



TRW Environmental  
Safety Systems Inc.

# **Evaluation of Soils in the Northern Amargosa Valley**

## **Civilian Radioactive Waste Management System**

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U.S. Department of Energy  
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*Cooperating Federal Agency:*  
U.S. Geological Survey

NIM 5507  
LM-11

WBS: 1.2.8.4.11  
QA: N/A

**Civilian Radioactive Waste Management System  
Management & Operating Contractor**

**Evaluation of Soils in the Northern Amargosa Valley**

**B00000000-01717-5705-00084 REV 00**

**February 1999**

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Under Contract Number  
DE-AC08-91RW00134

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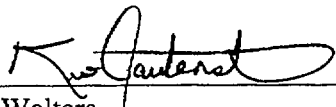
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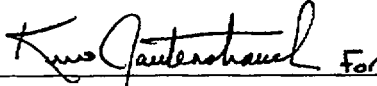
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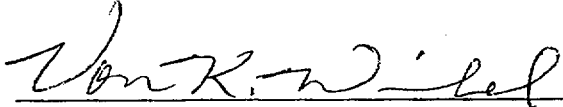
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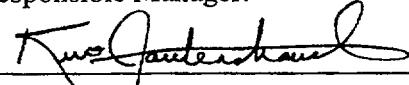
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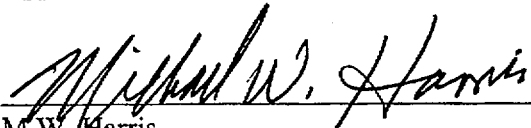
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## ACKNOWLEDGMENTS

The authors would like to thank Carl Adams, Kevin Blomquist, Everett Bartz, Jill Reilly, and Katherine Zander for their assistance in digging soil pits and collecting soil samples. Greg Sharp provided valuable help in preparing the soil data for summarization. Audrey Rager and Dan Steen were extremely helpful in digitizing existing soil maps and preparing the soil maps presented in this document. The assistance of the staff at the Utah State University Soil Laboratory is also appreciated.

The authors would like to thank Ralph McCracken, Ron Sellbach, Dave Hall, Alan Hinman, and Harold Carr for allowing scientists to access their farms to dig soil pits; Doug Merkler (Natural Resources Conservation Service) for general advice and assistance with interpretation of soils data; and the soil testing lab of Utah State University for soil analysis.

The authors would like to thank Kevin Blomquist, James Boone, Ron Green, Albert S. Dodd, Robert Kimble, and David Swanson for reviewing and improving this report.

This research was supported by the U.S. Department of Energy, Yucca Mountain Site Characterization Office, as part of the Civilian Radioactive Waste Management System program under contract DE-ACO8-91RW00134.

## EXECUTIVE SUMMARY

As part of a study of the potential impacts of a geologic repository at Yucca Mountain on human health, the U.S. Department of Energy is evaluating how close people may be living to the repository site in the future. One factor that may influence settlement patterns near Yucca Mountain is the quality of soil for agricultural production to the south of Yucca Mountain in Amargosa Valley. Currently, almost all agriculture in Amargosa Valley occurs in an area known as the "farming triangle," which is more than 30 km from the potential repository. It has been suggested that soils to the north of that area are not as suitable for farming; however, there is no comprehensive summary of soils in Amargosa Valley that could be used to determine if the current pattern of settlement in Amargosa Valley is due to poor-quality soil in the northern part of the valley or to other factors such as water availability or past land-use practices. This report summarizes existing published and unpublished information on soils in the area, presents additional site-specific data on soils, and uses that information to determine if soils north of the current farming triangle are unsuitable for farming.

Existing soil-survey information for Amargosa Valley was obtained from the Natural Resources Conservation Service office in Las Vegas, Nevada, and the National Cooperative Soil Survey Division Internet database. In addition, soils were sampled and described at 8 cultivated and 23 uncultivated locations to obtain site-specific data for the region north of the farming triangle.

Data from a Natural Resources Conservation Service Order III soil survey of southwestern Nye County are summarized in this report and detailed descriptions of soil series in the area are presented in appendices. All soil series that occur within and north of the farming triangle have one or more characteristics that may make them unsuitable for farming. Potentially unsuitable characteristics also were found in many sites sampled for this report. Characteristics commonly found that may make these soils unsuitable are high pH, hardpan or bedrock, and high salt content.

Although soils throughout the valley have characteristics that may make them unsuitable, farming is occurring on these soils in the farming triangle, possibly because of careful selection of crops and special management practices. Uncultivated soils sampled north of the farming triangle are similar to those being farmed. It is therefore concluded that at least some areas north of the farming triangle have soils that are as suitable for farming as those currently being used, which suggests that soils are not the primary factor limiting agriculture between the farming triangle and Yucca Mountain. Because Amargosa Valley is arid, depth, quality, and availability of water will likely be the most important factors determining the location and viability of agriculture in Amargosa Valley in the future.

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## ACRONYMS AND ABBREVIATIONS

dS/m	Decisiemens per meter
EC	Electrical conductivity
MUIR	Map Unit Interpretation
NRCS	Natural Resources Conservation Service
OSD	Official Series Description
SAR	Sodium adsorption ratio

## 1. INTRODUCTION

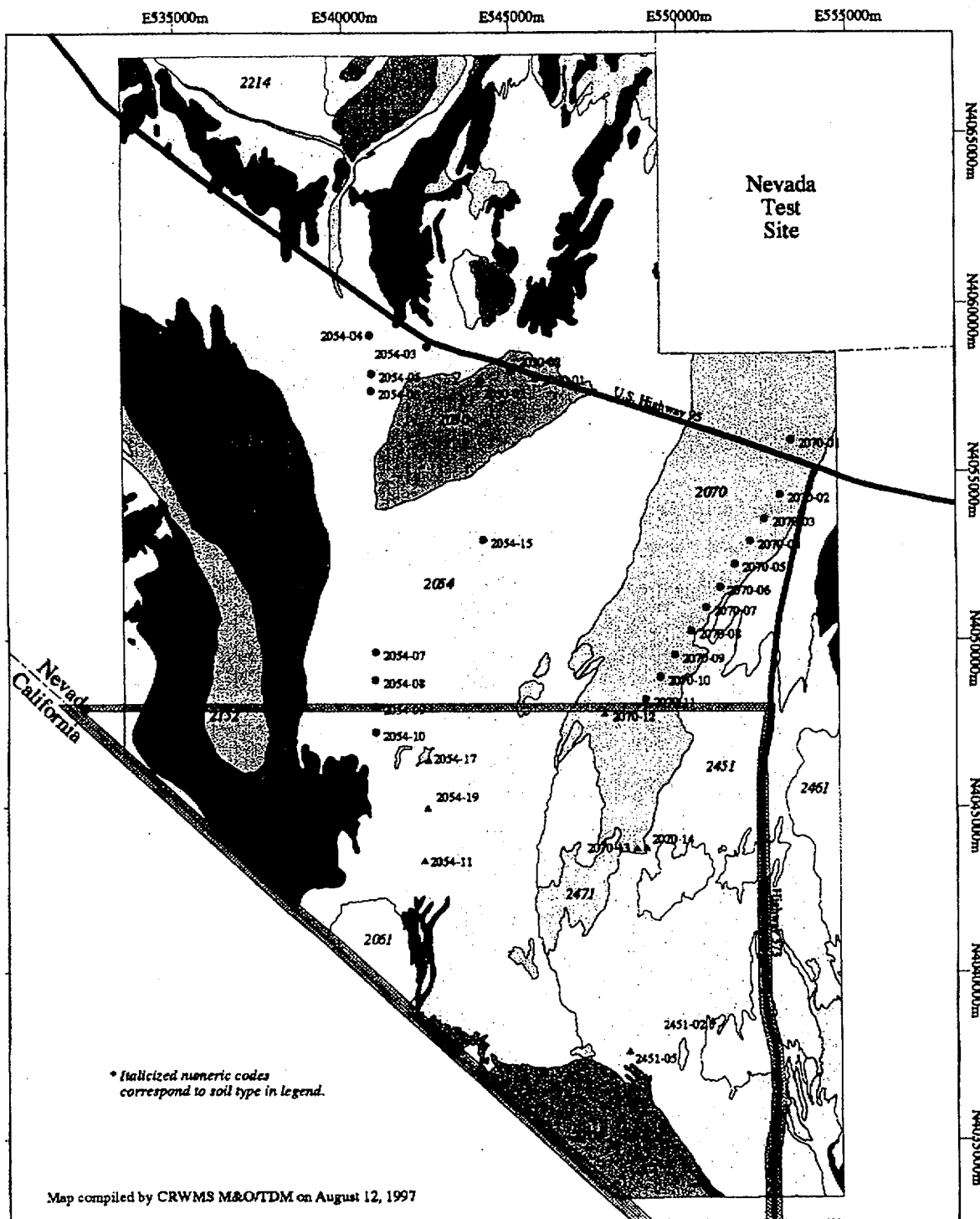
As part of a program to evaluate the suitability of Yucca Mountain as a monitored geologic repository of spent nuclear fuel and high-level radioactive waste, the U.S. Department of Energy is assessing potential impacts on human health. Performance-assessment models are being used to evaluate whether radioactive waste stored in Yucca Mountain would eventually pass beyond engineered and natural barriers, migrate into groundwater below Yucca Mountain, move southward into Amargosa Valley, and result in exposure to humans when contaminated groundwater is used to support human habitation (CRWMS M&O 1994; 1995). One of the primary pathways for radionuclides to enter the biosphere would be the use of contaminated groundwater for irrigating human and livestock food crops. Consumption of these crops and livestock could result in radiation doses to humans. For assessment of human health risks, the hypothetical critical group that would receive the maximum radiation dose has been identified as people living in the Amargosa Valley consuming groundwater and locally produced crops and livestock.

One important characteristic of this critical group is the distance that they live from Yucca Mountain. The farther this group is from Yucca Mountain, the longer it will take for groundwater to travel from the mountain to their location. Long groundwater travel times allow more radioactive decay, more opportunity for physical and/or chemical retardation of radionuclides in the saturated zone, and possibly dilution in the aquifer; thus, the location of the critical group is an important factor in the human health risk assessment.

One approach for determining the most appropriate location for the critical group is to base it on present-day living habits and conditions in the region. Most agriculture and associated human habitation south of Yucca Mountain occurs in a region of Amargosa Valley referred to as the "farming triangle." The farming triangle is bounded on the southwest by the Nevada-California border, on the east by Nevada State Highway 373, and by the Amargosa Farm Road to the north (Figure 1). The northern edge of this region is 30 km from the potential repository at Yucca Mountain.

Of interest for the human health assessment is why residential and commercial agriculture is limited north of the farming triangle, closer to Yucca Mountain. This area is topographically similar (e.g., relatively flat, sandy soils, and occasional ephemeral washes) to the farming triangle. Soil and water are two of the most important factors in determining the location and success of agriculture. Suitability of soils for farming is affected by such factors as soil depth, texture, water-holding capacity, pH, and salinity; however, without an adequate quantity of suitable water, even prime farmland soils are not capable of producing crops.

Southern Nevada is in an arid region where irrigation is critical for agricultural production; therefore, agriculture in Amargosa Valley is limited to those areas that have suitable soil and where it is economically feasible to pump groundwater for irrigation. Residents of Amargosa Valley have suggested that water is more accessible and soil is of better quality within the area currently farmed than in areas to the north (Horak and Carns 1997, p. 7). The depth of groundwater increases to the north of the farming triangle in Amargosa Valley (Waddell et al. 1984, p. 37); therefore, costs for pumping groundwater likely influence the location of agriculture in the valley. Soils also may



See page 3 for Legend

Figure 1. Amargosa Valley Area Soil Types



# Yucca Mountain Site Characterization Project



3 0 3 6 Kilometers

PRELIMINARY - INFORMATION ONLY: YAP-SIII.3Q.  
Section 5.2.2 states that, "The data provided herein have not received complete technical and quality checks and, therefore, are considered to be preliminary. These data are for information only and cannot be used for licensing activities..."

Soil data obtained from Natural Resource Conservation Service, Las Vegas, Nevada Office

Projection is Universal Transverse Mercator, Zone 11.

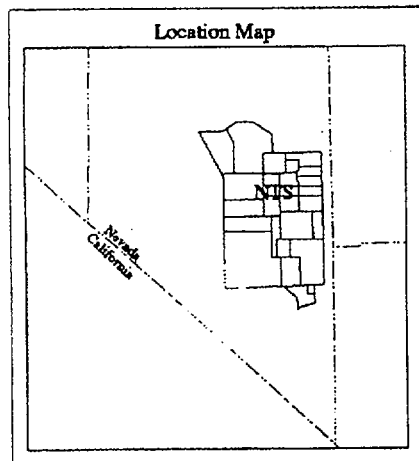


Figure 1

## AMARGOSA VALLEY AREA SOIL TYPES

### LEGEND

- Farming Triangle Boundary
- Cultivated Soil Pit Location
- Undisturbed Soil Pit Location
- (2152) Arizo Very Gravelly Sandy Loam, Moist, 0 to 2 Percent Slopes
- (2151) Arizo-Bluepoint-Dune Land Complex, 0 to 4 Percent Slopes
- (2153) Arizo-Corbilt-Commski Association
- (2810) Armpup-Mobl Variant Association
- (2770) Bullfor-Panor-Bluepoint Association
- (2061) Cave Gravelly Sandy Loam, 4 to 30 Percent Slopes
- (2781) Cirac Variant-Bluepoint-Panor Complex 0 to 4 Percent Slopes
- (2030) Corbilt Gravelly Fine Sandy Loam, Warm, 2 to 4 Percent Slopes
- (2201) Corbilt-Arizo Complex, 2 to 4 Percent Slopes
- (2031) Corbilt-Skelon Association
- (2204) Corbilt-Tencee-Sanwell Association
- (2910) Duneland
- (2471) Lewolac-Yermo Association
- (2461) Nowoy-Skelon-Besherm Association
- (3302) Pumpah-Rumpah, Dry Association
- (2002) Rock Outcrop-Upspring-Rubble Land Complex, 8 to 75 Percent Slopes
- (2451) Sanwell-Sanwell, Warm-Yermo Association
- (2172) Sanwell-Yermo Association
- (2070) Shamock Gravelly Fine Sandy Loam, 2 to 4 Percent Slopes
- (2281) Shorim-Yermo Association
- (2280) Shorim-Zalda-Upspring Association
- (2081) St. Thomas-Tecopa-Rock Outcrop Complex, 15 to 75 Percent Slopes
- (2054) Yermo, Hot-Arizo Association
- (2214) Yermo-Arizo Association
- (2012) Zalda-Greyeagle-Upspring Association

YMP-97-146.0

### Legend

Figure 1. Amargosa Valley Area Soil Types (Continued)

differ, and although some information on soils in the valley has been collected, some areas have not been sampled, and no comprehensive summary of the data has been prepared.

To better evaluate whether the current pattern of farming in Amargosa Valley is influenced by soil quality and whether soils may restrict farming north of the farming triangle in the future, data on soils in the region was collected. This report summarizes existing published and unpublished information on soils in the area, presents additional site-specific data on soils, and uses this information to determine if soils north of the current farming triangle are unsuitable for farming.

## 2. METHODS

### 2.1 COMMONLY USED SOILS TERMS AND PROPERTIES FOR EVALUATION OF SOIL QUALITY

Soil scientists use a variety of technical terms and consider a number of factors to evaluate the quality of soils. The following discussion of the terms and factors discussed in this report is from Chapter 4 of the U.S. Department of Agriculture (1993) Soil Survey Manual.

A *soil series* is a unique type of soil with specific characteristics. When soils are mapped at the series level, it implies a relative uniformity within each delineated area. As mapping units, the series are differentiated by "phase" (e.g., very gravelly fine sandy loam, 2–4 percent slopes). A *soil complex* is a combination of soil series and/or land forms that are too intermingled to be accurately differentiated. *Soil associations* are combinations of soil series and/or landforms which are not differentiated at the mapping intensity used during a soil survey. The term *soil mapping unit* refers to a phase (e.g., Arizo very gravelly fine sandy loam, 0–2 percent slopes), complex (e.g., Arizo-Bluepoint-Dune Land Complex, 0–4 percent slopes), association (e.g., Arizo-Corbilt-Commski Association), or land form (e.g., Dune Land) and varies depending upon the level of classification and mapping that was conducted.

Characteristics of desert soils that have the greatest influence on crop production include root inhibiting layers, soil pH, and salt content.

Root inhibiting layers restrict root growth and can be pedogenic (e.g., a duripan), man-induced (e.g., a plowpan), or can simply be the presence of bedrock. Pedogenic layers are classified as cemented or indurated depending upon their degree of hardness. Plowpans are removed by deep tillage while cemented pans, depending upon depth and thickness, can often be removed by using a ripper shank on large tracked equipment. Indurated pans often require the use of explosives for removal. In any case, hardpan removal is driven by economic feasibility. Bedrock removal is not an option, and when bedrock is shallow, it often prohibits agricultural production. When soils with root inhibiting layers are farmed (using shallow rooted crops), they require more frequent and shorter duration irrigation which increases the potential for salt accumulation.

Alkalinity is an important aspect of soil chemistry because it affects the availability of plant nutrients. Neutral to slightly alkaline conditions (pH 7.0–7.8) provide most plants with optimal growing conditions because nutrients are readily available in the proper quantities at these pH values.

At soil pH higher than 7.8, especially at pH higher than 8.4, some nutrients (e.g., iron, manganese, zinc, copper, and cobalt) become increasingly unavailable and may limit plant growth while other nutrients (e.g., selenium and molybdenum) become increasingly available and may reach toxic levels. Land use practices can affect pH. For example, calcareous soils (i.e., soils saturated with calcium carbonate) are common in arid regions and have a maximum pH of 8.4 (due to the buffering effects of the carbonates) in the absence of other salts; however, with irrigation and the associated addition of salts (e.g., sulfides, chlorides, and carbonates of sodium, potassium, magnesium, and calcium) to the soil, pH can increase beyond 8.4 and affect plant growth.

Salt content, irrespective of pH, is another characteristic of desert soils that can impair crop production. Many salts exist in soils; however, sodium salts generally cause the most severe agronomic problems. The amount of salt in the soil is quantified by electrical conductivity (EC) and sodium adsorption ratio (SAR). EC, reported in decisiemens per meter (dS/m), is determined using a saturation extract from the soil and is not specific for any single salt. SAR is the ratio of sodium to calcium and magnesium cations in the saturation extract. Soils with EC levels above 4 dS/m are considered saline. Soils having SAR values greater than 13 and EC levels below 4 dS/m are considered sodic. Soil salinity is classified as saline-sodic when both EC and SAR are greater than 4 dS/m and 13, respectively. Saline and sodic soils can severely impact agricultural production because they have strongly alkaline pH (in excess of 8.4); poor soil structure, which reduces infiltration and permeability; and decreased soil osmotic potential, which inhibits plants from extracting available water from the soil. In severe cases, water may be lost from plant root cells to the soil.

## **2.2 EXISTING SOILS INFORMATION**

Unpublished information from a soils survey of southwestern Nye County (Soil Survey Identification Number NV785) was obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service) in Las Vegas, Nevada. Additional information was obtained from the NRCS Soil Survey Division's National Soils Data Facility web site (NRCS 1998). Information was downloaded from the Map Unit Interpretation (MUIR) database and from the Official Series Description (OSD) database. The MUIR database provides ranges of physical and chemical properties and soil interpretations for surveyed areas. Data in the MUIR database were obtained by NRCS from field observations, site descriptions and transects, and laboratory data. It includes data on soil reaction, salinity, texture, coarse fragments, and available water content. The OSD database contains a description of all recognized soil series in the United States. Each description provides a range of characteristics necessary for identifying and classifying the series and distinguishing it from other series. The descriptions include the taxonomic classification, a detailed soil profile description, range in characteristics, list of similar series, geographic setting, geographically associated soils, drainage and permeability, use and vegetation, and distribution and extent. Information from these databases provide a broad overview of Amargosa Valley soils. These data were compared to the range of soil characteristics generally considered acceptable for agriculture (U.S. Department of Agriculture 1993) to evaluate the potential suitability of these soils.



## 2.3 SITE SPECIFIC DATA COLLECTION

Because only general information was available from the NRCS soil survey, site-specific soil information was collected from within the farming triangle and from areas north of the triangle. Soil pits were excavated in cultivated and uncultivated areas of the major soil types occurring within the farming triangle (Figure 1). Areas to the east of the farming triangle were omitted from this evaluation because these soil associations did not occur between the farming triangle and Yucca Mountain.

Three soil mapping units farmed within the farming triangle that also occurred between that region and Yucca Mountain were sampled: Sanwell-Sanwell, Warm-Yermo Association; Shamock Gravelly Fine Sandy Loam Series; and Yermo, Hot-Arizo Association (Figure 1). The only other common mapping unit between the farming triangle and Highway 95 south of Yucca Mountain was also sampled (Corbitt Gravelly Fine Sandy Loam, Warm Series). Cultivated and uncultivated sites in the Shamock series and Yermo, Hot-Arizo Association were sampled. Because the Sanwell-Sanwell, Warm-Yermo Association extended only slightly north of the farming triangle, only cultivated sites were sampled. Only uncultivated sites were sampled in the Corbitt soil series because there was no farming in this series.

The number of sampling locations varied within soil types and between cultivated and uncultivated areas (Table 1). Because of the lack of permission to dig soil pits on public lands, all sample sites were on privately owned land. Within each soil mapping unit, sample sites were selected to obtain geographic dispersion (Figure 1) but were not randomly located. All sample sites in uncultivated areas were 10–200 m from roads or other disturbances.

Sampling was conducted May 12–15, 1997. Soils were sampled from hand-excavated pits to a depth of approximately 1 m or to an impenetrable hardpan (duripan), whichever was shallower. Soils were sampled by horizon and sieved to separate the coarse fragment content (portion >2 mm) from the soil portion (< 2 mm) was split, bagged, and labeled. One sample was sent to the Utah State University Soil Characterization Laboratory for analysis, and the other was archived. At each sampling site, six site characteristics and four soil morphological characteristics were recorded (Appendix A). Laboratory analyses included measures of physical parameters, available nutrients, and water-holding capacity (Appendix A).

Table 1. Number Of Samples Collected In Cultivated And Uncultivated Areas Within Four Mapping Units In Amargosa Valley, Nevada

Soil Type (Map Unit Code)	Number of Sample Locations	
	Cultivated	Uncultivated
Corbitt Series (2030)	0	3
Sanwell-Sanwell, Warm-Yermo Association (2451)	2	0
Shamock Series (2070)	3	11
Yermo, Hot-Arizo Association (2054)	3	9

### 3. RESULTS

#### 3.1 NATURAL RESOURCES CONSERVATION SERVICE SOIL SURVEY INFORMATION

The NRCS conducted an Order III Soil Survey in southwestern Nye County, including Amargosa Valley, during the 1980s. Soil associations and complexes were classified and mapped based on land forms and vegetation. Six soil mapping units were identified that comprise the majority of the area within and north of the farming triangle (Figure 1). These mapping units include the following soil types (map unit symbols in parentheses): Yermo, Hot-Arizo Association (2054); Sanwell-Sanwell, Warm-Yermo Association (2451); Shamock Gravelly Fine Sandy Loam Series (2070); Arizo-Bluepoint-Dune Land Complex (2151); Arizo-Corbilt-Commski Association, (2153); and Arizo Very Gravelly Sandy Loam Series (2152). Five additional soil mapping units comprise a significant portion of the area between the farming triangle and Yucca Mountain (Figure 1). These include the Corbilt Gravelly Fine Sandy Loam Series (2030), Zalda-Grayeagle-Upspring Association (2012), Dune Land (2910), Pumpah-Rumpah Dry Association (3302), and the Shorim-Yermo Association (2281).

The NRCS does not designate any of the land within and north of the farming triangle as prime farmland. Prime farmland is defined as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion" (7 USC 4201(c)(1)(A)). The MUIR data (Appendix B) and the OSD (Appendix C) classify land use for the majority of the soil series in this area as rangeland or wildlife habitat.

Based on the MUIR data (Appendix B) and the OSD (Appendix C), each of the soil types that occur within and north of the farming triangle have one or more characteristics that are either unsuitable or potentially unsuitable for residential/sustainable farming (U.S. Department of Agriculture 1993, Section 2.1). Unsuitable characteristics found in the region include cemented horizons (layers); indurated horizons; shallow bedrock; high clay content; high potential erosion; minimum pH values exceeding 8.4; and minimum salt values for EC and SAR that are greater than 4 dS/m and 13, respectively (Appendix B). Potentially unsuitable characteristics include maximum values of pH, EC, and SAR values that meet or exceed the limits that influence plant growth (Appendix B).

Soil series comprising the 11 soil mapping units within and north of the farming triangle that have characteristics unsuitable for farming include (unsuitable characteristics in parentheses) Bluepoint (pH, erosion potential), Commski (gravel, cobbles, pH, EC), Dune Land (erosion potential), Greyeagle (indurated hardpan), Pumpah (clay, salts), Shorim (rock fragments, indurated), Upspring (bedrock), and Zalda (indurated hardpan, bedrock) (Appendix B). Soils having characteristics that are potentially unsuitable are Arizo (pH); Corbilt (pH); Sanwell (pH, salts); Sanwell, Warm (pH, salts); Shamock (cemented and indurated hardpan, pH); Yermo (pH); and Yermo, Hot (pH) (Appendix B).

Subsoil characteristics differ among soil series within soil mapping units (Appendix B and C). This could result in differential influences on crop production within mapping units. For example, the Sanwell-Sanwell, Warm-Yermo Association within the farming triangle contains the Yermo series.

This series does not appear to have any physical or chemical properties (except possibly pH) that would make it unsuitable for irrigated farming; however, the NRCS survey does not provide enough detail to determine if the Yermo series occurs where farming activity is most prevalent. It is also not possible to determine from the soil survey whether this soil mapping unit north of the farming triangle is comprised of the Yermo series or the Sanwell series, which has elevated salt and pH levels at depths of 9–60 inches (Appendix A). Because the location and relative abundance of each soil series within mapping units is not specified, general conclusions cannot be made regarding the suitability of each map unit for farming; thus, site-specific investigations are required to determine the suitability of soils for farming within a particular soil mapping unit.

### **3.2 SITE-SPECIFIC DATA**

Site-specific data from cultivated and uncultivated soils were compared to determine if uncultivated sites north of the farming triangle had characteristics similar to soils that farmers were using for agriculture. From an agronomic perspective, sampled cultivated and uncultivated sites were similar (Table 2, Appendix D). With the exception of root inhibiting layers, many of the uncultivated soils were potentially more suitable for farming than those currently in cultivation.

#### **3.2.1 Root Inhibiting Layers**

Only one cultivated sample location had a root-inhibiting layer at a depth of less than 1 m. Cemented or indurated horizons were present at many of the uncultivated sample locations, typically at about 50 cm. Generally, the root inhibiting layer was a duripan, not bedrock or indurated caliche. Duripans were most prevalent in the Shamock map unit.

#### **3.2.2 pH**

Mean pH within the A Horizon of cultivated and uncultivated soil samples was within the potentially unsuitable range (pH 7.8–8.4) for all four mapping units sampled (Table 2). Maximum pH within the A Horizon exceeded the criteria for unsuitability (pH >8.4) only in the Yermo, Hot-Arizo Association.

Minimum and mean pH values in the C1 Horizon and the C2 Horizon were within the potentially unsuitable range (pH 7.8–8.4) for the Shamock series and Yermo, Hot-Arizo Association, but maximum pH was greater than 8.4 in both map units. Mean, maximum, and minimum pH exceeded 8.4 in the C1 Horizon and the C2 Horizon of the Sanwell-Sanwell, Warm-Yermo Association and the Corbilt series.

Mean pH (compared within horizons) was similar between cultivated and uncultivated samples in the two map units for which cultivated and uncultivated samples were collected. However, maximum pH in the C1 Horizon and the C2 Horizon was higher in uncultivated samples (Table 2).

#### **3.2.3 Salts**

None of the soil units had an EC value too saline for farming (i.e., greater than 4.0) (Table 2). The Sanwell-Sanwell, Warm-Yermo series had EC values of 2.1–3.1, which are considered potentially unsuitable for farming.

Table 2. Mean, maximum, and minimum values for pH, electrical conductivity (EC, dS/m), sodium adsorption ratio (SAR), percent sand percent clay, percent coarse fragments (CF), and percent of coarse fragments >5 cm (CF) for soil horizons in uncultivated and cultivated soils within four soil mapping units in Amargosa Valley, Nevada (DTN: MO9812SOILAMVA.000). A complete listing of the data is in Appendix D. ( $n$ =number of soil pits)

Series	Location	A or Ap Horizon								C1 Horizon								C2 Horizon							
Parameter	<i>n</i>	pH	EC	SAR	Sand	Clay	CE	CF	pH	EC	SAR	Sand	Clay	CE	CF	pH	EC	SAR	Sand	Clay	CE	CF			
Shamock																									
Uncultivated	11																								
Mean		8.2	0.4	0.9	84.2	4.4	14.1	0.0	8.3	0.3	2.3	81.2	6.8	14.4	0.0	8.4	0.5	6.1	83.4	5.5	24.0	5.			
Minimum		7.9	0.2	0.5	80.0	1.0	10.0	0.0	8.1	0.1	0.9	69.0	40.	5.0	0.0	7.7	0.2	1.6	7730	4.0	10.1	0.			
Maximum		8.4	0.6	1.6	94.0	6.0	20.0	0.0	8.7	0.4	6.0	94.0	11.0	25.0	2.0	8.7	0.5	10.2	93.0	8.0	50.0	50.			
Cultivated	3																								
Mean		8.2	0.6	3.5	83.0	5.3	17.3	0.0	8.2	0.7	4.0	82.3	6.3	36.7	10.0	8.2	0.6	4.0	84.0	7.5	45.0	5.			
Minimum		8.1	0.4	2.2	81.0	4.0	12.0	0.0	7.8	0.4	2.5	80.0	5.0	30.0	0.0	8.2	0.3	2.4	78.0	4.0	30.0	0.			
Maximum		8.4	0.7	4.1	87.0	7.0	20.0	0.0	8.5	0.9	4.9	85.0	8.0	40.0	30.0	8.2	0.9	5.6	90.0	11.0	60.0	10.			
Yermo-Hot Arizo Association																									
Uncultivated	9																								
Mean		8.1	0.3	0.9	91.1	2.8	20.1	4.4	8.4	0.2	1.6	87.9	5.7	9.2	1.3	8.7	0.3	3.1	93.0	3.8	35.6	8.			
Minimum		7.6	0.3	0.5	88.0	1.0	10.0	0.0	8.1	0.2	0.6	78.0	4.0	5.0	0.0	8.5	0.2	1.3	88.0	2.0	15.0	0.			
Maximum		8.6	0.4	9.9	94.0	4.0	40.0	0.0	8.9	0.4	3.3	93.0	12.0	10.0	10.0	9.2	0.4	6.0	97.0	5.0	50.0	0.			
Cultivated	3																								
Mean		8.2	1.0	7.1	82.7	5.3	10.0	0.0	8.4	1.1	7.1	88.0	4.0	28.3	16.7	8.7	1.0	15.8	85.0	5.0	15.0	0.			
Minimum		8.0	0.8	3.7	81.0	5.0	10.0	0.0	8.2	0.4	2.5	84.0	2.0	10.0	0.0	8.7	1.0	15.8	85.0	5.0	15.0	0.			
Maximum		8.6	1.3	9.9	85.0	6.0	10.0	0.1	8.6	2.3	10.7	94.0	5.0	50.0	50.0	8.7	1.0	15.8	85.0	5.0	15.0	0.			
Sanwell-Sanwell, Warm-Yermo Association																									
Cultivated	2																								
Mean		8.2	2.9	13.4	79.5	8.5	22.5	0.0	9.0	2.9	41.8	80.5	7.0	37.5	0.0	9.1	2.8	18.1	78.0	6.0	30.0	30.			
Minimum		8.2	2.1	4.8	79.0	6.0	15.0	0.0	8.4	2.7	31.6	76.0	6.0	25.0	0.0	9.1	2.8	18.1	78.0	6.0	30.0	30.			
Maximum		8.2	3.6	21.9	80.0	11.0	30.0	0.0	9.6	3.1	52.0	85.0	8.0	50.0	0.0	9.1	2.8	18.1	78.0	6.0	30.0	30.			
Corbitt Gravely Fine Sandy Loam																									
Uncultivated	3																								
Mean		8.0	0.3	0.6	93.3	1.7	25.0	0.0	8.5	0.2	0.9	96.0	2.0	11.7	10.0	8.4	0.3	1.1	91.5	4.5	42.5	22.			

The Shamock; Yermo, Hot-Arizo; and Corbilt map units had SAR values of less than 13 and therefore were not sodic (Table 2). In contrast, all horizons in the cultivated Sanwell-Sanwell, Warm-Yermo Association had average SAR values exceeding 13.

EC and SAR levels generally were higher in cultivated soils than uncultivated soils. This is probably due to the addition of salts through irrigation (Table 2). Prolonged irrigation of these sites could cause soils to become more saline and sodic.

#### 4. DISCUSSION

Characteristics measured to evaluate the quality of cultivated and uncultivated soils in Amargosa Valley varied greatly. NRCS data and site-specific data collected during May 1997 indicated that cultivated and uncultivated sites had similar soil quality.

Using conventional guidelines for determining soil quality, NRCS data indicated that soils series within and north of the farming triangle had characteristics that could make them unsuitable for farming. The site-specific survey in May 1997 confirmed the NRCS results for a subset of these soils. In some cases, uncultivated soils were more suitable for farming than those currently cultivated. Characteristics commonly found that may have made these soils unsuitable were high pH, hardpan or bedrock, and high salt content.

Although soils in Amargosa Valley have characteristics that could make them unsuitable for agriculture, some soils there have supported commercial and residential agriculture for more than 30 years (McCracken 1992, pp. 51-61). The reason for this apparent contradiction may be that the conventional soil-quality guidelines used here are too conservative because they provide an indication of suitability for growing *most* crops. Cultivars of some crop species are available that are adapted to lower quality soils. For example, several cultivars of alfalfa are available for dry climates and soils with high pH. Farmers also may be implementing other management practices such as special tillage methods or soil amendments to rectify soil problems. Finally, the conventional soil-quality guidelines are used to assess suitability for growing most crops on a *sustainable* basis. Although cultivars and management practices may be found to overcome unsuitable conditions, production of these crops may not be sustainable over the long term. There are indications that soil salinity and sodicity are increasing in cultivated areas in Amargosa Valley. Continued increases in salinity levels could lead to reduced production and possibly abandonment of lands because of low productivity.

Some soils in Amargosa Valley appear to be more suitable for agriculture than others; however, the NRCS data are not mapped at a scale that is useful for determining precisely where those more suitable soils are located. Because the sites sampled for this report could not be located randomly throughout the region, the site-specific data reported here also cannot be used to determine the location of specific series throughout the valley; thus, a site-specific evaluation would be needed to determine the suitability of soils for farming at a location.

Because of the large range of characteristics that exists both within and between soil series, soil quality alone cannot be used as the primary discriminator for assessing whether farming can occur north of the farming triangle. Other factors, such as availability of water, availability of crops adapted to the region, or demand for crops, are probably more important considerations for determining whether farm agriculture is viable in this area. As with most agricultural enterprises, economics will most likely determine whether farming is feasible north of the current farming triangle in Amargosa Valley.

## 5. CONCLUSIONS

A review of NRCS information and site-specific data collected during May 1997 indicates that soils within and north of the farming triangle have characteristics (e.g., presence of root inhibiting layers, pH, and salts) that may make them unsuitable for farming; however, farming is occurring on some of these soils, possibly because of careful selection of crops and special management practices. Soils sampled north of the farming triangle are similar to those being farmed. It is therefore concluded that at least some areas north of the farming triangle have soils that are as suitable for farming as those currently being used, which suggests that soils are not the primary factor limiting agriculture between the farming triangle and Yucca Mountain; however, the soils information currently available is not of sufficient detail to identify which areas in the northern part of the valley have soils that would be most suitable for farming.

Economic considerations, such as availability of water, availability of suitable cultivars, and demand for crops, will likely remain the important factors determining whether farming will occur north of the farming triangle. Because this area is arid, crop production on any scale must rely on irrigation; therefore, depth, quality, and availability of water will likely be the most important factors determining the location and viability of agriculture in Amargosa Valley in the future.

## 6. REFERENCES

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## **6.2 CODES, STANDARDS, AND REGULATIONS**

Farmland Protection Policy Act. 7 USC 4201. TIC 242576.

**APPENDIX A**

**SOIL MORPHOLOGICAL CHARACTERISTICS RECORDED  
AND LABORATORY PARAMETERS MEASURED**



Prior to initiating field investigations (sampling), a field data sheet was developed to ensure that specific site and soil morphological characteristics were recorded at each site. Site characterization data consisted of:

- Global Positioning Satellite location
- Soil association
- Soil status (i.e., undisturbed, formerly cultivated, currently cultivated, or fallow)
- Vegetation type
- Slope
- Erosion condition (i.e., minimal, moderate, or severe)

Morphological characteristics consisted of:

- Horizon
- Depth range (cm)
- Coarse fragments > 2 mm (% of total horizon)
- Coarse fragments > 5 cm (% of total coarse fragments)

Laboratory analysis conducted by Utah State University consisted of the following parameters:

- pH
- Electrical conductivity (EC)
- Sodium adsorption ration (SAR)
- Cation exchange capacity (CEC)
- Bicarbonate ( $\text{HCO}_3$ )
- Calcium carbonate ( $\text{CaCO}_3$ )
- Organic matter (OM)
- Sulfate ( $\text{SO}_4\text{-S}$ )
- Texture (percent sand, silt, and clay)

Plant available:

Nitrogen ( $\text{NO}_3\text{-N}$ )	Zinc (Zn)
Phosphorus (P)	Iron (Fe)
Potassium (K)	Manganese (Mn)

Water-holding capacity at:

- 1/3-bar
- 1-bar
- 15-bar

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**APPENDIX B**

**SUMMARY OF SELECTED PARAMETERS FROM THE NATURAL RESOURCES  
CONSERVATION SERVICE MAP UNIT INTERPRETATION DATABASE  
(NRCS 1998)**

[illegible]

## Appendix B (Continued).

Map Unit Symbol	Depth Upper - Lower inches		Texture	Coarse Fragments 7-25 cm %	Coarse Fragments >2 mm %	Clay Content %	Available Water Content inches		pH	EC dS/l	SAR	Penneability in/hr
<i>Sanwell-Sanwell, Warm-Yermo Association</i>												
2451	0	9	GR-FSL	0 - 0	25 - 40	5 - 10	0.10 -	0.13	7.9 - 8.4	0 - 4	0 - 4	2.00 - 6.00
2451	9	16	GR-SLGR-FSL	0 - 15	25 - 40	5 - 10	0.08 -	0.12	8.5 - 9.0	4 - 8	0 - 4	2.00 - 6.00
2451	16	31	GRV-COSLGRV-SL	0 - 0	50 - 65	5 - 10	0.05 -	0.09	8.5 - 9.0	4 - 8	13 - 30	0.60 - 2.00
2451	31	60	GRV-COSL	0 - 0	50 - 75	5 - 10	0.05 -	0.08	8.5 - 9.0	4 - 8	13 - 30	6.00 - 20.00
2451	0	9	GR-FSL	0 - 0	25 - 40	5 - 10	0.10 -	0.13	7.9 - 8.4	0 - 4	0 - 4	2.00 - 6.00
2451	9	16	GR-SLGR-FSL	0 - 15	25 - 40	5 - 10	0.08 -	0.12	8.5 - 9.0	4 - 8	0 - 4	2.00 - 6.00
2451	16	31	GRV-COSLGRV-SL	0 - 0	50 - 65	5 - 10	0.05 -	0.09	8.5 - 9.0	4 - 8	13 - 30	0.60 - 2.00
2451	31	60	GRV-COSL	0 - 0	50 - 75	5 - 10	0.05 -	0.08	8.5 - 9.0	4 - 8	13 - 30	6.00 - 20.00
2451	0	6	GRV-SL	5 - 20	50 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	0 - 2	2.00 - 6.00
2451	6	60	SR GR-LGRX-SL	10 - 25	45 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	1 - 12	2.00 - 6.00
<i>Lewolac-Yermo Association</i>												
2471	0	3	GR-LFS	0 - 0	25 - 50	3 - 8	0.07 -	0.09	7.9 - 8.4	0 - 2	0 - 2	2.00 - 6.00
2471	3	16	FSLSL	0 - 0	10 - 25	5 - 10	0.14 -	0.17	7.9 - 9.0	2 - 4	0 - 4	2.00 - 6.00
2471	16	21	Cemented									0.00 0.20
2471	21	60	SR GR-LGRX-C	0 - 10	45 - 80	20 - 35	0.06 -	0.10	7.9 - 9.0	0 - 8	0 - 8	0.06 - 0.20
2471	0	6	GRV-SL	5 - 20	50 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	0 - 2	2.00 - 6.00
2471	6	60	SR GR-LGRX-SL	10 - 25	45 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	1 - 12	2.00 - 6.00
<i>Arizo-Bluepoint-Dune Land Complex, 0 to 4 Percent Slopes</i>												
2151	0	8	GRV-SL	0 - 5	50 - 75	5 - 12	0.05 -	0.07	7.4 - 9.0	0 - 2	0 - 5	2.00 - 6.00
2151	8	60	SR CB-COS GRX-S	10 - 35	50 - 80	0 - 5	0.04 -	0.06	7.4 - 9.0	0 - 2	1 - 12	20.00 - 20.00
2151	0	9	LFS	0 - 0	0 - 0	2 - 6	0.06 -	0.10	7.4 - 9.0	0 - 2	1 - 5	6.00 - 20.00
2151	9	24	SR FS GR-LFS	0 - 0	10 - 40	2 - 6	0.05 -	0.08	7.9 - 9.0	0 - 2	1 - 5	6.00 - 20.00
2151	24	41	LFSLSFS	0 - 0	0 - 0	2 - 6	0.05 -	0.09	7.9 - 9.0	0 - 4	1 - 12	6.00 - 20.00
2151	41	60	SRS VFSL	0 - 0	0 - 0	2 - 10	0.05 -	0.14	7.9 - 9.0	0 - 4	1 - 12	2.00 - 6.00

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## Appendix B (Continued).

Map Unit Symbol	Depth Upper - Lower inches		Texture	Coarse Fragments 7-25 cm %	Coarse Fragments >2 mm %	Clay Content %	Available Water Content inches		pH	EC dS/l	SAR	Permeability in/hr	
<i>Arizo-Corbilt-Commski Association</i>													
2153	0	8	GRV-SL	0 - 5	50 - 75	5 - 12	0.05 -	0.07	7.4 - 9.0	0 - 2	0 - 5	2.00 -	6.00
2153	8	60	SR CB-COS GRX-S	10 - 35	50 - 80	0 - 5	0.04 -	0.06	7.4 - 9.0	0 - 2	1 - 12	20.00 -	20.00
2153	0	4	GRV-SL	0 - 10	50 - 75	5 - 10	0.06 -	0.09	7.9 - 8.4	0 - 4	1 - 5	2.00 -	6.00
2153	4	32	GR-FSLGR-SL	0 - 0	25 - 45	5 - 10	0.11 -	0.13	8.5 - 9.6	0 - 2	1 - 5	2.00 -	6.00
2153	32	56	GRV-SL	10 - 25	40 - 50	2 - 6	0.06 -	0.07	8.5 - 9.6	0 - 2	1 - 12	2.00 -	6.00
2153	56	60	Cemented									0.00 -	0.20
2153	0	5	GRV-FSL	0 - 10	50 - 75	10 - 18	0.06 -	0.08	7.9 - 9.0	0 - 2	1 - 5	2.00 -	6.00
2153	5	14	GRX-SL	0 - 10	75 - 85	5 - 15	0.04 -	0.06	7.9 - 9.0	0 - 2	1 - 5	2.00 -	6.00
2153	14	60	GRX-COSLGRX-SLGRX	5 - 20	75 - 85	5 - 15	0.03 -	0.05	7.9 - 9.0	4 - 8	1 - 12	0.60 -	2.00
<i>Shorim-Yermo Association</i>													
2281	0	3	GRV-SL	0 - 10	45 - 75	5 - 15	0.04 -	0.07	7.9 - 8.4	0 - 2	0 - 2	2.00 -	6.00
2281	3	10	GR-SL	0 - 5	35 - 45	5 - 15	0.07 -	0.08	7.9 - 8.4	0 - 2	0 - 2	2.00 -	6.00
2281	10	35	GRV-FSLGRV-SL	0 - 10	45 - 75	5 - 15	0.03 -	0.06	8.5 - 9.0	0 - 2	0 - 2	2.00 -	6.00
2281	35	40	Indurated									0.00 -	0.01
2281	40	50	Bedrock									0.00 -	0.01
2281	0	6	GRV-SL	5 - 20	50 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	0 - 2	2.00 -	6.00
2281	6	60	SR GR-LGRX-SL	10 - 25	45 - 70	8 - 18	0.06 -	0.08	7.9 - 9.0	0 - 4	1 - 12	2.00 -	6.00
<i>Pumpah-Rumpah, Dry Association</i>													
3302	0	3	C	0 - 0	0 - 0	40 - 60	0.14 -	0.16	7.9 - 9.0	0 - 4	0 - 4	0.06 -	0.20
3302	3	54	CSIC	0 - 0	0 - 0	45 - 60	0.14 -	0.17	7.9 - 9.0	2 - 16	13 - 30	0.00 -	0.06
3302	54	60	CSIC	0 - 0	0 - 0	40 - 60	0.14 -	0.17	8.5 - 9.0	2 - 4	10 - 13	0.00 -	0.06

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**APPENDIX C**

**OFFICIAL SOIL SERIES DESCRIPTIONS FOR SOILS  
IN AND AROUND THE AMARGOSA VALLEY FARMING TRIANGLE  
(NRCS 1998)**

LOCATION ARIZO

NV+AZ CA NM

Established Series

Rev. LNL/RLB

05/97

## ARIZO SERIES

The Arizo series consists of very deep, excessively drained soils that formed in mixed alluvium. Arizo soils are on recent alluvial fans, inset fans, fan apron, stream terraces, floodplains of intermittent streams and channels. Slopes are 0 to 15 percent. The mean annual precipitation is about 7 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Sandy-skeletal, mixed, thermic Typic  
Torriorthents

**TYPICAL PEDON:** Arizo very gravelly fine sand, desert wildlife habitat. (Colors are for dry soil unless otherwise noted.)

A--0 to 8 inches; light brownish gray (10YR 6/2) very gravelly fine sand, dark grayish brown (10YR 4/2) moist; weak coarse platy structure; slightly hard, very friable, nonsticky and nonplastic; few fine and medium roots; few fine vesicular and many very fine and fine interstitial pores; 35 percent pebbles; strongly effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary. (0 to 10 inches thick)

C1--8 to 36 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; few fine and medium roots; many very fine and fine interstitial pores; 60 percent pebbles, 10 percent cobbles; few very thin coats of lime on undersides of pebbles; strongly effervescent; moderately alkaline (pH 8.2); gradual wavy boundary. (12 to 36 inches thick)

C2--36 to 62 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine, and few medium interstitial pores; 60 percent pebbles, 20 percent cobbles, 3 percent stones; strongly effervescent; moderately alkaline (pH 8.2).

**TYPE LOCATION:** Clark County, Nevada; about 1,000 feet east and 600 feet south of center of section 20, R. 13 S., R. 17 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry, moist for short periods throughout the moisture control section during December through March. Moist above and periodically in upper part of moisture control section for 10 to 20 days cumulative, during July through October.

Soil temperature - 59 to 72 degrees F.

Reaction: Mildly alkaline to strongly alkaline.

Other features: Effervescent in some or all parts, with thin lime coatings on undersides of rock fragments in some pedons.

Control section - Rock fragments: 35 to 85 percent, mainly pebbles.

**A horizon** - Hue: 10YR or 7.5YR.

Value: 5 through 8 dry, 3 through 6 moist.

Chroma: 2 through 6.

**C horizon** - 10YR or 7.5YR.

Value: 5 through 8 dry, 3 through 6 moist.

Chroma: 2 through 6.

Texture of fine earth: Averages coarse sand or loamy sand.

Structure: Single grained or massive.

**COMPETING SERIES:** These are the Jean (NV) and Kokan (NM) series. Jean soils have a shallow Bw horizon and have textures in the upper control section of loamy sand or loamy fine sand with less than 15 percent rock fragments. Kokan soils are moist for short periods in some part mainly in July, August, and early September and are dry the rest of the year.

**GEOGRAPHIC SETTING:** Arizo soils are on recent alluvial fans, stream terraces, floodplains of intermittent streams and channels. These soils formed in alluvium from mixed rock sources. Slopes are 0 to 15 percent. Elevations are 750 to 4,500 feet. The climate is arid or semiarid with mild winters and hot dry summers. The mean annual precipitation is 4 to 10 inches and may range to 13 inches in Arizona where temperatures are 67 to 70 degrees F.; mean annual temperature is 57 to 70 degrees F.; and the frost-free season is 200 to 300 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Bard, Bitter Spring, Gila, Nickel, Tonopah, and Vinton soils. Bard soils have a petrocalcic horizon. Bitter Spring soils have a gravelly sandy loam B2t horizon. Gila soils have a loamy control section. Nickel and Tonopah soils have a calcic horizon. Vinton soils have a loamy fine sand or loamy sand control section.

**DRAINAGE AND PERMEABILITY:** Excessively drained; slow or medium runoff; very rapid permeability.

**USE AND VEGETATION:** Source of sand and gravel, rangeland, and wildlife habitat. The present vegetation is mainly creosotebush and white bursage.

**DISTRIBUTION AND EXTENT:** Southern Nevada, Southern California, Arizona, and New Mexico. These soils are extensive. MLRA 30,40,41,42.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Clark County (Virgin River Area), Nevada. 1971.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Particle-size control section - The zone from 10 to 40 inches.

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National Cooperative Soil Survey  
U.S.A.



LOCATION ARMPUP NV

Established Series

Rev. JR/RLB

05/97

## ARMPUP SERIES

The Armpup series consists of deep, well drained soils that formed in alluvium from mixed rock sources. The Armpup soils are on pediment remnants and ballena toe slopes. Slopes are 2 to 8 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Fine, smectitic, thermic Typic Natrargids

**TYPICAL PEDON:** Armpup gravelly sandy clay loam, rangeland. (Colors are for dry soil unless otherwise noted.) About 60 percent of the soil surface is covered with pebbles and 10 percent with cobbles.

**A--0** to 3 inches; very pale brown (10YR 7/4) gravelly sandy clay loam, pale brown (10YR 6/3) moist; strong fine and medium platy structure; hard, firm, sticky and plastic; many very fine and fine vesicular pores, common fine tubular pores; 25 percent pebbles and 5 percent cobbles; violently effervescent; very strongly alkaline (pH 9.6); clear smooth boundary. (2 to 4 inches thick)

**Bt<sub>nz</sub>--3** to 6 inches; yellowish brown (10YR 5/4) gravelly clay, dark yellowish brown (10YR 4/4) moist; weak fine prismatic structure, hard, firm, very sticky and plastic; few very fine tubular pores; few fine faint clay films lining pores; 15 percent pebbles; violently effervescent; very strongly alkaline (pH 9.6); clear smooth boundary. (3 to 5 inches thick)

**B<sub>tn</sub>--6** to 18 inches; yellowish brown (10YR 5/4) gravelly clay, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure; hard, firm, very sticky and very plastic; few very fine tubular pores; common distinct clay films lining pores; 15 percent pebbles; strongly effervescent; very strongly alkaline (pH 9.6); abrupt smooth boundary. (7 to 12 inches thick)

**B<sub>tkn</sub>--18** to 46 inches; brown (10YR 5/3) extremely gravelly sandy clay, dark brown (10YR 4/3) moist; weak coarse prismatic structure; hard, firm, very sticky and plastic; common very fine and fine interstitial pores; many prominent clay bridges between sand grains; 65 percent pebbles, 3 percent cobbles; common prominent lime pendants on undersides of rock fragments; common coarse soft lime masses; violently effervescent; very strongly alkaline (pH 9.4); abrupt wavy boundary. (14 to 28 inches thick)

**B<sub>k</sub>--46** to 55 inches; brown (10YR 5/3) very gravelly loamy sand, dark brown (10YR 4/3) moist; massive, slightly hard, friable, nonsticky and nonplastic; common very fine and fine interstitial pores; 40 percent pebbles, 2 percent cobbles; few thin lime pendants on undersides of rock fragments, few very fine soft lime masses; strongly effervescent; very strongly alkaline (pH 9.4).

**Cr--55** to 59 inches; olive (5Y 5/3) weathered sedimentary bedrock.

**TYPE LOCATION:** Nye County, Nevada; approximately 1.2 miles southwest of the Ash Meadows Rancho and about 1,000 feet south and 1,500 feet west of the northeast corner of section 35, T. 18 S., R. 50 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry, moist in some part of the moisture control section for short periods in the winter and spring and for 10 to 20 days cumulative during the summer following convection storms from July through October.

Soil temperature - 67 to 72 degrees F.

Depth to paralithic contact - 40 to 60 inches.

Depth to argillic horizon - 3 to 6 inches.

Control section - Percent clay: 35 to 45 percent.

Rock fragments: 20 to 35 percent mainly pebbles.

**A horizon** - Value: 5 through 7 dry, 4 through 6 moist.

Chroma: 3 or 4.

Salinity: More than 16 mmhos/cm.

Other features: In some pedons a fluffy dry consistence is noted.

**Bt<sub>nz</sub> horizon** - Value: 4 or 5 dry, 4 or 5 moist.

Chroma: 3 or 4.

Texture: Gravelly clay loam, gravelly clay.

Clay content: 35 to 45 percent.

Rock fragments: 15 to 30 percent mainly pebbles.

Salinity: More than 16 mmhos/cm.

SAR: 13 to 50.

**Bt<sub>n</sub> horizon** - Value: 4 or 5 dry or moist.

Chroma: 3 or 4.

Texture: Gravelly clay loam, gravelly clay.

Clay content: 35 to 45 percent.

Rock fragments: 15 to 30 percent mainly pebbles.

Salinity: 8 to 16 mmhos/cm.

SAR: 13 to 50.

**Bt<sub>kn</sub> horizon** - Value: 4 or 5 moist.

Chroma: 4 or 5.

Texture: Very or extremely gravelly sand clay.

Clay content: 35 to 45.

Rock fragments: 50 to 70 percent mainly pebbles.

Secondary lime accumulation: Common through many very coarse soft lime masses; common prominent lime pendants on coarse fragments.

Salinity: More than 16 mmhos/cm

SAR: 13 to 50.

**Bk horizon** - Value: 4 or 5 moist.

Chroma: 3 or 4.

Texture: Very gravelly loamy sand through very gravelly sandy loam.

Clay content: 5 to 10 percent.

Rock fragments: 35 to 60 percent mainly pebbles.

Salinity: 8 to 16 mmhos/cm.

**COMPETING SERIES:** These are the Carollo(CA), Lethent(CA) and Oban(CA) series. Carollo, Lethent and Oban soils have nongravelly textural control sections and mean annual soil temperatures that are less than 67 degrees F.

**GEOGRAPHIC SETTING:** Armpup soils are on pediment remnants and ballena toe slopes. These soils formed in mixed alluvium, partially from tuffaceous sedimentary rocks. Slopes are 2 to 8 percent. Elevations are 2,000 to 4,000 feet. The climate is arid with hot dry summers and mild winters. The mean annual precipitation is between 3 to 6 inches; mean annual temperature is 62 to 70 degrees F., and the frost-free season is 210 to 220 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Ashmed series. Ashmed soils have loamy-skeletal control sections and generally more vegetation.

**DRAINAGE AND PERMEABILITY:** Well drained. Moderately rapid runoff; slow permeability.

**USE AND VEGETATION:** Rangeland and mining. The present vegetation is mainly a few seepweed and chorizanthe in concave washes.

**DISTRIBUTION AND EXTENT:** Southern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest part, 1982. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedons are:

Natric horizon - The zone from about 3 to 46 inches. (Btnz, Btn and Btkn horizons)

Paralithic contact - The boundary at about 55 inches.

Particle-size control section - The zone from about 3 to 23 inches. (Btnz and Btn horizons and part of the Btkn horizon)

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National Cooperative Soil Survey  
U.S.A.

LOCATION BLUEPOINT NV+AZ CA NM TX

Established Series  
Rev. LNL/RLB/WED  
05/97

## BLUEPOINT SERIES

The Bluepoint series consists of very deep, somewhat excessively drained soils that formed in sandy alluvium and eolian materials from mixed rock sources. The Bluepoint soils are on dunes and sand sheets mantling fan piedmonts, alluvial flats and flood plains. Slopes are 0 to 50 percent. The mean annual precipitation is about 5 inches and the mean annual temperature is about 66 degrees F.

**TAXONOMIC CLASS:** Mixed, thermic Typic Torripsamments

**TYPICAL PEDON:** Bluepoint loamy fine sand-cultivated. (Colors are for dry soil unless otherwise noted.)

**Ap**--0 to 9 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; many fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (3 to 11 inches thick)

**C1**--9 to 17 inches; light reddish brown (5YR 6/4) loamy fine sandy, reddish brown (5YR 5/4) moist; weak coarse platy structure due to stratification; soft and slightly hard, very friable, nonsticky and nonplastic; many fine and medium roots; few very fine and fine tubular and many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (7 to 15 inches thick)

**C2**--17 to 30 inches; pink (5YR 7/4) fine sand, reddish brown (5YR 5/4) moist; single grained; loose, nonsticky and nonplastic; many fine and common medium roots; many very fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary. (7 to 26 inches thick)

**C3**--30 to 41 inches; pink (5YR 7/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (10 to 22 inches thick)

**C4**--41 to 56 inches; pink (5YR 7/4) very fine sandy loam, reddish brown (5YR 5/4) moist; weak medium and coarse platy structure due to stratification; slightly hard, very friable, nonsticky and nonplastic; common fine roots; many very fine tubular pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (0 to 16 inches thick)

**C5**--56 to 80 inches; pink (5YR 7/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6).

**TYPE LOCATION:** Clark County, Nevada; approximately 2 miles south of Overton, about 2,390 feet south and 330 feet east of the northwest corner of section 29, T. 16 S., R. 68 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. Moist for short periods throughout the moisture control section December through March. Moist above and periodically in upper part of moisture control section 10 to 20 days cumulative, July through October.

Soil temperature - 65 to 70 degrees F.

Soil color - Darker values and lower chroma reflect lithochromic colors.

Control section - Percent clay: 2 to 10.

Rock fragments: Average less than 15 percent.

**A & C Horizons** - Hue: 5YR, 7.5YR or 10YR.

Value: 4 through 7 dry, 3 through 6 moist.

Chroma: 3 through 6.

Texture: Commonly loamy fine sand or loamy sand, includes sand or fine sand, containing more than 10 percent silt plus clay.

Structure - Single grain, massive or platy.

Reaction: Slightly alkaline to strongly alkaline.

Consistence: Loose to slightly hard dry, loose to very friable moist.

Other features: Calcareous in some part or all of control section. Few gypsum or lime segregations in some pedons.

**COMPETING SERIES:** These are the Brazito (AZ), Cajon (CA), Maynard Lake (NV), Moapa (NV), Pintura, Toquop, and Yturbide (NM) series. Brazito, Pintura, and Toquop soils have less than 10 percent silt plus clay in the series control section. Also, Pintura soils are mainly noncalcareous throughout. Cajon soils lack appreciable summer precipitation. Maynard Lake soils have more than 20 percent volcanic ash. Moapa soils have a paralithic contact at depths of 20 to 40 inches. Yturbide soils average 15 to 35 percent gravel in the series control section.

**GEOGRAPHIC SETTING:** Bluepoint soils are on dunes and sand sheets mantling fan skirts, alluvial flats, fan piedmonts and flood plains. These soils formed in sandy alluvial and eolian materials from mixed rock sources. Slopes are 0 to 50 percent. Elevations are 1,400 to 5,000 feet. The climate is arid with hot dry summers and mild winters. The mean annual precipitation is 3 to 10 inches; mean annual temperature is 56 to 67 degrees F., and the frost-free season is 180 to 300 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Bard, Overton and Virgin River soils. Bard soils are shallow or very shallow over indurated lime hardpans. Overton soils have fine textured control sections and are saturated during part of the year. Virgin River soils have fine-loamy control sections and are usually moist in some part of the moisture control section.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained. Very slow through medium runoff; rapid permeability. In some areas, phases with high water tables have been created by irrigation or other water use.

**USE AND VEGETATION:** Irrigated cropland, rangeland, and wildlife habitat. The present vegetation is mainly creosotebush, white bursage, ephedra, Indian ricegrass and big galleta.

**DISTRIBUTION AND EXTENT:** Southern Nevada, southern New Mexico and southwestern Texas. These soils are extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Clark County, (Las Vegas-Eldorado Valleys Area) Nevada, 1964.

**REMARKS:** Diagnostic horizon and features recognized in this pedon are:

Ochric epipedon - The surface to 9 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION COMMSKI NV

Established Series  
Rev. JR/RLB/WED  
05/97

## COMMSKI SERIES

The Commski series consists of very deep, well drained soils on ballena shoulders and fan piedmont remnants. They formed in alluvium mainly from limestone. Slopes are 0 to 50 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 67 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, carbonatic, thermic Typic Haplocalcids

**TYPICAL PEDON:** Commski very gravelly fine sandy loam, rangeland. (Colors are for dry soil unless otherwise noted.) About 55 percent of the soil surface is covered with pebbles, 30 percent with cobbles and 1 percent with stones.

**A--**0 to 5 inches; pale brown (10YR 6/3) very gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, sticky and slightly plastic; common very fine and fine roots; common very fine tubular, few very fine and fine interstitial pores; 40 percent pebbles, 2 percent cobbles, and 3 percent stones; strongly effervescent; strongly alkaline (pH 8.6); gradual smooth boundary. (3 to 7 inches thick)

**Bk1--**5 to 14 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine and fine roots; common very fine, many fine and medium interstitial pores; 65 percent pebbles, 2 percent cobbles, and 2 percent stones; common thick lime pendants on rock fragments; strongly effervescent; strongly alkaline (pH 8.6); diffuse smooth boundary. (0 to 12 inches thick)

**Bk2--**14 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly coarse sandy loam, brown (10YR 5/3) moist; massive; hard, firm, nonsticky and nonplastic; few very fine roots; many fine and medium interstitial, few very fine tubular pores; 70 percent pebbles, 5 percent cobbles, 5 percent stones; weak discontinuous brittle matrix; violently effervescent; strongly alkaline (pH 8.8).

**TYPE LOCATION:** Nye County, Nevada; approximately 1 mile southeast of Ash Meadows Rancho and about 35 feet north and 10 feet west of the southeast corner of section 25, T. 18 S., R. 50 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. The upper part of the moisture control section is moist for a very short time in late winter, and for 10 to 20 days cumulative between July and October due to convection storms.

Soil temperature - 63 to 69 degrees F.

Secondary lime: - Calcium carbonates equivalent ranges from 40 to 60 percent

Depth to calcic horizon - 5 to 18 inches.

Thickness of calcic horizon - More than 30 inches.

Reaction - Moderately alkaline or strongly alkaline.

Control section - Percent clay: 5 to 15.

Rock fragments: 60 to 80 percent mainly pebbles.

**A horizon** - Chroma: 3 or 4 moist or dry.

**Bk1 horizon** (when present) - Clay content: 5 to 15 percent.

Structure: Subangular blocky or massive.

Consistence: Slightly hard or hard dry, friable or firm moist.

**Bk2 horizons** - Chroma: 2 or 3 moist or dry.

Texture of fine earth: Averages sandy loam or coarse sandy loam.

Clay content: 5 to 15 percent.

Other features: Discontinuous weak brittle matrix cemented by calcium carbonate.

**COMPETING SERIES:** These are the Destazo (CA), Pahrump (NV), Stillwell (TX) and Weiser (NV) soils. Destazo has 18 to 35 percent clay in the control section and has lime nodules in the calcic horizon. Pahrump soils have 18 to 25 percent clay in the control section. Stillwell soils are moist 20 to 40 days during the summer and fall. Weiser soils have calcic horizons between 10 and 28 inches thick and lack continuous weak cementation.

**GEOGRAPHIC SETTING:** Commski soils are on ballena shoulders and sideslopes of fan piedmont remnants. These soils formed in alluvium mainly from limestone. Slopes are 0 to 50 percent. Elevations are 2,200 to 4,200 feet. The climate is hot and arid with dry summers and mild winters. Distribution of precipitation is relatively even with slight peaks in January and August. The mean annual precipitation is 3 to 6 inches. The mean annual temperature is 65 to 70 degrees F. The frost-free season is about 210 to 220 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Ashmed soils. They are found on ballena foot slopes and inset fan remnants and have argillic horizons.

**DRAINAGE AND PERMEABILITY:** Well drained. Medium to rapid runoff; moderate permeability.

**USE AND VEGETATION:** Mining, rangeland and wildlife habitat. The present vegetation is mainly desertholly, white bursage, and annuals.

**DISTRIBUTION AND EXTENT:** Southern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County (Southwest Part), Nevada. 1982. The name is coined.

**REMARKS:** Diagnostic horizon and features recognized in this pedon are:

Calcic horizon - The zone from about 5 to 60 inches.

Particle-size control section - The zone from 10 to 40 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION CORBILT NV

Established Series  
Rev. HJB/RLB/WED  
06/97

## CORBILT SERIES

The Corbilt series consists of very deep, well drained soils on alluvial fans, fan skirts and fan piedmonts. They formed in alluvium from mixed sources. Slopes are 0 to 8 percent. The mean annual precipitation is about 5 inches and the mean annual temperature is about 64 degrees F.

**TAXONOMIC CLASS:** Coarse-loamy, mixed, superactive, calcareous, thermic Typic Torriorthents

**TYPICAL PEDON:** Corbilt very gravelly fine sandy loam, rangeland. (Colors are for dry soil unless otherwise noted.) The soil surface is covered with 50 percent pebbles overlain by a patchy 2 to 1 inch thick mantle of windblown sand.

**A--**0 to 4 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; strong coarse platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine, common fine, and few medium vesicular pores; 35 percent pebbles; violently effervescent; moderately alkaline (pH 8.4); clear smooth boundary. (3 to 4 inches thick)

**Bk--**4 to 16 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, few fine and medium roots; common very fine interstitial pores; 15 percent pebbles; few scattered lime patches on faces of peds and pebbles; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (10 to 20 inches thick)

**Bqk--**16 to 32 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, light yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine, few fine and medium roots; common very fine and few fine interstitial pores; 20 percent pebbles; few fine masses weakly cemented by lime and silica; silica-lime pendants on undersides of most rock fragments; few fine lime filaments; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary. (15 to 24 inches thick)

**2Bkq--**32 to 56 inches; very pale brown (10YR 7/3) very gravelly sandy loam, light yellowish brown (10YR 6/4) moist; massive, soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and few fine interstitial pores; few scattered pockets (6 to 8 inch diameter) of loamy coarse sand; few thin (up to 1 inch thick), discontinuous weakly silica and lime cemented layers, lime-silica pendants on underside of most rock fragments; few fine lime filaments; 30 percent pebbles, 10 percent cobbles, 5 percent stones, some pebbles with lime coats on top and bottom; violently effervescent; strongly alkaline (pH 8.8); clear wavy boundary. (10 to 30 inches thick)

**2Bkqm--**56 to 60 inches; very pale brown (10YR 8/3) strongly cemented duripan, very pale brown (10YR 7/4) moist; massive; 40 percent pebbles, 5 percent cobbles; violently effervescent.

**TYPE LOCATION:** Nye County, Nevada; approximately 2 miles east of Lathrop Wells and one-third mile north of U.S. 95 and about 850 feet south and 500 feet east of the northwest corner of section 21, T. 15 S., R., 50 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. The upper part of the moisture control section is moist for a very short time in late winter, and for 10 to 20 days cumulative between July and October following summer convection storms.

Soil temperature - 63 to 69 degrees F.

Depth to duripan - 40 to 80 inches.



Secondary lime - Averages 15 to 20 percent calcium carbonate equivalent.

Other features - Some pedon contain a thin mantle of sand on the surface.

Control section - Clay content: 5 to 10 percent.

Rock fragments: Averages 15 to 35 Percent.

**A horizon** - Value: 6 or 7 dry, 4 or 5 moist.

Chroma: 3 or 4 dry or moist.

**Bk horizon** - Structure: Weak medium subangular blocky or massive.

Texture: Fine sandy loam and sandy loam

Effervescence: Strongly effervescent or violently effervescent.

Reaction: Moderately alkaline or very strongly alkaline.

**Bqk horizon** - Consistence of matrix: Soft dry, very friable moist.

Texture: Fine sandy loam, sandy loam, gravelly fine sandy loam and gravelly sandy loam.

Reaction: Strongly alkaline or very strongly alkaline.

Other features: Weakly cemented masses constitute up to 20 percent. In some pedons the matrix is effervescent and cemented patches are violently effervescent.

**2Bqk horizon** - Rock fragments: 30 to 50 percent pebbles, 5 to 10 percent cobbles, 0 to 5 percent stones.

Texture: Gravelly sandy loam, gravelly fine sandy loam, very gravelly sandy loam and very gravelly fine sandy loam.

Consistence: Soft dry, very friable moist.

Other features: Silica-lime cemented plates comprise up to 20 percent. Some pedons contain 20 percent or more hard nodules and concretions.

**COMPETING SERIES:** These are the Bitterwater (CA), Circular (AZ), Elkhills (CA), Herbel (T NM), Kimberlina (CA), Machone (T CA), McCullough and Seaman (NV) soils. All of these soils lack illuvial silica accumulations and very gravelly strata within 40 inches. In addition, Bitterwater, Elkhills, and Kimberlina soils are neutral to moderately alkaline. Circular contain less than 15 percent rock fragments in the control section. Machone soils are moderately deep to a paralithic contact. McCullough soils have a thin Bw horizon with 5YR or 7.5YR hue and sandy textures in the lower part of the control section. Seaman soils have less than 15 percent rock fragments in the profile.

**GEOGRAPHIC SETTING:** Corbilt soils are on alluvial fans, fan skirts, and fan piedmonts. These soils formed in alluvium from mixed rock sources, mostly limestone, basalt, shale, and quartzite, with some obsidian. Slopes are 0 to 8 percent. Elevations are 2,300 to 4,500 feet. The climate is hot with cool winters. Distribution of precipitation is relatively even with slight peaks in January and August. The mean annual precipitation is about 3 to 5 inches. The mean annual temperature is about 60 to 68 degrees F. The frost-free season is about 200 to 220 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Alko, Arizo, and Skelon soils. Alko and Skelon soils have a duripan within a depth of 40 inches. Arizo soils have control sections that average more than 35 percent rock fragments. Bluepoint soils have a sandy control section.

**DRAINAGE AND PERMEABILITY:** Well drained. Slow to medium runoff; moderately rapid permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The present vegetation is mainly creosotebush, spiny hopsage, Indian ricegrass and white bursage.

**DISTRIBUTION AND EXTENT:** Southern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada. (Southwest Part) 1983. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedons are:

Particle-size control section - The zone from 10 to 40 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION GREYEAGLE CA+AZ NV

Established Series

Rev. JCW/TDC

05/97

## GREYEAGLE SERIES

The Greyeagle series consists of shallow, somewhat excessively drained soils formed in mixed alluvium. Greyeagle soils are on fan terraces and hillslopes and have slopes of 0 to 40 percent. Average annual precipitation is 6 inches and mean annual temperature is 53 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, thermic, shallow Typic Durorthids

**TYPICAL PEDON:** Greyeagle very stony loam - on a sloping alluvial fan under creosotebush and white bursage at 2,246 feet elevation. (Colors are for dry soil unless otherwise stated. When described August 1976 the soil was dry throughout).

**A1--0 to 3 inches;** very pale brown (10YR 7/3) very stony loam, brown (10YR 5/3) moist; strong thick platy structure; hard, friable, slightly sticky and slightly plastic; common very fine vesicular and interstitial pores; 60 percent 2 mm to 7 cm pebbles, 15 percent stones, 2 percent cobbles; violently effervescent, disseminated lime; moderately alkaline (pH 8.0); abrupt smooth boundary. (2 to 4 inches thick)

**A2--3 to 6 inches;** light yellowish brown (10YR 6/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; few fine interstitial pores; 15 percent 2 mm to 7 cm pebbles; violently effervescent, disseminated lime; moderately alkaline (pH 8.1); clear wavy boundary. (3 to 5 inches thick)

**Bk--6 to 8 inches;** very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; 40 percent 2 to 5 mm fragments; violently effervescent, medium irregular soft masses of lime and coatings less than 1 mm thick on rock fragments; moderately alkaline (pH 8.0); clear wavy boundary. (2 to 5 inches thick)

**2Bqkm--8 to 24 inches;** white and very pale brown (10YR 8/2, 8/3) continuous duripan with thin opalized laminations between layers of cemented gravel, very pale brown (10YR 7/4) moist; massive; extremely hard, indurated by silica and calcium carbonate; clear smooth boundary. (16 to 18 inches thick)

**2Bk--24 to 60 inches;** very pale brown (10YR 7/4) stratified extremely stony loamy sand; massive; very hard and extremely hard, firm.

**TYPE LOCATION:** Inyo County, California; Saline Valley; about 1/4 mile south of intersection of Saline Valley Road and Lippincott mine road; about 20 feet east of Saline Valley Range and 20 feet west of an exposed bank in a drainage way, N 2 of SE 1/4 sec. 20, T. 15 S., R. 40 E., MDB&M.

**RANGE IN CHARACTERISTICS:** Depth to an indurated, lime-silica cemented duripan ranges from 4 to 20 inches. The mean annual soil temperature is about 65 degrees F. The particle-size control section averages 10 to 18 percent clay. These soils are dry throughout from June until late November for about 180 days. The soil temperature is warmer than 41 degrees F from March to mid-December for about 290 days.

The A horizon has dry color of 10YR 7/3, 6/3, 6/4; or 7.5YR 6/4 and moist color of 10YR 4/3, 4/4, 5/3, 5/4, 6/3; 7.5YR 4/4, or 5/4. The upper 3 to 4 inches of the A horizon consists of a vesticular layer of very stony loam to very gravelly loam. Rock fragments 2 mm to 7 cm in diameter range from 35 to 60 percent; 7 cm-25 cm 1 to 5 percent, and 25 cm+ up to 15 percent in the upper part of the A horizon. The lower part of the horizon ranges from gravelly sandy loam to very gravelly sand.

The Bk horizon has colors similar to the A horizon. It is very gravelly sandy loam or very gravelly loamy sand.

Underlying the 2Bqkm horizon is mixed, extremely gravelly, stratified alluvium that is massive and extremely hard or very hard when dry. It can be dug with a pick and shovel, but with difficulty.

**COMPETING SERIES:** These are the Alko, Muroc, Nebona, Osobb, Pahroc and Stewart series in other families. Alko, Muroc, Nebona and Stewart soils are loamy. Osobb and Pahroc soils have mesic soil temperature.

**GEOGRAPHIC SETTING:** Greyeagle soils are on old dissected fan terraces and hillslopes. Slopes are 0 to 40 percent. The soils formed in alluvium from mixed sources. Elevations are 1,800 feet to 4,000 feet. The climate is arid with very hot dry summers, with infrequent thunder showers of short duration, and cool slightly moist winters. The average annual precipitation varies from 4 to 12 inches. Mean January temperature is 45 degrees F, mean July temperature is 85 degrees F; mean annual temperature is 63 degrees F. Frost-free season is 235 to 300 days. Those soils formed on hillslopes up to 40 percent slopes and 12 inches of precipitation occur in the Sonoran Desert.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Arizo soils. Arizo soils lack a duripan and have a sandy-skeletal particle-size control section.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained; rapid runoff, moderately rapid permeability in the soil above the duripan.

**USE AND VEGETATION:** Used mainly for wildlife land and recreation land. The native vegetation is primarily creosotebush, white bursage, Anderson thornbush, spiny hopsage, and buckwheat.

**DISTRIBUTION AND EXTENT:** These soils are mapped in the northern part of the California Desert and are moderately extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Inyo County, California, Saline Valley Area, 1980.

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National Cooperative Soil Survey  
U.S.A.

LOCATION NOPAH NV

Established Series  
Rev. HJB/RLB/WED  
05/97

## NOPAH SERIES

The Nopah series consists of very deep, well-drained soils that formed in alluvium from mixed rock sources. The Nopah soils are on fan skirts and alluvial flats. Slopes are 0 to 8 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Fine-silty, carbonatic, thermic Typic Torriorthents

**TYPICAL PEDON:** Nopah loam, wildlife habitat. (Colors are for dry soil unless otherwise noted.)

A--0 to 2 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; few fine vesicular and tubular pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (2 to 4 inches thick)

C1--2 to 6 inches; light gray (10YR 7/2) loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to strong thin platy; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; violently effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary. (3 to 5 inches thick)

C2--6 to 9 inches; light gray (10YR 7/2) silt loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to strong thin platy; slightly hard, friable, sticky and plastic; common fine roots; common fine and few medium tubular pores; violently effervescent; strongly alkaline (pH 8.8); abrupt wavy boundary. (3 to 5 inches thick)

C3--9 to 18 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to strong coarse and thin platy; slightly hard, friable, sticky and plastic; common fine and few medium roots; few fine tubular pores; violently effervescent; strongly alkaline (pH 9.0); abrupt wavy boundary. (10 to 12 inches thick)

C4--18 to 30 inches; very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; slightly hard, friable, very sticky and plastic; few very fine and fine roots; few fine tubular pores; violently effervescent; very strongly alkaline (pH 9.4); clear smooth boundary. (10 to 14 inches thick)

C5--30 to 46 inches; very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; slightly hard, friable, very sticky and plastic; few very fine and fine roots; few fine tubular pores; violently effervescent; very strongly alkaline (pH 9.2); clear smooth boundary. (15 to 20 inches thick)

C6--46 to 61 inches; very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; slightly hard, friable, very sticky and plastic; few fine roots; few fine tubular pores; violently effervescent; very strongly alkaline (pH 9.2).

**TYPE LOCATION:** Nye County, Nevada; approximately 50 feet south and 200 feet east of the Junction of Gamebird and Homestead roads in Pahrump Valley and about 50 feet south and 150 feet east of the northwest corner of section 6 T. 21 S., R. 54. E., 39 degrees, 9 minutes, 54 seconds north latitude and 116 degrees, 2 minutes, 27 seconds west longitude.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. moist in some parts for short periods during winter and early spring months and for 10 to 20 days cumulative between July through October due to summer convection storms.

Soil temperature - 59 to 65 degrees F.

Other features: A few weakly cemented cylindrical castings are present in the upper 40 inches of some pedons.

Effervescence - Slightly effervescent to violently effervescent.

Calcium carbonate equivalent: 40 to 65 percent.

Control section - Clay content: 20 to 35 percent.

Rock fragments: 15 to 35 percent pebbles which are predominantly 2 to 5 millimeters in diameter.

**A horizon** - Value: 6 or 7 dry.

Chroma: 2 or 3 dry, 3 or 4 moist.

Reaction: Moderately alkaline to very strongly alkaline.

**C horizon** - Hue: Dominantly 10YR with strata of 5Y common in some pedons.

Value: 6 or 7 dry, 3 or 4 moist.

Chroma: 2 through 4 moist or dry.

Structure: Prismatic, platy or massive.

Texture: Stratified loam, silt loam, clay loam, silty clay, loam and clay.

Consistence: Soft through hard, very friable through firm, slightly sticky through very sticky, slightly plastic or plastic.

Reaction: Strongly alkaline or very strongly alkaline.

**COMPETING SERIES:** There are no competing series. Similar soils are the Armesa, Glencarb and Karro series. Armesa and Karro soils have calcic horizons with visible masses of secondary lime ranging from soft to hard consistence and are moistened frequently by summer rainfall. Glencarb soils have organic carbon content that decreases irregularly with depth.

**GEOGRAPHIC SETTING:** Nopah soils are on fan skirts and alluvial flats. These soils formed in alluvium from mixed rock sources of mostly limestone, with components of quartzite and reworked lacustrine sediments. Slopes are 0 to 8 percent. Elevations are 2400 to 3000 feet. The climate is arid with hot dry summers and cool moist winters. The mean annual precipitation is 3 to 5 inches; mean annual temperature is 60 to 65 degrees F., and frost-free season is 200 to 220 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Haymont, and Rumpah soils. Haymont have a coarse-silty, particle-size control section and Rumpah soils have a fine particle-size control section.

**DRAINAGE AND PERMEABILITY:** Well drained, slow runoff; slow permeability.

**USE AND VEGETATION:** Building sites, irrigated crops and wildlife habitat. The present vegetation is mainly cattle saltbush, shadscale and fourwing saltbush. Irrigated crops are alfalfa and small grains.

**DISTRIBUTION AND EXTENT:** Southwestern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1985. The name was taken from the Nopah Mountain range.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Particle-size control section - The zone between 10 to 40 inches (lower portion of C3 horizon and upper portion of C5 horizon.)

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National Cooperative Soil Survey

LOCATION NOWOY NV

Established Series  
Rev. WRK/RLB/WED  
05/97

## NOWOY SERIES

The Nowoy series consists of very deep, well drained soils. that form in mixed alluvium over lacustrine deposits. Noway soils are on relict alluvial flats. Slopes are 0 to 15 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 64 degrees F.

**TAXONOMIC CLASS:** Fine-loamy, carbonatic, thermic Typic Haplocalcids

**TYPICAL PEDON:** Nowoy gravelly loamy fine sand - rangeland. About 45 percent of the soil surface is covered with pebbles. (Color are for dry soil unless otherwise noted.)

**A--**0 to 3 inches; light yellowish brown (10YR 6/4) gravelly loamy fine sand, yellowish brown (10YR 5/4) moist; moderate medium platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine interstitial pores; 15 percent pebbles; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (1 to 5 inches thick)

**Bk1--**3 to 10 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine, fine and medium roots; common very fine and fine interstitial pores; 50 percent pebbles; violently effervescent; few very fine lime filaments; moderately alkaline (pH 8.4); clear wavy boundary. (5 to 9 inches thick)

**Bk2--**10 to 20 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and common fine roots; common very fine and fine interstitial pores; 50 percent pebbles; common fine soft lime masses; violently effervescent; moderately alkaline (pH 8.4) abrupt wavy boundary. (8 to 12 inches thick)

**2Bk3--**20 to 36 inches; white (10YR 8/1) clay loam, very pale brown (10YR 8/3) moist; massive; very hard, friable, sticky and plastic; common very fine, fine and medium roots; few very fine interstitial pores; many thin discontinuous weakly lime-cemented plates; violently effervescent, moderately alkaline (pH 8.4); gradual irregular boundary. (14 to 18 inches thick)

**2Bk4--**36 to 51 inches; light yellowish brown (10YR 6/4) clay loam; yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; common fine roots; few very fine interstitial pores; 20 percent lime concretions; violently effervescent; strongly alkaline (pH 8.8) clear wavy boundary. (13 to 17 inches thick)

**2Bk5--**51 to 61 inches; white (10YR 8/1) clay loam; very pale brown (10YR 8/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine interstitial pores; common discontinuous weakly lime-cemented masses; violently effervescent; strongly alkaline (pH 8.8).

**TYPE LOCATION:** Nye County, Nevada; approximately 11 miles southwest of the junction of U.S. 95 and State Route 160, about 3,700 feet south and 2,600 feet east of the northwest corner of section 20, T. 17 S., R. 51 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. but moist in some part for short periods during winter and early spring months and for 10 to 20 days cumulative between July and October due to convection storms.

Soil temperature - 63 to 67 degrees F.

Depth to calcic horizon - 10 to 25 inches.

Calcium carbonate equivalent: 40 to 60 percent.

Control section - Percent clay: 5 to 10 percent in upper part, 27 to 35 percent in the lower part, average 18 to 27 percent.

Rock fragments: 35 to 50 percent in upper part, 0 to 8 percent in the lower part, average 15 to 30 percent.

**A horizon** - Value: 5 through 7 dry, 4 or 5 moist.

Chroma: 2 through 4.

**Bk horizon** - Value: 5 through 7 dry, 4 through 6 moist.

Chroma: 2 through 4.

Clay content: 5 to 10 percent.

Rock fragments: 35 to 50 percent by average.

**2Bk horizon** - Hue: 10YR, 2.5Y or 5Y.

Value: 6 through 8 dry, 5 through 8 moist.

Chroma: 1 through 4.

Texture: Clay loam or silty clay loam.

Clay content: 27 to 35 percent.

Cementation: Weak lime cementation of peds, plates or masses in some subhorizons.

Other features: Thin stratification in most profiles.

**COMPETING SERIES:** These are the Jal(NM) and Lavello(NV) series. Both these soils lack very gravelly upper profiles with less than 18 percent clay.

**GEOGRAPHIC SETTING:** Nowoy soils are on erosional fan remnants of fan piedmonts and on relict alluvial flats. These soils formed in mixed alluvium over lacustrine sediments. Slopes are 0 to 15 percent. Elevations are 2,000 to 4,000 feet. The climate is arid with cool winters and dry summers. Distribution of precipitation is relatively even with slight peaks in January and August. The mean annual precipitation is between 3 and 5 inches. The mean annual temperature is about 60 to 65 degrees F. The frost-free season is about 210 to 240 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Canutio and Weiser soils. These soils have a loamy-skeletal control section.

**DRAINAGE AND PERMEABILITY:** Well drained. Very slow or slow runoff; moderately slow permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The present vegetation is mainly shockley goldenhead, shadscale and wolfberry with a few creosotebush, and desertlilly.

**DISTRIBUTION AND EXTENT:** Southwestern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1983. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon- The zone from the surface to 3 inches.

Calcic horizon - The zone from 10 to 36 inches.(Bk1, Bk2 and 2Bk1 horizon).



**Particle-size control section** - The zone from 10 to 40 inches. (Bk1, Bk2, 2Bk3 and part of 2Bk4 horizon).

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National Cooperative Soil Survey  
U.S.A.

LOCATION RUMPAH NV

Established Series  
Rev. HJB/RLB/WED  
05/97

## RUMPAH SERIES

The Rumpah series consists of very deep, well drained soils that formed in alluvium from mixed sources. The Rumpah soils are on old lake plains. Slopes are 0 to 2 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 63 degrees F.

**TAXONOMIC CLASS:** Fine, smectitic, thermic Sodic Haplotorrerts

**TYPICAL PEDON:** Rumpah clay, 0 to 2 percent slopes, (Colors are for dry soil unless otherwise noted.)

**A**--0 to 3 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong very fine and fine granular structure; hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; violently effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary. (2 to 3 inches thick)

**Bw**--3 to 10 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong coarse prismatic structure; hard, very firm, very sticky and very plastic; few very fine and fine tubular pores; few fine lime and gypsum flecks; violently effervescent; 3 percent gypsum; moderately alkaline (pH 8.4); abrupt smooth boundary. (5 to 8 inches thick)

**Bss1**--10 to 22 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong coarse prismatic structure; very hard, very firm, very sticky and very plastic; few fine tubular pores; few intersecting slickensides, few fine lime and gypsum flecks; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary. (10 to 15 inches thick)

**Bss2**--22 to 32 inches; pale brown (10YR 6/3) clay, pale brown (10YR 6/3) moist; strong coarse prismatic structure; very hard, very firm, very sticky and very plastic; few fine tubular pores; few intersecting slickensides, few fine lime and gypsum flecks; violently effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary. (10 to 12 inches thick)

**Bss3**--32 to 54 inches; pale brown (10YR 6/3) clay, pale brown (10YR 6/3) moist; strong coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky and very plastic; few fine tubular pores; few fine lime flecks; violently effervescent; strongly alkaline (pH 8.9); clear smooth boundary. (20 to 30 inches thick)

**2Bk**--54 to 74 inches; white (N 8/0) clay, white (10YR 8/2) moist; moderate coarse prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; few fine tubular pores, mostly filled with lime; violently effervescent; strongly alkaline (pH 8.5)

**TYPE LOCATION:** Nye County, Nevada; in Pahrump Valley about 2375 feet south and 1580 feet west of the northeast corner of section 19 T. 20 S., R. 52 E.; 36 degrees, 11 minutes, 54 seconds north latitude and 116 degrees, 2 minutes, 40 seconds west longitude.

**RANGE IN CHARACTERISTICS:**

Soil moisture - Usually dry, moist in the winter and early spring and for 10 to 20 days during the summer following summer convection storms from July through October.

Soil temperature - 62 to 66 degrees F.

Depth to 2Bk horizon - 40 to 65 inches.

Control section - Clay content: Averages 45 to 60 percent.

Calcium carbonates equivalent: 20 to 40 percent, mainly disseminated lime.

Other features: 1-to-5 centimeter wide vertical cracks, 8 to 18 inches apart, extending from the surface to a depth of 36 to 50 inches when the soil is dry.

Gilgi feature: Cracks are closed 5 to 30 days in most years.

SAR: 13 to 30 percent.

**A horizon** - Value: 5 or 6 dry, 4 or 5 moist.

Chroma: 2 or 3.

Consistence: Slightly hard or hard, firm or very firm, sticky or very sticky.

Reaction: Moderately alkaline or strongly alkaline.

**Bw and Bss horizons** - Value: 5 through 7 dry, 4 through 6 moist.

Texture: Clay or silty clay.

Structure: Prismatic or angular blocky.

Clay content: 45 to 60 percent, weighted average.

Consistence: Hard or very hard, very firm or extremely firm, sticky or very sticky.

Reaction: Moderately alkaline or strongly alkaline.

**2Bk horizon** - Hue: 10YR, 2.5Y or N.

Value: 7 or 8 dry or moist.

Chroma: 0 through 2.

Texture: Clay or silty clay.

Structure: Prismatic or subangular blocky.

Clay content: 45 to 60 percent weighted average.

Calcium carbonates equivalent: 40 to 60 percent.

**COMPETING SERIES:** There are no competing series.

**GEOGRAPHIC SETTING:** Rumpah soils are on old lake plains. These soils formed in alluvium from mixed sources mainly limestone, quartzite and reworked lacustrine sediments. Slopes are 0 to 2 percent. Elevations are 2400 to 2700 feet. The climate is arid with hot summers and mild winters. The mean annual precipitation is 3 to 5 inches with relatively even monthly distribution with slight peaks in January and August; mean annual temperature is 60 to 64 degrees F., and the frost-free season is 200 to 220 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Besherm and Nopah. Besherm is carbonatic. Nopah is fine loamy and carbonatic.

**DRAINAGE AND PERMEABILITY:** Well drained, slow runoff; very slow permeability.

**USE AND VEGETATION:** Wildlife habitat. The present vegetation is mainly fourwing saltbush and shadscale.

**DISTRIBUTION AND EXTENT:** Southern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California.

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1985. The name is coined.

**REMARKS:** The classification was changed from Typic Torrerets to Sodic Haplotorrerts in 7/94.

Diagnostic horizons and features recognized in this pedon are:

Vertic subgroup features - Cracks in the zone from the soil surface to a depth of 36 inches and slickensides.

Sodic feature - SAR of 13 or more in the control section.

Particle-size control section - The zone from 10 to 40 inches.

**ADDITIONAL DATA:** Partial characterization data S84-NV-023-001.

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National Cooperative Soil Survey  
U.S.A.

LOCATION SANWELL NV

Established Series  
Rev. JR/RLB/WED  
05/97

## SANWELL SERIES

The Sanwell series consists of very deep, well drained soils that formed in coarse lacustrine sediments. Sanwell soils are on relict alluvial flats and beach plains. Slopes are 0 to 8 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 61 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, calcareous, thermic Haploduridic Torriorthents

**TYPICAL PEDON:** Sanwell gravelly fine sandy loam - rangeland. (Colors are for dry soils unless otherwise noted.) The soil surface is covered with about 30 percent pebbles, and 5 percent cobbles.

**A--**0 to 3 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/6) moist; moderate medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine vesicular and few very fine and fine interstitial pores; 25 percent pebbles; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary. (1 to 5 inches thick)

**Bk--**3 to 9 inches; very pale brown (10YR 7/4) gravelly fine sandy loam, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine and coarse roots; many very fine and common fine interstitial pores; 15 percent pebbles; violently effervescent; few very fine lime filaments; moderately alkaline (pH 8.4); clear wavy boundary. (5 to 10 inches thick)

**Bqk1--**9 to 16 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; loose and soft, loose and very friable, nonsticky and nonplastic; many very fine and few fine roots; common very fine interstitial pores; 15 percent pebbles; few weakly cemented silica-lime pendants on undersides of rock fragments; few fine gypsum crystals; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (5 to 10 inches thick)

**Bqk2--**16 to 31 inches; very pale brown (10YR 8/3) very gravelly sandy loam, very pale brown (10YR 7/4) moist; massive; hard, firm and brittle, nonsticky and nonplastic; many very fine and few fine roots; common very fine interstitial pores; 40 percent pebbles; continuous weak brittle matrix; silica and lime pendants on undersides of most pebbles; violently effervescent; strongly alkaline (pH 8.8); diffuse irregular boundary. (3 to 15 inches thick)

**C--**31 to 61 inches; variegated pink (7.5YR 8/4) reddish yellow (7.5YR 7/6), white (10YR 8/1) and very pale brown (10YR 7/3) very gravelly coarse sandy loam; massive; slightly hard, firm, nonsticky and nonplastic; common very fine roots; few very fine interstitial pores; 45 percent pebbles; violently effervescent; strongly alkaline (pH 8.8).

**TYPE LOCATION:** Nye County, Nevada; about 7 miles southeast of Lathrop Wells, about 1,600 feet west and 500 feet north of the southeast corner of section 11, T. 16 S., R. 50 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry. moist during the winter and early spring and for 10 to 20 days during the month of July through October following summer convection storms.

Soil temperature - 64 to 72 degrees F.

Depth to continuous brittle matrix - 12 to 24 inches.

Control section - Clay content: 5 to 10 percent.

Rock fragments: Average 35 to 60 percent.

**A horizon** - Value: 6 or 7 dry; 5 or 6 moist.

Chroma: 3 through 6.

Effervescence: Strongly effervescent or violently effervescent.

**Bk horizon** - Value: 6 through 8 dry, 5 or 6 moist.

Chroma: 3 through 6.

Structure: Coarse or medium subangular blocky or is massive.

Texture of fine earth: Fine sandy loam, sandy loam, coarse sandy loam.

Other features: Some pedons have lime and silica coats on undersides of pebbles and few to common weakly cemented masses.

**Bqk horizon** - Value: 7 or 8 dry or moist.

Chroma: 1 through 5.

Dry consistence: Hard or very hard dry.

Cementation: Very weak or weak.

**C horizon** - Hue: 7.5YR or 10YR.

Rock fragments: 35 to 60 percent.

Other features: Lacustrine deposits highly variable in color, consistence, stratification and lime content.

**COMPETING SERIES:** This is the Wilst (T NV) series. Wilst soils have a lithic contact between 20 and 40 inches.

**GEOGRAPHIC SETTING:** Sanwell soils are on relict alluvial flats and beach plains. These soils formed in coarse lacustrine sediments, underlain by variable stratified sediments. Slopes are 2 to 8 percent. Elevations are 2,300 to 2,700 feet. The climate is arid; winters are cool and summers are hot and dry. Distribution of precipitation is relatively even with slight peaks in January and August. The average annual precipitation is 3 to 5 inches; average annual temperature is 63 to 70 degrees F., and the frost-free season is about 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the Lewdlac series. Lewdlac soils have a shallow thin duripan and have a substratum composed of fine-textured lacustrine deposits.

**DRAINAGE AND PERMEABILITY:** Well drained; slow or medium runoff; moderate permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The vegetation is principally creosotebush, wolfberry, and shadscale with some desert pepperweed and desertholly.

**DISTRIBUTION AND EXTENT:** Southern Nevada. Sanwell soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1983. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Durorthidic subgroup features - continuous brittle matrix because of silica cementation in the zone from about 16 to 31 inches (Bqk horizon)

Particle-size control section - The zone from 10 to 40 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION SHAMOCK NV

Established Series  
Rev. RLB/WED/LJL  
06/97

## SHAMOCK SERIES

The Shamock series consists of moderately deep over a duripan, well drained soils that are on fan remnants, alluvial plains and relict alluvial flats. Shamock soils formed in mixed alluvium. Slopes are 0 to 4 percent. The mean annual precipitation is about 4 inches and the mean annual air temperature is about 66 degrees F.

**TAXONOMIC CLASS:** Coarse-loamy, mixed, superactive, thermic Typic Haplodurids

**TYPICAL PEDON:** Shamock gravelly fine sandy loam - rangeland. (Colors are for dry soil unless otherwise noted.) Approximately 40 percent of the soil surface is covered with pebbles overlain by a 1/4 to 2 inch thick mantle of windblown sand.

**A1--**0 to 2 inches; pale brown (10YR 6/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; moderate medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine vesicular and common very fine and fine interstitial pores; 25 percent pebbles; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary. (1 to 3 inches thick)

**A2--**2 to 4 inches; pale brown (10YR 6/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and coarse roots; common very fine and few fine interstitial pores; 15 percent pebbles; violently effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (2 to 3 inches thick)

**Bk1 --**4 to 16 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, few fine and coarse roots; common very fine and few fine interstitial pores; 20 percent pebbles; few fine soft lime filament; violently effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (10 to 15 inches thick)

**Bk2--**16 to 21 inches; very pale brown (10YR 7/4) gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine, few fine and few coarse roots; common very fine and few fine interstitial pores; 20 percent pebbles; few fine lime filaments in cracks and pores; strongly effervescent matrix; moderately alkaline (pH 8.4); clear wavy boundary. (5 to 18 inches thick)

**Bqk--**21 to 37 inches; very pale brown (10YR 7/4) gravelly fine sandy loam, yellowish brown (10YR 5/6) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; common very fine and few fine interstitial pores; 20 percent pebbles, 5 percent as cobbles; 65 percent rounded and subangular weakly cemented durinodes; very thin lime-silica coats on undersides of rock fragments; strongly effervescent and violently effervescent on some durinodes and in some pores; strongly alkaline (pH 8.6); gradual irregular boundary. (0 to 16 inches thick)

**Bqkm1--**37 to 58 inches; very pale brown (10YR 7/4) strongly cemented duripan with indurated lamellae, yellowish brown (10YR 5/6) moist; massive; very hard, very firm; few very fine roots in fractures; few very fine interstitial pores; 25 percent pebbles, 5 percent cobbles; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary. (18 to 28 inches thick)

**Bqkm2--**58 to 60 inches; very pale brown (10YR 8/3) strongly cemented and indurated hardpan with thin (less than 1/16 inch) laminar cap, brownish yellow (10YR 6/6) moist; massive; very hard and extremely hard, very firm and extremely firm; 40 percent pebbles, 5 percent cobbles; violently effervescent.

**TYPE LOCATION:** Nye County, Nevada; approximately 2500 feet south and 100 feet east of the northwest corner of section 25, T. 15 S., R. 49 E.

**RANGE IN CHARACTERISTICS:**

Soil moisture - Usually dry, moist in some part for short periods during winter and early spring months for 10 to 20 days cumulative between July and October due to convection storms.

Soil temperature - 64 to 70 degrees F.

Other features - A thin layer (1/4 to 2 inch thick) of loose windblown sand commonly covers the surface.

Depth to duripan - 25 to 40 inches.

Control section - Clay content: 5 to 10 percent.

Rock fragments: 15 to 35 percent, weighted average. Mainly pebbles.

**A horizon** - Value: 6 or 7 dry, 4 or 5 moist.

Chroma: 3 through 5.

Reaction: Moderately alkaline or strongly alkaline.

Effervescence: Noneffervescent to strongly effervescent.

**Bk1 horizon** - Value: 5 through 7 dry, 4 through 6 moist.

Chroma: 2 through 4 dry, 3 or 4 moist.

Structure: Weak or moderate, medium or coarse.

Effervescence: Strongly effervescent or violently effervescent.

Reaction: Moderately alkaline or strongly alkaline.

**Bk2 horizon** - Value: 5 through 7 dry, 4 through 6 moist.

Chroma: 2 through 4 dry, 3 or 4 moist.

Structure: Massive or subangular blocky.

Consistence: Nonsticky to slightly sticky.

Effervescence: Strongly effervescent or violently effervescent.

Reaction: Moderately alkaline or very strongly alkaline.

**Bqk horizon** (when present) - Value: 6 or 7 dry.

Chroma: 4 through 6 dry.

Effervescence: Strongly effervescent or violently effervescent. Durinodes interiors commonly noneffervescent.

Reaction: Strongly alkaline or very strongly alkaline.

Cementation: 30 to 90 percent durinodes by volume .

**2Bqkm horizons** - Value: 7 or 8 dry; 5 or 6 moist.

Chroma: 3 or 4 dry, 4 through 6 moist.

Rock fragments: 20 to 60 percent, mainly pebbles.

Effervescence: Strongly effervescent or violently effervescent.



Reaction: Strongly alkaline or very strongly alkaline.

Cementation: Indurated in some subhorizon.

Rupture resistance: Strongly cemented to indurated.

**COMPETING SERIES:** There are no competing series.

**GEOGRAPHIC SETTING:** Shamock soils are on fan remnants, alluvial plains and relict alluvial flats. These soils formed in alluvium primarily from igneous rocks. Slopes are 2 to 4 percent. Elevations are 2,400 to 3,200 feet. The climate is arid with cool winters and summers are hot and dry. Distribution of precipitation is relatively even with slight peaks in January and August. The mean annual precipitation is 3 to 7 inches; average annual air temperature is 63 to 70 degrees F. The frost-free season is 200 to 280 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Arizo, Corbilt and Canutio series. Corbilt soils have a hardpan below the control section, but within a depth of 60 inches. Arizo and Canutio soils are skeletal and lack a hardpan within a depth of 60 inches.

**DRAINAGE AND PERMEABILITY:** Well drained; very slow to slow runoff; moderately rapid permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The vegetation is principally creosotebush with some chorizanthe, Indian ricegrass and white bursage.

**DISTRIBUTION AND EXTENT:** Southern Nevada. Shamock soils are moderately extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, (Southwest Part) 1981. The name is coined.

**REMARKS:** Reclassified according to Keys of Soil Taxonomy (1994).

Diagnostic horizons and features recognized in this pedon are:

Duripan - The zone from 37 to 60 inches (Bqkm horizon)

Textural control section - The zone from 10 to about 37 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION SHORIM NV

Established Series  
Rev. JR/RLB/WED  
05/97

## SHORIM SERIES

The Shorim series consists of moderately deep to duripan, well drained soils that formed in residuum from igneous rock flows with a component of calcareous eolian material. Shorim soils are on footslopes of hills. Slopes are 2 to 30 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 63 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, thermic Typic Haplodurids

**TYPICAL PEDON:** Shorim very gravelly sandy loam, rangeland. The soil surface is covered with 80 percent rock fragments, mainly pebbles.

**A1**--0 to 3 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; moderate coarse platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots, many fine and medium vesicular and few very fine tubular pores; 50 percent pebbles; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary. (1 to 6 inches thick)

**A2**--3 to 10 inches; pale brown (10YR 6/3) gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine and medium platy structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular, and common very fine tubular pores; 30 percent pebbles; violently effervescent; moderately alkaline (pH 8.4); gradual wavy boundary. (4 to 12 inches thick)

**Bk**--10 to 21 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic, few very fine roots; many very fine and fine interstitial and common very fine tubular pores; 40 percent pebbles; common thick lime coats on rock fragments; violently effervescent; strongly alkaline (pH 9.0); abrupt wavy boundary. (8 to 20 inches thick)

**Bqkm**--21 to 24 inches; pale brown (10YR 6/3) silica-lime cemented hardpan, yellowish brown (10YR 5/4) moist; indurated laminar cap. (1 to 5 inches thick.)

**R**--24 inches; extremely hard basalt bedrock.

**TYPE LOCATION:** Nye County, Nevada; 1,600 feet south and 2,600 feet east of the projected northwest corner of Section 11, T. 14 S., R. 48 E.

### **RANGE IN CHARACTERISTICS:**

Soil moisture - Usually dry. The upper part of the moisture control section is moist for a very short time in late winter.

Soil temperature - 64 to 70 degrees F.

Depth to duripan - 20 to 38 inches.

Depth to bedrock - 21 to 40 inches.

Control section - Rock fragments: 35 to 60 percent, mainly pebbles.

Clay content: 5 to 15 percent.

**A horizon** - Value: 6 or 7 dry, 4 or 5 moist.

Chroma: 2 through 4.

**Bk horizon** - Value: 6 or 7 dry, 4 or 5 moist.

Chroma: 3 or 4.

Texture of fine earth: Fine sandy loam, sandy loam and coarse sandy loam.

Reaction: Strongly alkaline or very strongly alkaline.

Duripan: Continuous laminar cap directly on top of hard bedrock.

**COMPETING SERIES:** This is the Skelon (NV) series. Skelon soils have a thick duripan over unconsolidated alluvium.

**GEOGRAPHIC SETTING:** Shorim soils are on footslopes of hills and formed from igneous rock flows. Slopes are 2 to 30 percent. Elevations are 3,000 to 4,500 feet. The climate is warm and arid. Distribution of precipitation is relatively even with slight peaks in January and August. Mean annual precipitation is 3 to 5 inches. The mean annual temperature is 62 to 67 degrees F., and the frost-free season is about 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Akela, Arizo and Canutio soils. The Akela soils lack a duripan and are shallow to bedrock. Arizo and Canutio soils are very deep soils in drainageways.

**DRAINAGE AND PERMEABILITY:** Well drained, medium runoff; moderately rapid permeability above the duripan.

**USE AND VEGETATION:** Livestock grazing and wildlife habitat. The vegetation is mainly shadscale, desertholly, creosotebush, ephedra, and white bursage.

**DISTRIBUTION AND EXTENT:** Southern Nevada. The soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1985. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Duripan - Indurated zone(Typic) from about 21 to 24 inches (Bqkm horizon).

Particle size control section - The zone from 10 to 21 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION SKELON NV

Established Series

Rev. HJB/RLB

05/97

## SKELON SERIES

The Skelon series consists of moderately deep over an indurated duripan, well drained soils formed in alluvium primarily from limestone, basalt, shale, quartzite and obsidian. Skelon soils are on alluvial fans and fan piedmonts. Slope gradients are 0 to 15 percent. The mean annual precipitation is about 4 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, thermic Typic Haplodurids

**TYPICAL PEDON:** Skelon gravelly sandy loam, rangeland. (Colors are for dry soil unless otherwise noted.) About 45 percent of the soil surface is covered with pebbles, 2 percent with cobbles overlain by a 2 to 1-inch thick mantle of alluvial sand.

**A1--**0 to 2 inches; very pale brown (10YR 7/3) gravelly sandy loam, yellowish brown (10YR 5/4) moist; moderate coarse platy structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine vesicular and few very fine and fine interstitial pores; 15 percent pebbles; violently effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary. (1 to 3 inches thick)

**A2--**2 to 4 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; 10 percent pebbles; few thin lime coats on ped faces and lining pores; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (2 to 3 inches thick)

**Bw--**4 to 13 inches; very pale brown (10YR 7/3) very gravelly fine sandy loam, light yellowish brown (10YR 6/4) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine and few fine interstitial pores; 45 percent pebbles, 5 percent cobbles; few thin lime-silica coats on undersides of rock fragments; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (6 to 10 inches thick)

**Bqk1--**13 to 20 inches; very pale brown (10YR 7/3) very gravelly coarse sandy loam, yellowish brown (10YR 5/4) moist; about 30 percent of horizon has moderate fine platy structure and the remainder is massive; soft, very friable, nonsticky and nonplastic; many very fine and few medium roots; common very fine interstitial pores; 50 percent pebbles, 5 percent cobbles; lime-silica pendants on undersides of most rock fragments; violently effervescent; moderately alkaline (pH 8.4); gradual wavy boundary. (6 to 12 inches thick)

**Bqk2--**20 to 28 inches; very pale brown (10YR 8/3) very gravelly fine sandy loam, very pale brown (10YR 7/4) moist; massive; soft and slightly hard, very friable, nonsticky and nonplastic; many very fine and common medium roots; common very fine interstitial pores; 40 percent pebbles, 5 percent cobbles; few thin lime coatings along fractures and pores; lime-silica coatings on undersides of most rock fragments; violently effervescent; moderately alkaline (pH 8.4); clear irregular boundary. (4 to 12 inches thick)

**Bqkm--**28 to 44 inches; white (10YR 8/1) indurated duripan with thin continuous laminar cap, very pale brown (10YR 7/3) moist; massive; extremely firm; strongly cemented horizontal lenses in lower part; 30 percent pebbles, 5 percent cobbles; violently effervescent. (6 to 36 inches thick)

**2B'qk1--**44 to 52 inches; very pale brown (10YR 8/3) very gravelly sandy loam, very pale brown (10YR 7/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine interstitial pores; 40 percent pebbles, 5 percent cobbles; common weakly silica and lime-cemented masses and few discontinuous strongly silica and lime cemented plates; violently effervescent; strongly alkaline (pH 8.6); clear smooth boundary. (0 to 24 inches thick)

**2B'qk2**--52 to 60 inches; very pale brown (10YR 8/3) extremely gravelly coarse sand, very pale brown (10YR 7/3) moist; single grain; loose, nonsticky and nonplastic; many very fine interstitial pores; 60 percent pebbles, 10 percent cobbles; common weakly and strongly silica and lime-cemented masses and discontinuous plates; violently effervescent; strongly alkaline (pH 8.6).

**TYPE LOCATION:** Nye County, Nevada; about 2.75 miles southeast of Lathrop Wells; 1700 feet south and 1500 feet east of the northwest corner of section 32, T. 15S, R 50E, MDBM.

#### **RANGE IN CHARACTERISTICS**

Soil moisture - Usually dry, moist in some part for short periods during winter and early spring months and for 10 to 20 days cumulative between July to October due to convection storms.

Soil temperature - 59 to 65 degrees F.

Depth to duripan: 20 to 40 inches.

Effervescence - Strongly effervescent or violently effervescent.

Control section - Percent clay: 3 to 10 percent.

Rock fragments: 35 to 60 percent, mainly pebbles.

**A horizon** - Value: 6 or 7 dry, 3 through 6 moist.

Chroma: 2 or 3 dry, 3 or 4 moist.

**Bw, Bqk1 and Bqk2 horizons** - Value: 6 through 8 dry, 3 through 7 moist.

Chroma: 2 through 4 dry, 3 through 6 moist.

Texture of fine earth: Fine sandy loam or coarse sandy loam.

Rock fragments: 35 to 60 percent weighted average, mainly pebbles.

Reaction: Mildly alkaline or strongly alkaline.

**Bqkm horizon** - Weakly to strongly cemented duripan with continuous laminar cap.

**COMPETING SERIES:** This is the Shorim (NV) series. Shorim soils have a thin duripan that lies directly over a lithic contact.

**GEOGRAPHIC SETTING:** Skelon soils are on fan piedmonts and alluvial fans. Slopes are 0 to 15 percent. These soils are formed in mixed alluvium primarily from limestone, basalt, shale and quartzite. Elevations are 2,300 to 5,000 feet. The climate is arid with cool winters and hot summers. Precipitation comes mostly as fall and winter rain. Average annual precipitation is between 3 and 8 inches. Average annual temperature is between 58 and 63 degrees F. The frost-free season is about 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are Corbilt and Shamock soils which contain less than 35 percent rock fragments in the control section. Corbilt soils also lacks a hardpan within the control section.

**DRAINAGE AND PERMEABILITY:** Well drained; slow or medium runoff; moderately rapid permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The vegetation is principally white bursage with some creosotebush, spiny hopsage and prickly pear cactus.

**DISTRIBUTION AND EXTENT:** Southern Nevada. Skelon soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Esmeralda County, Nevada, 1984.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - Zone from the surface to 7 inches.

Duripan feature - Indurated (Typic) zone at about 28 to 44 inches (Bqkm horizon).

Cambic horizon - The zone from 4 to 13 inches.

Particle-size control section - The zone at 10 to 28 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION STROZI NV

Established Series  
Rev. WRK/RLB/WED  
05/97

## STROZI SERIES

The Strozi series consists of moderately deep over a duripan, well drained soils that formed in mixed alluvium. Strozi soils are on fan piedmont remnants. Slopes are 0 to 8 percent. The mean annual precipitation is about 8 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Fine-loamy, mixed, thermic Argidic Argidurids

**TYPICAL PEDON:** Strozi gravelly fine sandy loam - rangeland. About 75 percent of the soil surface is covered with pebbles.

**A1--**0 to 2 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; moderate very coarse platy structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine vesicular pores; 20 percent pebbles; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (2 to 4 inches thick)

**A2--**2 to 5 inches; very pale brown (10YR 7/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine roots; common fine interstitial pores; 10 percent pebbles; moderately alkaline (pH 8.4); clear wavy boundary. (2 to 5 inches thick)

**Bt--**5 to 13 inches; reddish yellow (7.5YR 7/6) clay loam, strong brown (7.5YR 5/6) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine interstitial pores; common distinct clay film bridging sand grains; 5 percent pebbles; moderately alkaline (pH 8.4; ); clear wavy boundary (4 to 8 inches thick)

**Bqk--**13 to 32 inches; very pale brown (10YR 7/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very firm, nonsticky and nonplastic; common fine roots; common very fine and fine interstitial pores; 45 percent pebbles; 30 percent strongly cemented durinodes, violently effervescent; strongly alkaline (pH 8.6); abrupt wavy boundary. (10 to 24 inches thick)

**Bqkm--**32 to 33 inches; white (10YR 8/1) silica-and lime-cemented hardpan with a very thin discontinuous laminar cap, very pale brown (10YR 8/3) moist; massive; hard, very firm; strongly cemented grading to weakly cemented in the lower part; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary. (1 to 6 inches thick)

**Cqk--**33 to 60 inches, light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very firm, nonsticky and nonplastic; few fine roots; common very fine and fine interstitial pores; 45 percent pebbles; weak continuous brittle matrix; violently effervescent; strongly alkaline (pH 8.6)

**TYPE LOCATION:** Nye County, Nevada; in Sacorbatus Flat about 12 miles northwest of the town of Beatty, about 2,000 feet east and 3,000 feet south of the projected northwest corner of Section 11, T. 10 S., R. 45 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry, moist during the winter and early spring and for 10 to 20 days periods following summer convection storms July through October.

Soil temperature - 63 to 67 degrees F.

Depth to lower boundary of Bt horizon - 10 to 16 inches.

Depth to duripan - 20 to 40 inches.

Control Section: - Clay Content: 27 to 35 percent.

Sand content: 30 to 45 percent.

Rock fragments: 5 to 15 percent.

Effervescent: Noneffervescent or slightly effervescent.

**A horizon** - Value: 6 or 7 dry, 4 or 5 moist.

Chroma - 3 or 4

**Bt horizon** - Value: 5 through 7 dry, 4 or 5 moist.

Chroma: 3 through 6.

Rock fragments: 5 to 15 percent.

**Bqk horizon** - Value: 5 through 8 dry or moist.

Chroma: 1 or 2 dry, 3 or 4 moist.

Rock fragments: 35 to 50 percent.

Reaction: Moderately alkaline or strongly alkaline.

**COMPETING SERIES:** This is the Joshua (CA) series. Joshua soils have argillic horizons with sandy loam or sandy clay loam fine earth textures (more than 45 percent sand) and 15 to 35 percent fine pebbles.

**GEOGRAPHIC SETTING:** Strozi soils are on fan piedmont remnants. These soils formed in alluvium primarily from igneous rocks. Slopes are 0 to 8 percent. Elevations are 2,300 to 4,500 feet. The climate is arid with cool winters and summers are hot and dry. Distribution of precipitation is relatively even with slight peaks in January and August. The mean annual precipitation is between 6 and 9 inches; mean annual temperature is between 58 to 62 degrees F., and the frost-free season is about 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the Canutio series. The Canutio has a loamy-skeletal control section.

**DRAINAGE AND PERMEABILITY:** Well drained. Slow runoff; moderately slow permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The present vegetation is mainly shadscale.

**DISTRIBUTION AND EXTENT:** Nye County, Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada (Southwest Part). 1982. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Argillic horizon - The zone from about 5 to 13 inches (Bt horizon)

Duripan - The zone from about 32 to 33 inches (Bqkm horizon)

Haplic feature - duripan is not indurated.

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National Cooperative Soil Survey  
U.S.A.



LOCATION UPSPRING CA+NV

Established Series

Rev. JCW/TDC

05/97

## UPSPRING SERIES

The Upspring series consists of very shallow and shallow, somewhat excessively drained soils formed in material weathered from extrusive basic igneous rocks. Upspring soils are on hills, mountains, and plateaus and have slopes of 15 to 75 percent. The average annual precipitation is 5 inches and the mean annual temperature is 63 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, calcareous, thermic Lithic Torriorthents

**TYPICAL PEDON:** Upspring very stony loam, on a south southwest slope 15 percent on a plateau under extremely sparse cover of atriplex at 1,700 feet elevation. (colors are for dry soil unless otherwise stated. When described the soil was dry throughout.)

About 45 percent pebbles, 10 percent cobbles, and 15 percent stones on the surface.

**A1--**0 to 1 inch; light gray (10YR 7/2) very stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common very fine tubular and interstitial pores; 45 percent pebbles, 10 percent cobbles, and 15 percent stones (mostly on the surface); strongly effervescent, disseminated lime; moderately alkaline (pH 8.0); abrupt smooth boundary. (1 to 2 inches thick)

**A2--**1 to 6 inches; light gray (10YR 7/2) very stony sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common fine interstitial pores; 45 percent pebbles, 10 percent cobbles, and 15 percent stones; violently effervescent, disseminated lime and lime coating rock fragments; moderately alkaline (pH 8.0); clear irregular boundary. (2 to 8 inches thick)

**Bk--**6 to 8 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 4/3) moist; massive; hard, friable, nonsticky and nonplastic; few fine interstitial pores; 50 percent pebbles, 10 percent cobbles; violently effervescent, disseminated lime and lime coating on rock fragments; moderately alkaline (pH 8.0); abrupt wavy boundary. (1 to 4 inches thick)

**R--**8 inches fractured hard basalt.

**TYPE LOCATION:** Inyo County, California, Saline Valley; about 3 miles north of the dune road to lower Warm Springs; at the lower edge of the Saline Range lava flow; NW1/4 NW1/4 section 14, T.13S., R.38E., MDB&M.

**RANGE IN CHARACTERISTICS:** Depth to a lithic contact of hard basalt ranges from 4 to 14 inches thick. The mean annual soil temperature is 68 degrees F. The soil contains small amounts of amorphous material from pyroclastic volcanic rocks. Clay averages 10 to 18 percent from the surface to lithic contact. These soils are dry from June through November for about 180 days. The soil temperature is warmer than 41 degrees F. from about March to January for about 300 days. The soils is intermittently moist from January through May but never moist for 90 consecutive days.

The A horizon has dry color of 10YR 7/2 and 7/3 and moist color of 10YR 4/2, 4/3, 5/2 or 5/3. It is very gravelly to very stony sandy loam and averages 35 to 70 percent rock fragments.

The Bk horizon has 35 to 60 percent rock fragments.

**COMPETING SERIES:** These are the Akela(NM), Beach(T TX), Chatticup(T NV), Haleburu(NV), Hindu(AZ), Hulda(T AZ), Razorback(T AZ) and Tecopa(CA) series. Akela soils are moist during the summer from thunder storms. Beach have hue of 2.5YR and 5YR, and contain mainly sandstone fragments. Chatticup soils have 60 to 80 percent rock fragments, mainly pebbles. Haleburu and Razorback soils are moist 10 to 20 days cumulative between July and October. Hindu and Hulda soils are moist more than 20 days cumulative between July and September. Tecopa soils lack an

influence of amorphous materials from pyroclastic sources and have formed in materials weathered from quartzite, schist, and gneiss.

**GEOGRAPHIC SETTING:** Upspring soils are on plateaus, hills, and mountains. Slopes are 15 to 75 percent. The soils formed in material from extrusive basic igneous rocks with some pyroclastic materials. Elevations are 1,600 to 4,200 feet. The climate is arid, with hot, dry summers with infrequent thunder showers of short duration, and mildly slightly moist winters. The average annual precipitation is 4 to 6 inches. The mean annual temperature is 63 degrees F.; the average mean January temperature is 45 degrees F.; and the mean July temperature is 85 degrees F. The frost free season is 235 to 300 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Blacktop soils. Blacktop soils have mesic soil temperature.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained; rapid runoff; moderately rapid permeability.

**USE AND VEGETATION:** Used mainly for watershed, wildlife habitat, and recreation land. The native vegetation is primarily shadscale and winterfat.

**DISTRIBUTION AND EXTENT:** These soils are mapped in the lava flows of northern California Desert and are moderately extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Inyo County, California, Saline Valley Area, 1980.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from 0 to 6 inches (A1 and A2 horizons)

Lithic contact - the boundary with hard rock at about 8 inches.

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National Cooperative Soil Survey  
U.S.A.

LOCATION WODA NV

Established Series

Rev. WRK/RLB

05/97

## WODA SERIES

The Woda series consists of shallow over a petrocalcic horizon, well drained soils that formed in alluvium from limestone and reworked lacustrine deposits. The Woda soils are on isolated fan remnants and fan piedmonts. Slopes are 2 to 15 percent. The mean annual precipitation is about 6 inches and the mean annual temperature is about 64 degrees F.

**TAXONOMIC CLASS:** Loamy, carbonatic, thermic, shallow Typic Petrocalcids

**TYPICAL PEDON:** Woda gravelly sandy loam, rangeland. (Colors are for dry soil unless otherwise noted.) The soil surface is partially covered with 60 percent pebbles consisting mainly of pan fragments.

**A1--**0 to 1 inches; very pale brown (10YR 8/3) gravelly sandy loam, light yellowish brown (10YR 6/4) moist; moderate medium platy structure; soft, friable, nonsticky and nonplastic; few very fine roots, common very fine and fine vesicular pores; 16 percent pebbles; strongly effervescent; moderately alkaline (pH 8.4) clear wavy boundary (1 to 2 inches thick)

**A2--**1 to 10 inches; very pale brown (10YR 8/3) sandy loam, light yellowish brown (10YR 6/4) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic, common very fine, fine and medium roots, common very fine and fine interstitial pores, 5 percent pebbles, strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (0 to 9 inches thick)

**Bk--**10 to 18 inches; white (10YR 8/1) gravelly clay loam, light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/4); massive; soft, very friable, slightly sticky and plastic; common very fine, fine and medium roots; 20 percent pebbles; common soft lime filaments throughout horizon; violently effervescent; strongly alkaline (pH 9.0) abrupt, smooth boundary. (5 to 10 inches thick)

**Bkm--**18 inches, white (10YR 8/1) indurated petrocalcic horizon.

**TYPE LOCATION:** Nye County, Nevada; approximately 7 miles southwest of Lathrop Wells, and about 1,600 feet north and 500 feet west of the southeast corner of section 25, T. 16 S., R. 50 E.

### RANGE IN CHARACTERISTICS:

Soil moisture: Moist for short periods during winter and spring months and for 10 to 20 days from July thru October following summer convection storms.

Soil temperature - 62 to 67 degrees F.

Depth to petrocalcic horizon - 6 to 20 inches.

Calcium carbonates equivalent - 40 to 60 percent

Effervescence: Strongly effervescent or violently effervescent.

Reaction: Moderately alkaline or strongly alkaline.

Other features - In some areas a thin mantle of wind blown sand cover the soil surface.

Control section Percent clay: 20 to 30 percent.

Rock fragments: 15 to 30 percent, mainly pebbles.

**A horizon-** Value: 7 or 8 dry.

Chroma: 2 or 3 dry.

**Bk horizon** - Value: 5 through 7 moist.

Chroma: 3 or 4 moist.

Clay content: 20 to 30 percent.

Texture: Loam or clay loam

Rock fragments: 15 to 30 percent.

**Bkm horizon** - 4 to 15 feet thick.

**COMPETING SERIES:** These are the Bard (NV), Las Vegas (NV), Mormon Mesa (NV), and Wodavar (NV) series. Bard and Mormon Mesa soils lack horizons with more than 18 percent clay. Las Vegas soils contain horizons with more than 18 percent clay, but average less than 18 percent clay in the control section. Wodavar soils contain 5 to 18 percent clay in the particle size control section and contains gypsum above the petrocalcic horizon.

**GEOGRAPHIC SETTING:** Woda soils are on isolated mesa-like fan remnants and fan piedmonts with tops about 75 to 150 feet above general ground level. These soils formed in alluvium primarily from limestone. Slopes are 2 to 15 percent. Elevations are 2,400 to 2,800 feet. The climate is arid with cool winters and hot summers. The mean annual precipitation is between 3 and 6 inches; mean annual temperature between 60 to 65 degrees F., and the frost-free season is about 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Gosa and Canutio soils which lack a hardpan in the control section.

**DRAINAGE AND PERMEABILITY:** Well drained. Slow or medium runoff; moderately slow permeability.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The present vegetation is mainly desertholly.

**DISTRIBUTION AND EXTENT:** Southern Nevada. These soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada. 1981.

**REMARKS:** Diagnostic horizon and features recognized in this pedon are:

Ochric epipedon - The zone from the surface to 10 inches (A1 and A2 horizon)

Particle size control section - The zone from 10 to 18 inches (Bk horizon)

Petrocalcic horizon -The zone at 18 inches (Bkm horizon)

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National Cooperative Soil Survey  
U.S.A.

LOCATION YERMO CA+NV

Established Series  
Rev. GAW/JWF/GWH  
05/97

## YERMO SERIES

The Yermo series consists of deep, well drained soils that formed in mixed, moderately coarse textured, calcareous, gravelly or cobbly alluvium. Yermo soils are on long, smooth, alluvial fans or uplands and have slopes of 5 to 50 percent. The mean annual precipitation is about 5 inches and the mean annual temperature is about 62 degrees F.

**TAXONOMIC CLASS:** Loamy-skeletal, mixed, calcareous, thermic Typic Torriorthents

**TYPICAL PEDON:** Yermo cobbly sandy loam, on a 3 percent north facing slope under creosotebush, bursage, hopsage, Mormon tea, yucca, and a few Joshua trees at 3,600 feet elevation. (Colors are for dry soil unless otherwise stated. When described the soil was dry throughout.)

A--0 to 10 inches; pale brown (10YR 6/3) cobbly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; few fine interstitial pores; about 15 percent pebbles and 10 percent cobbles; strongly effervescent with disseminated lime; moderately alkaline (pH 8.0); abrupt smooth boundary. (8 to 12 inches thick)

C1--10 to 25 inches; very pale brown (10YR 7/3) gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common coarse and medium roots; common fine tubular pores; about 15 percent pebbles and 5 percent cobbles; violently effervescent with disseminated lime; moderately alkaline (pH 8.0); gradual smooth boundary. (10 to 15 inches thick)

C2--25 to 60 inches; light gray (10YR 7/2) very gravelly sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few very fine interstitial and tubular pores; about 55 percent pebbles and 15 percent cobbles; 1/8 to 1/4 inch lime coatings on bottom of coarse fragments; violently effervescent with disseminated lime; moderately alkaline (pH 8.0).

**TYPE LOCATION:** San Bernardino County, California; in Lucerne Valley about 0.6 miles southeast of Meridian Road on the turn to Pfizer Cement plant; in NE1/4 NW1/4 NE1/4 section 6, T.3 N., R.1 E.

**RANGE IN CHARACTERISTICS:** The mean annual soil temperature is 59 to 63 degrees F. and the soil temperature usually is not below 47 degrees F. at any time. The soil between the depths of about 8 and 24 inches is dry all the time from mid-spring to early winter and is not continuously moist for as long as 60 days.

The A horizon is pale brown, light yellowish brown, brown or yellowish brown (10YR 6/3, 6/4, 5/3, 5/4). It is cobbly sandy loam or gravelly sandy loam and has 15 to 25 percent gravel and 5 to 15 percent cobbles. Structure is weak to moderate, very fine and fine subangular blocky. This horizon is strongly calcareous to very strongly calcareous with disseminated lime, and is moderately to strongly alkaline.

The C horizon is light gray or very pale brown (10YR 7/2, 7/3). It is gravelly sandy loam and has 15 to 25 percent gravel and up to 5 percent cobbles in the upper part. It is moderately to strongly alkaline and is strongly effervescent. The lower part of the horizon is similar to the upper part but has 40 to 60 percent gravel and up to 15 percent cobbles.

**COMPETING SERIES:** These are the Canutio, Emot and Ogral series. All of the competing soils are intermittently moist in the moisture control section in the summer. Emot soils have more than 50 percent silt in the fine earth fraction. Ogral soils have hue of 7.5YR or 5YR throughout.

**GEOGRAPHIC SETTING:** Yermo soils are on broad, alluvial fans and on older, faulted or uplifted uplands or valley floors at elevations of about 3,600 to 4,100 feet. Slopes range from 5 to 50 percent. The soils formed in mixed, moderately coarse textured gravelly or cobbly alluvium. The climate is arid, with hot, dry summers and cool, somewhat

moist winters. The mean annual precipitation is 4 or 5 inches, most of which occurs as rain in the winter. Some moisture falls occasionally as snow. The mean annual temperature is about 62 degrees F.; the mean January temperature is 46 degree F.; and the mean July temperature is 84 degrees F. The frost free season is 210 to 255 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Arizo and Soboba soils. Arizo soils are loamy sand or coarser. Soboba soils have a xeric moisture regime and are loamy sand or coarser.

**DRAINAGE AND PERMEABILITY:** Well drained; medium to rapid runoff; moderately rapid permeability.

**USE AND VEGETATION:** Used for wildlife habitat and homesites. Vegetation is creosotebush, white bursage, scattered yucca and Joshua tree and annual grasses and forbs.

**DISTRIBUTION AND EXTENT:** Uplands and alluvial fans of Mojave Desert. The soils are moderately extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** San Bernardino County, California, Mojave River Area, 1978.

**REMARKS:**

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 10 inches.

Particle-size control section - 10 to 40 inches.

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National Cooperative Soil Survey  
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LOCATION ZALDA NV

Established Series  
Rev. JR/RLB/WED  
05/97

## ZALDA SERIES

The Zalda series consists of well drained soils that are shallow to a thin duripan over bedrock. Zalda soils are on low hill summits and crests. Zalda soils formed in residuum from igneous rocks, with a component of eolian material. Slopes are 2 to 30 percent. The mean annual precipitation is about 5 inches and the mean annual temperature is about 63 degrees F.

**TAXONOMIC CLASS:** Loamy, mixed, thermic, shallow Typic Haplodurids

**TYPICAL PEDON:** Zalda gravelly fine sand, rangeland. (Colors are for dry soil unless otherwise noted.) The soil surface is covered with 40 percent pebbles and 2 percent cobbles.

**A1--**0 to 3 inches; pale brown (10YR 6/3) gravelly fine sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; common very fine and fine interstitial and tubular pores; few very fine roots; 15 percent pebbles; moderately alkaline (pH 8.2); gradual wavy boundary. (2 to 7 inches thick)

**A2--**3 to 7 inches; very pale brown (10YR 7/3) loam, brown (10YR 4/3) moist; moderate medium and coarse platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine vesicular, common very fine and fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); abrupt wavy boundary. (3 to 8 inches thick)

**Bqkm--**7 to 8 inches; extremely hard lime-silica hardpan with an indurated laminar cap 3 to 5 millimeters thick; abrupt wavy boundary. (1 to 8 inches thick)

**R--**8 inches; basalt.

**TYPE LOCATION:** Nye County, Nevada; 750 feet west, 200 feet north of the projected southeast corner of section 31, T. 13 S., R. 49 E.

### RANGE IN CHARACTERISTICS:

Soil moisture - Usually dry, moist for short periods of time in the late winter and spring for 10 to 20 days from July through mid October following summer convection storms.

Soil temperature - 62 to 67 degrees F.

Depth to duripan - 7 to 14 inches.

Depth to bedrock - 8 to 15 inches.

Other features - Some pedons contain a thin Bw horizon that slightly effervescent.

Control section - Clay content: 6 to 18 percent.

Rock fragments: 5 to 25 percent.

**A horizons** - Value: 6 or 7 dry, 4 through 6 moist.

Chroma: 3 or 4.

Texture of fine earth: Fine sandy loam or loam.

**Bqkm horizon** - Continuous laminar cap on unfractured bedrock.

**COMPETING SERIES:** These are the Alko(NV), Muroc(CA), Nebona(CA), and Stewart(AZ) series. Alko, Nebona, and Stewart soils lack bedrock under the hardpan. Muroc soils have a duripan over soft weathered granitic rock, and have sandy loam or coarse sandy loam textures, and contain fine pebbles from decomposed granite.

**GEOGRAPHIC SETTING:** Zalda soils are on low hill summits and crests. The soils formed in residuum from rhyolitic ash fall tuffs and igneous flow rocks with a component of eolian materials. Slopes are 2 to 30 percent. Elevations are 2,500 to 4,200 feet. The climate is arid with relatively even distribution of moisture with slight peaks in January and August. The average annual precipitation is between 3 and 10 inches; the average annual temperature is about 60 to 65 degrees F., and the frost-free season 210 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Akela, Longjim and Shorim soils. Akela soils lack duripans over the bedrock and are found near rock outcrops. Longjim and Shorim soils have loamy-skeletal control sections are generally found on steeper positions of the landform.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate to rapid runoff; moderately rapid permeability above the duripan.

**USE AND VEGETATION:** Rangeland and wildlife habitat. The vegetation consists of shadscale, desertholly, white bursage, creosotebush, and wolfberry.

**DISTRIBUTION AND EXTENT:** Southern Nevada. The soils are not extensive. MLRA 30.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES PROPOSED:** Nye County, Nevada, Southwest Part, 1985. The name is coined.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

Duripan - The indurated zone(Typic) from about 7 to 8 inches (Bqkm horizon).

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National Cooperative Soil Survey  
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## **APPENDIX D**

**SITE IDENTIFICATION (D-1) AND ANALYTICAL DATA (D-2) FOR SITES  
SAMPLED MAY 12-15, 1997, IN AMARGOSA VALLEY, NEVADA  
(DTN: MO9812SOILAMVA.000)**

Appendix D-1. Soil sample identification log of soil samples collected May 12-15, 1997, in Amargosa Valley, Nevada: Utah State University laboratory ID number (USU#), Yucca Mountain Project Sample ID (YMP Sample ID), soil pit ID, soil association, sample date (Date), soil horizon (Horizon), depth (cm), universal transverse mercator coordinate - north (UTM N), universal transverse mercator coordinate - east (UTM E), soil condition, vegetation type (Vegetation), slope (%), and erosion condition.

USU#	YMP Sample ID	Soil Pit ID	Soil Association	Date	Horizon	Depth (cm)	UTM N	UTM E	Soil Condition	Vegetation	Slope(%)	Erosion Condition
2744	970515001	AV-2054-11	Yermo, Hot-Arizo	05/15/97	Ap	0-24	4043379	542468	formerly cultivated	grain stubble	0	none
2745	970515002	AV-2054-11	Yermo, Hot-Arizo	05/15/97	C1	24-45	4043379	542468	formerly cultivated	grain stubble	0	none
2746	970515003	AV-2054-11	Yermo, Hot-Arizo	05/15/97	C2	45+	4043379	542468	formerly cultivated	grain stubble	0	none
2747	970514001	AV-2070-06	Shamock gravelly fine sandy loam	05/14/97	A	0-7	4051527	551242	undisturbed	LATR	1	desert pavement
2748	970514002	AV-2070-06	Shamock gravelly fine sandy loam	05/14/97	C1	7-42	4051527	551242	undisturbed	LATR	1	desert pavement
2749	970514003	AV-2070-06	Shamock gravelly fine sandy loam	05/14/97	C2	42+	4051527	551242	undisturbed	LATR	1	desert pavement
2750	970514004	AV-2070-07	Shamock gravelly fine sandy loam	05/14/97	A	0-7	4050925	550832	undisturbed	LATR	1	desert pavement
2751	970514005	AV-2070-07	Shamock gravelly fine sandy loam	05/14/97	C1	7-22	4050925	550832	undisturbed	LATR	1	desert pavement
2752	970514006	AV-2070-07	Shamock gravelly fine sandy loam	05/14/97	C2	22-45	4050925	550832	undisturbed	LATR	1	desert pavement
2753	970514007	AV-2070-07	Shamock gravelly fine sandy loam	05/14/97	C3	45+	4050925	550832	undisturbed	LATR	1	desert pavement
2754	970514008	AV-2070-08	Shamock gravelly fine sandy loam	05/14/97	A	0-8	4050238	550373	undisturbed	LATR	1	desert pavement
2755	970514009	AV-2070-08	Shamock gravelly fine sandy loam	05/14/97	C1	8-30	4050238	550373	undisturbed	LATR	1	desert pavement
2756	970514010	AV-2070-08	Shamock gravelly fine sandy loam	05/14/97	C2	30-45	4050238	550373	undisturbed	LATR	1	desert pavement
2757	970514011	AV-2070-08	Shamock gravelly fine sandy loam	05/14/97	C3	45+	4050238	550373	undisturbed	LATR	1	desert pavement
2758	970514012	AV-2070-09	Shamock gravelly fine sandy loam	05/14/97	A	0-8	4049522	549889	undisturbed	LATR	1	desert pavement
2759	970514013	AV-2070-09	Shamock gravelly fine sandy loam	05/14/97	C1	8-35	4049522	549889	undisturbed	LATR	1	desert pavement
2760	970514014	AV-2070-09	Shamock gravelly fine sandy loam	05/14/97	C2	35-50	4049522	549889	undisturbed	LATR	1	desert pavement
2761	970514015	AV-2070-09	Shamock gravelly fine sandy loam	05/14/97	C3	50+	4049522	549889	undisturbed	LATR	1	desert pavement
2762	970514016	AV-2070-10	Shamock gravelly fine sandy loam	05/14/97	A	0-7	4048872	549455	undisturbed	LATR	1	desert pavement
2763	970514017	AV-2070-10	Shamock gravelly fine sandy loam	05/14/97	C1	7-35	4048872	549455	undisturbed	LATR	1	desert pavement
2764	970514018	AV-2070-10	Shamock gravelly fine sandy loam	05/14/97	C2	35-50	4048872	549455	undisturbed	LATR	1	desert pavement
2765	970514019	AV-2070-10	Shamock gravelly fine sandy loam	05/14/97	C3	50+	4048872	549455	undisturbed	LATR	1	desert pavement
2766	970514020	AV-2070-11	Shamock gravelly fine sandy loam	05/14/97	A	0-7	4048207	549013	undisturbed	LATR	1	desert pavement
2767	970514021	AV-2070-11	Shamock gravelly fine sandy loam	05/14/97	C1	7-35	4048207	549013	undisturbed	LATR	1	desert pavement
2768	970514022	AV-2070-11	Shamock gravelly fine sandy loam	05/14/97	C2	35+	4048207	549013	undisturbed	LATR	1	desert pavement
2769	970514023	AV-2070-12	Shamock gravelly fine sandy loam	05/14/97	Ap	0-40	4047780	547801	formerly cultivated	none	1	some wind erosion
2770	970514024	AV-2070-12	Shamock gravelly fine sandy loam	05/14/97	C1	40-50	4047780	547801	formerly cultivated	none	1	some wind erosion
2771	970513200	AV-2030-01	Corbitt gravelly fine sandy loam, Warm	05/13/97	A	0-3	4057760	545785	undisturbed	latr/amdu	2	desert pavement
2772	970513201	AV-2030-01	Corbitt gravelly fine sandy loam, Warm	05/13/97	C1	3-30	4057760	545785	undisturbed	latr/amdu	2	desert pavement
2773	970513202	AV-2030-01	Corbitt gravelly fine sandy loam, Warm	05/13/97	C2	30+	4057760	545785	undisturbed	latr/amdu	2	desert pavement
2774	970513204	AV-2030-02	Corbitt gravelly fine sandy loam, Warm	05/13/97	C2	52+	4057864	545022	undisturbed	latr/amdu	2	desert pavement
2775	970513205	AV-2030-02	Corbitt gravelly fine sandy loam, Warm	05/13/97	A	1-7	4057964	545022	undisturbed	latr/amdu	2	desert pavement
2776	970513206	AV-2030-02	Corbitt gravelly fine sandy loam, Warm	05/13/97	C1	7-52	4057864	545022	undisturbed	latr/amdu	2	desert pavement
2777	970513207	AV-2054-03	Yermo, Hot-Arizo	05/13/97	A	0-5	4058688	542562	undisturbed	latr	2	desert pavement
2778	970513208	AV-2054-03	Yermo, Hot-Arizo	05/13/97	C1	5-53	4058688	542562	undisturbed	latr	2	desert pavement
2779	970513209	AV-2054-03	Yermo, Hot-Arizo	05/13/97	C2	53+	4058688	542562	undisturbed	latr	2	desert pavement
2780	970514025	AV-2070-12	Shamock gravelly fine sandy loam	05/14/97	C2	50+	4047780	547801	formerly cultivated	none	1	some wind erosion
2781	970514200	AV-2054-04	Yermo, Hot-Arizo	05/14/97	A	0-3	4059022	540844	undisturbed	latr/amdu	2	desert pavement

USU#	YMP Sample ID	Soil Pit ID	Soil Association	Date	Horizon	Depth (cm)	UTM N	UTM E	Soil Condition	Vegetation	Slope(%)	Erosion Condition
2782	970514201	AV-2054-04	Yermo, Hot-Arizo	05/14/97	C1	3-32	4059022	540844	undisturbed	latr/amdu	2	desert pavement
2783	970514202	AV-2054-04	Yermo, Hot-Arizo	05/14/97	C2	32+	4059022	540844	undisturbed	latr/amdu	2	desert pavement
2784	970514203	AV-2054-05	Yermo, Hot-Arizo	05/14/97	A	0-3	4057893	540896	undisturbed	latr/amdu	1	desert pavement
2785	970514204	AV-2054-05	Yermo, Hot-Arizo	05/14/97	C1	3-45	4057893	540896	undisturbed	latr/amdu	1	desert pavement
2786	970514205	AV-2054-05	Yermo, Hot-Arizo	05/14/97	C2	45+	4057893	540896	undisturbed	latr/amdu	1	desert pavement
2787	970514206	AV-2054-06	Yermo, Hot-Arizo	05/14/97	A	0-4	4057371	540875	undisturbed	latr/amdu	0	desert pavement
2788	970514207	AV-2054-06	Yermo, Hot-Arizo	05/14/97	C1	4-54	4057371	540875	undisturbed	latr/amdu	0	desert pavement
2789	970514208	AV-2054-06	Yermo, Hot-Arizo	05/14/97	C2	54+	4057371	540875	undisturbed	latr/amdu	0	desert pavement
2790	970514209	AV-2054-07	Yermo, Hot-Arizo	05/14/97	A	0-5	4049621	541006	undisturbed	latr	0	desert pavement
2791	970514210	AV-2054-07	Yermo, Hot-Arizo	05/14/97	C1	5-37	4049621	541006	undisturbed	latr	0	desert pavement
2792	970514211	AV-2054-07	Yermo, Hot-Arizo	05/14/97	C2	37+	4049621	541006	undisturbed	latr	0	desert pavement
2793	970514212	AV-2054-08	Yermo, Hot-Arizo	05/14/97	A	0-4	4048805	540997	undisturbed	latr	0	playa lake bottom
2794	970514213	AV-2054-08	Yermo, Hot-Arizo	05/14/97	C1	4-16	4048805	540997	undisturbed	latr	0	playa lake bottom
2795	970514214	AV-2054-08	Yermo, Hot-Arizo	05/14/97	C2	16+	4048805	540997	undisturbed	latr	0	playa lake bottom
2796	970514215	AV-2054-09	Yermo, Hot-Arizo	05/14/97	A	0-4	4047998	540998	undisturbed	latr	0	slight pavement
2797	970514216	AV-2054-09	Yermo, Hot-Arizo	05/14/97	C1	4-42	4047998	540998	undisturbed	latr	0	slight pavement
2798	970514217	AV-2054-09	Yermo, Hot-Arizo	05/14/97	C2	42+	4047998	540998	undisturbed	latr	0	slight pavement
2799	970514218	AV-2054-10	Yermo, Hot-Arizo	05/14/97	A	0-4	4047222	541001	undisturbed	latr/atpo	0	desert pavement
2800	970514219	AV-2054-10	Yermo, Hot-Arizo	05/14/97	C1	4-34	4047222	541001	undisturbed	latr/atpo	0	desert pavement
2801	970514220	AV-2054-10	Yermo, Hot-Arizo	05/14/97	C2	34+	4047222	541001	undisturbed	latr/atpo	0	desert pavement
2802	970515200	AV-2030-03	Corbitt gravelly fine sandy loam, Warm	05/15/97	A	0-5	4057676	544119	undisturbed	latr/amdu	0	minimal
2803	970515201	AV-2030-03	Corbitt gravelly fine sandy loam, Warm	05/15/97	C1	5-90	4057676	544119	undisturbed	latr/amdu	0	minimal
2804	970515203	AV-2054-15	Yermo, Hot-Arizo	05/15/97	A	0-4	4052949	544201	undisturbed	latr/amdu	0	desert pavement
2805	970515204	AV-2054-15	Yermo, Hot-Arizo	05/15/97	C1	4-33	4052949	544201	undisturbed	latr/amdu	0	desert pavement
2806	970515205	AV-2054-15	Yermo, Hot-Arizo	05/15/97	C2	33+	4052949	544201	undisturbed	latr/amdu	0	desert pavement
2807	970515206	AV-2070-13	Shamock gravelly fine sandy loam	05/15/97	Ap	0-34	4043741	548745	currently cultivated	alfalfa	0	minimal, ag field
2808	970515207	AV-2070-13	Shamock gravelly fine sandy loam	05/15/97	C1	34+	4043741	548745	currently cultivated	alfalfa	0	minimal, ag field
2809	970515208	AV-2070-14	Shamock gravelly fine sandy loam	05/15/97	Ap	0-15	4043752	549025	currently cultivated	alfalfa	0	minimal, ag field
2810	970515209	AV-2070-14	Shamock gravelly fine sandy loam	05/15/97	C1	15-43	4043752	549025	currently cultivated	alfalfa	0	minimal, ag field
2811	970515210	AV-2070-14	Shamock gravelly fine sandy loam	05/15/97	C2	43-54	4043752	549025	currently cultivated	alfalfa	0	minimal, ag field
2812	970513001	AV-2070-01	Shamock gravelly fine sandy loam	05/13/97	A	0-5	4055911.87	553329	undisturbed	LATR/AMDU	1	slight pavement, fairly stable
2813	970513002	AV-2070-01	Shamock gravelly fine sandy loam	05/13/97	C1	5-30	4055911.87	553329	undisturbed	LATR/AMDU	1	slight pavement, fairly stable
2814	970513003	AV-2070-01	Shamock gravelly fine sandy loam	05/13/97	C2	30-55	4055911.87	553329	undisturbed	LATR/AMDU	1	slight pavement, fairly stable
2815	970513004	AV-2070-01	Shamock gravelly fine sandy loam	05/13/97	C3	55-70	4055911.87	553329	undisturbed	LATR/AMDU	1	slight pavement, fairly stable
2816	970513005	AV-2070-01	Shamock gravelly fine sandy loam	05/13/97	C4	70+	4055911.87	553329	undisturbed	LATR/AMDU	1	slight pavement, fairly stable
2817	970513006	AV-2070-02	Shamock gravelly fine sandy loam	05/13/97	A	0-4	4054284	553001	undisturbed	LATR	1	desert pavement
2818	970513007	AV-2070-02	Shamock gravelly fine sandy loam	05/13/97	C1	4-30	4054284	553001	undisturbed	LATR	1	desert pavement
2819	970513008	AV-2070-02	Shamock gravelly fine sandy loam	05/13/97	C2	30-45	4054284	553001	undisturbed	LATR	1	desert pavement
2820	970513009	AV-2070-02	Shamock gravelly fine sandy loam	05/13/97	C3	45+	4054284	553001	undisturbed	LATR	1	desert pavement
2821	970513010	AV-2070-03	Shamock gravelly fine sandy loam	05/13/97	A	0-5	4053564.6	552566	undisturbed	LATR	1	desert pavement
2822	970513011	AV-2070-03	Shamock gravelly fine sandy loam	05/13/97	C1	5-28	4053564.6	552566	undisturbed	LATR	1	desert pavement
2823	970513012	AV-2070-03	Shamock gravelly fine sandy loam	05/13/97	C2	28-40	4053564.6	552566	undisturbed	LATR	1	desert pavement
2824	970513013	AV-2070-03	Shamock gravelly fine sandy loam	05/13/97	C3	40+	4053564.6	552566	undisturbed	LATR	1	desert pavement
2825	970513014	AV-2070-04	Shamock gravelly fine sandy loam	05/13/97	A	0-5	4052898	552134	undisturbed	LATR	1	desert pavement
2826	970513015	AV-2070-04	Shamock gravelly fine sandy loam	05/13/97	C1	5-30	4052898	552134	undisturbed	LATR	1	desert pavement
2827	970513016	AV-2070-04	Shamock gravelly fine sandy loam	05/13/97	C2	30-45	4052898	552134	undisturbed	LATR	1	desert pavement

Appendix D-1 (Continued)

USU#	YMP Sample ID	Soil Pit ID	Soil Association	Date	Horizon	Depth (cm)	UTM N	UTM E	Soil Condition	Vegetation	Slope(%)	Erosion Condition
2828	970513017	AV-2070-04	Shamock gravelly fine sandy loam	05/13/97	C3	45+	4052898	552134	undisturbed	LATR	1	desert pavement
2829	970513018	AV-2070-05	Shamock gravelly fine sandy loam	05/13/97	A	0-5	4052215	551692	undisturbed	LATR	1	desert pavement
2830	970513019	AV-2070-05	Shamock gravelly fine sandy loam	05/13/97	C1	5+	4052215	551692	undisturbed	LATR	1	desert pavement
2832	970519203	AV-2451-02	Sanwell-Sanwell, Warm-Yermo	05/19/97	Ap	0-25	4038133	550890	currently cultivated	barley	0	minimal, ag field
2833	970519204	AV-2451-02	Sanwell-Sanwell, Warm-Yermo	05/19/97	C1	25+	4038133	550890	currently cultivated	barley	0	minimal, ag field
2836	970519207	AV-2451-05	Sanwell-Sanwell, Warm-Yermo	05/19/97	Ap	0-25	4037590	548496	current fallow	bare	0	moderate
2837	970519208	AV-2451-05	Sanwell-Sanwell, Warm-Yermo	05/19/97	C1	25-60	4037590	548496	current fallow	bare	0	moderate
2838	970519209	AV-2451-05	Sanwell-Sanwell, Warm-Yermo	05/19/97	C2	60+	4037590	548496	current fallow	bare	0	moderate
2841	970519212	AV-2054-17	Yermo, Hot-Arizo	05/19/97	Ap	0-25	4046379	542575	currently cultivated	alfalfa	0	none
2842	97-519213	AV-2054-17	Yermo, Hot-Arizo	05/19/97	C1	25+	4046379	542575	currently cultivated	alfalfa	0	none
2844	970519215	AV-2054-19	Yermo, Hot-Arizo	05/19/97	Ap	0-25	4044949	542566	currently cultivated	alfalfa	0	none
2845	970519216	AV-2054-19	Yermo, Hot-Arizo	05/19/97	C1	25+	4044949	542566	currently cultivated	alfalfa	0	none

## Appendix D-1 (Continued)

Appendix D-2. Print out of the laboratory analyses for soil samples collected during the May 1997 survey in Amargosa Valley (samples were analyzed by Utah State University soil Characterization Laboratory).



USU ANALYTICAL LABORATORIES  
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Logan, UT 84322-4830  
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18 JULY 1997

Von Winkel  
TRW  
1180 Town Center Drive  
Las Vegas, NV 89134

Soil Samples Received: 5/21/97

USU#	Ident.	SP %	pH	EC dS/m	SAR	HCO3 mmol/L	P -----mg/kg-----	K	NO3-N mg/kg	SO4-S mg/kg	Zn	Fe	Cu	Mn	Walkley-Black OM %	CaCO3 %	CEC meq/100g
2742	970515005	30.1	8.5	0.9	8.7	5.71	6.5	1050	8.4	4.0	0.6	0.8	0.3	5.1	1.09	1.8	12.6
2743	970515004	30.9	8.7	1.0	9.0	6.43	3.7	940	7.4	5.8	0.5	0.8	0.3	3.9	1.26	2.5	12.4
2744	970515001	30.4	8.6	1.0	9.9	7.14	4.1	1050	7.8	5.0	0.6	0.8	0.3	5.3	1.18	1.6	12.5
2745	970515002	25.5	8.6	0.7	8.2	3.71	2.8	1120	2.7	4.6	0.4	1.1	0.3	1.4	0.57	1.6	12.5
2746	970515003	27.8	8.7	1.0	15.8	4.28	2.0	1010	2.6	14.9	0.3	0.9	0.3	1.3	0.39	3.0	11.3
2747	970514001	23.1	8.4	0.4	0.8	2.86	3.7	378	1.6	2.0	0.4	1.1	0.3	1.6	0.52	1.2	7.7
2748	970514002	21.1	8.4	0.3	3.0	2.57	5.7	760	1.0	<1.8	0.3	0.7	0.3	1.0	0.59	2.0	10.5
2749	970514003	31.8	8.4	0.4	9.2	4.43	1.3	1040	0.6	<1.8	0.5	1.2	0.5	0.7	0.30	0.6	16.6
2750	970514004	23.2	8.4	0.3	1.2	2.14	3.3	356	2.4	<1.8	0.3	1.1	0.3	1.6	0.63	1.0	7.7
2751	970514005	22.9	8.2	0.3	1.3	1.71	5.8	420	0.6	<1.8	0.3	0.7	0.5	0.9	0.68	3.5	9.6
2752	970514006	21.1	8.5	0.5	6.9	2.71	3.9	810	2.5	<1.8	0.3	0.7	0.5	0.8	0.55	1.0	10.9
2753	970514007	30.9	8.5	0.5	6.4	6.43	1.8	930	0.7	<1.8	0.4	1.3	0.5	0.6	0.37	2.4	16.2
2754	970514008	20.0	8.2	0.4	1.0	2.71	4.9	360	1.4	<1.8	0.4	1.3	0.4	1.7	0.55	0.9	7.6
2755	970514009	23.9	8.2	0.3	2.3	2.43	3.9	990	1.1	<1.8	0.3	0.6	0.6	0.6	0.62	2.1	15.5
2756	970514010	31.8	8.4	0.4	4.1	3.43	1.7	1050	1.7	<1.8	0.2	0.8	0.3	0.7	0.41	2.4	15.8
2757	970514011	31.2	8.7	0.5	7.0	4.43	2.1	1030	1.0	<1.8	0.3	1.1	0.3	0.8	0.38	2.8	16.0
2758	970514012	22.9	8.2	0.3	0.6	1.71	3.0	283	1.1	<1.8	0.4	1.3	0.3	1.9	0.52	0.5	6.8
2759	970514013	22.5	8.4	0.3	1.8	1.57	3.6	670	1.1	<1.8	0.3	0.5	0.4	0.9	0.60	1.7	10.2
2760	970514014	25.2	8.4	0.4	4.3	3.57	2.6	830	0.8	<1.8	0.3	0.6	0.2	0.9	0.54	1.4	11.2
2761	970514015	28.0	8.6	0.5	7.3	4.28	1.3	790	0.7	<1.8	0.4	1.1	0.3	0.8	0.31	1.3	13.9
2762	970514016	23.8	8.4	0.3	0.9	2.14	4.7	370	1.8	<1.8	0.3	0.9	0.3	1.3	0.60	1.6	8.0
2763	970514017	24.2	8.4	0.3	1.0	2.71	7.4	430	0.7	<1.8	0.3	0.6	0.4	0.9	0.86	2.8	9.0
2764	970514018	26.5	8.6	0.5	7.4	5.00	2.0	810	0.6	<1.8	0.3	0.7	0.3	0.7	0.39	1.0	12.1
2765	970514019	26.1	8.9	0.6	11.0	5.00	2.0	750	0.6	<1.8	0.3	1.0	0.3	0.7	0.42	1.0	13.5

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## Appendix D-2. Continued.

2766	970514020	23.1	8.3	0.3	0.9	2.14	3.9	345	1.4	2.5	0.2	1.0	0.2	1.1	0.75	1.4	7.5
2767	970514021	24.9	8.6	0.4	6.0	3.14	5.9	1000	1.1	<1.8	0.2	0.6	0.7	0.6	0.94	1.7	13.8
2768	970514022	22.2	8.6	0.5	10.2	4.71	2.5	1100	0.6	<1.8	0.2	1.1	0.4	0.6	0.50	1.0	16.3
2769	970514023	24.7	8.4	0.4	2.2	2.71	5.3	480	1.1	2.9	0.3	0.6	0.2	1.0	0.77	1.7	8.1
2770	970514024	27.7	8.5	0.4	2.5	2.43	2.4	1010	2.0	1.8	0.2	0.5	0.3	0.6	0.67	2.3	12.0
2771	970513200	28.5	7.9	0.4	0.8	2.00	3.3	401	2.1	<1.8	0.3	1.4	0.2	1.3	0.46	0.0	5.4
2772	970513201	26.2	8.4	0.2	0.8	1.43	1.9	545	0.7	<1.8	0.2	0.7	0.1	0.9	0.63	0.0	6.1
2773	970513202	26.0	8.3	0.2	0.7	1.86	1.3	558	1.0	<1.8	<0.2	0.7	0.1	0.9	0.67	0.8	6.6
2774	970513204	23.6	8.4	0.3	1.4	1.43	3.3	683	0.9	<1.8	0.2	0.6	0.2	0.7	0.65	1.2	7.5
2775	970513205	26.8	7.9	0.3	0.5	2.00	3.4	330	2.0	<1.8	0.4	1.4	0.2	1.6	0.40	0.0	4.6
2776	970513206	26.1	8.5	0.2	1.0	1.71	4.4	560	0.7	<1.8	0.4	1.0	0.1	0.9	0.57	0.3	5.6
2777	970513207	26.2	7.6	0.3	0.6	2.50	3.3	343	2.1	<1.8	0.4	1.1	0.3	1.2	0.60	0.2	6.3
2778	970513208	26.1	8.4	0.2	1.3	2.50	4.4	750	0.9	<1.8	0.3	0.8	0.2	0.6	0.95	1.3	8.1
2779	970513209	27.3	8.5	0.3	2.4	2.14	2.8	970	1.3	<1.8	0.3	0.5	0.1	0.7	0.71	1.0	10.1
2780	970514025	29.4	8.2	0.3	2.4	2.86	2.4	1183	1.0	<1.8	0.2	0.7	0.3	0.7	0.54	3.0	12.1
2781	970514200	27.7	8.1	0.4	0.6	2.85	3.6	299	3.6	2.4	0.4	1.4	0.2	2.0	0.57	0.3	6.0
2782	970514201	27.2	8.3	0.3	1.3	1.43	4.2	526	0.7	<1.8	0.2	0.3	0.2	0.5	0.82	1.8	8.7
2783	970514202	28.3	8.8	0.3	2.6	2.85	2.9	567	1.7	2.0	<0.2	0.6	0.1	0.9	0.53	1.4	7.4
2784	970514203	26.0	8.3	0.4	0.7	2.14	2.9	284	2.6	<1.8	0.3	1.0	0.2	1.0	0.55	0.3	6.1
2785	970514204	25.8	8.6	0.2	0.9	1.78	3.6	426	0.9	<1.8	0.2	0.4	0.1	0.5	0.70	1.6	7.4
2786	970514205	24.7	8.5	0.3	1.3	2.50	4.5	718	1.3	<1.8	<0.2	0.6	0.2	0.8	0.69	3.5	8.8
2787	970514206	26.4	8.1	0.3	0.5	2.14	3.3	314	2.0	<1.8	<0.2	1.2	0.3	1.7	0.42	0.6	5.2
2788	970514207	27.6	8.2	0.2	1.0	2.32	1.8	622	0.8	<1.8	<0.2	0.5	0.2	0.8	0.84	2.6	7.9
2789	970514208	26.9	8.7	0.3	3.2	3.21	2.1	770	1.0	<1.8	<0.2	0.5	0.2	1.1	0.50	2.8	7.9
2790	970514209	25.2	8.6	0.3	1.5	2.14	2.0	688	1.2	<1.8	<0.2	0.8	0.1	1.1	0.44	0.5	5.9
2791	970514210	25.0	8.1	0.4	0.6	2.14	2.4	378	2.8	2.9	<0.2	1.4	0.1	2.5	0.61	0.0	5.4
2792	970514211	23.9	8.6	0.2	1.9	2.14	1.6	584	1.0	<1.8	<0.2	0.9	0.1	1.0	0.34	0.5	6.6
2793	970514212	21.6	8.2	0.3	0.7	2.68	2.0	365	1.7	<1.8	<0.2	1.6	0.2	2.7	0.69	1.2	6.3
2794	970514213	28.4	8.5	0.3	3.3	2.85	1.7	748	1.4	2.5	<0.2	0.5	0.2	1.1	0.60	3.2	11.7
2795	970514214	41.2	8.8	0.4	5.3	2.85	3.1	1320	2.1	1.8	0.2	0.4	0.8	0.9	0.53	8.4	18.6
2796	970514215	26.2	8.1	0.4	1.9	2.50	2.2	403	2.3	2.9	<0.2	1.4	0.2	3.1	0.98	0.2	6.0
2797	970514216	24.9	8.9	0.3	3.2	2.85	4.8	1031	1.7	<1.8	<0.2	1.1	0.1	1.4	0.68	1.2	9.5
2798	970514217	25.1	9.1	0.4	5.4	4.28	2.7	1254	1.4	<1.8	<0.2	1.1	0.1	1.1	0.50	1.0	13.6
2799	970514218	26.0	7.8	0.3	0.5	2.50	2.3	317	1.8	2.0	<0.2	1.4	0.1	3.4	0.59	0.2	5.8
2800	970514219	21.0	8.4	0.2	1.6	2.14	2.2	924	0.9	<1.8	<0.2	0.6	0.6	1.2	0.84	3.6	11.6
2801	970514220	26.1	9.2	0.4	6.0	3.93	2.6	888	1.1	<1.8	<0.2	1.0	0.2	0.9	0.73	1.0	8.5
2802	970515200	24.5	8.2	0.2	0.5	1.96	2.9	352	1.4	<1.8	<0.2	1.3	0.1	1.9	0.50	0.0	5.1
2803	970515201	27.1	8.7	0.2	0.9	1.78	2.1	501	1.5	<1.8	<0.2	0.9	0.1	1.0	0.42	0.4	6.4

Appendix D-2. Continued.

2804	970515203	25.3	8.2	0.2	0.7	1.96	2.5	317	1.2	<1.8	<0.2	1.1	0.1	1.1	0.42	0.0	5.6
2805	970515204	23.9	8.5	0.1	1.5	2.14	3.8	551	0.8	<1.8	0.2	0.7	0.2	0.9	0.74	0.3	6.8
2806	970515205	22.9	8.4	0.2	1.6	2.50	3.1	508	1.0	<1.8	0.4	0.9	0.3	1.0	0.60	0.4	6.8
2807	970515206	28.9	8.1	0.7	4.1	2.85	6.6	638	5.4	8.4	0.6	1.1	0.4	2.5	1.65	2.1	11.1
2808	970515207	31.2	7.8	0.9	4.5	2.85	2.5	930	4.9	12.1	0.4	1.1	0.3	1.2	0.98	3.6	15.6
2809	970515208	26.4	8.1	0.6	4.1	3.57	2.5	710	2.4	6.3	0.4	0.8	0.3	1.9	1.10	4.2	10.9
2810	970515209	22.5	8.2	0.7	4.9	2.50	2.0	750	2.1	8.0	0.3	0.9	0.3	1.2	0.75	3.1	11.6
2811	970515210	32.5	8.2	0.9	5.6	2.85	3.1	1180	3.2	15.1	0.5	1.3	0.7	0.8	0.82	14.5	19.0
2812	970513001	22.2	8.0	0.6	0.5	4.11	4.2	400	2.3	1.8	0.5	1.0	0.9	3.0	1.03	3.2	7.7
2813	970513002	22.1	8.2	0.3	1.1	2.50	5.6	389	1.0	<1.8	0.5	0.6	0.4	1.1	1.00	1.7	8.0
2814	970513003	23.9	8.4	0.5	3.6	3.93	1.9	662	2.6	1.9	0.5	0.7	0.5	1.4	0.88	1.7	10.5
2815	970513004	29.0	8.4	0.7	8.3	3.57	1.4	765	3.7	1.8	0.5	1.2	0.8	0.7	0.31	0.8	15.1
2816	970513005	24.1	8.3	2.1	13.6	2.50	1.1	630	3.7	12.8	0.4	0.9	0.4	0.8	0.40	1.0	12.2
2817	970513006	20.7	8.0	0.4	0.6	2.50	2.6	260	1.7	<1.8	0.4	1.2	0.3	1.4	0.72	0.5	6.7
2818	970513007	22.7	8.1	0.3	0.9	2.68	2.8	458	1.0	<1.8	0.3	0.6	0.3	0.9	1.03	3.1	10.2
2819	970513008	26.2	7.7	0.5	3.1	3.39	2.0	999	2.2	<1.8	0.3	0.7	0.4	0.9	0.81	1.7	14.5
2820	970513009	29.8	8.3	0.4	5.7	3.75	1.6	1079	0.9	<1.8	0.3	1.1	0.8	0.8	0.49	2.0	15.1
2821	970513010	20.8	8.2	0.5	1.1	2.14	2.6	322	2.0	1.8	0.4	1.3	0.3	1.8	0.89	1.4	7.4
2822	970513011	19.7	8.2	0.3	1.4	2.32	1.4	565	0.8	<1.8	0.2	0.6	0.4	1.0	1.27	3.4	9.9
2823	970513012	23.0	8.1	0.5	5.6	3.21	1.2	816	1.6	<1.8	0.2	0.6	0.4	1.0	0.81	1.6	11.5
2824	970513013	26.5	8.7	0.5	8.9	4.28	2.0	791	0.8	<1.8	0.2	1.4	0.5	0.9	0.45	1.2	14.3
2825	970513014	20.4	8.1	0.5	1.6	3.57	4.4	490	2.6	2.3	0.3	1.1	0.4	1.9	1.02	2.1	9.8
2826	970513015	21.8	8.3	0.4	2.3	2.50	2.4	635	1.8	<1.8	0.2	0.6	0.4	1.2	0.93	2.8	9.9
2827	970513016	27.1	8.7	0.5	6.6	4.64	1.0	917	0.9	<1.8	<0.2	0.7	0.2	0.9	0.80	2.2	13.3
2828	970513017	30.7	8.7	0.5	4.3	4.28	1.0	898	0.9	<1.8	0.2	1.6	0.4	1.1	0.54	1.8	14.2
2829	970513018	21.6	7.9	0.5	0.9	3.39	2.6	356	3.4	2.2	0.3	1.3	0.3	2.1	0.76	0.4	7.2
2830	970513019	24.7	8.7	0.4	3.9	3.57	1.1	546	0.8	<1.8	0.2	0.7	0.2	1.2	0.61	1.1	8.6
2831	970519200	30.8	7.6	8.4	9.6	8.57	64	1401	101.2	51.0	1.4	2.0	1.3	10.0	1.12	10.0	15.4
2832	970519203	46.2	8.2	3.6	21.9	6.98	50	2360	88.1	22.0	0.8	1.8	0.8	4.9	0.99	7.5	30.0
2833	970519204	46.1	9.6	2.7	52.0	14.28	3.7	1617	23.8	7.9	0.3	1.3	0.7	0.9	0.26	12.8	26.4
2834	970519205	31.8	7.8	10.5	8.7	6.78	49	1238	107.8	67.2	0.9	1.2	1.1	6.4	0.95	10.8	16.0
2835	970519206	23.5	8.3	0.5	1.6	3.21	3.1	585	2.5	2.0	0.3	0.9	0.4	1.9	0.84	4.9	8.3
2836	970519207	26.9	8.2	2.1	4.8	11.07	14	1273	7.7	15.2	0.4	2.7	0.4	6.6	1.12	4.6	9.6
2837	970519208	32.8	8.4	3.1	31.6	6.78	2.8	2026	28.4	38.1	0.2	1.0	0.4	1.4	0.74	12.7	19.8
2838	970519209	33.1	9.1	2.8	18.1	10.53	1.5	2287	21.3	24.1	0.5	1.6	0.4	0.8	0.42	6.8	22.6
2839	970519210	26.5	8.0	3.4	8.8	7.50	15	1463	29.2	33.8	0.6	1.3	0.4	4.5	1.24	5.4	12.0
2840	970519211	25.1	8.0	1.3	2.3	4.64	12	602	14.8	5.6	0.4	2.2	0.2	3.3	0.53	0.2	6.8
2841	970519212	27.5	8.1	0.8	3.7	5.89	3.3	675	3.7	3.1	0.4	1.3	0.4	2.8	0.89	1.0	10.5
2842	970519213	27.9	8.5	0.4	2.5	3.92	1.3	886	0.8	1.8	0.3	2.0	0.2	1.1	0.35	0.8	7.8
2843	970519214	31.8	8.1	2.0	7.8	6.60	3.6	847	23.2	25.5	1.4	3.0	1.4	3.3	1.00	0.4	10.6
2844	970519215	33.0	8.0	1.3	7.8	11.07	4.8	649	15.2	7.4	0.6	1.8	1.9	3.3	1.53	0.4	12.4
2845	970519216	28.2	8.2	2.3	10.7	4.50	1.3	710	2.1	43.7	0.3	1.8	0.3	2.0	0.74	1.9	12.4
2846	970519217	22.9	7.9	6.0	10.9	3.57	7.6	665	21.5	71.2	0.3	1.3	0.2	2.8	1.22	1.5	8.9
2847	970519218	25.4	8.1	7.7	13.9	3.93	6.5	908	27.6	86.9	0.3	1.0	0.3	4.5	1.25	1.7	10.3
2848	970519219	28.8	7.9	9.0	10.0	10.71	11	1277	35.1	87.1	1.1	2.2	0.5	10.1	1.26	1.2	10.6
2849	970519220	27.3	7.9	3.7	5.6	6.96	5.8	750	18.2	28.9	0.5	1.6	0.2	6.1	1.32	1.4	10.2
2850	970519221	22.0	8.3	2.4	15.3	10.53	2.7	769	7.2	21.5	0.4	1.4	0.4	4.8	0.43	2.3	12.1
2851	970519222	22.0	8.3	1.4	9.5	7.68	3.5	586	3.1	7.9	0.3	1.3	0.2	4.1	1.06	2.1	8.9
2852	970519223	22.3	8.3	1.0	6.3	6.78	3.2	437	3.4	5.1	0.3	1.6	0.2	3.4	0.56	0.6	6.9

Appendix D-2. Continued.

USU#	Ident.	Sand	Silt	Clay	Texture	1/3	1	15
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		%	%	%		%	%	%
2742	970515005	80	14	6	LS	10.0	8.4	4.9
2743	970515004	80	13	7	LS	9.7	8.7	3.7
2744	970515001	82	12	6	LS	9.7	8.5	3.7
2745	970515002	86	9	5	LS	7.9	7.0	4.8
2746	970515003	85	10	5	LS	7.6	6.5	2.5
2747	970514001	82	14	4	LS	8.1	6.5	3.9
2748	970514002	81	13	6	LS	7.7	6.6	4.6
2749	970514003	79	15	6	LS	10.2	8.7	7.1
2750	970514004	83	13	4	LS	7.9	6.4	3.6
2751	970514005	80	13	7	LS	9.5	8.1	4.6
2752	970514006	77	16	7	SL	8.9	7.2	4.7
2753	970514007	84	11	5	LS	11.6	9.4	6.9
2754	970514008	82	13	5	LS	8.5	6.6	4.0
2755	970514009	69	20	11	SL	12.4	11.1	6.6
2756	970514010	81	13	6	LS	12.5	10.1	6.5
2757	970514011	85	10	5	LS	11.5	9.9	6.7
2758	970514012	84	13	3	LS	7.0	5.4	3.5
2759	970514013	82	12	6	LS	8.2	6.8	4.5
2760	970514014	87	8	5	LS	8.0	6.3	4.6
2761	970514015	87	8	5	LS	9.0	7.2	5.7
2762	970514016	82	12	6	LS	8.9	6.8	4.0
2763	970514017	82	12	6	LS	9.2	7.6	4.4
2764	970514018	89	7	4	S	8.2	6.5	4.9
2765	970514019	90	6	4	S	8.5	6.9	5.4

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Appendix D-2. Continued.

2766	970514020	85	10	5	LS	8.4	6.5	3.8
2767	970514021	79	11	10	LS	10.6	9.2	5.7
2768	970514022	86	8	6	LS	10.5	8.7	6.8
2769	970514023	87	9	4	LS	7.4	5.8	3.7
2770	970514024	82	12	6	LS	11.8	9.0	5.1
2771	970513200	93	5	2	S	4.5	3.4	2.9
2772	970513201	96	2	2	S	4.4	3.7	3.2
2773	970513202	94	2	4	S	5.0	4.4	3.5
2774	970513204	89	6	5	S	6.6	5.1	3.6
2775	970513205	94	5	1	S	3.8	2.9	2.6
2776	970513206	96	2	2	S	4.0	3.3	2.8
2777	970513207	89	8	3	S	6.7	4.9	3.4
2778	970513208	93	1	6	S	6.2	5.0	3.7
2779	970513209	90	6	4	S	7.6	6.5	4.5
2780	970514025	90	6	4	S	12.0	9.1	6.1
2781	970514200	88	9	3	S	7.7	5.3	3.8
2782	970514201	86	9	5	LS	8.8	6.9	4.3
2783	970514202	94	3	3	S	7.6	5.6	3.7
2784	970514203	90	7	3	S	6.9	4.7	3.2
2785	970514204	90	6	4	S	7.2	5.5	3.8
2786	970514205	88	7	5	S	9.5	6.8	4.3
2787	970514206	93	6	1	S	5.4	3.9	2.8
2788	970514207	90	6	4	S	6.5	5.7	3.7
2789	970514208	93	4	3	S	7.0	5.7	3.5
2790	970514209	94	3	3	S	4.7	4.0	3.2
2791	970514210	89	7	4	S	4.8	3.7	2.9
2792	970514211	97	11	2	S	4.2	3.9	3.0
2793	970514212	89	8	3	S	6.3	4.7	3.1
2794	970514213	78	17	5	LS	13.6	9.3	5.0
2795	970514214	54	41	5	SL	27.7	17.5	7.3
2796	970514215	92	4	4	S	4.7	3.6	2.9
2797	970514216	90	3	7	S	6.2	5.6	4.1
2798	970514217	95	1	4	S	5.1	4.7	3.9
2799	970514218	91	5	4	S	4.9	4.1	2.9
2800	970514219	81	7	12	SL	10.5	9.3	5.2
2801	970514220	94	1	5	S	6.3	5.6	3.7
2802	970515200	93	5	2	S	3.6	3.4	2.7
2803	970515201	96	2	2	S	3.9	3.6	2.7