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Groundwater Resources Investigation Report – Flat Creek Watershed Analysis Jacumba Community Services District Jacumba Hot Springs, San Diego County, California

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TABLE OF CONTENTS

Section **Page No.**

TABLE OF CONTENTS (CONTINUED)

Section **Page No.**

APPENDICES

EXHIBITS

TABLE OF CONTENTS (CONTINUED)

Page No.

FIGURES

TABLES

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GLOSSARY OF TERMS AND ACRONYM

afy	Acre-Feet per Year
amsl	Above Mean Sea Level
APN	Assessor's Parcel Number
bgs	below ground surface
btoc	below top of casing
CIMIS	California Irrigation Management Information System
CN	Curve Number
CNM	Curve Number Method
County	County of San Diego
DDW	Division of Drinking Water
DG	decomposed granite
DPLU	Department of Planning and Land Use
DWR	Department of Water Resources
ET	Evapotranspiration
EPA	Environmental Protection Agency
FWS	U.S. Fish and Wildlife Services
GMMP	Groundwater Monitoring and Mitigation Plan
gpd	gallons per day
gpd/ft	gallons per day/foot
gpm	gallons per minute
HSA	Hydrologic Subarea
IFSAR	Interferometric Synthetic Aperture Radar
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
µg/L	Micrograms per Liter
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resource Conservation Service
NWS	National Weather Service
P	Precipitation
PDS	Planning and Development Services
Q	Runoff
RL	Rural Lands
RWQCB	Regional Water Quality Control Board
SR	Semi-rural Residential
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids

TOC	Top of Casing
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds
VR	Village Residential

EXECUTIVE SUMMARY

In accordance with San Diego County Planning guidance, Dudek has prepared this groundwater resources investigation report to examine the potential impact of the Jacumba Community Services District (JCSD) extracting additional water supply on groundwater resources within Jacumba Hot Springs, California. The water extracted by JCSD would be used to meet additional water supply for the District including use for construction projects (Project).

JCSD is proposing the use of the Park Well and the potential development and use of replacement well(s) for JCSD Wells 1 and 2 as a secondary source of groundwater to serve JCSD customers. This analysis addresses potential impacts on JCSD groundwater resources based on the Project producing up to 100 acre-feet per year of additional water supply. The significant results of the groundwater resource investigation report are as follows:

- The water demand from the Park Well and replacement well(s) is expected to be up to 32.6 million gallons, or 100 acre-feet per year.
- The peak water demand for the Park Well and replacement wells(s) is anticipated to be approximately 200 gallons per minute (288,000 gallons per day).
- The current groundwater storage in the alluvium underlying the Jacumba Valley, including the portion of the watershed located in Mexico, is conservatively estimated to be 6,014 acre-feet.
- The volume of groundwater storage would not be reduced to 50% or less than the maximum storage in the aquifer as a result of additional pumping for JCSD water supply, provided water level thresholds were established to maintain groundwater in storage.
- The estimated water level drawdown resulting from groundwater production from the Park Well after 90 days, 1 year and 5 years is predicted to be 0.58 feet, 1.36 feet, and 3.79 feet, respectively at Well Km. Based on the County of San Diego well interference threshold guidance for alluvial wells, this drawdown is less than significant.
- The estimated drawdown at the nearest groundwater dependent habitat as a result of groundwater production from the Park Well after 90 days, 1 year and 5 years is predicted to be 0.69 feet, 1.46 feet, and 3.92 feet, respectively and would not exceed the historical low water level recorded in the Jacumba Valley alluvium. Thus, impacts to groundwater dependent habitat resulting from Project water production would be less than significant.
- Water quality analyses of the Park Well indicate elevated concentrations of volatile organic compounds (VOCs) and hydrocarbons. This water quality is acceptable for

construction use after wellhead treatment, if necessary. Therefore, impacts due to the use of non-potable water would be less than significant.

A separate Groundwater Monitoring and Mitigation Plan (GMMP) has been prepared for the proposed groundwater extraction from the Park Monitoring Well and additional replacement well(s), which details thresholds for off-site well interference, groundwater in storage and groundwater dependent habitat. The GMMP will provide recommendations for ongoing water level monitoring and establish groundwater thresholds for off-site well interference, groundwater in storage, and groundwater dependent habitat.

1 INTRODUCTION

1.1 Purpose of the Report

This groundwater resources investigation was prepared on behalf of Jacumba Community Services District (JCSD) by Dudek for submittal to County of San Diego Planning and Development Services (PDS) to satisfy groundwater resource investigation scoping requirements outlined in Guidelines for Determining Significance and Report Format and Content Requirements—Groundwater Resources (County of San Diego, 2007). This groundwater resource investigation evaluates the use of up to 100 acre-feet per year (afy) of groundwater from JCSD's Park Well and potentially replacement well(s) for JCSD Wells 1 and 2 yet to be drilled in the same or similar location(s). The results of this investigation should not be relied upon for use in any other groundwater proposal subject to County review in Jacumba Hot Springs, California.

1.2 Project Location

The JCSD is located in Jacumba Hot Springs on the international border with Mexico in southeastern San Diego County, California (Figures 1 and 2). JCSD operates several water supply wells that serve approximately 561 residents or 294 total housing units (US Census 2010). In addition, several commercial entities are supplied by the JCSD. The Park Well is within assessor's parcel number (APN) 660-140-07, located on the south side of Old Highway 80 between Heber Street and Campo Street, within Jacumba Community Park (Figures 2). JCSD owns the parcel and operates the well (currently inactive), which is completed to a depth of 124 feet below the ground surface (bgs) with a 4-inch PVC casing and a screened interval from 79 to 124 feet feet bgs. It is estimated to have a production capacity of approximately 80 gallons per minute (gpm) based on aquifer pump testing (Petra, 2006).

The study area for the purpose of discussions of groundwater storage is the area of the Jacumba Valley alluvium. The study area for the purpose of discussions of recharge is the Flat Creek and Boundary Creek watersheds (see Section 2.1). The study area for the purpose of well interference is the 0.5 mile radius around the Park Well.

1.3 Project Description

JCSD is proposing the use of the Park Well and the potential development and use of replacement well(s) as a secondary source of groundwater to serve JCSD customers.[1] In accordance with California regulations governing new and existing drinking water source capacity, JCSD is required to have a minimum of two approved sources capable of meeting the

[1] As per CCR, Title 22, Section 60101 Specific Activities within Categorical Exemption Classes (Class 1), water wells of substantially the same capacity are CEQA exempt.

service area's maximum day demand in a scenario where its highest capacity source goes off line (CCR Section 64554(b)(4)(c)). The only active well currently used by JCSD to serve potable water demands is Well 4, located on the western portion of Jacumba Hot Springs north of Old Highway 80. Well 4 has an approximate production capability of 175 gallons per minute (gpm). Based on available data from Barrett Consulting Group (Barrett, 1996), JCSD produced between 86 and 146 acre-feet annually from 1991 to 1995. More recent production data indicates Well 4 produced 85 acre-feet in 2013 and 80 acre-feet in 2014.

Based on historical patterns of production, JCSD is proposing to develop additional production capacity of 100 afy of groundwater from APN 660-140-07, using the Park Well and/or replacement well(s) yet to be completed. These wells are intended to serve as a redundant backup supply in the event JCSD's main potable supply well goes offline as well as to increase the reliability and versatility of JCSD's water supply system. In addition, JCSD intends to use these wells to supplement its sales of non-potable water from Well 6 for construction related uses in the region. To facilitate sales of water suitable for construction-related uses, water will be extracted from the Park Well using a new submersible pump and discharged to a 12,000 gallon water tower.

The Park Well and/or replacement well(s) will be used as a redundant/backup water supply or to supply water to commercial customers for non-potable use. JCSD is not proposing an increase in its number of residential service connections or its existing potable water service area.

This groundwater resources investigation is being prepared to analyze the potential effects on groundwater and surrounding groundwater users from production of 100 acre-feet annually. In order to assess potential short-term effects for supplying non-potable use, water supply may extracted at a rate up to 200 gallons per minute over a period of 90 days. Both the 90-day and 1-year water demands are analyzed in accordance with County Guidelines.

1.4 Applicable Groundwater Regulations

The County Guidelines for Determining Significance—Groundwater Resources contain a series of thresholds for determining significance for both groundwater quantity and groundwater quality. To evaluate impacts to groundwater resources, a water balance analysis is typically required. The County Guidelines for Determining Significance—Groundwater Resources contains the following guideline that, if met, would be considered a significant impact to local groundwater resources as a result of project implementation:

> For proposed projects in fractured rock and sedimentary basins, groundwater impacts will be considered significant if a soil moisture balance, or equivalent analysis, conducted using a minimum of 30 years of precipitation data, including drought

> periods, concludes that at any time groundwater in storage is reduced to a level of 50% or less as a result of groundwater extraction (County of San Diego 2007).

To evaluate off-site well interference in alluvial wells as a result of this project, the following guideline for determining significance is typically used:

> As an initial screening tool, off-site well interference will be considered a significant impact if after a five year projection of drawdown, the results indicate a decrease in water level of 5 feet or more in the off-site wells. If site-specific data indicates alluvium or sedimentary rocks exist which substantiate a saturated thickness greater than 100 feet in off-site wells, a decrease in saturated thickness of 5% or more in the off-site wells would be considered a significant impact (County of San Diego 2007).

To evaluate groundwater quality impacts as a result of this project, the following guideline for determining significance is typically used:

> Groundwater resources for proposed projects requiring a potable water source must not exceed the Primary State or Federal Maximum Contaminant Levels (MCLs) for applicable contaminants. Proposed projects that cannot demonstrate compliance with applicable MCLs will be considered to have a significant impact. In general, projects will be required to sample water supply wells for nitrate, bacteria (fecal and total coliform), and radioactive elements. Projects may be required to sample other contaminants of potential concern depending on the geographical location within the County.

To evaluate groundwater impacts to groundwater dependent habitat as a result of this project, the following guideline for determining significance is typically used:

> The project would draw down the groundwater table to the detriment of groundwater-dependent habitat, typically a drop of 3 feet or more from historical low groundwater levels (County of San Diego 2010a).[2]

The JCSD is a Water Service Agency regulated by the State Water Resources Control Board's Division of Drinking Water (DDW) (formerly California Department of Public Health's Drinking Water Program). Thus, JCSD is not subject to the County's Groundwater Ordinance (County of San Diego, 2013).

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[2] Studies have found that groundwater elevation reductions adversely affect native plant species. Two of the referenced studies (Integrated Urban Forestry, 2001 and National Research Council, 2002) found that a permanent reduction in groundwater elevation of greater than three feet is enough to induce water stress in some riparian trees, particularly willow (*Salix* spp.), cottonwood (*Populus* spp.) and *Baccharis* species.

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2 EXISTING CONDITIONS

2.1 Topographic Setting

Jacumba Hot Springs is located in the southeastern corner of San Diego County and is bordered by Imperial County to the east and Mexico to the south (Figures 1 and 2). The Jacumba Valley watershed covers a 119 square mile area with 70% of the watershed located in the state of Baja California, Mexico (Swenson, 1981). The Mexico side of the watershed is located in the Upper Carrizo Creek Hydrologic Unit as defined by the USGS (Figure 3). For this report, the naming conventions adopted by Swenson (1981) will be used. Flow from Mexico north into the Jacumba Valley will be referred to as derived from the Flat Creek watershed (Figure 10). The Flat Creek watershed does not include the Boundary Creek watershed, which is predominantly located in the United States. The Jacumba Valley ultimately drains through a narrow constriction north of Jacumba Hot Springs known as the Carrizo Gorge. Jacumba Hot Springs is located at an approximate elevation of 2,829 feet above mean sea level (amsl).

The Park Well is located south of Old Highway 80 at an approximate elevation of 2,810 feet amsl (Figure 2). The Park Well is located within the Jacumba Valley. The precipitation that recharges the Park Well falls predominantly within the Flat Creek watershed, which is tributary to Jacumba Valley (Figure 4). The Flat Creek watershed consists of approximately 52,405 acres, with 1,058 acres (2%) of the watershed located in the United States. The Flat Creek watershed ranges from 4,265 feet amsl and its headwaters along the Sierra Juarez Mountains to 2,810 feet amsl at the Park Well.

2.2 Climate

Jacumba experiences warm summer months and cool winters. Average temperatures vary greatly within the region. Mean maximum temperatures in the summer months reach the high-80s to low-90s (degrees Fahrenheit). Temperatures may fall below freezing in the winter, with snow levels occasionally below 2,500 feet.

Monthly precipitation records were obtained from the County of San Diego for a rain gauge previously located in Jacumba at 32°37' North latitude, 116°11' West longitude, and an elevation of 2,800 feet. The period of record available is from March 1963 until March 2011. Table 2-1 provides average monthly precipitation data, as well as the highest and lowest monthly precipitation for the Jacumba rain gauge.

Table 2-1
Precipitation Data Recorded at Jacumba Rain Gauge

Month	Rainfall (inches) – 1963–2011		
	Average	*Highest/ Year*	*Lowest*[a]
Jan.	1.45	5.79/ 1983	0
Feb.	1.66	10.86/ 1993	0
Mar.	1.82	6.76/ 1998	0
Apr.	1.45	7.13/ 1991	0
May	0.50	2.38/ 1965	0
June	0.19	2.24/ 1981	0
July	0.06	0.96/ 1984	0
Aug.	0.45	3.97/ 1984	0
Sep.	0.50	3.48/ 1992	0
Oct.	0.37	4.58/ 1976	0
Nov.	0.60	4.37/ 2004	0
Dec.	0.85	3.82/ 1965	0
Year	9.64	22.16/ 1982-83	2.26

Notes: Jacumba rain gauge located at N 32°37', W 116°11', at an elevation of 2,800 feet.
a. Lowest monthly recorded precipitation data is not available due to data gaps.
Source: Allan, R. B., 2013.

For the period between 1963 and 2011, the average annual precipitation at the Jacumba rain gauge was approximately 9.64 inches with 85% of the precipitation occurring between October and April. Annual precipitation totals at the Jacumba rain gauge vary from a high of 22.16 inches in the 1982 – 1983 water year to a low of 2.26 inches in the 2001 – 2002 water year (Exhibit 2-A).

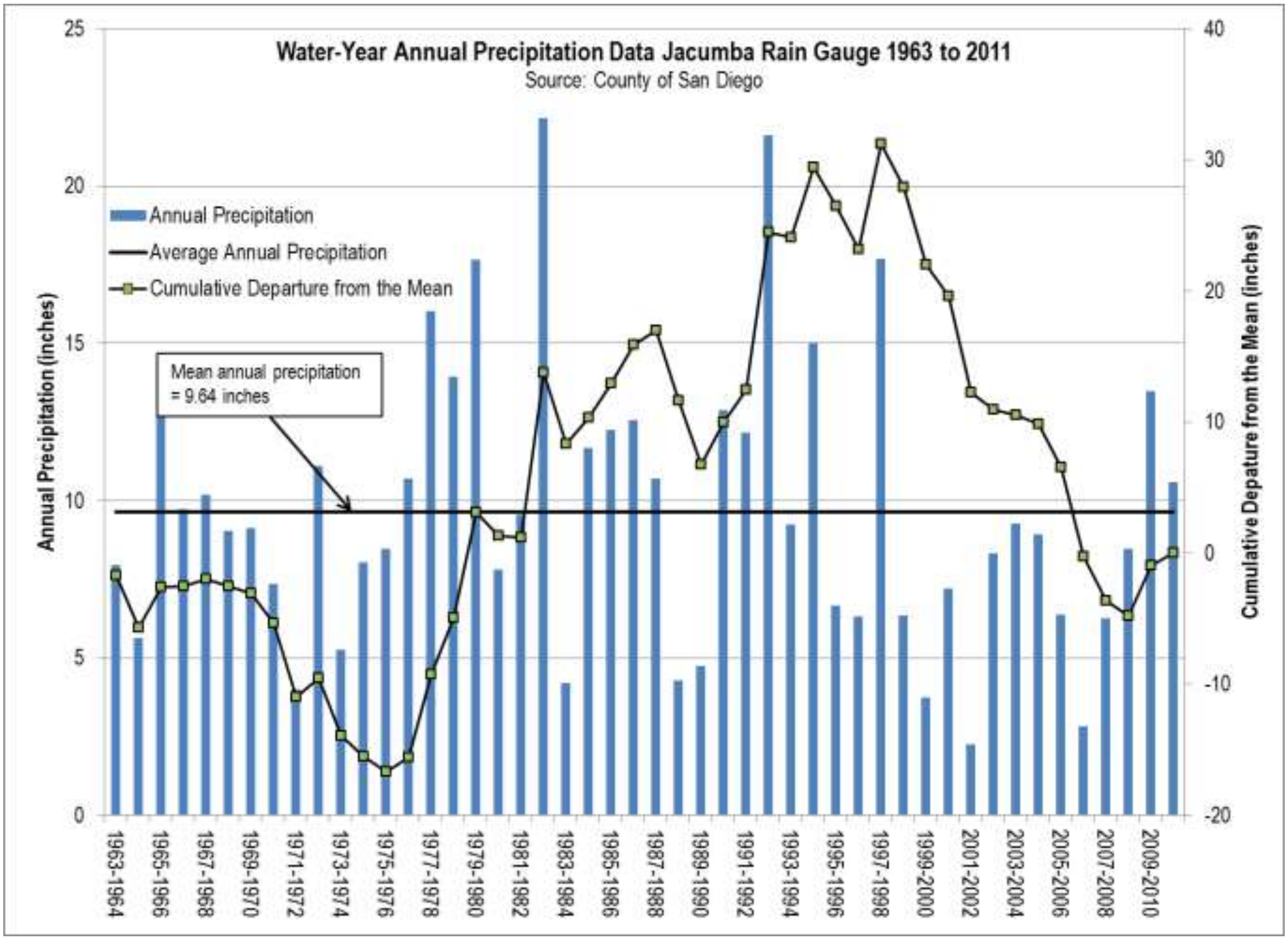
Precipitation records from four nearby rain gauges were obtained in order to determine annual average rainfall within the Flat Creek watershed. The rain gauges are located in Boulevard (two stations), Tierra del Sol, and Jacumba. The location, elevation, years of operation, mean annual rainfall and source of data are provided in Table 2-2.

Table 2-2
Rain Gauges in Project Area

Station	Location	Elevation (feet amsl)	Years of Operation	Average Annual Rainfall (inches)	Source
Boulevard 1	N 32°40', W 116°17'	3,353	1924 to 1967	14.8	NOAA
Boulevard 2	N 32°40', W 116°18'	3,600	1969 to 1994	17.0	NOAA
Tierra del Sol	N 32°39', W 116°19'	4,000	1971 to 2014	10.95	County
Jacumba	N 32°37', W 116°11'	2,800	1963 to 2011	9.64	County

The isohyetal map of annual precipitation, developed by Swenson, shows that the majority of the Flat Creek watershed receives an average of 11 inches of precipitation per year (Figure 4). The lower elevations of the watershed receive an average of 9 inches of precipitation per year. This agrees with the average precipitation calculated for the Jacumba rain gauge between 1963 and 2011. The Jacumba rain gauge was located at the lowest elevation in the Flat Creek watershed. Mean annual precipitation, as determined from the County of San Diego map entitled "Groundwater Limitations Map" on file with the Clerk of the Board of Supervisors as Document No. 195172, indicates the Flat Creek watershed is located within a precipitation isohyetal of 9 to 14 inches (County of San Diego 2004). The County precipitation isohyetals roughly concur with those developed by Swenson (Figure 4).

Exhibit 2-A
Annual Precipitation Data Jacumba Rain Gauge 1963 to 2011



Notes: Station located at N 32°37', W 116°11' at an elevation of 2,800 feet
Source: Allan, R. B., 2013.

According to the State of California Reference Evapotranspiration Map developed by the California Irrigation Management Information System (CIMIS), the Project is located in Evapotranspiration Zone 16, with an average of 62.5 inches of reference evapotranspiration (ETo) per year (CIMIS 1999). Table 2-3 presents ETo by month in CIMIS Zone 16. The annual 62.5 inches of ETo is based on potential evapotranspiration (ET) from turf grass/alfalfa crop, which assumes a continuous source of moisture and does not consider summer plant dormancy. Therefore, ETo is an overestimation of actual ET, which varies with the vegetation type. In order to account for variations in plant water consumption and more accurately assess ET, a crop coefficient can be applied to ETo. Plants that consume less water have lower crop coefficients. Drought-tolerant plants and native vegetation have a crop coefficient of approximately 0.3 (DWR and UCCE 2000). Using this crop coefficient, the annual estimated ET is 62.5 x 0.3 = 18.75 inches.

Table 2-3
CIMIS Zone 16 Reference Evapotranspiration

Month	ETo (inches)
January	1.55
February	2.52
March	4.03
April	5.7
May	7.75
June	8.7
July	9.3
August	8.37
September	6.3
October	4.34
November	2.4
December	1.55
Year	**62.51**

Source: CIMIS 1999

2.3 Land Use

According to the San Diego General Plan, Jacumba Hot Springs is located within the Mountain Empire Subregional Plan Area (County of San Diego 2011). Land Use designations within 0.5 mile radius of the Park Well include: open space, public facilities, communications and utilities, commercial use, library, elementary school, religious facility, single family residential and rural residential and (Figure 5). The parcel on which the Park Well is located is zoned as special purpose (S-80). The JCSD owns the property on which the Park Well is located. Adjacent current land uses are vacant land, commercial businesses along Old Highway 80 and residences.

Current land use within the Flat Creek watershed consists primarily of vacant, undeveloped land with the exception of the town of Jacume (Figure 5). The land outside Jacumba Hot Springs within the Flat Creek watershed is predominantly agricultural or undeveloped land.

2.4 Water Demand

The existing conditions water demands include potable demand for Jacumba Valley Ranch (Ketchum Ranch Water Company), non-potable demand for sand mining activities ongoing at Jacumba Valley Ranch and potentially for six domestic wells identified within the boundary of the Jacumba Valley alluvial aquifer. The Jacumba Valley Ranch's Ketchum Ranch Water Company is classified as a transient non-community (TNC) water system. According to County of San Diego Department of Environmental Health (DEH) Small Drinking Water System files, a total of 7 connections: 3 ranch homes, 2 gas stations and 2 fire hydrants, are part of the Ketchum Ranch water system (pers. comm. Jamelle McCullough, April 8, 2015). Data are not currently available for the water demands from Ketchum Ranch Water Company, Jacumba Valley Ranch sand mining or the domestic water users.

The following method was used to estimate the demand by the Jacumba Valley Ranch sand mining operation. Wiedlin (2014) reported that the East County Sand Mine uses approximately 17 gallons per cubic yard of excavated material for sand washing. Approximately 10% of this water is lost to evaporation while the other 90% is returned for reuse (Wiedlin, 2014). Thus, the consumptive use is about 1.7 gallons per cubic yard. The actual volume of sand washed is unknown. For the purposes of this water demand estimate, the overall consumptive use of the sand mining operation is assumed to be 0.5 acre-feet of water

Water use from the actual washing of the sand is minor compared to use for dust control and evaporation from pond storage. The size of the sand mining pond is 0.26 acres and the size of the sand wash area is 0.58 acres based on review of aerial photography (Google Earth 2015). Annual evaporative loss for the combined 0.84 acres of pond and sand wash area is estimated to be 4 acre-feet based on the reported average annual pan-corrected evaporation rate of 58.3 inches (4.86 feet) from Lake Morena Reservoir (AECOM 2013). Dust control is estimated to require 1,500 gallons per day based on similar operations (Wiedlin 2014). Assuming water is used for dust control 365 days per year, the maximum water demand for dust control is expected to be 1.7 acre-feet. The total current water demand for sand mining operations at Jacumba Valley Ranch, which includes water for sand washing, dust control, and maintaining the ponds, is estimated to be 6.2 acre-feet per year. To be conservative, the water use for sand mining operations at

Jacumba Valley Ranch was rounded up to 10 afy in order to evaluate potential impacts to groundwater in storage.

Estimated water demands for the Ketchum Ranch Water Company and domestic wells located in the Jacumba Basin alluvial aquifer are 5 afy and 3 afy, respectively, as summarized in Table 2-4.

Table 2-4
Jacumba Valley Alluvial Aquifer Existing Water Demands

Land Use	Quantity	Water Demand Per Unit (acre-feet/year)	Total Water Demand (acre-feet/year)
Ketchum Ranch Water Co.	5[a]	1	5
Jacumba Valley Ranch sand mining	1[b]	6.2	10
Domestic Wells	6[c]	0.5	3
		Total Existing Water Demand	18

Notes:
[a] Ketchum Ranch Water Company has 7 connections: 3 ranch homes, 2 gas stations and 2 fire hydrants. No water demand was assigned to the fire hydrants. Water demand is estimated at approximately 1acre-foot per connection.
[b] Jacumba Valley Ranch water demand for sand mining has been estimated based on water use derived from the East County Sand Mine (Wiedlin 2014)
[c] Not all domestic wells are currently active; however, a consumptive water demand of 0.5 afy has been assigned to all know domestic wells.

2.5 Geology and Soils

Geology

Jacumba Hot Springs is located on the eastern portion of the Peninsular Range geomorphic province, which consists of northwest-oriented mountain ranges separated by northwest trending fault-produced valleys, subparallel to faults branching from the San Andreas Fault. The regional geology of the Flat Creek watershed is depicted in Figure 6. Because much of the project area is located south of the International Border, worldwide geologic data was used to depict geology south of the border (GSA, 2005).

The surface area of the Flat Creek watershed primarily consists of exposed Cretaceous plutonic rocks of the composite Peninsular Ranges Batholith. These plutonic rocks consist of the bedrock unit known as the tonalite of La Posta (also referred to as the La Posta Quartz Diorite) (USGS, 2004). The Sierra Juarez Mountains, located on the southeastern side of the watershed in Mexico consist of Mesozoic sedimentary rocks (GSA 2005).Quaternary alluvium is present in low-lying areas in portions of the watershed including the Jacumba Valley (USGS, 2004).

Jacumba Valley contains exposures of the Jacumba Volcanics and Anza formation, overlain by Quaternary alluvium (Swenson, 1981). Alluvial thickness in the center of Jacumba Valley is 100 to 150 feet, thinning towards the sides and ends of the valley (Swenson 1981). The Jacumba Volcanics are encountered below the Jacumba Valley alluvium as reported in numerous boring log reports (CRA, 2007; Leighton, 1991; Petra, 2006; SC Soil & Testing, 2002). The migmatitic schist and gneiss of the Stephenson Peak Formation outcrop just west of the valley (Swenson, 1981; USGS. 2004).

Soils

The type, areal extent, and key physical and hydrological characteristics of soils mapped on the United States side of the Flat Creek watershed were identified based on a review of soil surveys completed by the USDA, Natural Resources Conservation Service (NRCS) (NRCS, 2015). Soil units are shown in Figure 7 and are described in Table 2-5. The permeability, specific retention, and active rooting depth of a given soil type control the percentage of precipitation that infiltrates the soil, satisfies the soil moisture deficit, and is available to recharge the groundwater aquifer.

Swenson (1981) provides a map and description of soil types on the Mexico side of the Flat Creek watershed based on representative soil samples and measurements of their porosity and specific retention.

Table 2-5
Soil Units within the Flat Creek Watershed

Map Unit, Soil Name	Acres (Percent of the Flat Creek Watershed)	Parent Material	Depth to restrictive layer (inches)	Hydrologic Group[a]	Erosion Factor [b]
Soil Identification by USDA					
AcG, Acid Igneous Rock Land	0.4 (0.001%)	Acid igneous rock	0–4	D	—
CeC, Carrizo Very Gravelly Sand, 0-9% slope	1.9 (0.004%)	Alluvium derived from mixed igneous rocks		D	0.02
InA, Indio silt loam, 0-2% slope	63.1 (0.12%0	alluvium derived from igneous rock and mica schist		B	0.55
InB, Indio silt loam, 2-5% slope	79.1 (0.15%)	alluvium derived from igneous rock and mica schist		B	0.55
IoA, Indio silt loam, saline, 0-2% slope	14.9 (0.03%)	alluvium derived from igneous rock and mica schist		B	0.55

Table 2-5
Soil Units within the Flat Creek Watershed

Map Unit, Soil Name	Acres (Percent of the Flat Creek Watershed)	Parent Material	Depth to restrictive layer (inches)	Hydrologic Group[a]	Erosion Factor [b]
LcE2, La Posta Loamy Coarse Sand, 5-30% slope, eroded	43.9 (0.08%)	Residuum weathered from granodiorite	27	A	0.02
MnB, Mecca coarse sandy loam, 2 – 5% slopes	12.8 (0.02%)	alluvium derived from granite		A	0.20
RaC, Ramona sandy loam, 5-9% slopes	157.5 (0.30%)	alluvium derived from granite		C	0.32
RaD2, Ramona sandy loam, 9-15% slopes, eroded	6.5 (0.01%)	alluvium derived from granite		C	0.32
RkA, Reiff fine sandy loam, 0-2% slopes	171.4 (0.33%)	alluvium derived from granite		A	0.28
RsC, Rositas Loamy Coarse Sand, 2-9% slope	60.9 (0.12%)	Alluvium derived from granite		A	0.15
SrD, Sloping Gullied Land	126.3 (0.24%)			D	
SvE, Stony Land	320.4 (0.61%)	Mixed colluvium		D	
Subtotal	*1,059.1 (2.02%)*				
Soil Identification by Swenson					
W, Sandy Alluvium	7,153.0 (13.65%)			B	
X, Metamorphic and Plutonic Residuum	43,555.9 (83.11%)	Metamorphic granitic rocks		D	
Y, Volcanic residuum and Fine sand alluvium	639.1 (1.22%)			A	
Subtotal	*51,348.0 (97.98%)*				
Total Acreage	**52,407.0**				

Notes:

[a] Hydrologic soil groups are used for estimating the runoff potential of soils on watersheds at the end of long-duration storms after a prior wetting and opportunity for swelling, and without the protective effect of vegetation. Soils are assigned to groups A through D in order of increasing runoff potential.

[b] Erosion factor Kw indicates the susceptibility of the whole soil to sheet and rill erosion by water (estimates are modified by the presence of rock fragments). The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. A range of values is given because map units are composed of several soil series.

Source: USDA 2015

2.6 Hydrogeologic Units

Boring logs were obtained for JCSD wells and select Jacumba Valley Ranch wells. The subsurface lithology within the vicinity of the Park Well consists of the following:

Alluvium: Alluvium up to a depth of 140 feet bgs was logged at JCSD Well 2 drilled approximately 2,200 feet east of the Park Well (Swenson, 1981). The depth of the alluvium at the Park Well is 124 feet (Petra, 2006).

Jacumba Volcanics (Tj): Hard crystalline volcanic rocks form portions of the hills along the western and eastern sides of Jacumba Valley. Jacumba Volcanics have been encountered underlying the alluvium in boreholes drilled for JCSD Well 1 and the Park Well at depths of 124 feet bgs and 127 feet bgs, respectively. Jacumba Volcanics were encountered at a depth of 80 feet bgs in Chevron Service Station Well MW-9. The thickness of the Jacumba Volcanics is estimated to be up to 60 feet based on geophysical logs (Barrett, 1996).

Decomposed Granite (DG): Decomposed granite (DG), ranging from 13 to 40 feet in thickness, was logged up to 80 feet bgs in JCSD Wells 6, 7 and 8 and in monitoring wells drilled approximately 1,200 feet west of the Park Well (Conestoga-Rovers and Associates, 2012).

Granitic Bedrock: The crystalline bedrock is predominantly composed of granodiorite with tonalite outcrops present throughout the Flat Creek watershed. Extensive fractures were logged up to a depth of 500 feet bgs while drilling JCSD Wells 7 and 8. Regional lineaments that trend both northwest–southeast and west–east as depicted on the interferometric synthetic aperture radar (IFSAR) digital ortho-photography (Figure 8) also indicate extensive fracturing.

2.7 Hydrogeologic Inventory and Groundwater Levels

Published and confidential well logs were reviewed to locate wells and refine the thickness of hydrologic units present within the Flat Creek watershed. Table 2-6 provides a summary of the information available from driller well logs obtained to date.

Table 2-6
Well Inventory

Well Number	Well Completion Depth (feet bgs)/ (Year Drilled)	Depth to Water (feet btoc);date	Approximate Production Capability (gpm)	Alluvium/ Residual Soil (feet bgs)	Bedrock Depth (feet bgs)/ (Type)
Jacumba Community Services District Wells					
JCSD 1	124 (1956)	43.0; 10/1955	148	120	124 (volcanic)
JCSD 2	140 (1963)	72.13; 11/1979		140	

Table 2-6
Well Inventory

Well Number	Well Completion Depth (feet bgs)/ (Year Drilled)	Depth to Water (feet btoc);date	Approximate Production Capability (gpm)	Alluvium/ Residual Soil (feet bgs)	Bedrock Depth (feet bgs)/ (Type)
JCSD 3	79				
JCSD 3A	49			49	
JCSD 4	39	9.92; 8/2014	175[a]	0-39[b]	
JCSD 5					
JCSD 6	465 (2003)	3.17; 8/2014	600+		
JCSD 7	518 (2008)	29.0; 1/2009	300+	0-10	10-23 (granitic)
JCSD 8	518 (2009)	30.00; 8/2014	275+	0-42	42-55 (granitic)
MW-3	84.5 (2007)	28.0; 3/2009	monitor well	0-30	30-80 (granitic)
Park Well	124 (2005)	54.42; 8/2014	80	0-127	127 (volcanic)
Jacumba Ranch Wells					
K	102+ (1960s)				
K1	110 (1950s)	42.3; 9/6/1980		106	
K2	103 (1950s)	41.0; 4/1958		103	
K3	117 (1950s)	8.5; 2/1996	1000		
K4	109 (1950s)	9.9; 3/1994	908		
Ketchum Ranch Water Co. Well	150 (130 silted)	24.2; 4/1980	33.7		
Test Well 1 JVR	82 (1990)	2; 5/1990	225	75	
P-9		60.76; 3/5/2015	monitor well		
Other Wells					
R1	137				
R2	400				
(Abandoned Well near R2)	Abandoned (1979)				150-492 (Sandstone)
T5					
T8					
T1					
RM	34				
Spa Well	200 (1955)				
Daley Construction Well	230 (NA)				
Former Chevron Service Station 20-5934					
MW-8S	50 (2007)			81.5+	
MW8-D	80 (2007)			81.5+	
MW-9S	50 (2007)			80	80 (Volcanics)
MW-9D	80 (2007)			80	80 (Volcanics)
MW-10	57 (2007)			50+	
MW-11	80 (2007)			80+	
MW-12	80 (2012)			40	40 (DG to 80.5)

Table 2-6
Well Inventory

Well Number	Well Completion Depth (feet bgs)/ (Year Drilled)	Depth to Water (feet btoc);date	Approximate Production Capability (gpm)	Alluvium/ Residual Soil (feet bgs)	Bedrock Depth (feet bgs)/ (Type)
MW-13	80 (2012)			81+	
MW-14	81 (2012)			80.5+	
B-10	(2012)			55.5+	
B-11	(2012)			66.5+	
B-12	(2012)			57	57 (DG to 70)

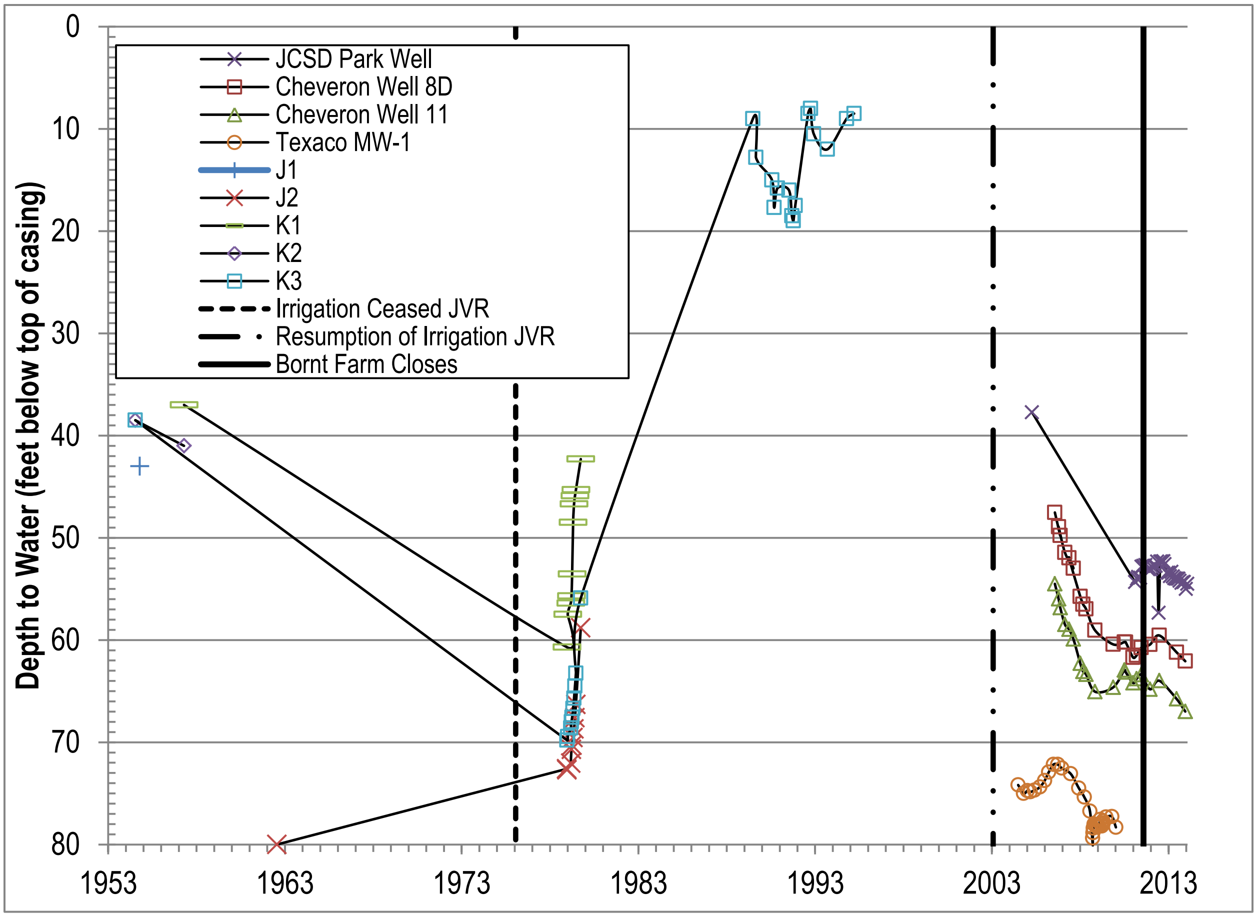
Sources: Barrett 1996, JCSD 2015, Petra 2006, Swenson 1981
Notes:
[a] Reported pumping capacity provided by JCSD.
[b] Alluvial depth based on total depth of Well 4.

Groundwater level data were obtained from the JCSD from January 2012 through December 2014 (Troutt, pers. comm. 2015). Water level data were also obtained from Barrett Consulting Group (1996), Geotracker (2015), and Swenson (1981). Historical water level data were available for Jacumba Valley as far back as 1955 but a continuous water level record was not available.

Fluctuations in the historical water levels in the Jacumba Valley alluvial aquifer of up to 61 feet in Well K3 result from both groundwater production and cycles of wet and dry climatic periods. When Well K3 was initially drilled in 1955, the water level was 38.5 feet below land surface. From 1932 to 1977 Jacumba Valley Ranch extracted on average 2,066 afy from the Jacumba Valley alluvial aquifer (Barrett 1996). Jacumba Valley Ranch pumping in combination with lower than average precipitation in the late 1960's through the mid 1970's (see declining cumulative departure form mean precipitation in Exhibit 2A) resulted in a water level decline in the Jacumba Valley alluvial aquifer (Exhibit 2-B). Irrigation of agricultural lands ceased on the Jacumba Valley Ranch in approximately 1977. In 1979, the water level in Well K3 was 69.9 feet bgs (over 30 feet lower than initial water level recorded in 1955). By 1990, water levels had risen to near the surface in several Jacumba Valley alluvial aquifer wells (9 feet bgs in Well K3) because of higher recharge rates during a period of above average precipitation in the late 1970's and mid 1980's (see ascending cumulative departure form mean precipitation in Exhibit 2A) and low groundwater extraction during this time period.

Exhibit 2-B[J1]

Jacumba Valley Alluvial Aquifer Water Level Data July 1955 to December 2014



Sources: Barrett 1996, Geotracker 2015, JCSD 2015, Swenson 1981

2.8 Water Quality

The Park Well was initially intended for use as a potable water well; however, low concentrations of volatile organic compounds (VOCs) were detected during drilling. Toluene was detected at concentrations of 291 micrograms per liter (µg/L), 199 µg/L and 520 µg/L in water quality samples collected in 2006. As a result, water produced from the Park Well is currently limited to non-potable use as discussed in further detail in Section 4.0.

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3 WATER QUANTITY IMPACTS ANALYSIS

This section discusses the potential impacts on local groundwater resources in terms of the County PDS significance criteria.

3.1 50% Reduction of Groundwater Storage

In order to apply the County methodology for determining a 50% reduction in groundwater storage to a given well, the area of the aquifer that can be accessed by a pumping well must be defined. For this analysis the extent and thickness of the alluvium underlying the Jacumba Valley as defined by Swenson (1981) was used to perform the 50% reduction in storage analysis. The area of the alluvial aquifer in the Jacumba Valley contributing to the Park Well is 2,060 acres (Figure 6).

3.1.1 Guidelines for Determination of Significance

The following requirement is set forth in the County of San Diego Guidelines (2007):

> For proposed projects in fractured rock and sedimentary basins, groundwater impacts will be considered significant if a soil moisture balance, or equivalent analysis, conducted using a minimum of 30 years of precipitation data, including drought periods, concludes that at any time groundwater in storage is reduced to a level of 50% or less as a result of groundwater extraction.

A project-specific soil moisture-based water balance was not performed for the Park Well. Instead, Project withdrawals of up to 100 afy were compared to historical groundwater extraction rates from the Jacumba Valley alluvium and estimates of groundwater in storage made by Swenson (1981) and Barrett (1996). The analysis evaluates whether the water demands for the JCSD maintain at least 50% groundwater in storage over the 2,060-acre Jacumba Valley alluvial aquifer.

3.1.2 Methodology

3.1.2.1 Groundwater Recharge

Groundwater recharge was not calculated for the Flat Creek watershed and Jacumba Valley alluvial aquifer. Instead, the 50% reduction of groundwater in storage was evaluated in the context of historical groundwater production and water levels as discussed in the following sections.

3.1.2.2 Groundwater Demand

The groundwater demands of the Jacumba Valley alluvial aquifer vary with time. Jacumba Valley Ranch is the primary potential user of groundwater from the Jacumba Valley alluvial aquifer. Jacumba Valley Ranch produces water for irrigation of agricultural lands. From 1932 through 1977, Jacumba Valley Ranch extracted on average 2,066 afy of groundwater (Barrett, 1996). Irrigation ceased on Jacumba Valley Ranch and the agricultural lands were fallowed from about 1977 until 2002. From 2002 until 2013, Bornt Farms resumed irrigation at Jacumba Valley Ranch. The water demand of Bornt Farms was reported to be in excess of 1 million gallons per day (JCSD, pers. comm. 2015). In order to determine the area of active irrigated agricultural land by year, historical aerial photographs were reviewed. Between 2002 to 2013, 187 to 465 acres of the Jacumba Valley Ranch was irrigated to grow predominantly lettuce and spinach (JCSD 2015). Over this time period,Bornt farms is estimated to have extracted 7,413 acre-feet, based on the area of active irrigation and the water demand of lettuce and spinach crops.

Other groundwater users include the Ketchum Ranch Water Company (historically in excess of 242 afy[J2]; Barrett 1996), and groundwater extraction on the Mexican side of the border at the town of Jacume (24 afy) (Barrett, 1996). There may be a small volumeof groundwater (less than 5 afy) extracted from well permits located in the residential area in Jacumba Hot Springs but residential use is not considered a significant source of groundwater extraction from the alluvium.

Table 3-1
Historical Jacumba Valley Alluvial Aquifer Groundwater Demand

Land Use	Quantity	Water Demand Per Unit (acre-feet/year)	Total Water Demand (acre-feet/year)	Total Water Demand Over 5 Years
Jacumba Valley Ranch[a]	1	0 – 2,066	0 – 2,066	50
Ketchum Ranch Water Co.[b]	1	5 – 242	5 – 242	25
Residential[c]	6	–0.5	3	15
JCSD Wells 1 and 2 (inactive)[d]	1	0 – 100	0 – 100	0
Additional Proposed JCSD Water Demand				
Park Well and Replacement Wells	1	0 – 100	0 – 100	500
		Total Existing Water Demand	—	**Varies**

Notes:
a. Current Jacumba Valley Ranch water demand is estimated at 10 afy for sand mining operations.
b. Used to supply a total of 7 connections: 3 ranch homes, 2 gas stations and 2 fire hydrants (pers. comm. Jamelle McCullough, April 8, 2015).
c. Not all domestic wells are currently active; however, a consumptive water demand of 0.5 afy has been assigned to all know domestic wells.
d. JCSD Wells 1 and 2 supplied all potable demands for the town of Jacumba Hot Springs until JCSD Wells 3 and 4 were drilled in the early 1970's.

3.1.2.4 Groundwater in Storage

The groundwater storage capacity was calculated using estimates of the saturated thickness of the alluvium underlying the 2,066-acre area of Jacumba Valley alluvial aquifer. The estimated saturated thickness is based on the recent water levels measured in the Park Well and Jacumba Valley Ranch piezometer P-9, extrapolated to all of the Swenson compartments (A through E) as depicted on Figure 6. In 2014, the measured depth to water in the Park Well was approximately 54 feet and the total depth of the well is 124 feet. Thus, there was approximately 70 feet of saturated thickness at the Park Well in 2014. The Park Well is adjacent to Swenson section C, which had a saturated thickness of approximately 67 feet in 1980, comparable to the estimated saturated thickness in 2014. In order to provide a more conservative estimate of saturated thickness by allowing for potential variation in alluvial thickness of the aquifer, a saturated thickness of 45 feet for compartment C was selected, or approximately 65% of the estimated thickness based on the water level measurements. A similar procedure was followed for the other compartments, with the estimated saturated thickness of each compartment ranging from 14 feet in compartment E to 45 feet in compartment C. The resulting area weighted average saturated thickness of the alluvium is 29.2 [J3]feet (rounded) (derived from Swenson compartments A-E analysis). In comparison, the area weighted average saturated thickness estimated by Swenson was approximately 61.8 feet. The current estimate is approximately 60% of that estimated by Swenson (1981).

The estimated specific yield for the alluvial aquifer was obtained from estimates made by Swenson (1981) and calculated from aquifer testing performed by Barrett (1996). The specific yield associated with the alluvium is conservatively estimated to be 10%. Barrett (1996) estimated specific yield to be 25% based on aquifer testing of Well K4, Test Well No. 1 and the Ketchum Ranch Water Company Well. For this analysis, the lower specific yield estimate is used to calculate groundwater in storage. By multiplying the acreage of the study area by the estimated specific yield and by the estimated saturated thickness for the alluvial hydrologic unit, the current total groundwater in storage within the Jacumba Valley alluvial aquifer area is estimated to be 6,014 acre-feet[J4] (Table 3-2).[3] In comparison, the maximum recoverable water of the Jacumba Valley alluvial aquifer was estimated by Swenson to be 9,720 acre-feet (Swenson, 1981).

[3] The estimate of 6,014 acre-feet of groundwater in storage in 2014 for the Jacumba Valley alluvial aquifer is an initial estimate based on available data including well logs, water levels, surface geophysical studies and aquifer properties estimated by pump testing. The estimated storage in the Jacumba Valley alluvial aquifer may be revised as additional data is acquired.

Table 3-2
Jacumba Valley Alluvial Aquifer 2014 Groundwater in Storage Estimate

Alluvial Aquifer Section	Area (acres)	Area (ft^2)	Alluvial Thickness (feet)	Depth to Water 2014 (feet bgs)	Saturated Thickness (feet)	Saturated Volume (ft^3)	Coefficient of Storage (unit less)	Storage (ft^3)	Storage (acre-feet)
A	240	10,451,786	50+	No data	15	1.57.E+08	0.10	1.57E+07	360
B	105	4,560,732	50+	No data	15	6.84.E+07	0.10	6.84E+06	157
C	439	19,140,264	120+	60-65[a]	45	8.61.E+08	0.10	8.61E+07	1,977
D	1,083	47,163,719	100+	61[b]	30	1.41.E+09	0.10	1.41E+08	3,248
E	194	8,433,652	80+	55[c]	14	1.18.E+08	0.10	1.18E+07	271
								Total Groundwater in Storage	**6,014**

a Inferred from piezometer P-9
b Water level from piezometer P-9
c Water level from Park Well

3.1.2.5 Long-Term Groundwater Availability

Long-term groundwater availability was evaluated in context of the current available groundwater in storage, maximum recoverable water (maximum storage), historical water levels and water demands. The volume of groundwater in storage varies depending on the rate of recharge and the volume of water pumped from storage (water demand). The long-term groundwater availability is less than the historical average groundwater production rate of 2,066 afy from 1932 to 1977. This is observed during dry periods when the Jacumba Valley experienced groundwater overdraft, as indicated by declining water levels in the alluvial aquifer wells (Exhibit 2-B). Pumping by Jacumba Valley Ranch between 2003 and 2013 has also resulted in water level declines in the alluvial aquifer. Bornt Farms grew lettuce and spinach on about 500 acres, year-round. Assuming a crop irrigation rate of 2.14 acre-feet per acre for lettuce, the annual water demand of the lettuce crop at Bornt Farms is 1,070 acre-feet (Barrett 1996; UC Davis 2011). Due to Bornt Farms resumption of irrigation and below average precipitation recorded in the Flat Creek watershed over the last decade, the water demands have exceeded available recharge, resulting in water level decline (Exhibit 2-B). JCSD proposes to extract groundwater up to a maximum rate of 100 afy [J5]or about 17% the annual production quantity of Bornt Farms. At a maximum annual production rate of 100 acre-feet, it would take in excess of 74 years for JCSD to extract the quantity of groundwater Bornt Farms produced in the last 12 years.

3.1.3 Significance of Impacts Prior to Mitigation

The results of the analysis show that historical groundwater extraction rates of 618 to 2,000 afy resulted in groundwater overdraft during dry climatic periods such as those experienced between

1963 and 1976, and 1998 through 2008. Between 1955 and 1978, in conjunction with high pumping rates and low recharge rates, water levels in the Jacumba Valley alluvial aquifer decreased by approximately 30 feet. The groundwater overdraft and storage reduction observed in the Jacumba Valley alluvial aquifer between 1938 and 1978 was erased, however, by 1993 when water levels recovered to within 8 feet of land surface at well K3 (Exhibit 2B). This shows that aquifer recharge is as important as groundwater withdrawal for maintaining adequate storage in the aquifer. The proposed groundwater production, at a rate up to 100 afy, is 5 to 17% of the historical average pumping in the aquifer. It is also less than 2% of the current groundwater in storage in the aquifer. If there is no recharge over a 10 year period, the reduction in total storage resulting from the proposed pumping is approximately 1,000 acre-feet, or 17% of the total current water in storage in the aquifer. Historically, there has not been a 10 year period without recharge, therefore, storage reductions resulting from this pumping are not anticipated to result in the reduction in groundwater in storage below the 50% significance threshold, and are not anticipated to be significant. [J6]

3.1.4 Mitigation Measures and Design Considerations

Because actual conditions during groundwater extraction for the Project may vary from the above analysis, a Groundwater Monitoring and Mitigation Plan (GMMP) will be prepared to ensure that pumping does not unduly impact existing well users. The GMMP will include monitoring the duration and rate of pumping in order to verify the total volume of groundwater removed, and water level monitoring from the pumping well(s) and monitoring wells.

3.1.5 Conclusions

The proposed Project is determined to have a less-than-significant impact to groundwater storage, as defined by the PDS County guidelines.

3.2 Well Testing

3.2.1 Guidelines for Determination of Significance

3.2.1.1 Well Interference

The following significant impact requirements are set forth in the County of San Diego Guidelines (2007):

> *Alluvial Well:* As an initial screening tool, off-site well interference will be considered a significant impact if after a five year projection of drawdown, the results indicate a decrease in water level of 5 feet or more in the off-site wells.

> If site-specific data indicates alluvium or sedimentary rocks exist which substantiate a saturated thickness greater than 100 feet in off-site wells, a decrease in saturated thickness of 5% or more in the off-site wells would be considered a significant impact.

According to the County Groundwater Geologist, the primary author of the County of San Diego Guidelines, the intent of the above guideline was to cover projects that have continual ongoing water uses that remain static over time. Historically, this has been the case for the vast majority of groundwater dependent projects processed by the County. This Project, however, proposes to use variable quantities of water, with intensive pumping over short periods. The intensive pumping during short periods may cause direct well interference impacts. Therefore, to evaluate potential impacts from short-term pumping of groundwater, the County Groundwater Geologist has requested a short-term drawdown analysis, in addition to the 5 year projection of drawdown, to evaluate the potential impacts from operating at the highest rate of pumping.

Potential well interference impacts for the Park Monitoring Well were evaluated over a 0.5 mile radius from the well. Table 3-3 lists JCSD and private wells within 0.5 mile radius of the Park Well.

Table 3-3
Alluvial Aquifer Wells Within 0.5-Mile Radius of Park Well

Well Number	Use	Distance from Park Well (feet)
Well 1	Public/Inactive	2,136
Well 2	Public/Inactive	2,195
Well 3	Public/Inactive	1,600[a]
Well 4	Public/Active	2,147
Well 5	Public/Inactive	1,906
Jacumba Valley Ranch Wells		
Well Km	Small Water System	1,688
Well K3	Irrigation	2,136
Piezometer P-9	Monitoring	

Notes:
[a] JCSD Well 3 exact location not identified

3.2.1.2 Groundwater Dependent Habitat

The County's Guideline 4.2.C from the County's Biological Guidelines for Determining Significance defines the following threshold for determining a significant impact to riparian habitat or a sensitive natural community:

> The project would draw down the groundwater table to the detriment of groundwater-dependent habitat, typically a drop of 3 feet or more from historical low groundwater levels.[4]

Potential groundwater-dependent habitats present near the Park Well are depicted in Figure 11. Riparian and bottomland habitat associated with Boundary Creek is potentially groundwater dependent habitat and located approximately 1,620 feet north of the Park Well.

Southern cottonwood willow riparian forest is composed of tall, open, broadleafed winter-deciduous riparian forests dominated by cottonwoods, and several tree willows. Understories usually are shrubby willows. This habitat is usually found in sub-irrigated and frequently overflowed lands along rivers and streams. The dominant species require moist, bare mineral soil for germination and establishment. This soil is deposited as floodwaters recede, leading to uniformly aged stands in this seral type (Holland, 1986). The dominant species within the southern cottonwood will riparian forest are cottonwood (*Populus fremontii*), willows (*Salix sp*.) and mulefat (*Baccharis salicifolia*) (AECOM, 2011). The Fremont cottonwood (*Populus fremontii*) and willows are phreatophytes. Robinson (1952) reported that cottonwoods and willows rarely grow where the water table is more than 20 feet deep. Mulefat (*Baccharis salicifolia*) is a phreatophyte shrub that requires groundwater levels within 12 inches of the ground surface to establish (NRCS Plant Database), and can have roots extending to 12 feet below ground surface (Robinson, 1958).

3.2.2 Park Well Testing Methodology

The following sections (3.2.2.1 and 3.2.2.2) describe the procedures followed during the aquifer testing of the Park Well.

3.2.2.1 Well Test Description

A 15-hour step test was performed for the Park Well by Petra and Fain Drilling on March 14, 2006 at pumping rates of 20 gpm, 40 gpm, 60 and 70 gpm. The purpose of the 15-hour step test was to obtain an approximate long-term production rate for the well and to estimate aquifer properties.

3.2.2.2 Well Test Analysis

After 15 hours of pumping, the drawdown observed was approximately 48 feet in the Park Well. The results of the Park Well aquifer test are presented graphically in Exhibit 2-C. Aquifer

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4 Historical water level hydrographs compiled by the Jacumba Community Sponsor Group –Town Center Well Hydrographs from 1990 to 2008 indicate up to 20 feet of water level decline in one well during this period of measurement (Figure 2-58; County of San Diego 2010b). Historical water level monitoring for JCSD Well 4 from 1990 to 2008 indicates up to 20 feet of water level decline during the period of measurement..

transmissivity (the rate at which water flows through a vertical strip of the aquifer 1-foot wide and extending through the full saturated thickness, under a hydraulic gradient of 1 or 100%) is calculated using the Cooper–Jacob approximation to the Theis equation (Cooper and Jacob 1953) as follows:

$$T = \frac{2.303\,Q}{4\,\pi\,\Delta s}$$

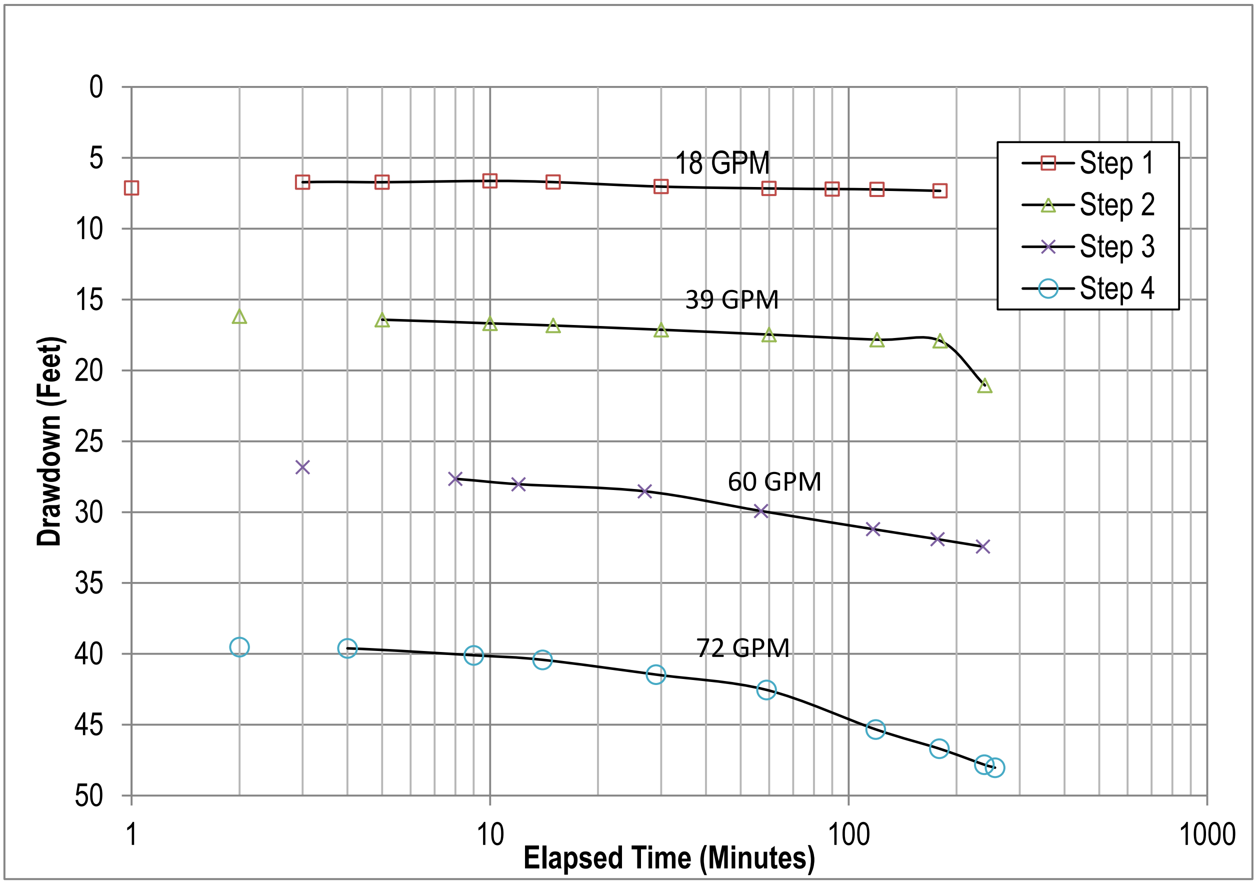
Where:

- T = transmissivity (feet^2/day) [multiply by 7.48 to get units of gpd/foot]
- Q = average pumping rate (feet^3/day) = varies (18 – 72 gpm = 3,465 – 13,861 feet^3/day)
- π = pi (3.14)
- Δs = difference in drawdown over one log cycle (feet) = varies (0.58 – 6.3 feet)

The transmissivity (T) for the Park Well was estimated by averaging the transmissivity values calculated for each of the four step production rates and the corrected time analysis (Birsoy and Summers 1980). T is estimated to be 526 feet^2/day or 3,934 gallons per day/foot (gpd/ft) (Appendix A).

The aquifer coefficient of storage (also called storativity) is the volume of water released from storage per unit decline in hydraulic head in the aquifer per unit area of the aquifer. Due to well losses at the pumping well, drawdown in the pumping well cannot be used to estimate storativity. Instead, the drawdown at an observation well is required to represent the change in storage in the aquifer in response to pumping. No drawdown data are available from an observation well during the period of the pump test. Therefore, the storativity was not calculated.

Exhibit 3-A
Park Well Aquifer Test Results



The closest well to the Park Well, is Well Km located approximately 1,688 feet away. The following estimate of groundwater drawdown at the nearest off-site well, induced by Project pumping, relies on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation (USGS, 1962):

$$s = \frac{264\,Q}{T} \log_{10} \frac{0.3\,Tt}{r^2 S}$$

Where:

- s = predicted drawdown (feet)
- Q = pumping rate (gpm) = varies per Table 3-4
- T = Transmissivity (gpd/ft) = 526 feet^2/day or 3,934 gpd/ft

- t = time (days) = Calculated at 90, 365 and 1,826 days
- r = distance from pumping well (feet) = varies per Table 3-4
- S = coefficient of storage (dimensionless) = 0.10

Drawdown at the closest well (Well Km) as a result of pumping 200 gpm for 90 continuous days (25.9 million gallons, or 80 acre-feet) from Park Well is predicted to be 0.58 feet. If annual pumping of 100 acre-feet is amortized over 1 and 5 year periods, predicted drawdown in Well Km is 1.36 feet and 3.79 feet, respectively. Table 3-4 indicates projected drawdown at select distances from the pumping well using the Cooper-Jacob approximation of the Theis non-equilibrium flow equation and Theis semi-log approximation

Table 3-4
Park Well Distance Drawdown Calculations

Distance from Park Well (feet)	90 Day Production Drawdown[a] (S=0.1)	End Year 1 Drawdown[a] (S=0.1)	End Year 5 Drawdown[a] (S=0.1)
1,000	3.07	2.87	5.59
1,500	0.94	1.67	4.18
1,620	0.69	1.46	3.92
1,688	0.58	1.36	3.79
2,000	0.24	0.97	3.22
2,640	0.03	0.45	2.35

Notes:
a. 90 day production rate 200 gpm, or 288,000 gpd.
b. Amortized 1 year production rate 62 gpm, or 89,274 gpd .
c. Amortized annual 5 year production rate 62 gpm or 89,274 gpd.

3.2.3 Significance of Impacts Prior to Mitigation

Based on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation and Theis equation analysis, drawdown due to water production of 288,000 gallons per day (gpd), or 200 gpm from Park Well results in predicted drawdown of 0.58 feet in Well Km located approximately 1,688 feet away after 90 days of continuous pumping. If pumping is amortized over 1 year at a production rate of 100 afy, predicted drawdown is 1.36 feet at Well Km. Amortizing pumping over 5 years at an annual pumping rate of 100 afy results in predicted drawdown at Well Km of 3.79 feet (Table 3-2).

The estimated drawdown at Well Km is less than the County threshold of significance: a decrease in water level of 5 feet or more for an alluvial well.

Based on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation analysis, drawdown due to water production of 288,000 gallons per day (gpd), or 200 gpm from Park Well results in predicted drawdown of 0.69 feet in the nearest Boundary Creek riparian habitat located approximately 1,620 feet away after 90 days of continuous pumping. Amortizing pumping over 5 years, at an annual pumping rate of 100 afy results in predicted drawdown of 3.92 feet (Table 3-2). The historical low groundwater level in the vicinity the Boundary Creek riparian habitat is not known over the period corresponding to the lifespan of the vegetation. This lack of historical water level data precludes determination of a water level threshold 3 feet below the historical low. Based on the predicted drawdown at the riparian habitat, groundwater extraction from the Park Well is not likely to exceed the County threshold of significance.

3.2.4 Mitigation Measures and Design Considerations

As the above analysis is based on limited site data and well testing, monitoring will be conducted to ensure that water levels remain stable in JCSD wells. A GMMP, which details establishment of groundwater thresholds for off-site well interference and groundwater dependent habitat, will be prepared for off-site water supply.

3.2.5 Conclusions

The analysis above indicates that well interference resulting from off-site water supply at a pumping rate of 200 gpm over a 90 day period is not predicted to impact off-site wells. Water level monitoring will be performed in several wells to record water levels during groundwater extraction. A GMMP detailing groundwater thresholds for off-site well interference and groundwater dependent habitat will be prepared. Annual review of water level data should be conducted by a Certified Hydrogeologist registered in the State of California to evaluate long-term impacts.

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4 WATER QUALITY IMPACT ANALYSIS

This section identifies and defines the potential effects of the Project on water quality.

4.1 Guidelines for the Determination of Significance

The Project would result in a significant impact with respect to water quality if the groundwater resources to be used on-site exceed the primary state or federal Maximum Contaminant Levels (MCLs) for applicable contaminants.

4.2 Methodology

Sampling procedures and analytical methods used were in compliance with County of San Diego requirements (County of San Diego, 2007) and described below.

4.2.1 Sampling Procedures

To determine whether the supply well (Park Well) would exceed applicable MCLs, water samples from Park Well were collected and analyzed between April 2003 and August 2007. The samples were analyzed by Institute for Environmental Health Environmental Engineering Laboratory of San Diego, California, Enviromatix Analytical, Inc. of San Diego, California and H&P Mobile Geochemistry of San Diego, California.

4.2.2 Sampling Analysis

A wide range of water quality analyses including inorganic minerals, general physical/mineral properties, nitrate, bacteria (fecal and total coliform), and radionuclide activity have been performed for Well 6. The laboratory report is included as an appendix to this report (Appendix D). Tables 4-1 through 4-6 below list the results of the water quality analyses, analytical method, and comparison to California Drinking Water primary MCLs and secondary MCLs.

Table 4-1
Park Well Conventional Chemistry Water Quality Results

Constituent	Analytical Method	Units	Park Well Groundwater Sample (December 19, 2005)	California Drinking Water MCLs
Chloride	SM4500	mg/L	90	250/500/600[a]
Fluoride	SM4500	mg/L	1.9	2.0[b]
Nitrate as N	SM4500	mg/L	0.05	45 (10 as N)
pH	EPA 150.1	pH Units	6.92	6.5 – 8.5[b]
Total Dissolved Solids	SM2540 C	mg/L	452	500[b]

Table 4-1
Park Well Conventional Chemistry Water Quality Results

Constituent	Analytical Method	Units	Park Well Groundwater Sample (December 19, 2005)	California Drinking Water MCLs
Sulfate as SO4	SM4500	mg/L	103	250/500/600[a]

[a] Recommended/Upper/Short-Term Secondary MCLs.
[b] Secondary MCLs.

Table 4-2
Well 6 Inorganic Minerals Water Quality Results

Constituent	Analytical method	Units	Park Well Groundwater Sample (March 15, 2006)	California Drinking Water MCLs
Aluminum	SM 3120B	ug/L	770	1,000
Antimony	SM 3113B	ug/L	<6.0	6
Arsenic	SM 3120B	ug/L	<2.0	10
Barium	SM 3120B	ug/L	180	1,000
Beryllium	SM 3120B	ug/L	<2.0	4
Cadmium	SM 3120B	ug/L	<1.0	5
Chromium (Total)	SM 3120B	ug/L	<1.0	50
Cyanide (Total)	SM4500E	ug/L	<100	150
Fluoride	EPA 300.0	mg/L	1.96	2.0[b]
Lead	SM 3113B	ug/L	<5.0	15[a]
Mercury	SM 3112B	ug/L	<1	0.002
Nickel	SM 3112B	ug/L	<10	0.1
Nitrate + Nitrite (as N)	EPA 300.0	ug/L	<400	10,000 (as N)
Nitrogen, Nitrate (as NO3)	EPA 300.0	mg/L	<2	45 (10 as N)
Nitrogen, Nitrite (as N)	EPA 300.0	mg/L	<400	10,000 (as N)
Selenium	SM 3113B	ug/L	<5.0	50
Thallium	EPA 200.9	ug/L	<1.0	2

[a] Convert nitrate to nitrate-nitrogen: x mg/L nitrate (NO3) X 0.226 = y mg/L nitrate nitrogen (NO3 – N).
[b] Secondary MCLs.

Table 4-3
Well 6 Volatile Organic Compounds (VOCs) Water Quality Results

Constituent	Analytical Method	Units	Well 6 Groundwater (Sample from March 15, 2006)	California Drinking Water MCLs
1,1,1-Trichloroethane	EPA 524.2	ug/L	<0.50	200

Table 4-3
Well 6 Volatile Organic Compounds (VOCs) Water Quality Results

Constituent	Analytical Method	Units	Well 6 Groundwater (Sample from March 15, 2006)	California Drinking Water MCLs
1,1,1,2-Tetrachloroethane	EPA 524.2	ug/L	<0.50	
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	<0.50	—
1,1,2-Trichloroethane	EPA 524.2	ug/L	<0.50	5
1,1-Dichloroethane	EPA 524.2	ug/L	<0.50	5
1,1-Dichloroethene	EPA 524.2	ug/L	<0.50	6
1,1-Dichloropropene	EPA 524.2	ug/L	<0.50	
1,2,3-Trichloropropane	EPA 524.2	ug/L	<0.50	
1,2,3-Trichlorobenzene	EPA 524.2	ug/L	<0.50	
1,2,3-Trimethylbenzene	EPA 524.2	ug/L	<0.50	
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	<0.50	5
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	<0.50	—
1,2-Dichlorobenzene	EPA 524.2	ug/L	<0.50	600
1,2-Dichloroethane	EPA 524.2	ug/L	<0.50	5
1,2-Dichloropropane	EPA 524.2	ug/L	<0.50	5
1,3-Dichlorobenzene	EPA 524.2	ug/L	<0.50	
1,3-Dichloropropane	EPA 524.2	ug/L	<0.50	
1,3-Dichloropropene	EPA 524.2	ug/L	<0.50	0.5
1,3,5-Trichlorobenzene	EPA 524.2	ug/L	<0.50	
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	<0.50	
1,4-Dichlorobenzene	EPA 524.2	ug/L	<0.50	5
2,2-Dichloropropane	EPA 524.2	ug/L	<0.50	
Benzene	EPA 524.2	ug/L	<0.50	1
Bromobenzene	EPA 524.2	ug/L	<0.50	
Bromochloromethane	EPA 524.2	ug/L	<0.50	—
Bromodichloromethane	EPA 524.2	ug/L	<1.0	—
Bromomethane	EPA 524.2	ug/L	<0.50	
Bromoform	EPA 524.2	ug/L	<1.0	—
n-Butylbenzene	EPA 524.2	ug/L	<0.50	
sec-Butylbenzene	EPA 524.2	ug/L	<0.50	
Carbon Tetrachloride	EPA 524.2	ug/L	<0.50	0.5
Chlorobenzene	EPA 524.2	ug/L	<0.50	70
Chloroethane	EPA 524.2	ug/L	<0.50	
Chloroform	EPA 524.2	ug/L	<1.0	—
Chloromethane	EPA 524.2	ug/L	<0.50	
cis-1,2-Dichloroethene	EPA 524.2	ug/L	<0.50	6
cis-1,3-Dichloropropene	EPA 524.2	ug/L	<0.50	—

Table 4-3
Well 6 Volatile Organic Compounds (VOCs) Water Quality Results

Constituent	Analytical Method	Units	Well 6 Groundwater (Sample from March 15, 2006)	California Drinking Water MCLs
Dibromomethane	EPA 524.2	ug/L	<0.50	
Dichloromethane	EPA 524.2	ug/L	<0.50	5
Dichlorodifluoromethane	EPA 524.2	ug/L	<0.50	
Dibromochloromethane	EPA 524.2	ug/L	<1.0	—
Ethylbenzene	EPA 524.2	ug/L	0.50	300
Hexachlorobutadiene	EPA 524.2	ug/L	<0.50	
Isopropylbenzene	EPA 524.2	ug/L	<0.50	
Methyl tert butyl Ether	EPA 524.2	ug/L	<3.0	13
Methylene Chloride	EPA 524.2	ug/L	<0.50	5
Napthalene	EPA 524.2	ug/L	<0.50	
n-Propylbenzene	EPA 524.2	ug/L	<0.50	
p-Isopropyltoluene	EPA 524.2	ug/L	<0.50	
Styrene	EPA 524.2	ug/L	<0.50	100
tert-Butylbenzene	EPA 524.2	ug/L	<0.50	
Tetrachloroethene	EPA 524.2	ug/L	<0.50	5
Toluene	EPA 524.2	ug/L	**291**	150
trans-1,2-Dichloroethene	EPA 524.2	ug/L	<0.50	10
trans-1,3-Dichloropropene	EPA 524.2	ug/L	<0.50	—
Trichloroethene	EPA 524.2	ug/L	<0.50	5
Trichlorofluoromethane	EPA 524.2	ug/L	<5	150
Trichlorotrifluoroethane	EPA 524.2	ug/L	<10	1,200
Trihalomethanes (total)	EPA 524.2	ug/L	<1.0	80
Vinyl Chloride	EPA 524.2	ug/L	<0.50	0.5
Xylenes	EPA 524.2	ug/L	<1.0	1,750

4.3 Significance of Impacts Prior to Mitigation

Because water quality results from 2005 and 2006 of the Park Well indicated toluene concentrations exceeded drinking water MCLs, the Project would result in a significant impact with respect to water quality provided no mitigation.

4.4 Mitigation Measures and Design Considerations

Water quality testing performed in 2005 and 2006 on the Park Well indicated elevated concentrations of toluene at 291 µg/L, 199 µg/L and 520 µg/L, which are above the drinking water MCL of 150 µg/L. Sampling of monitoring wells located to the west of the Park Well at Former Chevron Service Station No. 20-5934 in 2014 detected low concentrations of hydrocarbons (AECOM 2015). The Park Well will be re-sampled for hydrocarbons and VOCs to determine current concentrations prior to use. If hydrocarbons or VOCs are detected, wellhead treatment would be provided. The GMMP will describe the selected wellhead treatment technology, such as granular activated carbon, sampling frequency, and reporting methods for this well should it require wellhead treatment.

4.5 Conclusions

Water quality analyses indicate that groundwater pumped from Park Well is suitable for use for construction activities provided wellhead treatment is included for low concentrations of hydrocarbons and VOCs detected.

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5 SUMMARY OF PROJECT IMPACTS AND MITIGATION

5.1 50% Reduction in Groundwater Storage

As discussed in Section 3.1, a project-specific soil moisture-based water balance was not performed for the Park Well. Instead, Project withdrawals of up to 100 afy were compared to historical groundwater extraction rates from the Jacumba Valley alluvial aquifer and estimates of groundwater in storage made by Swenson (1981) and Barrett (1996). The analysis evaluates whether the water demands for the JCSD maintain at least 50% groundwater in storage over the 2,060-acre Jacumba Valley alluvial aquifer. The analysis indicates that the volume of groundwater in storage remains above the 50% significance threshold provided water level monitoring thresholds be placed on groundwater extraction. As the Project will not exceed the 50% reduction in groundwater storage threshold and other cumulative groundwater demands will be met, groundwater impacts to storage will be less than significant.

Historically, groundwater overdraft conditions developed from agricultural groundwater extraction at Jacumba Valley Ranch from 1932 to 1977 and again from 2003 to 2012. Groundwater overdraft conditions have developed when pumping 618 afy during below average rainfall conditions.

The water balance analysis assumes the addition of up to 100 afy for JCSD use with no other uses being added to the alluvial basin. If agricultural irrigation recommences at Jacumba Valley Ranch and/or other water uses commence on land within the alluvial basin, a detailed water balance analysis would need to be developed to determine the long-term sustainable yield of the basin. Additionally, future discretionary development at maximum density of the General Plan has not been considered in this analysis. The approximate 1,300-acre Ketchum Ranch is designated as a Specific Plan area with a potential density of 1.7 dwelling units per acre. If discretionary permits were obtained, this would potentially allow for over 2,000 residential units and commercial development. This type of development would require a detailed groundwater investigation far beyond the analysis provided in this study to determine the long-term sustainable yield of the basin.

5.2 Well Interference

As presented in Section 3.2, based on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation analysis, drawdown at the closest well (Well Km) as a result of pumping from the Park Well after 90 days, 1 year and 5 years is predicted to be 0.58 feet, 1.36 feet, and 3.79 feet, respectively (Table 3-2). These results indicate that drawdown is not predicted to exceed the County well interference threshold of significance of a decrease in water level of 5 feet or more in off-site alluvial wells (County of San Diego 2007).

5.3 Groundwater Dependent Habitat

As presented in Section 3.2.1.2, riparian and bottomland habitat associated with Boundary Creek located approximately 1,620 feet north of the Park Well is potentially groundwater dependent habitat. Based on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation analysis, drawdown at the closest groundwater dependent habitat as a result of pumping from the Park Well after 90 days, 1 year and 5 years is predicted to be 0.69 feet, 1.46 feet, and 3.92 feet, respectively (Table 3-2). The Project is unlikely to draw down the groundwater table to the detriment of groundwater-dependent habitat, typically a drop of 3 feet or more from historical low groundwater levels as Boundary Creek represents as recharge boundary. Therefore, impacts to groundwater dependent habitat would be less than significant.

5.4 Water Quality

As presented in Section 4.0, historical water quality analyses of the Park Well detected low concentrations of hydrocarbons and VOCs. If hydrocarbons and VOCs are detected in future samples at concentrations above drinking water MCLs, wellhead treatment will be provided to remove the constituents. Provided wellhead treatment such as activated carbon filtration, if necessary, groundwater impacts from water quality would be less than significant.

5.5 Mitigation Measures

Monitoring will be in place during production from the Park Well and additional JCSD replacement wells to ensure that impacts to groundwater storage, well interference and groundwater dependent habitat do not occur. If required, wellhead treatment will ensure that impacts to water quality are less than significant. A GMMP detailing groundwater thresholds for off-site well interference and groundwater dependent habitat has been prepared.

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7 LIST OF PREPARERS AND PERSONS AND ORGANIZATIONS CONTACTED

This report was prepared by Dudek Hydrogeologist Trey Driscoll, PG, CHG. Dudek Hydrogeologist Stephen K. Dickey, PG, CHG, CEG, provided review assistance and coordination with the County as the County-approved hydrogeologist. Jill Weinberger, PhD, PG, provided peer review of this report. Graphics and GIS mapping and analyses were provided by Dylan Duverge, PG and Jeff Kubran. This report was prepared in coordination with County Groundwater Geologist James Bennett with meteorological input from Rand Allan from the San Diego County Flood Control. Debby Troutt, General Manger, Jacumba Community Services District assisted with background information and data for this report.

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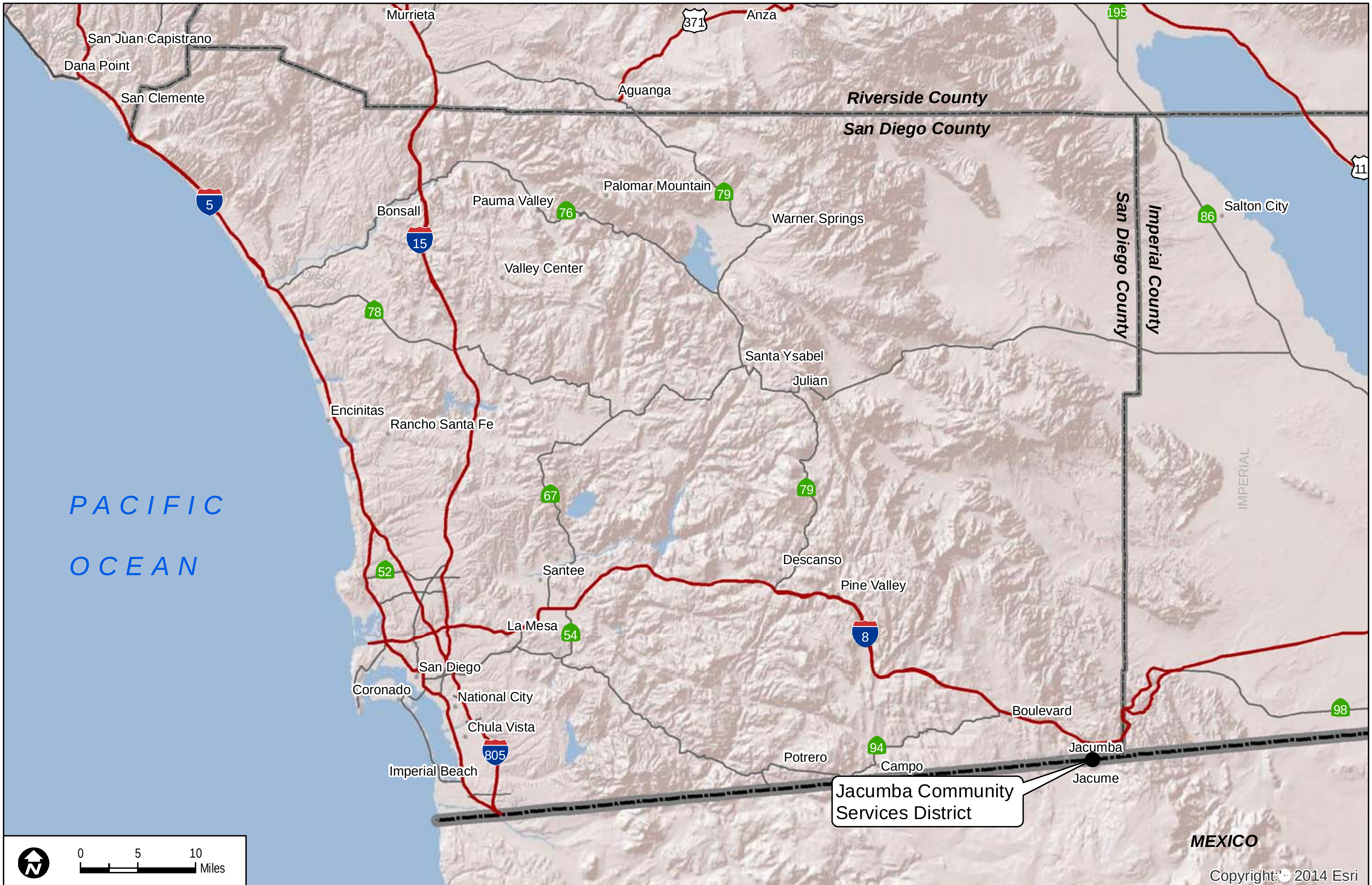

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FIGURE 1

Regional Location

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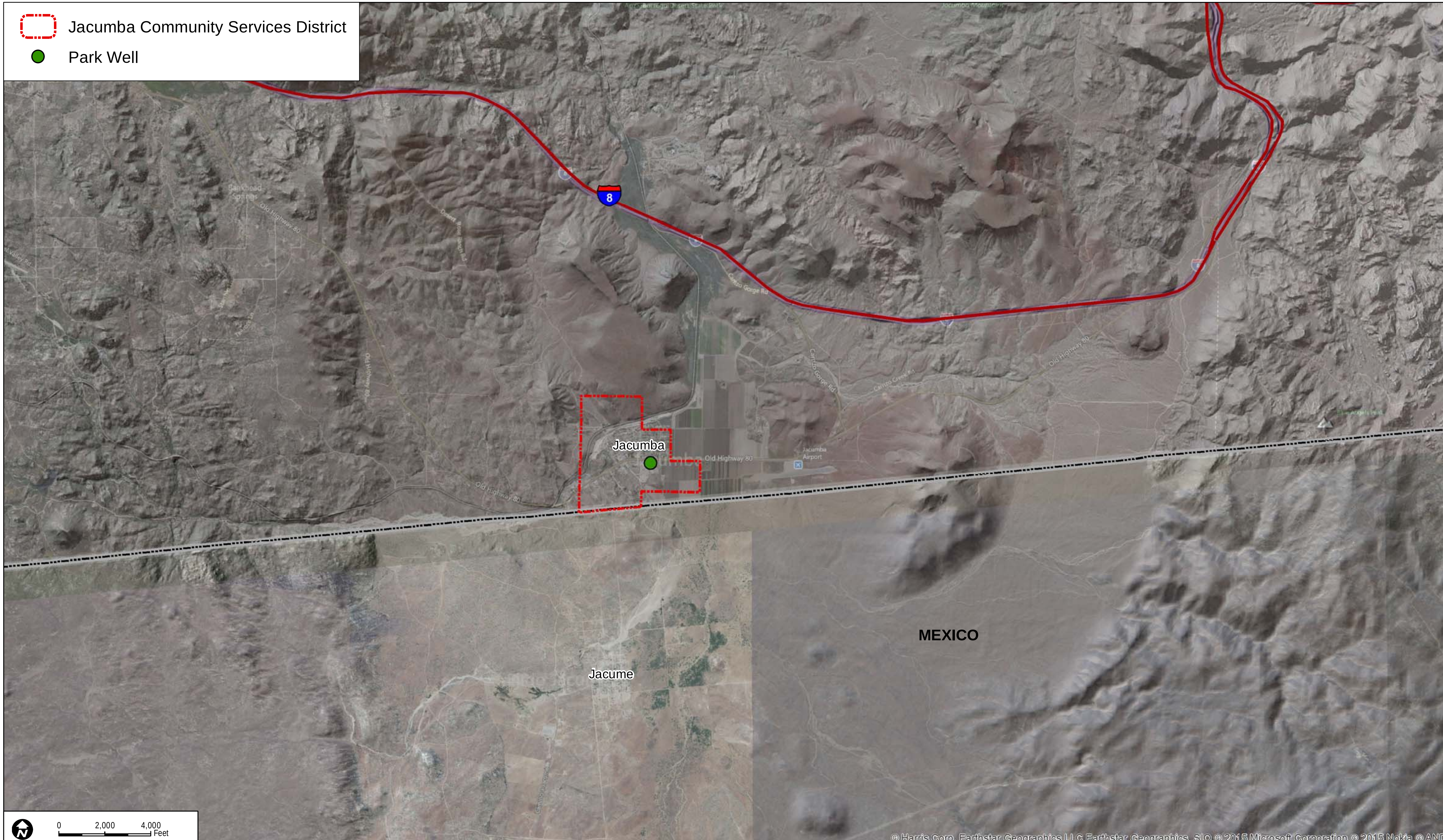

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SOURCE: Bing Maps 2015

FIGURE 2
Vicinity Map

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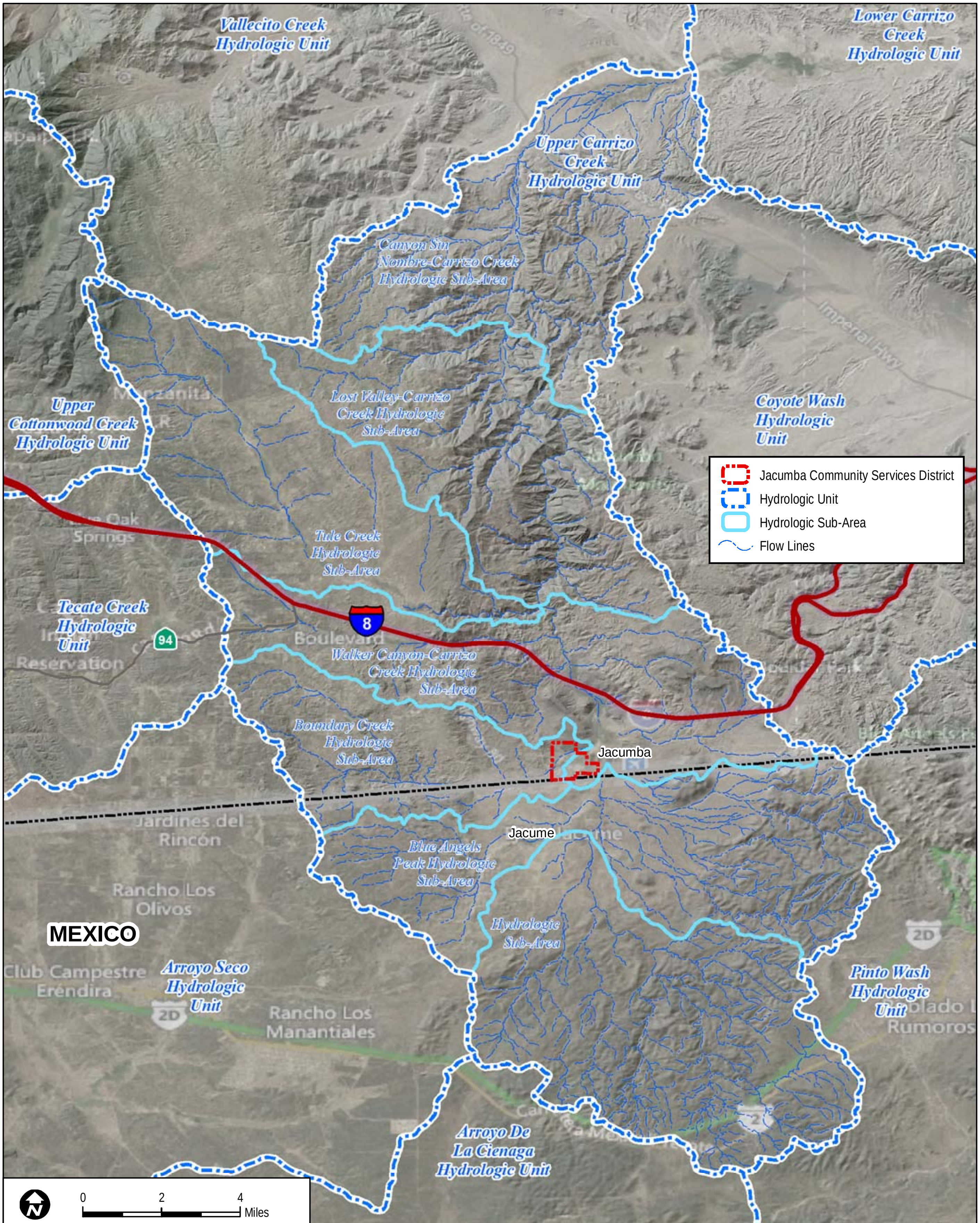

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SOURCE: BING 2012; USGS 2015.

FIGURE 3

Hydrologic Areas

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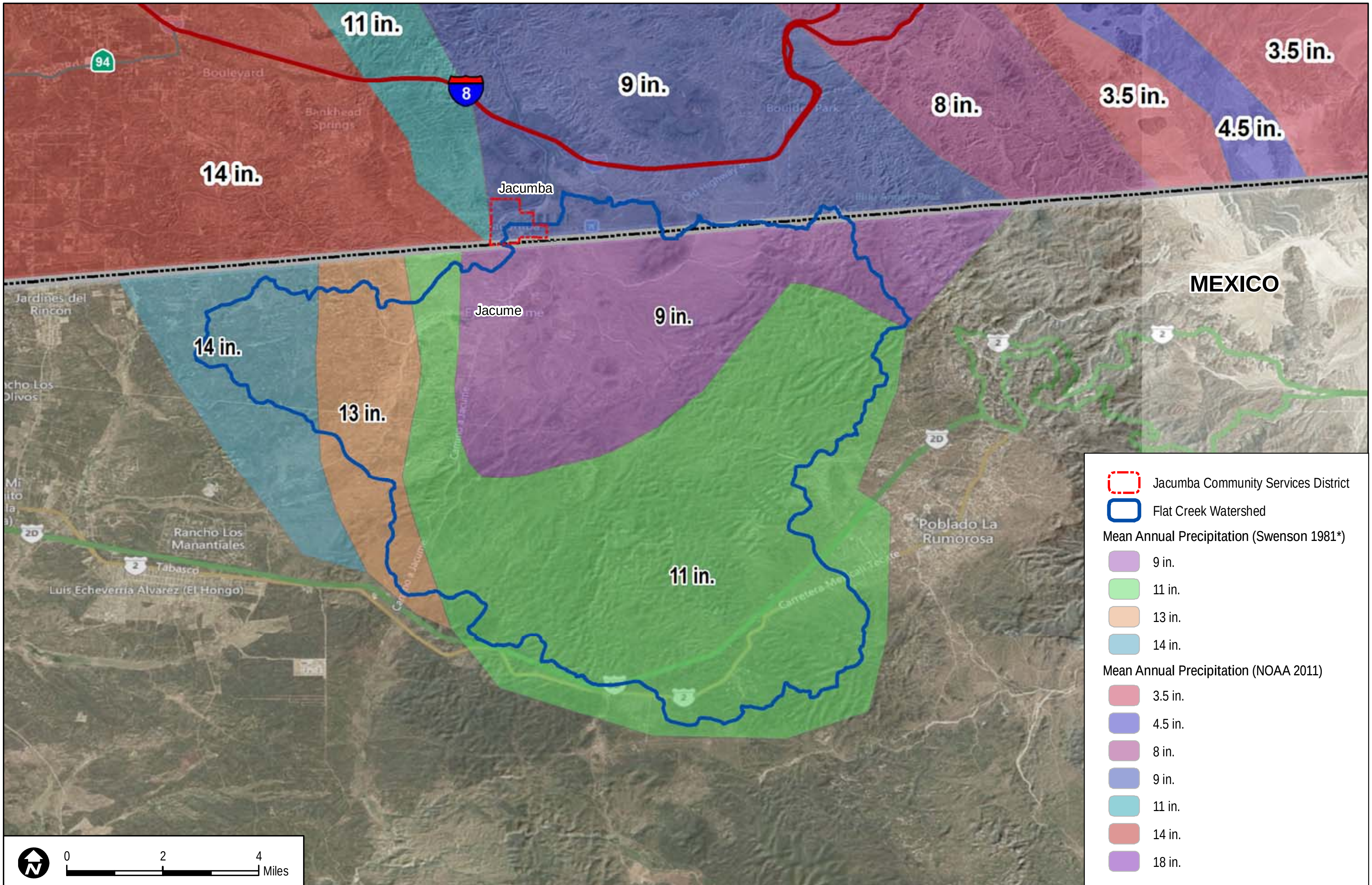

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SOURCE: NOAA; County of San Diego; Swenson 1981.
* Precipitation data interpolated from Swenson isohyetal lines.

FIGURE 4

Regional Mean Annual Precipitation

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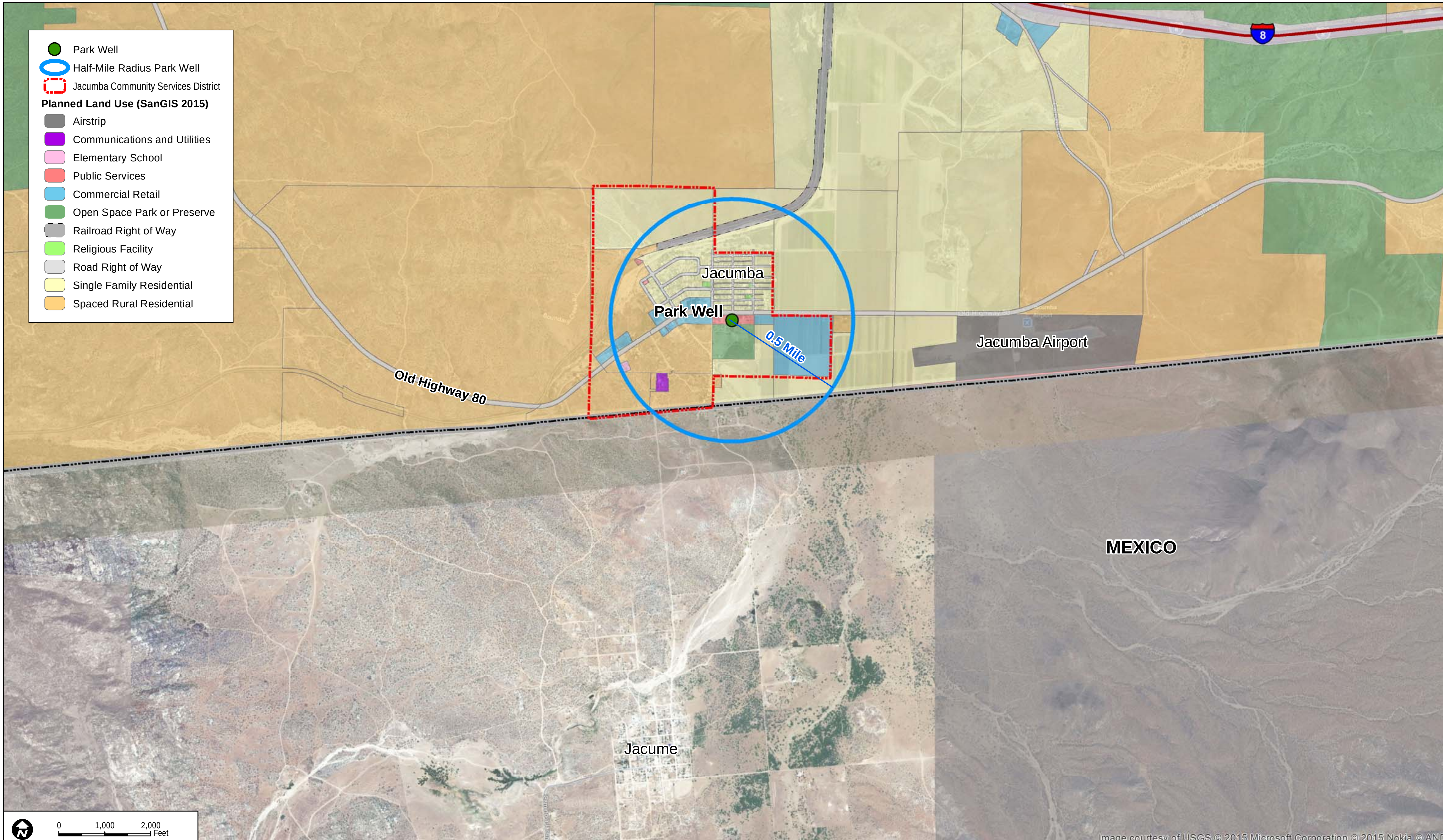

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SOURCE: SanGIS 2015

FIGURE 5
Planned Land Use and Aerial Photograph

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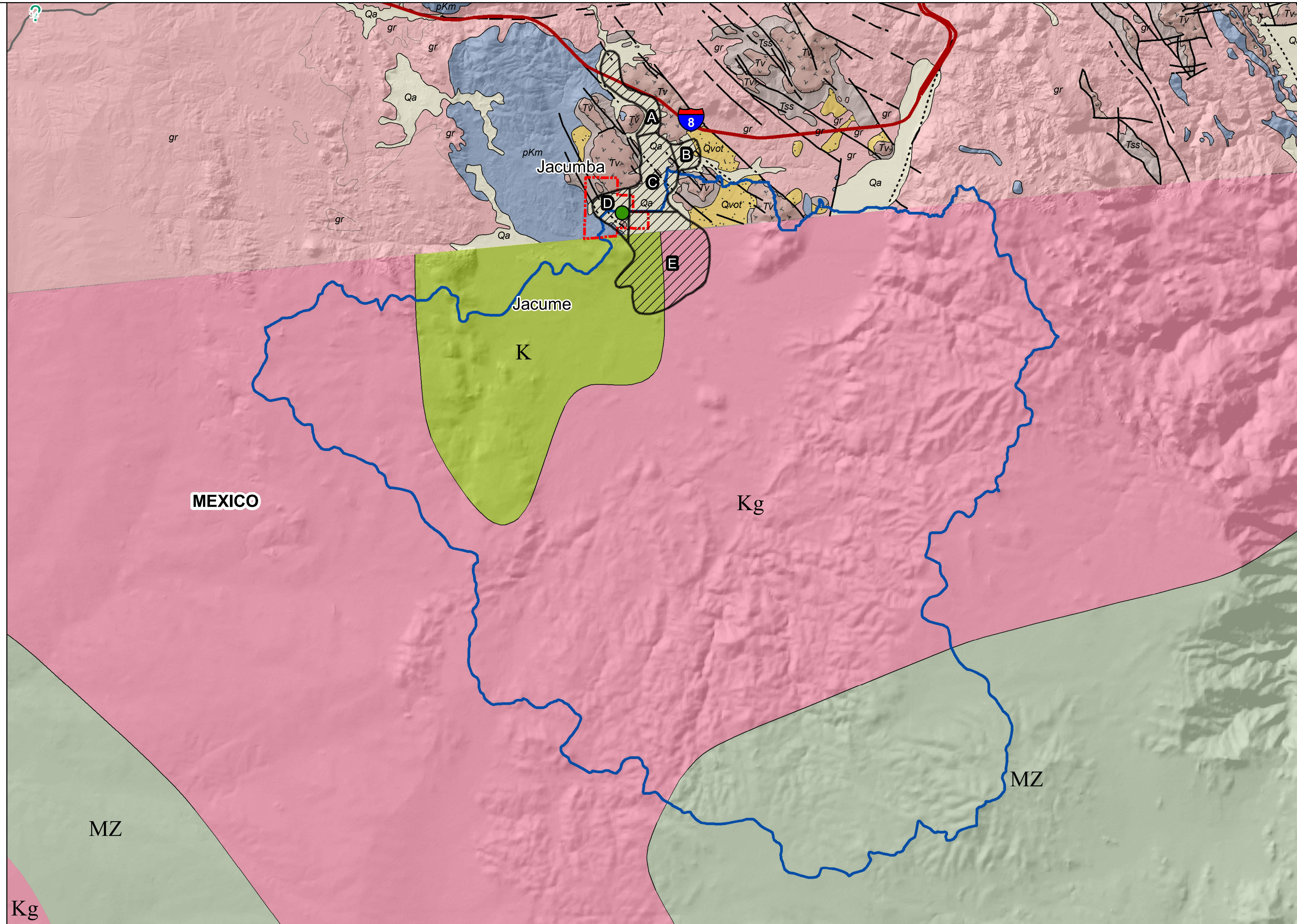

- Park Well
- Jacumba Community Services District
- Flat Creek Watershed
- Quaternary Alluvial Aquifer (Swenson

Geologic Units (CGS 2012)

Late Holocene (Surficial Deposits)

- Qa, Alluvial Valley

Middle to Early Pleistocene

- Qvot, Very Old Terrace Deposits

Tertiary Units (Bedrock)

- Tss, Coarse-Grained Tertiary Age
- Tv, Tertiary Age Formations of Volcanic

Mesozoic and Older Units (Bedrock)

- Kss, Coarse-Grained Cretaceous age Formations of Sedimentary Origin
- pKm, Cretaceous and Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origin
- gr, Granitic and Other Intrusive Crystalline Rocks

Faults and Geologic Contacts (CGS 2012)

- contact, identity and existence certain, location accurate
- contact, identity and existence certain, location approximate
- reference contact, identity or existence questionable, location accurate
- reference contact, identity and existence certain, location accurate
- fault, identity and existence certain, location accurate
- fault, identity and existence certain, location approximate
- fault, identity and existence certain, location concealed
- fault, identity and existence certain, location inferred

Geologic Units (GSA 2005)

- K, Sedimentary, Cretaceous
- Kg, Plutonic, undivided grantic rocks, Cretaceous
- MZ, Sedimentary, Mesozoic

Geologic Contacts (GSA 2005)

- Location accurate

0 1 2 Miles

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SOURCE: CSA 2012; GSA 2005; Swenson 1981

FIGURE 6
Regional Geologic Map

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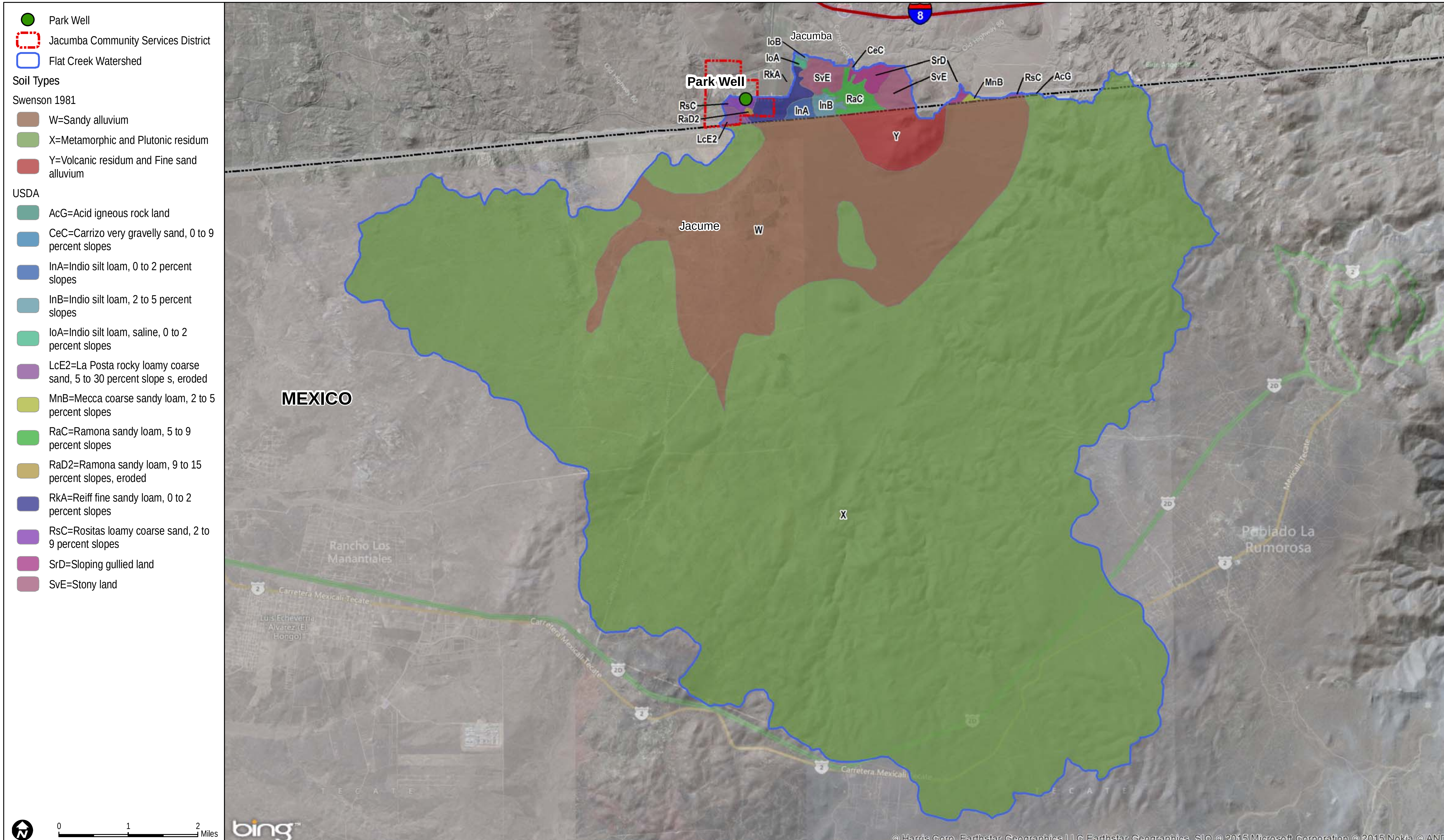

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SOURCE: Bing Maps, USDA, Swenson

FIGURE 7
Soils Map

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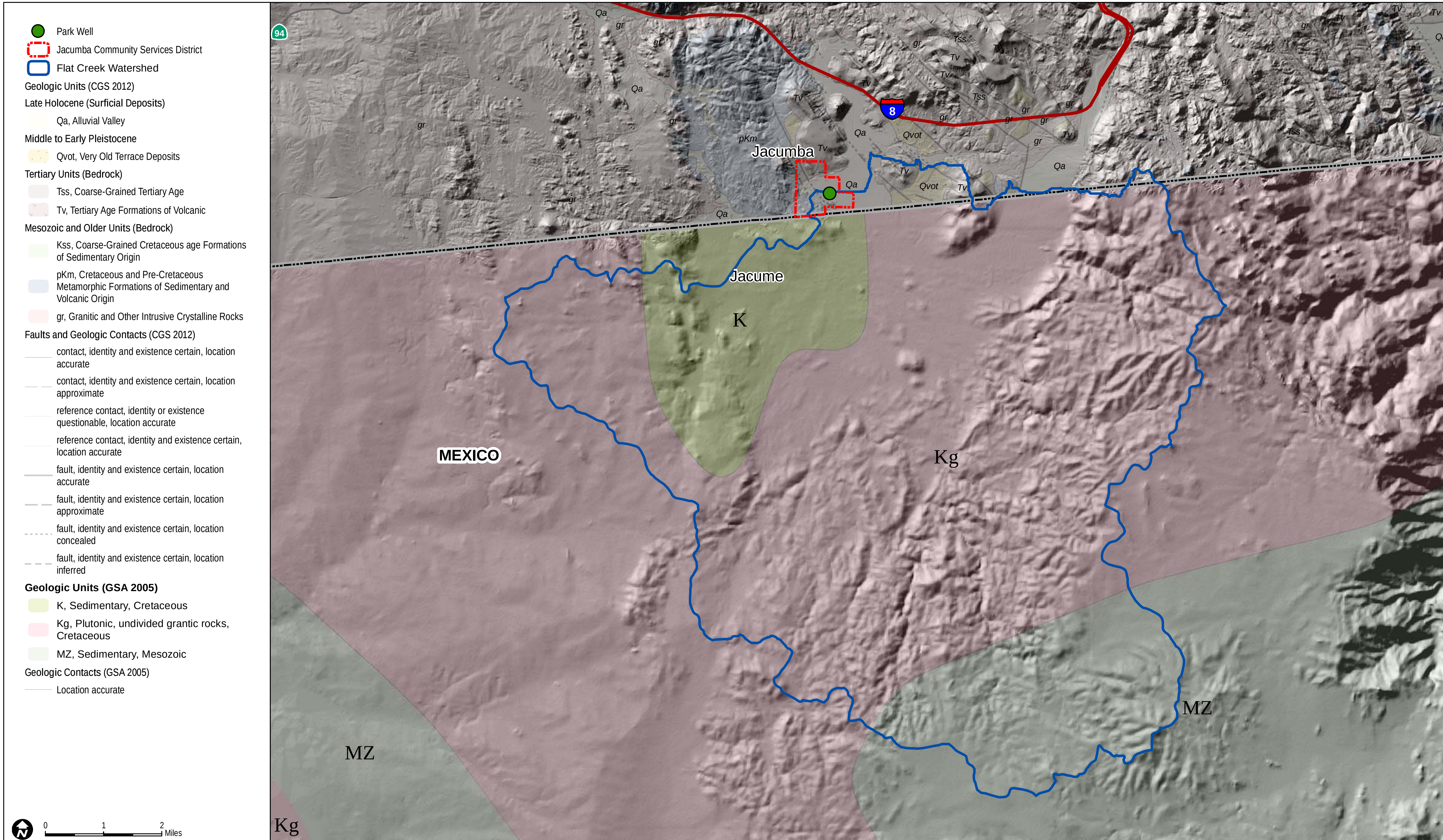

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SOURCE: CSA 2012; GSA 2005; USGS

FIGURE 8
Digital Elevation Model

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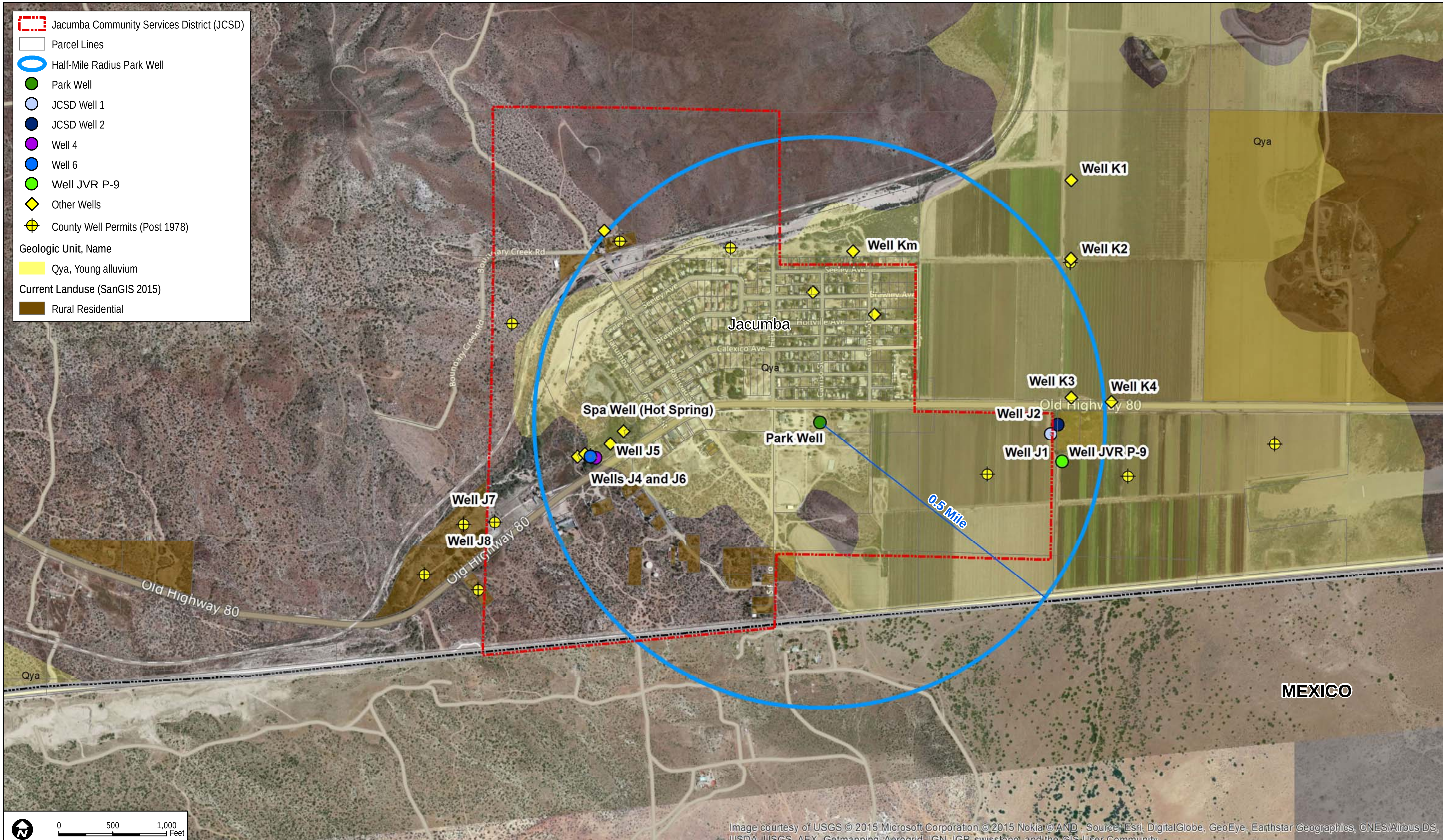

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SOURCE: JCSD; SanGIS 2003

FIGURE 9

Wells Map

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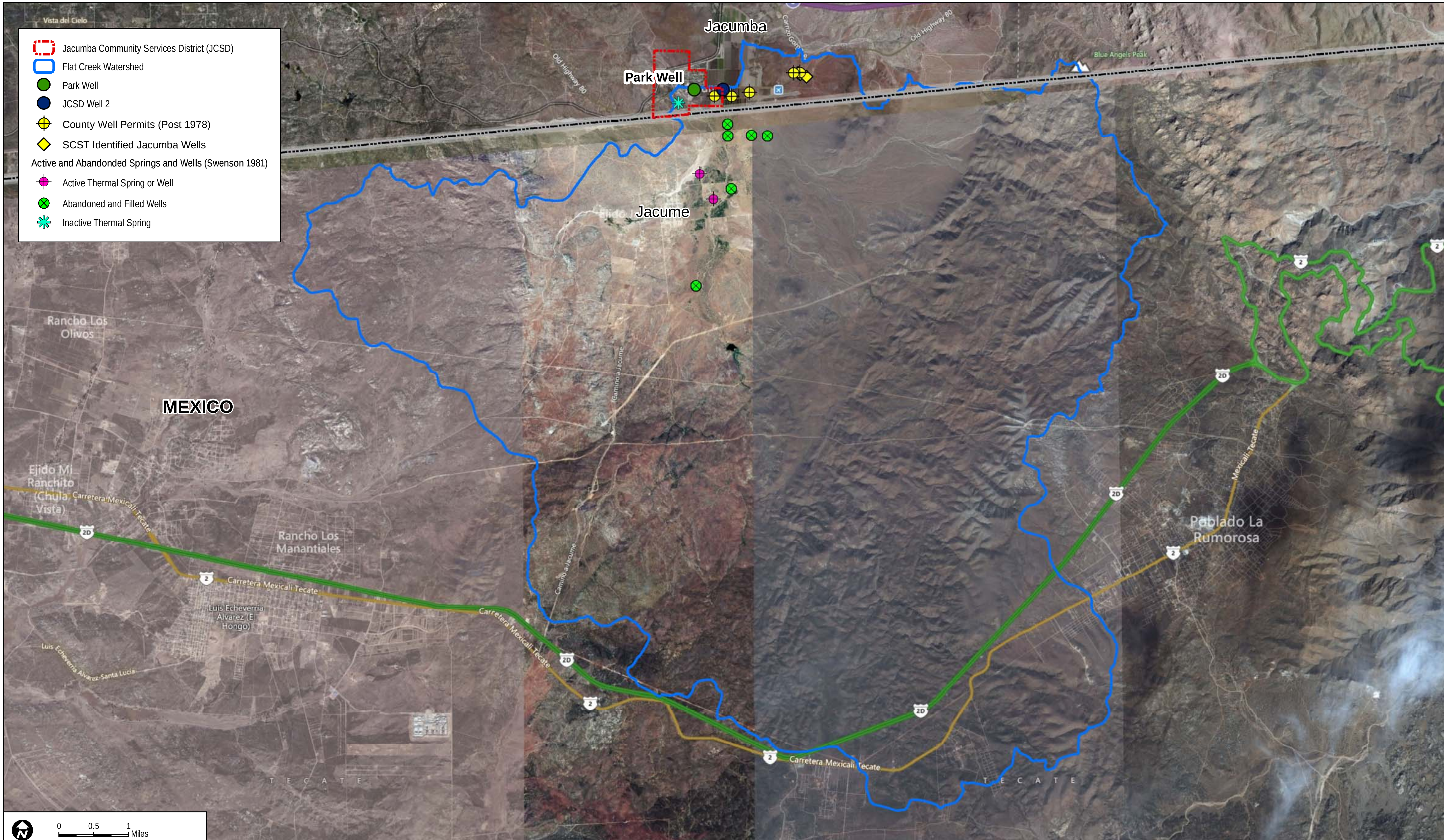

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SOURCE: Bing Maps; San Diego County; Swenson 1981

FIGURE 10
Flat Creek Watershed Land Use and Wells

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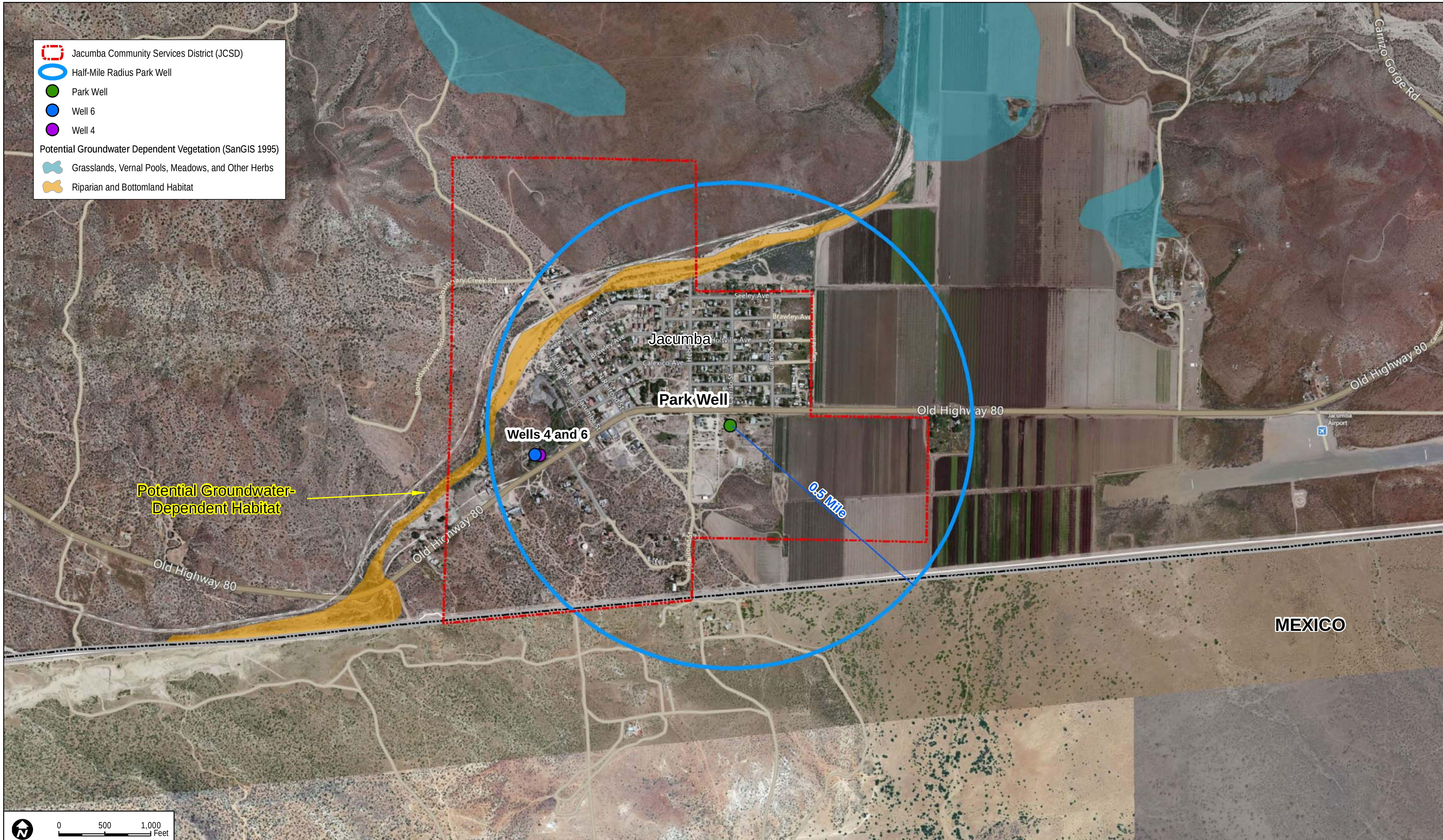

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SOURCE: Bing Maps, SanGIS

FIGURE 11
Potential Groundwater-Dependent Vegetation

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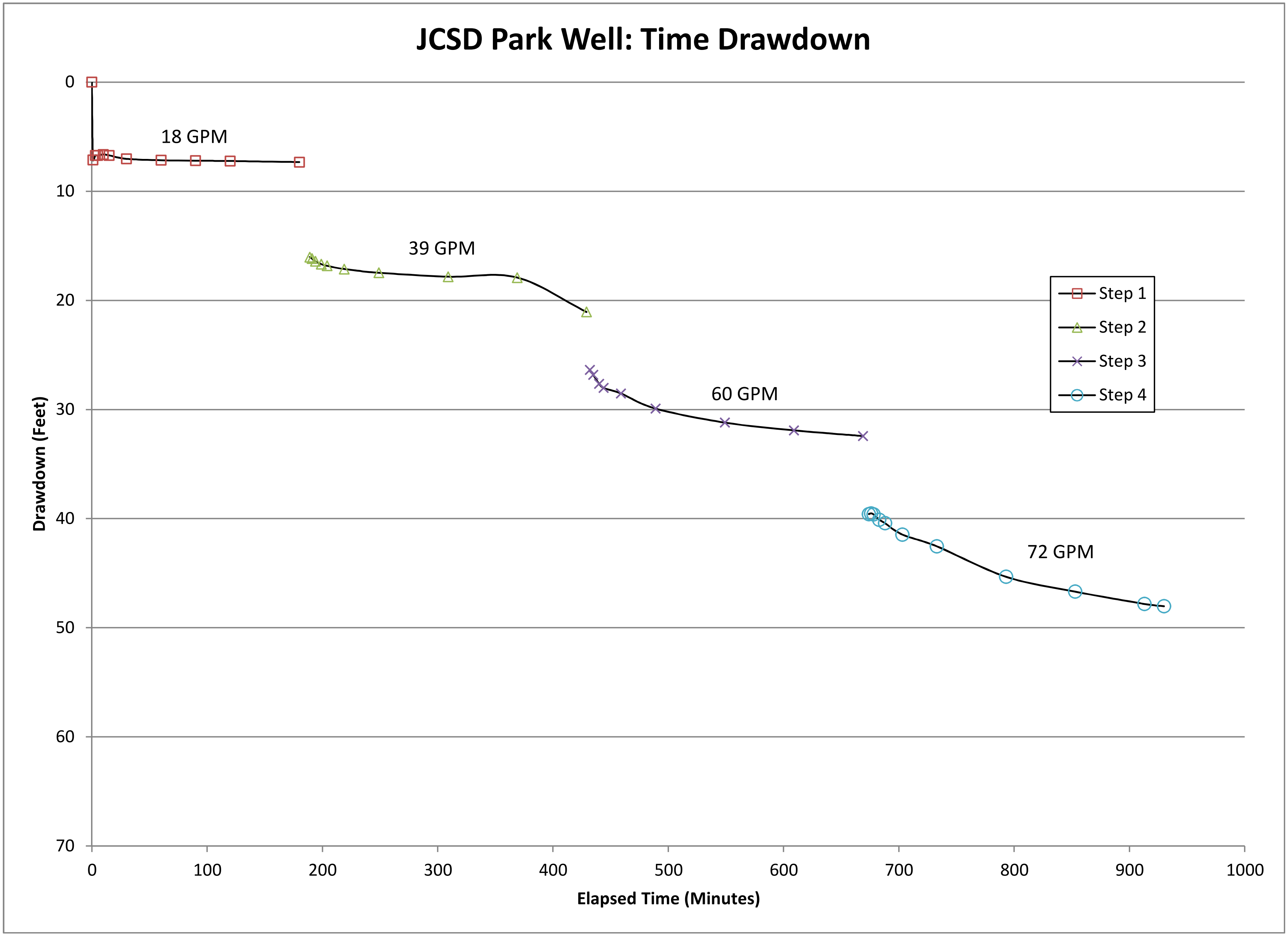
APPENDIX A

Park Well Pump Test Results



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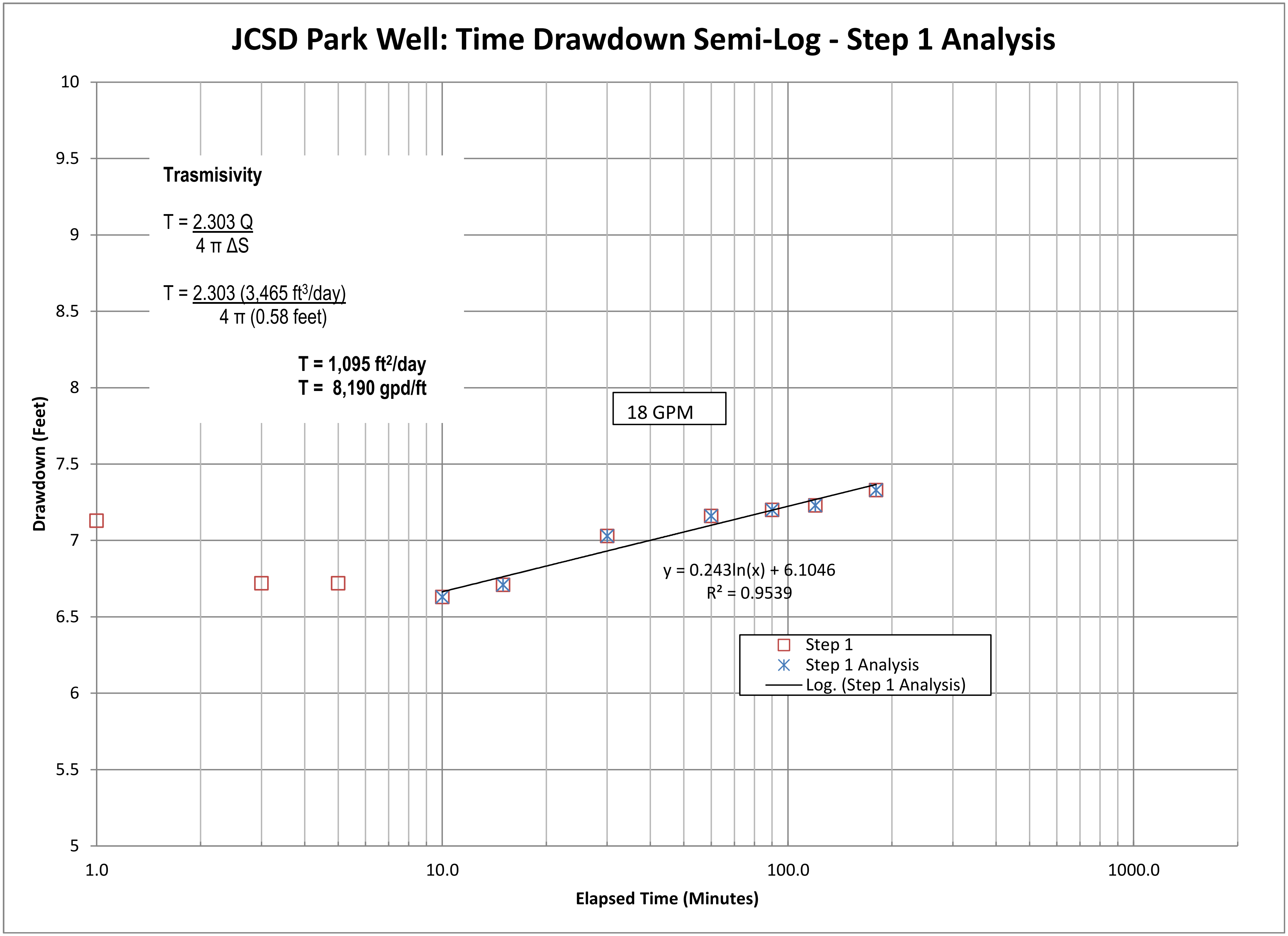
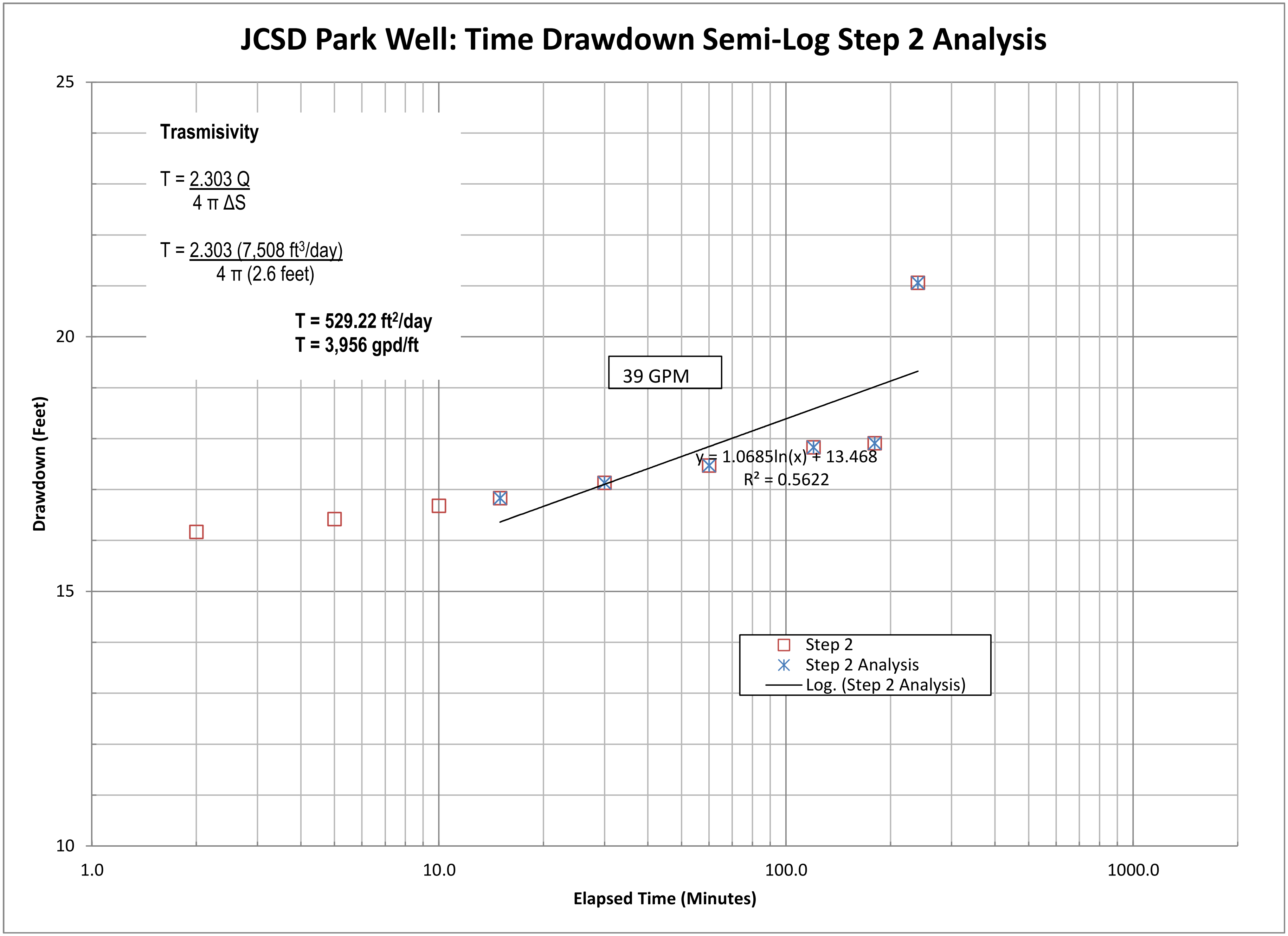
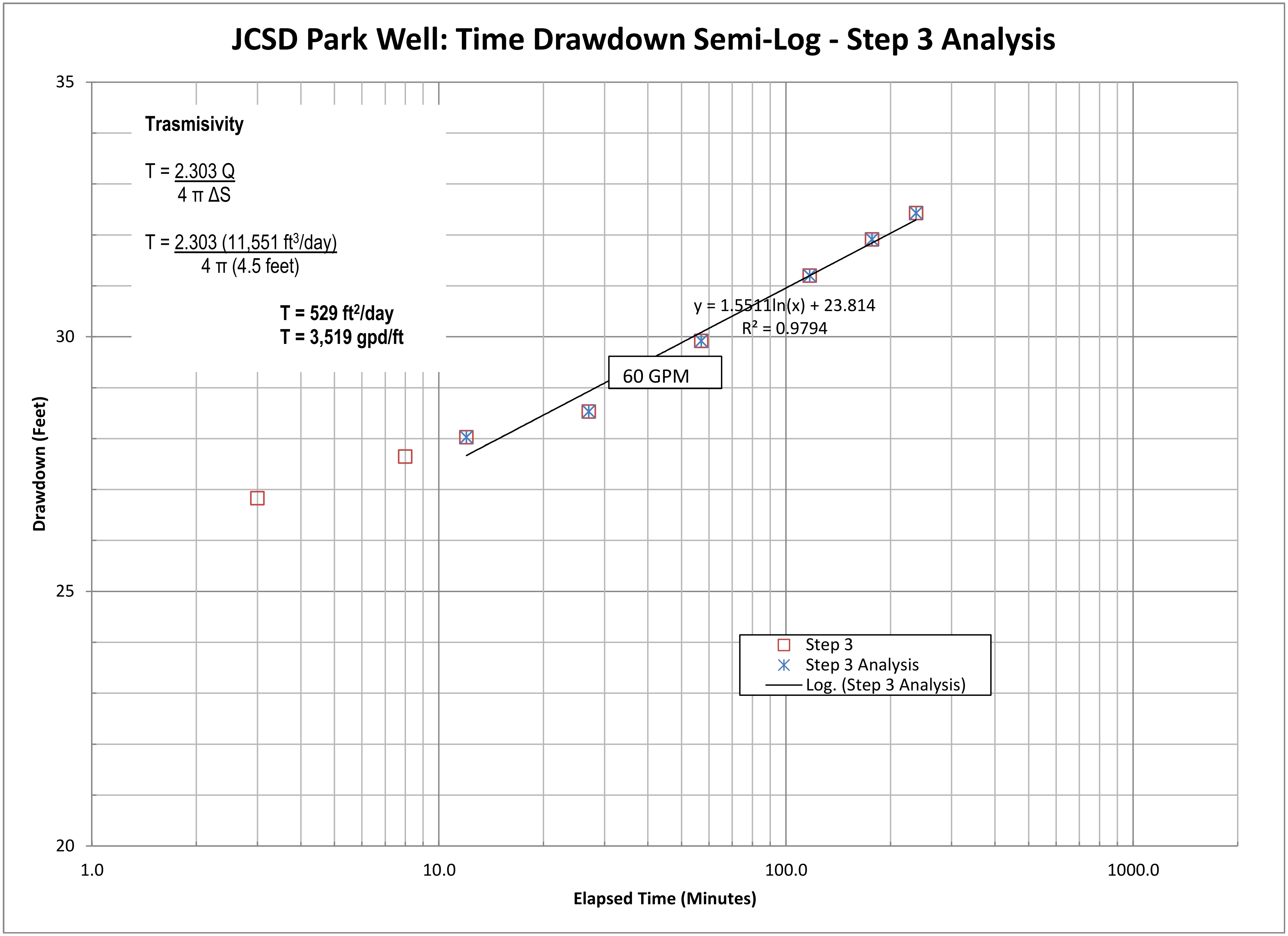


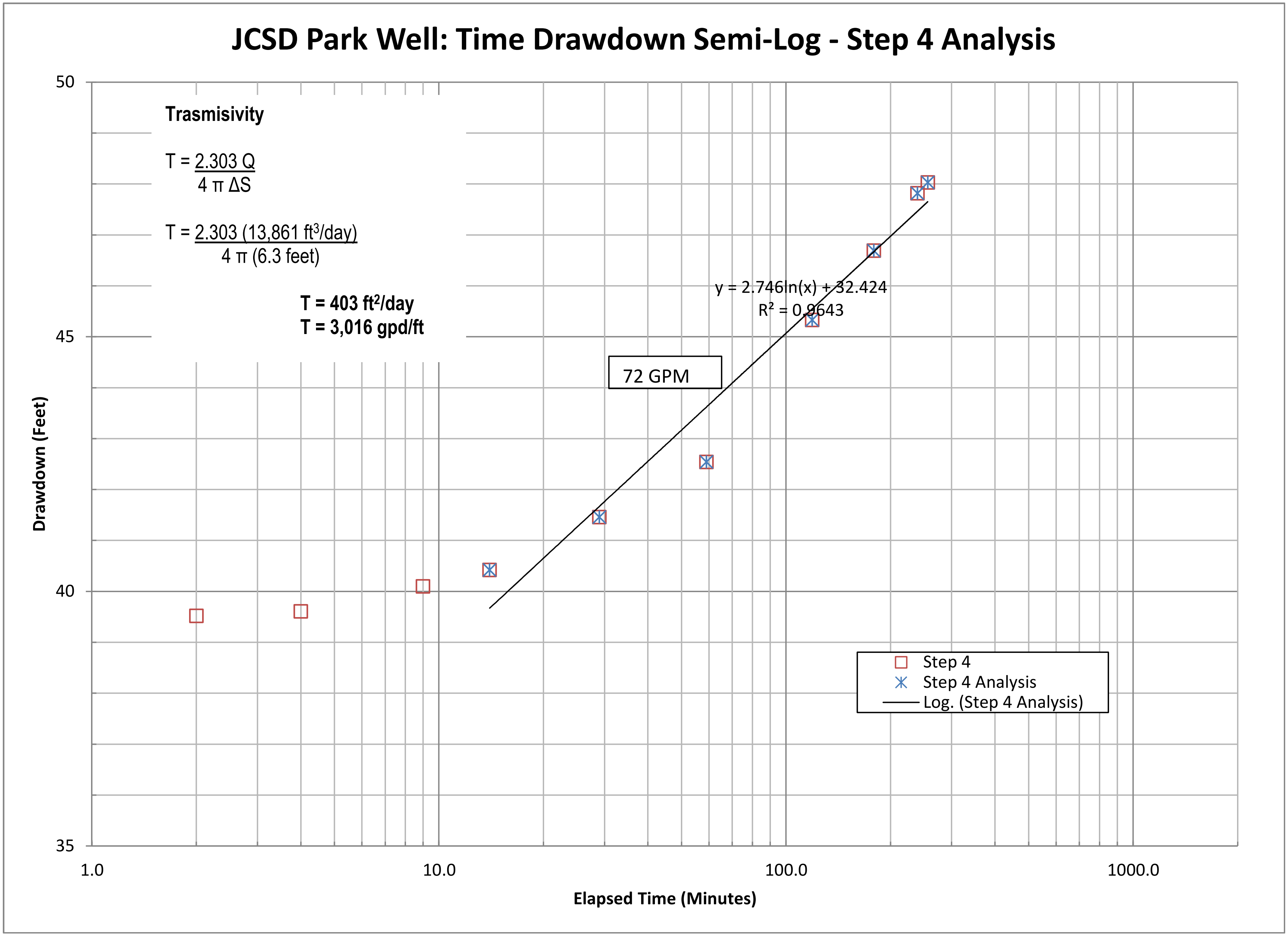
JCSD Park Well: Time Drawdown Semi-Log - Step 1 Analysis
Trasmisivity
T = 2.303 Q / 4 π ΔS
T = 2.303 (3,465 ft³/day) / 4 π (0.58 feet)
T = 1,095 ft²/day
T = 8,190 gpd/ft
18 GPM
y = 0.243ln(x) + 6.1046
R² = 0.9539
Step 1
Step 1 Analysis
Log. (Step 1 Analysis)
Drawdown (Feet)
Elapsed Time (Minutes)
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
1.0
10.0
100.0
1000.0



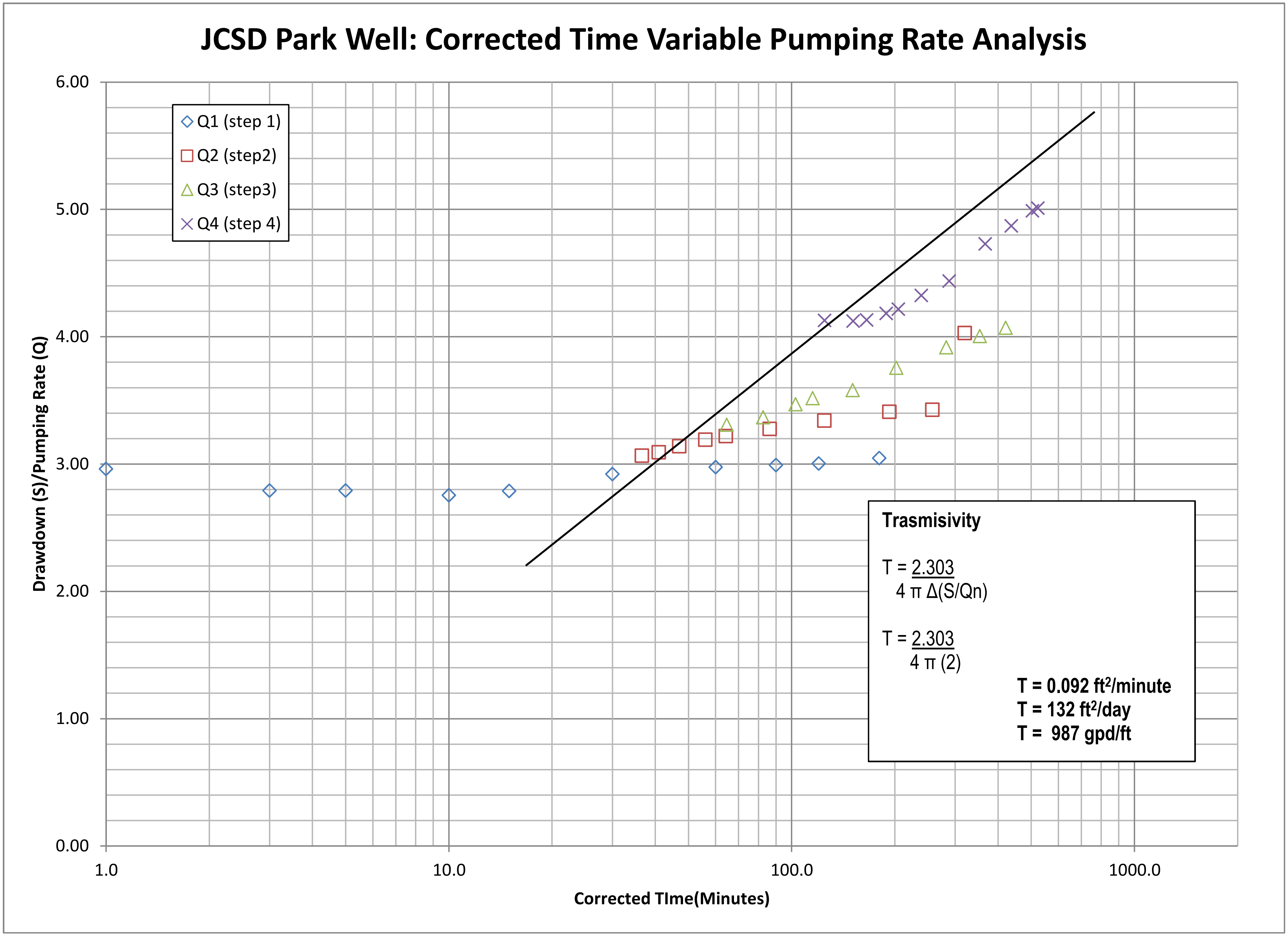
JCSD Park Well: Time Drawdown Semi-Log Step 2 Analysis
Trasmisivity
T = 2.303 Q / 4 π ΔS
T = 2.303 (7,508 ft³/day) / 4 π (2.6 feet)
T = 529.22 ft²/day
T = 3,956 gpd/ft
39 GPM
y = 1.0685ln(x) + 13.468
R² = 0.5622
Step 2
Step 2 Analysis
Log. (Step 2 Analysis)
Drawdown (Feet)
Elapsed Time (Minutes)
25
20
15
10
1.0
10.0
100.0
1000.0



JCSD Park Well: Time Drawdown Semi-Log - Step 3 Analysis
Trasmisivity
T = 2.303 Q / 4 π ΔS
T = 2.303 (11,551 ft³/day) / 4 π (4.5 feet)
T = 529 ft²/day
T = 3,519 gpd/ft
y = 1.5511ln(x) + 23.814
R² = 0.9794
60 GPM
Step 3
Step 3 Analysis
Log. (Step 3 Analysis)
Drawdown (Feet)
35
30
25
20
1.0
10.0
100.0
1000.0
Elapsed Time (Minutes)



JCSD Park Well: Time Drawdown Semi-Log - Step 4 Analysis
Trasmisivity
T = 2.303 Q / 4 π ΔS
T = 2.303 (13,861 ft³/day) / 4 π (6.3 feet)
T = 403 ft²/day
T = 3,016 gpd/ft
y = 2.746ln(x) + 32.424
R² = 0.9643
72 GPM
Step 4
Step 4 Analysis
Log. (Step 4 Analysis)
Drawdown (Feet)
Elapsed Time (Minutes)
50
45
40
35
1.0
10.0
100.0
1000.0



JCSD Park Well: Corrected Time Variable Pumping Rate Analysis
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Q1 (step 1)
Q2 (step2)
Q3 (step3)
Q4 (step 4)
Drawdown (S)/Pumping Rate (Q)
1.0
10.0
100.0
1000.0
Corrected TIme(Minutes)
Trasmisivity
T = 2.303 / 4 π Δ(S/Qn)
T = 2.303 / 4 π (2)
T = 0.092 ft²/minute
T = 132 ft²/day
T = 987 gpd/ft

APPENDIX B

Park Well Laboratory Water Quality Results

EnviroMatrix Analytical, Inc.

30 December 2005

PETRA Geotechnical, Inc.
Attn: Chuck Houser
12225 World Trade Drive, Suite P
San Diego, California 92128

EMA Log #: 0512315

Project Name: Jacumba CSD

Enclosed are the results of analyses for samples received by the laboratory on 12/20/05 07:29. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Dan Verdon
Laboratory Director

CA ELAP Certification #: 2564

Client Name:	PETRA Geotechnical, Inc.
Project Name:	Jacumba CSD

EMA Log #: 0512315

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	0512315-01	Water	12/19/05 12:50	12/20/05 07:29

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: PETRA Geotechnical, Inc.
Project Name: Jacumba CSD

EMA Log #: 0512315

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (0512315-01) Water	**Sampled: 12/19/05 12:50**	**Received: 12/20/05 07:29**							
Chloride	**90.0**	0.05	mg/l	1	5122220	12/22/05	12/27/05	SM4500 Cl C	
Fluoride	**1.9**	0.1	"	"	5122204	12/22/05	12/22/05	SM4500 F C	
Nitrate as N	**0.05**	0.05	"	"	5122032	12/20/05	12/20/05	SM4500 NO3 E	
pH	**6.92**	0.10	pH Units	"	5122101	12/20/05	12/20/05	EPA 150.1	
Total Dissolved Solids	**452**	20	mg/l	"	5122111	12/20/05	12/22/05	SM2540 C	
Sulfate as SO4	**103**	25.0	"	5	5122702	12/27/05	12/27/05	SM4500 SO4 E	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: PETRA Geotechnical, Inc.
Project Name: Jacumba CSD

EMA Log #: 0512315

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122032										
Blank (5122032-BLK1)				Prepared & Analyzed: 12/20/05						
Nitrate as N	ND	0.05	mg/l							
LCS (5122032-BS1)				Prepared & Analyzed: 12/20/05						
Nitrate as N	0.50	0.05	mg/l	0.500		100	80-120			
LCS Dup (5122032-BSD1)				Prepared & Analyzed: 12/20/05						
Nitrate as N	0.51	0.05	mg/l	0.500		102	80-120	2	20	
Duplicate (5122032-DUP1)		**Source: 0512315-01**		Prepared & Analyzed: 12/20/05						
Nitrate as N	0.06	0.05	mg/l		0.05			18	20	
Matrix Spike (5122032-MS1)		**Source: 0512315-01**		Prepared & Analyzed: 12/20/05						
Nitrate as N	0.53	0.05	mg/l	0.500	0.05	96	80-120			
Matrix Spike Dup (5122032-MSD1)		**Source: 0512315-01**		Prepared & Analyzed: 12/20/05						
Nitrate as N	0.56	0.05	mg/l	0.500	0.05	102	80-120	6	20	
Reference (5122032-SRM1)				Prepared & Analyzed: 12/20/05						
Nitrate as N	4.32	0.50	mg/l	4.32		100	87-113			
Batch 5122101										
Duplicate (5122101-DUP1)		**Source: 0512315-01**		Prepared & Analyzed: 12/20/05						
pH	6.89	0.10	pH Units		6.92			0.4	20	
Reference (5122101-SRM1)				Prepared & Analyzed: 12/20/05						
pH	8.83	0.10	pH Units	9.10		97	97-103			

Client Name: PETRA Geotechnical, Inc.	EMA Log #: **0512315**
Project Name: Jacumba CSD	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122111										
Duplicate (5122111-DUP1)		**Source: 0512228-02**		Prepared: 12/20/05 Analyzed: 12/22/05						
Total Dissolved Solids	760	20	mg/l		785			3	20	
Duplicate (5122111-DUP2)		**Source: 0512266-02**		Prepared: 12/20/05 Analyzed: 12/29/05						
Total Dissolved Solids	3750	20	mg/l		3760			0.3	20	
Reference (5122111-SRM1)				Prepared: 12/20/05 Analyzed: 12/22/05						
Total Dissolved Solids	242	20	mg/l	216		112	86-114			
Batch 5122204										
Blank (5122204-BLK1)				Prepared & Analyzed: 12/22/05						
Fluoride	ND	0.1	mg/l							
LCS (5122204-BS1)				Prepared & Analyzed: 12/22/05						
Fluoride	0.9	0.1	mg/l	1.00		90	80-120			
LCS Dup (5122204-BSD1)				Prepared & Analyzed: 12/22/05						
Fluoride	0.9	0.1	mg/l	1.00		90	80-120	0	20	
Duplicate (5122204-DUP1)		**Source: 0512315-01**		Prepared & Analyzed: 12/22/05						
Fluoride	1.9	0.1	mg/l		1.9			0	20	
Matrix Spike (5122204-MS1)		**Source: 0512315-01**		Prepared & Analyzed: 12/22/05						
Fluoride	2.8	0.1	mg/l	1.00	1.9	90	80-120			
Matrix Spike Dup (5122204-MSD1)		**Source: 0512315-01**		Prepared & Analyzed: 12/22/05						
Fluoride	2.8	0.1	mg/l	1.00	1.9	90	80-120	0	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: PETRA Geotechnical, Inc.	EMA Log #: 0512315
Project Name: Jacumba CSD	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122204										
Reference (5122204-SRM1)				Prepared & Analyzed: 12/22/05						
Fluoride	4.5	0.1	mg/l	4.73		95	86-114			
Batch 5122220										
Blank (5122220-BLK1)				Prepared: 12/22/05 Analyzed: 12/29/05						
Chloride	ND	0.05	mg/l							
LCS (5122220-BS1)				Prepared: 12/22/05 Analyzed: 12/27/05						
Chloride	202	0.05	mg/l	200		101	80-120			
LCS Dup (5122220-BSD1)				Prepared: 12/22/05 Analyzed: 12/27/05						
Chloride	204	0.05	mg/l	200		102	80-120	1	20	
Duplicate (5122220-DUP1)		**Source: 0512264-01**		Prepared: 12/22/05 Analyzed: 12/27/05						
Chloride	266000	12.5	mg/l		264000			0.8	20	
Matrix Spike (5122220-MS1)		**Source: 0512264-01**		Prepared: 12/22/05 Analyzed: 12/27/05						
Chloride	315000	12.5	mg/l	50000	264000	102	80-120			
Matrix Spike Dup (5122220-MSD1)		**Source: 0512264-01**		Prepared: 12/22/05 Analyzed: 12/27/05						
Chloride	314000	12.5	mg/l	50000	264000	100	80-120	0.3	20	
Batch 5122702										
Blank (5122702-BLK1)				Prepared & Analyzed: 12/27/05						
Sulfate as SO4	ND	5.0	mg/l							

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122702										
LCS (5122702-BS1)				Prepared & Analyzed: 12/27/05						
Sulfate as SO4	8.8	5.0	mg/l	10.0		88	80-120			
LCS Dup (5122702-BSD1)				Prepared & Analyzed: 12/27/05						
Sulfate as SO4	8.9	5.0	mg/l	10.0		89	80-120	1	20	
Duplicate (5122702-DUP1)		**Source: 0512315-01**		Prepared & Analyzed: 12/27/05						
Sulfate as SO4	101	25.0	mg/l		103			2	20	
Matrix Spike (5122702-MS1)		**Source: 0512315-01**		Prepared & Analyzed: 12/27/05						
Sulfate as SO4	149	25.0	mg/l	50.0	103	92	80-120			
Matrix Spike Dup (5122702-MSD1)		**Source: 0512315-01**		Prepared & Analyzed: 12/27/05						
Sulfate as SO4	146	25.0	mg/l	50.0	103	86	80-120	2	20	

he results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name: PETRA Geotechnical, Inc.	EMA Log #: **0512315**
Project Name: Jacumba CSD	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

EnviroMatrix Analytical, Inc.
4340 Viewridge Ave., Ste. A • San Diego, CA 92123 • Phone (858) 560-7717 • Fax (858) 560-7763

EMA DATE/TIME STAMP: DEC 20 '05 7:52

EMA LOG #: 0512315

Client: Petra Geotechnical
Address: 12225 World Trade Dr., Ste P
San Diego, CA 92128
Attn: Chuck Houser Phone: (858) 485-5530
Sampled by: Chuck Houser Fax: (858) 485-8215
Billing Address: 3185-A Airway Ave
Costa Mesa, CA
Project: Jacumba CSD PO #:

REQUESTED ANALYSIS

EMA ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container(s) #	Container(s) Type*	418.1 (TRPH)	Oil & Grease 413.1__ 413.2__ 1664__	TPH (8015B) Gas__ Diesel__	TPH-Extended 8015B__ ASTM D2887__	602 / 8021 BTXE__ MTBE__	601 / 8021 (Purgeable Halocarbons)	608 / 8081 (Pesticides)	608 / 8082 (PCB's)	624 / 8260 (Volatile Organics)	625 / 8270 (Semi Volatile Organics)	TTLC Metals (CAC Title 22)	STLC Metals (CAC Title 22)	TCLP (RCRA) Metals__ Organics__	Cd Cr Cu Pb Ni Ag Zn	pH EC TSS TDS	TDS	Chloride	Nitrate	Sulfate	pH	Fluoride		
1	MW-1	12/19/05	12:50	Water																		X	X	X	X	X	X		
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													

*Container Types: B=Brass Tube; V=VOA; G=Glass; P=Plastic; O=Other (list)

Tamper-Proof Seals Intact: Yes No N/A
Correct Containers: Yes No
Sample(s): Cold Ambient Warm
VOAs w/ZHS: Yes No N/A
All Samples Properly Preserved: Yes No N/A
Disposal: N/C (aqueous) *EMA (@$5.00/sample) Return Hold
Turnaround Time: 24 hr 48 hr 3 day 4 day 5 day (Normal)
Comments: T = 10°C

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature: [signature]	12/20/05	Signature: [signature]
Print: Chuck Houser	7:29	Print: Vassilka Vatcarska
Company: Petra		Company: EMA
Signature	12/20/05	Signature
Print	7:29	Print
Company:		Company:
Signature		Signature
Print		Print
Company:		Company:

*EMA reserves the right to return samples that do not match our waste profile.

White - EMA Canary - Accounting Pink - Client (w/Report) Goldenrod - Client (Relinquish Samples)

ENVIRONMENTAL ENGINEERING LABORATORY, INC.
3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

Analyzed: 3/24/2006 @ 13:32 **Method:** EPA 504.1
Analyst: BSK **Dilution Factor:** 1

EDB And DBCP By EPA 504

Parameter	Result %	MCL %	RL %
Bromoform	**120**	-	-
Dibromochloropropane (DBCP)	**ND**	0.2	0.01
Ethylene Dibromide (EDB)	**ND**	0.05	0.02

Report Date: 04/11/2006

Approval: [signature]
Director

RECEIVED
MAY 24 2006

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

EEL Analytical
ENVIRONMENTAL ENGINEERING LABORATORY, INC.
3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

Analyzed: 4/5/2006 @ 14:34 **Method:** EPA 524.2
Analyst: **Dilution Factor:** 1

VOC By EPA 502.2/524.2

Parameter	Result ug/L	MCL ug/L	RL ug/L	Parameter	Result ug/L	MCL ug/L	RL ug/L
1,1,1,2-Tetrachloroethane	ND	80	0.5	Chloroethane	ND	80	0.5
1,1,1-Trichloroethane	ND	200	0.5	Chloroform	ND	80	0.5
1,1,2,2-Tetrachloroethane	ND	1	0.5	Chloromethane	ND	80	0.5
1,1,2-Trichloroethane	ND	5	0.5	Cis-1,2-Dichloroethylene	ND	6	0.5
1,1-Dichloroethane	ND	5	0.5	Cis-1,3-Dichloropropene	ND	80	0.5
1,1-Dichloroethylene	ND	6	0.5	Dibromochloromethane	ND	80	0.5
1,1-Dichloropropene	ND	80	0.5	Dibromomethane	ND	80	0.5
1,2 Dichlorobenzene (o-DCB)	ND	600	.5	Dichlorodifluoromethane	ND	80	0.5
1,2,3-Trichlorobenzene	ND	80	0.5	Dichloromethane(Methylenchlor)	ND	5	0.5
1,2,3-Trichloropropane	ND	-	0.5	Ethylbenzene	0.50	300	0.5
1,2,4-Trichlorobenzene	ND	5	0.5	Hexachlorobutadiene	ND	80	0.5
1,2,4-Trimethylbenzene	0.50	80	0.5	Isopropylbenzene (Cumene)	ND	80	0.5
1,2-Dichloroethane	ND	0.5	0.5	Methyl Ethyl Ketone	ND	-	5
1,2-Dichloropropane	ND	5	0.5	Methyl Tert-butyl Ether (MTBE)	ND	5	1.0
1,3,5-Trimethylbenzene	ND	80	0.5	Monochlorobenzene	ND	70	0.5
1,3-Dichlorobenzene	ND	80	0.5	Napthalene	ND	80	0.5
1,3-Dichloropropane	ND	80	0.5	N-butylbenzene	ND	80	0.5
1,3-Dichloropropene	ND	0.5	0.5	Nitrobenzene	ND	-	0.5
1,4-Dichlorobenzene (p-DCB)	ND	5	0.5	N-propylbenzene	ND	80	0.5
2,2-Dichloropropane	ND	80	0.5	Pentachlorothane	ND	-	0.5
2-Chlorotoluene	ND	80	0.5	P-isopropyltoluene	ND	80	0.5
4-Chlorotoluene	ND	80	0.5	Sec-butylbenzene	ND	80	0.5
Benzene	0.70	1.0	0.5	Styrene	ND	100	0.5
Bromobenzene	ND	80	0.5	Tert-butylbenzene	ND	80	0.5
Bromochloromethane	ND	80	0.5	Tetrachloroethylene (PCE)	ND	5	0.5
Bromodichloromethane	ND	80	0.5	Toluene	291	150	0.5
Bromoform	ND	80	0.5	Total Trihalomethanes	ND	80	0.5
Bromomethane	ND	80	0.5	Trans-1,2-dichloroethylene	ND	10	0.5
Carbon Tetrachloride	ND	0.5	0.5	Trans-1,3-dichloropropene	ND	80	0.5

Report Date: 04/11/2006

Approval: [signature]
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

EEL Analytical

ENVIRONMENTAL ENGINEERING LABORATORY, INC.

3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

Analyzed: 4/5/2006 @ 14:34 **Method:** EPA 524.2
Analyst: **Dilution Factor:** 1

VOC By EPA 502.2/524.2

Parameter	Result ug/L	MCL ug/L	RL ug/L	Parameter	Result ug/L	MCL ug/L	RL ug/L
Trichloroethylene (TCE)	ND	5	0.5				
Trichlorofluoromethane	ND	150	5.00				
Trichlorotrifluoromethane	ND	1200	10.0				
Vinyl Chloride	ND	0.5	0.5				
Xylenes	ND	1750	0.5				

Surrogates	% Recovered	QC Limits (%)	
4-Bromofluorobenzene	70%	40	140

Report Date: 04/11/2006

Approval: [signature]
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

ENVIRONMENTAL ENGINEERING LABORATORY, INC.
3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

Carbamates By 531.1

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
3-Hydroxycarbofuran	ND	µg/L	3	NA	1	EPA 531.1	03/27/2006 13:34	BSK
Aldicarb	ND	µg/L	3	NA	1	EPA 531.1	03/27/2006 13:34	BSK
Aldicarb Sulfoxide	ND	µg/L	3	NA	1	EPA 531.1	03/27/2006 13:34	BSK
Aldicard Sulfone	ND	µg/L	2	NA	1	EPA 531.1	03/27/2006 13:34	BSK
BDMC	100	%	-	-	1	EPA 531.1	03/27/2006 13:34	BSK
Carbaryl	ND	µg/L	5	NA	1	EPA 531.1	03/27/2006 13:34	BSK
Carbofuran	ND	µg/L	5	18	1	EPA 531.1	03/27/2006 13:34	BSK
Methomyl	ND	µg/L	2	NA	1	EPA 531.1	03/27/2006 13:34	BSK
Oxamyl	ND	µg/L	20	50	1	EPA 531.1	03/27/2006 13:34	BSK

Coliform Total (1) Colilert

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Chlorine Residual	NA	mg/L	0.1		1	SM4500G	03/15/2006 13:50	MEH
Coliform, E. Coli.	Absent	None	0	0	1	SM 9223	03/15/2006 13:50	MEH
Total Coliform	Absent	None	0	0	1	SM 9223	03/15/2006 13:50	MEH

General Physical

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Color, Visual	<4	UNITS	3	15	1	SM 2120B	03/20/2006 16:16	FN
Odor	ND	TON	1		1	SM 2150	03/20/2006 16:16	FN
Turbidity	4.08	NTU	0.10	1.0	1	SM2130B	03/16/2006 17:01	FN

Gross Alpha and Beta

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Gross Alpha Counting Error	0.710	pCi/L	0	0	1	EPA900.0	03/30/2006 14:32	TLI
Gross Beta Counting Error	0.660	pCi/L	0	0	1	EPA900.0	03/30/2006 14:32	TLI
Radioactivity, Gross Alpha	0.00	pCi/L	0	15	1	EPA900.0	03/30/2006 14:32	TLI
Radioactivity, Gross Beta	1.29	pCi/L	0	0	1	EPA900.0	03/30/2006 14:32	TLI

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

ENVIRONMENTAL ENGINEERING LABORATORY, INC.
3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient: Tom Lindenmeyer
JACUMBA COMM.SERVICE DIST.
BOX 425
JACUMBA, CA 92034
Reference: 0631270
Lab ID: 0631270-001
Sample #:
Project#:
Comment: VOC analyzed past holding time

Matrix: WATER
Sampled: 03/15/2006 6:05
Received: 03/15/2006 11:45
Collection Address:
Sample Location: MW-1
Description:
Date Started: 03/15/2006
Date Completed: 04/11/2006
PS Code: WAT

Herbicides by EPA 515.1

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
2,4-D (Dichlorophenoxy) Acetic Acid	ND	µg/L	10	70	1	EPA 515.1	03/21/2006 13:33	MEH
2.4.5-T	ND	µg/L	1	NA	1	EPA 515.1	03/21/2006 13:33	BSK
Bentazon	ND	µg/L	2	18	1	EPA 515.1	03/21/2006 13:33	BSK
Dalapon	ND	µg/L	10	200	1	EPA 515.3	03/21/2006 13:33	BSK
Dicamba	ND	µg/L	1.5	NA	1	EPA 515.1	03/21/2006 13:33	BSK
Dinoseb	ND	µg/L	2	7	1	EPA 515.1	03/21/2006 13:33	BSK
Pentachlorophenol	ND	µg/L	0.2	1	1	EPA 515.1	03/21/2006 13:33	BSK
Picloram	ND	µg/L	1	500	1	EPA 515.1	03/21/2006 13:33	BSK
Silvex	ND	µg/L	1	50	1	EPA 515.1	03/21/2006 13:33	BSK

Pesticides and PCBs by EPA 505

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Aldrin	ND	µg/L	0.075	NA	1	EPA 505	03/20/2006 13:32	BSK
Chlordane	ND	µg/L	0.1	0.1	1	EPA 505	03/20/2006 13:32	BSK
Chlorothalonil (Daconil, Bravo)	ND	µg/L	5.0	NA	1	EPA 505	03/20/2006 13:32	BSK
Dieldrin	ND	µg/L	0.02	NA	1	EPA 505	03/20/2006 13:32	BSK
Endrin	ND	µg/L	0.1	2	1	EPA 505	03/20/2006 13:32	BSK
Heptachlor	ND	µg/L	0.01	0.01	1	EPA 505	03/20/2006 13:32	BSK
Heptachlor epoxide	ND	µg/L	0.01	0.01	1	EPA 505	03/20/2006 13:32	BSK
Hexachlorobenzene	ND	µg/L	0	1	1	EPA 505	03/20/2006 13:32	BSK
Hexachlorocyclopentadiene	ND	µg/L	1	50	1	EPA 505	03/20/2006 13:32	BSK
Lindane (BHC gamma isomer)	ND	µg/L	0.2	0.2	1	EPA 505	03/20/2006 13:32	BSK
Methoxychlor	ND	µg/L	10	30	1	EPA 505	03/20/2006 13:32	BSK
PCBs: Arolchlor Screen	ND	µg/L	0.2	0.5	1	EPA 505	03/20/2006 13:32	BSK
Toxaphene	ND	µg/L	1	3	1	EPA 505	03/20/2006 13:32	BSK
Trifluralin	ND	µg/L	1	NA	1	EPA 505	03/20/2006 13:32	BSK

RL = Reporting Limit   MCL = Maximum Contaminant Level   MDL = Method Detection Limit   N/A = Not Applicable

ENVIRONMENTAL ENGINEERING LABORATORY, INC.
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Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

SVOCs By EPA 525.2 (Full List)

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
1,3-Dimethyl-2-nitrobenzene	110	%	-	-	1	EPA 525.2	04/04/2006 13:34	BSK
Alachlor	ND	µg/L	1	2	1	EPA 525.2	04/04/2006 13:34	BSK
Atrazine	ND	µg/L	0.5	1	1	EPA 525.2	04/04/2006 13:34	BSK
Benzo (a) Pyrene	ND	µg/L	0.1	0.2	1	EPA 525.2	04/04/2006 13:34	BSK
Bis(2-ethylhexyl)adipate	ND	µg/L	3	400	1	EPA 525.2	04/04/2006 13:34	BSK
Bis(2-ethylhexyl)phthalate	ND	µg/L	3	4	1	EPA 525.2	04/04/2006 13:34	BSK
Bromacil (Hyvar)	ND	µg/L	10	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Butachlor	ND	µg/L	0.38	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Diazinon	ND	µg/L	0.25	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Dimethoate (Cygon)	ND	µg/L	10	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Metolachlor	ND	µg/L	0.5	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Metribuzin	ND	µg/L	0.5	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Molinate (Ordram)	ND	µg/L	2	20	1	EPA 525.2	04/04/2006 13:34	BSK
Prometryn (Caparol)	ND	µg/L	2	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Propachlor	ND	µg/L	0.5	NA	1	EPA 525.2	04/04/2006 13:34	BSK
Simazine	ND	µg/L	1	4	1	EPA 525.2	04/04/2006 13:34	BSK
Thiobencarb (Bolero)	ND	µg/L	1	70	1	EPA 525.2	04/04/2006 13:34	BSK

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Diquat By EPA 549	ND	ug/L	4.0	20	1	549	03/17/2006 13:31	BSK
Endothall By EPA 548	ND	ug/L	45	100	1	548.1	03/20/2006 13:31	BSK
Glyphosate By EPA 547	ND	ug/L	25	700	1	547	03/17/2006 13:31	BSK
Uranium	ND	pCi/L	2.0	20	1	EPA 908.0	03/28/2006	BSK

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

ENVIRONMENTAL ENGINEERING LABORATORY, INC.

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Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	03/15/2006 6:05
		Received:	03/15/2006 11:45
		Collection Address:	
Reference:	0631270	**Sample Location:**	MW-1
Lab ID:	0631270-001	**Description:**	
Sample #:		**Date Started:**	03/15/2006
Project#:		**Date Completed:**	04/11/2006
Comment:	VOC analyzed past holding time	**PS Code:**	WAT

Title 22 Primary Inorganic Chemicals

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Analyzed	Analyst
Aluminum	770	ug/L	50.0	1000	1	SM 3120B	03/29/2006 10:43	JLA
Antimony	ND	ug/L	6.0	6	1	SM 3113B	03/29/2006 10:44	JLA
Arsenic	ND	ug/L	2.0	50	1	SM 3120B	03/29/2006 10:44	JLA
Barium	180	ug/L	100.0	1000	1	SM 3120B	03/29/2006 10:44	JLA
Beryllium	ND	ug/L	1.0	4	1	SM 3120B	03/29/2006 10:44	JLA
Cadmium	ND	ug/L	1.0	5	1	SM 3120B	03/29/2006 10:44	JLA
Chromium, Total (screen)	ND	µg/L	1.0	-	1	SM 3120B	03/29/2006 10:44	MEH
Cyanide, Total	ND	ug/L	100	150	1	SM4500E	03/21/2006	MEH
Fluoride	1.96	mg/L	0.1	2.0	1	EPA 300.0	03/15/2006 16:49	MEH
Lead	ND	ug/L	5.0	15	1	SM 3113B	03/29/2006 10:44	JLA
Mercury	ND	ug/L	1.0	2	1	SM3112B	03/29/2006 10:44	JLA
Nickel	ND	ug/L	10	100	1	SM 3120B	03/29/2006 10:44	JLA
Nitrate + Nitrite (as N)	ND	µg/L	400	10,000	1	EPA 300.0	03/15/2006 10:43	MEH
Nitrogen, Nitrate (as NO3)	ND	mg/L	2.0	45	1	EPA 300.0	03/15/2006 14:38	MEH
Nitrogen, Nitrite (as N)	ND	ug/L	400	1000	1	EPA 300.0	03/15/2006 14:38	MEH
Selenium	ND	ug/L	5.0	50	1	SM 3113B	03/29/2006 10:44	JLA
Thallium	ND	ug/L	1.0	2	1	EPA 200.9	03/29/2006 10:44	JLA

Report Date: 04/11/2006

Approval: [signature]
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

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Environmental Engineering Laboratory, Inc.

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Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	04/18/2006
		Received:	04/18/2006 2:40
		Collection Address:	
Reference:	0631569	**Sample Location:**	Old Hwy 80
Lab ID:	0631569-001	**Description:**	
Sample #:		**Date Started:**	04/18/2006
Project#:		**Date Completed:**	05/03/2006
Comment:		**PS Code:**	WAT

Analyzed: 4/28/2006 @ **Method:** EPA 524.2

Analyst: **Dilution Factor:** 1

VOC By EPA 502.2/524.2

Parameter	Result ug/L	MCL ug/L	RL ug/L	Parameter	Result ug/L	MCL ug/L	RL ug/L
1,1,1,2-Tetrachloroethane	ND	80	0.5	Chloroethane	0.60	80	0.5
1,1,1-Trichloroethane	ND	200	0.5	Chloroform	ND	80	0.5
1,1,2,2-Tetrachloroethane	ND	1	0.5	Chloromethane	ND	80	0.5
1,1,2-Trichloroethane	ND	5	0.5	Cis-1,2-Dichloroethylene	ND	6	0.5
1,1-Dichloroethane	ND	5	0.5	Cis-1,3-Dichloropropene	ND	80	0.5
1,1-Dichloroethylene	ND	6	0.5	Dibromochloromethane	ND	80	0.5
1,1-Dichloropropene	ND	80	0.5	Dibromomethane	ND	80	0.5
1,2 Dichlorobenzene (o-DCB)	ND	600	.5	Dichlorodifluoromethane	ND	80	0.5
1,2,3-Trichlorobenzene	ND	80	0.5	Dichloromethane(Methylenchlor)	ND	5	0.5
1,2,3-Trichloropropane	ND	-	0.5	Ethylbenzene	ND	300	0.5
1,2,4-Trichlorobenzene	ND	5	0.5	Hexachlorobutadiene	ND	80	0.5
1,2,4-Trimethylbenzene	ND	80	0.5	Isopropylbenzene (Cumene)	ND	80	0.5
1,2-Dichloroethane	ND	0.5	0.5	Methyl Ethyl Ketone	ND	-	5
1,2-Dichloropropane	ND	5	0.5	Methyl Tert-butyl Ether (MTBE)	ND	5	1.0
1,3,5-Trimethylbenzene	ND	80	0.5	Monochlorobenzene	ND	70	0.5
1,3-Dichlorobenzene	ND	80	0.5	Napthalene	ND	80	0.5
1,3-Dichloropropane	ND	80	0.5	N-butylbenzene	ND	80	0.5
1,3-Dichloropropene	ND	0.5	0.5	Nitrobenzene	ND	-	0.5
1,4-Dichlorobenzene (p-DCB)	ND	5	0.5	N-propylbenzene	ND	80	0.5
2,2-Dichloropropane	ND	80	0.5	Pentachlorothane	ND	-	0.5
2-Chlorotoluene	ND	80	0.5	P-isopropyltoluene	ND	80	0.5
4-Chlorotoluene	ND	80	0.5	Sec-butylbenzene	ND	80	0.5
Benzene	0.70	1.0	0.5	Styrene	ND	100	0.5
Bromobenzene	ND	80	0.5	Tert-butylbenzene	ND	80	0.5
Bromochloromethane	ND	80	0.5	Tetrachloroethylene (PCE)	ND	5	0.5
Bromodichloromethane	ND	80	0.5	Toluene	199	150	0.5
Bromoform	ND	80	0.5	Total Trihalomethanes	ND	80	0.5
Bromomethane	ND	80	0.5	Trans-1,2-dichloroethylene	ND	10	0.5
Carbon Tetrachloride	ND	0.5	0.5	Trans-1,3-dichloropropene	ND	80	0.5

Report Date: 05/03/2006

Approval: [signature]
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

ENVIRONMENTAL ENGINEERING LABORATORY, INC.
3538 Hancock St. San Diego, CA 92110 | P:(619)298-6131 | F:(619)298-6141 | ELAP Cert.#2616

Recipient:	Tom Lindenmeyer JACUMBA COMM.SERVICE DIST. BOX 425 JACUMBA, CA 92034	**Matrix:**	WATER
		Sampled:	04/18/2006
		Received:	04/18/2006 2:40
		Collection Address:	
Reference:	0631569	**Sample Location:**	Old Hwy 80
Lab ID:	0631569-001	**Description:**	
Sample #:		**Date Started:**	04/18/2006
Project#:		**Date Completed:**	05/03/2006
Comment:		**PS Code:**	WAT

Analyzed: 4/28/2006 @ **Method:** EPA 524.2
Analyst: **Dilution Factor:** 1

VOC By EPA 502.2/524.2

Parameter	Result ug/L	MCL ug/L	RL ug/L
Trichloroethylene (TCE)	ND	5	0.5
Trichlorofluoromethane	ND	150	5.00
Trichlorotrifluoromethane	ND	1200	10.0
Vinyl Chloride	ND	0.5	0.5
Xylenes	ND	1750	0.5

Surrogates	% Recovered	QC Limits (%)	
4-Bromofluorobenzene	69%	40	140

Report Date: 05/03/2006

Approval: [signature]
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

MOBILE GEOCHEMISTRY
H&P

20 April 2006

Ms. Melissa Monti
Petra Geotechnical
12225 World Trade Drive, Suite P
San Diego, CA 92128

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RE: PG041906-31

Enclosed are the results of analyses for samples received by the laboratory on 19-Apr-06 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rebecca L Johnson for

Tamara Davis
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 1839, 2088, 2278, 2530, 2543, 2579 and 2595.

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148 South Vinewood Street, Escondido, California 92029 | 760 735.3208 — Fax 760 735.2469
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Petra Geotechnical 12225 World Trade Drive, Suite P San Diego CA, 92128	Project: PG041906-31 Project Number: Jacumba Community Service District Project Manager: Ms. Melissa Monti	Reported: 20-Apr-06

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	E604068-01	Water	18-Apr-06	19-Apr-06

MOBILE GEOCHEMISTRY
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Petra Geotechnical 12225 World Trade Drive, Suite P San Diego CA, 92128	Project: PG041906-31 Project Number: Jacumba Community Service District Project Manager: Ms. Melissa Monti	Reported: 20-Apr-06

Volatile Organic Compounds by EPA Method 8260B/5030

H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
MW-1 (E604068-01) Water Sampled: 18-Apr-06 Received: 19-Apr-06									
Dichlorodifluoromethane	ND	1.0	ug/l	0.1	ED61905	19-Apr-06	19-Apr-06	EPA 8260B	
Chloromethane	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
Methylene chloride	ND	1.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
Di-isopropyl ether	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
Bromochloromethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	1.0	"	"	"	"	"	"	
Benzene	ND	0.5	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
Dibromomethane	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Toluene	520	5.0	"	1	"	"	19-Apr-06	"	
trans-1,3-Dichloropropene	ND	1.0	"	0.1	"	"	19-Apr-06	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromoethane (EDB)	ND	1.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	0.5	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	

MOBILE GEOCHEMISTRY

H&P

Petra Geotechnical 12225 World Trade Drive, Suite P San Diego CA, 92128	Project: PG041906-31 Project Number: Jacumba Community Service District Project Manager: Ms. Melissa Monti	Reported: 20-Apr-06

Volatile Organic Compounds by EPA Method 8260B/5030

H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
MW-1 (E604068-01) Water Sampled: 18-Apr-06 Received: 19-Apr-06									
m,p-Xylene	ND	1.0	ug/l	0.1	ED61905	19-Apr-06	19-Apr-06	EPA 8260B	
o-Xylene	ND	0.5	"	"	"	"	"	"	
Styrene	ND	1.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
Isopropylbenzene	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
n-Propylbenzene	ND	1.0	"	"	"	"	"	"	
Bromobenzene	ND	1.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	1.0	"	"	"	"	"	"	
p-Isopropyltoluene	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
n-Butylbenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Naphthalene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
Tert-butyl alcohol	ND	5.0	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*90.2 %*	*75-125*		"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*92.4 %*	*62-139*		"	"	"	"	
Surrogate: Toluene-d8		*88.2 %*	*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.2 %*	*75-125*		"	"	"	"	

MOBILE GEOCHEMISTRY
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Petra Geotechnical 12225 World Trade Drive, Suite P San Diego CA, 92128	Project: PG041906-31 Project Number: Jacumba Community Service District Project Manager: Ms. Melissa Monti	Reported: 20-Apr-06

Volatile Organic Compounds by EPA Method 8260B/5030 - Quality Control
H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED61905 - EPA 5030										
Blank (ED61905-BLK1)				Prepared & Analyzed: 19-Apr-06						
Dichlorodifluoromethane	ND	1.0	ug/l							
Chloromethane	ND	1.0	"							
Vinyl chloride	ND	1.0	"							
Bromomethane	ND	1.0	"							
Chloroethane	ND	1.0	"							
Trichlorofluoromethane	ND	1.0	"							
1,1-Dichloroethene	ND	1.0	"							
Methylene chloride	ND	1.0	"							
Methyl tert-butyl ether	ND	1.0	"							
trans-1,2-Dichloroethene	ND	1.0	"							
Di-isopropyl ether	ND	1.0	"							
1,1-Dichloroethane	ND	1.0	"							
Ethyl tert-butyl ether	ND	1.0	"							
2,2-Dichloropropane	ND	1.0	"							
cis-1,2-Dichloroethene	ND	1.0	"							
Chloroform	ND	1.0	"							
Bromochloromethane	ND	1.0	"							
1,1,1-Trichloroethane	ND	1.0	"							
1,1-Dichloropropene	ND	1.0	"							
Carbon tetrachloride	ND	1.0	"							
1,2-Dichloroethane	ND	1.0	"							
Tert-amyl methyl ether	ND	1.0	"							
Benzene	ND	0.5	"							
Trichloroethene	ND	1.0	"							
1,2-Dichloropropane	ND	1.0	"							
Bromodichloromethane	ND	1.0	"							
Dibromomethane	ND	1.0	"							
cis-1,3-Dichloropropene	ND	1.0	"							
Toluene	ND	0.5	"							
trans-1,3-Dichloropropene	ND	1.0	"							
1,1,2-Trichloroethane	ND	1.0	"							
1,2-Dibromoethane (EDB)	ND	1.0	"							
1,3-Dichloropropane	ND	1.0	"							
Tetrachloroethene	ND	1.0	"							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED61905 - EPA 5030										
Blank (ED61905-BLK1)				Prepared & Analyzed: 19-Apr-06						
Dibromochloromethane	ND	1.0	ug/l							
Chlorobenzene	ND	1.0	"							
Ethylbenzene	ND	0.5	"							
1,1,1,2-Tetrachloroethane	ND	1.0	"							
m,p-Xylene	ND	1.0	"							
o-Xylene	ND	0.5	"							
Styrene	ND	1.0	"							
Bromoform	ND	1.0	"							
Isopropylbenzene	ND	1.0	"							
1,1,2,2-Tetrachloroethane	ND	1.0	"							
1,2,3-Trichloropropane	ND	1.0	"							
n-Propylbenzene	ND	1.0	"							
Bromobenzene	ND	1.0	"							
1,3,5-Trimethylbenzene	ND	1.0	"							
2-Chlorotoluene	ND	1.0	"							
4-Chlorotoluene	ND	1.0	"							
tert-Butylbenzene	ND	1.0	"							
1,2,4-Trimethylbenzene	ND	1.0	"							
sec-Butylbenzene	ND	1.0	"							
p-Isopropyltoluene	ND	1.0	"							
1,3-Dichlorobenzene	ND	1.0	"							
1,4-Dichlorobenzene	ND	1.0	"							
n-Butylbenzene	ND	1.0	"							
1,2-Dichlorobenzene	ND	1.0	"							
1,2-Dibromo-3-chloropropane	ND	1.0	"							
1,2,4-Trichlorobenzene	ND	1.0	"							
Hexachlorobutadiene	ND	1.0	"							
Naphthalene	ND	1.0	"							
1,2,3-Trichlorobenzene	ND	1.0	"							
Tert-butyl alcohol	ND	5.0	"							
Surrogate: Dibromofluoromethane	*4.61*		*"*	*5.00*		*92.2*	*75-125*			
Surrogate: 1,2-Dichloroethane-d4	*4.86*		*"*	*5.00*		*97.2*	*62-139*			
Surrogate: Toluene-d8	*4.46*		*"*	*5.00*		*89.2*	*75-125*			

MOBILE GEOCHEMISTRY
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Petra Geotechnical 12225 World Trade Drive, Suite P San Diego CA, 92128	Project: PG041906-31 Project Number: Jacumba Community Service District Project Manager: Ms. Melissa Monti	Reported: 20-Apr-06

Volatile Organic Compounds by EPA Method 8260B/5030 - Quality Control
H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED61905 - EPA 5030										
Blank (ED61905-BLK1)				Prepared & Analyzed: 19-Apr-06						
Surrogate: 4-Bromofluorobenzene	*5.59*		*ug/l*	*5.00*		*112*	*75-125*			
LCS (ED61905-BS1)				Prepared & Analyzed: 19-Apr-06						
1,1-Dichloroethene	6.00	1.0	ug/l	5.00		120	75-125			
Benzene	5.60	0.5	"	5.00		112	75-125			
Trichloroethene	5.60	1.0	"	5.00		112	75-125			
Toluene	5.37	0.5	"	5.00		107	74-125			
Chlorobenzene	5.57	1.0	"	5.00		111	75-125			
Surrogate: Dibromofluoromethane	*4.77*		*"*	*5.00*		*95.4*	*75-125*			
Surrogate: 1,2-Dichloroethane-d4	*4.98*		*"*	*5.00*		*99.6*	*75-125*			
Surrogate: Toluene-d8	*4.25*		*"*	*5.00*		*85.0*	*75-125*			
Surrogate: 4-Bromofluorobenzene	*4.87*		*"*	*5.00*		*97.4*	*75-125*			
LCS Dup (ED61905-BSD1)				Prepared & Analyzed: 19-Apr-06						
1,1-Dichloroethene	5.91	1.0	ug/l	5.00		118	75-125	1.51	20	
Benzene	5.50	0.5	"	5.00		110	75-125	1.80	20	
Trichloroethene	5.51	1.0	"	5.00		110	75-125	1.62	20	
Toluene	5.17	0.5	"	5.00		103	74-125	3.80	20	
Chlorobenzene	5.28	1.0	"	5.00		106	75-125	5.35	20	
Surrogate: Dibromofluoromethane	*4.83*		*"*	*5.00*		*96.6*	*75-125*			
Surrogate: 1,2-Dichloroethane-d4	*5.56*		*"*	*5.00*		*111*	*75-125*			
Surrogate: Toluene-d8	*4.39*		*"*	*5.00*		*87.8*	*75-125*			
Surrogate: 4-Bromofluorobenzene	*5.16*		*"*	*5.00*		*103*	*75-125*			

MOBILE GEOCHEMISTRY
H&P

Petra Geotechnical	Project:	PG041906-31	
12225 World Trade Drive, Suite P	Project Number:	Jacumba Community Service District	Reported:
San Diego CA, 92128	Project Manager:	Ms. Melissa Monti	20-Apr-06

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CHAIN-OF-CUSTODY RECORD

MOBILE/ONE LABORATORIES INC.

MOL: P6041906-01

148 So. Vinewood Street, Escondido, CA 92029-1921 (760) 735-3208 FAX (760) 735-2469

Date: 4/19/06 Page 1 of 1

Client: Petra Geotechnical, Inc

Site Address: 12225 World Trade Dr, Ste P
San Diego, CA 92128

Project: Jacumba Community Service District

Sampler (signature): Melissa Monti

Turnaround Requested:
- ☐ Onsite/24-48 hrs.
- ☐ Offsite
- ☒ Other Std

Analysis Requested

Sample ID	Date	Time	Location	TPHg+d-8015M	TPHg-8015M (P&T)	BTEX-8020	TPHg/BTEX-8015M/8020	TRPH-418.1	8260 (VOC's-8240)	8260 VOC - Full Scan (+oxy)					Matrix: Soil (S), Sludge (SL), Aqueous (W)	Number of containers
MW-1	4/18/06	12:45								X					W	5

1. RELINQUISHED BY:		2. RELINQUISHED BY:		3. RELINQUISHED BY:	
Signature:* Melissa Monti	Date:	Signature:*	Date:	Signature:*	Date:
Printed Name: Melissa Monti	Time:	Printed Name:	Time:	Printed Name:	Time:
Company: Petra Geotechnical		Company:		Company:	
1. RECEIVED BY:		**2. RECEIVED BY:**		**3. RECEIVED BY:**	
Signature:* Ann Kim	Date: 4/19/06	Signature:*	Date:	Signature:*	Date:
Printed Name: Ann Kim	Time: 10:20am	Printed Name:	Time:	Printed Name:	Time:
Company: H&P		Company:		Company:	

*Signature constitutes authorization to proceed with analysis and acceptance of conditions on back.

Sample Receipt
- Intact: (Yes) No
- Seal Intact: Yes No (N/A)
- Cold: (Yes) No
- N/A (Received on site)

Special Instructions

DRAFT

Groundwater Monitoring and Mitigation Plan – Flat Creek Watershed Analysis Jacumba Community Services District Jacumba Hot Springs, San Diego County, California

Lead Agency:

County of San Diego
Planning and Development Services
5510 Overland Avenue
San Diego, California 92123
Contact: Ashely Gungle

Project Proponent:

Jacumba Community Services District
P.O. Box 425
Jacumba Hot Springs, California 91934
Contact: Debby Troutt

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DUDEK
605 Third Street
Encinitas, California 92024

Stephen K. Dickey, PG, CHG, CEG

APRIL 2015

Printed on 30% post-consumer recycled material.

TABLE OF CONTENTS

Section **Page No.**

FIGURES

TABLE

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1 INTRODUCTION

Jacumba Community Services District (JCSD) is proposing the use of the Park Well and the potential development and use of replacement well(s) as a secondary source of groundwater to serve JCSD customers (the Project). This Groundwater Monitoring and Mitigation Plan (GMMP) has been prepared by Dudek in order to provide protection of nearby groundwater dependent habitat and ensure adequate groundwater supply for other groundwater users in the area.

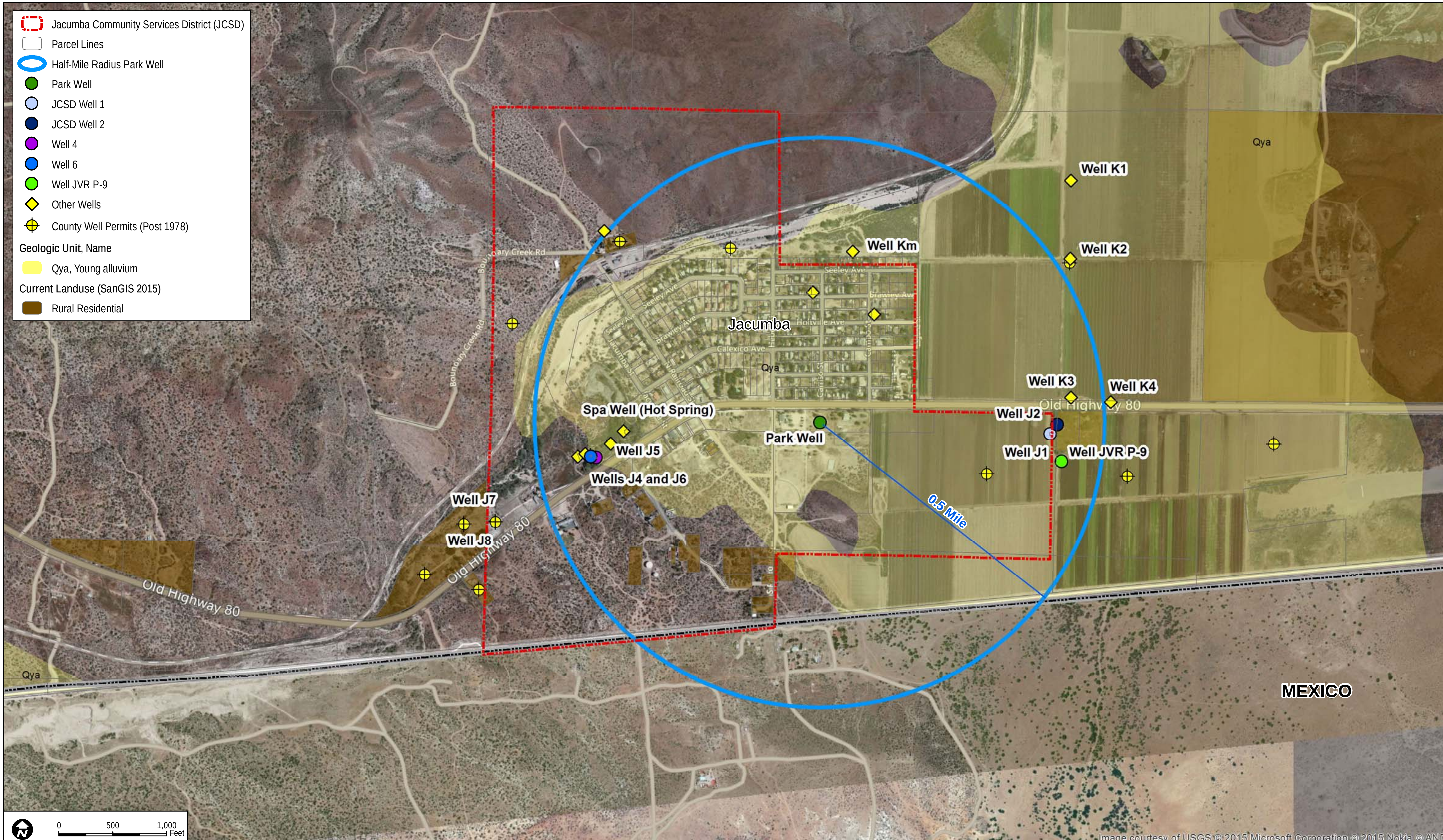
As described in the Groundwater Resources Investigation Report – Flat Creek Watershed for the Jacumba Community Services District (Dudek, 2015), JCSD is proposing to develop additional production capacity of 100 acre-feet per year of groundwater from the Park Well and/or replacement well(s) yet to be completed. These wells are intended to serve as a redundant backup supply in the event JCSD's main potable supply well goes offline as well as to increase the reliability and versatility of JCSD's water supply system. In addition, JCSD intends to use these wells to supplement its sales of non-potable water from Well 6 for construction related uses in the region. To facilitate sales of water suitable for construction-related uses, water will be extracted from the Park Well using a new submersible pump and discharged to a 12,000 gallon water tower. The Park Well is located at the east end of downtown Jacumba Hot Springs on assessor's parcel number (APN) 660-140-07 (Figure 1).

In order to provide a conservative analysis, the Groundwater Resources Investigation Report – Flat Creek Watershed for the Jacumba Community Services District assumed that the Park Well would supply up to 100 acre-feet per year. Results of the Groundwater Resources Investigation indicate that short-term pumping of the Park Well and replacement well(s) to meet water demand would result in a less than significant impact to groundwater storage. Assuming a maximum groundwater extraction rate up to 200 gallons per minute continuously over a 90 day period (25.9 million gallons or 80 acre-feet) from the Park Well, the estimated drawdown at the nearest well (Well Km) is 0.58 feet based on the Theis semi-log approximation (Dudek, 2015). If pumping is amortized over 1 year at a production rate of 100 acre-feet per year, predicted drawdown is 1.36 feet at Well Km. Amortizing pumping over 5 years at an annual pumping rate of 100 acre-feet per year results in predicted drawdown at Well Km of 3.79 feet. This is less than the County of San Diego well interference threshold guidance for alluvial wells of 5 feet.

The drawdown at the nearest groundwater dependent habitat, riparian and bottomland habitat associated with Boundary Creek located approximately 1,620 feet north of the Park Well, as a result of extraction of groundwater is estimated after 90 days, 1 year and 5 years is predicted to be 0.69 feet, 1.46 feet, and 3.92 feet, respectively (Dudek 2015). The Project is unlikely to draw down the groundwater table to the detriment of groundwater-dependent habitat, typically a drop of 3 feet or more from historical low groundwater levels as Boundary Creek represents as recharge boundary. Thus, impacts to groundwater dependent habitat would be less than significant.

Because actual conditions during groundwater extraction for the Projects may vary from conditions assumed in the Groundwater Resources Investigation (Dudek, 2105) this GMMP has been prepared for the JCSD. This GMMP establishes protective groundwater drawdown thresholds for off-site well interference and groundwater-dependent habitat.

This GMMP also describes the monitoring, mitigation and reporting procedures by which the County of San Diego Planning and Development Services (PDS) can ensure that the conditions and criteria for the Project's groundwater extraction activities are continually being upheld. A 5-year monitoring period is proposed to assess the impact of groundwater extractions.



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SOURCE: JCSD; SanGIS 2003

FIGURE 1

On-Site and Off-Site Well Locations

GROUNDWATER MONITORING AND MITIGATION PLAN - JACUMBA COMMUNITY SERVICES DISTRICT

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2 ESTABLISHMENT OF GROUNDWATER THRESHOLDS

According to the County of San Diego Guidelines for Determining Significance and Report Format Content Requirements (County of San Diego, 2007), this Project-related groundwater extraction would incur a significant well interference impact if after a five year projection of drawdown, the results indicate a decrease in water level of 5 feet or more in the off-site wells. If site-specific data indicates alluvium or sedimentary rocks exist which substantiate a saturated thickness greater than 100 feet in off-site wells, a decrease in saturated thickness of 5% or more in the off-site wells would be considered a significant impact. The County's Guidelines for Determining Significance for Biological Resources (County of San Diego, 2010) defines a project-related drawdown of 3 feet below historical low groundwater levels as causing a significant impact to riparian habitat of a groundwater sensitive natural community. Additionally, groundwater resources for proposed projects requiring a potable water source must not exceed the Primary State or Federal Maximum Contaminant Levels (MCLs) for applicable contaminants. The thresholds established below incorporate these guidelines and represent a conservative basis for monitoring and mitigating potential groundwater impacts related to the Project.

2.1 Potential Off-Site Well Interference

As described in the Groundwater Resources Investigation Report – Flat Creek Watershed (Dudek, 2015), wells identified near the pumping well (Park Well) include Well Km Well K3, Spa Well and JCSD Wells 1, 2, 4, 5 and 6 (Figure 1).

Four existing JCSD groundwater wells (Wells 2, 4, 5 and 6) will be included in the groundwater monitoring program (Figure 1). Additionally, Jacumba Valley Ranch Wells Km and K3, and piezometer P-9 will be included if property access is granted. Accessible wells will be fitted with pressure transducers prior to the onset of Project pumping. The pressure transducers will record the water level in the wells at 15 minute intervals for approximately 1 month prior to the onset of Project related groundwater extraction. Transducer accuracy will be confirmed through manual water level measurements recorded with a sounder. Manual water levels will also be recorded for JCSD Wells 2, 4, 5 and 6 and the Park Monitoring Well on a weekly basis during Project pumping.

An additional three wells were identified within a 0.5 mile radius of the Park Well and are indicated in Table 1.

Table 1
JCSD Wells within 0.5 Mile Radius of Well 6

Well Number	Use	Distance from Park Well (feet)
Jacumba Community Service District Wells		
Well 1	Public/Inactive	2,136
Well 2	Public/Inactive	2,195
Well 4	Public/Active	2,147
Well 5	Public/Inactive	1,906
Well 6	Public/Active (Non-Potable)	2,206
Jacumba Ranch Wells		
Well Km	Small Water System/Active	1,688
Well K3	Irrigation	2,136
Piezometer P-9	Monitoring Point	2,256
Other Wells		
Spa Well	Private/Active Hot Well	1,829

The measurements collected from the JCSD wells will be used to establish a water level baseline and capture water level patterns generated by pumping of these wells. An understanding of these patterns will allow for their continued use as monitoring wells despite the possibility that they may be pumped over the duration of the Projects. During pumping at the Park Well, a maximum drawdown of 5 feet below the water level baseline at Well Km will be allowed. This threshold is protective of a maximum drawdown of 5 feet at the closest property with a Small Water System well located within 0.5 mile feet from the pumping well. If Well Km is not accessible for water level monitoring, a maximum drawdown of 3.85 feet and 3.93 feet below the water level baseline will be allowed at JCSD Wells 2 and 4 to ensure that water level threshold of 5 feet is not exceeded at Well Km.

Results of the off-site well interference analysis detailed in the Groundwater Resources Investigation Report conclude that well interference is not anticipated to pose a significant impact. A groundwater monitoring program will be implemented in order to establish a water level baseline in the JCSD wells and characterize change in water levels due to potable and non-potable water system pumping.

2.2 Groundwater Dependent Habitat

Groundwater-dependent vegetation communities mapped approximately 1,620 feet north of the Park Well that may depend on groundwater include riparian and bottomland habitat associated with Boundary Creek (Figure 2). Drawdown at the closest groundwater dependent habitat as a result of pumping from the Park Well after 90 days, 1 year and 5 years is predicted to be 0.69 feet, 1.46 feet, and 3.92 feet, respectively. The Project is unlikely to draw down the groundwater table to the detriment of groundwater-dependent habitat, typically a drop of 3 feet or more from historical low groundwater levels as Boundary Creek represents a recharge boundary.

Therefore, project-related groundwater production from the Park Well is not anticipated to result in drawdown of the groundwater table to the detriment of this groundwater-dependent habitat.

Due to the limited potential for impacts to groundwater dependent habitat Dudek recommends no initial monitoring of the groundwater dependent habitat. Monitoring of the groundwater dependent habitat would be required in the event that water levels in Well 4 drop below historical low groundwater levels, which were recorded at 23 feet below ground surface. Aquifer water level monitoring for the duration of pumping at the Park Well for the Project is proposed. Biological monitoring procedures are described below in Section 3.2.

2.3 Water Quality

Water quality testing performed in 2005 and 2006 on the Park Well indicated elevated concentrations of toluene at 291 µg/L, 199 µg/L and 520 µg/L, which are above the drinking water MCL of 150 µg/L. Sampling of monitoring wells located to the west of the Park Well at Former Chevron Service Station No. 20-5934 in 2014 detected low concentrations of hydrocarbons (AECOM 2015).

Water quality impacts to groundwater resources could potentially by significant if resampling of the Park Well indicates concentrations of VOCs and hydrocarbons above drinking water MCLs. Mitigation consisting of wellhead treatment will be required if current concentrations of VOCs and hydrocarbons exceed drinking water MCLs as discussed in Section 3.

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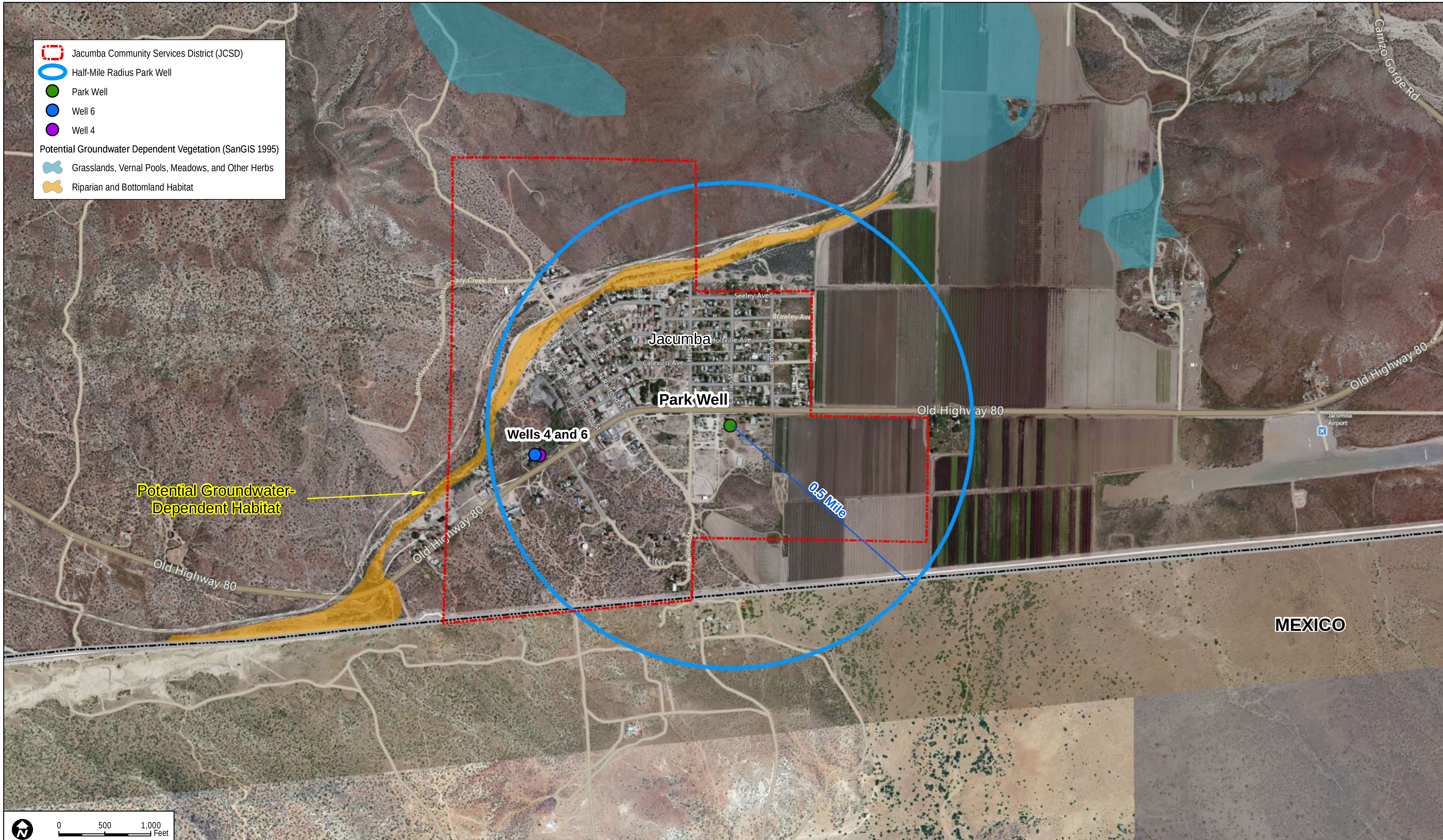

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SOURCE: Bing Maps; SanGIS 1995

FIGURE 2
Potential Groundwater-Dependent Vegetation

GROUNDWATER MONITORING AND MITIGATION PLAN - JACUMBA COMMUNITY SERVICES DISTRICT

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3 MONITORING PROCEDURES AND MITIGATION CRITERIA

The groundwater monitoring, water quality monitoring and, if necessary, biological monitoring procedures, and mitigation criteria outlined below will be followed during pumping at the Park Well. The groundwater monitoring program defined herein will be carried out under the direction of a Certified Hydrogeologist registered in the State of California.

3.1 Groundwater Production and Water Level Monitoring

Pressure transducers will be maintained in a network of the four JCSD groundwater wells (Well 2, Well 4, Well 5 and Well 6, Figure 1) as well as in the production well (Park Well). Additionally, Jacumba Valley Ranch Wells Km and K3, and piezometer P-9 will be included if property access is granted. The pressure transducers will be programed to record the water level every 15 minutes. In addition, ambient barometric pressure and temperature will be recorded at 15 minute intervals with a barometric logger. Manual water level measurements may be required for wells where a pressure transducer cannot initially be fitted in the well due to lack of appropriately sized port or sounding tube.

Transducer data will be downloaded on a weekly basis at all the instrumented wells for 1 month prior to the onset of Project related groundwater extraction. Transducer data will also be downloaded weekly during periods of pumping for non-potable construction water supply to the Projects. Cumulative groundwater usage will be monitored at the Park Well using an instantaneous flow meter. Flow rate and volume measurements will be recorded daily during pumping for the Projects.

3.2 Groundwater Dependent Habitat Monitoring

The following monitoring program will be carried out for groundwater dependent habitat if water levels in Well 4 drop below the established threshold. The goal would be to determine if the project's use of groundwater is impacting groundwater dependent habitat in the vicinity of the production well.

3.2.1 Monitoring

Baseline data will be collected within a 0.5 mile radius of the Park Well and confined to groundwater dependent habitat; specifically the riparian corridor associated with Boundary Creek. Potentially affected native trees within the study area would be evaluated for overall physical condition and attributes. The trees would be inventoried by an ISA Certified Arborist or Registered Professional Forester with specific experience evaluating riparian dominant species such as cottonwoods and willows.

The baseline monitoring evaluations would include the following:

- Establishment of 18 equidistant plots or transects within the riparian and bottomland habitat within 0.5 mile of the Park Well. Sample plots/transects would include the range of existing habitat conditions, including elevation, slope and aspect, proximity to roads and other land uses.
- Tagging of trees and recording species, tag number, trunk diameter at breast height (dbh) (in.), height (ft.) and dominance (i.e., whether the tree is under the canopy of another tree or forms the uppermost canopy). Slope, aspect, and elevation of each tree location, existing understory species (including proportion of natives to exotics), presence of debris and litter, and soil type, depth, and parent material will be noted for each tree or plot/transect.
- Assessment of tree status, including documentation of:
  - Dbh measured at 4.5 feet above ground (according to standard practices)
  - Number of stems
  - Overall tree height (based on ocular estimates)
  - Tree crown spread (measurement in each cardinal direction, based on ocular estimate)
  - Overall tree health condition (Good, Fair, Poor, Dead)
  - Overall tree structural condition (Good, Fair, Poor, Dead)
  - Pest presence (Type, Extent – minimal, moderate, high)
  - Disease presence (Type, Extent – minimal, moderate, high)
  - Other specific comments
- Assessment of seedling establishment and sapling tree densities and conditions
- The data collection procedure will include full data collection at each plot/transect so that consistency is maintained among sampling plots.
- Creation of database using GIS or similar application

3.3 Water Quality

The Park Well will be re-sampled for hydrocarbons and VOCs to determine current concentrations prior to use. If hydrocarbons or VOCs are detected, wellhead treatment will be provided.

3.3.1 Sampling

The Park Well will be resampled using established protocols as generally outlined in U.S. Environmental Protection Agency (EPA) *Field Sampling Guidance #1220 Groundwater Well Sampling* (EPA 2004). A minimum of three purge volumes (136 gallons based on 2014 water levels) will be pumped form the Park Well in order to collect a representative sample of water quality. Field water quality parameters will be monitored and have stabilized prior to sample collection.

Water quality samples will be submitted to a California accredited laboratory for chemical analysis of total petroleum hydrocarbons as gasoline (TPH-g) and total petroleum hydrocarbons as diesel (TPH-d) by (EPA) Method 8015B (M), and of benzene, toluene, ethylbenzene, total xylenes (collectively referred to as BTEX), and fuel oxygenate compounds: methyl-t-butyl ether (MTBE), tert-amyl-methyl ether, tert-butyl alcohol (TBA), diisopropyl ether, ethyl-t-butyl ether, and ethanol by EPA Method 8260B.

3.3.2 Mitigation

If water quality results from resampling of the Park Well indicate concentrations of VOCs or hydrocarbons detected above drinking water MCLs, wellhead treatment will be required. Final system design will be based on updated water quality results. Conceptual wellhead treatment design to remove VOCs and hydrocarbons includes the following equipment: 20,000 gallon Baker tank, filter skid for pre-filtration, liquid phase carbon vessels to remove VOCs and hydrocarbons, discharge header to 12,000 gallon water tower(s), automated controls and water level switches. All equipment would be installed and maintained by a commercial vendor such as Drewelow Remediation Equipment, Inc. (http://www.dre-equip.com) who has provided initial conceptual design and cost estimate (Pers. comm. David Drewelow, March 27, 2015). This would include system prove out, periodic water quality sampling and system maintenance. Final design and standard operating procedures including periodic water quality monitoring will prepared by a licensed California Professional Engineer.

3.4 Groundwater Mitigation Criteria

The following mitigation criteria will be established to protect groundwater resources and groundwater-dependent habitat in the Project area:

- If the groundwater levels at Jacumba Valley Ranch Well Km drops 5 feet below the baseline water level, groundwater pumping at the Park Well will cease until the water level at the well that experienced the threshold exceedance has increased above the threshold and remained there for at least 30 continuous days. Additionally, written permission from the County Planning and Development Services (PDS) must be obtained before production may be resumed. If Well Km is not accessible, than the well interference threshold will be 3.85 feet at Well 2 and 3.93 feet at Well 4 in order to ensure that Well Km does not exceed the maximum drawdown of 5 feet.

- If groundwater levels at Well 4 drops more than 23 feet below ground surface, than monitoring of the groundwater dependent habitat would be triggered.
- If the groundwater levels exceed historical low water levels in Well 4 (lowest recorded static water level in Well 4 is 23 bgs) and there is evidence of deteriorating riparian habitat health by the Arborist or Forester, there may be a temporary or permanent cessation of pumping at the Park Well.

4 REPORTING REQUIREMENTS

A groundwater monitoring report will be completed by a Certified Hydrogeologist registered in the State of California and submitted to the County PDS annually for groundwater extraction from the Park Well no later than 28 days following the end of the calendar year. The reports will include the following information:

- Water level hydrographs and tabulated water level data for each monitoring well.
- Tabulated groundwater production volumes from each production well.
- Documentation of groundwater drawdown at JCSD Wells 2, 4, 5, 6 and Park Monitoring Well included in the groundwater monitoring program.
- Documentation of any threshold-included curtailment of groundwater production.
- Documentation of groundwater dependent habitat monitoring, if necessary, as described above.

If the baseline water levels at the JCSD wells included in the groundwater monitoring program are exceeded by 5 feet, the County PDS will be notified via letter and electronic mail within one working day of the exceedance. Additionally, if water level thresholds at the off-site wells are exceeded by their respective thresholds, pumping of the Park Well shall cease and the County PDS notified via letter and electronic mail within one working day.

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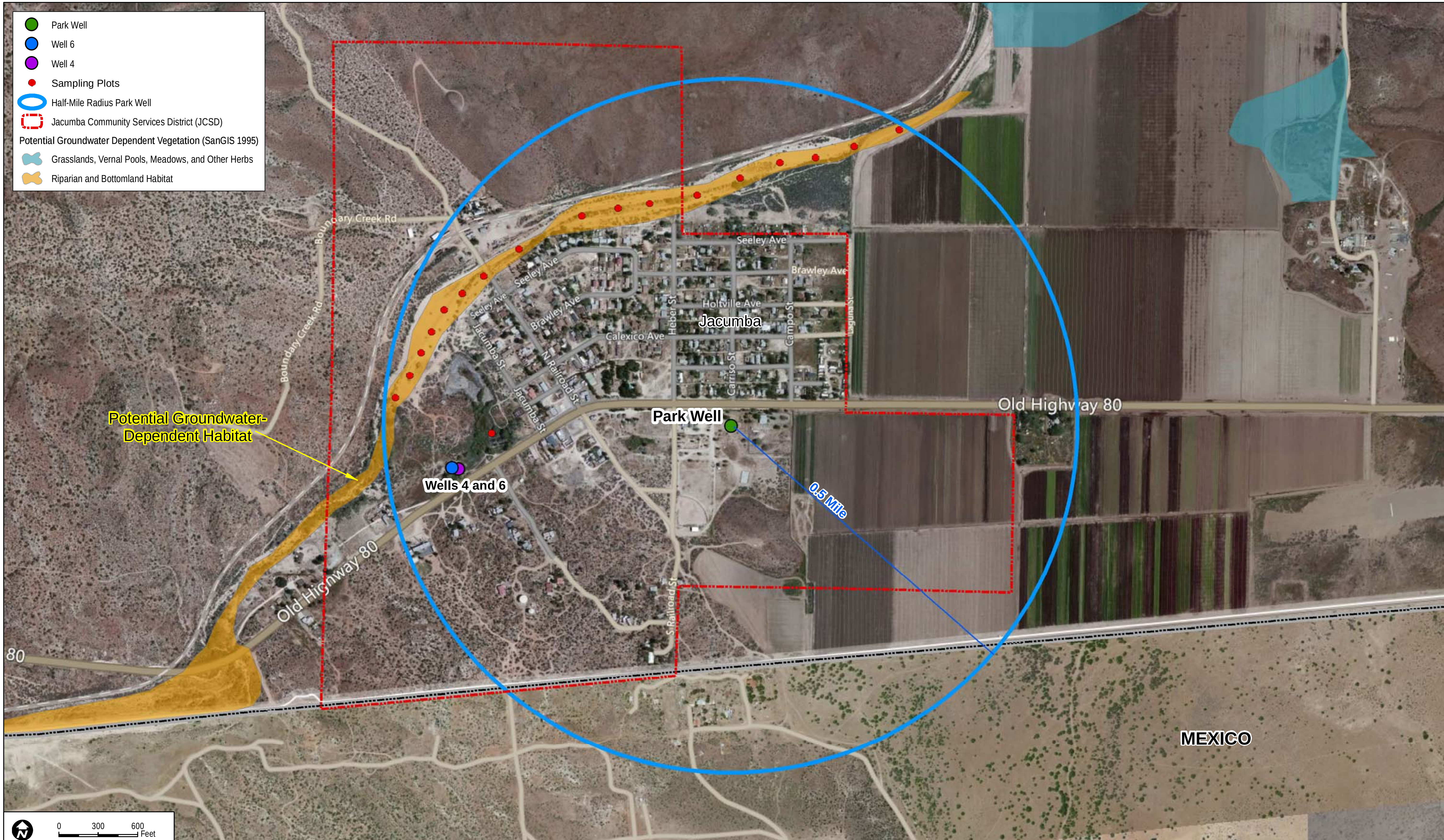

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APRIL 2015

SOURCE: Bing Maps; SanGIS 1995

FIGURE 3
Potential Groundwater-Dependent Vegetation Monitoring Locations

GROUNDWATER MONITORING AND MITIGATION PLAN - JACUMBA COMMUNITY SERVICES DISTRICT

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6 LIST OF PREPARERS

This GMMP was prepared by Dudek Hydrogeologist, Trey Driscoll, PG, CHG. Dudek arborist, Michael S. Huff prepared the monitoring program for the groundwater dependent habitat. Dudek Hydrogeologist Stephen K. Dickey, PG, CHG, CEG, provided review assistance and coordination with the County as the County-approved hydrogeologist.

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