



ERLER & KALINOWSKI, INC.

**EXPERT REPORT ON WATER USE AT THE COPA DE ORO PROPERTY
KERN COUNTY, CALIFORNIA**

TABLE OF CONTENTS

A. INTRODUCTION 1

B. BACKGROUND 1

 B.1. SUBJECT PROPERTY DESCRIPTION 1

 B.2. WATER SOURCES 2

C. PAST WATER USE AT THE SUBJECT PROPERTY 3

 C.1. AVEK DELIVERY RECORDS 3

 C.2. AGRICULTURAL WATER USE ESTIMATES BASED ON CROPPING AND CLIMATE DATA 3

 C.3. DATA SOURCES 4

 C.4. RESULTS OF AGRICULTURAL WATER USE ESTIMATION 10

 C.5. COMPARISON TO AVEK WATER DELIVERY RECORDS 10

D. HISTORICAL GROUNDWATER USE AT THE SUBJECT PROPERTY PRIOR TO AVEK
DELIVERIES 11

 D.1. REVIEW OF AVAILABLE HISTORICAL AERIAL PHOTOGRAPHS 11

REFERENCES 13

ERLER & KALINOWSKI, INC.

EXPERT REPORT ON WATER USE AT THE COPA DE ORO PROPERTY KERN COUNTY, CALIFORNIA

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

- 1 Crop Acreages from Kern County Agricultural Chemical Permit and Use Data
- 2 Monthly Climate Information
- 3 Crop Coefficients for Carrots, Onions, and Pumpkins
- 4 Example Calculation of Monthly and Agricultural Water Use
- 5 Estimated Agricultural Water Use, 1997 through 2004
- 6 Estimated Crop Water Use Factors
- 7 Comparison of Estimated Agricultural Water Use and Reported AVEK Deliveries
- 8 Historical Aerial Photographs Obtained for Review

LIST OF FIGURES

- 1 Subject Property Location
- 2 Correlation between Reference Evapotranspiration at the CIMIS Palmdale Station and the CIMIS Arvin-Edison Station
- 3 Reference Evapotranspiration at the CIMIS Palmdale Station and the CIMIS Arvin-Edison Station
- 4 Correlation between Precipitation at the CIMIS Palmdale Station and the WRCC Palmdale Station
- 5 Precipitation at the CIMIS Palmdale Station and the WRCC Palmdale Station
- 6 Aerial Photograph, 3 June 1963
- 7 Aerial Photograph, 1965 (4 June to 1 August)
- 8 Aerial Photograph, 16 August 1972
- 9 Aerial Photograph, 11 April 1974
- 10 Cropped Version of Aerial Photograph from 1965

LIST OF ATTACHMENTS

- A Letter from AVEK to BKS, dated 28 July 2011
- B Aerial Photographs from the County of Kern Public Online Mapping System
- C Documentation of Easements for AVEK Turnout and Pipeline Infrastructure on the Subject Property
- D USGS Topographic Map of Little Buttes 7.5-minute Quadrangle
- E Photographs Taken On Subject Property in February 2012

ERLER & KALINOWSKI, INC.

EXPERT REPORT ON WATER USE AT THE COPA DE ORO PROPERTY KERN COUNTY, CALIFORNIA

TABLE OF CONTENTS (CONTINUED)

LIST OF ABBREVIATIONS

<i>A</i>	crop area
APN	Assessor's Parcel Number
AVEK	Antelope Valley-East Kern Water Agency
BKS	Bartkiewicz, Kronick & Shanahan
<i>C</i>	conversion factor
CIMIS	California Irrigation Management Information System
DWR	California Department of Water Resources
<i>eff</i>	irrigation efficiency
EKI	Erler & Kalinowski, Inc.
<i>ETo</i>	reference evapotranspiration
ft amsl	feet above mean sea level
GIS	geographic information system
IRWMP	Integrated Regional Water Management Plan
<i>K_c</i>	crop coefficient
KCDAMS	Kern County Department of Agriculture and Measurement Standards
LADWP	Los Angeles Department of Water and Power
NIFA	National Institute of Food and Agriculture
<i>P</i>	precipitation
UCCE	University of California Cooperative Extension
UCDANR	University of California Division of Agriculture and Natural Resources
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WRCC	Western Regional Climate Center

A. INTRODUCTION

Ms. Vera H. Nelson of Erler & Kalinowski, Inc. (“EKI”) has prepared this report (“Expert Report”) on water use at the Copa de Oro property, located in southern Kern County, California (“Subject Property”). This Expert Report presents the expert opinion of Ms. Vera Nelson, P.E. concerning past water use at the Subject Property. This Expert Report has been prepared for use in the Phase 4 Trial of the Antelope Valley Groundwater Litigation (Consolidated Cases), Los Angeles County Superior Court, Lead Case No. BC 325 201. The Expert Report was prepared on behalf of Copa de Oro Land Company (“Client”).

B. BACKGROUND

This section of the Expert Report provides background information pertinent to the evaluation of past water use at the Subject Property.

B.1. Subject Property Description

The Subject Property (Figure 1) is located approximately 10 miles west of Rosamond California in the Antelope Valley area of southern Kern County, California and comprises an approximately one (1) square mile area that is bounded by Gaskell Road to the north, 110th Street to the East, Avenue A to the south, and 120th Street to the west. Avenue A is coincident with the Kern County / Los Angeles County line. The Subject Property lies within Section 35 of Township 9N, Range 14W, San Bernardino Base & Meridian. Assessor’s Parcel Numbers (“APNs”) associated with the Subject Property include 359-032-17-4 (299.92 acres) and 359-032-01-8 (299.11 acres) (Kern County Assessor/Recorder website).¹ A Los Angeles Department of Water and Power (“LADWP”) right-of-way for high-voltage power lines runs from the southwestern corner of the Subject Property to the mid-point of the northern property boundary.

The Subject Property is located within the Antelope Valley Groundwater Basin (California Department of Water Resources [“DWR”] Basin No. 6-44) (DWR Bulletin 118, last updated 27 February 2004). The land surface is generally flat with a slight slope from west to east. Land surface elevations range from approximately 2,515 feet above mean sea level (“ft amsl”) on the northwestern corner of the property to approximately 2,483 ft amsl along the northeastern property boundary.

Like many properties in the immediate vicinity of the Subject Property, land use at the Subject Property has historically been agricultural. This conclusion is based on an inspection of historical aerial photographs (discussed further below) and records of agricultural chemical use permits from the Kern County Department of Agriculture and Measurement Standards (“KCDAMS”) (discussed further below). No agricultural use has occurred on the

¹ <http://recorder.co.kern.ca.us>, accessed 6 December 2012

Subject Property since 2004; the historically farmed land is currently in a fallow state. Kern County Assessor/Recorder records indicate that parcel 359-032-17-4 contains a single building unit built in 1952; this building can be seen on aerial photographs of the Subject Property and is located in the south central portion of the Subject Property.

B.2 Water Sources

The Subject Property received imported surface water from the Antelope Valley-East Kern Water Agency (“AVEK”) through a turnout located on Gaskell Road. AVEK water comes from the State Water Project California Aqueduct, then through an underground pipeline known as the “West Feeder” which runs along Gaskell Road in the vicinity of the Subject Property. Information provided by AVEK pursuant to a Public Records Act request (see Attachment A), shows that AVEK delivered water to the Subject Property between 1977 and 2004.

Aerial photographs of the Subject Property from June 2000, June 2003, and an unspecified month in 2006 were obtained from the Kern County Online Mapping System.² These photographs, included in Attachment B, show areas of active agriculture on the southern portion of the Subject Property in 2000 and 2003 but not in 2006. This is consistent with the records of AVEK water deliveries and the agricultural water use estimates based on cropping and climate data discussed below in Section C.

Attachment C includes copies of an easement for the AVEK turnout on Gaskell Road and an easement for an underground water line extending from the AVEK turnout to the center of the Subject Property. This latter easement would have allowed the construction of infrastructure for delivery of AVEK water to the southern portion of the Subject Property where aerial photographs and historical records show agricultural use primarily occurred. The end of the easement coincides with the location of an agricultural well identified on the Subject Property, which, as discussed below, is believed to have been used to support irrigated agriculture on the Subject Property prior to the delivery of AVEK water. Therefore, this location would be coincident with the head of the irrigation distribution system for the Subject Property.

Prior to 1977, water for agriculture on the Subject Property is believed to have come from groundwater. Several lines of evidence support this conclusion. First, as indicated above, a groundwater well exists on the Subject Property. The well is shown on the U.S. Geological Survey (“USGS”) 7.5-minute topographic map of the Little Buttes quadrangle dated 1965 (see Attachment D). Ground-level photographs of the Subject Property taken by the Client in February 2012 (see Attachment E) appear to show a historically active well in the same location as the well identified on the Subject Property on the 1965 USGS Topographic Quadrangle. The relatively large diameter of the well casing shown in the photograph (i.e., appears to be approximately 8 inches or larger, although scale is uncertain) is consistent with an agricultural well potentially capable of supplying large quantities of water. Further,

² <http://maps.co.kern.ca.us>, accessed 23 June 2008.

examination of historical aerial photographs indicates that irrigated agriculture occurred on the Subject Property prior to 1977 (see Section D below).

C. PAST WATER USE AT THE SUBJECT PROPERTY

This section summarizes estimated historical water use on the Subject Property between 1997 and 2004. This estimate is based on a review of AVEK water delivery records to the Subject Property and an evaluation of agricultural water use on the Subject Property. Results of the agricultural water use evaluation have been used to corroborate AVEK water delivery information for the Subject Property. The agricultural water use evaluation is conducted utilizing climatic data and cropping information obtained from KCDAMS chemical use permits which are available for the time period between 1997 and 2004. As indicated above, AVEK delivery records show that surface water was delivered to the Subject Property as far back as 1977, however, KCDAMS cropping records do not exist for the time period prior to 1997 for the Subject property. Therefore, this evaluation focuses on the period between 1997 and 2004, when corroborating data is available.

C.1 AVEK Delivery Records

As stated above, records of deliveries of AVEK water to the Subject Property for the years 1977 through 2010 were obtained from AVEK (see Attachment A). As shown in Attachment A, reported AVEK water deliveries ranged from 208 acre-feet to a maximum of 867 acre-feet between 1997 and 2004. The annual average AVEK water delivery to the Subject Property between 1997 and 2004 was 690 acre-feet and the annual average AVEK water delivery to the Subject Property from 2000 through 2004 was 774 acre-feet. The maximum reported annual AVEK delivery during this period, 867 acre-feet, occurred in 2003.

C.2 Agricultural Water Use Estimates Based on Cropping and Climate Data

AVEK water deliveries to the Subject Property between 1997 and 2004 are supported by agricultural water use estimates that are calculated on the basis of cropping and climate data for the Subject Property.³ Agricultural water use rates are estimated based on the following considerations:

- crop type;
- crop area (acreage);
- climate (precipitation and potential evapotranspiration); and
- irrigation method.

³ Water use for domestic purposes in and around the building on the Subject Property is expected to be minimal in comparison to agricultural water use on the Subject Property, and is therefore not considered here.

Annual agricultural water use rates at the Subject Property are calculated for each year for which data (discussed below) are available. During those years, for each crop and for each month during the crop growing season of that crop, estimated agricultural water use for that crop is calculated using the crop coefficient method (DWR, 1986) as follows:

$$\text{Monthly Agricultural Water Use [acre-feet per month]} = A * (ET_o * K_c - P) * C / \text{eff} \quad [1]$$

where A equals the crop area [acres], ET_o is the potential or reference evapotranspiration [inches per month], K_c is the crop coefficient for that month of the growing season [dimensionless], P is the precipitation [inches per month], C is a conversion factor from inches to feet (equal to 1/12 or approximately 0.083), and eff is the irrigation efficiency [dimensionless]. Non-averaged monthly climate data were used as input to equation [1], as discussed further below in Section C.3.

Total annual agricultural water use for each year is calculated as the sum of the monthly agricultural water use values for all crops grown during that year. Total annual agricultural water use was also calculated using crop area data and total applied water (“ AW_T ”) values presented in Table D.3-2 of Appendix D of the *Summary Expert Report Phase 3 – Basin Yield and Overdraft, Antelope Valley Area of Adjudication* (Beeby et al., 2010; “Antelope Valley Expert Report”).

C.3 Data Sources

Crop Type and Area

KCDAMS maintains records of agriculture chemical permits and use within Kern County over the years from 1997 through 2012.⁴ This data was used to determine the crop types and areas (acres) on the Subject Property from the years 1997 through 2011. The data available through the KCDAMS website⁵ include:

- Kern County Restricted Material / Operator ID Permit and Use Report tabular data; and
- Annually permitted crop boundary spatial data in geographic information system (“GIS”) file format.

All available data were obtained from these two datasets. The tabular permit and use data cover the period from 1994 through 2011. The spatial permit data cover the period from 1997 through 2011, with years 1997 through 1999 only partially complete (i.e., less than 100 percent of the permitted lands during those years are included in the spatial map data).

For the purposes of this crop water use evaluation, the pertinent fields in these annual permit and use tabular data files are COMMODITY and QUANTITY (acres planted). The pertinent

⁴ As of 21 December 2012, the 2012 KCDAMS records are partial, through 4 June 2012

⁵ <http://www.kernag.com/>

attributes in the spatial data files are COMM (the common name for the permitted crop represented by the polygon) and AC_PRMT (acres permitted – grower-provided net planted acres for the site). The tabular and spatial permit data are consistent with each other for all years when the spatial data completeness is 100 percent (i.e., 2000 onward). The tabular use data are in some cases different than the permit data, suggesting that in some cases a permit was obtained for use of agricultural chemicals but actual use was never reported to the Kern County Agricultural Commissioner. Data relevant to the Subject Property were determined by filtering the KCxxPURS.ASC dataset by township (09N), Range (14W), and Section (35).

Based on the KCDAMS datasets, the type and total acreage of crops grown on the Subject Property were determined. Table 1 shows the data from the COMMODITY and QUANTITY fields for each year from 1997 through 2011. As shown on Table 1, crops grown on the Subject Property between 1997 and 2004 include carrots, onions, and pumpkins. Total cropped acreage ranged from 60 to 290 acres. No crops have been grown on the Subject Property since 2004.

Climate

The Subject Property is located within the unofficially defined “High Desert” region of California, which is generally bounded by the San Gabriel Mountains and the Tehachapi Mountains on the west and extends into the Mojave Desert to the east. Being cut off from the maritime climatic influence by the mountain ranges to the west, the High Desert region experiences a continental desert climate regime.⁶ This climate regime includes warmer summers (relative to the maritime-influenced areas), colder winters, and lower relative humidity.

Climate information required for the agricultural water use estimation equation [1] above includes monthly values for reference evapotranspiration (“*ET_o*”, also known as potential evapotranspiration) and precipitation. Monthly *ET_o* data was obtained from the DWR Climate Information Management Information System (“CIMIS”) website.⁷ DWR operates a network of climate monitoring stations under the CIMIS program. The closest CIMIS station to the Subject Property is Station #197 located in Palmdale approximately 20 miles from the Subject Property. The data record for the Palmdale station #197 only extends from April 2005 to November 2012. Over that period, the average annual *ET_o* has been 66.19 inches. This value is in good agreement with the average value for CIMIS *ET_o* Zone 17, High Desert Valleys, in which the Subject Property is located, which is 66.5 inches per year.

To obtain *ET_o* information for periods prior to April 2005, EKI obtained data from CIMIS Station #125 (Arvin-Edison) which is approximately 36 miles northeast of the Subject Property. The CIMIS data record from the Arvin-Edison station #125 extends from March 1995 through November 2012. Under the assumption that climatic conditions at the Subject Property are better represented by the Palmdale CIMIS station, a comparison was made of

⁶ Western Regional Climate Center, <http://www.wrcc.dri.edu/narratives/CALIFORNIA.htm>, accessed 3 July 2008

⁷ <http://www.cimis.water.ca.gov/cimis>, accessed 17 December 2012

the monthly *ET_o* values from both stations during their common period of record from April 2005 through November 2012. Results from this comparison are shown on Figure 2 and indicate that there is a strong correlation between the two stations. The line of best fit through the data, and its equation, are also shown on Figure 2. The best-fit line equation indicates that for their common period of record, the Palmdale monthly *ET_o* value can be approximated by multiplying the Arvin-Edison monthly *ET_o* value by 0.9538 and adding 0.7669 inches. This relationship was used to estimate monthly *ET_o* in the vicinity of the Subject Property for the period from March 1995 through March 2005. Figure 3 shows the measured *ET_o* for both the Palmdale and the Arvin-Edison CIMIS stations, as well as the estimated *ET_o* at the Palmdale station based on the best-fit line equation shown on Figure 2.

Precipitation data from the Arvin-Edison and Palmdale CIMIS stations are not as well correlated as the *ET_o* data, most likely due to the fact that the Tehachapi Mountains separate the two locations. Therefore, precipitation data from the Arvin-Edison station was not used to estimate precipitation at the Subject Property. Instead, an alternative source for precipitation data was used. Data from the Western Regional Climate Center (“WRCC”) station in Palmdale, California (station #046624) were obtained from WRCC website.⁸ A correlation was then established between monthly precipitation data for the common period of record between the Palmdale CIMIS station and the Palmdale WRCC station (see Figure 3). This correlation was used to estimate rainfall at the Palmdale CIMIS station for the period before November 2005. Figure 4 shows the measured rainfall for both the CIMIS and WRCC Palmdale stations, as well as the estimated rainfall at the Palmdale CIMIS station based on the correlation equation shown on Figure 3. It should be noted that precipitation during the growing season is quite low, and variations between stations during these warmer, drier months have little effect on the calculation of agricultural water use by equation [1].

Table 2 shows the monthly measured and estimated evapotranspiration and precipitation data over the period from March 1995 through November 2012. This non-averaged monthly data was used as input to equation [1].

Crop Growing Season

The crop growing season is the period during the year during which a given crop is actively growing and therefore using water for its evapotranspiration demand. Different crops are grown at different times of the year. Information on the actual planting and harvest dates of the carrot, onion, and pumpkin crops grown at the Subject Property is not available. Therefore, information on typical growing seasons for these crops in the High Desert region of California were obtained from the following sources:

- Publications in the Vegetable Production Series published by the University of California Division of Agriculture and Natural Resources (“UCDANR”) (UCDANR, 1997, 2008, and 2011).

⁸ <http://www.wrcc.dri.edu/climatedata/climsum/>

- Crop Profiles published by the National Information System of the Regional Integrated Pest Management Centers, sponsored by the United States Department of Agriculture (“USDA”) and National Institute of Food and Agriculture (“NIFA”) (Fennimore et al., 1999 and 2000).⁹

Based on review of the above documents, the typical growing seasons in the vicinity of the Subject Property for carrots, onions, and pumpkins are as follows:

- For carrots:
 - planting between March and July, harvest between July and November, with each crop taking approximately five months from planting to harvest.
- For onions:
 - planting between March and April, harvest between August and September, with each crop taking approximately six months from planting to harvest.
- For pumpkins:
 - planting in June or July, harvest in September or October, with each crop taking approximately four months from planting to harvest.

These growing seasons are generally consistent with those identified for similar crops in the Antelope Valley Expert Report (Beeby et al., 2010), Appendix D-3, Table 5.¹⁰ Because of the range in growing seasons shown above, each crop was assigned a number of alternative growing season scenarios and each scenario was used in the calculation of crop coefficients, described below, and monthly agricultural water use by equation [1]. Five alternative scenarios were defined for carrots, two for onions, and two for pumpkins. Each scenario involved a constant total growing season duration for a given crop, but varied in the planting and harvesting months.¹¹

Crop Coefficients

Crop coefficients (K_c in equation [1] above) are factors which, when multiplied by the reference evapotranspiration, provide an estimate of crop evapotranspiration for a specific crop. Crop coefficients vary throughout the life cycle of the crop as the crop height and leaf area increase. Crop coefficients also vary due to local conditions and rainfall or irrigation frequency. A typical pattern (University of California Cooperative Extension [“UCCE”], 2002) is as follows: K_c starts at a relatively low initial value, increases during the development period, reaches a maximum during mid-stage growth, and decreases during

⁹ <http://www.ipmcenters.org/cropprofiles/GetCropProfiles.cfm>

¹⁰ The Antelope Valley Expert Report (Beeby et al., 2010) identifies typical growing seasons for carrots and onions. Information for pumpkin growing seasons is not identified in that report.

¹¹ For example, the two alternative growing seasons for pumpkins were 1) planting in June, harvest in September, and 2) planting in July, harvest in October.

late-stage growth. The length of each growth stage varies for different crops and different “cultural” practices. Information on crop coefficients was obtained from Allen et al. (1998).

The methodology used to calculate crop coefficients for carrots, onions, and pumpkins on the Subject Property is based on information provided in Chapter 6 of Allen et al. (1998) and is as follows:

- 1) Determine approximate durations, in whole months, of crop development stages based on the information provided in Table 11 of Allen et al. (1998) and the growing seasons described above.
 - a. For Carrots: initial stage = 1 month, development stage = 1 month, mid-stage = 2 months, late-stage = 1 month
 - b. For Onions: initial stage = 1 month, development stage = 1 month, mid-stage = 3 months, late-stage = 1 month
 - c. For Pumpkins: initial stage = 1 month, development stage = 1 month, mid-stage = 1 month, late-stage = 1 month
- 2) Obtain base estimates mid-stage K_c and ending K_c from Table 12 of Allen et al. (1998).
- 3) Estimate initial K_c from Figure 30 of Allen et al. (1998), assuming a 7 day interval between irrigation events.
- 4) Calculate adjusted mid-stage K_c from equation (62) in Allen et al. (1998), based on averaged monthly CIMIS data on minimum relative humidity and average wind speed from the Palmdale CIMIS station (#197) during the mid-stage months.
- 5) Calculate adjusted ending K_c from equation (65) in Allen et al. (1998), based on averaged monthly CIMIS data on minimum relative humidity and average wind speed from the Palmdale CIMIS station (#197) during the late-stage month.
- 6) Assign initial K_c to the initial stage month and mid-stage K_c to the mid-stage month(s). Assign the average of initial K_c and mid-stage K_c to the development stage month. Assign the average of the mid-stage K_c and the ending K_c to the late-stage month.

Table 3 shows the calculated crop coefficients for each alternative growing season scenario for each crop. It should be noted that reported crop coefficients vary somewhat depending upon which source of information is used. The values included herein, are generally consistent with those presented in the *Antelope Valley Integrated Regional Water Management Plan* (RWMG-KJ, 2007; “IRWMP”) and the Antelope Valley Expert Report (Beeby et al., 2010).

Irrigation Efficiency

Irrigation efficiency, eff in equation [1] above, is defined as the ratio of the amount of water required by the crop divided by the amount of water applied, expressed as a percent. Irrigation efficiency depends primarily on the method of irrigation and is always less than 100%. The exact method(s) of irrigation that were used on the Subject Property are not known. However, based on inspection of historical aerial photographs of the Subject

Property that show a pattern of narrow parallel bands over the cropped areas, it is suspected that the primary irrigation methods were either furrow or sprinkler. This assumption is corroborated by the following excerpts from the UCDANR Crop Production Series documents and USDA-NIFA Crop Profile documents, which discuss irrigation methods for crops grown on the Subject Property:

- For Carrots:
 - *“Carrots are usually irrigated by solid-set sprinklers. In the Imperial Valley, carrots are germinated using solid-set sprinklers, then switched to furrow irrigation at the first cultivation. Some acreage has been converted to center pivot irrigation, but its use is still limited. Drip irrigation has been tested with carrots, but the results have been poor.”* (UCDANR, 2008).
 - *“Fields are sprinkler-irrigated during the entire season except in Imperial Valley where the fields are typically furrow irrigated after emergence.”* (Fennimore et al., 2000).
- For Onions (Fresh-Market Bulb):
 - *“Overhead sprinklers are typically used for germination and stand establishment. ... After emergence, the crop is usually irrigated by furrow or drip.”* (UCDANR, 2011)
 - *“When sprinkler irrigation is used, four to six rows are planted on the bed top at equidistant [sic]. When drip irrigation is used, four to six rows are planted with a space in the middle of the bed for the irrigation tape.”* (Fennimore et al., 1999)
- For Pumpkins:
 - *“Most pumpkins are grown with sprinkler irrigation, but drip and furrow irrigation are also used.”* (UCDANR, 1997)

Ranges of values for irrigation efficiency for different methods of irrigation have been compiled (Howell, 2003). Irrigation efficiencies for sprinkler irrigation range between 55 and 85 percent, with an average of 65 to 75 percent. Irrigation efficiencies for graded and level furrows range between 50 and 95 percent, with an average of 65 to 80 percent. It should be noted that these irrigation efficiency values assume that irrigation is applied for the sole purpose of meeting the crop evapotranspiration needs, i.e., not for other potential reasons such as germination, frost control, crop cooling, chemigation, fertigation, or weed germination. Based on the values presented above, it is assumed herein that irrigation efficiency at the Subject Property likely ranged between 65 and 85 percent during the period of interest.

C.4 Results of Agricultural Water Use Estimation

Agricultural water use on the Subject Property was calculated using equation [1] for each month from January 1997 through December 2004. This period was selected because it is the only period during which crops were grown at the Subject Property and cropped acreage data from KCDAMS are available. Monthly values of estimated agricultural water use were summed into annual values for each calendar year from 1997 through 2004. During each year, all of the alternative growing season scenarios were evaluated, resulting in a range of estimated water use for each year. Table 4 shows an example of the calculation when Alternative 1 (i.e., the earliest planting and harvest date) is used for all crops and the irrigation efficiency is set to 75 percent. Table 5 shows the range of estimated water use based on the range of alternative growing season scenarios, alternative irrigation efficiencies (65 to 85 percent), and the inclusion or exclusion of additional water applied for the purposes of erosion control and field preparation.¹² The estimated water use ranges from approximately 120 to 220 acre-feet in 2002 up to approximately 900 to 1,680 acre-feet in 2003.

Crop water use factors, in acre-feet of water per acre of crop, were calculated for each year that a crop was grown by dividing the estimated water use by the area of the crop and multiplying the result by the assumed irrigation efficiency. Table 6 presents the estimated crop water use factors. As shown on Table 6, carrots were estimated to use between 1.8 and 3.3 acre-feet of water per acre, onions between 3.4 and 4.0 acre-feet per acre, and pumpkins between 1.5 and 2.1 acre-feet per acre. Variations in lower and upper estimates of crop water use rates within a single year are due to different growing season scenarios. Variations in crop water use rates between years are due to variations in climate (*ET_o* and precipitation) between years.

C.5 Comparison to AVEK Water Delivery Records

Table 7 shows estimated agricultural water use values from Table 5 and reported AVEK deliveries for the years 1997 through 2004. Although there are some discrepancies, agricultural water use estimates generally corroborate AVEK water deliveries to the Subject Property. The primary discrepancies occur (a) in years 1997 and 2002, when reported AVEK deliveries exceed estimated water use on the Subject Property based upon KCDAMS cropping information and (b) in year 2003 when reported AVEK deliveries underestimate water use calculated based on KCDAMS cropping information. Overall, however, AVEK deliveries fall within the estimated range of agricultural water use on the Subject Property. As previously discussed, water use rates can vary significantly based upon many factors, including use of different irrigation management strategies such as deficit irrigation or allowing the crops to dry in the field towards the end of the growing season and addition of

¹² The Antelope Valley Expert Report (Beeby et al., 2010) states that additional water for erosion control and/or field preparation is often used to grow crops in Antelope Valley (Antelope Valley Expert Report Appendix D-3: Table 4). The additional water amounts are as follows: for carrots = 12.5 inches or 1.04 acre-feet per acre; for onions = 7 inches or 0.58 acre-feet per acre; for pumpkins (based on melons and squash) = 4 inches or 0.33 acre-feet per acre.

water for germination, frost control, crop cooling, chemigation, fertigation, weed germination, or field preparation. As such AVEK delivery records are believed to be the most reliable source of information regarding actual agricultural water use at the Subject Property.

D. HISTORICAL GROUNDWATER USE AT THE SUBJECT PROPERTY PRIOR TO AVEK DELIVERIES

As discussed in Section C.1, AVEK deliveries to the Subject Property began in 1977. Review of historical aerial photographs indicates that irrigated agriculture existed on the Subject Property prior to 1977 when AVEK deliveries were initiated. Groundwater is believed to have been used to support irrigated agriculture on the Subject Property prior to 1977. This conclusion is supported by the presence of a groundwater supply well that has been identified on the Subject Property and historical aerial photographs which show irrigated agriculture on the Subject Property prior to 1977.

D.1 Review of Available Historical Aerial Photographs

Four historical aerial photographs were obtained for the period prior to 1997. These aerial photographs depict the Subject Property during the typical irrigated crop growing season. The dates and sources of the four photographs are summarized in Table 8, below.

Table 8. Historical Aerial Photographs Obtained for Review

Photo Date	Source	Notes
3 June 1963	National Aerial Resources, LLC	Scanned from a print; Scale of print: 1 inch = 3,333 feet
1965 (4 June to 1 August)	University of California Santa Barbara Aerial Photo Collection ⁽¹⁾	Digital file is an aerial photo mosaic
16 August 1972	Continental Aerial Photo Inc.	Digital file
11 April 1974	National Aerial Resources, LLC	Scanned from a print; Scale of print: 1 inch = 2,500 feet

(1) http://collections.alexandria.ucsb.edu/ap/indexes/abl1965/abl-1965_2.jpg

Figures 6 through 9 show these aerial photographs with the Subject Property boundary overlain. Figure 10 shows a closer cropped version of the 1965 photograph. The Subject Property was located on each photo by using landmarks (i.e., the northeast trending LADWP right-of-way that crosses the western portion of the Subject Property), buildings on the Subject Property and adjacent properties, and other physical features of the landscape.

The following is a summary of findings of review of the aerial photographs:

- Figure 6: 1963 Photograph. Shows dark areas and east-west striations over approximately 7/8 of the southern half of the Subject Property (i.e., all but the southeastern-most 40-acre block), indicating the presence of irrigated agriculture on the Subject Property. The northeastern quadrant of the Subject Property appears lighter colored but shows broad north-south banding potentially related to agricultural activity.
- Figure 7: 1965 Photograph and Figure 10: cropped version of 1965 Photograph. Show dark areas over most of the southern half of the Subject Property, indicating the presence of irrigated agriculture. The northeastern quadrant of the property appears lighter colored but shows broad north-south banding potentially related to agricultural activity.
- Figure 8: 1972 Photograph. Does not show any significant dark areas in Subject Property, suggesting no recent irrigated agricultural activity. The southern half of the Subject Property appears more uniform in color than the northern half, suggesting more uniform, likely human-influenced, land surface characteristics on the southern half. The northern portion of property appears more mottled, suggesting more natural influences on surface cover.
- Figure 9: 1974 Photograph. Shows that the entire southern half of the Subject Property is medium-dark gray in color with east-west striations indicative of agricultural activity. The northern portion of the Subject Property is lighter in color and more mottled, suggesting natural influences on surface cover.

In summary, the four historical aerial photographs obtained for review indicate that irrigated agriculture existed on portions of the Subject Property (primarily the southern half) prior to 1977, when AVEK water deliveries were initiated. Specifically aerial photographs from 1963, 1965 and 1974 (i.e., three out of the four photographs examined) show dark areas indicative of irrigated agriculture during typical crop growing seasons. Additionally, the northeast quadrant of the Subject Property shows wide parallel bands, suggesting some human modification to the land surface, possibly related to agricultural activity. Given that the climate in the area of the Subject Property is a continental desert-type climate, irrigation would have been required to support agricultural activity observed in aerial photographs of the Subject Property during the summer months.

Based upon the information reviewed, it is concluded that irrigated agriculture supported by groundwater use existed on the Subject Property prior to the initiation of AVEK deliveries. Further, in most of the aerial photographs obtained, the areal extent of such agriculture, which extends across much of the southern half of the property (i.e., approximately 300 acres), appears to have been similar to, or greater than, the areal extent of cropped areas identified between 1997 and 2004, based on the KCDAMS permit data (i.e., which range between 60 and 290 acres) and aerial photographs from 2000 and 2003 (see Attachment B).

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TABLE 1
CROP ACREAGES FROM KERN COUNTY AGRICULTURAL CHEMICAL PERMIT
AND USE DATA

Copa De Oro Land Company
Kern County, California

Year	Data Fields in the KCDAMS Permit and Use Data Files (a)		
	PERMIT	COMMODITY	QUANTITY (acres planted)
1997	1902091	CARROT	80
	1902091	PUMPKIN	70
1998	1902091	PUMPKIN	80
1999	1902091	ONION DRY ETC	150
2000	1503001	CARROT	137
2001	1503001	CARROT	150
2002	1902091	PUMPKIN	60
2003	1902091	ONION DRY ETC	140
	1503001	CARROT	150
2004	1902091	ONION DRY ETC	140
2005	--	--	--
2006	--	--	--
2007	--	--	--
2008	--	--	--
2009	--	--	--
2010	--	--	--
2011	--	--	--

Abbreviations:

-- no data for the Subject Property in the dataset
KCDAMS Kern County Department of Agriculture and Measurement Standards

Notes:

(a) Kern County Agricultural Chemical Permit and Use Data were obtained from the KCDAMS website. Permit data are from the files "KCxxPMTB.ASC" where xx is the two digit year. Use data are from the files "KCxxPURS.ASC" where xx is the two digit year.

TABLE 2
MONTHLY CLIMATE INFORMATION
Copa De Oro Land Company
Kern County, California

Month-Year	Evapotranspiration			Rainfall		
	Measured ETo at Arvin-Edison CIMIS Station (inches)	Measured ETo at Palmdale CIMIS Station (inches)	Estimated ETo at Palmdale CIMIS Station (a) (inches)	Measured Rainfall at Palmdale WRCC Station (inches)	Measured Rainfall at Palmdale CIMIS Station (inches)	Estimated Rainfall at Palmdale CIMIS Station (b) (inches)
Mar-95	1.59	--	2.28	2.25	--	2.07
Apr-95	5.22	--	5.75	0.13	--	0.12
May-95	6.27	--	6.75	0.00	--	0.00
Jun-95	8.08	--	8.47	0.07	--	0.06
Jul-95	8.62	--	8.99	0.03	--	0.03
Aug-95	8.42	--	8.80	0.02	--	0.02
Sep-95	5.99	--	6.48	0.00	--	0.00
Oct-95	4.39	--	4.95	0.00	--	0.00
Nov-95	2.39	--	3.05	0.03	--	0.03
Dec-95	1.44	--	2.14	0.73	--	0.67
Jan-96	1.23	--	1.94	0.29	--	0.27
Feb-96	1.82	--	2.50	2.36	--	2.17
Mar-96	4.11	--	4.69	0.42	--	0.39
Apr-96	6.02	--	6.51	0.00	--	0.00
May-96	8.09	--	8.48	0.00	--	0.00
Jun-96	8.89	--	9.25	0.00	--	0.00
Jul-96	9.38	--	9.71	0.00	--	0.00
Aug-96	9	--	9.35	0.13	--	0.12
Sep-96	6.45	--	6.92	0.00	--	0.00
Oct-96	4.25	--	4.82	0.93	--	0.86
Nov-96	1.85	--	2.53	0.41	--	0.38
Dec-96	1.17	--	1.88	1.19	--	1.10
Jan-97	1.35	--	2.05	0.81	--	0.75
Feb-97	2.05	--	2.72	0.05	--	0.05
Mar-97	4.83	--	5.37	0.00	--	0.00
Apr-97	6.23	--	6.71	0.14	--	0.13
May-97	8.39	--	8.77	0.00	--	0.00
Jun-97	8.38	--	8.76	0.00	--	0.00
Jul-97	8.89	--	9.25	0.00	--	0.00
Aug-97	8.36	--	8.74	0.00	--	0.00
Sep-97	6.07	--	6.56	1.20	--	1.10
Oct-97	4.3	--	4.87	0.20	--	0.18
Nov-97	2	--	2.67	0.91	--	0.84
Dec-97	1.52	--	2.22	2.46	--	2.26
Jan-98	1.46	--	2.16	1.10	--	1.01
Feb-98	1.52	--	2.22	6.35	--	5.85
Mar-98	3.56	--	4.16	1.96	--	1.80
Apr-98	5.03	--	5.56	0.89	--	0.82
May-98	5.56	--	6.07	1.01	--	0.93
Jun-98	7.48	--	7.90	0.00	--	0.00
Jul-98	9	--	9.35	0.00	--	0.00
Aug-98	8.47	--	8.85	0.00	--	0.00
Sep-98	5.61	--	6.12	0.36	--	0.33
Oct-98	3.89	--	4.48	0.03	--	0.03
Nov-98	1.88	--	2.56	0.45	--	0.41
Dec-98	1.48	--	2.18	0.13	--	0.12
Jan-99	1.45	--	2.15	0.35	--	0.32
Feb-99	2.18	--	2.85	0.23	--	0.21
Mar-99	3.68	--	4.28	0.19	--	0.17
Apr-99	5.59	--	6.10	0.83	--	0.76
May-99	7.78	--	8.19	0.00	--	0.00
Jun-99	8.38	--	8.76	0.06	--	0.06
Jul-99	8.83	--	9.19	0.57	--	0.52
Aug-99	8.46	--	8.84	0.00	--	0.00
Sep-99	6.39	--	6.86	0.00	--	0.00
Oct-99	4.56	--	5.12	0.00	--	0.00
Nov-99	1.87	--	2.55	0.03	--	0.03
Dec-99	1.53	--	2.23	0.00	--	0.00
Jan-00	1.15	--	1.86	0.22	--	0.20
Feb-00	2.3	--	2.96	1.85	--	1.70
Mar-00	3.66	--	4.26	0.81	--	0.75

TABLE 2
MONTHLY CLIMATE INFORMATION
Copa De Oro Land Company
Kern County, California

Month-Year	Evapotranspiration			Rainfall		
	Measured ETo at Arvin-Edison CIMIS Station (inches)	Measured ETo at Palmdale CIMIS Station (inches)	Estimated ETo at Palmdale CIMIS Station (a) (inches)	Measured Rainfall at Palmdale WRCC Station (inches)	Measured Rainfall at Palmdale CIMIS Station (inches)	Estimated Rainfall at Palmdale CIMIS Station (b) (inches)
Apr-00	4.57	--	5.13	0.79	--	0.73
May-00	7.38	--	7.81	0.00	--	0.00
Jun-00	8.77	--	9.13	0.00	--	0.00
Jul-00	8.83	--	9.19	0.00	--	0.00
Aug-00	8.35	--	8.73	0.21	--	0.19
Sep-00	5.79	--	6.29	0.00	--	0.00
Oct-00	3.7	--	4.30	0.19	--	0.17
Nov-00	1.96	--	2.64	0.00	--	0.00
Dec-00	1.44	--	2.14	0.00	--	0.00
Jan-01	1.67	--	2.36	1.69	--	1.56
Feb-01	2.16	--	2.83	2.51	--	2.31
Mar-01	4.08	--	4.66	0.63	--	0.58
Apr-01	5.29	--	5.81	0.83	--	0.76
May-01	8.27	--	8.65	0.00	--	0.00
Jun-01	9.42	--	9.75	0.00	--	0.00
Jul-01	9.09	--	9.44	0.00	--	0.00
Aug-01	8.74	--	9.10	0.00	--	0.00
Sep-01	6.4	--	6.87	0.00	--	0.00
Oct-01	4.28	--	4.85	0.17	--	0.16
Nov-01	2.07	--	2.74	0.75	--	0.69
Dec-01	1.23	--	1.94	0.56	--	0.52
Jan-02	1.32	--	2.03	0.49	--	0.45
Feb-02	2.68	--	3.32	0.05	--	0.05
Mar-02	4.55	--	5.11	0.14	--	0.13
Apr-02	5.54	--	6.05	0.04	--	0.04
May-02	7.97	--	8.37	0.02	--	0.02
Jun-02	9.17	--	9.51	0.00	--	0.00
Jul-02	9.49	--	9.82	0.00	--	0.00
Aug-02	8.79	--	9.15	0.00	--	0.00
Sep-02	6.39	--	6.86	0.00	--	0.00
Oct-02	4.05	--	4.63	0.00	--	0.00
Nov-02	1.95	--	2.63	0.39	--	0.36
Dec-02	1.58	--	2.27	1.54	--	1.42
Jan-03	1.36	--	2.06	0.00	--	0.00
Feb-03	2.25	--	2.91	3.79	--	3.49
Mar-03	4.15	--	4.73	2.03	--	1.87
Apr-03	4.88	--	5.42	0.77	--	0.71
May-03	7.1	--	7.54	0.41	--	0.38
Jun-03	8.51	--	8.88	0.00	--	0.00
Jul-03	8.74	--	9.10	0.09	--	0.08
Aug-03	7.83	--	8.24	0.00	--	0.00
Sep-03	6.27	--	6.75	0.01	--	0.01
Oct-03	4.71	--	5.26	0.00	--	0.00
Nov-03	1.92	--	2.60	0.55	--	0.51
Dec-03	1.55	--	2.25	0.96	--	0.88
Jan-04	1.09	--	1.81	0.02	--	0.02
Feb-04	2.17	--	2.84	3.24	--	2.98
Mar-04	4.73	--	5.28	0.25	--	0.23
Apr-04	6.57	--	7.03	0.06	--	0.06
May-04	8.33	--	8.71	0.00	--	0.00
Jun-04	9.03	--	9.38	0.00	--	0.00
Jul-04	9.53	--	9.86	0.00	--	0.00
Aug-04	8.74	--	9.10	0.00	--	0.00
Sep-04	6.56	--	7.02	0.00	--	0.00
Oct-04	3.76	--	4.35	3.53	--	3.25
Nov-04	1.87	--	2.55	0.46	--	0.42
Dec-04	1.49	--	2.19	4.27	--	3.93
Jan-05	1.16	--	1.87	3.91	--	3.60
Feb-05	1.92	--	2.60	5.60	--	5.16
Mar-05	3.28	--	3.90	0.93	--	0.86
Apr-05	5.2	5.09	--	0.96	1.37	--

**TABLE 2
MONTHLY CLIMATE INFORMATION**

Copa De Oro Land Company
Kern County, California

Month-Year	Evapotranspiration			Rainfall		
	Measured ETo at Arvin-Edison CIMIS Station (inches)	Measured ETo at Palmdale CIMIS Station (inches)	Estimated ETo at Palmdale CIMIS Station (a) (inches)	Measured Rainfall at Palmdale WRCC Station (inches)	Measured Rainfall at Palmdale CIMIS Station (inches)	Estimated Rainfall at Palmdale CIMIS Station (b) (inches)
May-05	6.99	7.55	--	0.25	0.87	--
Jun-05	8.07	9.17	--	0	0	--
Jul-05	9.63	10.05	--	0.22	0	--
Aug-05	9.15	8.72	--	0.1	0	--
Sep-05	5.86	5.96	--	0.73	0.61	--
Oct-05	3.95	4.53	--	1.76	1.48	--
Nov-05	2.37	2.98	--	0	0.01	--
Dec-05	1.36	2.04	--	0.08	0.09	--
Jan-06	1.82	2.5	--	0.64	0.56	--
Feb-06	2.71	3.19	--	1.36	0.96	--
Mar-06	3.17	3.82	--	1.53	0.84	--
Apr-06	4.52	5.29	--	1.26	0.73	--
May-06	7.44	8.36	--	0	0.03	--
Jun-06	8.3	8.97	--	0.11	0	--
Jul-06	8.75	9.56	--	0	0	--
Aug-06	8.14	9.2	--	0	0	--
Sep-06	6.12	6.55	--	0	0.52	--
Oct-06	3.49	4.44	--	0.42	0	--
Nov-06	1.87	3.02	--	0	0.01	--
Dec-06	1.73	2.11	--	0.43	0.19	--
Jan-07	1.67	2.56	--	0.11	0.06	--
Feb-07	2.07	2.83	--	0.42	0.47	--
Mar-07	4.44	5.22	--	0	0.01	--
Apr-07	5.51	6.26	--	0.03	0.01	--
May-07	8.15	8.32	--	0	0	--
Jun-07	8.77	9.71	--	0	0	--
Jul-07	8.73	10.66	--	0	0	--
Aug-07	8.06	9.53	--	0	3.35	--
Sep-07	5.66	5.72	--	0.62	0.15	--
Oct-07	3.75	4.59	--	0.01	0.01	--
Nov-07	2.06	2.86	--	0.75	0.76	--
Dec-07	1.43	2.14	--	0	0.2	--
Jan-08	2.01	1.97	--	3.45	2.31	--
Feb-08	2.44	2.97	--	0	0.45	--
Mar-08	4.67	5.03	--	0	0.15	--
Apr-08	6.45	6.58	--	0	0.07	--
May-08	7.65	7.74	--	0	0	--
Jun-08	9.29	9.21	--	0	0	--
Jul-08	9.15	9.42	--	0	0	--
Aug-08	8.81	8.74	--	0	0	--
Sep-08	6.25	6.14	--	0	0.17	--
Oct-08	4.42	4.8	--	0	0.01	--
Nov-08	1.9	2.77	--	1.47	0.38	--
Dec-08	1.05	1.72	--	1.52	1.08	--
Jan-09	1.33	2.42	--	0	0.13	--
Feb-09	2.23	2.47	--	2.81	1.9	--
Mar-09	4.26	4.9	--	0.23	4.63	--
Apr-09	6.46	6.81	--	0	0.02	--
May-09	7.93	8.93	--	0	0	--
Jun-09	8.06	7.93	--	0	0.01	--
Jul-09	9.48	9.99	--	0	0	--
Aug-09	8.28	8.33	--	0	0	--
Sep-09	6.41	6.32	--	0	0.02	--
Oct-09	4.14	4.41	--	0.04	0	--
Nov-09	2.13	3.08	--	0	0.03	--
Dec-09	1.27	1.78	--	1.19	0.15	--
Jan-10	1.28	1.69	--	3.62	5.91	--
Feb-10	1.81	2.44	--	2.13	3.19	--
Mar-10	3.56	4.7	--	0.32	1.59	--
Apr-10	4.61	5.99	--	0.71	1.31	--
May-10	6.99	7.98	--	0	0	--

**TABLE 2
MONTHLY CLIMATE INFORMATION**

Copa De Oro Land Company
Kern County, California

Month-Year	Evapotranspiration			Rainfall		
	Measured ETo at Arvin-Edison CIMIS Station (inches)	Measured ETo at Palmdale CIMIS Station (inches)	Estimated ETo at Palmdale CIMIS Station (a) (inches)	Measured Rainfall at Palmdale WRCC Station (inches)	Measured Rainfall at Palmdale CIMIS Station (inches)	Estimated Rainfall at Palmdale CIMIS Station (b) (inches)
Jun-10	8.7	9.06	--	0	0.02	--
Jul-10	9.47	9.81	--	0.68	0.14	--
Aug-10	8.86	8.93	--	0	0.11	--
Sep-10	6.26	6.18	--	0	0.06	--
Oct-10	3.7	3.4	--	2.06	1.65	--
Nov-10	2.2	2.91	--	0.38	0.31	--
Dec-10	1.21	1.64	--	4.67	3.78	--
Jan-11	1.21	2.31	--	0.41	0.4	--
Feb-11	2.48	2.98	--	1.24	0.83	--
Mar-11	3.44	4.55	--	1.7	1.6	--
Apr-11	5.62	6.56	--	0	0.02	--
May-11	7.26	7.84	--	0	0.06	--
Jun-11	8.53	8.77	--	0	0	--
Jul-11	9.21	8.89	--	0	0	--
Aug-11	8.6	8.95	--	0	0	--
Sep-11	6.12	6.32	--	1.45	0.56	--
Oct-11	3.82	4.69	--	0.12	0.1	--
Nov-11	2.01	2.64	--	0.38	0.44	--
Dec-11	1.8	2.29	--	0.4	0.36	--
Jan-12	2.05	2.91	--	0.06	0.14	--
Feb-12	2.9	3.26	--	0.54	0.48	--
Mar-12	4.34	4.99	--	1.1	0.55	--
Apr-12	5.24	6.4	--	0.71	0.48	--
May-12	8.36	8.61	--	0	0	--
Jun-12	8.88	9.38	--	0	0	--
Jul-12	9.14	8.97	--	0	0	--
Aug-12	8.75	8.08	--	0.1	0.07	--
Sep-12	6.37	6.97	--	0	0	--
Oct-12	4.21	4.79	--	0	0	--
Nov-12	2.25	2.87	--	0	0.07	--

Abbreviations:

CIMIS California Irrigation Information Management System
 ETo Reference evapotranspiration
 WRCC Western Regional Climate Center

Notes:

- (a) ETo at the Palmdale CIMIS station for the period from March 1995 through March 2005 is estimated using the linear relationship between ETo at the Palmdale and Arvin-Edison CIMIS stations for the period from April 2005 through November 2012 (see Figure 2).
- (b) Rainfall at the Palmdale CIMIS station for the period from March 1995 through March 2005 is estimated using the linear relationship between rainfall at the Palmdale CIMIS station and the Palmdale WRCC station for the period from April 2005 through November 2012 (see Figure 4).

**TABLE 3
CROP COEFFICIENTS FOR CARROTS, ONIONS, AND PUMPKINS**

Copa De Oro Land Company
Kern County, California

Month	Crop Coefficients (a)								
	Carrots					Onions		Pumpkins	
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 1	Alt 2	Alt 1	Alt 2
January									
February									
March	0.47					0.47			
April	0.79	0.38				0.80	0.38		
May	1.12	0.75	0.33			1.12	0.75		
June	1.12	1.12	0.72	0.28		1.12	1.12	0.28	
July	1.08	1.12	1.12	0.69	0.26	1.12	1.12	0.68	0.26
August		1.07	1.12	1.11	0.68	0.98	1.12	1.07	0.66
September			1.06	1.11	1.10		0.97	0.97	1.06
October				1.06	1.10				0.96
November					1.05				
December									

Abbreviations:

Alt growing season alternative scenario
 CIMS California Irrigation Management Information System
 ETo reference evapotranspiration

Notes:

- (a) Crop coefficients are calculated for each alternative growing season scenario as follows:
- 1) initial stage crop coefficient values are estimated from Figure 30 of Allen et al. (1998) using average ETo from the CIMIS Palmdale station for the initial season month and assuming a 7-day irrigation frequency;
 - 2) the base crop coefficient values for mid-stage and ending stage are obtained from Table 12 of Allen et al. (1998);
 - 3) the base mid-stage and ending stage values are adjusted to account for local relative humidity and wind speed conditions using equations (62) and (65) of Allen et al., (1998); and
 - 4) crop coefficient values are assigned to each month in the growing season.

TABLE 4
EXAMPLE CALCULATION OF MONTHLY AND ANNUAL AGRICULTURAL WATER USE (a)
Copa De Oro Land Company
Kern County, California

Month-Year	ETo (a) (inches)	Rainfall (a) (inches)	Monthly Water Use Calculation															Total Annual Water Use (g) (acre-feet)		
			Carrots					Onions					Pumpkins						Total Monthly Water Use (f) (acre-feet)	
			Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)			
Jan-97	2.05	0.75	80	0.00	75%	0.083	0							70	0.00	75%	0.083	0	0	
Feb-97	2.72	0.05	80	0.00	75%	0.083	0							70	0.00	75%	0.083	0	0	
Mar-97	5.37	0.00	80	0.47	75%	0.083	22							70	0.00	75%	0.083	0	20	
Apr-97	6.71	0.13	80	0.79	75%	0.083	46							70	0.00	75%	0.083	0	50	
May-97	8.77	0.00	80	1.12	75%	0.083	87							70	0.00	75%	0.083	0	90	
Jun-97	8.76	0.00	80	1.12	75%	0.083	87							70	0.28	75%	0.083	19	110	
Jul-97	9.25	0.00	80	1.08	75%	0.083	88							70	0.68	75%	0.083	49	140	
Aug-97	8.74	0.00	80	0.00	75%	0.083	0							70	1.07	75%	0.083	73	70	
Sep-97	6.56	1.10	80	0.00	75%	0.083	0							70	0.97	75%	0.083	41	40	
Oct-97	4.87	0.18	80	0.00	75%	0.083	0							70	0.00	75%	0.083	0	0	
Nov-97	2.67	0.84	80	0.00	75%	0.083	0							70	0.00	75%	0.083	0	0	
Dec-97	2.22	2.26	80	0.00	75%	0.083	0							70	0.00	75%	0.083	0	0	520
Jan-98	2.16	1.01												80	0.00	75%	0.083	0	0	
Feb-98	2.22	5.85												80	0.00	75%	0.083	0	0	
Mar-98	4.16	1.80												80	0.00	75%	0.083	0	0	
Apr-98	5.56	0.82												80	0.00	75%	0.083	0	0	
May-98	6.07	0.93												80	0.00	75%	0.083	0	0	
Jun-98	7.90	0.00												80	0.28	75%	0.083	20	20	
Jul-98	9.35	0.00												80	0.68	75%	0.083	56	60	
Aug-98	8.85	0.00												80	1.07	75%	0.083	84	80	
Sep-98	6.12	0.33												80	0.97	75%	0.083	50	50	
Oct-98	4.48	0.03												80	0.00	75%	0.083	0	0	
Nov-98	2.56	0.41												80	0.00	75%	0.083	0	0	
Dec-98	2.18	0.12												80	0.00	75%	0.083	0	0	210
Jan-99	2.15	0.32						150	0.00	75%	0.083	0							0	
Feb-99	2.85	0.21						150	0.00	75%	0.083	0							0	
Mar-99	4.28	0.17						150	0.47	75%	0.083	31							30	
Apr-99	6.10	0.76						150	0.80	75%	0.083	68							70	
May-99	8.19	0.00						150	1.12	75%	0.083	153							150	
Jun-99	8.76	0.06						150	1.12	75%	0.083	163							160	
Jul-99	9.19	0.52						150	1.12	75%	0.083	163							160	
Aug-99	8.84	0.00						150	0.98	75%	0.083	144							140	
Sep-99	6.86	0.00						150	0.00	75%	0.083	0							0	
Oct-99	5.12	0.00						150	0.00	75%	0.083	0							0	
Nov-99	2.55	0.03						150	0.00	75%	0.083	0							0	
Dec-99	2.23	0.00						150	0.00	75%	0.083	0							0	710

TABLE 4
EXAMPLE CALCULATION OF MONTHLY AND ANNUAL AGRICULTURAL WATER USE (a)
Copa De Oro Land Company
Kern County, California

Month-Year	ETo (a) (inches)	Rainfall (a) (inches)	Monthly Water Use Calculation															Total Annual Water Use (g) (acre-feet)	
			Carrots					Onions					Pumpkins						Total Monthly Water Use (f) (acre-feet)
			Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)		
Jan-00	1.86	0.20	137	0.00	75%	0.083	0											0	510
Feb-00	2.96	1.70	137	0.00	75%	0.083	0											0	
Mar-00	4.26	0.75	137	0.47	75%	0.083	19											20	
Apr-00	5.13	0.73	137	0.79	75%	0.083	51											50	
May-00	7.81	0.00	137	1.12	75%	0.083	133											130	
Jun-00	9.13	0.00	137	1.12	75%	0.083	155											160	
Jul-00	9.19	0.00	137	1.08	75%	0.083	150											150	
Aug-00	8.73	0.19	137	0.00	75%	0.083	0											0	
Sep-00	6.29	0.00	137	0.00	75%	0.083	0											0	
Oct-00	4.30	0.17	137	0.00	75%	0.083	0											0	
Nov-00	2.64	0.00	137	0.00	75%	0.083	0											0	
Dec-00	2.14	0.00	137	0.00	75%	0.083	0											0	
Jan-01	2.36	1.56	150	0.00	75%	0.083	0											0	600
Feb-01	2.83	2.31	150	0.00	75%	0.083	0											0	
Mar-01	4.66	0.58	150	0.47	75%	0.083	27											30	
Apr-01	5.81	0.76	150	0.79	75%	0.083	64											60	
May-01	8.65	0.00	150	1.12	75%	0.083	161											160	
Jun-01	9.75	0.00	150	1.12	75%	0.083	182											180	
Jul-01	9.44	0.00	150	1.08	75%	0.083	169											170	
Aug-01	9.10	0.00	150	0.00	75%	0.083	0											0	
Sep-01	6.87	0.00	150	0.00	75%	0.083	0											0	
Oct-01	4.85	0.16	150	0.00	75%	0.083	0											0	
Nov-01	2.74	0.69	150	0.00	75%	0.083	0											0	
Dec-01	1.94	0.52	150	0.00	75%	0.083	0											0	
Jan-02	2.03	0.45										60	0.00	75%	0.083	0	0	0	170
Feb-02	3.32	0.05										60	0.00	75%	0.083	0	0	0	
Mar-02	5.11	0.13										60	0.00	75%	0.083	0	0	0	
Apr-02	6.05	0.04										60	0.00	75%	0.083	0	0	0	
May-02	8.37	0.02										60	0.00	75%	0.083	0	0	0	
Jun-02	9.51	0.00										60	0.28	75%	0.083	18	20	20	
Jul-02	9.82	0.00										60	0.68	75%	0.083	44	40	40	
Aug-02	9.15	0.00										60	1.07	75%	0.083	65	70	70	
Sep-02	6.86	0.00										60	0.97	75%	0.083	44	40	40	
Oct-02	4.63	0.00										60	0.00	75%	0.083	0	0	0	
Nov-02	2.63	0.36										60	0.00	75%	0.083	0	0	0	
Dec-02	2.27	1.42										60	0.00	75%	0.083	0	0	0	

TABLE 4
EXAMPLE CALCULATION OF MONTHLY AND ANNUAL AGRICULTURAL WATER USE (a)
Copa De Oro Land Company
Kern County, California

Month-Year	ETo (a) (inches)	Rainfall (a) (inches)	Monthly Water Use Calculation															Total Annual Water Use (g) (acre-feet)	
			Carrots					Onions					Pumpkins						Total Monthly Water Use (f) (acre-feet)
			Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)	Crop Acreage (b) (acres)	Crop Coefficient (c) (-)	Irrigation Efficiency (d) (%)	Conversion Factor (-)	Monthly Water Use (e) (acre-feet)		
Jan-03	2.06	0.00	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	1,160
Feb-03	2.91	3.49	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	
Mar-03	4.73	1.87	150	0.47	75%	0.083	6	140	0.47	75%	0.083	5						10	
Apr-03	5.42	0.71	150	0.79	75%	0.083	60	140	0.80	75%	0.083	56						120	
May-03	7.54	0.38	150	1.12	75%	0.083	134	140	1.12	75%	0.083	126						260	
Jun-03	8.88	0.00	150	1.12	75%	0.083	166	140	1.12	75%	0.083	155						320	
Jul-03	9.10	0.08	150	1.08	75%	0.083	162	140	1.12	75%	0.083	158						320	
Aug-03	8.24	0.00	150	0.00	75%	0.083	0	140	0.98	75%	0.083	126						130	
Sep-03	6.75	0.01	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	
Oct-03	5.26	0.00	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	
Nov-03	2.60	0.51	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	
Dec-03	2.25	0.88	150	0.00	75%	0.083	0	140	0.00	75%	0.083	0						0	
Jan-04	1.81	0.02						140	0.00	75%	0.083	0						0	750
Feb-04	2.84	2.98						140	0.00	75%	0.083	0						0	
Mar-04	5.28	0.23						140	0.47	75%	0.083	35						40	
Apr-04	7.03	0.06						140	0.80	75%	0.083	86						90	
May-04	8.71	0.00						140	1.12	75%	0.083	152						150	
Jun-04	9.38	0.00						140	1.12	75%	0.083	164						160	
Jul-04	9.86	0.00						140	1.12	75%	0.083	172						170	
Aug-04	9.10	0.00						140	0.98	75%	0.083	139						140	
Sep-04	7.02	0.00						140	0.00	75%	0.083	0						0	
Oct-04	4.35	3.25						140	0.00	75%	0.083	0						0	
Nov-04	2.55	0.42						140	0.00	75%	0.083	0						0	
Dec-04	2.19	3.93						140	0.00	75%	0.083	0						0	

Abbreviations:

- A cropped area, in acres
- C conversion coefficient from inches to feet
- eff irrigation efficiency
- ETo reference evapotranspiration, in inches
- Kc crop coefficient
- P precipitation, in inches

Notes:

- (a) Monthly rainfall and ETo are as shown on Table 1.
- (b) Crop acreages are as shown on Table 2.
- (c) Crop coefficients are as shown on Table 3.
- (d) Irrigation efficiency is assumed to be 75 percent based on ranges for furrow and sprinkler irrigation in Howell (2003).
- (e) Monthly water use is calculated using the equation below:
water use (acre-feet per month) = A * (ETo * Kc - P) * C / eff (see Abbreviations for definition of terms)
This calculation is performed using the Alternative 1 growing season scenarios for each crop.
- (f) Total monthly agricultural water use is the sum of the monthly use for all crops
- (g) Total annual agricultural water use is the sum of all monthly values for the year.

TABLE 5
ESTIMATED AGRICULTURAL WATER USE, 1997 THROUGH 2004 (a)

Copa De Oro Land Company
 Kern County, California

Year	Lower Estimate (b) (acre-feet)	Upper Estimate (c) (acre-feet)	Range of Estimated Agricultural Water Use (d) (acre-feet)
1997	290	710	290 to 710
1998	150	270	150 to 270
1999	640	930	640 to 930
2000	300	790	300 to 790
2001	340	910	340 to 910
2002	120	220	120 to 220
2003	900	1680	900 to 1680
2004	650	950	650 to 950
Average (1997 - 2004)	420	810	420 to 810
Average (2000 - 2004)	460	910	460 to 910
Maximum (2000 - 2004)	900	1680	900 to 1680

Notes:

- (a) All values are rounded to the nearest 10 acre-feet.
- (b) The lower estimates of agricultural water use are based on the lowest calculated value from the alternative growing season scenarios for that crop, an irrigation efficiency of 85 percent, and no additional water use for other purposes (e.g., erosion control, field preparation).
- (c) The upper estimates of agricultural water use are based on the highest calculated value from the alternative growing season scenarios for that crop, an irrigation efficiency of 65 percent, and additional water for erosion control and field preparation, as indicated on Appendix D-3, Table 4 of the Antelope Valley Expert Report (Beeby et al., 2010). The additional water amounts to 1.04 acre-feet per acre for carrots, 0.58 acre-feet per acre for onions, and 0.33 acre-feet per acre for pumpkins.
- (d) Range of values reflects estimation using a range of alternative growing season scenarios, irrigation efficiencies, and inclusion or exclusion of additional water for erosion control and field preparation.

TABLE 6
ESTIMATED CROP WATER USE FACTORS (a)
Copa De Oro Land Company
Kern County, California

Year	Carrots		Onions		Pumpkins	
	Lower Estimate (b) (acre-feet per acre)	Upper Estimate (c) (acre-feet per acre)	Lower Estimate (b) (acre-feet per acre)	Upper Estimate (c) (acre-feet per acre)	Lower Estimate (b) (acre-feet per acre)	Upper Estimate (c) (acre-feet per acre)
1997	1.8	3.2	--	--	1.5	1.9
1998	--	--	--	--	1.6	2.0
1999	--	--	3.6	3.7	--	--
2000	1.9	3.1	--	--	--	--
2001	2.0	3.3	--	--	--	--
2002	--	--	--	--	1.8	2.1
2003	2.0	3.0	3.4	3.5	--	--
2004	--	--	4.0	4.0	--	--
Average	1.9	3.1	3.6	3.7	1.6	2.0

Abbreviations:

-- crop not grown on the Subject Property during that year

Notes:

- (a) These estimated crop water use factors are based on the annual water use estimates (Table 5) excluding the effect of irrigation efficiency and any additional water use for erosion control or field preparation.
- (b) The lower estimates of crop water use factors are based on the lowest estimated annual water demand from all of the alternative growing season scenarios for that crop.
- (c) The upper estimates of crop water use factors are based on the highest estimated annual water demand from all of the alternative growing season scenarios for that crop.

**TABLE 7
COMPARISON OF ESTIMATED AGRICULTURAL WATER USE AND
REPORTED AVEK DELIVERIES**

Copa De Oro Land Company
Kern County, California

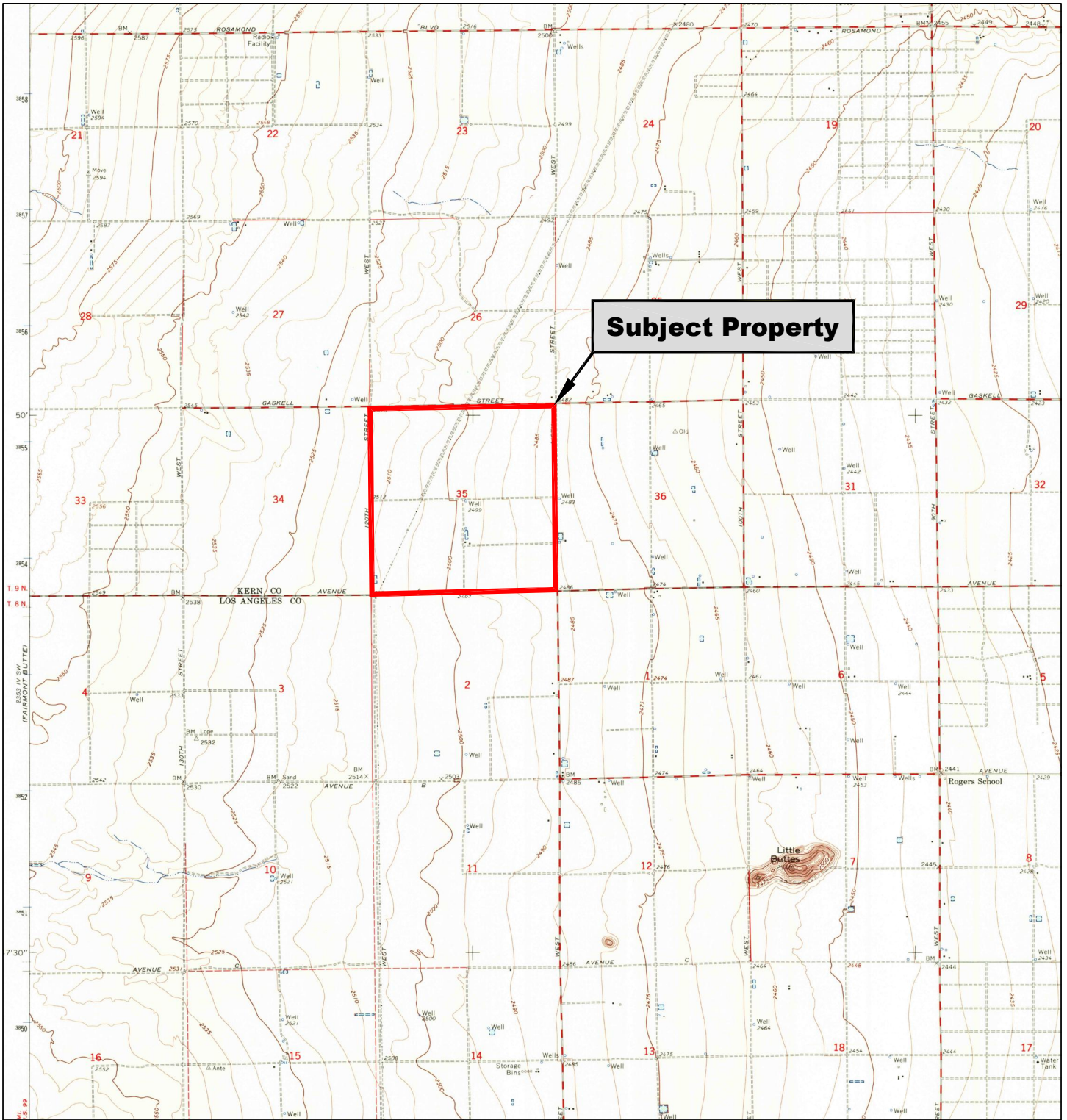
Year	Estimated Water Use Based on Total Applied Water Factors (b) (acre-feet)	Range of Estimated Agricultural Water Use (a) (acre-feet)	Reported AVEK Deliveries (c) (acre-feet)
1997	510	290 to 710	805
1998	220	150 to 270	208
1999	680	640 to 930	635
2000	530	300 to 790	708
2001	590	340 to 910	829
2002	170	120 to 220	842
2003	1220	900 to 1680	867
2004	630	650 to 950	626
Average (1997 - 2004)	570	420 to 810	690
Average (2000 - 2004)	630	460 to 910	774
Maximum (2000 - 2004)	1220	900 to 1680	867

Abbreviations:

AVEK Antelope Valley-East Kern Water Agency
BKS Bartkiewicz, Kronick & Shanahan

Notes:

- (a) Estimated water use values are from Table 5. All values are rounded to the nearest 10 acre-feet.
- (b) Estimated water use based on total applied water factors from Table D.3-2 of Appendix D of the Antelope Valley Expert Report (Beeby et al., 2010). All values are rounded to the nearest 10 acre-feet.
- (c) AVEK deliveries data are from a letter from AVEK to BKS, dated 28 July 2011 (see Attachment A).



Notes:

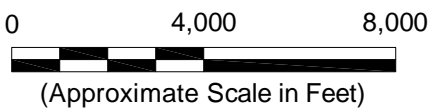
- 1. All locations are approximate.
- 2. Basemap source: US Geological Survey Topographical Map, Little Buttes, California, 1965.

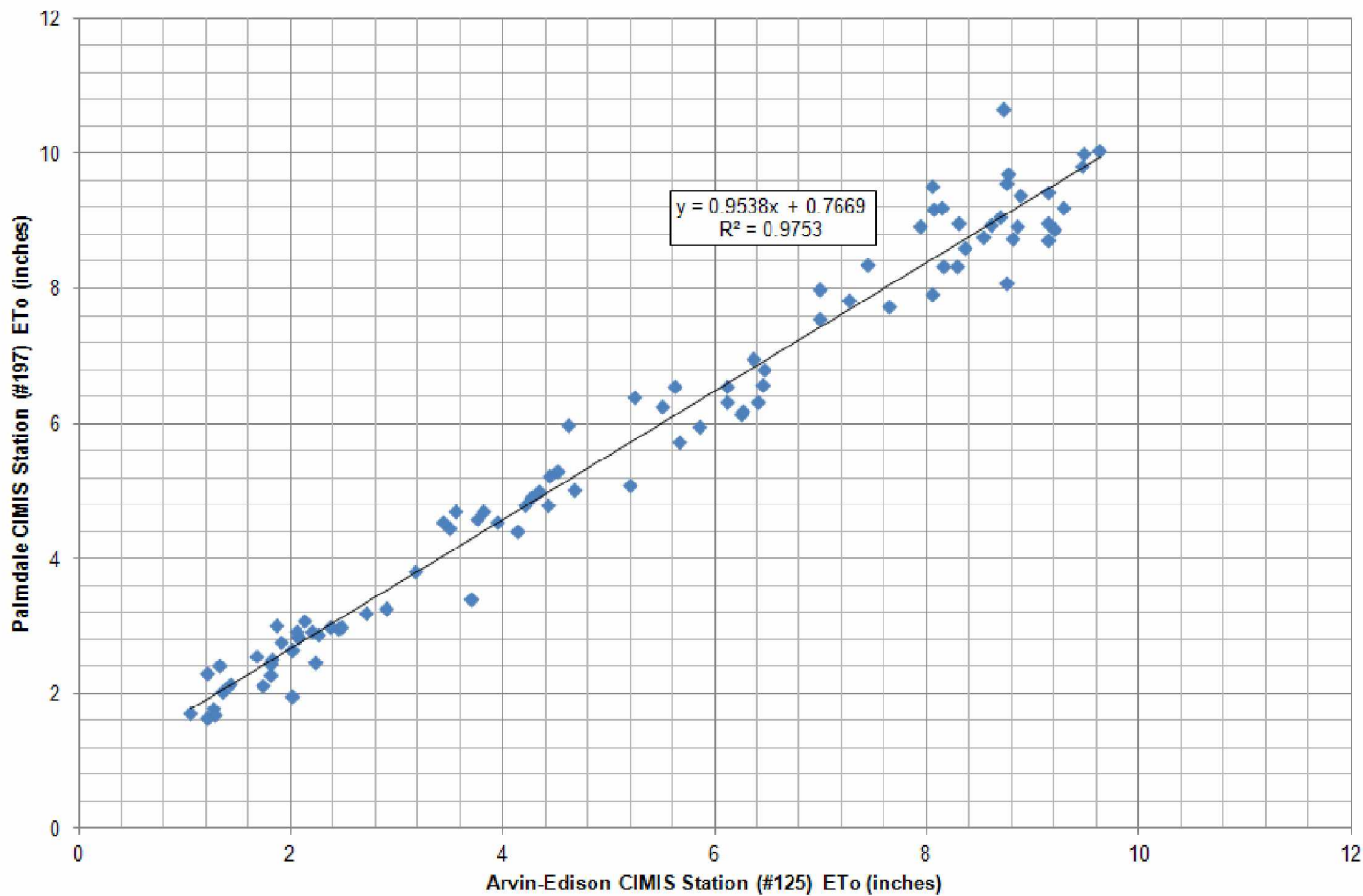
Erler & Kalinowski, Inc.

Subject Property Location

Copa De Oro
 Kern County, CA
 January 2013
 EKI A80023.02

Figure 1





Abbreviations:

CIMIS California Irrigation Management Information System
ETo Reference evapotranspiration

Notes:

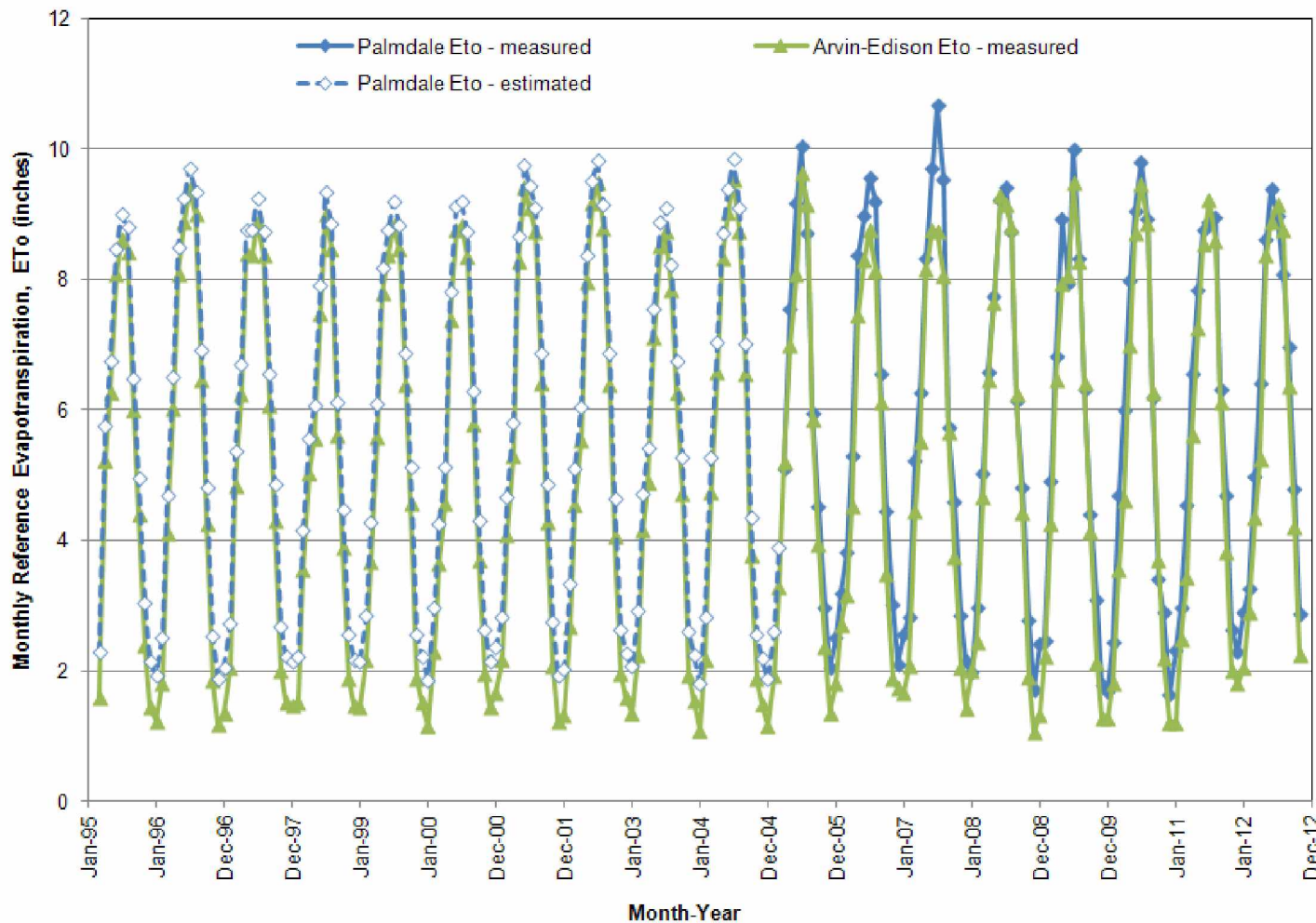
1. Data plotted are from the common period of record of the CIMIS Palmdale station (#197) and the CIMIS Arvin-Edison station (#125), April 2005 through November 2012.
2. Data were obtained on 17 December 2012 from the CIMIS website:
<http://www.cimis.water.ca.gov/cimis>

**Erler &
Kalinowski, Inc.**

**Correlation Between Reference
Evapotranspiration at the CIMIS
Palmdale Station and the CIMIS
Arvin-Edison Station**

Copa De Oro Land Company
Kern County, California
January 2013
EKI A80023.02

Figure 2



Abbreviations:

CIMIS California Irrigation Management Information System
 ETo Reference evapotranspiration

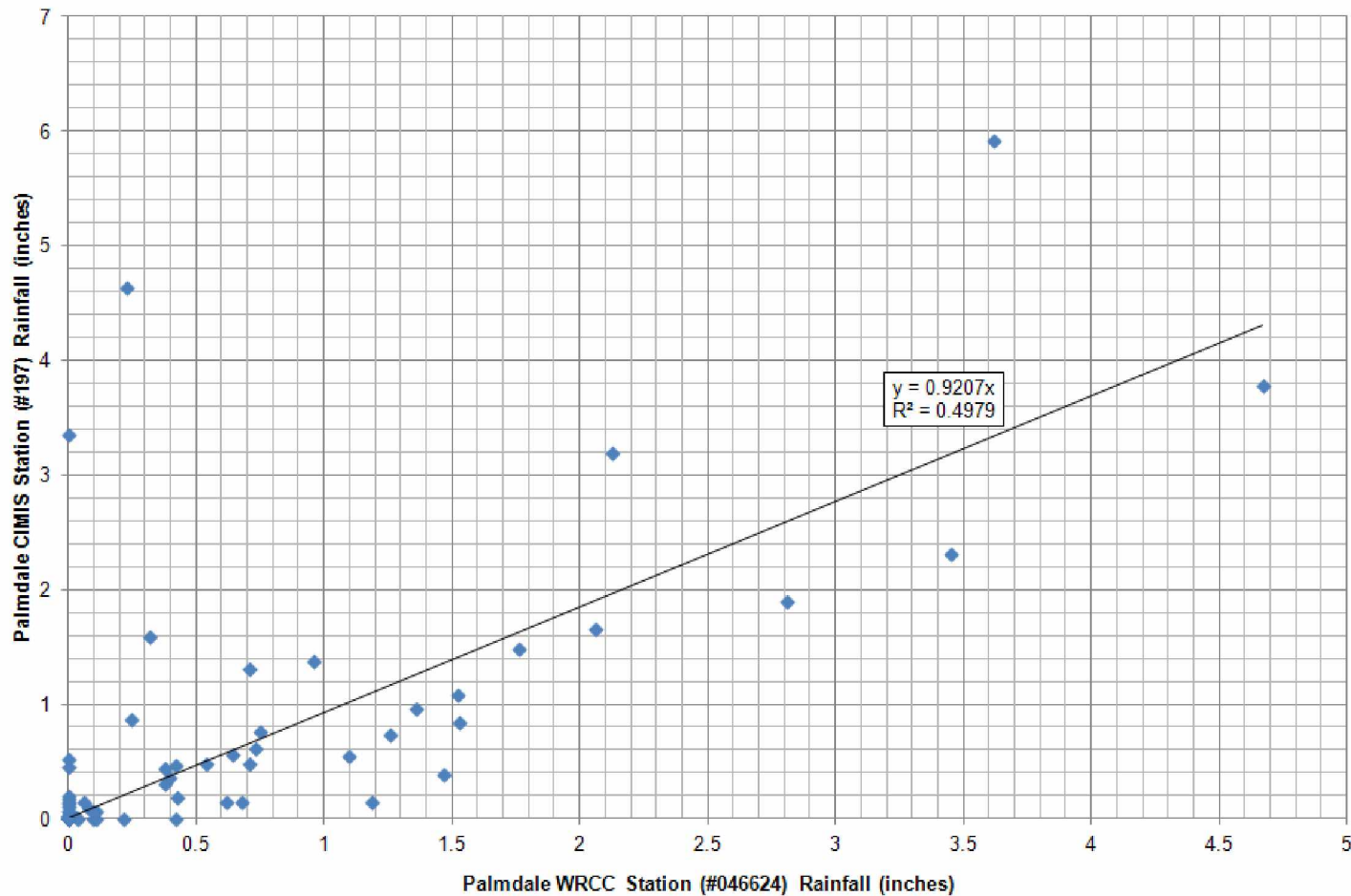
Notes:

1. All data shown for the CIMIS Arvin-Edison station (#125) are measured values.
2. Data shown for the CIMIS Palmdale station (#197) are measured values starting April 2005 and estimated values prior to April 2005. Estimated values are based on the linear correlation shown on Figure 2.

**Erlar &
Kalinowski, Inc.**

**Reference Evapotranspiration at
the CIMIS Palmdale Station and
the CIMIS Arvin-Edison Station**

Copa De Oro Land Company
 Kern County, California
 January 2013
 EKI A80023.02
Figure 3



Abbreviations:

CIMIS California Irrigation Management Information System
 WRCC Western Regional Climate Center

Notes:

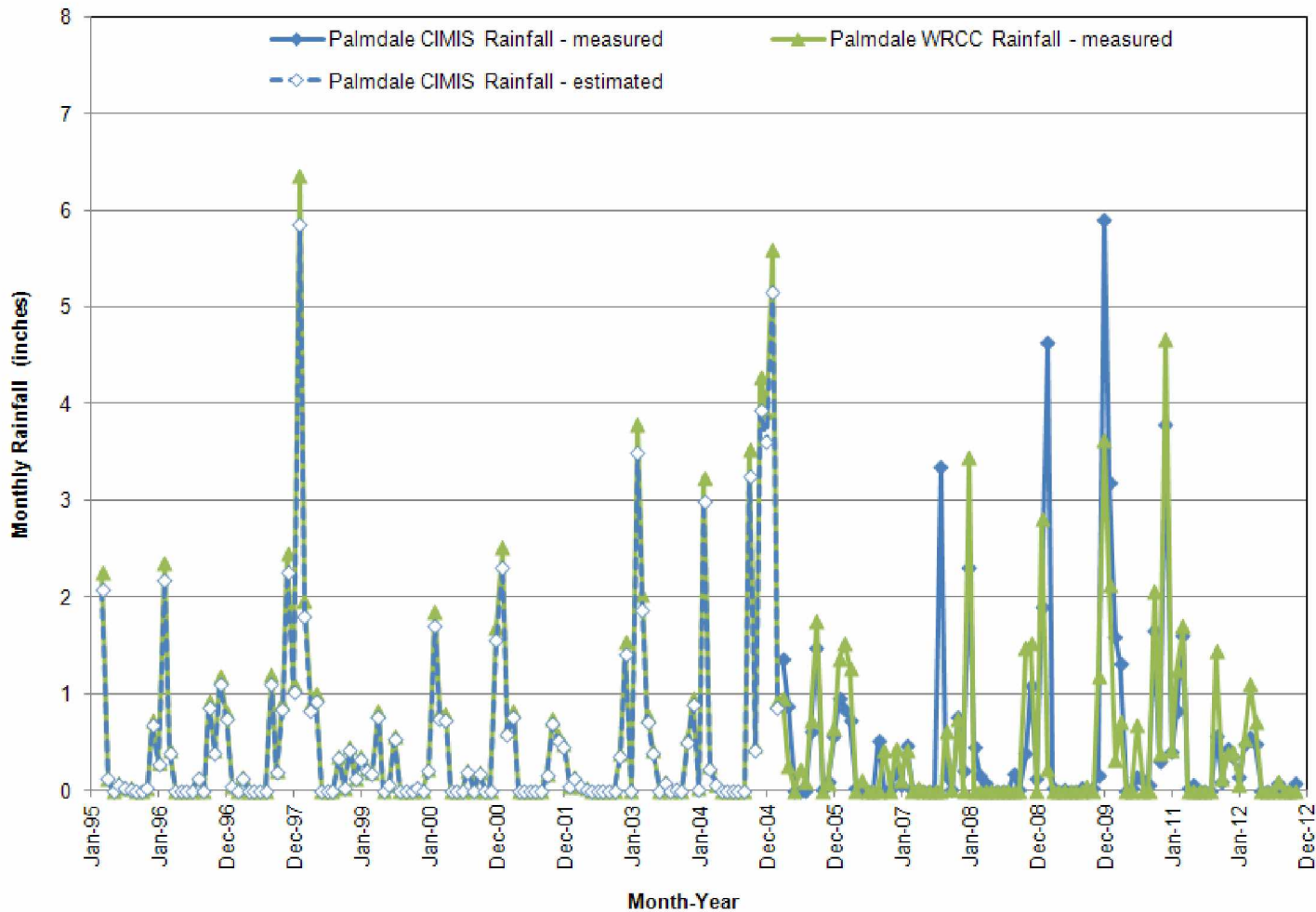
1. Data plotted are from the common period of record of the CIMIS Palmdale station (#197) and the WRCC Palmdale station (#046624), April 2005 through November 2012, excluding months when the WRCC data had more than 5 days missing (11 months).
2. CIMIS data were obtained on 17 December 2012 from the CIMIS website: <http://www.cimis.water.ca.gov/cimis>
3. WRCC data were obtained on 17 December 2012 from the WRCC website: <http://www.wrcc.dri.edu/climatedata/cli/msum/>

**Erler &
 Kalinowski, Inc.**

**Correlation Between
 Precipitation at the CIMIS
 Palmdale Station and the WRCC
 Palmdale Station**

Copa De Oro Land Company
 Kern County, California
 January 2013
 EKI A80023.02

Figure 4



Abbreviations:

CIMIS California Irrigation Management Information System
 WRCC Western Regional Climate Center

Notes:

1. All data shown for the WRCC Palmdale station (#046624) are measured values.
2. Data shown for the CIMIS Palmdale station (#197) are measured values starting April 2005 and estimated values prior to April 2005. Estimated values are based on the linear correlation shown on Figure 4.

**Erler &
Kalinowski, Inc.**


**Precipitation at the CIMIS
Palmdale Station and the WRCC
Palmdale Station**

Copa De Oro Land Company
 Kern County, California
 January 2013
 EK1 A80023.02

Figure 5

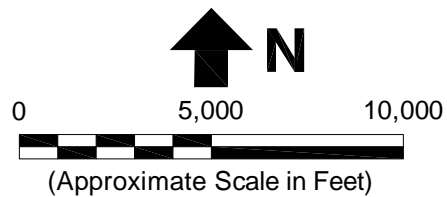


Legend:

 Subject Property

Notes:

1. All locations are approximate.
2. Basemap source: Scanned from print purchased by EKI from National Aerial Resources, LLC

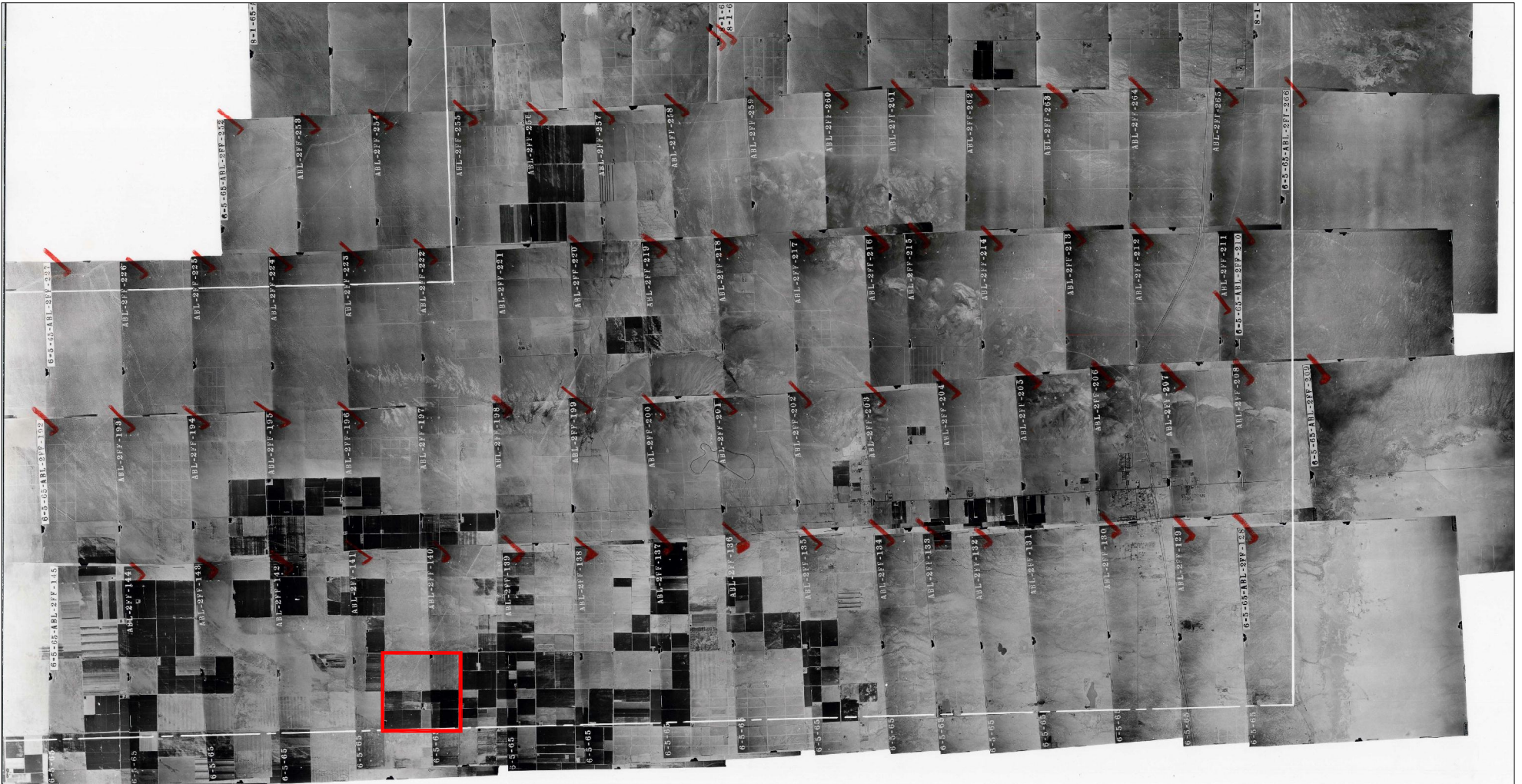


**Erler &
Kalinowski, Inc.**


Aerial Photograph, 3 June 1963

Copa De Oro
Kern County, CA
January 2013
A80023.02

Figure 6

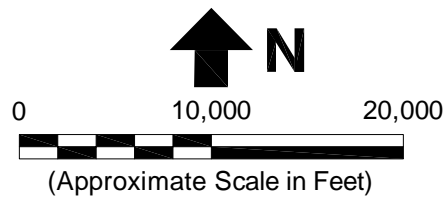


Legend:

 Subject Property

Notes:

1. All locations are approximate.
2. Basemap source: UCSB Aerial Photo Collection (accessed 13 Feb 2012) http://collections.alexandria.ucsb.edu/ap/indexes/abl1965/abl-1965_2.jpg



Erler & Kalinowski, Inc.


Aerial Photograph, 1965 (4 June to 1 August)

Copa De Oro
Kern County, CA
January 2013
A80023.02

Figure 7

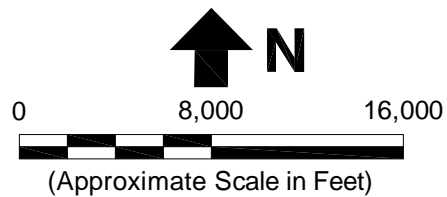


Legend:

 Subject Property

Notes:

1. All locations are approximate.
2. Basemap source: Sent to EKI via email from Continental Aerial



**Erler &
Kalinowski, Inc.**


Aerial Photograph, 16 August 1972

Copa De Oro
Kern County, CA
January 2013
A80023.02

Figure 8

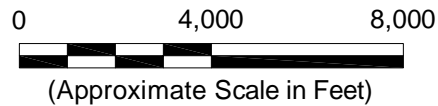
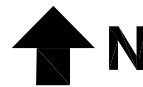


Legend:

 Subject Property

Notes:

1. All locations are approximate.
2. Basemap source: Scanned from print purchased by EKI from National Aerial Resources, LLC

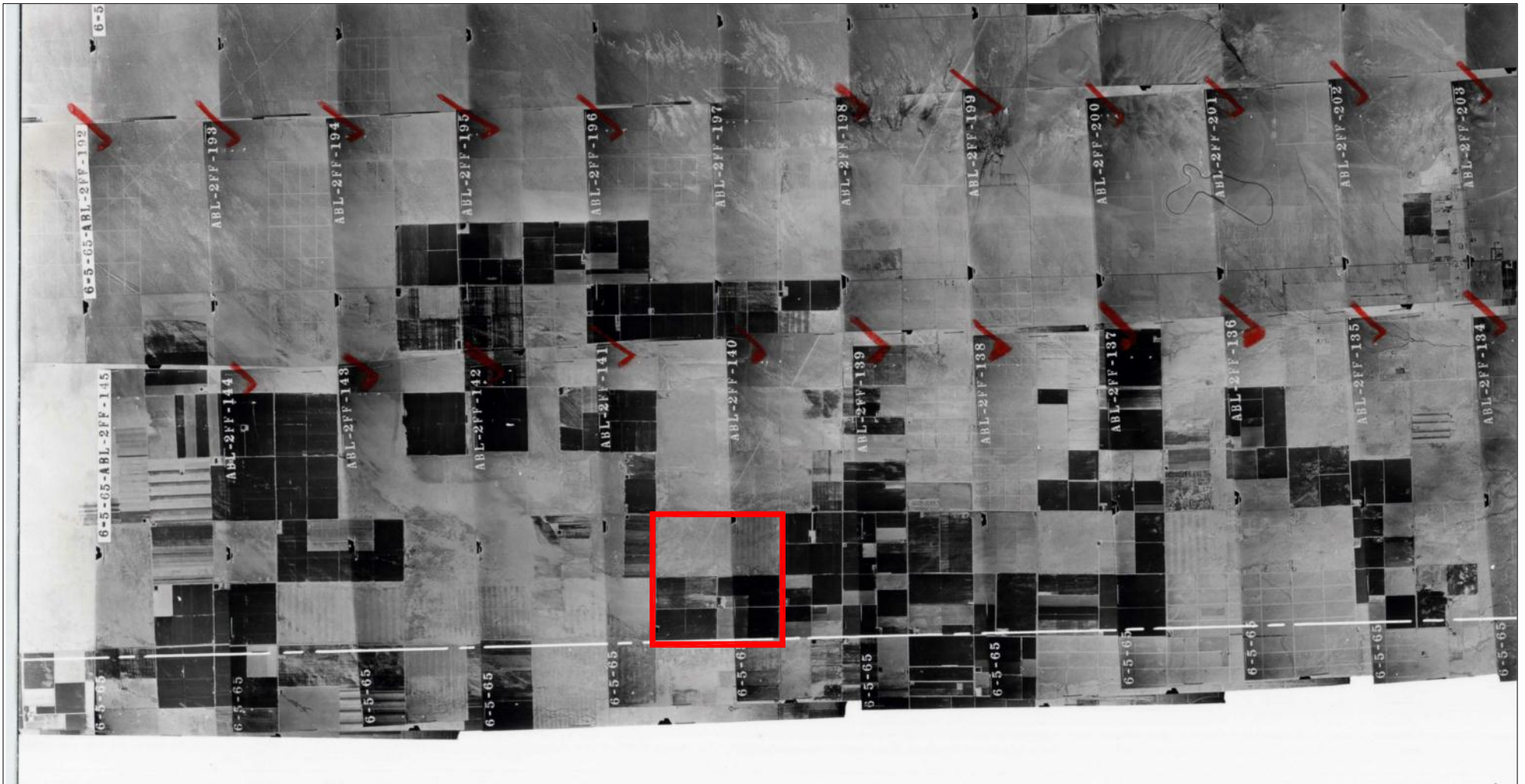


Erler & Kalinowski, Inc.


Aerial Photograph, 11 April 1974

Copa De Oro
 Kern County, CA
 January 2013
 A80023.02

Figure 9



Legend:

 Subject Property

Notes:

1. All locations are approximate.
2. Basemap source: UCSB Aerial Photo Collection (accessed 13 Feb 2012) http://collections.alexandria.ucsb.edu/ap/indexes/abl1965/abl-1965_2.jpg



0 10,000 20,000



(Approximate Scale in Feet)

Erlar & Kalinowski, Inc.

Cropped Version of Aerial Photograph from 1965

Copa De Oro
Kern County, CA
January 2013
A80023.02

Figure 10

Attachment A

Letter from AVEK to BKS, dated 28 July 2011

BOARD OF DIRECTORS

GEORGE M. LANE
Division 4
President

KEITH DYAS
Division 2
Vice President

CHARLIE O'LOUGHIN
Division 1

FRANK S. DONATO
Division 3

ANDY D. RUTLEDGE
Division 5

MARLON BARNES
Division 6

DAVID RIZZO
Division 7



A PUBLIC AGENCY

OFFICERS

DAN FLORY
General Manager

HOLLY H. HUGHES
Secretary-Treasurer

July 28, 2011

Bartkiewicz, Kronick & Shanahan
1011 22nd Street
Sacramento, CA 95816-4907

Attn: Ryan Bezzera

**Re: Public Records Act Request – Kern County Property
Gaskell Road & 110th St W-120th St W
APNs 359-032-01 and 359-032-17
("Copa de Oro" Project)**

Dear Mr. Bezzera,

In follow-up to your Public Records Request letter to AVEK dated July 12, 2011 and our conversation from today, I have included our historical untreated water deliveries for the mentioned property. The last deliveries made through our two (2) 11.6R turnout meters located on the property were in 2004. Since 1977, we have delivered 28,133 Acre-Feet of water coming from the State Water Project, Calif. Aqueduct to the site.

Please allow us another 10-15 days to collect the remainder of what documents are available as requested. This will include any contracts for water deliveries by AVEK to the property and any correspondence concerning the site's AVEK water. We have no records related to groundwater pumping on the property.

Sincerely,

Tom Barnes
Resources Manager
AVEK Water Agency

AVEK Customer Water Use Report - 1976 thru 2010
Water Deliveries (Acre-Feet) - Location of AVEK Turnouts

LOCATION: 115th St West & Gaskell Rd.

YEAR	Acre-Ft	Acre-Ft
2010	0	0
2009	0	0
2008	0	0
2007	0	0
2006	0	0
2005	0	0
2004	0	626
2003	0	867
2002	0	842
2001	0	829
2000	0	708
1999	0	635
1998	0	208
1997	0	805
1996	0	182
1995	0	447
1994	0	204
1993	0	234
1992	0	117
1991	0	0
1990	0	899

AVEK Customer Water Use Report - 1976 thru 2010
Water Deliveries (Acre-Ft) - Location of AVEK Turnouts

LOCATION: 115th St West & Gaskell Rd.

YEAR	Acre-Ft	Acre-Ft
1989	637	767
1988	641	595
1987	634	657
1986	584	276
1985	746	505
1984	806	478
1983	0	1,535
1982	0	1,757
1981	1,838	1,122
1980	1,768	1,084
1979	1,136	701
1978	646	1,010
1977	606	---
1976	---	---
TOTAL:	10,043	18,090

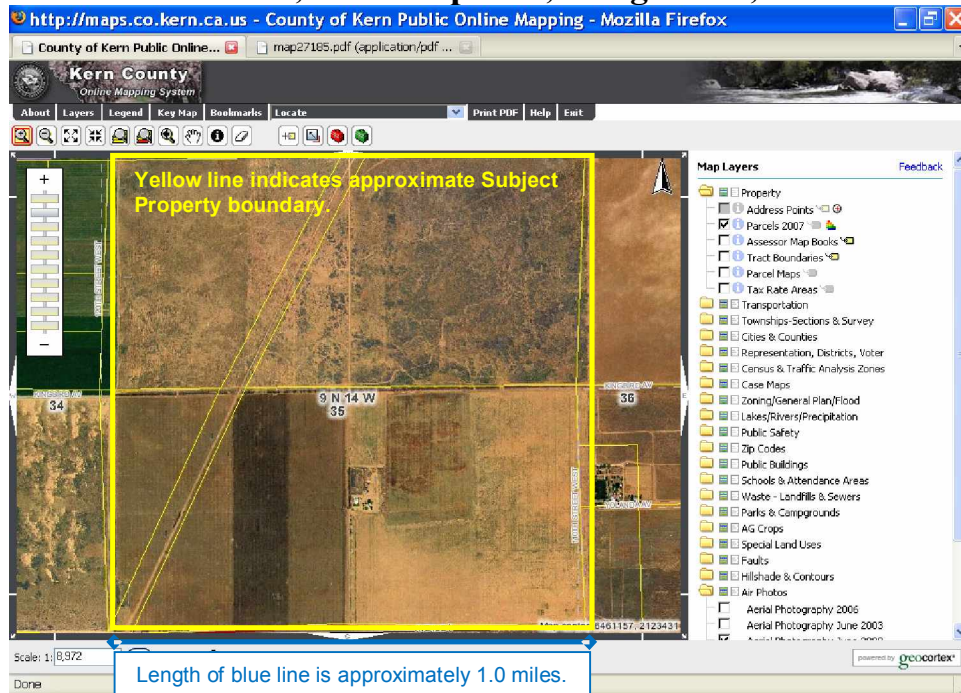


Attachment B

Aerial Photographs from the County of Kern Public Online Mapping System

Attachment B
Aerial Photographs from the County of Kern Public Online Mapping System

2000 Aerial Photo, Township 09N, Range 14W, Section 35

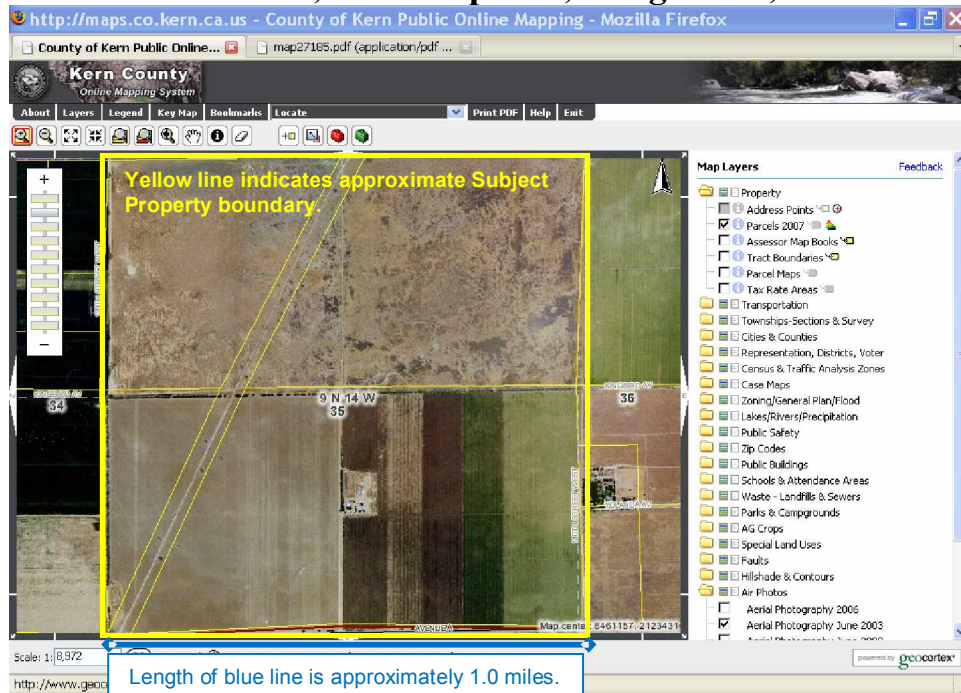


Source: Kern County Online Mapping System, accessed 23 June 2008.

Attachment B

Aerial Photographs from the County of Kern Public Online Mapping System

2003 Aerial Photo, Township 09N, Range 14W, Section 35

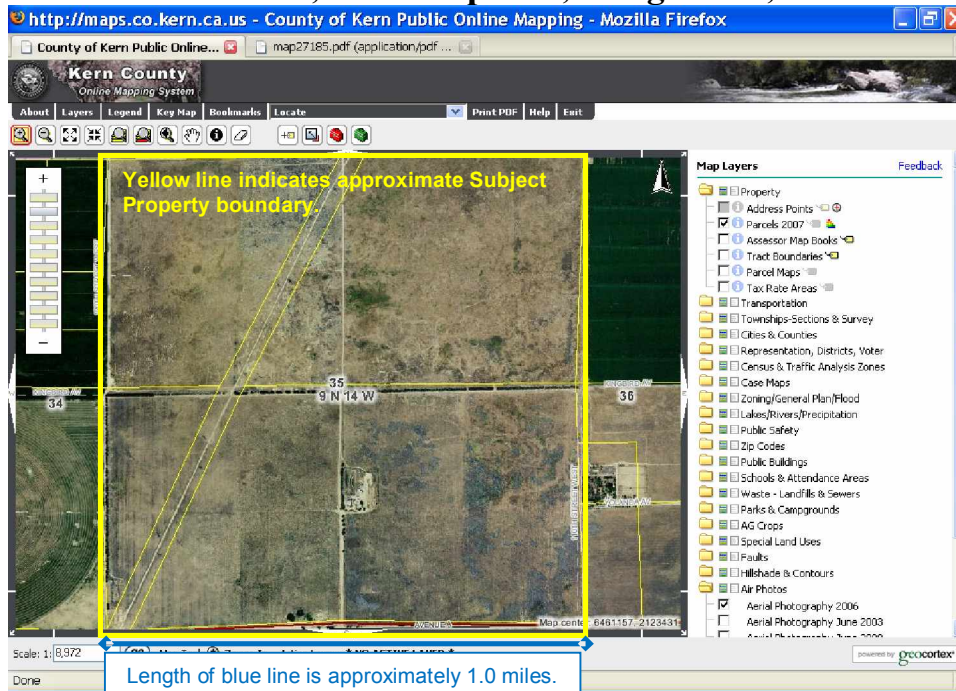


Source: Kern County Online Mapping System, accessed 23 June 2008.

Attachment B

Aerial Photographs from the County of Kern Public Online Mapping System

2006 Aerial Photo, Township 09N, Range 14W, Section 35



Source: Kern County Online Mapping System, accessed 23 June 2008.



Attachment C

*Documentation of Easements for AVEK Turnout and Pipeline Infrastructure on
the Subject Property*

RECORDING
REQUESTED BY
& MAIL TO

BOOK 5013 PAGE 2049 FD
A 18 FOR 3 0.00

MAR 14 1977 2 22 7 8 10 00

ANTELOPE VALLEY - EAST KERN
WATER AGENCY
554 W. LANCASTER BLVD.
LANCASTER, CA 93534

Recorded By KAY A. ...

TURNOUT EASEMENT

KNOW ALL MEN BY THESE PRESENTS:

That, for good and valuable consideration consisting of making agricultural water available, the undersigned, LAND RESEARCH INVESTMENT, hereinafter called "Grantor", hereby grants and transfers unto ANTELOPE VALLEY-EAST KERN WATER AGENCY, a Public Corporation, hereinafter called "Grantee", a perpetual easement and right-of-way to construct, operate, maintain, repair and if necessary replace a turnout structure and related facilities for agricultural water from the Grantee's underground water pipeline known as the "West Feeder", located on adjacent real property, which easement and right-of-way is in all that portion of the Northeast Quarter of Section 35, Township 9 North, Range 14 West, San Bernardino Meridian, in the County of Kern, State of California, according to the Official Plat thereof, included within a strip of land 30.00 feet (9.15 meters) of even width, the center line of said 30.00 foot wide strip of land being described as follows:

NO FEE

Beginning at the Northeast Corner of the Northeast Quarter of said Section 35, thence westerly along the North line of said Northeast Quarter 2360.00 feet (719.51 meters); thence southerly along a line perpendicular to said North line 30.00 feet (9.15 meters) to the True Point of Beginning of said center line; thence continuing along said perpendicular line 50.00 feet (15.24 meters) to the southerly terminus of said center line.

Said easement shall include, but not be limited to, the right and privilege of workmen, contractors, and any and all agents employed by the Grantee herein to use and occupy said easement for the purpose of constructing, operating and maintaining agricultural turnout facilities and any and all

appurtenances incidental thereto within the above described lands of the Grantor herein. Said easement shall also include the right and privilege to place and operate any and all equipment and machinery on said lands which the Grantee herein or any agent or contractor employed by said Grantee deems necessary for the construction, operation and maintenance of said agricultural turnout facilities.

Reserving to the Grantor herein, his successors and assigns, an easement for ingress and egress over and across all of the lands described above, except that which may cause damage to or restrict the proper operation of said agricultural turnout facilities.

In Witness Whereof, this instrument has been executed this

14 day of Feb, 1977.

LAND RESEARCH INVESTMENTS

By: Everett W. Hughes, Jr.
Everett W. Hughes, Jr., Partner

Certificate of Acceptance
Pursuant to Section 27281 of the Government Code

This is to certify that the interest in real property conveyed by the deed or grant dated February 14, 1977 from Good Properties Investments to the Antelope Valley-East Kern Water Agency, a political subdivision of the State of California, is hereby accepted by the undersigned officer or agent on behalf of the Board of Directors of the Antelope Valley-East Kern Water Agency pursuant to authority conferred by resolution of the said Board of Directors adopted on March 8, 1977, and the grantee consents to recordation thereof by its duly authorized officer.

Date March 10, 1977

By Wallace B. Spivack
General Manager

TO 442 C
(Partnership)



STATE OF CALIFORNIA
COUNTY OF Los Angeles } SS.

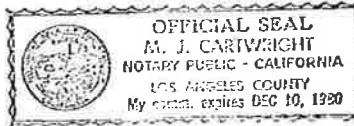
On February 14, 1977
before me, the undersigned, a Notary Public in and for said State, personally appeared Everett W. Hughes, Jr.

STAPLE HERE

_____ known to me
to be one of the partners of the partnership
that executed the within instrument, and acknowledged to me
that such partnership executed the same.

WITNESS my hand and official seal.

Signature: M. J. Cartwright
M. J. Cartwright
Name (Typed or Printed)



(This area for official notarial seal)

RECORDERS MEMO. POOR RECORDED
REPRODUCTION DUE TO QUALITY OF
PRINT OR TYPE ON ORIGINAL DOCUMENT.

RECORDING REQUESTED BY
 WINGERT, GRESING, ANELLO, CHAPIN
 Melvin M. Stuevo
 642 Smoketree Drive
 La Verne, California 91750
 496717-80
 TITLE INSURANCE AND TRUST COMPANY
 AND WHEN RECORDED MAIL TO

5511 1008
 4.00 ORS
 1.00 REEP
 07201 11716782 5.00 CASH

059829

1982 DEC 16 AM 8:20

RECORDED
 RAY A. VERCAMMEN
 KERN COUNTY RECORDER

NAME Melvin M. Stuevo
 ADDRESS 642 Smoketree Drive
 CITY & STATE La Verne, CA 91750

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MAIL TAX STATEMENTS TO
 NAME
 ADDRESS N/A
 CITY & STATE

Documentary transfer tax \$ 0.00
 Computed on full value of property conveyed, or
 Computed on full value less liens & encumbrances
 remaining thereon at time of sale.
 Signature of declarant or agent determining tax - firm name
 Unincorporated area City of

OR
 MD
 UN

Grant Deed

THIS FORM FURNISHED BY SECURITY TITLE INSURANCE COMPANY

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,
 LAND RESEARCH INVESTMENTS,

hereby GRANT(S) to Melvin M. Stuevo and Kathleen J. Stuevo (husband and wife)
 and Sidney E. Wasserman and Evelyn Wasserman (husband and wife)

the following described real property in the Rosamond Area
 county of Kern, state of California:

An easement 10' in width for installation and maintenance of underground
 water lines located in the N $\frac{1}{2}$ Sec. 35 T0N, R14W, SBBM. The center line
 of said easement as per attached exhibit "A".

Dated _____
 Everett W. Hughes, Jr.
 Partner
 Land Research Investments

TO 1944 CA (8-74)
 (Partnership)

STATE OF CALIFORNIA }
 COUNTY OF Los Angeles } SS.

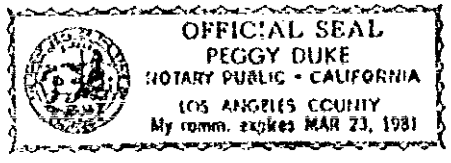
On August 16, 1977
 before me, the undersigned, a Notary Public in and for said State, personally appeared
 Everett W. Hughes, Jr.

He is known to me
 to be ONE of the partners of the partnership
 that executed the within instrument, and acknowledged to me
 that such partnership executed the same.
 WITNESS my hand and official seal.

Signature Peggy Duke
 Peggy Duke



IR STAMP



(This area for official notarial seal)

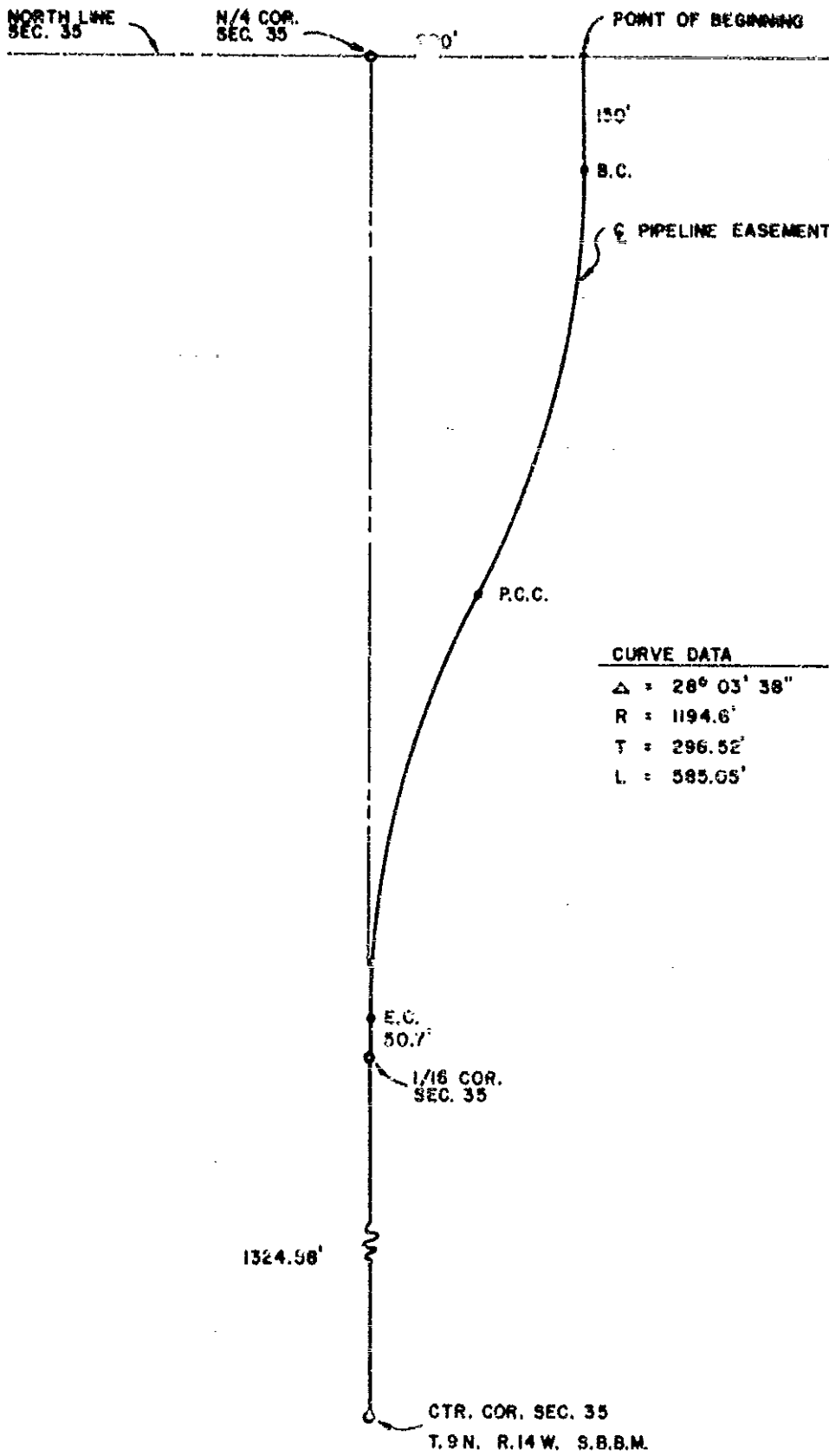


EXHIBIT 'A'