing behind the hitching post shaking hands with Murdell Earl, owner of the ENT Drug Store in North Las Vegas. 1950s
15. Hidden Hills Ranch, Pahrump Valley, Nevada. The remains of a fireplace believed to have been constructed by the Indians. Left to right: Ruth Elderbrook; unidentified; unidentified; Frank Elderbrook. Bob Lee remembered seeing these two fireplaces when he was a child. Circa 1950.
16. Cathedral Canyon in Hidden Hills Ranch. Roland Wiley is on left in white shirt; Mr. Elderbrook, from Palm Springs, is in the foreground in the white hat. Mrs. Elderbrook and Hoot Gibson's wife are also pictured. Between 1950 and 1960.
17. Fred Kennedy, riding a gaited horse owned by Roland Wiley at Cathederal Canyon Hidden Hills Ranch. Approximately 1939.
18. Mummified remains of an Indian renegade known as Queho. Standing second from left is Frank White, a member of the posse that initially searched for Queho. 1940s.
19. A view of a truck, farm workers, and melons grown on the Roland Wiley's Hidden Hills Ranch. 1967
20. 15 acres of Roland Wiley's land holdings on the California side of the Pahrump Valley were planted in melons. Part of the irrigation system and the crop from that enterprise are shown. 1967.
21. Unidentified persons and melons grown on the California side of Roland Wiley's Ranch. 1967
22. Dora Lee Brown and her granddaughter at Dora's place on the Yount (Hidden Hills) Ranch, Circa 1940.
23. Granddaughter of Dora Lee Brown near spring at Dora's place on the Yount (Hidden Hills) Ranch. Circa 1940

Middle Run Bridge

Summer Camp.

"...YOU GOT TWO-BITS?"

"Me Chief [illegible]"

by
Stanley W. Paher
Author of
"Nevada Ghost Towns & Mining Camps"

Pahrump Valley's oldest ranch is the Manse, located near the Nye-Clark County line, alongside the paved road. In the accompanying picture, the son of the founder of the Manse, San Yount, is engaged in a game of pool with another well-known desert character of this area, Chief Tecopa, at right.

He is attired in his habitual dress – shoeless, but with top hat and vest. He begged his way through life and it is said that he bathed only annually.

• • •

Around the turn of the century, Chief Tecopa frequently hung out around the station of the California Eastern Railway at Manvel, Calif., about 40 miles south of Pahrump and 15 miles west of Searchlight. He used to meet the trains coming in from Goffs, near Needles, on the Santa Fe Railroad main line. There he liked to beg for change to buy food or whiskey.

Capt. Ray Gibson, now 85 and retired from the desert, saw Chief Tecopa in action, and relates the following description: If he saw a man with a pair of high boots, he knew that he was an engineer and would have a lot of money. Tecopa liked three buckled boots better than two buckled boots, believing that the richer engineers had more buckles.

So he would walk up to an engineer and say, "Me Chief Tecopa, Paiute Indian. Great friend of '49ers. Me fight Shoshone. Doctor say got tuberculosis. Me 106 years old. Pretty soon die. You got two bits?" In this way he was able to sustain himself.

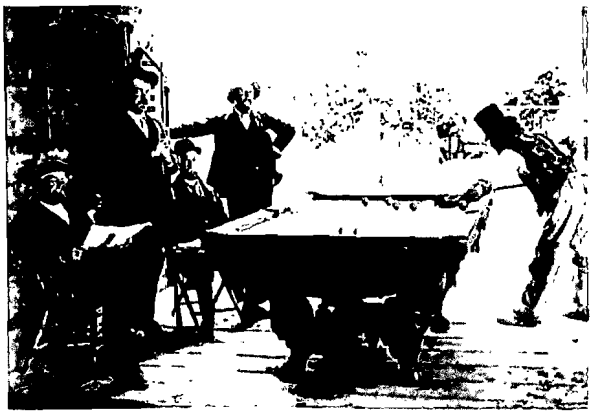
Every fall he would go to Los Angeles where he met a banker friend who used to take him to a good Turkish bath. His clothes would be stiff with dirt.

He would return to the desert the happiest man alive because he would have a new outfit on. He wore a swallow-tailed coat, a hat with a big rosette on the side, a white tie, a white shirt and stripped pants.

The last year Gibson saw Tecopa, around 1904, he had gone into Los Angeles to see his old banker friend, but the banker had gone to Europe. Tecopa went into the bank as usual, and the other tellers all knew him, but none of them had any authority to give him anything. So he continued to hang around the bank.

This was during the time of the year when the bank was counting its money. Gold coins were stacked all over the place.

Tecopa kept asking about the whereabouts of his friend, and the bankers ignored him.



"Where Mr. Dutton?", he would ask.

"He's in Europe."

"Where Europe?"

"Maybe 30 days east."

"When he come back?"

"I don't know."

And so the old Chief kept waiting around and getting in the way. Finally the cashier took $2.50 out of his own pocket and sent it across the counter to Tecopa, hoping he would leave.

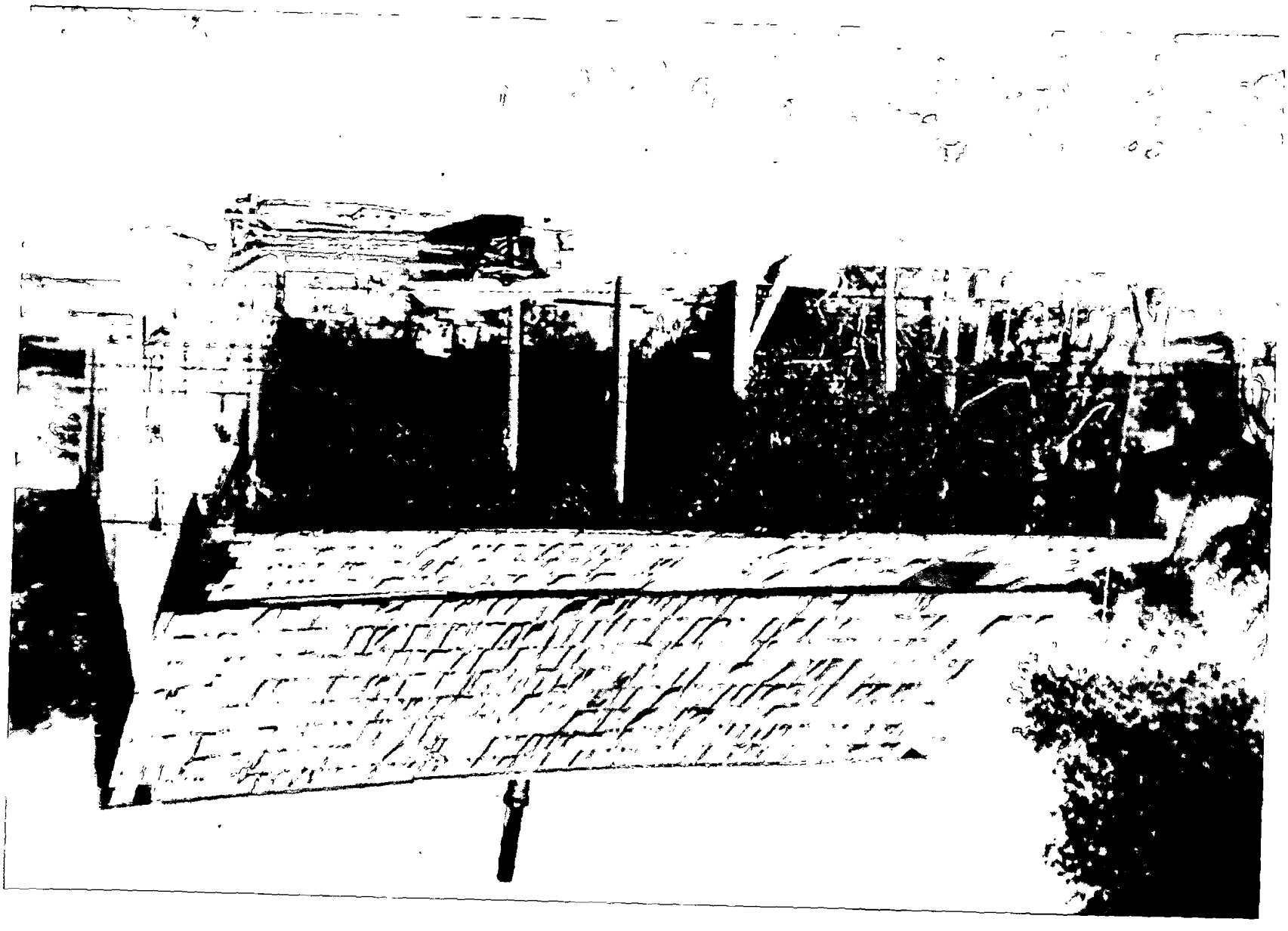
But Tecopa wasn't satisfied. He said, "Big money store! You keep 'em."

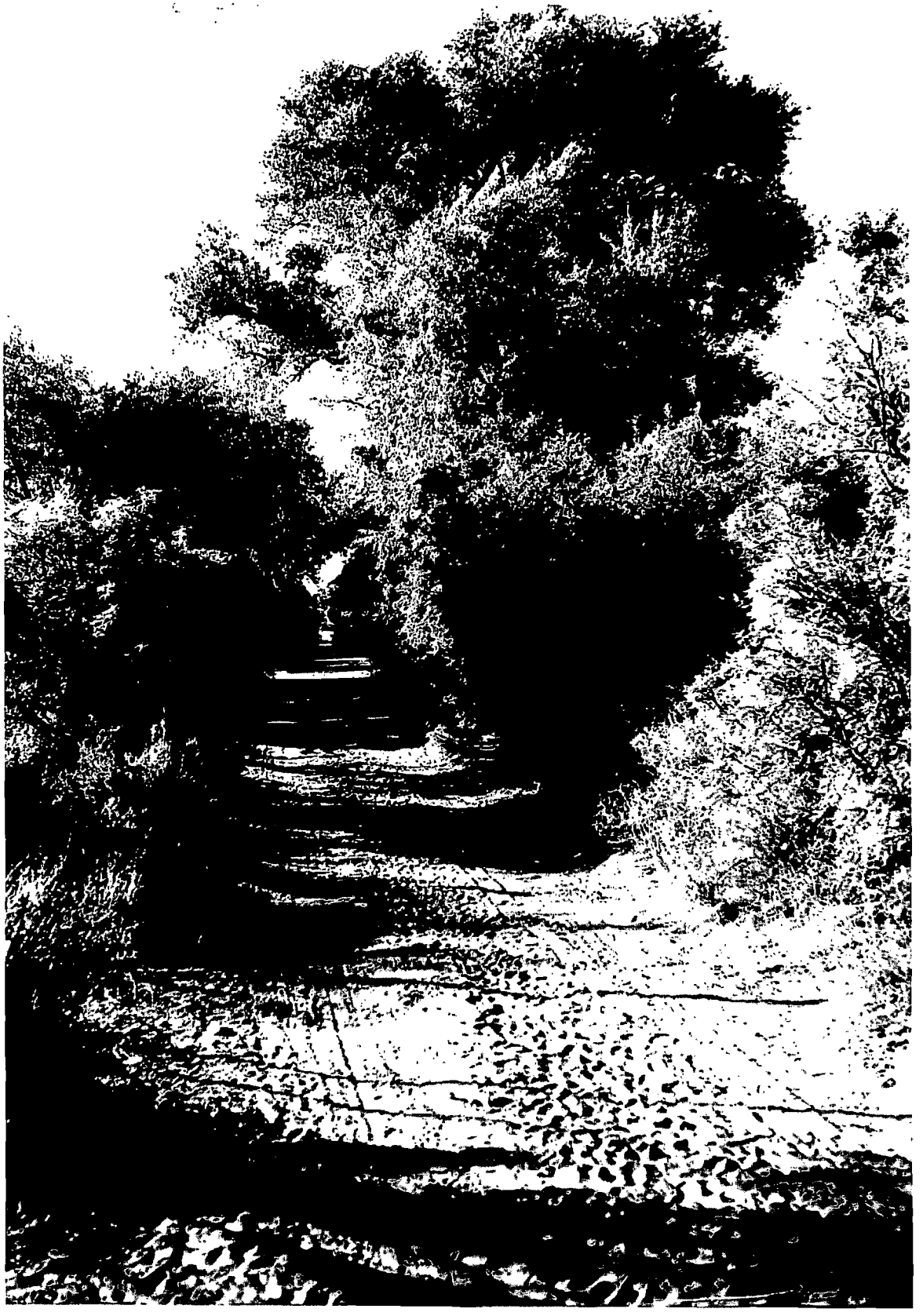
Because Tecopa would not leave, the cashier then called the police.

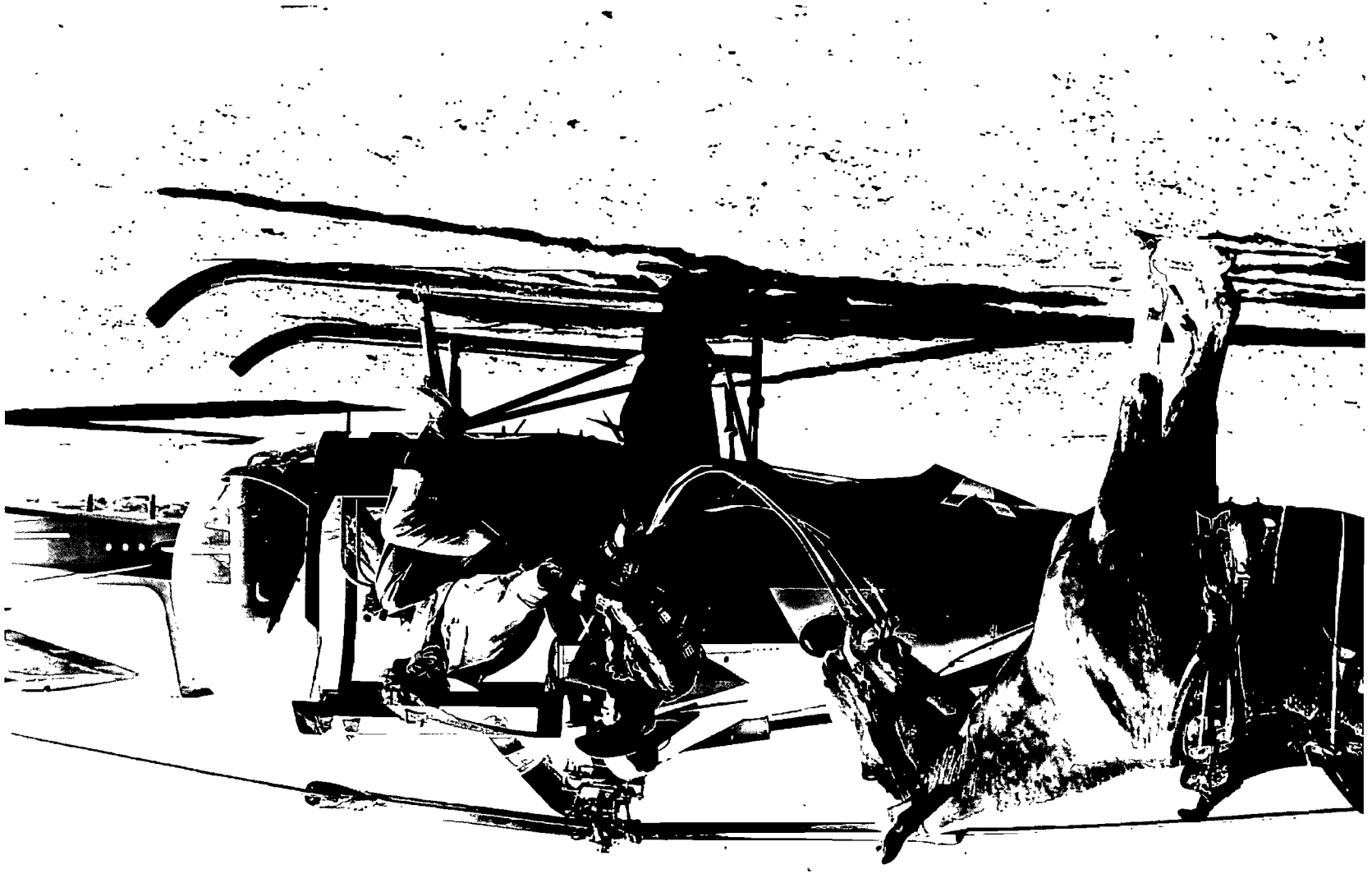
When Tecopa returned to the desert, here's the story he told Gibson:

"Police came...big strong man...take me to fine hotel. Bars. No one get you. Fine grub...fine dinner...breakfast. Bacon, egg, good bread, nice coffee. All fine..."

That was Chief Tecopa's idea of a jail. He reportedly died about 1905, at age of over 100. Gibson said he looked about 200. He had millions of wrinkles and squinted. You could hardly see what color his eyes were. He had a face you'd never forget.

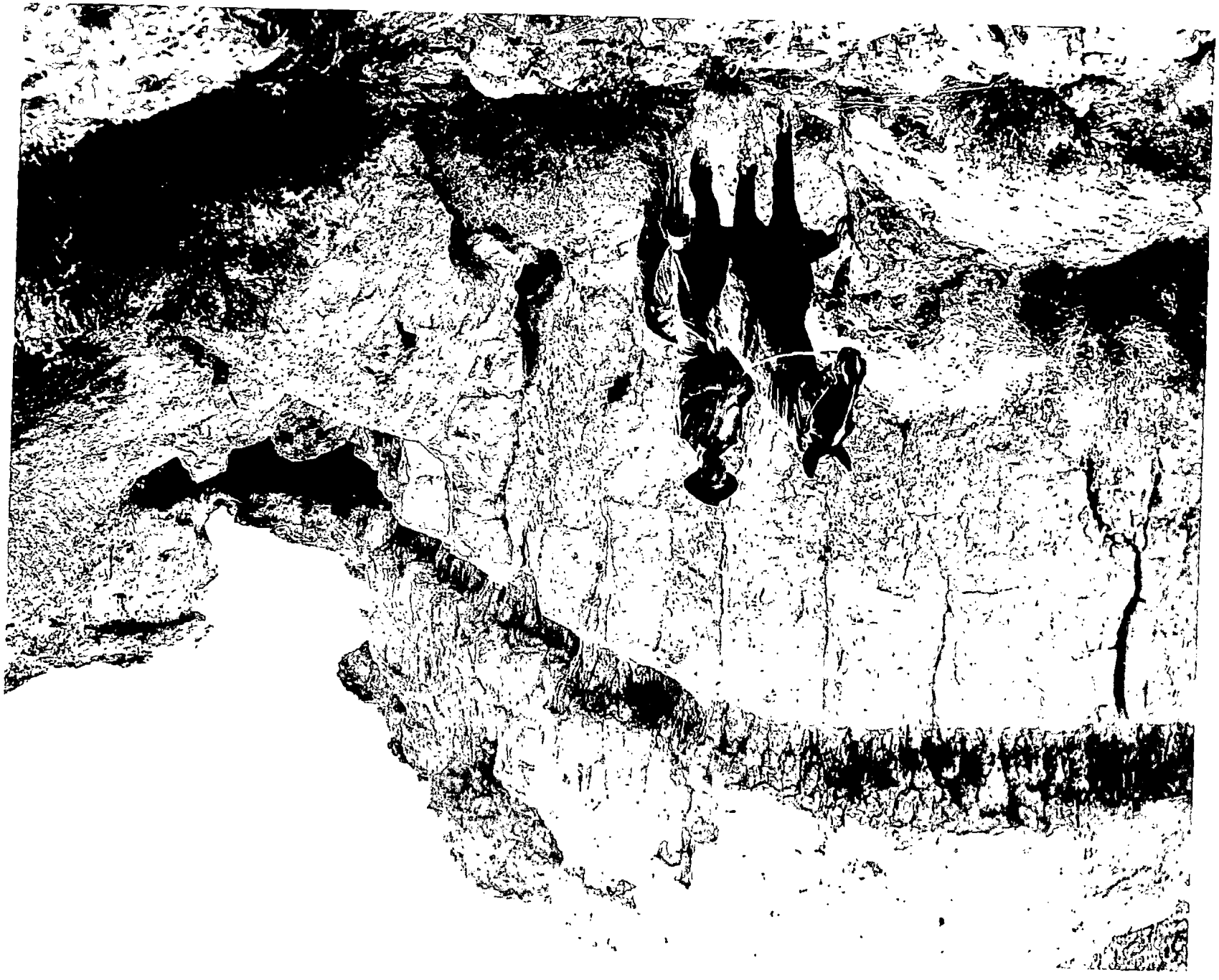






HIDDEN
RANCH

picturesq[illegible] widely kno[illegible]
now lighted a[illegible] improved with lights, entrance [illegible]
natural fireplaces etc. Recently named "the [illegible]
because of many similairities to Cathedral Architecture.
Located 150' from entrance to famous
Hidden Hills Ranch Cottages.



HIDDEN HILLS
RANCH

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION FOR THE *HIDDEN HILLS SOLAR ELECTRIC GENERATING SYSTEM*

DOCKET NO. 11-AFC-02

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(Revised 8/14/12)

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County of Inyo
Dana Crom
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Nye County
Lorinda A. Wichman, Chairman
Board of County Supervisors
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Tonopah, NV 89049
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Nye County Water District
L. Darrel Lacy
Interim General Manager
2101 E. Calvada Boulevard
Suite 100
Pahrump, NV 89048
llacy@co.nye.nv.us

*indicates change

DECLARATION OF SERVICE

I, Raquel Rodriguez, declare that on August 17, 2012, I served and filed copies of the attached Hidden Hills Solar Electric Generating Systems – California Energy Commission Ethnographic Report with New Redacted Appendix A, dated August, 2012. This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: **www.energy.ca.gov/sitingcases/hiddenhills/index.html**.

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit or Chief Counsel, as appropriate, in the following manner:

(Check all that Apply)

For service to all other parties:

_X_ Served electronically to all e-mail addresses on the Proof of Service list;

Served by delivering on this date, either personally, or for mailing with the U.S. Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "e-mail preferred."

AND

For filing with the Docket Unit at the Energy Commission:

_X_ by sending an electronic copy to the e-mail address below (preferred method); ***OR***

_X_ by depositing an original and 12 paper copies in the mail with the U.S. Postal Service with first class postage thereon fully prepaid, as follows:

CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
Attn: Docket No. 11-AFC-02
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.ca.gov

OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:

____ Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

California Energy Commission
Michael J. Levy, Chief Counsel
1516 Ninth Street MS-14
Sacramento, CA 95814
mchael.levy@energy.ca.gov

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Originally Signed
Raquel Rodriguez
Siting, Transmission and Environmental Protection Division

Raquel Rodriguez

January 14, 2015

Inyo County Planning Department
P.O. Drawer L
168 N. Edwards St
Independence, CA 93526

Re: Comment Letter on Inyo County Renewable Energy General Plan Amendment (REGPA) Draft Programmatic Environmental Impact Report (PEIR)

We, the undersigned, are concerned business owners and merchants in Eastern Inyo County, and we feel that the Chicago Valley and Charleston View are not appropriate areas to develop utility-scale solar energy.

The economy of Eastern Inyo County is dependent on tourism. All year long, tourists from around California, the United States, and around the globe visit our area. Many of these tourists are attracted to Eastern Inyo County because it is remote and undeveloped. They share their stories about how refreshing it is to come to a place so far from the trappings of civilization and the industrialized cityscapes many of them call home.

Permitting the development of utility-scale solar energy facilities in the Chicago Valley and Charleston View would change the character of our region. Eastern Inyo County would no longer feel undeveloped and remote—instead tourists would arrive to find industrialized energy production zones.

We are concerned that the development of utility-scale solar energy in our region would have a negative impact on our local economy. If the landscape of Eastern Inyo County changes from remote to industrialized, tourists might be inclined to spend their leisure time elsewhere. This could mean less business, less tax revenue for Inyo County, and a decrease in employment levels and opportunities in our area.

Please do not permit utility-scale solar energy development in Chicago Valley or Charleston View.

Signed,

Concerned Eastern Inyo County business owners and merchants

(please see signatories below)

Suzi Dennett
Death Valley Chamber of Commerce

Brian Brown
China Ranch Date Farm

Susan Sorrells
Shoshone Development Inc.

Amy Noel
Tecopa Hot Springs Resort

Nancy Good
New Light Foto Design

Karin Pine
Tecopa Hot Springs Therapeutic Massage

January 12, 2015

We, the undersigned, are full-time and part-time residents of Tecopa. We do not believe that industrial-scale solar energy production is right for Eastern Inyo County. Tourism forms the basis of our economy, and many tourists come here seeking the remote, undeveloped landscapes that the Death Valley Region has to offer. Charleston View and the Chicago Valley are important parts of our region, and if they were to be converted into utility-scale solar energy production areas, it could potentially have a negative impact on tourism, and thereby a negative impact on our local economy.

Please withdraw Charleston View and Chicago Valley from consideration as Solar Energy Development Areas.

Signed,

Kate Knight — P.O. Box 113, Shoshone, CA 92384

Bonnie Robert Tanti — P.O. Box 144, Tecopa CA 92384

Business - Paul Barnes, Tecopa Hot Springs Conservancy, PO Box 103, Tecopa, CA 92389

Business - Nancy Good, New Light Foto Design, P.O. Box 103, Tecopa, CA 92389

Dennis Clark — P.O Box 214 Tecopa CA 92389

Rudy Johnson — P.O Box 24 Tecopa Ca. 92389

Will Wath ← Lived here over 10 yrs. | P.O. Box 334, Tecopa, Ca.

Name	City	State	Zip Code	Country
Patrick Donnelly	Shoshone	California		United States
Julie Vargo	Bishop	California	93514	United States
Kevin Emmerich	Beatty	Nevada	89003	United States
Jim Mattern	Joshua Tree	California	92252	United States
John Smolinski	Yucca Valley	California	92284	United States
connie j cunningham	Boise	Idaho	83709	United States
Lorraine Vineyard	Lake Havasu City	Arizona	86404	United States
Rob Ortegon	Rio Rancho	New Mexico	87124	United States
Jack Cook	Lacka	New York	14218	United States
Per Roam	Phoenix	Arizona	85032	United States
Lynne DeSpain	Bisbee	Arizona	85603	United States
shaunt kouyoumdjian	Glendale	California	91202	United States
Ann Harrell	Shoshone	California	92384	United States
Patrick Overlie	San Bernardino	California	92404	United States
Daniel price	Adelanto	California	92301	United States
jeff mcauliff	castro valley	California	94546	United States
christopher snyder	Marina	California	93933	United States
chiara graziosi			53035	Italy
Kim wright	Tehachapi	California	93561	United States
guido voltolini			53035	Italy
Freddie Miller	Fresno	California	93727	United States
Renee Sweezey	Santa Rosa	California	95404	United States
Joseph Linert	North Las Vegas	Nevada	89081	United States
Pat martin	Quail Valley	California	92587	United States
faye helms	daleville	Alabama	36322	United States
chris evans	Lake Havasu City	Arizona	86403	United States
Yesenia Smith	victorville	California	92392	United States
monica martini			53035	Italy
Seth Cline	Bishop	California	93514	United States
Erika Diamond	Tustin	California	92770	United States
Jared Fuller	Plesant Grove	Utah	84062	United States
Earline Ahonima	San Francisco	California	94114-2434	United States
Jeff Cooper	Apple Valley	California	92307	United States
Carol Corbett	Las Vegas	Nevada	89149	United States
eric h	Santee	California	92071	United States
Scott Fajack	Los Angeles	California	90026	United States
Erin McGuire	Palmdale	California	93591	United States
Keith Suleski	Santa Ana	California	92706	United States
Ann Bucharelli	Inyokern	California	93527	United States
Jamie Weleber	Columbia	New Jersey	7832	United States
Catherine Ruane	Buckeye	Arizona	85309	United States
Reid Campbell	Darwin	California	93522	United States
Dulce Stein	Hawthorne	California	90250	United States
Patricia Davis	California City	California	93505	United States
Sharon Garabedian	Canoga Park	California	91304	United States
Kathryn Holmes	Hains	Alaska	99827	United States

Kyri Freeman	Barstow	California	92311	United States
Karin Pine	Tecopa	California	92389	United States
claudia millerbragg	Campo	California	91906	United States
Craig Dicht	Joshua Tree	California	92252	United States
Roger Shervington	Claremont	California	91711	United States
Pete zwanenburg	rotterdam			Netherlands
fred rinne	San Francisco	California	94112	United States
James Ledwidge	Mojave	California	93501	United States
Elizabeth Perluss	Auburn	California	95602	United States
Reece Parker	Albuquerque	New Mexico	87123	United States
sue sch.	Florida	Florida	89077	United States
Constance Parker	Albuquerque	New Mexico	87123	United States
Elizabeth Morgan	San Diego	California	92126	United States
Alan Brechlin	Victorville	California	92395	United States
Robert Hansen	Hayward	California	94545-2935	United States
Mary Roper	Independence	California	93526	United States
Chris Clarke	Joshua Tree	California	92252	United States
Jeff Dyer	Pinon Hills	California	92372	United States
Pierre Plas			66470	France
Edwin Palacios	Sylmar	California	91342	United States
Carma roper	Independence	California	93526	United States
Ryan Drnek	Culver City	California	90230	United States
Clayton Ellis	Tunnel Hill	Georgia	30755	United States
Rob Spangler	Syracuse	Utah	84075	United States
Rana Schindler	Lone Pine	California	93545	United States
Kenneth Sitz	Los Angeles	California	90026	United States
Sonie Sampson	San Francisco	California	94121	United States
Jacklyn Velasquez	Big Pine	California	93513	United States
Robert Davis jr	Bethesda	Maryland	20817	United States
John Feeney	Boulder	Colorado	80304	United States
shani kleinahus	Palo Alto	California	94303	United States
Jill Bays	Pinon Hills	California	92372	United States
Tamie Warren	Ridgecrest	California	93555	United States
Erin Barca	Walnut Creek	California	94596	United States
Laraine Turk	Joshua Tree	California	92252	United States
Dennis Kaplan	Mayfield Heights	Ohio	44124	United States
William Fortney	Camarillo	California	93010	United States
Bill Helmer	Independence	California	93526	United States
Yaney MacIver	Corvallis	Oregon	97330-3179	United States
randy ness	Rosamond	California	93560	United States
Sonya Shiffer	Pismo Beach	California	93449	United States
Paul Fretheim	Independence	California	93526	United States
Mary Williams	Burbank	California	91504	United States
david Martinez	San Dimas	California	91773-2032	United States
Duncan Bell	Claremont	California	91711	United States
William Heller	Union Beach	New Jersey	7735	United States
Linda Webb	Albuquerque	New Mexico	87111	United States

Ty dennison	Inyokern	California	93527	United States
Elizabeth Nannini	Castro Valley	California	94546	United States
Mike Hudak	Binghamton	New York	13904	United States
b Coons	San Diego	California	92110	United States
Spencer Coffin	Twentynine Palms	California	92277	United States
Neil Toll	Gallatin	Tennessee	37066	United States
Tresa Gallegos	Leesville	Louisiana	71446	United States
Patty smith	Savannah	Georgia	31404	United States
Alison Erickson	Des Plaines	Illinois	60018	United States
Trevolyn Haines	Chino Hills	California	91709	United States
Carol Underhill	Victorville	California	92392	United States
Robert Morgan	Bishop	California	93514	United States
Karyn Newbill	Simi Valley	California	93063	United States
G. Donald Bain	El Cerrito	California	94530-6503	United States
Nicholas Lessig	San Diego	California	92117	United States
Jane Mcdonald	Independence	California	93526	United States
edie trimmer	big pine	Utah	93513	United States
Christian Hogan	Marysville	California	95901	United States
Penelope Melko	Tehachapi	California	93561-8154	United States
Dylan NEUBAUER	Santa Cruz	California	95060	United States
Rose Masters	Independence	California	93526	United States
Aaron Hampton	Independence	California	93526	United States
Robert Temple	Ridgecrest	California	93555	United States
Kathy Tieu	Santa Ana	California	92705	United States
Randy Stevenson	Atascadero	California	93422	United States
Michael Rotolo	El Segundo	California	90245	United States
Gann Matsuda	Culver City	California	90230	United States
John Moore	Sacramento	California	95820	United States
Linda Emerson	Bishop	California	93514	United States
Ilene Mandelbaum	Lee Vining	California	93541	United States
Stan Russell	Santa Cruz	California	95060	United States
Joel Masser	San Jose	California	95124	United States
Bruce E	Los Angeles	California	90026	United States
Frank Bluntew	Los Angeles	California	90024	United States
Annie Bergman	Portland	Oregon	97206	United States
Jennifer Jennings	Long Beach	California	90806	United States
Daniel Pritchett	Bishop	California	93514	United States
Lynn Johnson	Independence	California	93526	United States
Kirsten Liske	Santa Cruz	California	95062	United States
sarah rose	YOSEMITE NATIONAL PARK	California	95389	United States
Jen Michelsen	Santa Cruz	California	95062	United States
Kevin McDavid	Costa Mesa	California	92626	United States
Beth Jackson	Fishers	Indiana	46037	United States
Steven McLaughlin	Big Pine	California	93513	United States
Donna Archer	Independence	California	93526	United States
Michael Prather	Lone Pine	California	93545	United States
Christopher Capp	Venice	California	90291	United States

John Corathers	Reno	Nevada	89523	United States
BryAnna Vaughan	Big Pine	California	93513	United States
Karen Brorson	Bishop	California	93514	United States
Steve Campini	Temecula	California	92591	United States
Jesse Roper	Portland	Oregon	97213	United States
Clare Marter Kenyon	Los Angeles	California	90065	United States
Sydney Quinn	Big Pine	California	93513	United States
Nancy Masters	Independence	California	93526	United States
Patricia Tapanes	Los Angeles	California	90045	United States
Richard kelty	Bishop	California	93514	United States
Mark Campbell	Rosamond	California	93560	United States
Joel Ferree	Pasadena	California	91106	United States
brian cashore	Bishop	California	93514	United States
Christian Corathers	Long Beach	California	90814	United States
Ellen Donnelly	Southbury	Connecticut	6488	United States
janis lloyd	North Bend	Oregon	97459	United States
Richard DiPrima	Bishop	California	93514	United States
julia still	wells		5363	United Kingdom
john walton	Carmel Valley	California	93924	United States
Michael Brorson	Bishop	California	93514	United States
Edwin Thomas	Catonsville	Maryland	21228	United States
Amy Noel	Tecopa	California	92389	United States
Howard Steidtmann	Stateline	Nevada	89449	United States
Nancy Good	Las Vegas	Nevada	89110	United States
Jora Fogg	June Lake	California	93529	United States
Sam Roberts	Millbrae	California	94030	United States
Carol Conner-Turner	Bishop	California	93514	United States
Elaine Bowers	Big Pine	California	93513	United States
cassie baez	Mountain View	California	94043	United States
Bryce Winter	Santa Cruz	California	95060	United States
Monica Wilson	Coarsegold	California	93614	United States
Matthew Page	Simi Valley	California	93065	United States
Candas Klosowski -jones	Valencia	California	Valencia	United States
Deborah Cruze	New Washoe City	Nevada	89704	United States
Austin Womack	Ontario	California	91764	United States
Andrea Mann	Concord	California	94521	United States
Guy hatzvi	Los Angeles	California	90042	United States
Karin Kersteter	Ventura	California	93001	United States
Larry Thompson	Huntington Beach	California	92647	United States
Jeff Mitchell	Lancaster	California	93536	United States
Dave Wagner	Independence	California	93526	United States
Elisabeth Chaplin	Santa Barbara	California	93101	United States
Chastity Richkarday	Van Nuys	California	91405	United States
Lauralea Thompson	Laguna Niguel	California	92677	United States
Leslie Sobel	Milan	Michigan	48160	United States
Olivia Grah	Bishop	California	93514	United States
James Morehouse	Las Vegas	Nevada	89135	United States

Lori Simpson	Bishop	California	93514	United States
Sherrie Good	Harrisonburg	Virginia	22801	United States
charlene roueche	Torrance	California	90503	United States
William Turner	Oakland	California	94618-1029	United States
Brian McColgan	Ojai	California	93023	United States
francesca militeau	boulder	Colorado	80302	United States
Terry Frewin	Santa Barbara	California	93130	United States
sam foster	San Francisco	California	94112	United States
Joyce Hana	Brea	California	92821	United States
Amanda Wendt	Independence	Iowa	50644	United States
Roland Peachie	Ridgecrest	California	93555-4137	United States
karen orso	Wilseyville	California	95257	United States
Steve Haga	Auburn	California	95602	United States
Julie Rolfe	Mammoth Lakes	California	93546	United States
Lance Rava	Reno	Nevada	89521	United States
Jose Witt	Las Vegas	Nevada	89143	United States
Susan Kollins	Long Beach	California	90808	United States
David Herbst	Bishop	California	93514	United States
Kerry Farris	Klamath Falls	Oregon	97603	United States
Laura Furuyama	Livermore	California	94551	United States
Keith Thompson	Beaumont	California	922238603	United States
Edward Logue	Palmdale	California	93552	United States
david iverson	Cottonwood	Arizona	86326	United States
Bob Meacham	San Antonio	Texas	78218	United States
Steven Smith	Barstow	California	92311	United States
Molly Hansen	Arroyo Seco	New Mexico	87514	United States
Sarah Lewis	Long Beach	California	90803	United States
lara hartley	Barstow	California	92311	United States
James Wilson	Big Pine	California	93513	United States
Graham Cooper	Big Pine	California	93513	United States
Tom Budlong	Los Angeles	California	90049	United States
Janet Westbrook	Ridgecrest	California	93556	United States
Valerie Hart	Big Pine	California	93513	United States
Mary Jane McEwan	Ridgecrest	California	93555	United States
Jack Freer	Gardnerville	Nevada	89410	United States
Susan Odell	Silver Spring	Maryland	20910	United States
Devona Snook	San Francisco	California	94131	United States
Kathryn LaShure	Inyokern	California	93527	United States
SHAWN RUMMEL	Buena Park	California	90621	United States
Gordon Matassa	San Francisco	California	94112	United States
Jonathan Pusey	Long Beach	California	90803	United States
Ariana Wylie	Byron	California	94514	United States
Eric Bero	Gardnerville	Nevada	89460	United States
dale aastrom	Montclair	California	91763	United States
Anca Logan	Mammoth Lakes	California	93546	United States
Ross Heckmann	Arcadia	California	91006-2406	United States
Deny Dudzik	Yorkville	California	95494	United States

D. Wall	San Pedro	California	90732	United States
nancy gooch	Ridgecrest	California	93555	United States
Bob Kent	Chatsworth	California	91311	United States
David Rose	Conroe	Texas	77303	United States
Norma Ryan	Simi Valley	California	93065	United States
Thomas Perkins	Ridgecrest	California	93555	United States
robert gaude	Verdi	Nevada	89439	United States
Whitney Peterson	Minneapolis	Minnesota	55438	United States
Dean Godinez	Costa Mesa	California	92626	United States
Katheryn Uccello	Monterey	California	93940	United States
Linda Bozack	Brookings	Oregon	97415	United States
Marcos Trinidad	Los Angeles	California	90041	United States
Michelle Stahnke	Atascadero	California	93422	United States
Teresa Mokma	San Jose	California	95128	United States
Andrew Yocum	Simi Valley	California	93063	United States
Janet Kruse	Portland	Oregon	97293	United States
Yolanda Demotto	Chula Vista	California	91911	United States
Lynne Almeida	Bishop	California	93514	United States
Colby Brokvist	Oakhurst	California	93644	United States
Steve Byrne	Pacifica	California	94044	United States
Sara Manning	Bishop	California	93514	United States
Mervin Hess	Bishop	California	93514	United States
Will Scott	Lagunitas	California	94938	United States
Jessica Dixon	Mammoth Lakes	California	93546	United States
Shirley Mills	Alturas	California	96101	United States
Priyantha Wijesooriya	Colombo5			Sri Lanka
Eric O'Rafferty	Altadena	California	91001	United States
Leslie Gunning	Studio City	California	91604	United States
Mitzi patterson	Las Vegas	Nevada	89129	United States
Aleah Sato	Phoenix	Arizona	85012	United States
Sharon Stein	Hawthorne	California	90250	United States
Darlene McGriff	Sacramento	California	95826	United States
Julio Soria	Montebello	California	90640	United States
David Ross	Paulsboro	New Jersey	8066	United States
Stacy Fitzgerald	Reno	Nevada	89521	United States
Tracie Denton	Aliso Viejo	California	92656	United States
sedda wuller	Los Angeles	California	90026	United States
Adina Ross	Murrieta	California	92564	United States
Cheryl Hobson	Morongo Valley	California	92256	United States
Diane Mahle	Newhall	California	91321	United States
Jennifer Riley	Antelope	California	95843	United States
Judith Millward	W Richland	Washington	WA 99353	United States
Justin Blake	Tecopa	California	92389	United States
Andres Burrola	Lomita	California	90717	United States
Ariella Daly	Nevada City	California	95959	United States
Sherry Cosgrove	Keeler	California	93530	United States
Paula Hugill	San Diego	California	92154	United States

Jacqueline Halpin	Altadena	California	91001	United States
Steve Parmenter	Bishop	California	93514	United States
julie haber	Ridgecrest	California	93555	United States
Diana Williams-Horning	Sparks	Nevada	89431	United States
David Kurdeka	Ridgecrest	California	93555	United States
Sandra Schwarzbach	Ridgecrest	California	93555	United States
Louise Mathias	Joshua Tree	California	92252	United States
Jo barlow	Bishop	California	93514	United States
Mary Jean Sitter	Pleasant Hill	Missouri	64080	United States
Chris Kalashian	Clovis	California	93619	United States
Ellen Kalashian	Clovis	California	93619	United States
Keith Ross	Battle Ground	Washington	98604	United States
Susan Maylone	Dallas	Texas	75240	United States
jane nye	Chicago	Illinois	60640	United States
Theresa Hoff	Mooresville	North Carolina	28117	United States
Rosemary Jarrett	Bishop	California	93514	United States
George Mitchell	San JOse	California	95155-655	United States
Michelle Westrum	Nevada City	California	95959	United States
Andrew Morin	Lone Pine	California	93545	United States
Jael Hoffmann	Olancha	California	93549	United States
Jamey Wilcher	Davis	California	95616	United States
Ethel Messer	Shoshone	California	92384	United States
Samantha Dixon	Las Vegas	Nevada	89120	United States
Li Newton	Asheville	North Carolina	28803	United States
John G Curry	Durham City	England	DH1 4HP	United Kingdom
Scott Parker	Antioch	California	94509	United States
Linda Anderson	Ridgecrest	California	93555	United States
Shawn Delehanty	Bishop	California	93515	United States
Hilary Parish	Bishop	California	93515	United States
Lucy Alexander	Toronto		M4M2Y8	Canada
Lisa Ronning	Chula Vista	California	91911	United States
Michel Collins	Cayce	South Carolina	29033	United States
Sheila Steeples Anders	Flagstaff	Arizona	86001	United States
Laura Beardsley	Mammoth Lakes	California	93546	United States
Cathy Huff	Ridgecrest	California	93555	United States
Virginia Davis	Camano Island	Washington	98282	United States
Jackie Brown	Ridgecrest	California	93555	United States
Teresa Skye	Pahrump	Nevada	89048	United States
Patricia Brannon	Glendora	California	91740	United States
Mike Hay	Bishop	California	93514	United States
tina breedlove	inyokern	California	93527	United States
Barbara Durham	DEATH VALLEY	California	92328	United States
Jesse Noh	Brea	California	92823	United States
Brian Settle	Worthington	Ohio	43085	United States
Cynthia Koff	Long Beach	California	90808	United States
kate kingston	fairfax	California	94930	United States
Tracey Bowers-Stidham	Ramona	California	92065	United States

joseph cappiello	Pomona	California	91768	United States
Toreia Miller	Mentone	California	92359	United States
Mike Bond	Sparks	Nevada	89431	United States
Barbara Carter	Vallejo	California	94591	United States
Joseph Leomo	Los Angeles	California	91324	United States
nancy higbee	Perris	California	92570-7873	United States
Barry Lehrman	Claremont	California	91711	United States
Joey Davidson	Bishop	California	93514	United States
Mike Kelly	Hesperia	California	92345	United States
Ryan Navales	Los Angeles	California	90014	United States
Robert oinas	San Bernardino	California	92407	United States
Andy Williams	Cortlandt	New York	10567	United States
David Rosenthal	Westlake Village	California	91361	United States
K. Belt	Silver City	New Mexico	88061	United States
annie belt	San Jose	California	95126	United States
Ann Michelle DeSelms	Colstrip	Montana	59323	United States
john whitworth	Acworth	Georgia	30102	United States
Barbara Burns	ARCATA	California	95521	United States
alfredo figueroa	Blythe	California	92225	United States
Greg Belt	Lompoc	California	93436	United States
Michael Hale	Oklahoma City	Oklahoma	73162	United States
frances Trotta	Silver City	New Mexico	88061	United States
Alex Fuhrer	Carpinteria	California	93013	United States
Jef Chadwick	Mammoth Lakes	California	93546	United States
Randy Kennedy	Montrose	Colorado	81401	United States
Raven Gray	Inverness	California	94937	United States
Jesse Deyden	Huntington Beach	California	92647	United States
William Hein	Los Angeles	California	91405	United States
Cathy Billings	Los Angeles	California	90042	United States
Robert Sr	Mina	Nevada	89422	United States
Barbara Hausteen	Riverside	California	92504	United States
Zachary Michelson	Orinda	California	94563	United States
Kiriaki Keramitsoglou	Didimoticho			Greece
Matilde Reyes	South Pasadena	California	91030	United States
enrika lazdauskaite	Los Angeles	California	90038	United States
Carie Ledbetter	Riverside	California	92504	United States
Chris Christensen	Olancha	California	93549	United States
Dominique Tardif	Boise	Idaho	83703	United States
Chantal Buslot	Hasselt	Texas	78753	United States
michelle strong	los angeles	California	90042	United States
Shannon Mallory	San Diego	California	92111	United States
Mark Reback	Los Angeles	California	90042-1107	United States
Erik Polczwartek	Joshua Tree	California	92252	United States
Melissa Crusinberry	Blythe	California	92225	United States
Gerry Mulryan	Castaic	California	91384	United States
Kendall Mallory	San Diego	California	92111	United States
Maryanne Murray	Littlerock	California	93543	United States

Louise Grabowski	Quincy	Massachusetts	2171	United States

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change.org
Amargosa Conservancy

Recipient: Inyo County Planning Department

Letter: Greetings,

I have enjoyed my visits to the stunning Eastern Sierra and Death Valley Regions of Inyo County. These areas are iconic American landscapes, and I hope to continue visiting in the future. I am attracted to the area because of its remote and undeveloped character, and eye-popping unspoiled beauty.

The Eastern Sierra and Death Valley Regions, and my experience of them as a visitor, would be permanently altered by the presence of industrial-scale solar energy production. No longer remote and undeveloped, the areas would feel like an industrial landscape- the very sort of place I visit Inyo County to escape. If these developments went forward, it might influence where I chose to take future trips or vacations.

Please eliminate the Charleston View, Chicago Valley, Pearsonville, and Rose Valley SEDAs, and please limit solar development in the county to small-scale facilities which will directly generate renewable energy for in-county use.

Please do not spoil the irreplaceable landscapes of the Eastern Sierra and the Death Valley Region with utility-scale solar development.

Comments

Name	Location	Date	Comment
Julie Vargo	Bishop, United States	2015-01-05	Industrial scale solar is not the future. We need energy solutions that do not destroy the few remaining pristine areas of our country.
Lorraine Vineyard	Lake Havasu City, AZ	2015-01-05	We as a nation have spoiled enough land. We need to repurpose what we have now and leave the rest for our ancestors.
Jack Cook	Lacka, United States	2015-01-05	Large-scale solar has proven to be devastating to ecosystems, wildlife, and to cause pollution with the coolant, erosion from runoff, and yet big-energy still tries and destroy our desert with these solar plants. Put solar panels on rooftops!
Daniel price	Adelanto, CA	2015-01-05	we don't need solar stuff making the beautiful desert ugly. They have put some solar stuff arround my area and it's ugly. I travel a lot up and down 393 and 58 and I see that ugly solar stuff. Now don't get me wrong I don't mind saving the earth by going solar but I also would like to save our beautiful Death Valley. Put that solar stuff somewhere that it don't destroy our wild life and desert. Put it in the city on top of buildings were no one sees it our cares. Thank you for your time. Daniel Price
christopher snyder	sedona, United States	2015-01-05	Solar panels belong where the power is used.
chiara graziosi	Italy	2015-01-05	To preserve the natural beauty of this wild landscape. Let the wild be wild!!
guido voltolini	Italy	2015-01-05	I love these places
Pat Martin	Canyon Lake, CA	2015-01-05	this is a stupid proposal.
monica martini	Italy	2015-01-05	i love the lonlyness of the inyo county
Seth Cline	Bishop, CA	2015-01-05	I'm signing this because there's simply no need to ruin a amazing area like this. We don't need any more damage. L.A department of water and power already did enough!!
Jamie Weleber	Columbia, NJ	2015-01-05	The Mojave is a fully functional, vibrant ecosystem. Large scale solar, so far removed from the demand for the power, degrades the landscape. Easier, more efficient options, such as DG, currently exist and should be pursued over large scale solar.
Patricia Davis	California City, United States	2015-01-05	I am against the Western USA Deserts looking like a wasteland.. What will we look like when these companies change to another source for electricity and these are no longer needed, who will clean up all the scrap? We will be the "dumping" ground in the USA
Kyri Freeman	Barstow, United States	2015-01-05	Solar belongs on rooftops, not in wilderness
Craig Dicht	Joshua Tree, United States	2015-01-05	Until Inyo County adequately explores distributed generation, it should not look to pristine desert for energy needs. Energy, government fee, and tax generation will all prove less than expected on these projects.
Rev. Roger Shervington	Claremont, CA	2015-01-05	We don't need this eyesore in this land of incredible beauty!
fred rinne	san francisco, CA	2015-01-05	huge solar farms are a scam. rooftop solar is the best option for us all.
James Ledwidge	Mojave, CA	2015-01-05	There is plenty of land right next to all the wind turbines. They could share the transmission lines. Why waist more of our beautful Desert.
Constance Parker	Big Pine, CA	2015-01-05	I am outraged that Inyo County is considering the destruction of a very fragile environment with this development. I support solar utility but think there are many more suitable places to consider within the county borders where a wilderness area will not be so negatively impacted.
Pierre Plas	France	2015-01-05	J'aime et je respecte la nature. Ne touchez pas à la Death Valley!

Name	Location	Date	Comment
Rob Spangler	Syracuse, UT	2015-01-05	This is the wrong location for a solar project. The local ecology in the proposed project location should be protected, not subject to intensive development.
Ken Sitz	Los Angeles, CA	2015-01-05	I have visited the Death Valley region many times and it is a irreplaceable national treasure that deserves protection from these ill-conceived industrial solar schemes. We need tp preserve these fragile ecosystems and the magnificent viewscape. Real alternative energy means solar on rooftops - industrial solar is NOT a solution.
Sonie Sampson	Pioneertown, CA	2015-01-05	We DON'T need solar in wilderness areas!! Put it on rooftops and on degraded lands only.
Jacklyn Velasquez	Big Pine, CA	2015-01-05	Renewable energy should be placed at the source of consumption not hundreds of miles away.
John Feeney	Boulder, CO	2015-01-06	We need to protect fragile desert ecosystems.
William Fortney	Camarillo, United States	2015-01-06	Keep it wild.
Bill Helmer	Independence, CA	2015-01-06	I oppose industrial scale solar developments in Inyo County. Distributed generation solar projects should be encouraged.
Yaney MacIver	Corvallis, United States	2015-01-06	I'm an expat Owens Valley person hoping to return this summer. Don't make this mistake!
randy ness	Rosamond, CA	2015-01-06	I have this locally and we hate the view, dust, and the lack of wild life.
Mary Williams	Burbank, CA	2015-01-06	It's wrong to destroy this environment.
Ty dennison	Inyokern, CA	2015-01-06	im signing this petition because i dont want to see the god damn solar panels out in the beautiful owens valley LA is already raping us from our water an now their trying to take our land Whats next? Time to take our valley back
Elizabeth Nannini	Castro valley, CA	2015-01-06	I'm signing out of respect for the landscape. There are more rooftops in the US than open spaces. Put the panels on the roofs, give people free power as rent for the space and power your factory or town or whatever.
Spencer Coffin	San Diego, CA	2015-01-06	Natural land should be kept natural. There are millions of rooftops to put solar panels on.
Neil Toll	Gallatin, TN	2015-01-06	For decades, the government has been stealing land from the public. We were told that even a footprint damages the delicate desert environment. I know several desert land owners that cannot access their land because of the laws passed to "protect" the environment. Projects such as this will completely destroy the area in and around it, more than billions of footprints could possibly do.
Patricia Smith	Littlerock, CA	2015-01-06	this is a beautiful area and a solar array would ruin it
Karyn Newbill	Simi Valley, CA	2015-01-06	Death Valley area needs to stay wild.
G. Donald Bain	El Cerrito, CA	2015-01-06	I love wild and open country.
Penelope Melko	Tehachapi, CA	2015-01-07	Get out and stay the hell out of Death Valley and protected area you greedy bastards. One Hundred Third Congress of the United States of America AT THE SECOND SESSION. Begun and held at the City of Washington on Tuesday, the twenty-fifth day of January, one thousand nine hundred and ninety-four An Act. To designate certain lands in the California Desert as wilderness, to establish the Death Valley and Joshua Tree National Parks, to establish the Mojave National Preserve, and for other purposes. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Name	Location	Date	Comment
Randy Stevenson	Atascadero, CA	2015-01-07	I don't think locating solar in the desert, even if it has been previously disturbed is a wise use of land, especially when there are so many rooftops, parking lots, canals, etc where panels can be located.
kirsten liske	santa cruz, CA	2015-01-07	These landscapes are special habitats and places that offer humans a unique experience. The power lines and roads infrastructure required for solar plants should not impact the experience of these wild and rural working landscapes of the eastern sierra
Jen Michelsen	Santa Cruz, CA	2015-01-07	I'm signing because that area of the Eastern Sierra is one of my favorite recreation areas and an industrial solar energy installation would destroy the fragile ecosystem.
Kevin McDavid	Costa Mesa, CA	2015-01-07	Picture Kramer Junction or Ivanpah solar facilities in Olancha or on Owens Lake. This would be a huge mistake.
Steven McLaughlin	Big Pine, CA	2015-01-07	Distributed solar is the superior option.
Donna Archer	Independence, CA	2015-01-07	I don't want beauty and biodiversity ruined!!!!!!!!!
Michael Prather	Lone Pine, CA	2015-01-07	My wife and I lived and worked in Death Valley from 1972-1980. We taught school there and met people in Chicago Valley (the Messer family, who oppose solar development there), Shoshone (Susan Sorrells, another opponent of this industrialization) and the Charleston View Area (Resting Springs & China Ranch Brian Brown who also opposes this proposal). Precious groundwater and world class landscapes are at risk. Please reject zoning that will threaten these lands. Since 1980 my family has lived in Lone Pine where we have raised our two daughters. We love the lands of our county and support the sustainable tourism-based economy that exists here. We oppose threats to that economy and the natural beauty that attracts millions of visitors from around the US and the world.
Christopher Capp	Venice, CA	2015-01-07	To change the Landscape and Local Ecology of the Eastern Sierra and Death Valley Regions would not only be detrimental to the delicate balance of the areas ecosystem but it will also be devastating to the natural balance of its Beauty. Please find somewhere else to build your Industrialized Energy production zone and not destroy our sacred land and playground.
John Corathers	Reno, United States	2015-01-07	We also have a house in the eastern Sierra. Pleas, no big solar installations!!!
BryAnna Vaughan	Big Pine, CA	2015-01-07	I love Eastern Sierra just the way it is! I am 7th generation resident of this valley and I hope that 7 generations from now people will enjoy the Eastern Sierra the same way that I have. Alternative energy can be a good thing, but only if it is done in a way that is well thought out. The best place to have solar in the Eastern Sierra is on top of existing roof tops or parking structures. If the policies for tax credits and similar incentives do not currently exist, then let's wait!
Clare Marter Kenyon	Los Angeles, United States	2015-01-07	These areas of our State are precious, exceptional and wild. I have traveled and hiked in these remote and beautiful landscapes for decades - in fact, I was married at a lake high in the Sierra Nevada 31 years ago. Losing these unique areas and wildlife to solar farms must be prevented and the lands protected for the generations to come.
Sydney Quinn	Big Pine, CA	2015-01-07	The Eastern Sierra has been my home since 1970. While I can support small scale solar development on already disturbed land, industrial scale solar is not appropriate for our fragile environment. Our house is fully solar and that's where panels belong, on rooftops and over parking lots.
Mark Campbell	Rosamond, CA	2015-01-07	I am concerned about the destruction this will cause to the beauty, biology, and cultural resources of the area.

Name	Location	Date	Comment
Edwin Thomas	Catonsville, MD	2015-01-07	I'm moving to the county in the next year and would hate to see the area ruined.
Amy Noel	Tecopa, CA	2015-01-07	Energy can and needs to be produced where it is used. Let's preserve open space and beauty for our souls and future generations!
Nancy G	Las Vegas, NV	2015-01-07	It makes no sense to place utility-scale solar operations in remote and pristine lands with no existing infrastructure in place to support them. When we think of "green" energy, we must also consider the green philosophy of recycling abandoned warehouses, military bases, airports, and other simililarly-disturbed lands in areas already set up to handle these types of utilities.
Jora Fogg	June Lake, CA	2015-01-07	I want the Eastern Sierra to remain the same with opportunities for recreation and developing ecotourism to strengthen our economy. I support the development of small scale PV solar, particularly on roof tops and parking lots.
Sam Roberts	Millbrae, CA	2015-01-07	I care about the Eastern Sierra and Death Valley.
Carol Conner-Turner	Bishop, United States	2015-01-07	I lived in Inyo & Mono counties for 32 years & loved it for it's remoteness, it's beauty & diversity. Please don't destroy it for money! Please don't destroy it ever- for any reason!!! IT'S NOT YOURS TO CHANGE OR DESTROY!!!!! Please, please don't do this to 'my forever home'.
Elaine Bowers	Big Pine, United States	2015-01-07	I don't want our beauty ruined. Why do u guys want to mess up a good thing. There aren't that many places of natural beauty. Leave a good thing alone
Bryce Winter	Santa Cruz, United States	2015-01-07	We need to save wild places and not create more impact in areas that are not already impacted severely.
guy hatzvi	los angeles, CA	2015-01-07	I am opposed to polluting the beauty of the views of the Owens Valley with the power needs of a city that has already taken so much from this valley. No No NO. LADWP can find alternatives.
Karin Kersteter	Ventura, CA	2015-01-07	Please do not destroy this pristine area! The destruction of habitat cannot be allowed to continue.
Lauralea Thompson	Laguna Niguel, CA	2015-01-07	I visit and spend time in these areas and have for many years. There us no reason to spoil these lands. Bad enough LA took the water years ago.
James Morehouse	Las Vegas, NV	2015-01-07	Solar belongs on roof tops, not spread out over the Owens Valley.
William C Turner	Oakland, CA	2015-01-07	it is not spelled out what the environmental impact of the solar development in the Death Valley Region would be.
Joyce Hana	Brea, CA	2015-01-08	The Eastern Sierra is an essential, irreplaceable part of wild California. It needs preservation, not destruction.
karen orso	wilseyville, CA	2015-01-08	solar panels belong on the rooftops of buildings and parking lots in urban areas right next to where the power is needed. It makes no sense to despoil undeveloped lands where their is little or no need for power. We need to protect and restore our undeveloped wild lands.
Steve Haga	Auburn, CA	2015-01-08	There are places for solar farms for sure. This is not one of them.
Susan Kollins	Long Beach, CA	2015-01-08	I think solar energy is a good source for our needs, but why would the panels be put where no one lives or does business . . . they need to be put on top of buildings at the point of use. Leave our beautiful areas alone.

Name	Location	Date	Comment
Kerry Farris	Klamath Falls, OR	2015-01-08	Seems to me that large-scale solar projects should be constructed in areas where a certain amount of infrastructure already exists (e.g., urban areas), not in the few expanses of true wilderness that remain. Constructing solar-panel roofs over parking lots, or using existing large buildings would create the energy much closer to where it is consumed and likely reduce costs. Or, what about covering the entire length of the Imperial Valley Water Project with solar panels to both produce energy and reduce the evaporation of water? It's currently being done in India http://motherboard.vice.com/read/indias-ingenious-plan-to-cover-1000-miles-of-canals-with-solar-power-plants
Keith Thompson	Beaumont, CA	2015-01-08	I have been visiting the Owens Valley for over 60 years. I am incredulous that you would even consider desecrating this area with large-scale solar projects. Please do not even begin to consider this a feasible use of this precious area.
Robert Meacham	San Antonio, TX	2015-01-08	Because I saw my sister-in-law share about it on Facebook it's important to her
Molly Hansen	Arroyo Seco, United States	2015-01-08	I'm signing because I believe that industrial-scale solar belongs on already disturbed lands and has absolutely no place on our pristine lands.
lara hartley	barstow, CA	2015-01-08	it would be an obscenity to destroy the pristine landscape of the proposed solar plants. the destroy and burn the land cannot ever be repaired. long after the solar plants are built - and die - the land will be scorched. we can't come back from these misguided solar projects.
James Wilson	Pahrump, NV	2015-01-08	This is my home!
Tom Budlong	Los Angeles, CA	2015-01-08	It is myopic to ignore the vast rooftop resource in CA cities while proposing serious damage to unspoiled desert.
Valerie Hart	Big Pine, United States	2015-01-08	I love this area and please don't ruin it.
Mary Jane McEwan	Ridgecrest, CA	2015-01-08	Owens Valley and the areas around Death Valley should be preserved for their scenic value and wildlife habitat. Los Angeles has already benefited from taking water from the region. Thousands of Angelinos drive north through Owens Valley - the open vistas and gorgeous scenery are a respite from the crowded scene they come from. This last areas of open space in California should be free of industrial solar developments. Solar power can be placed on rooftops closer to the place of use.
Susan Odell	Silver Spring, United States	2015-01-08	Regardless of the value of large-scale solar energy development, some places are more important than increasing input to the electricity grid. Although I haven't been to the Eastern Sierra or Death Valley for a few years, they are important to me as a citizen of the US and the world; they deserve to be left in a natural state to support and enhance the ecosystems in that region and inspire local residents as well as visitors from around the globe. Until we have used every rooftop and every industrial site to install solar equipment, we should stay away from the unique and important ecological expanses of this region.
SHAWN RUMMEL	Buena Park, CA	2015-01-08	STAY AWAY FROM OUR ONLY VIEW OF MOUNTAINS AND NATURE. GO TO THE CITY AND INSTALL YOUR SOLAR,,,,,
Ariana Wylie	Bishop, CA	2015-01-08	i love this place, and solar can be put in any numerous open lands. Not here in inyo county
D. Wall	San Pedro, CA	2015-01-08	Why destroy more landscape when distributed solar can do the job in cities and towns that already exist?
nancy gooch	Ridgecrest, CA	2015-01-08	Big solar means big drains of potable water.

Name	Location	Date	Comment
Bob Kent	Chatsworth, United States	2015-01-08	This unique place is the wrong place because of its unique ecosystem and the light pollution it would cause in a truly natural area!
David Rose	Conroe, TX	2015-01-08	i love the valle the way it is
Norma Ryan	Simi Valley, CA	2015-01-08	Leave the beautiful open space free of solar plants.
Linda Bozack	Brookins, OR	2015-01-08	The desert is an important ecosystem that we must preserve!
Teresa Mokma	San Jose, CA	2015-01-08	I don't want solar panels or any other industrialized energy production source to destroy the natural habitat & beauty of this area!! Why are you destroying this natural place of beauty?
Janet Kruse	Portland, United States	2015-01-08	It is immoral to defile these sacred places
Yolanda Demotto	Chula Vista, CA	2015-01-08	This beautiful land is one of the last wild, natural bastions in California. I've never seen beauty like the Sierra Nevada anywhere else. I can only hope we can preserve the beauty for the next generations, who will have to travel far and wide to find undisturbed nature.
Lynne Almeida	Bishop, CA	2015-01-08	There are so many better options and choices than this ill-considered plan ... Please don't be a part of the ruination of the Owens Valley.
Steve Byrne	San Francisco, China	2015-01-08	I love the wild Eastern Sierra and deserts and want them to remain unblighted for my children.
Mervin Hess	Bishop, CA	2015-01-08	I enjoy the scenic beauty of my homelands!
Will Scott	Lagunitas, CA	2015-01-08	I work and live in the eastern sierra part time and this would be a disaster for the fragile desert out here. Solar should be scaled to individual homes and buildings, not mass-marketed as the next energy "fix". It isn't a fix if it's destroying the places we live (especially the places where countless sensitive species live).
Will Scott	Lagunitas, CA	2015-01-08	I work and live in the eastern sierra part time and this would be a disaster for the fragile desert out here. Solar should be scaled to individual homes and buildings, not mass-marketed as the next energy "fix". It isn't a fix if it's destroying the places we live (especially the places where countless sensitive species live).
Mitzi patterson	Las Vegas, NV	2015-01-08	Because I care !
Stacy Fitzgerald	Reno, United States	2015-01-08	We need to keep these areas wild for future generations!
Tracie Denton	Aliso Viejo, CA	2015-01-08	I Don't Wish To See These Precious Places Defaced By Anything!!! I Enjoy The Beauty Of The Amargosa, The WildErness And All Its Natural Inhabitants. We Dont Need A Solar Farm There. Put It On Every Rooftop In LA.
Adina Ross	Murrieta, CA	2015-01-08	I don't want to detract from the beauty of our sierras, plus I don't think this help with the energy crisis. Most governmental agencies lie to you for their own interests.
Cheryl Hobson	Morongo Valley, CA	2015-01-08	I'm signing this petition, because it would damage the beauty of our country, which is being destroyed else where in the US.
Diane Mahle	Newhall, CA	2015-01-08	I don't want Chinese doing any part of my country and state. They wouldn't let us come to their land to set up things. So, why would we let them come here? Also, I want the wild places to stay wild.
Jennifer Riley	Antelope, CA	2015-01-08	I don't agree. Let's keep and honor this wild gem.
Judith Millward	W Richland, WA	2015-01-08	I believe that we don't have enough natural space and beauty left undeveloped, and that there are areas still available for industrial development.
Justin Blake	Tecopa, CA	2015-01-08	I live on the edge of Death Valley because it is rare and unspoiled. The land must be preserved.

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Sherry Cosgrove	Keeler, United States	2015-01-08	This is a terrible idea for us people, the wildlife and the land. They should be shade structures for urban environments.
julie haber	ridgecrest, CA	2015-01-08	i live in the area, and believe they can find a more suitable region, then something so rare and breathtaking
Diana Williams-Horning	Sparks, NV	2015-01-08	I grew up in this area, and death valley and surrounding lands are one of a kind, and should not be exploited for any reason
Sandra Schwarzbach	Ridgecrest, CA	2015-01-08	I don't want any more of the unique desert land destroyed. And it will be, these people care for nothing but maximizing their profits, no matter the irreversible destruction.
Chris Kalashian	Clovis, United States	2015-01-09	This is just wrong. Solar panels have already ruined the beautiful landscapes near Carrizo Plain and South of the Tehachapi Mountains. No, no, no!
Ellen Kalashian	Clovis, CA	2015-01-09	I'm signing because I love this area and do not want to see it ruined by this project!
Susan Maylone	Dallas, United States	2015-01-09	Hands off both of these natural treasures, we must protect them from commercial usage at all cost.
Theresa Hoff	Mooresville, United States	2015-01-09	Its beauty should remain, don't taint the landscape!
G Dan Mitchell	San Jose, CA	2015-01-09	I know this beautiful landscape and it is no place for an industrial installation — and solar is better installed closer to the users, as on the roofs of urban structures.
Andrew Morin	Bishop, CA	2015-01-09	Because industrial solar makes no sense at this point (with point of use solar becoming the norm) and is destructive to the environment and economy of Inyo.
Ethel Messer	Shoshone, CA	2015-01-09	I don't want to see any solar in my area.
Scott Parker	Antioch, CA	2015-01-09	There are far more suitable places elsewhere. lets save one of the most beautiful parts on the state!
LINDA ANDERSON	Ridgecrest, CA	2015-01-09	Hey, I like solar. But please do not destroy our landscape. This area is too valuable in it natural state.
Lisa Ronning	Chula Vista, CA	2015-01-09	The area needs protection from industrialization
Sheila Steeples Anders	Flagstaff, United States	2015-01-09	this is a unique and iconic American landscape. destroying it would be uniquely and iconically short sighted and stupid.
Cathy Huff	Ridgecrest, CA	2015-01-09	This is one of a few areas in this country that should remain pristine. There are plenty of other areas to place the solar farm. Leave the Eastern Sierra and Death Valley alone!
Teresa Skye	Pahrump, NV	2015-01-09	I love the desert and all the beauty it gives. Nothing should inhibit that.
Patricia Brannon	Glendora, United States	2015-01-09	Industrial scale solar is the most rediculius thing ever dreamt up! It has absolutely nothing to go with green energy or saving the planet & everything to do with money, period.
Mike Hay	Bishop, CA	2015-01-09	Solar panels should go on rooftops, not on undeveloped land.
Barbara Durham	Death Valley, CA	2015-01-09	I live here in Death Valley, our Timbisha native aboriginal lands are threatened.
Brian Settle	Delaware, United States	2015-01-09	I am an avid offroader and love the outdoors. I would have to see our area spoiled by the installation of a giant solar farm.
kate kingston	fairfax, United States	2015-01-09	Solar farms are the modt preposterously stupid, shortsighted, all-for-profit and control idea in the industry! Hands off our wikdernesses!

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Joseph cappiello	Pomona, CA	2015-01-09	I do not want the desert that I grew up exploring to be ruined by more hideous, underperforming, wastes of tax dollars. I want my son to have the opportunity to see the land the way I have.
Mike Bond	Sparks, NV	2015-01-09	Keep ugly solar power units out of the area
nancy higbee	Perris, CA	2015-01-09	We are frequent visitors to this area and value it's uniqueness. Furthermore, roof top solar that doesn't involve long routes for power delivery should be accomplished before large scale projects can even be evaluated for need.
Joey Davidson	asheville, NC	2015-01-09	I'm signing this cause I want the eastern sierra to remain open and beautiful. I honestly don't think it'll make a difference though. Money rules our world, not pretty landscapes. So I'm sure I'll be using some of that solar energy soon enough.
Robert oinas	San Bernardino, CA	2015-01-09	This is not the place for a solar farm losing recreational land is wrong.
David Rosenthal	Westlake Village, CA	2015-01-09	I'm a frequent visitor to the area, I love Death Valley and the surrounding area and I believe it should be protected.
annie belt	San Jose, CA	2015-01-09	We need to put solar on rooftops, over parking lots, and over only the most denuded, lifeless soils.
Ann Michelle DeSelms	Colstrip, MT	2015-01-09	I grew up in/Tecopa Hot Springs/Shoshone area. I'm concerned about water resources that this project will consume. I'm also concerned about bird populations, which will be severely impacted by the solar panels. It has been documented that solar farms negatively impact birds, both migrating and local populations. Additionally, I'm concerned about the impact on insect life in the desert, as well as migrating butterflies.
Alfredo Figueroa	Blythe, CA	2015-01-10	to much has been destroyed
Michael Hale	Oklahoma City, OK	2015-01-10	I grew up in Trona, and spent all of my formative years in the desert. I hope to return there someday. I know, firsthand, the beauty of the Amargosa, of Death Valley, of the Owens Valley. It seems only right that energy for large metro areas like Los Angeles should come from areas where we have already left our mark. I vote NO to utility-scale solar in the Eastern Sierra and Death Valley regions.
Jef Chadwick	Clovis, CA	2015-01-10	While I support solar energy, the Eastern Sierra and Death Valley regions are not appropriate for this type of development.
Randy Kennedy	Montrose, CO	2015-01-11	I grew up in beautiful into county. To put up this eye soar would be the most hearty braking news I have ever encountered in my life. This is just pure sight pollution and would bring negative energy to Inyo county.
Catherine Billings	Los Angeles, United States	2015-01-11	Because the promise of solar is in small scale residential and commercial buildings, not in giant corporate money making schemes that are detrimental to the environment!
Robert Sr	Mina, NV	2015-01-11	I have been to Amergosa Valley and have seen what the desert looks like in Tonopah, Nev with that solar crap.
Barbara Hausteen	Riverside, United States	2015-01-11	Because my husband and I love the Eastern Sierras and surrounding valley!
matilde reyes	los aneles, CA	2015-01-11	Large utility scale projects in our local mountains @ deserts is not "green". The destruction of our environment is not "green".
Dominique Tardif	Boise, ID	2015-01-13	I am signing this petition because I treasure the wild and rural nature of the East side of the Sierra and of Death Valley. I reject the idea that the deserts of California should sacrificed to feed the power needs of urban Southern California or any urban center. SoCal stole Owens Valley's water and now they want this? Just say no to utility-scale solar projects. Instead put solar panels on every roof and over every parking lot, golf course and amusement park in SoCal.

Name	Location	Date	Comment
Shannon Mallory	San Diego, CA	2015-01-14	I love the Owens Valley. I was raised there and don't want to see its pristine beauty ruined. PUT THIS PROJECT SONEWHERE ELSE!
Melissa Crusinberry	Blythe, CA	2015-01-14	I see the destruction being done in Eastern Riverside County and can attest to the horrendous damage that big scale wind and solar do to the deserts. Please, don't do the same in Inyo County.