

Upper Ventura River Groundwater Agency (UVRGA)
Groundwater Extraction Estimates Technical Memorandum
DWR Grant Category B, Task 4
Prepared by UVRGA Directors Larry Rose and Bruce Kuebler
Reviewed by UVRGA Executive Director Bryan Bondy, PG, CHG
June 30, 2020

INTRODUCTION

Records for 164 wells in the Upper Ventura River Basin past and present were identified. It hasn't been known how much water is pumped from each well except for the public water supply wells. To refine the basin's water budget and to help in the analysis of a fee structure, it is necessary to estimate the amount of groundwater pumped by well owners so the fee will be proportional to usage and will exclude *de minimis* well owners. One of the most cost-effective methods to determine water usage if meters are not present is infrared (IR) aerial photography with automated irrigated landscape analysis. A recent test by the California Department of Water Resources of Eagle Aerial's system verified that the accuracy of their technology was within the same tolerance as hand measurements of irrigated areas.

This technical memorandum describes the process and results of estimating groundwater use, including an inventory of wells and meters.

ANALYTICAL APPROACH

UVRGA contracted with Eagle Aerial to have the basin flown during July 2017 with IR imagery and identify each parcel that has a well (Attachment A). The vendor provides ESRI-compatible parcel polygons indicating types of irrigated vegetation and impervious surfaces; and a corresponding Excel data file indicating the square footage of vegetation and impervious surfaces for each polygon. With the IR imagery and corresponding irrigated landscape analysis, an appropriate evapotranspiration rate was applied to each parcel. The rate was based on known historical water use for agricultural parcels as well as crop water use data gathered from the Farm Bureau and UC Cooperative Extension. This evaluation was performed by Larry Rose, who has extensive experience with irrigated agriculture and knowledge of the area. He is on the UVRGA Board of Directors representing environmental stakeholders and active in the Ojai Valley Land Conservancy.

DETAILED DESCRIPTION OF PROCESS

On February 1, 2018 an initial list of 196 wells was obtained from the County of Ventura. On inspection it became apparent that it was based on boundaries prior to Basin Boundary Modification. On February 27, 2017 UVRGA received from the County of Ventura *Active and Inactive Wells* spreadsheet including Assessor Parcel Numbers and State Well Number of 121 wells within the district on which analysis was begun. This list was replaced on March 9, 2018 with a similar list of 144 wells that included ownership and address information that then could be reconciled with the Eagle Aerial IR analysis list of 220 wells. Eagle Aerial's anomalous duplications were eliminated and calculated Irrigated Areas indicated 72 wells for further analysis. Most of the 72 wells were confirmed to be *de minimis*. The four public agencies and two mutual water companies were straightforward with accessible metered records of use. During his review of this memorandum in March 2020, the UVRGA Executive Director identified 38 additional wells that were not previously evaluated. These wells were added to the inventory and reviewed.

The infrared analysis had queried APN parcels with wells. Unfortunately, only two of the ultimate nine private pumpers wells were on parcels associated with their irrigation use. Typically, wells were on adjacent parcels within the floodplain away from their orchards. (sample in Figure 1).



Figure 1.

Larry Rose was familiar with all the orchards of the private pumpers having had supplied nursery stock to them for many decades. He then mapped each pumper’s irrigated areas. (sample in Figure 2).



Figure 2.

Orchards are primarily citrus and avocado of various ages. Citrus depending on soil moisture retention and evapotranspiration (Et) typically use 1.5 to 2 acre feet per acre per year. Avocado uses 2 to 3.5 acre feet per year. Young trees can be 10% of mature orchard use. After conferring with the University of California Cooperative Extension, an estimate of two acre feet per acre per year was used as a factor multiplied to the mapped pumper acreage.

Ground proofing and grower interviews confirmed area and irrigation use reconciled with the few metered wells. Twelve initial private pumpers were confirmed to be only nine. Site visits were also made to eliminate other borderline *de minimis* users.

Fifteen pumpers were identified whose amounts were greater than two acre feet per year, including four public agencies, two mutual water companies and nine private growers.

RESULTS

Well and Meter Inventory

101 active or presumed active *de minimis* wells were identified. An additional 4 domestic wells were identified, but are listed as non-compliant by Ventura County and are, therefore, presumed to be inactive. There are 15 pumpers initially estimated to use more than 2 acre feet per year: 4 water districts; 2 mutual water companies; and 9 private owners. Water districts and one mutual water company are metered. As of 2017, only 2 private owners had meters (Owners A and G). The well inventory is included as Attachment B.

Estimated Water Use

Estimated water use during 2017 was determined by the UVRGA Board to be the best basis for developing a fee structure for private pumpers because there were essentially no meters for private owners and the best use estimate was based on IR imagery. The Thomas Fire in December 2017 damaged many growers making it unrealistic to use any 2018 information. With the exception of Casitas Municipal Water District, the four largest public suppliers used the 2013 to 2017 five-year average as the 2017 extraction fee basis. Casitas Municipal Water District used the average of 2012, 2013, and 2017 due to abnormally low extractions during 2014-2016.

Groundwater use by entities reporting to the SWRCB for 2017 was used and adjustments made for private pumpers if a municipal supply was used to meet total use indicated by the IR imagery and crop analysis. Data for mutual water companies was obtained from the State Division of Drinking Water.

2017 estimated groundwater extractions in acre feet totaled 4,355.8 (later revised to 4,340.8) as follows: water districts 3,972.6; mutual water companies 31; and private owners 352.2 (later revised to 337.2). Metered water districts pumping was approximately 91% of the total.

Water Districts

- City of San Buenaventura 2,384 (metered)
- Ventura River Water District 858.4 (metered)
- Meiners Oaks Water District 542 (metered)
- Casitas Municipal Water District 188.2 (metered)

Mutual water companies

- MWC #1 9 (metered)
- MWC #2 22

Private owners

- A 23
- B 47
- C 90 (later revised to 75)
- D 54
- E 70
- F 14
- G 12
- H 2.2
- I 40

Stakeholder Engagement

UVRGA's Ad Hoc Funding Committee met with the 7 largest pumpers on January 7 and 8 2019 to describe plans for establishing an extraction fee, to answer questions, and to discuss interests and concerns. A February 2, 2019 letter, "Notice: Determination of Amount of Groundwater Extracted from Upper Ventura River Groundwater Basin" was mailed or given to each pumper explaining the process, specifying the estimated amount, and inviting comments and submission of data and information that could justify changing the estimate. Replies were requested by March 8. Properties were inspected, as necessary and appropriate, to verify type of crop and condition of wells. Board members on the Agency's Ad Hoc Funding Committee called or met individually with as many individual landowners as possible to discuss extraction amounts and preliminary estimates of extraction fees during GSP preparation, whether or not the landowner responded to the February 8 letter. Changes were made, if justified by field investigations, independent of a response to the February 8 letter. Revisions were also made on the basis of documented use of non-pumped water from another source.

Changes in Estimates:

- Owner A: Decreased by use of Casitas water.
- Owner C: Decreased by use of Casitas water.
- Owner D: Increased based on metered use.
- Owner I: Increased based on owner's estimate.

Subsequent to this process Owner C's estimated usage was revised from 90 to 75 acre feet, via a fee protest hearing on October 10, 2019.

Attachment A

Eagle Aerial IR Survey Results

Digital Files Provided Under Separate Cover

Attachment B

Well Inventory and Groundwater Usage Estimate Results

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
03N23W08H02S						No information available.
03N23W08H03S						No information available.
04N23W11F02S						No information available.
04N23W03D03S	Domestic	1	0100090110		<= 2	de minimus
04N23W08J01S	Agricultural	2	0110250295		<= 2	de minimus
03N23W08C01S	Domestic	3	0600270010	2	<= 2	de minimus
03N23W05A01S	Agricultural	4	0610160130		<= 2	de minimus
03N23W05B01S	Municipal	4	0610160040		<= 2	de minimus
03N23W05K02S	Domestic	5	0610190260		<= 2	de minimus
04N23W20Q01S	Domestic	6	0310114045		<= 2	de minimus
05N23W28P01S	Domestic	7	0100180360		<= 2	de minimus
03N23W05K01S	Domestic	8	0600220150		<= 2	de minimus
03N23W05L01S	Agricultural	8	0600220150		<= 2	de minimus
04N23W16A04S	Agricultural	9	0180111245		<= 2	de minimus
04N23W16A01S	Domestic	10	0180111080		188.2	Active
03N23W05H01S	Municipal	11	0610190050		22	Active
04N23W04R01S	Agricultural	12	0170160165		<= 2	de minimus
04N23W16C01S	Domestic	13	0180140280		<= 2	de minimus
03N23W08C02S	Municipal	14	0600220260		2,384	Active
03N23W05B02S		14	0600220210			Abandoned_HOLD; part of record above
03N23W05G01S		14	0600220260			Abandoned_HOLD; part of record above
03N23W05G02S		14	0600220260			Abandoned_HOLD; part of record above
03N23W05P02S	Domestic	14	0600220260			Part of record above
03N23W05P03S	Domestic	14	0600220150			Abandoned_HOLD; part of record above
03N23W05P04S	Domestic	14	0600220150			Abandoned_HOLD; part of record above
03N23W08B01S	Municipal	14	0600220260			Part of record above
03N23W08B02S	Municipal	14	0600220260			Part of record above
03N23W08B03S	Municipal	14	0600220260			Abandoned_HOLD; part of record above
03N23W08B04S		14	0600220260			Abandoned_HOLD; part of record above
03N23W08B10S	Municipal	14	0600220260			Abandoned_HOLD; part of record above
03N23W08B11S	Municipal	14	0600220260			Part of record above
03N23W08B12S	Municipal	14	0600029015			Part of record above
03N23W08B13S	Municipal	14	0600029015			Part of record above
04N23W09M03S	Domestic	15	0110250075		<= 2	de minimus

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
04N23W29L01S	Agricultural	16	0600180130	23.6	47	Active; Mapped and crop estimated developed with ground truthing.
04N23W32C02S	Agricultural	16	0600200090			Part of record above
04N23W32C01S	Domestic	16	0600200090			Part of record above; Confirmed well exists May 2020, 15 hp pump
04N23W20K03S	Domestic	17	0310093025		<= 2	de minimus
03N23W08B07S		18	0600290015			Abandoned_HOLD
03N23W08G01S		18	0600290015			Abandoned_HOLD
04N23W16F05S	Domestic	19	0320070070	5.56	14	Mapped and crop estimated developed with ground truthing.
04N23W17B01S	Agricultural	20	0110240205		<= 2	de minimus
05N23W33R02S	Agricultural	21	0100080210	70.5	23	Active; Mapped and crop estimated developed with ground truthing.
05N23W33J01S	Agricultural	21	0100080210			Part of record above
05N23W33J02S	Agricultural	21	0100080210			Part of record above
05N23W33R03S	Agricultural	21	0100080210			Part of record above
04N23W03M02S	Domestic	22	0170010060		<= 2	de minimus
04N23W20J05S	Domestic	23	0310094225			Non-Compliant
04N23W09M01S	Domestic	24	0110250085		<= 2	de minimus
04N23W10G03S	Domestic	25	0170330245		<= 2	de minimus
04N23W17H02S	Domestic	26	0110230015		<= 2	de minimus
04N23W09M02S	Agricultural	27	0110250105		<= 2	de minimus
04N23W17H01S	Domestic	28	0110220195			Non-Compliant_Abandoned
04N23W16B04S	Domestic	29	0180140160		<= 2	de minimus
04N23W03D02S	Agricultural	30	0100090060		<= 2	de minimus
03N23W08C03S	Agricultural	31	0600270195		<= 2	de minimus
04N23W17A03S	Domestic	32	0110240015		<= 2	de minimus
04N23W15D02S	Domestic	33	0330030080		<= 2	de minimus
04N23W16C09S	Agricultural	34	0180140365		<= 2	de minimus
04N23W17L01S	Domestic	35	0320010065			Non-Compliant
04N23W09P01S	Domestic	36	0180010255		<= 2	de minimus
04N23W09G01S	Domestic	37	0180010300		<= 2	de minimus
04N23W16H01S	Industrial	38	0330082015		<= 2	de minimus
04N23W29H07S	Domestic	39	0600181180		<= 2	de minimus
04N23W21E03S	Domestic	40	0310101045		<= 2	de minimus

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
05N23W33C01S	Agricultural	41	0100050010	59.5	75	Mapped and crop estimate developed with ground truthing. Volume revised Oct. 10, 2019 due to protest fee protest. Some fallow in 2017 base year. Many young tree blocks.
05N23W33B05S	Agricultural	41	0100050010			Part of record above
05N23W33G02S	Domestic	42	0100050260			Confirmed well no longer exist by Larry Rose
04N23W16A03S	Domestic	43	0180102175		<= 2	de minimus
04N23W21E02S	Agricultural	44	0320202105		<= 2	de minimus
04N23W20H03S	Domestic	45	0320201195		<= 2	de minimus
05N23W28Q01S	Domestic	46	0100180080	17	54	Confirmed well exists May 2020
04N23W29B03S	Agricultural	47	0310113325		<= 2	de minimus
04N23W29G04S	Domestic	48	0310111695			Abandoned
04N23W32J01S	Domestic	49	0610150285		<= 2	de minimus
04N23W32J06S	Agricultural	49	0610150285		<= 2	de minimus
04N23W32J08S	Domestic	49	0610150285		<= 2	de minimus
04N23W16A02S	Agricultural	50	0180200135		<= 2	de minimus
04N23W29F02S	Domestic	51	0310111225		<= 2	de minimus
04N23W08R03S	Agricultural	52	0110240115		<= 2	de minimus
04N23W10D02S	Agriculture	53	0170180360			Non-Compliant_Abandoned
04N23W20H02S		54	0310101055			Non-Compliant_Abandoned
04N23W20J01S		55	0310094085		<= 2	de minimus
04N23W15G01S	Domestic	56	0330130085		<= 2	de minimus
05N23W33R01S	Domestic	57	0100080275	0.7	<= 2	de minimus
04N23W29F01S	Domestic	58	0310111055		<= 2	de minimus
04N23W03D01S	Domestic	59	0100090030		<= 2	de minimus
04N23W17A02S	Municipal	60	0110230035		<= 2	de minimus
04N23W17G01S	Domestic	61	0110230195		<= 2	de minimus
04N23W09G02S	Domestic	62	0180010280		<= 2	de minimus
04N23W15C01S	Domestic	63	0330050130		<= 2	de minimus
04N23W15C03S	Domestic	63	0330050130		<= 2	de minimus
04N23W20H01S		64	0310094175			Non-Compliant
04N23W29B04S	Domestic	65	0310114265		<= 2	de minimus
04N23W03F01S	Domestic	66	0100102330		<= 2	de minimus
04N23W10G02S	Domestic	67	0170270130		<= 2	de minimus
04N23W16B03S	Domestic	68	0180130075		<= 2	de minimus

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
04N23W15A02S	Domestic	69	0180050120	N/A	12	Active; Water use estimate developed in consultation with owner. Lanscape irrigation only - no agriculture.
04N23W10J02S	Agricultural	69	0180050120			Part of record above
04N23W11N01S	Agricultural	69	0180050120		<= 2	de minimus; part of record above
04N23W14D01S	Agricultural	69	0180050120		<= 2	de minimus; part of record above
04N23W29C01S	Agricultural	70	0310112015		<= 2	de minimus
04N23W15E01S	Domestic	71	0330110385		<= 2	de minimus
04N23W29F03S	Domestic	72	0310111255		<= 2	de minimus
04N23W10B01S	Agricultural	73	0170210520	1.87	2.2	Active; Mapped and crop estimated developed with ground truthing.
04N23W08R02S	Domestic	74	0110240095		<= 2	de minimus
04N23W20J03S	Domestic	75	0310094115			Non-Compliant
04N23W09R01S	Agricultural	76	0180071120		<= 2	de minimus
04N23W08R01S	Agricultural	77	0110250255			
05N23W33B03S	Municipal	78	0100050220		542	Active
04N23W04J01S	Municipal	78	0110020095			Part of record above
04N23W09B02S	Domestic	78	0110030030			Non-Compliant; part of record above
04N23W09B03S	Agricultural	78	0110030030			Non-Compliant; part of record above
04N23W09B04S	Agricultural	78	0110030060			Part of record above
04N23W09B05S	Agricultural	78	0110030060			Part of record above
04N23W16B05S	Domestic	78	0180150075			Part of record above
04N23W16B06S	Domestic	78	0180150075			Non-Compliant; part of record above
05N23W33B04S	Municipal	78	0100050220			Part of record above
05N23W33B01S	Domestic	78	0100050220			Confirmed well no longer exist by Larry Rose; part of record above
05N23W33B02S	Domestic	78	0100050220			Confirmed well no longer exist by Larry Rose; part of record above
04N23W17G02S	Domestic	79	0010220295		<= 2	de minimus
05N23W33G01S	Agricultural	80	0100050072	5.72	<= 2	de minimus
05N23W33G02S	Domestic	80	0100050260		<= 2	de minimus
04N23W16C02S	Domestic	81	0180130235		<= 2	de minimus
04N23W03M01S	Domestic	82	0170040150		<= 2	de minimus
04N23W03Q02S	Domestic	83	0170090025		<= 2	de minimus
04N23W10H01S	Domestic	84	0170290020		<= 2	de minimus

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
04N23W04G01S		85	0110010110			Abandoned_HOLD
04N23W04H01S	Domestic	85	0110020135		<= 2	de minimus
04N23W04K01S	Agricultural	85	0110270105			Confirmed well no longer exist by Larry Rose
04N23W10G01S	Domestic	85	0170330305		<= 2	de minimus
04N23W16D02S	Agricultural	85	0110070060			Abandoned_HOLD
04N23W32B02S	Domestic	85	0610150260			Confirmed well no longer exist by Larry Rose
04N23W32B03S	Agricultural	85	0610150260			Confirmed well no longer exist by Larry Rose
04N23W32K03S	Domestic	85	0610160365			
04N23W32Q01S	Agricultural	85	0610160365		<= 2	de minimus
04N23W11L01S		86	0240010110			Confirmed well no longer exist by Larry Rose
04N23W09M04S	Domestic	87	0110250065		<= 2	de minimus
04N23W17A01S	Domestic	88	0110240265		<= 2	de minimus
04N23W16C06S	Domestic	89	0180140310		<= 2	de minimus
04N23W29F04S	Agricultural	90	0600180160		<= 2	de minimus
04N23W20Q07S	Domestic	91	0310112265		<= 2	de minimus
03N23W05H02S	Domestic	92	0610181330		<= 2	de minimus
04N23W32J02S	Domestic	93	0350120255		<= 2	de minimus
04N23W04Q01S	Agricultural	94	0110010110	272	70	Active; Mapped and crop estimated developed with ground truthing.
04N23W09B01S	Agricultural	94	0110070060			Part of record above
04N23W16C05S	Domestic	94	0110070060			Part of record above
05N23W33G03S	Agricultural	94	0100050280			Part of record above
04N23W15C02S	Domestic	95	0330050120		<= 2	de minimus
04N23W20R01S	Domestic	96	0310101135		<= 2	de minimus
04N23W20J04S	Domestic	97	0310094375		<= 2	de minimus
04N23W29B01S	Domestic	98	0310113425		<= 2	de minimus
04N23W15F01S	Domestic	99	0330050590		<= 2	de minimus
04N23W29G03S	Domestic	100	0310111735			Abandoned
04N23W29B02S	Domestic	101	0310112305		<= 2	de minimus
04N23W29G01S	Domestic	102	0310111685		<= 2	de minimus
04N23W17G03S	Domestic	103	0110230235		<= 2	de minimus
04N23W11F01S	Domestic	104	0190180030		<= 2	de minimus
04N23W20K01S	Domestic	105	0310200185		<= 2	de minimus
04N23W32F01S	Agricultural	106	0600200070	9.25	40	Active; Mapped and crop estimated developed with ground truthing.
04N23W32C03S	Agricultural	106	0600200070			Part of record above
04N23W32K01S	Agricultural	106	0600200070			Part of record above
04N23W32F03S	Agricultural	106	0600200070			Part of record above

Attachment B
Well Inventory and Groundwater Usage Estimate Results

State Well Number	Well Type Per Ventura County Records	Owner	APN	Irrigated Acres (Where Known)	2017 Groundwater Use Estimate (AF)	Comments
04N23W09G03S	Domestic	107	0180010290		<= 2	de minimus
04N23W16B02S		108	0180130260		<= 2	de minimus
04N23W15A03S	Domestic	109	0330070050		<= 2	de minimus
04N23W16C03S	Domestic	110	0180130185		<= 2	de minimus
04N23W11D02S	Agriculture	111	0190082020		<= 2	de minimus
04N23W32G01S	Domestic	112	0610150015		<= 2	de minimus
04N23W16B07S	Municipal	113			9	Active
04N23W15D03S	Municipal	114	0180170380		<= 2	de minimus
05N23W33Q01S	Domestic	115	0110270020			Confirmed well no longer exist by Larry Rose
04N23W15B01S	Municipal	116	0330060415		858.4	Active
04N23W16F04S	Municipal	116	0110070035			Part of record above
04N23W16C11S	Municipal	117	0110070035			Part of record above
04N23W16C07S	Municipal	117	0110070035			Part of record above
04N23W16C08S	Municipal	117	0110070035			Part of record above
04N23W16C10S	Municipal	117	0110070035			Part of record above
04N23W15A01S	Domestic	118	0330070125		<= 2	de minimus
04N23W20A01S	Domestic	119	0320202075		<= 2	de minimus
04N23W17B02S	Agricultural	120	0110230055		<= 2	de minimus
04N23W17J03S	Domestic	121	0320042035		<= 2	de minimus