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GROUNDWATER GEOLOGY OF TAOS COUNTY

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Abstract.— Accurate locations of water wells using handheld GPS units has allowed mapping of the geologic structure and water table over Taos County. The Rio Grande rift basin is complexly faulted, and these faults locally interrupt groundwater flow. West of the Rio Grande groundwater flow is deep and southeasterly toward a base level at the river. East of the Rio Grande gorge, groundwater recharge is mainly from mountain-front streams, and groundwater flows westward at shallower depths toward the river. A north-northwest-trending system of four or more distinct faults underlies the Taos Valley, extending from the Picuris Mountains to the Rio Hondo-Rio Grande intersection. Another fault system at the down-warped eastern edge of the rift basin underlies the town of Taos and the urban area along the mountain front. Many of these faults appear to compartmentalize the groundwater system. Groundwater quality is generally excellent. However, shallow wells may have septic contamination and wells along faults or mineralized areas may contain elevated levels of some chemical elements.

INTRODUCTION

An effort has been made over the past five years to provide a groundwater table map over the whole of Taos County (Fig. 1) to provide home owners, ranchers, drillers and water planners a better picture of depth to water. Previous studies, mostly unpublished, provided maps over some local areas. Well records submitted by drillers to the State Engineer's Office are rarely located accurately enough on a map to be utilized in an areal study. University of New Mexico-Taos students were employed to accurately locate known wells in the field using handheld GPS units, to a horizontal accuracy within thirty feet and surface elevation from topographic maps within five feet. Driller's well reports were then used for static water level and stratigraphic correlation. Static water levels were usually recorded after the well was standing overnight, but some drillers recorded the water level where they saw water entering the well – the "water-bearing strata." Cross-sections were drawn through nearly every well. In this portion of the Rio Grande rift interbedded basalts and clastics were easily recognized by the drillers and could be correlated from well to well, making a clear stratigraphic and structural picture. Much of the Taos portion of the San Luis rift basin is heavily faulted, some of which was previously known from obvious surface fault expression, while other faults were suspected from topographic lineaments. Water-well control provides evidence for fault offsets on many topographic features. The recent USGS high resolution aeromagnetic (HRAM) survey of eastern Taos Valley provides more detail on some of these faults.

In the Taos Valley area, a structural map on top of the Servilleta Basalt (as defined by Lipman and Mehnert, 1979) was made to delineate major faults (Fig. 3) before contouring the water table (Fig. 4). Where well control was sufficient, many of these faults were found to offset the water table and act as impermeable or semi-permeable membranes to lateral groundwater flow. Numerous faults in the Taos Valley area make the water table depth and groundwater flow direction very complex. The remainder of the county may be equally complex in structure and groundwater attributes, but sparse well control allows only a regional picture (Fig. 1). The following discussion of local areas within the county provides a summary, along with the maps and cross sections, of the water table elevation, acquifer lithology, groundwater sources and peculiarities of each area.

This work will continue to be updated and refined. GIS data will be maintained and is available at the Taos Soil and Water Conservation District office.

WEST OF THE GORGE

Widely scattered wells west of the Rio Grande show the water table (Fig. 1) dipping gently southeast toward its intercept with the river, the base level control for the groundwater system.

The northern one-third of western Taos County has an almost flat water table tied to the low gradient of the Rio Grande. Wells are 200-300 feet deep, with an aquifer in the Miocene Los Pinos Formation conglomerate. Recharge is probably mainly from the San Juan Mountains headwaters of the Rio Grande in southwest Colorado, through the Alamosa Valley, with a very long residence time. Some recharge probably also comes from San Antonio Mountain and the Tusas Mountains directly to the west.

In the central one-third of western Taos County, the water table dips more steeply (but still less than one-half degree) to the southeast. Groundwater discharge ties the water table to the steeper gradient of the Rio Grande gorge (Taos Box). Well depths are 400-800 feet in this area. The aquifer is poorly sorted volcano-clastics of the Los Pinos Formation below the Servilleta Basalt, which forms a gentle east-dipping surface layer (Fig. 2A) around slightly older composite volcanos of the Taos Plateau volcanic field (Lipman and Mehnert 1979; Appelt, 1998). South of Highway 64, where the water table is deepest, fine-grained sands of the Miocene Ojo Caliente Formation form a low permeability aquifer, that is difficult to drill without hole collapses. Slow seepage into well bores makes water detection difficult and low production rates are found at these greater depths. Groundwater flow toward the gorge is probably interrupted by Miocene lavas in the Brushy Mountain-Timbered Hills horst block and by north-trending rift-associated faults, (Fig. 2A).

Tres Piedras

A local groundwater high exists in the vicinity of Tres Piedras, recharged from infiltration on Tusas Ridge immediately west. Precipitation infiltrates the outcropping Los Pinos clastics and flows eastward through or around 1.7 Ga granite knobs (Fig 2A).

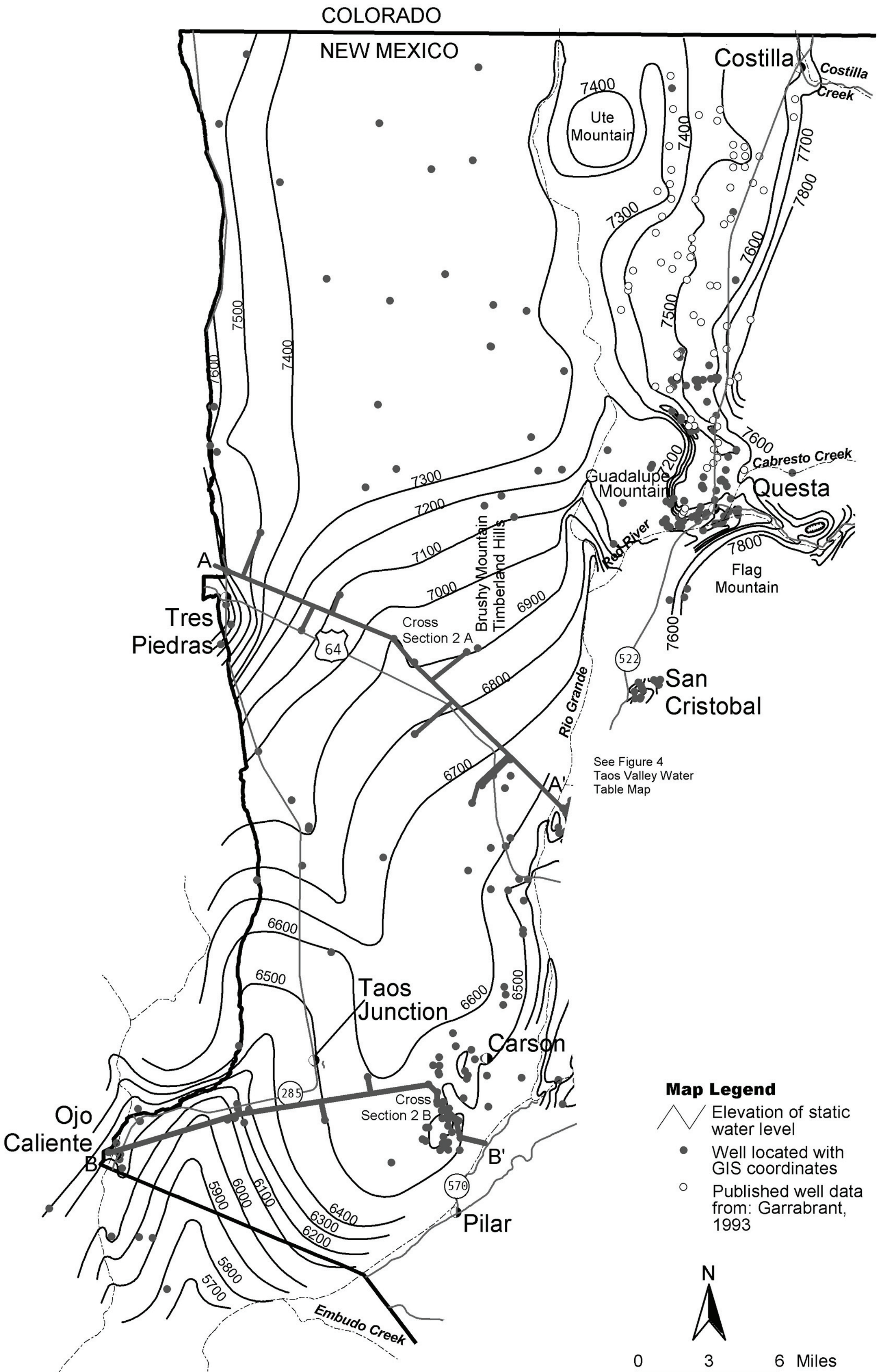

FIGURE 1. Taos County Water Table Map

SOUTHWESTERN TAOS COUNTY

This area of relatively low water table dip is farthest from the main recharge area in Colorado. Wells are deeper, from 600 to over 1000 feet in depth in this area. Numerous springs along the Rio Grande represent groundwater seepage that contributed to the sapping, mass wastage and widening of the Rio Grande Valley south of Pilar.

Carson

The Carson area water table (Fig. 1) has a low dip of 50 feet per mile to the southeast. Local differences in water table elevation of less than 50 feet may represent historical drawdown. A cross-section (Fig. 2B) prepared from driller's sample descriptions illustrates the stratigraphy and water-producing zones. Surface Pleistocene dune sands cover the Servilleta Basalt, which generally has three intervals of basalt separated by fine-grained clastics. The main water-bearing strata include: clastic interbeds in south Carson, Santa Fe Group sands toward the west and fractured basalt and dacite of Tres Orejas to the north. Permeability in the fine-grained clastic interbeds is low and storage capacity in the basalt fractures is low. The best aquifer requires the extra drilling depth to encounter the coarser clastics of the Santa Fe Group.

The main water-bearing strata in the CAR-21 well (Fig. 2B) are only one-quarter mile west of the same clastic interbed outcrop on the lower talus-covered wall of the Petaca gorge. Riparian vegetation including willows and cattails and standing pools of water provide evidence of groundwater seepage. The Petaca dry gorge is probably being enlarged by groundwater sapping, which in turn controls the level of the groundwater table in Carson.

Taos Junction

Seven wells were drilled to 700 feet depth in Section 11-24N-9E, midway between Taos Junction and Ojo Caliente, surrounded by a large area of undrilled National Forest lands. The water table here dips locally west toward the Cañon de los Comanches and the Rio Ojo Caliente (Fig. 2B), not east toward the Rio Grande. The main water-bearing strata are fractured basalts underlying Miocene Chama-El Rito Formation sandstones and conglomerates, whose lower 100 feet are also water-bearing. Stratigraphically similar basalts called the Hinsdale Formation outcrop west of Ojo Caliente (May, 1984) as part of a 15 Ma mid-Miocene volcanic field.

Ojo Caliente

Groundwater is at floodplain level in the Rio Ojo Caliente Valley (Fig. 1). Recharge is mainly from surface river water that flows from the north in the Tusas Mountains. Some subsurface recharge may also come from the east as well as from the highlands west of Ojo Caliente. The Rio Ojo Caliente recharges the water table beneath it, which slopes in a southeast direction toward the much deeper Rio Grande. The proposed regional landfill, three miles southeast of Ojo Caliente, is 300 feet above the water table.

TAOS VALLEY

The Taos Valley Acequia Association defines the Taos Valley as that area east of the Rio Grande gorge to the Sangre de Cristo Mountain front and north of the Picuris Mountains to the Rio Hondo drainage. The groundwater table is at or near the surface, depending on annual snow and rainfall, in the Rio Hondo and Arroyo Seco valleys to the north and the Rio Pueblo valley to the south with its three principal tributaries, Rio Pueblo de Taos, Rio Fernando de Taos and Rio Grande del Rancho.

Few water wells are shown within these alluvial valleys where wells are shallow and the water table is within twenty feet of the surface. These perennial streams are the main recharge sources for the groundwater system and stream volume studies show losing reaches. Stream withdrawal for acequia irrigation may replenish groundwater where the water table is shallow. Minor recharge sources include infiltration along the mountain front, particularly along alluvial fans of intermittent streams, and precipitation draining into alluvial valleys, where groundwater is very shallow.

The groundwater table (Fig. 4) shows great complexity as a result of extensive faulting that appears to interrupt groundwater flow westward toward the Rio Grande gorge. Extensive well control in the Los Cordovas area shows the four Los Cordovas faults altering the groundwater depth and flow direction. Faults along the Weimer-Cañon foothills separate distinct groundwater levels. Blueberry Hill is a fault-bounded uplift, whose surface topography clearly reflects several north-northeast-trending faults, which may control subtle changes in groundwater. The Hondo Mesa area has variations in water depth which are thought to be due to faults flanking the Airport arch. The Stagecoach Hills area has abundant well control that show several north-south faults that are not seen at the surface and effect the water table. The Cerro Negro dacite volcano north of Rio Hondo has a major impact on groundwater. The water table in the Des Montes and Arroyo Seco areas is very complex, as they are adjacent to the Rio Hondo recharge source, located over a buried volcano and underlain by possible east-west faults. Water table levels near the Rio Hondo change seasonally and during drought may drop by several hundred feet.

Los Cordovas

The Servilleta Basalt outcrops along the north wall of the Rio Pueblo where four well-exposed north-trending normal faults form east-dipping cuestas of Servilleta Basalt. These faults can be traced further northward following topographic valleys. Water wells just north of Los Cordovas (Fig. 5A) show three layers of Servilleta Basalt, offset by about 100 feet of throw. South of the Rio Pueblo, the four Los Cordovas faults are buried by Quaternary clastics shed off the Picuris Mountains. The Servilleta Basalt flows dip southeasterly, beneath the water table, so only a few deep wells penetrate the basalt marker beds. Structural highs and lows and water table changes south of Los Cordovas suggest the Los Cordovas faults extend southward toward the five major north-northwest-trending faults mapped in outcrop of the Picuris Mountains (Bauer, et. al., 1999). These faults are primar-

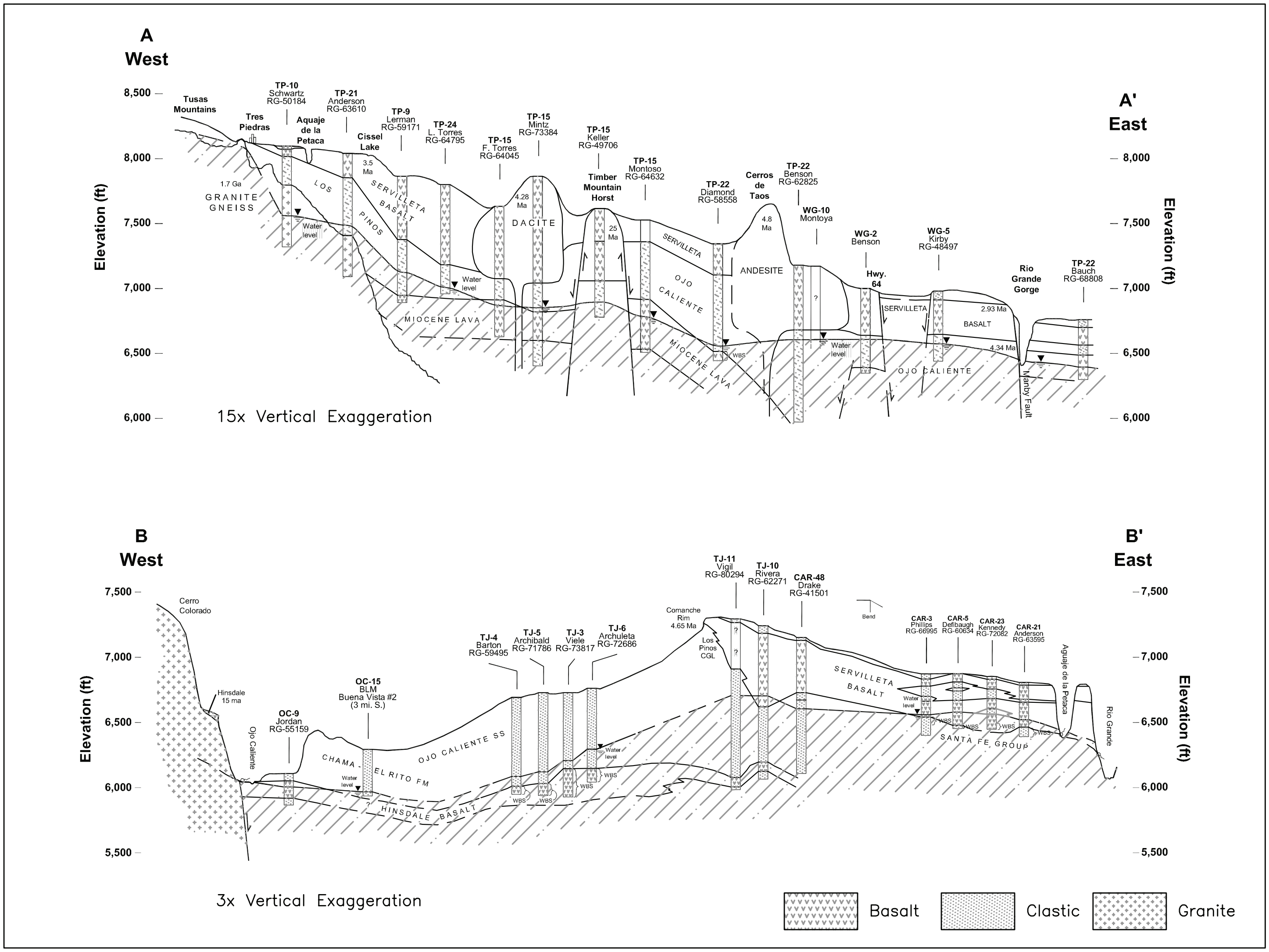

FIGURE 2. Western Taos County Cross Sections, A. Highway 64 B. Ojo Caliente to Carson Cross Section.

ily strike-slip, but local changes in apparent throw and continuity may occur.

Waste Water Treatment Plant

A detailed water table map was constructed around the waste-water treatment plant north of the Golf Course using monitoring wells and surrounding water wells. A water table low (Fig. 4) appears to follow a buried valley overlying the western-most Los Cordovas fault scarp. The low may be due to groundwater piling up on the eastern side of the fault, or greater permeability and withdrawal of water in clastics filling the buried valley. Groundwater is 20 to 60 feet below land surface at the wastewater leach field.

Taos Golf Course

A fault-bounded structural high under the Taos Golf Course coincides with a water table high (Fig. 3, 4). This structural and groundwater high continues south to the southeast depositional edge of basalt near Highway 570.

Los Cordovas/Ranchitos valley

Detailed well control in the central fault block south of Los Cordovas shows structural dip to the south of 100 feet per mile, on the base of the upper Servilleta Basalt. The top of the Servilleta is locally eroded by ancestral meanders of the Rio Pueblo. The Rio Pueblo may follow a northeast-trending fault zone with local apparent throw of 50 feet, down-to-the-north (Fig. 3). The straight northeast trend of the Rio Pueblo suggests predominately strike-slip motion similar to other east-trending possible faults between the airport and the Rio Hondo (Fig. 3).

The water table (Fig. 4) in southern Los Cordovas dips gently 100 feet per mile to the north-northwest where it adds water to the Rio Pueblo. Changes in water table elevation and flow direction occur across the projected fault exten-sions of the buried Los Cordovas faults. Uniform northward dip on the water table

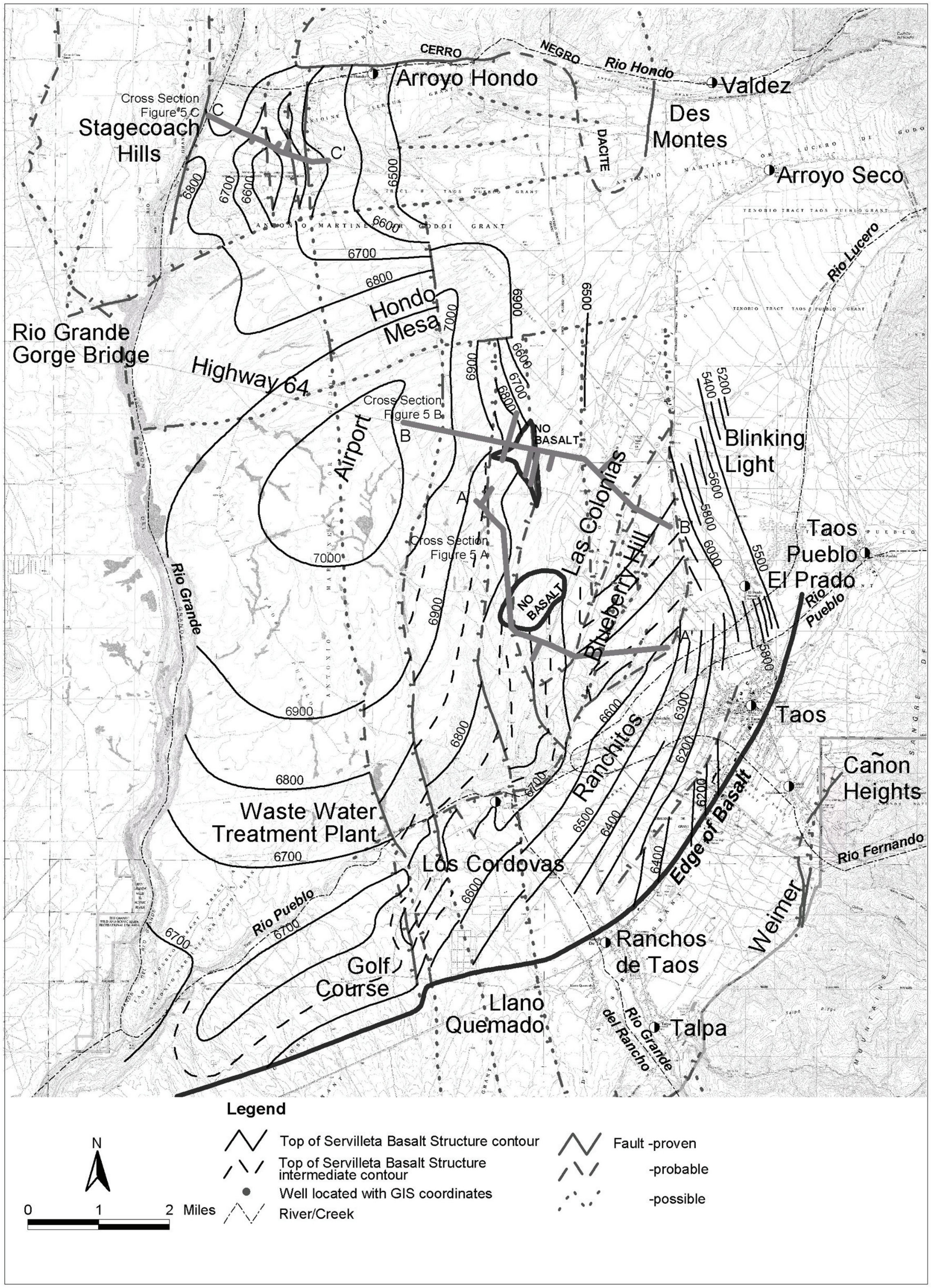

FIGURE 3. Taos Valley Structure, Top of Servilleta Basalt.

suggests a common aquifer of fractured basalt and porous clastics. Limited pore space in the fractured basalt is probably being recharged from underlying water in clastic beds.

Shallow water table data shown in Figure 4 is from Spiegel and Couse (1969). Changes in water table depth and flow direction suggest the location of buried Los Cordovas faults. The shallow nature of groundwater is illustrated by the extensive McCarthy springs (Fig. 4) along the southern Ranchitos valley.

Llano Quemado

Shallow water wells located near Llano Quemado show gentle northwest water table dip toward the Ranchitos valley (Fig. 4). Changes in water table level and flow direction occur along the projected traces of the buried Los Cordovas faults.

Detailed well mapping by Peggy Johnson (Bauer et. al., 1999) suggests separate aquifers in the Llano Quemado-Talpa area in the Pennsylvanian formations, Tertiary Picuris conglomerate and Tertiary gravels. Steep water table dips, or separate fault compartments may occur along the Picuris mountain front where young east-trending Embudo faults (Kelson, et. al., 1997) intercept older northwest-trending strike-slip faults of the Pecos-Picuris system.

Stakeout Foothills

Wells in the area of the Stakeout Restaurant south of Highway 68 on the north flank of the Picuris Mountains are drilled deeper than 1000 feet in gravel fans shed from the mountains. The water table at an elevation of 6400 feet suggests distant subsurface migration (Fig. 4) from the Rio Grande del Rancho at 6900 feet elevation several miles east. Direct mountain front infiltration may be an additional, but minor, recharge mechanism. The last ten-year drought has lowered the water table in this area.

Ranchos de Taos

Along Highway 68 through Ranchos de Taos northward to the town of Taos, the water table is shallow (100 feet) and relatively flat, to locally high, as previously mapped (Bauer et. al., 1999). This water table high may be a result of westward-flowing groundwater ponding against the Town Yard Fault (Fig. 4). Ground-water flow at depth may be heated along the fault zone at depth and rise buoyantly. Deep wells (BOR-3 and Taos Town Yard) were drilled to test deeper aquifers that may be somewhat pressure-separated from the shallow water system. The Pennsylvanian rocks encountered at relatively shallow depth in the eastern Town Yard well limits the potential thickness of the porous clastic aquifer.

Weimer

A detailed water well study was made in the Weimer Neighborhood Association area. The groundwater appears to be compartmentalized by north-trending mountain-front faults.

The east edge of Weimer has groundwater at a depth of about 100 feet in fractured Pennsylvanian shales and sandstones. North-south fault along Verde Road drop the Pennsylvanian rocks and water table down by 200 feet within a lateral distance of 450 feet. This large change indicates that the water table probably drops in steps across low permeability fault zones caused by fault gouge sealing, or mineralization. The water table west of the Verde Road fault system is nearly flat all the way past Paseo del Pueblo Sur to the Town Yard fault (Fig. 4).

Minor groundwater highs occur in the northeast Weimer area (Fig. 4) where groundwater influx comes southwest from the Rio Fernando, and southeast Weimer, where influx comes northwest from the Rio Grande de Rancho source. Water table high lobes immediately west of the Verde Road fault zone suggest some leakage across the fault from mountain-front surface water infiltration. The easternmost Weimer wells are the most likely to suffer water table drops during drought periods.

Frequent water mineralization, especially calcium, sulphate and iron, and warm waters suggest much buried faulting along the mountain front that could add complexity to the groundwater picture.

Cañon/Cañon Heights

Unlike the Weimer foothills to the south, the water table under Cañon Heights is not compartmentalized across faults cutting the Pennsylvanian rocks mapped by Bauer et. al., (1999). The HRAM data suggest considerably more apparent fault offset in Weimer than in Cañon. The water table (Fig. 4) has a westward slope under Cañon Heights of less than 100 feet in one-half mile. Depth to the water ranges from 150 to 400 feet, where it is obtained from fractures in Pennsylvanian sandstones and shales and is high in calcium and iron. Several drilling attempts are commonly required to complete a good producing well.

The water table flattens west of Piedmont Road at the base of the foothills in the Cañon area and is nearly coincident with the level of the Rio Fernando. No offset in the water table occurs at the major mountain-front fault zone paralleling Piedmont Road. The Rio Fernando appears to recharge the Cañon Valley north and south of the river. Cañon Heights appears to be recharged from infiltration through vertical fractures, from 150 to 400 feet down from the surface. Some groundwater migration may come from upstream Rio Fernando, several miles southeast, if lateral fracture continuity exists.

Low bulk fracture porosity, probably less than five percent in the Pennsylvanian rocks, may result in lowering of the water table under Cañon Heights wells with continued drought conditions.

Blueberry Hill

Blueberry Hill appears to be fault-separated from the Las Colonias valley to the west and the El Prado plain to the east. Steep linear 100-foot escarpments delineate the west and east edges of Blueberry Hill. Figure 5A illustrates the structure, stratigraphy and water table differences in this area. The lower Las Colonias valley appears to be a structural dip surface, whose land surface low is occupied by Arroyo Seco. This normally dry stream has a groundwater high just below the surface recharged

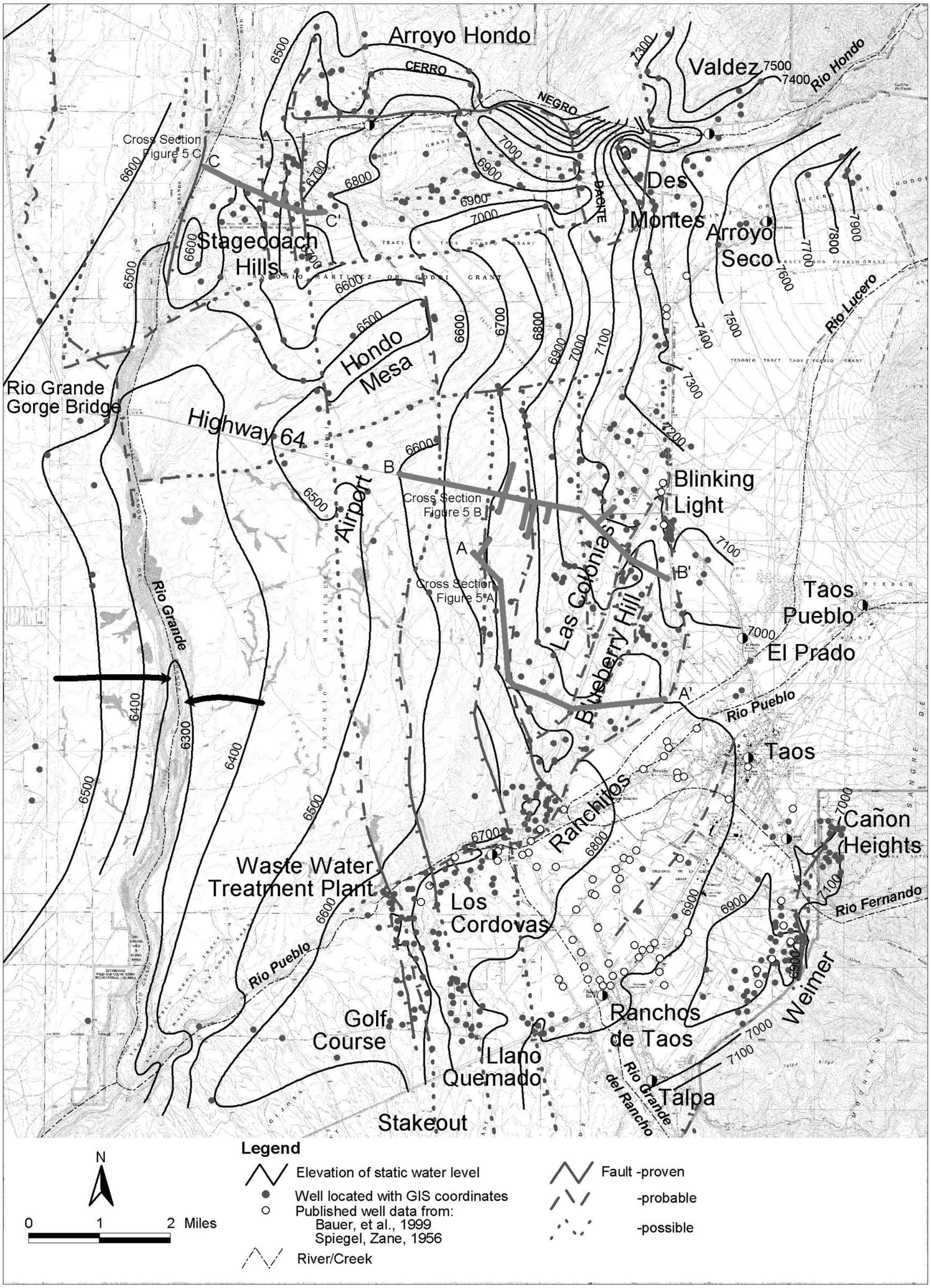

FIGURE 4. Taos Valley Water Table Map.

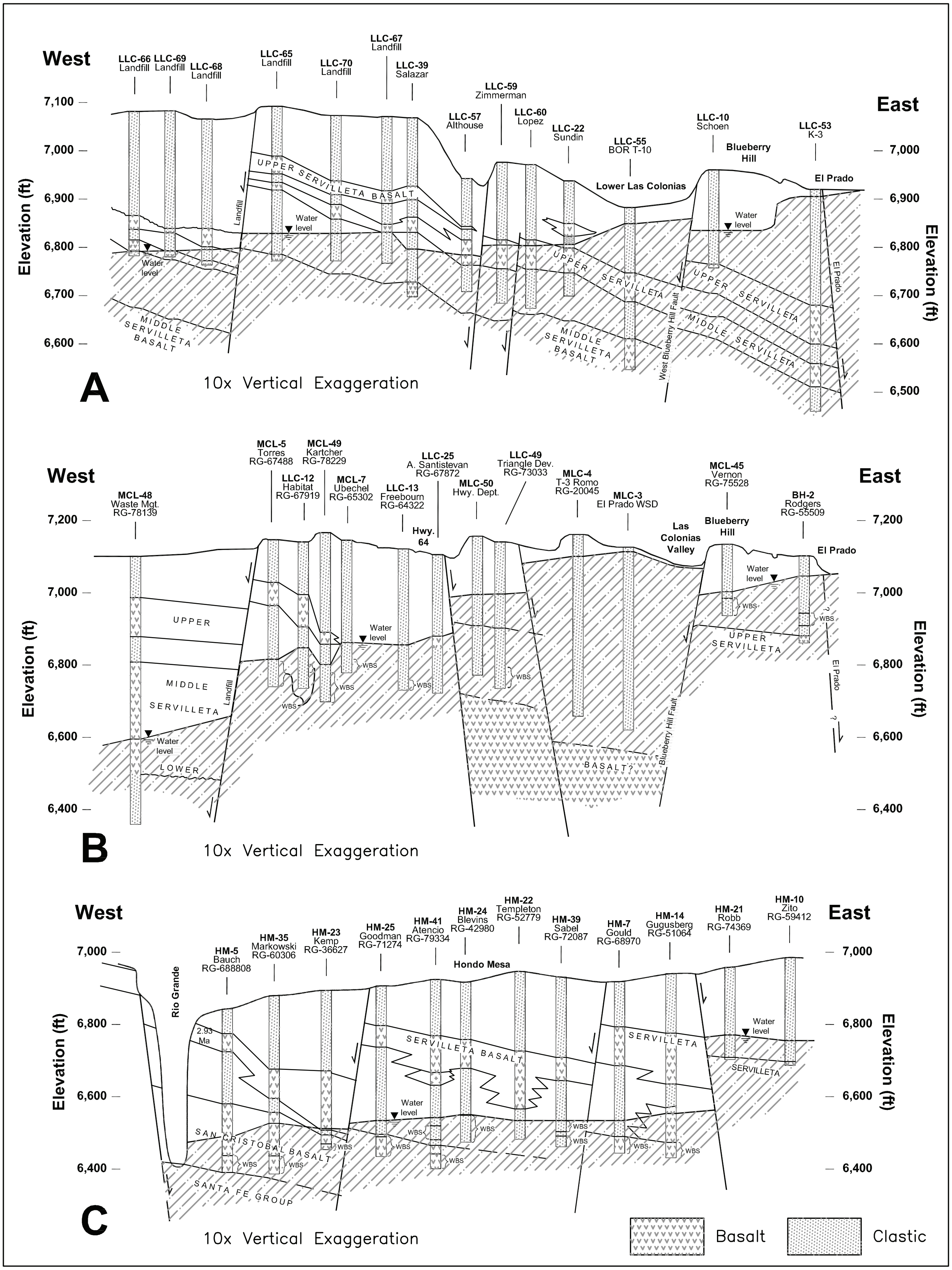

FIGURE 5. Taos Mesa Cross Sections, A. Middle Blueberry Hill. B. Highway 64. C. Hondo Mesa.

from upstream. Southern Blueberry Hill is underlain by Servilleta Basalt 100 feet structurally high to wells immediately west in the Las Colonias valley (Fig. 4). The west Blueberry Hill fault is probably in discontinuous fault segments. Groundwater may be high or low east of this fault system as recharge from Arroyo Seco seeks paths around the fault segments.

Offset on the El Prado fault on the east side of Blueberry Hill is more difficult to document, as most wells on the El Prado Plain are shallow. The BOR well (DM-27, Fig. 3) encountered basalt 1300 feet structurally lower than the Millicent Rodgers well (BH-2), two miles southwest of the El Prado fault (Fig. 5B).

In the southernmost section of Blueberry Hill, the west Blueberry Hill fault and the El Prado fault swing southwest toward the eastern most Los Cordovas fault. The structural and water table picture becomes highly complex at this junction (Fig. 3, 4).

Middle Las Colonias, east from the Airport arch to Blueberry Hill, is characterized by east-dipping Servilleta Basalt overlain by beds of Quaternary alluvium. The straight northeast-trending asymmetrical topographic valleys were previously interpreted to be erosional migration off the rising Airport arch (Dugan, et. al., 1984). These valleys are probably cuestas of Quaternary alluvium dipping off the southwest-plunging Airport arch. The HRAM survey suggests north-south fault trends extending north of Highway 64.

Wells in northern Blueberry Hill show no basalt at its expected depth (Fig. 4). This has been interpreted as a thick Pliocene fan of Arroyo Seco. This northern Blueberry Hill area could also be a down-thrown block with thickened steeply east-dipping Quaternary-Tertiary clastic layers off the Airport arch.

Of particular interest is the fault underlying the Taos Regional Landfill (Fig. 5A). A series of monitoring wells show the upper Servilleta Basalt layers offset nearly 200 feet and dropping of the water table about 50 feet across the fault. This fault appears to represent a permeability barrier locally, possibly due to clay smearing or mineralization along the fault zone. The depth of the water table is 250 feet below the surface at this location.

El Prado

A gasoline storage tank leak was detected by the New Mexico Environment Department in 1989 at the Mountain View Grocery Store on Highway 64 just south of the "old blinking light". Closely spaced monitoring wells provide water table data over a thirteen year period. The water table dips west-southwest (Fig. 4) and can be mapped in detail on a five-foot contour interval. The water table continues uninterrupted across the interpreted El Prado/East Blueberry Hill fault at this shallow level. The water table is at or near the surface east of Highway 64, where flood irrigation is prevalent. A thirteen-year history of water wells here shows seasonal spring/summer rises of ten feet due to irrigation recharge to the groundwater table. Drought conditions since l995 have caused an overall twenty foot drop in the water table. This type of seasonal and drought related water table variation is expected to occur throughout the El Prado plain. A water table contour interval of greater than twenty feet is needed in order to compensate for these small seasonal and drought variations on the water table elevation (Fig. 3)

Airport

The Airport arch (Fig. 2) is a large five by ten mile structural arch, highly faulted on its steep-dipping east side. Its structure can be seen along the Rio Grande gorge, where it was first noticed (Hawley, 1978, Dungan, et. al., 1984) and called the Gorge arch. Its gentle crest however, lies under the Taos Airport runway, the only flat surface feature on the Taos plateau. The Servilleta Basalt is close to the surface and locally crops out. Radial drainage patterns suggest a domal crest just south of the runway. The Servilleta Basalt is nearly 600 feet of mostly basalt with thin clastic interbeds near the top and bottom. Groundwater occurs in the basal Servilleta fractured basalts and fine clastic interbeds, with a major water reservoir in the fine grained Chamita and Ojo Caliente sands of the underlying Santa Fe Group.

The origin of this structure, which is a topographic high today between Taos and the Rio Grande gorge, is thought to be related to cross rift structural discontinuities, similar to the Cerro Azul uplift to the south and the San Luis Hills uplift to the north within the greater San Luis rift basin.

Hondo Mesa

North of Highway 64, gentle surface dip slopes and cuestas suggest structural dips off the Airport arch. East-trending surface valleys (Fig. 3) suggest fault zones that may interfere with groundwater flow. A water table low two miles north of the airport (Fig. 4) may be bounded by faults on the north, east and south that limit groundwater recharge.

Stagecoach Hills

The northwest corner of the Hondo mesa is characterized by north-south faults (A,B,C; Fig. 5C) that offset the east-dipping Servilleta Basalt. These faults have little surface expression, except for the Manby fault, which the Rio Grande follows. The water table appears to pond on the east side of the Manby fault, just east of the gorge. Fault C, although with little vertical displacement, has a 200-foot rise in the water table on its east side. Although the water table appears compartmentalized by faults, recharge appears to tie directly to the Rio Hondo water level to the north. Anomalous thick and thin clastic intervals within and above the Servilleta Basalt layers suggests a complex history of deposition, groundwater sapping and Pliocene to Quaternary faulting. These Stagecoach Hills faults appear to be a northwest extension of the Los Cordovas and Pecos-Picuris fault systems.

Arroyo Hondo North

The Rio Hondo flows along the south edge of the Cerro Negro dacite volcano. West of Arroyo Hondo, gravel terraces veneer the fractured dacite flows, but water wells produce from within this volcanic layer. Servilleta Basalt flows from 3 to 4 Ma. (Appelt,

1998) onlap this dacite volcano dated at 5.24 Ma. The water table is about 200 feet above the adjacent Rio Hondo and is probably recharged from high on Cerro Negro approximately ten miles northeast. Individual fracture zones encountered may lead to local artesian wells (AH-2), high above and pressure-separated from the regional water table.

East of Arroyo Hondo in the Arroyos del Norte area groundwater is within a thick clastic zone. The east-trending arroyos are probably fault-zones that may interfere with recharge southward from the Rio Hondo.

Des Montes

This area is characterized geologically by a buried dacite lava dome (Fig. 3). Tongues of dacite crop out and dip north across the eroded Gates of Valdez along the Rio Hondo just west of Des Montes. The water table is high over and to the east of this dacite dome (Fig. 4). Groundwater in the Hondo valley and west of the dome is very low, suggesting this dacite dome is an overall barrier to westward groundwater migration. Eastward extension of the Arroyos del Norte faults may also interfere with groundwater recharge from the adjacent Rio Hondo. Seasonal and longer-term drought effects on the Rio Hondo water volume may cause hundreds of feet of variation in the adjacent groundwater table elevation. Housing development is often blamed for the water table declines in this area, but average household use of 100-150 gallons per day would only drop the water table 3-5 inches per year (with no recharge) in a 100-foot radius around each well producing from clastic zones.

Arroyo Seco

The west-dipping water table underlying Arroyo Seco eastward to the mountain-front is high above the Rio Hondo-Valdez valley (Fig. 3) and is probably recharged by the Arroyo Seco. It is a smaller watershed and subject to low snowpack during drought years, which leads to significant variability in water table, especially close to the mountain-front. Fault zones along the mountain front may cause local water level compartments, which are more difficult to recharge.

NORTHEAST TAOS COUNTY

Groundwater north of the Rio Hondo to the Colorado border originates from major and minor drainageways in the Sangre de Cristo Mountains to the east (Fig. 1). Major groundwater recharge corridors include the broader valleys of the Red River, Cabresto Creek and Costilla Creek. Numerous other minor intermittent streams and fans along the mountain front supply some infiltration during storms or snowpack melt to a zone within a mile or two of the mountain front.

San Cristobal

Shallow groundwater exists in the alluvium of San Cristobal Creek (Fig. 1) and in gravels northward in the thick Quaternary Lama alluvial fan. Recharge depends on local snowpack and thunderstorm runoff on the east slope of Flag Mountain. To the south the water table rises on Cerro Negro, where little reservoir storage is available in the dacite lava fractures. The entire mountain front alluvial fan slope between the Rio Hondo and the Red River is prone to drought-related lowering of the water table.

Red River

Groundwater in the alluvial aquifer of the Red River Valley is near the level of the Red River (Fig. 1). Local changes in groundwater level due to bedrock changes and constrictions have been mapped (Anne Wagner, personal communication, 2004). Minor amounts of groundwater are stored in the Precambrian igneous and metamorphic rocks. Major infiltration is occurring from side slopes. Nearly year-round snowmelt and rainfall probably maintain a constant water level despite drought conditions elsewhere. A local cone-of-depression exists over the underground mining operation at the Moly Mine, where the Red River is losing water through fracture systems to the underground mine and pumping to dewater the mine has locally lowered the water table (Fig. 1). Cabresto Canyon groundwater depth, aquifer characteristics and recharge are probably similar to the Red River.

Questa and Cerro

The Red River loses water to the alluvial sediments flanking the river in the southern, low part of Questa. The water table elevation under northern Questa to Cerro (including the tailings pond west of Questa) is just above 7,500 feet. Most of Questa's groundwater appears to be recharged from Cabresto Creek, although a minor amount under the tailings pond may be supplied from the tailings slurry pipeline.

There is a steep water table drop (from 7,500 feet to 7,150 feet elevation) along the north valley wall of the Red River with numerous seeps and under Guadalupe Mountain where fractures in dacite lava beds probably have great permeability.

The village of Cerro on the northeast side of Guadalupe Mountain appears to have a small local source of recharge from the northeast flank of Guadalupe Mountain with a water table elevation of 7,500 to 7,600 feet. Lack of recharge from drought conditions has lowered the water table in these mountain-front wells.

A water table low extends southeastward from Cerro, and may reflect the distal axis between recharge from the Sangre de Cristos to the northeast and the Guadalupe Mountains to the southwest, or may be drawndown from irrigation along the Cerro valley.

The water table remains flat under Guadalupe Mountain southwest to the Red River fault zone (Fig. 1), which appears to act as a permeability barrier to groundwater flow. The water table dips more steeply from the Red River fault zone to the Rio Grande and Red Rivers (Fig. 1), across the BLM Wild and Scenic Rivers Recreation Area where several springs, such as Big Arsenic Springs, discharge groundwater to these rivers.

Sunshine Valley

The water table dips gently westward in Quaternary gravels toward the Rio Grande. Springs are seen in the Rio Grande canyon walls north of the Chiflo Crossing. The water table lies just below the surface in the Sunshine Valley, and has risen 50 to 100 feet since the intense irrigation of the l960's (Garrabrant, 1993). The western Sunshine Valley is underlain by Servilleta Basalt dipping eastward. Faulting may play some part in local elevation changes of the water table. Near the Colorado state line groundwater recharge is coming from the San Luis Valley to the north and Costilla Creek to the east. Groundwater along Costilla Creek to Amalia occurs near the surface. Minor recharge may come from Ute Mountain.

GREATER PEÑASCO AREA

South of the Picuris Mountains the water table (Fig. 6) is in alluvial gravels near the river levels of the Rio Pueblo, Rio Santa Barbara and Chamisal Creek, with the main recharge from the Pecos Wilderness area far upstream. Only a few wells have been drilled on the terrace gravel hills between the streams. These wells suggest only a slight rise of water table away from the streams and therefore some minor recharge from local precipitation probably occurs. The high mountain recharge area seems to suffer less in drought years and little change is noted in the water table. Because the groundwater is so shallow, numerous septic tanks and barnyards may lead to ground-water contamination in this area.

The amount of groundwater storage in the alluvial stream sediments and thin Quaternary-Tertiary gravels is small due to limited thickness of those units.

Deeper groundwater aquifer storage might be available in the Miocene Picuris Formation gravels greater than 500 feet thick with recharge from the Picuris Mountains to the north. Deep groundwater flow westward maybe interrupted by a series of north-south faults, mapped by Bauer et al. (2003), in the Picuris Mountains just north of the Rio Pueblo. These faults, a continuation of the Pecos-Picuris and other fault systems, probably continue under the greater Peñasco area to the Truchas Peaks.

GROUNDWATER QUALITY

One hundred groundwater samples (Table 1) were contracted to be analyzed for forty major chemical elements by the New Mexico Bureau of Geology and Mineral Resources.

Water quality is rated excellent, although water is generally hard (greater than 150 ppm $CaCO_3$), probably indicative of relatively long residence time, especially west of the gorge.

Less desirable as drinking water were wells in upper Weimer, Cañon Heights, and along the Red River in Questa, with high levels of SO_4, Fe, Ca, Mg, Na, Al, Ni, Mo, and Sr. Wells northeast of Tres Piedras were highest in Zn, Ur, Pb, and exceeded EPA guidelines. Arsenic was higher west of the gorge, generally at .005-.010 ppm, and exceeds the new EPA guideline of .010 ppm in two wells. Flourine exceeded the EPA guideline of 4 ppm at one well in Vadito. Water samples from three hot springs on known surface faults (Ojo Caliente, Ponce de Leon and Manby) were all very high in TDS, HCO_3, SO_4, Fl, Br, Cl, Na, K, As, B, Fe, and Li. Other warm mineralized well waters are found mostly near interpreted subsurface faults and are probably upflowing groundwater from deeper magmatic heat sources.

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FIGURE 6. Peñasco area water table map.

TABLE 1. Taos County water analyses.

All values in ppm except for pH and conductivity. Hardness is reported as ppm $CaCO_3$. Nitrate is reported as ppm NO_3 not ppm nitrogen.

All values in ppm except for pH and conductivity. Hardness is reported as ppm $CaCO_3$. Nitrate is reported as ppm NO_3 not ppm nitrogen.

Well ID	UTM-E	UTM-N	Owner	pH	Conductivity	TDS	Hardness	HCO_3	Cl	SO_4	NO_3	PO_4	F	Br	Na	K	Mg	Ca	SiO_2	Ag	Al	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Hg	Li	Pb	Mn	Mo	Ni	Se	Sr	Th	U	V	Zn
AH-3	438933	4043868	Wiard	8.20	304	200	111	145	3.3	32	3	<0.5	0.19	<0.1	17	4.1	7.5	32	29	<0.001		<0.001	0.037			<0.001	0.002	<0.001	0.009	0.007	<0.0001	<0.01	<0.001	<0.001	0.006	<0.001	<0.001	0.201	<0.001	0.004	0.004	0.146
AH-19	438330	4042611	Colonias	7.90	416	280	169	182	4.3	62	2.1	<0.5	0.71	<0.1	25	1.8	12	48	30	<0.001		<0.001	0.041			<0.001	0.011	<0.001	0.002	0.566	<0.0001	<0.01	<0.001	<0.001	0.01	<0.001	<0.001	0.277	<0.001	0.007	0.013	0.011
AS-3	448437	4041132	Bridgers	7.20	397	250	172	235	8	8	3.7	<0.5	0.37	<0.1	23	1.2	12	49	25	<0.001		<0.001	0.032			<0.001	0.001	<0.001	0.013	0.011	<0.0001	<0.01	<0.001	<0.001	0.001	<0.001	<0.001	0.255	<0.001	0.002	0.001	0.004
CAR-1	427638	4023980	Busick	7.80	317	220	132	178	2.6	7.6	11	<0.5	0.31	<0.1	13	3.7	12	33	49	<0.001		0.005	0.03			<0.001	0.007	<0.001	0.003	0.01	<0.0001	0.03	<0.001	<0.001	<0.001	<0.001	<0.001	0.32	<0.001	0.004	0.021	0.004
CAR-3	427324	4022672	Phillip	8.20	249	190	72	136	2.4	8.6	5.7	<0.5	0.56	<0.1	23	3.5	6	19	52	<0.001		0.007	0.035			<0.001	0.007	<0.001	0.022	0.21	<0.0001	0.03	<0.001	0.002	0.001	<0.001	<0.001	0.22	<0.001	0.002	0.021	0.45
CAR-5	427915	4021508	Definbaug	7.90	268	190	91	150	1.9	6.7	6.7	<0.5	0.49	<0.1	20	4.2	6.3	26	45	<0.001		0.012	0.06			<0.001	0.005	<0.001	0.002	0.008	<0.0001	0.03	<0.001	<0.001	0.002	<0.001	0.002	0.29	0.003	<0.001	0.022	0.012
CAR-8	426919	4018938	Logue	7.80	283	210	119	172	2	5.7	4.4	<0.5	0.47	<0.1	13	4.4	8.8	33	48	<0.001		0.007	0.039			<0.001	0.003	<0.001	0.009	0.013	<0.0001	0.03	<0.001	<0.001	<0.001	<0.001	<0.001	0.28	<0.001	0.004	0.016	0.36
CAR-19	428619	4020712	Stephens	8.40	269	180	95	159	1.8	8	2.9	<0.5	0.45	<0.1	21	4.2	4.9	30	30	<0.001		0.002	0.077			<0.001	0.002	<0.001	0.006	0.195	<0.0001	0.03	0.001	<0.001	0.001	<0.001	<0.001	0.51	<0.001	0.002	0.006	0.06
CAR-22	428681	4018706	Beirc	7.80	277	200	100	160	2	8.3	3.7	<0.5	0.48	<0.1	19	3.9	8	27	43	<0.001		0.004	0.027			<0.001	0.004	<0.001	0.003	0.022	<0.0001	0.03	<0.001	<0.001	0.001	<0.001	<0.001	0.25	<0.001	0.003	0.01	0.078
CAR-25	428353	4020879	Schwilling	7.90	270	190	96	156	2.1	5.7	7.5	<0.5	0.51	<0.1	18	4.4	6.3	28	43	<0.001		0.005	0.072			<0.001	0.005	<0.001	0.003	0.008	<0.0001	0.04	<0.001	<0.001	0.001	0.001	<0.001	0.42	<0.001	0.003	0.012	0.13
CAR-31	431408	4024479	Boxberger	8.10	248	190	92	140	2.2	8	5.5	<0.5	0.62	<0.1	19	4.3	6	27	52	<0.001		0.005	0.072			<0.001	0.005	<0.001	0.002	0.008	<0.0001	0.03	0.001	<0.001	0.001	0.001	<0.001	0.42	<0.001	0.003	0.01	0.134
CAR-35	428091	4023946	Roby	7.70	293	210	119	164	2.4	6.7	10	<0.5	0.33	<0.1	13	3.5	12	28	48	<0.001		0.005	0.029			<0.001	0.005	<0.001	0.004	0.05	<0.0001	0.02	<0.001	0.001	<0.001	<0.001	<0.001	0.3	<0.001	0.004	0.013	0.05
CAR-49	427939	4021345	McRae	8.00	264	190	97	145	2.3	5.4	11	<0.5	0.5	<0.1	18	3.7	9	24	48	<0.001		0.007	0.023			<0.001	0.005	<0.001	0.017	0.04	<0.0001	0.02	0.001	0.002	0.001	<0.001	<0.001	0.23	0.001	0.003	0.016	0.022
CER-22	445589	4067402	Martinez	7.40	490	380	267	222	23	55	42	<0.5	0.25	0.29	22	2	20	74	26	<0.001	0.004	<0.001	0.093		0.016	<0.001	<0.001	<0.001	0.023	0.14	<0.0001	0.004	<0.001	<0.001	0.001	<0.001	0.001	0.56	<0.001	0.01	<0.001	0.028
CER-23	439961	4059597	BLM/WRRA VC	8.30	210	180	81	108	8.1	24	3.6	<0.5	1.1	<0.1	24	3	5.7	23	34	<0.001	0.005	0.002	0.015		0.03	<0.001	0.002	<0.001	0.051	<0.05	<0.0001	0.024	0.001	0.001	0.004	<0.001	<0.001	0.18	<0.001	0.003	0.006	0.05
CER-25	448298	4077608	Donnithorn	7.70	110	90	54	75	1.1	2.5	1.1	<0.5	0.33	<0.1	5.9	0.75	3.9	15	20	<0.001	0.006	<0.001	0.008		0.009	<0.001	<0.001	<0.001	0.02	0.11	<0.0001	0.001	0.002	0.001	0.003	<0.001	<0.001	0.13	<0.001	<0.001	0.001	0.01
CER-26	446967	4068360	Gwinn	7.44	170	140	80	112	1.9	8.4	1.9	<0.5	0.28	<0.1	9.9	1.5	6.1	22	28	<0.001	<0.001	<0.001	0.034		0.008	<0.001	<0.001	<0.001	0.009	0.09	<0.0001	0.003	<0.001	0.005	0.003	<0.001	<0.001	0.16	<0.001	<0.001	<0.001	1.1
CER-27	444491	4072350	Eaton	7.32	94	80	37	37	1.3	1.5	2.9	<0.5	0.5	<0.1	5.9	0.6	2.9	10	24	<0.001	0.016	<0.001	0.018	<0.001	0.006	<0.001	<0.001	<0.001	0.02	<0.05	<0.0001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.095	<0.001	<0.001	0.002	0.017
CH-1	433127	4003494	Wagner	7.41	490	360	247	336	10	8.4	4.8	<0.5	0.73	0.2	32	2.7	15	74	43	<0.001	<0.001	0.003	0.1		0.042	<0.001	0.001	<0.001	0.049	<0.05	<0.0001	0.022	<0.001	<0.001	0.003	<0.001	0.002	0.98	<0.001	0.016	0.006	0.003
CH-25	434171	3996642	Schiller	7.14	405	230	190	240	4.2	6.5	6.4	<0.5	0.28	<0.1	8.6	0.79	7.3	64	15	<0.001	<0.001	<0.001	0.27	<0.001	0.014	<0.001	<0.001	<0.001	0.011	<0.05	<0.0001	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	0.26	<0.001	0.002	0.002	0.071
CH-26	435732	3999276	Lopez/Duran	7.23	380	220	168	225	4.6	8.6	1.1	<0.5	0.35	0.12	12	1.5	9.2	52	17	<0.001	0.004	<0.001	0.14	<0.001	0.019	<0.001	<0.001	<0.001	0.004	<0.05	<0.0001	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	0.31	<0.001	0.003	0.003	0.004
CH-27	429740	4002193	Samson	6.69	580	350	263	335	8.7	22	0.39	<0.5	0.61	0.22	19	1.4	13	84	28	<0.001	<0.001	0.001	0.15	<0.001	0.021	<0.001	0.002	<0.001	0.003	<0.05	<0.0001	0.048	0.005	0.048	0.002	0.002	<0.001	0.51	<0.001	0.007	0.004	0.011
CN-12	450728	4026818	Smith	7.09	2610	2710	1956	295	36	1800	<0.1	<0.5	0.17	0.27	38	3.1	190	470	23	<0.001	<0.001	<0.001	0.008	<0.001	0.058	<0.001	0.001	<0.001	0.005	3.4	<0.0001	0.022	<0.001	0.320	<0.001	0.006	0.001	2.4	<0.001	0.001	<0.001	0.098
CN-27	440178	4027249	Lenwell	7.41	653	450	370	424	14	50	0.3	<0.5	0.15	<0.1	13	0.97	22	112	21	<0.001	0.002	<0.001	0.16	<0.001	0.053	<0.001	0.002	<0.001	0.11	<0.05	<0.0001	0.003	0.004	<0.001	<0.001	0.001	<0.001	0.61	<0.001	0.006	<0.001	0.073
COR-17	441655	4026037	Peck	7.30	597	390	241	280	13	75	5.2	<0.5	0.85	0.13	32	13	10	80	20	<0.001		<0.001	0.036			<0.001	0.001	<0.001	0.002	0.253	<0.001	<0.01	<0.001	0.004	0.003	<0.001	0.001	0.427	<0.001	0.004	<0.001	0.022
COR-33	444042	4027656	Romero	8.30	161	110	45	83	3	8.7	2.1	<0.5	0.2	<0.1	18	13	0.54	17	19	<0.001		<0.001	0.021			<0.001	0.009	<0.001	<0.001	0.017	<0.0001	<0.01	<0.001	<0.001	0.001	<0.001	<0.001	0.116	<0.001	0.001	0.008	0.01
COS-1	448128	4082269	Cisneros	7.29	250	180	119	155	3.2	11	7.6	<0.5	0.5	0.1	14	1.7	7.1	36	25	<0.001	0.001	<0.001	0.082		0.025	<0.001	<0.001	<0.001	0.42	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.22	<0.001	0.004	0.002	0.018
COS-2	443956	4090732	Johnson	7.77	146	120	75	87	3.9	5.4	5.2	<0.1	0.41	0.11	6.7	1.2	3.6	24	23	<0.001	<0.001	<0.001	0.053		0.009	<0.001	0.002	<0.001	0.023	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.16	<0.001	0.003	0.002	0.032
COS-3	459817	4089320	Salazar	6.93	390	300	220	256	6.5	30	<0.1	<0.5	1.4	<0.1	18	1.5	14	65	30	<0.001	0.004	<0.001	0.095		0.019	<0.001	<0.001	<0.001	0.75	0.2	<0.0001	0.011	0.001	0.043	0.002	0.001	<0.001	0.54	<0.001	0.008	<0.001	0.21
COS-4	461020	4084388	Garcia	6.89	465	280	165	225	17	24	6.1	<0.5	0.11	0.13	30	1.4	11	48	26	<0.001	0.001	<0.001	0.16	<0.001	0.013	<0.001	0.001	<0.001	0.03	<0.05	<0.0001	0.032	<0.001	<0.001	0.002	<0.001	<0.001	0.64	<0.001	0.005	0.002	0.01
DM-1	446164	4042169	Arroyos del Norte	8.10	383	230	164	180	13	25	8.2	<0.5	0.15	0.22	14	1.8	9.6	50	19	<0.001		<0.001	0.067			<0.001	0.005	<0.001	0.068	0.023	<0.001	<0.01	<0.001	<0.001	0.003	<0.001	0.001	0.342	<0.001	0.009	0.004	0.074
DM-29	444790	4042187	Mann	8.00	173	160	110	131	1.7	17	0.78	<0.5	<0.1	<0.1	6.7	2.3	7.3	32	30	<0.001	0.016	<0.001	0.001			<0.001	<0.001	<0.001	0.025	0.078	<0.001	<0.01	0.002	0.003	0.003	<0.001	<0.001	0.183	<0.001	0.002	0.002	0.933
DM-45	446346	4044594	Holthouse	7.30	330	220	152	125	1.5	63	0.68	<0.5	0.15	<0.1	8.5	1.7	9.6	45	34	<0.001		<0.001	0.029			<0.001	0.002	<0.001	0.015	0.006	<0.0001	<0.01	<0.001	<0.001	0.003	<0.001	0.001	0.416	<0.001	<0.001	0.001	0.002
DM-51	442490	4042240	Jaramillo	7.50	414	250	164	239	2.4	19	3.3	<0.5	0.21	0.31	21	1.3	7.8	53	25	<0.001	0.002	<0.001	0.11			<0.001	<0.001	<0.001	0.005	<0.001	<0.0001	<0.01	<0.001	<0.001	0.002	<0.001	<0.001	0.31	<0.001	0.016	0.002	0.17
ES-5	449973	4042257	Wiggin	8.00	168	150	89	133	0.42	4.9	1.5	0.11	0.13	<0.1	12	1.3	6.5	25	33	<0.001		<0.001	0.033			<0.001	0.001	<0.001	0.008	0.018	<0.0001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	0.143	<0.001	<0.001	0.005	0.001
HM-3	438528	4040408	Allen	7.60	220	150	67	80	5	20	12	<0.5	0.15	0.15	13	1.3	3.6	21	31	<0.001	0.056	<0.001	0.045			<0.001	0.007	<0.001	0.008	<0.1	<0.0001	<0.01	<0.001	0.003	0.002	<0.001	0.002	0.16	<0.001	0.001	0.003	0.025
HM-5	437056	4042068	Bauch	8.00	231	160	93	102	2.7	27	3.7	<0.5	0.17	<0.1	11	2.6	5.5	28	29	<0.001	<0.001	<0.001	0.016			<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.003	<0.001	<0.001	0.161	<0.001	<0.001	0.004	0.004
HM-6	441533	4038992	Vann	8.10	175	130	48	85	3.1	11	3.9	<0.5	0.25	<0.1	18	2.9	1.9	16	27	<0.001	0.001	<0.001	0.009			<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	0.076	<0.001	<0.001	0.006	0.196
LL-2	440229	3998365	Tafoya	7.57	270	190	156	183	2.3	13	3.6	<0.5	0.2	<0.1	4.6	0.48	3.9	56	16	<0.001	0.003	<0.001	0.17		0.01	<0.001	0.001	<0.001	0.003	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	0.17	<0.001	<0.001	0.001	0.011
LL-4	441605	3999984	Alley	7.52	394	290	210	275	1.9	25	3.1	<0.5	0.89	<0.1	20	1.6	14	61	23	<0.001	0.004	<0.001	0.086		0.035	<0.001	0.001	<0.001	0.011	<0.05	<0.0001	0.026	0.004	0.001	0.001	<0.001	0.002	0.45	<0.001	0.003	0.001	1.1
LL-6	440691	3999593	Martinez, A	6.84	355	200	164	164	8.8	23	1.2	<0.5	0.22	<0.1	4.4	1.4	5.9	56	12	<0.001	0.008	<0.001	0.13	<0.001	0.007	<0.001	<0.001	<0.001	0.014	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	0.23	<0.001	0.002	<0.001	0.032
LLC-8	442781	4031872	Heider	8.00	173	120	58	87	3.2	8.7	3.3	<0.5	0.23	<0.1	14	1.3	1.9	20	22	<0.001	0.003	<0.001	0.016			<0.001	0.009	<0.001	0.002	<0.001	<0.001	<0.01	<0.001	<0.001	0.002	<0.001	<0.001	0.117	<0.001	0.001	0.004	0.008
LLC-11	444471	4033463	Concha	7.50	1040	710	439	168	96	270	9	<0.5	0.52	1.9	70	1.3	23	138	22	<0.001	0.007	<0.001	0.043			<0.001	0.007	<0.001	0.001	0.114	<0.001	<0.01	<0.001	0.003	0.002	<0.001	0.009	0.498	<0.001	0.055	0.001	0.012
LLC-34	446351	4031828	Paradis	7.50	335	220	142	160	3.9	37	4.5	<0.5	0.17	<0.1	14	0.94	8.3	43	27	<0.001	0.001	<0.001	0.019			<0.001	0.003	<0.001	0.018	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	0.001	0.207	<0.01	0.006	0.002	0.003
LLC-40	444172	4030925	Mailand	6.50	388	250	132	180	11	31	4.8	<0.5	0.32	0.19	30	0.64	7.9	40	30	<0.001	<0.001	<0.001	0.046			<0.001	<0.001	<0.001	0.055	<0.001	<0.001	<0.01	0.002	<0.001	<0.001	<0.001	<0.001	0.204	<0.001	0.003	0.001	0.073
LQ-11	443863	4023023	Torres	7.40	714	470	232	405	7.4	63	6.5	<0.5	0.84	<0.1	85	2.5	14	70	23	<0.001		<0.001	0.484			<0.001	0.002	<0.001	0.032	0.014	<0.0001	0.03	<0.001	0.001	0.002	<0.001	<0.001	0.529	<0.001	0.016	0.002	0.418
LR-1	445220	4027950	Vigil	7.40	560	360	266	309	7.6	50	4.2	<0.5	0.26	<0.1	25	1.5	13	85	20	<0.001		<0.001	0.08			<0.001	0.013	<0.001	<0.001	0.642	<0.0001	<0.01	<0.001	0.001	0.001	<0.001	0.001	0.44	<0.001	0.02	0.006	<0.001
MLC-5	443009	4035028	Concha	7.60	212	140	82	110	3.6	12	4.3	<0.5	0.19	<0.1	14	0.93	3.5	27	22	<0.001	<0.001	<0.001	0.033			<0.001	0.009	<0.001	0.011	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	0.001	0.14	<.001	0.001	0.002	0.008
MLC-27	438866	4037368	Podleski	7.40	178	130	32	93	2.3	11	0.77	<0.5	0.37	<0.1	26	3.4	1.1	11	28	<0.001	0.012	0.002	0.007			<0.001	0.003	<0.001	0.007	0.19	<0.001	<0.01	0.002	0.007	0.002	0.002	<0.001	0.416	<0.001	<0.001	0.003	0.036
MLC-31	438560	4037606	Keating	8.30	176	120	29	82	1.9	14	2.9	<0.5	0.2	<0.1	22	1.5	1.4	9.2	25	<0.001	0.003	0.001	0.008			<0.001	0.006	<0.001	0.009	1.4	<0.0001	0.01	<0.001	0.039	0.002	<0.001	0.001	0.59	<0.001	<0.001	0.009	0.012
MLC-34	436689	4039950	Palma	8.30	167	130	63	100	1.5	13	1.5	<0.5	0.26	<0.1	15	3	5	17	27	<0.001		<0.001	0.006			<0.001	0.005	<0.001	<0.001	0.017	<0.0001	<0.01	<0.001	<0.001	0.005	<0.001	<0.001	0.111	<0.001	0.001	0.003	0.002
MLC-38	443013	4037316	Ferguson	7.90	228	150	95	112	4.3	16.4	4.1	<0.5	0.18	<0.1	12	0.97	4.9	30	23	<0.001	0.003	<0.001	0.03			<0.001	0.006	<0.001	0.004	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	0.001	0.165	<0.001	0.002	0.002	0.012
MLC-42	438118	4038520	Thompson	8.20	213	140	66	90	2.5	20	5.1	<0.5	0.21	<0.1	14	1.9	3.8	20	25	<0.001		<0.001	0.019			<0.001	0.009	<0.001	0.007	0.019	<0.001	<0.01	<0.001	<0.001	0.003	<0.001	<0.001	0.167	<0.001	0.001	0.005	0.188
OC-2	406024	4018671	Ojo Caliente well	7.35	900	720	378	396	77	158	0.11	<0.5	0.67	0.37	115	4.2	30	102	34	<0.001	<0.001	0.005	0.081		0.27	<0.001	0.001	<0.001	0.016	0.09	<0.0001	0.23	<0.001	0.055	0.003	0.002	<0.001	0.99	<0.001	0.021	0.005	0.011
PEN-3	438710	4002961	Kit Carson	6.91	455	260	221	250	4.5	24	0.38	<0.5	0.21	<0.1	4	0.79	5.2	80	12	<0.001	0.004	<0.001	0.24	<0.001	0.008	<0.001	0.001	<0.001	0.023	0.44	<0.0001	0.006	<0.001	0.003	<0.001	0.001	<0.001	0.23	<0.001	0.001	<0.001	0.19
Q-11	447415	4061102	Sanchez	6.86	330	260	169	46	4.7	146	0.28	<0.5	1	<0.1	6.6	1.8	10	51	12	<0.001	0.006	<0.001	0.035		0.005	<0.001	<0.001	<0.001	0.002	7.5	<0.0001	0.003	0.003	0.160	0.024	0.004	<0.001	0.34	<0.001	<0.001	<0.001	0.11
Q-19	447799	4065549	Klose	7.58	230	180	113	135	3	24	1.8	<0.5	0.46	<0.1	15	1.5	9.2	30	29	<0.001	0.002	<0.001	0.04		0.022	<0.001	<0.001	<0.001	0.017	0.08	<0.0001	0.005	<0.001	<0.001	0.004	<0.001	<0.001	0.19	<0.001	0.001	0.001	0.02
Q-20	444434	4060885	Herrera	7.32	1682	1670	1013	205	15	1050	1.7	<0.5	0.3	0.2	98	1.9	50	323	23	<0.001	<0.001	<0.001	0.06		0.04	<0.001	<0.001	0.001	0.004	1.1	<0.0001	0.006	<0.001	0.007	0.02	0.003	0.001	1.7	<0.001	0.029	<0.001	0.007
Q-21	446898	4060944	Duran	6.60	380	320	216	60	4.4	178	1.3	<0.5	1.2	<0.1	7	1.4	13	65	17	<0.001	0.004	<0.001	0.028		0.005	<0.001	<0.001	<0.001	0.007	0.22	<0.0001	0.002	<0.001	<0.001	0.021	0.004	<0.001	0.38	<0.001	<0.001	<0.001	0.031
Q-22	447621	4061656	Village of Questa	7.68	320	240	130	200	1.4	36	3	<0.5	0.76	<0.1	30	0.97	6.8	41	19	<0.001	<0.001	<0.001	0.039		0.053	<0.001	<0.001	<0.001	0.019	0.14	<0.0001	0.002	0.003	<0.001	0.005	<0.001	<0.001	0.26	<0.001	0.004	<0.001	0.026
Q-23	452157	4064456	Rael	7.39	850	740	548	143	3	440	0.55	<0.5	1.5	<0.1	14	1.3	36	160	11	<0.001	<0.001	<0.001	0.01		0.008	<0.001	<0.001	<0.001	0.002	0.58	<0.0001	0.013	<0.001	0.009	<0.001	0.002	0.001	1.2	<0.001	<0.001	<0.001	0.19
RL-8	435226	4005271	Gurule	6.96	540	320	260	280	6.8	26	19	<0.5	0.18	<0.1	8	0.38	8.6	90	24	<0.001	<0.001	<0.001	0.16	<0.001	0.015	<0.001	0.001	<0.001	0.012	0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.45	<0.001	0.002	0.001	0.017
RR-1	462636	4061451	Town of Red River	6.93	310	190	141	94	1.1	75	0.4	<0.5	0.22	<0.1	3.1	0.72	6.4	46	8.1	<0.001	0.001	<0.001	0.038	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.05	<0.0001	0.005	<0.001	<0.001	0.002	<0.001	<0.001	0.28	<0.001	0.001	<0.001	0.003
SC-3	441648	4050132	Sharfin	6.80	212	280	199	231	4.8	32	5.3	<0.5	0.16	<0.1	18	1.1	10	63	25	<0.001	<0.001	<0.001	0.189			<0.001	<0.001	<0.001	0.02	0.39	<0.001	<0.01	0.002	<0.001	0.002	<0.001	0.001	0.388	<0.001	0.004	<0.001	0.02
SW-4	441478	4022493	UNM Klauer	8.70	285	190	6	93	11	32	<0.1	<0.5	0.55	<0.1	57	0.22	0.02	2.5	34	<0.001	0.003	0.016	<0.001			<0.001	<0.001	<0.001	0.003	<0.01	<0.0001	0.01	<0.001	<0.001	0.002	<0.001	<0.001	0.006	<0.001	<0.001	0.051	0.024
SW-7	441949	4023536	Kragel	7.40	641	410	283	191	31	120	9.2	<0.5	0.33	0.41	21	2.2	11	95	25	<0.001		<0.001	0.066			<0.001	0.002	<0.001	0.002	0.013	<0.0001	<0.01	<0.001	<0.001	<0.001	<0.001	0.004	0.545	<0.001	0.03	0.002	0.036
SW-30	439778	4018578	Orner	7.80	364	260	148	190	12	13	1.8	<0.5	0.54	0.23	14	3.8	11	41	64	<0.001		0.002	0.155			<0.001	0.007	<0.001	0.005	0.097	<0.001	<0.01	<0.001	<0.001	0.002	<0.001	0.002	0.39	<0.001	0.003	0.011	1.03
TC-1	455042	4026070	Vaughn	7.12	1000	670	506	325	9.3	290	0.39	<0.5	0.18	0.1	21	1.3	50	120	14	<0.001	0.02	<0.001	0.064	<0.001	0.023	<0.001	0.001	<0.001	0.012	0.25	<0.0001	0.01	<0.001	0.01	<0.001	<0.001	0.002	1.3	<0.001	0.003	<0.001	0.087
TP-10	413593	4057691	Schwartz	7.20	381	240	150	204	7.7	13.1	4.1	<0.5	2.4	0.19	17	1.9	11	42	41	<0.001		0.004	0.014			<0.001	<0.001	<0.001	0.022	<0.001	<0.0001	0.03	0.015	0.006	0.01	0.003	<0.001	0.26	<0.001	0.025	0.007	5.1
TP-13	429932	4052205	Painter	7.10	268	210	99	161	2	3.7	2.6	<0.5	0.36	<0.1	18	4.1	9	25	64	<0.001		0.004	0.018			<0.001	0.001	<0.001	0.048	0.002	<0.0001	0.04	0.001	<0.001	<0.001	<0.001	<0.001	0.224	0.001	<0.001	0.011	0.4
TP-14	426366	4051497	Mintz	7.80	218	180	78	129	1.6	3.6	2.2	<0.5	0.46	<0.1	14	3.6	7.3	19	60	<0.001		0.005	0.012			<0.001	0.002	<0.001	0.005	0.114	<0.0001	0.02	<0.001	0.002	0.001	<0.001	<0.001	0.17	<0.001	<0.001	0.013	0.037
TP-21	415852	4060361	Walker/Anderson	7.70	385	380	274	372	2.7	7.8	11	<0.5	0.31	<0.1	25	5.5	18	80	45	<0.001		<0.001	0.023			0.001	0.001	<0.001	0.024	0.073	<0.0001	0.05	0.033	0.006	0.002	0.002	0.002	0.59	<0.001	0.021	<0.001	5.3
TP-25	413157	4052732	Cope	7.30	393	270	184	210	14	11.5	3.8	<0.5	1.2	0.15	13	1.9	10	57	48	<0.001		0.002	0.023			<0.001	<0.001	<0.001	0.026	0.037	<0.0001	0.01	<0.001	<0.001	<0.001	0.001	0.002	0.382	<0.001	0.005	0.007	0.015
TR-1	432131	3998423	Gonzales	7.21	390	230	158	215	9.2	11	6.6	<0.5	0.85	0.15	17	1.6	7.5	51	21	<0.001	<0.001	0.001	0.027	<0.001	0.015	<0.001	<0.001	<0.001	0.011	<0.05	<0.0001	0.038	<0.001	<0.001	0.001	<0.001	<0.001	0.38	<0.001	0.01	0.002	0.004
ULC-11	445498	4036515	Senescu	6.80	182	110	64	97	2.2	3.2	3.9	<0.5	0.5	<0.1	10	0.67	4	19	19	<0.001	0.002	<0.001	0.016			<0.001	<0.001	<0.001	0.028	<0.1	<0.0001	<0.01	<0.001	<0.001	0.001	<0.001	<0.001	0.11	<0.001	<0.001	0.002	0.024
VAD-5	438327	4005380	Stanley	7.78	360	260	99	169	10.5	39	3.1	<0.5	9.3	0.18	53	3	4.7	32	21	<0.001	0.002	0.007	0.008		0.19	<0.001	<0.001	<0.001	0.023	<0.05	0.0002	0.025	0.002	<0.001	0.009	<0.001	0.001	0.62	<0.001	0.013	<0.001	0.08
VAD-13	443600	4003715	Borrego	7.00	695	400	324	295	54	40	0.79	<0.5	0.21	0.1	12	1.6	15	105	20	<0.001	<0.001	<0.001	0.16	<0.001	0.017	<0.001	0.002	<0.001	0.006	<0.05	<0.0001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	0.59	<0.001	0.003	0.002	0.051
W-6	449581	4025164	Felt	7.59	520	400	271	185	12	141	6.6	<0.5	0.19	0.19	28	1.1	13	87	21	<0.001	0.07	<0.001	0.03		0.025	<0.001	<0.001	<0.001	0.005	0.16	<0.0001	0.006	<0.001	0.003	<0.001	<0.001	0.005	0.26	<0.001	<0.001	<0.001	0.014
W-24	449844	4025048	Farr	8.02	700	540	245	289	4.5	202	<0.1	<0.5	0.5	<0.1	96	2.2	34	42	15	<0.001	0.26	<0.001	0.11		0.16	<0.001	0.001	<0.001	0.012	0.93	<0.0001	0.056	0.002	0.032	0.003	<0.001	<0.001	2.5	<0.001	<0.001	<0.001	0.004
WG-1	431593	4038837	Jones	7.20	281	220	100	173	2.7	4.2	2.4	<0.5	0.51	<0.1	20	4.9	8.4	26	61	<0.001		0.009	0.72			<0.001	0.001	<0.001	0.011	0.077	<0.0001	0.04	0.004	0.002	0.001	0.001	<0.001	0.23	<0.001	0.002	0.014	0.002
WG-2	431750	4043778	Benson	7.10	301	230	94	181	3	4.1	2.1	<0.5	0.28	<0.1	26	4.7	8.2	24	63	<0.001		0.008	0.049			<0.001	0.002	<0.001	0.01	0.015	<0.0001	0.07	<0.001	<0.001	<0.001	<0.001	0.13	0.21	<0.001	0.002	0.016	0.014
HM-42	435200	4040400	Manby Hot Spgs	7.24	440	360	98	200	27	63	2.3	<0.5	1.9	0.15	70	6.3	5	31	56	<0.001	0.001	0.014	0.088	<0.001	0.15	<0.001	0.003	<0.001	0.002	0.07	0.0002	0.15	<0.001	<0.001	0.01	<0.001	<0.001	0.48	<0.001	0.003	0.02	<0.001
LQ-12	445636	4019834	Ponce de Leon Spg	8.60	650	500	37	95	90	127	0.86	<0.5	14	0.7	152	3.3	0.5	14	51	<0.001	0.006	0.004	<0.001		0.5	<0.001	<0.001	<0.001	0.005	0.025	<0.0001	0.2	<0.001	<0.001	0.028	<0.001	<0.001	0.18	<0.001	<0.001	<0.001	0.002
OC-1	405500	4018050	Ojo Cal. Iron Spg	6.93	3220	2590	96	2130	238	153	<0.1	<0.5	14	0.96	980	36	7.6	26	64	<0.001	0.003	0.22	0.095	0.041	1.8	<0.001	0.009	<0.001	0.039	0.68	<0.0001	3.1	<0.001	0.024	0.009	<0.001	<0.001	1.4	<0.001	0.007	0.002	<0.001