

FINAL

**INDIAN WELLS VALLEY
GROUNDWATER AUTHORITY**

A large, faint, light blue graphic of water ripples is centered on the page, serving as a background for the main title.

**GROUNDWATER PUMPING
VERIFICATION REPORT**

AUGUST 2020

**PREPARED BY:
STETSON ENGINEERS INC.**



(Page left intentionally blank)

FINAL

**INDIAN WELLS VALLEY GROUNDWATER AUTHORITY
PUMPING VERIFICATION REPORT**

AUGUST 17, 2020

Introduction

The purpose of this Pumping Verification Report (Report) is to verify and certify, to the extent possible, groundwater production from all groundwater pumpers that do not claim to be a “De minimis extractor” per California Water Code § 10721(e). The results of this Report will be used in making determinations related to groundwater extractions and access rights to the Transient Pool.

To be eligible for the Transient Pool, a groundwater pumper must have completed and submitted a complete and timely response to the Authority’s *Notice of Groundwater Extraction Reporting for Pumping Verification: Questionnaire 1* (Questionnaire). As such, this Report does not discuss those pumpers that failed to provide timely responses to the Questionnaire. Additionally, in accordance with California water law and the Sustainable Groundwater Management Act (SGMA), the period between January 2010 and December 2014 has been considered by the Indian Wells Valley Groundwater Authority (Authority) to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. A pumper must have **continuously** pumped each year during the Base Period of January 2010 and December 2014 to be eligible for the Transient Pool.

A general discussion of the pumping verification processes, analysis of the production data **as provided in the responses to the Questionnaire**, methods of verification, and findings on each pumper’s pumping is presented herein.

The appendices to this Report provide detailed verification discussions for each pumper who provided sufficient information for the verification processes. Table 1 presents the groundwater pumpers who provided responses to the Questionnaire and the corresponding appendix in which a discussion of that pumper's provided information is discussed and analyzed in detail. Several pumpers responded to the Questionnaire but provided limited or no information on annual groundwater production, and therefore did not provide sufficient information for pumping to be verified. Information from these pumpers as provided in response to the Questionnaire is discussed in Appendix O.

Facility History

Facility history refers to the land size or service area of the pumpers, the purposes of groundwater use, the starting date of groundwater extraction, and the number and construction of wells owned by the pumper. The facility history information for each pumper that provided such data, including current irrigated acreage/service area size, is provided in Table 2. In addition, general information on well construction, water levels, well pumps, and service status for each pumper is provided in Table 3.

Groundwater Production

In general, groundwater extractions based on metered records are considered as the most accurate type of groundwater production data. However, groundwater production based on metered records are not always available. As such, the pumpers may have adopted several alternative methodologies to provide their historical groundwater production. Table 4 summarizes the annual groundwater production and the corresponding production estimation methodology reported in the responses to the Questionnaire during the Base Period (between January 2010 and December 2014) for each pumper.

Data for Pumping Verification

Data that can be generally utilized in the verification of groundwater production from the Basin includes historical land use and crop type information, power consumption data, water truck load counting, flow meter readings, production compiled by the Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) shown on page 5 below in the table entitled “IWV Groundwater Production Estimates, 1975-Present”, and recently initiated monthly groundwater production reported to the Authority. In addition, there are several empirical pump equations that can be used to determine the pump flow rate and subsequent groundwater production based on actual power consumption records, or vice versa. However, these empirical equations generally require information that may not have been provided in the pumpers’ responses to the Questionnaire, such as well construction, pump power and efficiency, friction, and/or hydraulic head. Table 5 summarizes the type of data provided by each pumper, and whether groundwater production records were available for each pumper from the Cooperative Group and the Authority for the period between 1937 and 2019.

Basis of Verification

Groundwater extractions reported by the pumpers were verified using several approaches. These approaches include:

- Specific engineering methods using data provided by the pumpers, such as power consumption records, pump efficiency tests, population and/or meters served, irrigated acreage, and crop type; and
- Groundwater production records from the Cooperative Group and the Authority.

Table 6 presents the groundwater production verification results during the Base Period and during 2019. It should be noted that significant discrepancies between the groundwater production verification results in Table 6 do not necessarily mean that the

groundwater production reported in the responses to the Questionnaire is incorrect. Some of the methods for groundwater production estimation are generally subject to various uncertainties, and/or the data sources used for the verification processes may be unreliable.

Review of Methods of Verification and Conclusions

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. The lowest annual groundwater production for continuous pumping during the Base Period for each respective pumper, as reported in the responses to the Questionnaire, as well as the basis for estimating groundwater production, are shown in Table 7.

IWV Ground Water Production Estimates 1975 - Present

Year	Meadow-brook Farms (e)	Simmons Ranch (f)	China Lake Acres	City of R/C	SVM	IWVWD	Inyokern CSD	NAWS (c)	Neal Ranch	Private Wells	Quist Farms	Orchards (d)	R/C Heights	S. Leroy (a/b)	Annual Totals
1975	1516		400		2781	2983	300	5000	2000				1000		15980
1976	1494		400		2911	3099	300	5000	2000				1000	1600	17804
1977	2702		400		3315	3063	300	5000	2000				1000	1600	19380
1978	3216		400		3081	3357	300	5000	2000				1000	1600	19954
1979	3257		400		3081	3402	300	5154	2000	2100			1000	1600	22294
1980	7515		400		2887	3319	300	4995	2041	2100			1000	1600	26157
1981	10036		400		3065	4223	300	4804	2002	2100			1000	1600	29530
1982	10324		400		2887	3963	300	4450	1478	2100			1000	1600	28502
1983	10087		400		2476	4316	300	4402	1752	2400			1000	1600	28733
1984	10312		400		2307	4940	300	4694	1568	2400			1000	1600	29521
1985	10100		400		2397	4981	300	4002	2450	2500			1000	1600	29730
1986	5389		400		2557	5901	300	4430	2353	2500			1000	1600	26430
1987	4141		Purchased		2560	7426	300	4422	1447	2500			Purchased	Ranch	22796
1988	5255		by		2560	7889	173	3980	1195	2500			by	Closed	23552
1989	7064		IWVWD		2320	8725	175	4205	Purchased	2650		500	IWVWD		25639
1990	6187				2505	8600	170	3667	by	2650		525			24304
1991	6737				2406	7700	150	3364	IWVWD	2650		525			23532
1992	7104				2528	7650	141	3351		2650		550			23974
1993	7701				2607	7800	150	3411		2650		575			24894
1994	7504				2607	8300	146	3684		2650		575			25466
1995	7427				2710	8100	125	3848		2650		595			25455
1996	7807				2620	8504	134	3367		2650		600			25682
1997	7800				2522	8534	139	2983		2650		625			25253
1998	7800				2527	7719	102	3018		2700		640			24506
1999	7800				2537	8242	104	2541		2700		690			24614
2000	7800				2701	8148	111	2690		2800		725			24975
2001	8150				2732	8392	97	2840		2800		750			25761
2002	8460			445	2564	8865	115.6	3138		2800	750	750			27887.6
2003	9420			616	2561	9098	126	3325		2800	750	775			29471
2004	9370			413	2470	8992	118.4	2331		2800	750	800		950	28994.4
2005	9580			366	2504	8545	135	2288		2800	750	825		1025	28818
2006	9460			385	2591.2	8864.4	135	2440		2800	750	840		1050	29315.6
2007	9270			420	2530.4	9198.5	90.7	2533		2800	750	840		1000	29432.6
2008	8957			392	2520.7	8564.8	118	2119		2800	750	900		1200	28321.5
2009	9536			400	2534.5	8398.2	118	1883		2800	750	925		1125	28469.7
2010	9437			339	2586.6	7570	118	1710		2800	750	925		1050	27285.6
2011	9827			370	2457.5	7364.25	118	1734		2800	750	925		1050	27395.75
2012	9876			348	2743	7633.45	117.927	1710		2800	750	1062		800	27840.377
2013	9354	918		423	2706	7531.69	117.68	1538		1100	750	2846			27284.37
2014	7524	1087		392	2679	7318.7	108	1618		1100	750	4087			26663.7
2015	6517	1003		427	2518	7050	90.532	1442		1100	750	4387			25284.532
2016	6387	918		373	2377	6411.8	102.335	1595		1100	750	4300			24314.135
2017					2629	6506.6		1450							
Total	315200	3926	4800	6109	113158.9	297188.39	7546.174	141156	26286	93250	11250	33062	12000	26850	1081196.9
Ave.	7505	982	400	407	2632	6911	180	3283	1878	2454	750	1181	1000	1343	25743

(a) Spike Leroy ranch started back up in 2004 with approx. 150 acres of alfalfa x 7
 (b) 2012 number is an estimate/converted to pistachio 2013
 (c) Navy began aggressive water conservation program in 2007

(d) 2013 number based on March 4, 2014 letter to BOS.
 2014/2015/2016 data includes 3,700 and 4,000 AF from Mojave Pistachio
 "based off the UC Davis Pistachio Cost Study plus dust mitigation."

(e) 2005 Brown Road Fanning changed to Meadowbrook Farms
 (f) Simmons Alfalfa Ranch added 2014

TABLES

Table 1**List of Pumpers with Responses to the Questionnaire**

No.	Pumper Name	Individual Detailed Discussions
1	Arthur Hickle	Appendix A
2	China Lake Acres Mutual Water Company	Appendix B
3	CHLT Water Group	Appendix C
4	City of Ridgecrest	Appendix D
5	Indian Wells Valley Water District	Appendix E
6	Jumper St. Water Co-op	Appendix F
7	Kern County Public Works Department	Appendix G
8	Meadowbrook	Appendix H
9	Patricia Davis (Amberglow)	Appendix I
10	Quist Farms	Appendix J
11	Searles Valley Minerals	Appendix K
12	Sierra Shadows Ranch (John T. Conaway)	Appendix L
13	Simmons Farms	Appendix M
14	Terese Farms - Hovaten	Appendix N
15	Carey Marvin	Appendix O
16	Crestview Water	Appendix O
17	Dixie Water Company/Michael R. Haynes	Appendix O
18	Donna Sue Water Co	Appendix O
19	Hammer Water Cooperative	Appendix O
20	Heritage Village Master Community	Appendix O
21	Inyokern Community Services District	Appendix O
22	Larry Schiller	Appendix O
23	Life Water Co-op	Appendix O
24	Mirage St. Water Co-op	Appendix O
25	Northeast Leliter Water Co-op	Appendix O
26	Owens Peak Water Cooperative	Appendix O
27	Pinon Water Cooperative	Appendix O
28	Southern California Edison	Appendix O
29	TNT Western Home, Inc	Appendix O
30	Welfl's Mini Mart Inc	Appendix O
31	West Valley Mutual Water Co-op	Appendix O
32	Yellow Bird Water Co-op	Appendix O

**Table 2
Facility Information and History of Groundwater Pumpers**

No.	Pumper Name	Current Irrigated Acreage/Service Area Size (acres)	Groundwater Extraction Starting Year	Number of Wells	Groundwater Uses	Most Significant Groundwater Use
1	Arthur Hickle	20.5	1984	2	Domestic, Landscaping, and Agricultural	Agricultural
2	China Lake Acres Mutual Water Company	60	1979	2	Potable Water Customer Service	
3	CHLT Water Group	20	1998	2	Domestic and Landscaping	
4	City of Ridgecrest	36	1970's/1980's	5	Landscaping	Landscaping
5	Indian Wells Valley Water District	24,320	1943	11	Potable Water Customer Service	
6	Jumper St. Water Co-op	17.5	1988	1	Potable Water for Household and Landscaping	
7	Kern County Public Works Department	505	1968	2	Solid Waste Operations	
8	Meadowbrook Dairy	1,277	1975	14	Domestic and Agricultural	Agricultural
9	Patricia Davis (Amberglow)	12	1968	3	Household and Agricultural	Agricultural
10	Quist Farms	150	1973	7	Domestic, Livestock, and Agricultural	Agricultural
11	Searles Valley Minerals	3,741	1930	5	Industrial and Municipal	Industrial
12	Sierra Shadows Ranch (John T. Conaway)	200	1972	7	Agricultural	Agricultural
13	Simmons Farms	133	2010	3	Domestic, Landscaping, and Agricultural	Agricultural
14	Terese Farms - Hovaten	80	1984	5	Domestic and Agricultural	Agricultural

**Table 3
Well Construction Information**

Pumper	Well Name / Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pump Depth (ft, bgs)	Pump Type	Motor HP	Manufacturer's Pump Rating (gpm)	Pump Test (gpm)	Date of Pump Test	Service Status
Arthur Hickle	1	1984	370	N/A	272	372	Submersible	10	60	N/A	N/A	Active
	2	2012	450	N/A	270	370	Submersible	10	60	N/A	N/A	Active
China Lake Acres Mutual Water Company	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
CHLT Water Group	1	1987	250	N/A	185	220	N/A	N/A	N/A	N/A	N/A	Active
	2	1987	250	N/A	186	220	N/A	N/A	N/A	N/A	N/A	Active
City of Ridgecrest	1	N/A	N/A	N/A	210	273	N/A	N/A	N/A	N/A	N/A	Active
	2	N/A	N/A	N/A	150	315	N/A	N/A	N/A	N/A	N/A	Active
	3	N/A	N/A	N/A	147	N/A	N/A	N/A	N/A	N/A	N/A	Active
	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Indian Wells Valley Water District	Well 9A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 34	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pending	
Jumper Street Water Co-Op	1	1987	250	N/A	185	220	N/A	5	N/A	N/A	N/A	Active

**Table 3
Well Construction Information**

Pumper	Well Name / Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pump Depth (ft, bgs)	Pump Type	Motor HP	Manufacturer's Pump Rating (gpm)	Pump Test (gpm)	Date of Pump Test	Service Status
Kern County Public Works Department	1	1968	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	2	1983	606	585	340	550	Submersible	50	300	285	4/5/2005	Active
Meadowbrook Dairy	Well 1 (North)	1979	N/A	N/A	247.4	271.6	N/A	200	N/A	N/A	2/10/2015	Active
	Well 2 (Big Horn)	2008	N/A	N/A	262	283	N/A	400	N/A	N/A	3/8/2016	Active
	Well 3 (New)	2006	N/A	N/A	215.6	251.1	N/A	200	N/A	N/A	4/4/2017	Active
	Well 4	1981	N/A	N/A	188.9	227.8	N/A	150	N/A	N/A	4/4/2017	Active
	Well 4R	2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 5	1976	N/A	N/A	160.2	190.3	N/A	150	N/A	N/A	4/4/2017	Active
	Well 6	1980	N/A	N/A	147.5	178.1	N/A	150	N/A	N/A	4/4/2017	Active
	Well 7	1980	N/A	N/A	130	151.3	N/A	150	N/A	N/A	3/8/2016	Active
	Well 8	1979	N/A	N/A	164.5	179.9	N/A	150	N/A	N/A	4/4/2017	Active
	Coyote Trails Well	1980	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	HQ Well	2014	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Old Well 2	1979	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	Old Well 3	1977	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Old HQ Well	1970	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive	
Patricia Davis (Amberglow)	1	1987	350	N/A	242	N/A	N/A	N/A	N/A	N/A	N/A	Active
	2	2016	462	N/A	280	N/A	N/A	N/A	N/A	N/A	N/A	Active
	3	1968	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

**Table 3
Well Construction Information**

Pumper	Well Name / Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pump Depth (ft, bgs)	Pump Type	Motor HP	Manufacturer's Pump Rating (gpm)	Pump Test (gpm)	Date of Pump Test	Service Status
Quist Farms	East Well	1991	405	400	226	294	Submersible	10	89	250	1991/Apr	Active
	Center Well1	1974	404	399	262	320	Submersible	5	37	N/A	N/A	Active
	West Well	1991	405	400	232	273	Submersible	10	85	300	1991/May	Active
	Well B2	1994	450	450	263	315	Submersible	30	267	N/A	N/A	Active
	Well C	1994	457	455	240	315	Submersible	30	285	N/A	N/A	Active
	Well D	2015	500	500	271	315	Submersible	30	285	300	2015/Mar	Active
	Well E3	1995	455	455	272	315	Submersible	30	285	N/A	N/A	Active
Searles Valley Minerals	IW30	1951	387	N/A	180	183.75	N/A	100	N/A	N/A	N/A	Active
	IW35	1989	850	850	233	N/A	N/A	N/A	N/A	1500 gpm	1989/May	Active
	IW36	1990	1145	982	249	N/A	N/A	N/A	N/A	2000 gpm	1990/Aug	Active
	WE2	1940	375	278	116	131	N/A	N/A	N/A	N/A	N/A	Active
	WE4	1965	866	555	214	231	N/A	N/A	N/A	N/A	N/A	Active
	Well 22	1912	N/A	N/A	175	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	Well 23	1942	300	300	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	Well 34 (Pribus)	1953	402	370	153	193.5	N/A	100	N/A	N/A	N/A	Inactive
	WE 1	1931	185	N/A	114	119	N/A	N/A	N/A	125 gpm	1979/Mar	Inactive
	Windy Acres Well	1930	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	WE3	1946	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	4A1	1959	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
5B1	1959	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive	

**Table 3
Well Construction Information**

Pumper	Well Name / Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pump Depth (ft, bgs)	Pump Type	Motor HP	Manufacturer's Pump Rating (gpm)	Pump Test (gpm)	Date of Pump Test	Service Status
Sierra Shadows Ranch (John T. Conaway)	Well 1	N/A	N/A	N/A	N/A	N/A	N/A	200	N/A	N/A	N/A	Active
	Well 2	N/A	N/A	N/A	N/A	N/A	N/A	50	N/A	N/A	N/A	Active
	Well 3	N/A	N/A	N/A	N/A	N/A	N/A	15	N/A	N/A	N/A	Active
	Well 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 8	1960's	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Simmons Farms	Domestic Well	Early 1960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Small Ag Well	Early 1960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
	Large Ag Well	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Terese Farms	North	1982	500	N/A	390	450	N/A	N/A	N/A	N/A	N/A	Active
	East	1998	600	N/A	420	500	N/A	N/A	N/A	N/A	N/A	Active
	South	2015	622	N/A	431	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Bow	2009	401	N/A	229	N/A	N/A	N/A	N/A	N/A	N/A	Active
	Well 5*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active

Notes:

* Information for 4 of the 5 wells owned by Terese Farms was provided. The remaining well was not given a well name, and is referred to in this Report as "Well 5."

- ft = feet
- bgs = Below ground surface
- WL = Water level
- gpm = Gallons per minute
- HP = Horsepower

Table 4
Reported Annual Groundwater Production Between 2010 and 2014

Pumper	Year	Reported Annual Production (acre-feet)	Average Monthly Production (acre-feet)	Basis of Reported Production
Arthur Hickle	2010	20.43	1.70	Power consumption records
	2011	20.47	1.71	Power consumption records
	2012	23.80	1.98	Power consumption records
	2013	43.82	3.65	Power consumption records
	2014	52.79	4.40	Power consumption records
China Lake Acres Mutual Water Company	2010	37.51	3.13	Meter (average annual production)
	2011	37.51	3.13	Meter (average annual production)
	2012	37.51	3.13	Meter (average annual production)
	2013	37.51	3.13	Meter (average annual production)
	2014	37.51	3.13	Meter (average annual production)
CHLT Water Group	2010	N/A	N/A	N/A
	2011	N/A	N/A	N/A
	2012	N/A	N/A	N/A
	2013	10.41	0.87	Meter (average annual production)
	2014	10.41	0.87	Meter (average annual production)
City of Ridgecrest	2010	339.00	28.25	Cooperative Group records
	2011	370.00	30.83	Cooperative Group records
	2012	348.00	29.00	Cooperative Group records
	2013	423.00	35.25	Cooperative Group records
	2014	392.00	32.67	Cooperative Group records
Indian Wells Valley Water District	2010	7,570.00	630.83	Meter
	2011	7,364.30	613.69	Meter
	2012	7,633.50	636.13	Meter
	2013	7,531.70	627.64	Meter
	2014	7,318.70	609.89	Meter
Jumper Street Water Cooperative	2010	6.24	0.52	Meter (average annual production)
	2011	6.24	0.52	Meter (average annual production)
	2012	6.24	0.52	Meter (average annual production)
	2013	6.24	0.52	Meter (average annual production)
	2014	6.24	0.52	Meter (average annual production)

Table 4
Reported Annual Groundwater Production Between 2010 and 2014

Pumper	Year	Reported Annual Production (acre-feet)	Average Monthly Production (acre-feet)	Basis of Reported Production
Kern County Public Works Department	2010	20.00	1.67	Amount of water-truck loads
	2011	20.00	1.67	Amount of water-truck loads
	2012	20.00	1.67	Amount of water-truck loads
	2013	20.00	1.67	Amount of water-truck loads
	2014	20.00	1.67	Amount of water-truck loads
Meadowbrook Dairy	2010	6,880.00	573.33	Power consumption and pump efficiency test
	2011	6,840.00	570.00	Power consumption and pump efficiency test
	2012	7,660.00	638.33	Power consumption and pump efficiency test
	2013	8,070.00	672.50	Power consumption and pump efficiency test
	2014	8,920.00	743.33	Power consumption and pump efficiency test
Patricia Davis (Amberglow)	2010	75.09	6.26	Tree number, irrigation time, and irrigation flow rate
	2011	75.09	6.26	Tree number, irrigation time, and irrigation flow rate
	2012	67.58	5.63	Tree number, irrigation time, and irrigation flow rate
	2013	67.58	5.63	Tree number, irrigation time, and irrigation flow rate
	2014	67.58	5.63	Tree number, irrigation time, and irrigation flow rate
Quist Farms	2010	443.80	36.98	Power consumption
	2011	410.90	34.24	Power consumption
	2012	426.00	35.50	Power consumption
	2013	429.30	35.78	Power consumption
	2014	496.40	41.37	Power consumption
Searles Valley Minerals	2010	2,586.60	215.55	Cooperative Group records
	2011	2,457.50	204.79	Cooperative Group records
	2012	2,743.00	228.58	Cooperative Group records
	2013	2,706.00	225.50	Cooperative Group records
	2014	2,679.00	223.25	Cooperative Group records
Sierra Shadows Ranch (John T. Conaway)	2010	241.68	20.14	Number of trees and drip emitters
	2011	241.68	20.14	Number of trees and drip emitters
	2012	241.68	20.14	Number of trees and drip emitters
	2013	288.00	24.00	Number of trees and drip emitters
	2014	299.14	24.93	Number of trees and drip emitters

Table 4
Reported Annual Groundwater Production Between 2010 and 2014

Pumper	Year	Reported Annual Production (acre-feet)	Average Monthly Production (acre-feet)	Basis of Reported Production
Simmons Farms	2010	56.00	4.67	N/A
	2011	58.00	4.83	N/A
	2012	918.00	76.50	Meter
	2013	918.00	76.50	Meter
	2014	1,087.00	90.58	Meter
Terese Farms	2010	260.00	21.67	Irrigated acreage, estimated water requirement
	2011	269.00	22.42	Irrigated acreage, estimated water requirement
	2012	293.00	24.42	Irrigated acreage, estimated water requirement
	2013	305.00	25.42	Irrigated acreage, estimated water requirement
	2014	317.00	26.42	Irrigated acreage, estimated water requirement

**Table 5
Available Data For Groundwater Production Verification**

Pumper	Data from Questionnaire Responses		Other Data Sources for Reported Groundwater Production	
	Data Period	Data Type	Compiled by the Cooperative Group	Reported to the Authority
Arthur Hickle	1937 to 1984	N/A	N/A	N/A
	1985 to 2009	Land Use	N/A	N/A
	2010 to 2019	Power Consumption	N/A	Monthly Production after September 2018
China Lake Acres Mutual Water Company	1937 to 1978	N/A	N/A	N/A
	1979 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
CHLT Water Group	1937 to 2012	N/A	N/A	N/A
	1979 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
City of Ridgecrest	1937 to 2001	N/A	N/A	N/A
	2002 to 2016	Cooperative Group Report	Annual Production	N/A
	2017 to 2019	N/A	N/A	Monthly Production after September 2018
Indian Wells Valley Water District	1937 to 1942	N/A	N/A	N/A
	1943 to 1973	Population	Annual Production	N/A
	1974 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
Jumper Street Water Cooperative	1937 to 1987	N/A	N/A	N/A
	1988 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
Kern County Public Works Department	1937 to 1982	N/A	N/A	N/A
	1983 to 2015	Water Truck Loads	N/A	N/A
	2016 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
Meadowbrook Dairy	1937 to 1974	N/A	N/A	N/A
	1975 to 2017	Power Consumption and Pump Test	Annual Production	N/A
	2018 to 2019	Flowmeter Reading	N/A	Monthly Production after September 2018
Patricia Davis (Amberglow)	1937 to 1983	N/A	N/A	N/A
	1984 to 2018	Land Use	N/A	N/A
	2019	Flowmeter Reading	N/A	Monthly Production after September 2018
Quist Farms	1937 to 1974	N/A	N/A	N/A
	1975 to 2008	Land Use	Annual Production (2002 to 2016)	N/A
	2009 to 2019	Power Consumption		Monthly Production after September 2018

**Table 5
Available Data For Groundwater Production Verification**

Pumper	Data from Questionnaire Responses		Other Data Sources for Reported Groundwater Production	
	Data Period	Data Type	Compiled by the Cooperative Group	Reported to the Authority
Searles Valley Minerals	1937 to 1974	Various Production Reports	N/A	N/A
	1975 to 2016	Cooperative Group Report	Annual Production (1975 to 2016)	N/A
	2017 to 2019	Internal Water Production Records	N/A	Monthly Production after September 2018
Sierra Shadows Ranch (John T. Conaway)	1937 to 1972	N/A	N/A	N/A
	1972 to 2019	Land Use	N/A	Monthly Production after September 2018
Simmons Farms	1937 to 2011	N/A	N/A	N/A
	2012 to 2019	Flowmeter Reading	Annual Production (2013 to 2016)	Monthly Production after September 2018
Terese Farms	1937 to 2008	N/A	N/A	N/A
	2009 to 2018	Land Use and Power Consumption	N/A	Monthly Production after September 2018
	2019	Land Use	N/A	Monthly Production

Table 6
Verification of Annual Groundwater Production Between 2010 and 2014
(units: Acre-Feet)

Pumper	Year	Questionnaire Groundwater Production	Verification Process			Remarks ²
			Reproduced Questionnaire Production ¹	Cooperative Group Production	Authority Recorded Production	
Arthur Hickle	2010	20.43	20.43	N/A	N/A	Reproduction of Questionnaire Groundwater Production was able to be performed based on Mr. Hickle's methodology.
	2011	20.47	20.47	N/A	N/A	
	2012	23.80	23.80	N/A	N/A	
	2013	43.82	43.82	N/A	N/A	
	2014	52.79	52.79	N/A	N/A	
	2019	47.63	47.63	N/A	15.40	
China Lake Acres Mutual Water Company	2010	37.51	N/A	N/A	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	37.51	N/A	N/A	N/A	
	2012	37.51	N/A	N/A	N/A	
	2013	37.51	N/A	N/A	N/A	
	2014	37.51	N/A	N/A	N/A	
	2019	37.51	N/A	N/A	37.51	
CHLT Water Group	2010	N/A	N/A	N/A	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	N/A	N/A	N/A	N/A	
	2012	N/A	N/A	N/A	N/A	
	2013	10.41	N/A	N/A	N/A	
	2014	10.41	N/A	N/A	N/A	
	2019	10.41	N/A	N/A	9.61	

Table 6
Verification of Annual Groundwater Production Between 2010 and 2014
(units: Acre-Feet)

Pumper	Year	Questionnaire Groundwater Production	Verification Process			Remarks ²
			Reproduced Questionnaire Production ¹	Cooperative Group Production	Authority Recorded Production	
City of Ridgecrest	2010	339.00	N/A	339.00	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	370.00	N/A	370.00	N/A	
	2012	348.00	N/A	348.00	N/A	
	2013	423.00	N/A	423.00	N/A	
	2014	392.00	N/A	392.00	N/A	
	2019	NA	NA	N/A	145.80	
Indian Wells Valley Water District	2010	7,570.00	N/A	7,570.00	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	7,364.30	N/A	7,364.30	N/A	
	2012	7,633.50	N/A	7,633.50	N/A	
	2013	7,531.70	N/A	7,531.70	N/A	
	2014	7,318.70	N/A	7,318.70	N/A	
	2019	6,120.10	N/A	N/A	6,116.20	
Jumper Street Water Cooperative	2010	6.24	N/A	N/A	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	6.24	N/A	N/A	N/A	
	2012	6.24	N/A	N/A	N/A	
	2013	6.24	N/A	N/A	N/A	
	2014	6.24	N/A	N/A	N/A	
	2019	4.83	N/A	N/A	5.01	

Table 6
Verification of Annual Groundwater Production Between 2010 and 2014
(units: Acre-Feet)

Pumper	Year	Questionnaire Groundwater Production	Verification Process			Remarks ²
			Reproduced Questionnaire Production ¹	Cooperative Group Production	Authority Recorded Production	
Kern County Public Works Department	2010	20.00	N/A	N/A	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed (Authority November 2019 production is missing).
	2011	20.00	N/A	N/A	N/A	
	2012	20.00	N/A	N/A	N/A	
	2013	20.00	N/A	N/A	N/A	
	2014	20.00	N/A	N/A	N/A	
	2019	15.80	N/A	N/A	13.94	
Meadowbrook Dairy	2010	6,880.00	6,052.55	9,437.00	N/A	Reproduced Questionnaire Production based on power consumption data significantly varies from Questionnaire Groundwater Production and Cooperative Group Production. See Appendix for detailed discussions.
	2011	6,840.00	5,762.69	9,827.00	N/A	
	2012	7,660.00	6,817.76	9,876.00	N/A	
	2013	8,070.00	6,851.71	9,354.00	N/A	
	2014	8,920.00	N/A	7,524.00	N/A	
	2019	4,403.00	N/A	N/A	4,403.00	
Patricia Davis (Amberglow)	2010	75.09	75.13	N/A	N/A	Reproduction of Questionnaire Groundwater Production was able to be performed based on Ms. Davis' methodology.
	2011	75.09	67.61	N/A	N/A	
	2012	67.58	67.61	N/A	N/A	
	2013	67.58	67.61	N/A	N/A	
	2014	67.58	67.61	N/A	N/A	
	2019	50.23	45.08	N/A	N/A	

Table 6
Verification of Annual Groundwater Production Between 2010 and 2014
(units: Acre-Feet)

Pumper	Year	Questionnaire Groundwater Production	Verification Process			Remarks ²
			Reproduced Questionnaire Production ¹	Cooperative Group Production	Authority Recorded Production	
Quist Farms	2010	443.80	N/A	750.00	N/A	Reproduction of Questionnaire Groundwater Production was able to be performed based on power consumption records.
	2011	410.90	N/A	750.00	N/A	
	2012	426.00	N/A	750.00	N/A	
	2013	429.30	N/A	750.00	N/A	
	2014	496.40	N/A	750.00	N/A	
	2019	637.50	N/A	N/A	636.30	
Searles Valley Minerals	2010	2,586.60	N/A	2,586.60	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	2,457.50	N/A	2,457.50	N/A	
	2012	2,743.00	N/A	2,743.00	N/A	
	2013	2,706.00	N/A	2,706.00	N/A	
	2014	2,679.00	N/A	2,679.00	N/A	
	2019	2,708.00	N/A	N/A	2,708.00	
Sierra Shadows Ranch (John T. Conaway)	2010	241.68	N/A	N/A	N/A	Reproduction of Questionnaire groundwater production cannot be performed.
	2011	241.68	N/A	N/A	N/A	
	2012	241.68	N/A	N/A	N/A	
	2013	288.00	N/A	N/A	N/A	
	2014	299.14	N/A	N/A	N/A	
	2019	501.14	N/A	N/A	457.32	

Table 6
Verification of Annual Groundwater Production Between 2010 and 2014
(units: Acre-Feet)

Pumper	Year	Questionnaire Groundwater Production	Verification Process			Remarks ²
			Reproduced Questionnaire Production ¹	Cooperative Group Production	Authority Recorded Production	
Simmons Farms	2010	56.00	N/A	N/A	N/A	Reproduction of Questionnaire Groundwater Production cannot be performed.
	2011	58.00	N/A	N/A	N/A	
	2012	918.00	N/A	N/A	N/A	
	2013	918.00	N/A	918.00	N/A	
	2014	1,087.00	N/A	1,087.00	N/A	
	2019	471.00	N/A	N/A	471.00	
Terese Farms	2010	260.00	260.00	N/A	N/A	Reproduction of Questionnaire Groundwater Production was able to be performed based on Terese Farms' methodology.
	2011	269.00	269.00	N/A	N/A	
	2012	293.00	293.00	N/A	N/A	
	2013	305.00	305.00	N/A	N/A	
	2014	317.00	317.00	N/A	N/A	
	2019	320.00	320.00	N/A	322.00	

Notes:

- ¹ This column presents annual groundwater production calculated using the methodology and data provided in the response to the Questionnaire, if possible. See Remarks column.
- ² Remarks are provided regarding whether the production reported by the pumpers in their responses to the Questionnaire could be reproduced using the methodology and data provided by each pumper.

Table 7
Reported Minimum Annual Groundwater Production
Between 2010 and 2014

Pumper	Year(s)	Minimum Production Reported in Questionnaire (acre-feet)	Method of Production Estimate	Remark
Arthur Hickie	2010	20.43	Power consumption records	
China Lake Acres Mutual Water Company	2010 to 2014	Undetermined	Meter (average annual production)	An average groundwater production (37.5 AF) was assumed for the Base Period. Groundwater production was not continuous during the Base Period.
CHLT Water Group	2010 to 2012	0.00	Meter (average annual production)	Groundwater production was not continuous during the Base Period.
City of Ridgecrest	2010	339.00	Cooperative Group records	
Indian Wells Valley Water District	2014	7,318.70	Meter	
Jumper Street Water Cooperative	2010 to 2014	Undetermined	Meter (average annual production)	An average groundwater production (6.24 AF) was assumed for the Base Period
Kern County Public Works Department	2010 to 2014	Undetermined	Amount of water-truck loads	An average groundwater production (20 AF) was assumed for the Base Period
Meadowbrook Dairy	2011	6,840.00	Power consumption and pump efficiency test	
Patricia Davis (Amberglow)	2012 to 2014	67.58	Tree number, irrigation time and irrigation flow rate	
Quist Farms	2010	410.90	Power consumption	
Searles Valley Minerals	2011	2,457.50	Cooperative Group records	
Sierra Shadows Ranch (John T. Conaway)	2010 to 2012	241.68	Number of trees and drip emitters	
Simmons Farms	2010	56.00	N/A	Meter installed in 2012
Terese Farms	2010	260.00	Irrigated acreage and estimated water requirement	

APPENDICES

APPENDIX A
Verification Report for
Mr. Arthur Hickle

Appendix A: Pumping Verification Report for Arthur Hickle

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Mr. Arthur Hickle for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Mr. Arthur Hickle owns 20.5 acres of property in Ridgecrest, California [Assessor Parcel Number (APN): 341-071-24-9]. Mr. Hickle reports that the property deed includes appurtenant water rights. The property is located within the Basin boundary and Mr. Hickle reports that groundwater has been extracted since 1984. There are currently two (2) wells drilled within this property, and there is no information to suggest that any wells existed on this property prior to 1984. Extracted groundwater has been reportedly used for domestic, landscaping, and agricultural (irrigation of pistachio orchards) purposes, though the quantities of extracted groundwater for domestic and landscaping purposes were not specified in the responses to the Questionnaire. A significant portion of the total extracted groundwater has been used for agricultural purposes, though the annual volume of water used for irrigation varies depends on the size of the pistachio orchard.

Description of Facilities

There are currently two (2) active wells and no inactive wells located within this property. According to the well construction data provided by Mr. Hickle, Well 1 was drilled in 1984 with a total depth of 370 feet, a static water level of 272 feet below ground surface (bgs), and a submersible pump installed at 372 feet bgs (it should be noted that there is an inconsistency between the reported well depth and pump location as the pump location is deeper than the well depth). Well 2 was drilled in 2012 with a total depth of 450 feet and a static water level of 270 feet bgs. Well 2 has a pressure pump installed; the pump intake is located at 270 feet bgs, and a submersible pump is installed at 370 feet bgs.

Appendix A: Pumping Verification Report for Arthur Hickle

Both pumps are rated 10 horsepower with no manufacturer reported flow rates; however, data provided in the Questionnaire suggests that the pump flow rates for these two (2) wells are 60 gallons per minute (gpm) each. Operation of these wells has been performed by Mr. Hickle since 1984. Extracted groundwater is either fed into a drip irrigation system through the submersible well pumps for agricultural irrigation, or stored in an above-ground reservoir through a surface pressure pump for domestic and landscaping uses. General information on well construction, water level, well pumps, and service status is provided in Table A-1.

Groundwater Production

Historical groundwater production based on metered records are not available because flow meters are not installed on the wells. The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) and the Authority do not have historic reported groundwater production specific to Mr. Hickle, except for the Authority's monthly groundwater production records between September 2018 and December 2019.

Mr. Hickle provided the estimated combined groundwater production of the two (2) wells' in the Questionnaire. Estimates of production were determined using on two (2) methods: irrigated acreage and power consumption. Details of the production estimates are discussed in the following sections. The annual groundwater production estimates between 1985 and 2019 are provided on Table A-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by Mr. Hickle from the Basin.

Groundwater Production Questionnaire

Mr. Hickle provided the combined groundwater production of the two (2) wells between 1985 and 2019. Groundwater production for the period between 1985 and 2009

was estimated based on the irrigated acreage of pistachio trees; however, details for the production estimate method were not provided for this period. Groundwater production between 2010 and 2019 was estimated based on power consumption records and pump flow rates provided by Mr. Hickle. The monthly pump flow rates and power consumption data attached to the responses to the Questionnaire are provided in Appendix A-1. It is not clear if the power consumption data shown in Appendix A-1 corresponds to agricultural uses only.

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the Questionnaire, are shown on Table A-3. Due to the lack of available groundwater production records from Cooperative Group, a comparison of groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table A-3. The Authority does not have production records prior to August 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either.

A breakdown of extracted groundwater for agricultural, domestic, commercial, and industrial purposes between 2010 and 2014 is provided in Table A-4. Between 2010 and 2014, annual groundwater production reported in the Questionnaire ranged from 20.43 acre-feet (AF) in 2011 to 52.79 AF in 2014.

Power Consumption Data

Electric power consumption data from the Southern California Edison Company (Edison) for the two (2) active wells between 2010 and 2019 were summarized by Mr. Hickle and submitted with the Questionnaire (Appendix A-1). The data shown in Appendix A-1 includes monthly power usage (in kilowatt-hour, kWh), power load (kilowatt, kW), and pump flow rates (60 gpm for each well and total monthly flow capacity). Because pump tests were not available and flow meters are not currently installed at these two (2) wells, it is not clear if the pump flow rate data was obtained from the results of pump tests or from other indirect methods. Based on the data shown in Appendix A-1, it appears

that monthly groundwater production was determined by taking the product of the monthly total pump flow rate and the monthly pumping duration (total hours) for each month. The pumping duration can be calculated by taking the ratio of monthly power usage (kWh) to power load (kW). It should be noted that the power consumption data shown in Appendix A-1 may include power consumption for agricultural pumping, domestic, and other uses. In addition, the pump flow rates may vary significantly depending on various factors such as depth to groundwater, pipe size, pump age, etc.

Land Use Data

The annual irrigated land acreage between 1985 and 2009 is provided in Table A-2. The property's irrigated lands are for pistachio orchards only. Generally, groundwater production can be estimated by applying the crop water requirement to the total irrigated acreage. Therefore, the annual volume of extracted groundwater should be correlated to the acreage of irrigated land. As reported in the Questionnaire, this property has had 5 acres of pistachio orchards between 1985 and 1989, 10 acres between 1990 and 1993, and 17.5 acres after 1993.

Basis of Verification

The available data discussed in the "**Verification Data and Information**" section was considered in the verification of groundwater production by Mr. Hickle.

Records of Groundwater Production from the Authority and Cooperative Group

Records of groundwater production from the Authority and the Cooperative Group were not available for this property except for monthly groundwater production reports submitted to the Authority between September 2018 and December 2019. As reported in the Questionnaire, annual groundwater production during 2019 was 47.6 AF; however, groundwater production data reported to the Authority in 2019 was 15.4 AF. The

discrepancy is about 68 percent (Table A-3); that is, the Authority production record is about one third (1/3) of the production reported in the Questionnaire.

Power Consumption Data

Power consumption data shown in Appendix A includes the monthly energy consumption (kWh), the rate of electrical energy consumption (kW), and average monthly pumping rate (gpm). Assuming that the power consumption data in Appendix A is solely for agricultural irrigation, the pumping duration for each month can be determined by calculating the ratio of monthly power usage (kWh) to power load (kW). The monthly volume of extracted groundwater can then be estimated by calculating the product of the pumping flow rate and pumping duration. The method discussed above is the same method used to calculate groundwater production reported in the Questionnaire. It should be noted that power consumption, electrical load, and flow rate data shown in Appendix A were only provided for the period between 2010 and 2019, so the method described above only provides groundwater production estimates for the period between 2010 and 2019.

Land Use Data

Pistachios are generally considered to be crops with a high volume of water demand. To reduce the quantity of water required for pistachio tree irrigation, Mr. Hickle installed a drip irrigation system (installation year is not available) to minimize the waste of water. Typically, the annual water requirement to grow pistachio trees is approximately three (3) to four (4) AF per acre of pistachio orchard. If the annual water requirement of 3 AF per acre is applied to the pistachio orchards located on this property, the estimated annual water requirements during the period between 1985 and 2009 (shown on Table A-2) are greater than the production reported in the Questionnaire. For example, in 1985 the size of this property's pistachio orchard was 5 acres, and the production estimate using the annual water requirement of 3 AF per acre would be 15 AF. The reported 1985 groundwater production in the Questionnaire was only 3 AF (difference of 12 AF).

Similarly, the reported 2009 groundwater production in the Questionnaire was 20 AF (see Table A-2), which is 32.5 AF less than the estimated annual water requirement for 17.5 acres of pistachios orchard (52.5 AF). However, the average annual production estimate of 50.6 AF reported between 2013 and 2019 is similar to the estimated annual water requirement of 52.5 AF based on the 3 AF per acre annual water requirement for pistachio orchards.

Review of Methods and Verification and Conclusions

Although the reported groundwater production in the Questionnaire covers the period between 1985 and 2019, verifications of groundwater production between data collected from the Cooperative Group and the Questionnaire were not performed because the Cooperative Group has no production records for this property. Groundwater production was reported for 2019 to the Authority, and based on the 2019 Authority records, Mr. Hickle's groundwater production is approximately one third (1/3) of the reported production in the Questionnaire (Table A-3).

The annual groundwater production reported in the Questionnaire between 1985 and 2009 were estimated based on the acreage of the pistachio orchard. The method to estimate groundwater production based on acreage is generally subject to uncertainty due to unknown factors such as irrigation schedule and irrigation management. Although pistachios are considered to be crops with a high-water demand, if an annual water requirement of 3 AF per acre of pistachio orchard is assumed, the annual groundwater production reported in the Questionnaire appears to be low, specifically during the period between 1985 and 2012 (see Table A-2). Reported power consumption data was used to estimate annual groundwater production between 2010 and 2019. Though verification of groundwater production using empirical equations was not performed, estimated groundwater production between 2010 and 2019 can be reproduced based on the power consumption, electrical load, and pump flow rate data provided in the Questionnaire (Appendix A). Comparisons of groundwater production reported in the Questionnaire to groundwater production estimates based on the assumed annual water requirement of 3 AF per acre of pistachio orchard suggest groundwater production estimates between

Appendix A: Pumping Verification Report for Arthur Hickle

1985 and 2009 may be underestimated; however, a fairly good match between 2013 and 2019.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table A-2. As reported in the response to the Questionnaire, Mr. Hickle's lowest annual Base Period groundwater production of 20.4 AF occurred in 2010, estimated using power consumption records.

J:\2652 IWVGA\Pumping Verification Reports\Whole Report\Appendix Text - Revised_JMM\Appendix A - Hickle_jmm.docx

Table A-1
Well Construction Information

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating* (gpm)	Pump Test	Date of Pump Test	Service Status
1	1984	N/A	N/A	272	372	Submersible	N/A	60	N/A	N/A	Active
2	2012	N/A	N/A	270	370	Pressure	N/A	60	N/A	N/A	Active

Notes:

- Arthur Hickle did not distinguish between the two pumps in the questionnaire.
- The pump type and rating were inferred from the fact that the well from 1984 has been used for irrigation since then.
- It is unclear if both wells are used for irrigation.
- Pump Rating is estimated based on the flow rate data provided by Arthur Hickle (Appendix (Power Consumption)).

Table A-2
Annual Groundwater Production Estimates Between 1937 And 2019

Year	Crop	Questionnaire				Groundwater Use ¹ (AF)	Production Difference ² (AF)
		Land Use (acre)	Groundwater Use (AFY)	Estimate Method	Average Water Use per Acre (AF)		
1937 to 1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	Pistachios	5.0	3.0	Irrigation Land	0.60	15.0	-12.0
1986	Pistachios	5.0	3.0	Irrigation Land	0.60	15.0	-12.0
1987	Pistachios	5.0	3.0	Irrigation Land	0.60	15.0	-12.0
1988	Pistachios	5.0	3.0	Irrigation Land	0.60	15.0	-12.0
1989	Pistachios	5.0	3.0	Irrigation Land	0.60	15.0	-12.0
1990	Pistachios	10.0	7.0	Irrigation Land	0.70	30.0	-23.0
1991	Pistachios	10.0	7.0	Irrigation Land	0.70	30.0	-23.0
1992	Pistachios	10.0	7.0	Irrigation Land	0.70	30.0	-23.0
1993	Pistachios	10.0	7.0	Irrigation Land	0.70	30.0	-23.0
1994	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
1995	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
1996	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
1997	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
1998	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
1999	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
2000	Pistachios	17.5	10.0	Irrigation Land	0.57	52.5	-42.5
2001	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2002	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2003	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2004	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2005	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2006	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2007	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2008	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2009	Pistachios	17.5	20.0	Irrigation Land	1.14	52.5	-32.5
2010	Pistachios	17.5	20.4	Power Consumption	1.17	52.5	-32.1
2011	Pistachios	17.5	20.5	Power Consumption	1.17	52.5	-32.0
2012	Pistachios	17.5	23.8	Power Consumption	1.36	52.5	-28.7
2013	Pistachios	17.5	43.8	Power Consumption	2.50	52.5	-8.7
2014	Pistachios	17.5	52.8	Power Consumption	3.02	52.5	0.3
2015	Pistachios	17.5	52.1	Power Consumption	2.98	52.5	-0.4
2016	Pistachios	17.5	51.7	Power Consumption	2.95	52.5	-0.8
2017	Pistachios	17.5	54.2	Power Consumption	3.10	52.5	1.7
2018	Pistachios	17.5	52.1	Power Consumption	2.98	52.5	-0.4
2019	Pistachios	17.5	47.6	Power Consumption	2.72	52.5	-4.9

Notes:

- Based on 3 AF per acre

- Production difference is the difference between the reported groundwater production and the production estimate based on 3 AF water requirement per acre for pistachio orchard

Table A-3
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	1	20.43	1.70	N/A	N/A	N/A	N/A	N/A	N/A
2011	1	20.47	1.71	N/A	N/A	N/A	N/A	N/A	N/A
2012	2	23.80	1.98	N/A	N/A	N/A	N/A	N/A	N/A
2013	2	43.82	3.65	N/A	N/A	N/A	N/A	N/A	N/A
2014	2	52.79	4.40	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Mr. Hickle reported groundwater production of 47.63 AF in 2019. The IWVGA report has a record of 15.4 AF in 2019.

- The discrepancy is 67.7% (the IWVGA production data is about 1/3 of the reported production).

Table A-4
Summary of Land Use and Water Use

Year	Total Property Land (acre)	Agricultural			Domestic Usage (acre-foot)	Commercial Usage (acre-foot)	Industrial Usage (acre-foot)	Total Water Usage (acre-foot)
		Crop	Land Use (acres)	Water Use (acre-foot)				
2010	20.5	Pistachios	17.5	20.43	N/A	N/A	N/A	20.43
2011	20.5	Pistachios	17.5	20.47	N/A	N/A	N/A	20.47
2012	20.5	Pistachios	17.5	23.80	N/A	N/A	N/A	23.80
2013	20.5	Pistachios	17.5	43.82	N/A	N/A	N/A	43.82
2014	20.5	Pistachios	17.5	52.79	N/A	N/A	N/A	52.79

APPENDIX B
Verification Report for
China Lake Acres Mutual Water Company

Appendix B: Pumping Verification Report for China Lake Acres Mutual Water Company

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the China Lake Acres Mutual Water Company for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The China Lake Acres Mutual Water Company (CLAMWC) was incorporated in October 1979 to provide water to the rural area of China Lake Acres, located within Kern County approximately 3 miles west of the City of Ridgecrest. Groundwater production by the CLAMWC is reported to have begun in October 1979, and is solely used to provide potable water to customers. CLAMWC's service area consists of approximately 60 acres of land with 60 service connections that are served potable water produced by CLAMWC. Individual meters are located on each property. As reported in the Questionnaire, CLAMWC produced approximately 1,633,770 cubic feet [approximately 37.5 acre-feet (AF)] of groundwater during 2019, and estimates that the same quantity of groundwater was produced each year since incorporation. Estimates of groundwater production were provided using the combined total of all individual meter reads, though further details of individual groundwater extractions were not provided.

Description of Facilities

The CLAMWC has historically operated (and currently operates) two (2) groundwater production wells and no inactive wells. No information about well construction, drill date, or pump type/capacity was provided in the Questionnaire. The California SWRCB (SWRCB) online well database lists that 2 active groundwater production wells are currently owned by CLAMWC, though additional well construction information was also not available.

Groundwater Production

Historical groundwater production as reported in the Questionnaire was based on the sum of all individual meter records since incorporation of the CLAMWC in 1979. Groundwater production data from the Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) indicates that an entity referred to as “China Lake Acres” produced 400 AFY of groundwater each year from 1975 to 1986, and was then purchased by the Indian Wells Valley Water District. Indian Wells Valley Water District staff has confirmed in writing that the “China Lake Acres” entity recorded in the Cooperative Group production data is not the CLAMWC but a different entity entirely. Therefore, the “China Lake Acres” production recorded by the Cooperative Group was not used for the purpose of groundwater pumping verification by the CLAMWC. . The Authority has no historic reported groundwater production data specific to CLAMWC, except for the Authority’s monthly groundwater production records between September 2018 and December 2019. Annual groundwater production estimates reported for CLAMWC between 1979 and 2019 are provided on Table B-1.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by the CLAMWC from the Basin.

Groundwater Production Questionnaire

CLAMWC provided records of combined groundwater production from the two (2) wells between 1979 and 2019. Groundwater production for the period between 1979 and 2019 (see Table B-1) was estimated based on the sum of individual meter reads on properties served by CLAMWC. Annual groundwater production from 1979 to 2009 as reported in the Questionnaire, is shown on Table B-2.

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the Questionnaire, is shown on Table B-3. Due to the lack of available groundwater production records from the Cooperative Group, a comparison of

Appendix B: Pumping Verification Report for China Lake Acres Mutual Water Company

groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table B-3. The Authority does not have production records prior to September 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either.

Between 2010 and 2014, annual groundwater production reported in the Questionnaire remained at a constant 37.51 AF.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by the CLAMWC.

Records of Groundwater Production from the Authority and the Cooperative Group

Significant records of Base Period groundwater production from the Cooperative Group and the Authority were not available for CLAMWC, except for monthly groundwater production reports submitted to the Authority between September 2018 and December 2019. As reported in the Questionnaire, annual groundwater production during 2019 was 37.51 AF; groundwater production data reported to the Authority in 2019 was also 37.51 AF. There is no discrepancy between groundwater production reported in the Questionnaire, and groundwater production submitted to the Authority.

Review of Methods and Verification and Conclusions

Groundwater production by CLAMWC wells is used to provide potable water to customers. Groundwater production by CLAMWC wells is not used for any type of agricultural irrigation. Although the reported groundwater production in the Questionnaire covers the period between 1979 and 2019, verifications of groundwater production

Appendix B: Pumping Verification Report for China Lake Acres Mutual Water Company

between data collected from the Cooperative Group and the Questionnaire were not performed because the Cooperative Group has no accurate production records for this producer. Groundwater production was reported for 2019 to the Authority, and based on the 2019 Authority records, the CLAMWC's groundwater production is equal to the reported production in the Questionnaire.

The annual groundwater production reported in the Questionnaire between 1979 and 2019 were estimated based on the sum of individual meter reads on the properties served by CLAMWC. The method to estimate groundwater production based on individual meter reads is generally reliable and accurate.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production by CLAMWC as reported in the response to the Questionnaire during the Base Period are shown in Table B-3. As reported in the response to the Questionnaire, the CLAMWC's production remained constant at 37.51 AF during each year of the Base Period, estimated using the sum of individual metered records on all properties within CLAMWC's service area. Therefore, the lowest annual Base Period groundwater production for CLAMWC cannot be determined.

Table B-1

Data Source Used For Groundwater Production Estimation

Year	Groundwater Production (acre-foot)	Estimate Method
1979	37.51	Meter
1980	37.51	Meter
1981	37.51	Meter
1982	37.51	Meter
1983	37.51	Meter
1984	37.51	Meter
1985	37.51	Meter
1986	37.51	Meter
1987	37.51	Meter
1988	37.51	Meter
1989	37.51	Meter
1990	37.51	Meter
1991	37.51	Meter
1992	37.51	Meter
1993	37.51	Meter
1994	37.51	Meter
1995	37.51	Meter
1996	37.51	Meter
1997	37.51	Meter
1998	37.51	Meter
1999	37.51	Meter
2000	37.51	Meter
2001	37.51	Meter
2002	37.51	Meter
2003	37.51	Meter
2004	37.51	Meter
2005	37.51	Meter
2006	37.51	Meter
2007	37.51	Meter
2008	37.51	Meter
2009	37.51	Meter
2010	37.51	Meter
2011	37.51	Meter
2012	37.51	Meter
2013	37.51	Meter
2014	37.51	Meter
2015	37.51	Meter
2016	37.51	Meter
2017	37.51	Meter
2018	37.51	Meter
2019	37.51	Meter

Notes:

- Groundwater extraction was the sum of all individual meters.
- Details of individual extractions were not provided.

Table B-2
Comparisons of Reported Annual Groundwater Production Between 1979 and 2009
(unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
1979	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1980	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1981	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1982	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1983	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1984	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1985	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1986	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1987	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1988	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1989	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1990	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1991	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1992	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1993	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1994	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1995	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1996	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1997	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1998	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
1999	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2000	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2001	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2002	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2003	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2004	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2005	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2006	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2007	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2008	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2009	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A

Table B-3

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2011	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2012	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2013	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A
2014	2	37.51	3.13	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- China Lake Acres Mutual Water Company provided groundwater production of 37.51 AF in 2019.

- The IWVGA report also has a record of 37.51 AF in 2019.

- In addition, Cooperative Group has a record of China Lake Acres Mutual Water Company's annual extraction between 1975 and 1986.

- The average annual extraction of 400 AFY is significant higher than the China Lake Acres Mutual Water Company reported extraction.

APPENDIX C
Verification Report for
CHLT Water Group

Appendix C: Pumping Verification Report for CHLT Water Group

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the CHLT Water Group for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The CHLT Water Group (CHLT) is a cooperative water group consisting of four (4) 5-acre parcels (total of 20 acres) using equally-shared and equally-owned common groundwater production wells. The IWVGA Pumping Verification Questionnaire for CHLT was submitted by one (1) CHLT parcel owner, Mr. Edward Tipler, on February 3, 2020. As stated in the Questionnaire, groundwater production by CHLT is estimated to have begun in 1998, when Mr. Tipler purchased his parcel. Mr. Tipler noted that a previous owner had constructed housing on his parcel around 1987, though groundwater production data between 1987 and 1998 was not provided. Mr. Tipler indicated that he was not aware of the date of construction on two (2) of the other parcels within CHLT, though the date of construction on the fourth parcel is estimated by Mr. Tipler to be around 2005.

Groundwater production by CHLT wells is used to provide potable water to the four parcels for general domestic uses, plus landscape irrigation including irrigation of windbreak trees. As stated in the Questionnaire, groundwater production by CHLT wells is not used for any type agricultural irrigation. Individual meters have been used on each parcel since 2013, when the meters were first installed. As reported in the Questionnaire, since meters were installed in 2013, the reported groundwater use of each of the four parcels in CHLT is estimated to be 2.603 acre-feet per year (AFY) using meter records, and a combined total annual groundwater production of 10.41 AFY for all four parcels. Prior to meter installation in 2013, groundwater production was not recorded, and the

member parcels paid an equal quarterly contribution to CHLT for expenses including maintenance, repair, and electricity.

Description of Facilities

Three of the parcels (Kern County Assessor's Parcel Nos. 455-070-07, 455-070-08, 455-070-16), which includes the parcel owned by Mr. Tipler, use only one (1) active groundwater production well. The construction date of this well is estimated by Mr. Tipler to be around 1987. According to the Questionnaire, the original drilling depth of this well was not documented but is estimated by Mr. Tipler to be 250 feet below ground surface (bgs). Previous well maintenance records were also not documented, but Mr. Tipler indicated that a static water level of 185 feet bgs and a pumping depth of 220 feet bgs were last observed (date of observation not provided). The well has been fitted with a meter since installation, but meters were not installed on individual parcels until 2013.

The fourth parcel (Kern County Assessor's Parcel No. 455-070-15) uses one (1) additional active groundwater production well. Well construction information for this additional well was not directly provided in the Questionnaire, but Mr. Tipler estimates the construction date of the well to be in 2016. There are currently no inactive wells owned by any of the four parcel owners within CHLT. Well construction data for the two (2) wells operated by the parcel owners of CHLT are provided in Table C-1.

Groundwater Production

Historical groundwater production as reported in the Questionnaire was based on individual parcel meter records since meter installation in 2013. Groundwater production data from the Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) was not available for CHLT specifically. The Authority has no historic reported groundwater production data specific to CHLT, except for the Authority's monthly groundwater production records between September 2018 and December 2019. Annual

groundwater production estimates reported for CHLT between 1987 and 2019 are provided on Table C-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by CHLT from the Basin.

Groundwater Production Questionnaire

CHLT provided records of combined groundwater production from the two (2) wells between 2013 and 2019. Groundwater production by CHLT for the period between 2013 and 2019 (see Table C-2) was estimated based on meter records on the parcels served by CHLT wells. Annual groundwater production by CHLT during the Base Period (from 2010 to 2014) as reported in the Questionnaire, is shown on Table C-3. Due to the lack of available groundwater production records during the Base Period from the Cooperative Group, a comparison of groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table C-3. The Authority does not have production records for CHLT prior to September 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either. No annual groundwater production data was provided in the Questionnaire for the years 2010, 2011, and 2012. In 2013 and 2014, annual groundwater production reported in the Questionnaire remained at a constant 10.41 AF.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by the CHLT.

Records of Groundwater Production from the Authority and the Cooperative Group

Significant records of Base Period groundwater production from the Cooperative Group and the Authority were not available for CHLT, except for monthly groundwater production reports submitted to the Authority between September 2018 and December 2019. As reported in the Questionnaire, annual groundwater production during 2019 was 10.41 AF; groundwater production data reported to the Authority in 2019 was 9.61 AF. There is a discrepancy of approximately 7.7% between 2019 groundwater production reported in the Questionnaire, and 2019 groundwater production submitted to the Authority.

Review of Methods and Verification and Conclusions

Groundwater production by CHLT wells is used to provide potable water to the four parcels within CHLT for general domestic uses, plus landscape irrigation including irrigation of windbreak trees. As stated in the Questionnaire, groundwater production by CHLT wells is not used for any type agricultural irrigation. Although the reported groundwater production in the Questionnaire covers the period between 2013 and 2019, verifications of groundwater production between data collected from the Cooperative Group and the Questionnaire were not performed because the Cooperative Group has no accurate production records for this producer. Groundwater production was reported for 2019 to the Authority, and based on the 2019 Authority records, CHLT's groundwater production is nearly equal to the reported production in the Questionnaire, with a discrepancy of approximately 7.7%.

The annual groundwater production reported in the Questionnaire between 2013 and 2019 were estimated based on individual meter records on the parcels served by CHLT wells. The method to estimate groundwater production based on individual meter records is generally reliable and accurate.

Appendix C: Pumping Verification Report for CHLT Water Group

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production by CHLT as reported in the response to the Questionnaire during the Base Period are shown in Table C-3. As reported in the response to the Questionnaire, CHLT's groundwater production was not provided/recorded during 2010, 2011, and 2012. Meters were installed on each parcel in 2013, and total groundwater production remained constant at 10.41 acre-feet during 2013 and 2014, estimated using individual metered records on all parcels served by CHLT wells.

J:\2652 IWVGA\Pumping Verification Reports\Whole Report\Appendix Text - Revised_JMM\Appendix C - CHLTWaterGroup_jmm.docx

Table C-1
Well Construction Information

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
1 ¹	1987	250	N/A	185	220	N/A	N/A	N/A	N/A	N/A	Active
2 ²	2016	250	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active

General Comments:

- Wells estimated to be drilled in 1987, prior to the purchasing of the property in 1998.
- Well construction information is not provided. Extracted groundwater is used for household purposes only.
- There is a main meter installed for both wells. No meter readings were provided.

Notes:

¹ Well construction information and static water level data were estimated. No measurements provided.

² Well drill date was estimated. Well construction information and static water level data were not provided

Table C-2

Data Source Used For Groundwater Production Estimation

Year	Groundwater Production (acre-feet)	Estimate Method	Remark
1987	N/A	N/A	No data provided
1988	N/A	N/A	No data provided
1989	N/A	N/A	No data provided
1990	N/A	N/A	No data provided
1991	N/A	N/A	No data provided
1992	N/A	N/A	No data provided
1993	N/A	N/A	No data provided
1994	N/A	N/A	No data provided
1995	N/A	N/A	No data provided
1996	N/A	N/A	No data provided
1997	N/A	N/A	No data provided
1998	N/A	N/A	No data provided
1999	N/A	N/A	No data provided
2000	N/A	N/A	No data provided
2001	N/A	N/A	No data provided
2002	N/A	N/A	No data provided
2003	N/A	N/A	No data provided
2004	N/A	N/A	No data provided
2005	N/A	N/A	No data provided
2006	N/A	N/A	No data provided
2007	N/A	N/A	No data provided
2008	N/A	N/A	No data provided
2009	N/A	N/A	No data provided
2010	N/A	N/A	No data provided
2011	N/A	N/A	No data provided
2012	N/A	N/A	No data provided
2013	10.41	Meter	Meter installed
2014	10.41	Meter	-
2015	10.41	Meter	-
2016	10.41	Meter	-
2017	10.41	Meter	-
2018	10.41	Meter	-
2019	10.41	Meter	-

Notes:

- CHLT Water Group indicated in the response to the Questionnaire that one parcel produces 1 AF per year while the remaining three parcels equally produce the remaining amount (9.41 AF).

Table C-3
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-feet)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2011	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2013	2	10.41	0.87	N/A	N/A	N/A	N/A	N/A	N/A
2014	2	10.41	0.87	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- CHLT estimated groundwater production of 10.41 AF in 2019. The IWVGA report has a record of 9.61 AF in 2019.

- The discrepancy is 7.68 % (the IWVGA production data is slightly less than the CHLT estimated production).

APPENDIX D
Verification Report for
City of Ridgecrest

Appendix D: Pumping Verification Report for City of Ridgecrest

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the City of Ridgecrest for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The City of Ridgecrest (City) owns five (5) groundwater wells:

1. Well located in the Kerr McGee Sports Complex
 - a. Kern County Assessor Parcel Number (APN) 508-020-08.
2. Two (2) wells located in northwest and southwest Leroy Jackson Park
 - a. Kern County APN 396-911-11
3. Well located in Freedom Park
 - a. Kern County APN 478-010-07
4. Well located in Pearson Park
 - a. Kern County APN 453-111-01

The City indicated that groundwater has been extracted for landscaping irrigation since the 1970's and 1980's. The City has irrigated approximately 39 acres of City-owned land since the beginning of groundwater extractions. The volume of extracted groundwater was not measured prior to 2019 because the extracted groundwater was fed into an irrigation system with an automatic timing system. Water meters were installed in January 2019 to accurately measure groundwater extractions.

Description of Facilities

The City has historically operated (and currently operates) five (5) groundwater production wells and no inactive wells. In the response to the Questionnaire, the City indicated that its wells were drilled during the 1970s and/or 1980s; however, well drilling dates and well completion reports for the City's wells were not provided in the response

to the Questionnaire. The well located in the Kerr McGee Sports Complex had a static water level measurement of 210 feet below ground service (bgs) and a groundwater intake location of 273 feet bgs. The well located in the Northwest Leroy Jackson Park had a static water level measurement of 150 feet bgs and a groundwater intake location of 315 feet bgs. The well located in the Southwest Leroy Jackson Park had a static water level measurement of 147 feet bgs, though a groundwater intake location was not provided. No well construction, static water level, and pump information for the other two (2) wells (located in the Freedom Park and the Pearson Park) were provided in the response to the Questionnaire. Available information about well construction, drill date, or pump type/capacity provided in the response to the Questionnaire is summarized in Table D-1.

Groundwater Production

The City indicated in the response to the Questionnaire that groundwater extractions probably started in the 1970's and/or 1980's. The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) has recorded groundwater production for the City from the years 2002 to 2016, and the City has referenced these records as their estimated production during these years. The City installed flow meters in January 2019 to measure groundwater extractions; however, the metered groundwater production after 2019 was not provided in the response to the Questionnaire. The reported annual groundwater production values between 2012 and 2019 are provided on Table D-2.

Verification Data and Information

All of the data provided in the Questionnaire that can be used in the verification of groundwater production is described below.

Groundwater Production Questionnaire

The City submitted records of combined groundwater production recorded by the Cooperative Group for the five (5) wells between 2002 and 2016. Extracted groundwater was mainly used for the landscaping irrigation on 39 acres of land owned by the City. Based on the Cooperative Group's annual production records, the average irrigated water per acre is approximately 10.4 feet (see Table D-2).

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by the City.

Records of Groundwater Production from the Authority and the Cooperative Group

Although the Authority's record of 2019 groundwater extraction by the City is 145.8 AF, the 2019 production appears to be low when compared to the average annual groundwater production of 407.3 AF between 2002 and 2016 obtained from the Cooperative Group (see Table D-2). Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the response to the Questionnaire, is shown on Table D-3.

Review of Methods and Verification and Conclusions

The City does not apply extracted groundwater for agricultural purposes. Extracted groundwater is only used for landscaping irrigation. In the response to the Questionnaire, the City reported its annual groundwater production using the Cooperative Group production records; therefore, a comparison between the reported production in the response to the Questionnaire and the Cooperative Group production records was not performed. The Authority's record of 2019 groundwater extraction by the City is 145.8 AF; however, the Authority's 2019 production appears to be low when compared to the

Appendix D: Pumping Verification Report for City of Ridgecrest

average annual groundwater production of 407.3 AF reported by the City to the Cooperative Group between 2002 and 2016 (see Table D-2). In addition, verifications of groundwater production based on power consumption data and/or empirical equations were not performed due to the lack of data provided in the response to the Questionnaire.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period as shown in Table D-3 indicates that the City's lowest annual Base Period groundwater production of 339.0 AF occurred in 2010, estimated based on the groundwater production presented by the Cooperative Group.

J:\2652 IWVGA\Pumping Verification Reports\China Lake Acres Mutual Water Company\Pumping Verification Report (CLAMWC).docx

**Table D-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
Kerr Mcgee Sports Complex	1970's / 1980's	N/A	N/A	210	273	N/A	N/A	N/A	N/A	N/A	Active
NW Leroy Jackson Park		N/A	N/A	150	315	N/A	N/A	N/A	N/A	N/A	Active
SW Leroy Jackson Park		N/A	N/A	147	N/A	N/A	N/A	N/A	N/A	N/A	Active
Freedom Park		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Pearson Park		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active

Notes:

- City of Ridgecrest owns 5 active wells and pumped groundwater is used for landscaping purposes.
- Groundwater wells are estimated to be drilled between 1970 and 1980.

Table D-2

Annual Groundwater Production Estimates Between 1937 And 2019

Year	Crop	Questionnaire			
		Land Use (acre)	Groundwater Use (AFY)	Estimate Method	Average Water Use per Acre (acre-feet)
1937 to 2001	N/A	N/A	N/A	N/A	N/A
2002	No	39.0	445.0	NA	11.41
2003	No	39.0	616.0	Cooperative Group Report	15.79
2004	No	39.0	413.0	Cooperative Group Report	10.59
2005	No	39.0	366.0	Cooperative Group Report	9.38
2006	No	39.0	385.0	Cooperative Group Report	9.87
2007	No	39.0	420.0	Cooperative Group Report	10.77
2008	No	39.0	392.0	Cooperative Group Report	10.05
2009	No	39.0	400.0	Cooperative Group Report	10.26
2010	No	39.0	339.0	Cooperative Group Report	8.69
2011	No	39.0	370.0	Cooperative Group Report	9.49
2012	No	39.0	348.0	Cooperative Group Report	8.92
2013	No	39.0	423.0	Cooperative Group Report	10.85
2014	No	39.0	392.0	Cooperative Group Report	10.05
2015	No	39.0	427.0	Cooperative Group Report	10.95
2016	No	39.0	373.0	Cooperative Group Report	9.56
2017	No	39.0	N/A	NA	NA
2018	No	39.0	N/A	NA	NA
2019	No	39.0	145.8	Meter	3.74
Average		39.0	407.3		10.44

Table D-3
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1*	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	5	339.0	28.3	N/A	N/A	N/A	339.0	28.3	0.0%
2011	5	370.0	30.8	N/A	N/A	N/A	370.0	30.8	0.0%
2012	5	348.0	29.0	N/A	N/A	N/A	348.0	29.0	0.0%
2013	5	423.0	35.3	N/A	N/A	N/A	423.0	35.3	0.0%
2014	5	392.0	32.7	N/A	N/A	N/A	392.0	32.7	0.0%

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Well flow meters were installed in 2019, as reported in the response to the Questionnaire.

- The Authority has a production record of 145.8 AF in 2019.

* The Cooperative Group production records were used by the City of Ridgecrest and reported in the Questionnaire.

APPENDIX E
Verification Report for
Indian Wells Valley Water District

Appendix E: Pumping Verification Report for Indian Wells Valley Water District

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the Indian Wells Valley Water District for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The Indian Wells Valley Water District (IWWVD) is the successor agency to the Ridgecrest County Water District, which was formed in January 1955 as a result of consolidation of several small water companies serving domestic water in the City of Ridgecrest area. The IWWVD has been operating under its current name since 1980, but groundwater production by the IWWVD and its preceding agencies dates back to 1943. Groundwater production by the IWWVD is solely used to provide potable water to customers. The IWWVD service area encompasses approximately 38 square miles with approximately (at the time of this Report) 14,064 service connections that are served potable water produced by IWWVD. Individual meters are used to track water use on the property of IWWVD customers, and master meters are used to track water use for multi-family dwellings. As reported in the Questionnaire, IWWVD produced approximately 6,120.1 acre-feet (AF) of groundwater during 2019. Estimates of groundwater production were provided in the Questionnaire for the period from 1943 to 2019 using a combination of historic census population data and metered production records.

Description of Facilities

No information on number of wells, well construction, or well/pump status was provided in the Questionnaire. According to the State Water Resources Control Board (SWRCB) database, the IWWVD currently operates ten (10) active groundwater production wells and one (1) pending well. A summary of the current IWWVD wells is provided in Table E-1.

Groundwater Production

Historical groundwater production as reported in the Questionnaire was based on a combination of historic census population data and meter production records. Groundwater production records from the Cooperative Group exists for the period between 1975 and 2017. The Authority has no historic reported groundwater production data specific to IWVWD, except for the Authority's monthly groundwater production records between September 2018 and December 2019. Annual groundwater production estimates reported for IWVWD between 1979 and 2019 are provided on Table E-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by the IWVWD from the Basin.

Groundwater Production Questionnaire

IWVWD provided records of total groundwater production between 1943 and 2019. Groundwater production for the period between 1943 and 2019 (see Table E-2) was estimated based on a combination of historic census population data and meter production records. A comparison between the IWVWD's production as reported in the Questionnaire and the IWVWD's groundwater production data from 1975 to 2017 as recorded by the Cooperative Group was performed, and it was determined that the IWVWD's reported production from the Questionnaire exactly matches the Cooperative Group data for the years available.

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the Questionnaire, is shown on Table E-3. Groundwater production during the 2010 to 2014 Base Period exactly matched the values recorded by the Cooperative Group for the same period. The Authority does not have production records prior to September 2018, though a full year of IWVGA production records was available for 2019. According to the IWVGA production records, the IWVWD produced approximately 6,116.2 AF during

calendar year 2019, compared to approximately 6,120.1 AF as reported in the Questionnaire.

Between 2010 and 2014, annual groundwater production reported in the Questionnaire ranged from 7,318.7 AF (2014) to 7,633.5 AF (2012), with an annual average of approximately 7,483.6 AF.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by the IWVWD.

Records of Groundwater Production from the Authority and the Cooperative Group

Records of Base Period groundwater production from the Cooperative Group were available for comparison to the IWVWD’s reported production as provided in the Questionnaire. The IWVWD’s reported production exactly matches the production recorded by the Cooperative Group for the period from 1975 to 2017 (including the Base Period). Significant records of Base Period groundwater production from the Authority were not available for IWVWD, except for monthly groundwater production reports submitted to the Authority between September 2018 and December 2019. As reported in the Questionnaire, IWVWD groundwater production during 2019 was 6,120.1 AF, while groundwater production data reported to the Authority in 2019 was 6,116.2 AF. There is minimal difference (less than 1%) between the IWVWD’s groundwater production reported in the Questionnaire, and groundwater production submitted to the Authority during 2019.

Population Data

IWVWD production data reported in the Questionnaire from 1943 to 1973 was estimated by applying per-capita water use to the historic population of the City of

Ridgecrest, estimated using <https://population.us>. It should be noted that the IWWVD's service area currently includes the City of Ridgecrest, as well as certain unincorporated areas outside of the City of Ridgecrest's jurisdiction. The extent of the IWWVD's service area during the period from 1943 to 1973 was not specified in the Questionnaire. Per-capita water use was estimated in the Questionnaire to be 0.21 AF per person from 1943 to 1969, and 0.25 AF per person from 1970 to 1973. Assuming that these values correspond to annual water use, per-capita water use was estimated in the Questionnaire to be 187 gallons per day per person from 1943 to 1973, and 223 gallons per day per person from 1970 to 1973. These values of per-capita water use are likely appropriate for the given time period and the use of water by Indian Wells Valley residents for domestic uses and for irrigation of landscaping and windbreak trees.

Review of Methods and Verification and Conclusions

In the response to the Questionnaire, the IWWVD estimated that production from the Basin began in 1943 from smaller water companies that were consolidated to form the Ridgecrest County Water District, the IWWVD's predecessor agency. Groundwater production by IWWVD wells is used to provide potable water to customers. Groundwater production by IWWVD wells is not used for any type of agricultural irrigation. The IWWVD's reported production in the Questionnaire exactly matches the Cooperative Group's production records from 1975 to 2017. Groundwater production was reported for 2019 to the Authority, and based on the 2019 Authority records, the IWWVD's groundwater production is nearly equal to the reported production in the Questionnaire.

Annual groundwater production reported in the Questionnaire between 1943 and 1973 was estimated based on historic census population data and per-capita water use, while annual groundwater production reported in the Questionnaire between 1974 and 2019 (including the Base Period) was estimated based on metered records. The production estimates between 1943 and 1973 are likely appropriate given the time period and the use of water by Indian Wells Valley residents for domestic uses and for irrigation of landscaping and windbreak trees. Metered records are generally considered reliable and accurate methods of groundwater production estimation.

Appendix E: Pumping Verification Report for Indian Wells Valley Water District

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production by IWVWD as reported in the response to the Questionnaire during the Base Period are shown in Table E-3. As reported in the response to the Questionnaire, the IWVWD's lowest production during the Base Period was 7,318.7 AF in 2014.

J:\2652 IWVGA\Pumping Verification Reports\IWVWD\Pumping Verification Report (IWVWD).docx

Table E-1
Well Construction Information

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
Well 09A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 34	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pending

Notes:

- According to SWRCB online database, IWVWD owns 11 wells (10 active and 1 pending)
- The other wells have either destroyed or abandoned.

**Table E-2
Data Source Used For Groundwater Production Estimation**

Year	Groundwater Production (acre-foot)	Estimate Method	Remark: Population*
1943	41.2	Population	196
1944	95.8	Population	456
1945	150.8	Population	718
1946	205.8	Population	980
1947	260.8	Population	1,242
1948	315.8	Population	1,504
1949	370.9	Population	1,766
1950	425.9	Population	2,028
1951	467.0	Population	2,224
1952	512.1	Population	2,439
1953	561.6	Population	2,674
1954	615.9	Population	2,933
1955	675.3	Population	3,216
1956	740.6	Population	3,527
1957	812.1	Population	3,867
1958	890.6	Population	4,241
1959	976.6	Population	4,651
1960	1,070.8	Population	5,099
1961	1,114.8	Population	5,309
1962	1,160.6	Population	5,527
1963	1,208.3	Population	5,754
1964	1,258.0	Population	5,990
1965	1,287.0	Population	6,237
1966	1,363.5	Population	6,493
1967	1,419.6	Population	6,760
1968	1,477.9	Population	7,038
1969	1,538.6	Population	7,327
1970	1,930.0	Population	7,629
1971	2,053.0	Population	8,212
1972	2,209.8	Population	8,839
1973	2,378.6	Population	9,515
1974	2,794.0	Meter	N/A
1975	2,983.0	Meter	N/A
1976	3,099.0	Meter	N/A
1977	3,063.0	Meter	N/A
1978	3,357.0	Meter	N/A
1979	3,402.0	Meter	N/A
1980	3,319.0	Meter	N/A
1981	4,223.0	Meter	N/A
1982	3,963.0	Meter	N/A
1983	4,316.0	Meter	N/A
1984	4,940.0	Meter	N/A
1985	4,981.0	Meter	N/A

**Table E-2
Data Source Used For Groundwater Production Estimation**

Year	Groundwater Production (acre-foot)	Estimate Method	Remark: Population*
1986	5,901.0	Meter	N/A
1987	7,426.0	Meter	N/A
1988	7,889.0	Meter	N/A
1989	8,725.0	Meter	N/A
1990	8,600.0	Meter	N/A
1991	7,700.0	Meter	N/A
1992	7,650.0	Meter	N/A
1993	7,800.0	Meter	N/A
1994	8,300.0	Meter	N/A
1995	8,100.0	Meter	N/A
1996	8,504.0	Meter	N/A
1997	8,534.0	Meter	N/A
1998	7,719.0	Meter	N/A
1999	8,242.0	Meter	N/A
2000	8,148.0	Meter	N/A
2001	8,392.0	Meter	N/A
2002	8,865.0	Meter	N/A
2003	9,098.0	Meter	N/A
2004	8,992.0	Meter	N/A
2005	8,545.0	Meter	N/A
2006	8,864.4	Meter	N/A
2007	9,198.5	Meter	N/A
2008	8,564.8	Meter	N/A
2009	8,398.2	Meter	N/A
2010	7,570.0	Meter	N/A
2011	7,364.3	Meter	N/A
2012	7,633.5	Meter	N/A
2013	7,531.7	Meter	N/A
2014	7,318.7	Meter	N/A
2015	7,050.0	Meter	N/A
2016	6,411.8	Meter	N/A
2017	6,506.6	Meter	N/A
2018	6,769.8	Meter	N/A
2019	6,120.1	Meter	N/A

Notes:

*Average water use per person as reported in the Questionnaire is:

0.21 AF between 1943 and 1969

0.25 AF between 1970 and 1973

Table E-3

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Well	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	N/A	7,570.0	630.8	N/A	N/A	N/A	7,570.0	630.8333	0.0%
2011	N/A	7,364.3	613.7	N/A	N/A	N/A	7,364.3	613.6875	0.0%
2012	N/A	7,633.5	636.1	N/A	N/A	N/A	7,633.5	636.1208	0.0%
2013	N/A	7,531.7	627.6	N/A	N/A	N/A	7,531.7	627.6408	0.0%
2014	N/A	7,318.7	609.9	N/A	N/A	N/A	7,318.7	609.8917	0.0%

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- IWVWD reported groundwater production of 6,120.1 AF in 2019. The IWVGA report has a record of 6,116.2 AF in 2019. The discrepancy is 0.06 %.

APPENDIX F
Verification Report for
Jumper Street Water Co-op

Appendix F: Pumping Verification Report for Jumper Street Water Cooperative

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the Jumper Street Water Cooperative for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The Jumper Street Water Cooperative (Jumper Street Co-op) is a cooperative water group located in Inyokern, California. Groundwater has been extracted to provide potable water to customers for household and landscaping usages since 1988 within the Jumper Street Co-op service area of approximately 17.5 acres. There were zero customer connections prior to May 1988; 8 connections between May 1988 and the end of 1991; and 7 connections between 1992 and present. The beginning date of groundwater extraction for potable water service is not known; however, groundwater has been extracted by a well drilled under County Permit H-618 since 1988.

Description of Facilities

There is one (1) active well owned by the Jumper Street Co-op; the active well is located in Kern County Assessor Parcel Number 352-440-03. The well was drilled in 1985 with a static water level of 110 feet below ground surface (bgs), measured when the well was installed, and a total depth of 250 feet bgs. The pump was manufactured by Sta-Rite Industries and is rated 5 horsepower. There is a flow meter installed to measure groundwater extraction; however, the Jumper Street Co-op did not regularly record the volume of groundwater extraction until recently. General information on well construction, water level, well pumps, and service status is provided in Table F-1.

Groundwater Production

According to the responses to the Questionnaire, the total groundwater extracted between May 23, 1988 and February 1, 2020 based on meter total reading is approximately 205.8 AF, and the average annual groundwater extracted is approximately 6.24 AF. Jumper Street Co-op's reported 2019 groundwater production is approximately 4.83 AF.

Verification Data and Information

All of the data provided in the Questionnaire that can be used in the verification of groundwater production is described below.

Groundwater Production Questionnaire

The Jumper Street Co-op indicated in the responses of the Questionnaire that the average annual groundwater extraction between 1988 and present is approximately 6.24 AF. Though the well has a flow meter installed, the Jumper Street Co-op did not provide records of extraction readings. The Jumper Street Co-op also reported a total 2019 extraction of approximately 4.83 AF based on monthly flow meter readings.

Basis of Verification

The available data discussed in the "**Verification Data and Information**" section was considered in the verification of groundwater production.

Records of Groundwater Production from the Authority and Cooperative Group

The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) do not have records of groundwater production for Jumper Street

Co-op. The Authority has a record of 5.01 AF groundwater extracted at the Jumper Street Co-op in 2019.

Review of Methods and Verification and Conclusions

Although the reported groundwater production in the Questionnaire covers the period between 1988 and 2019, verifications of groundwater production from the Cooperative Group were not performed because the Cooperative Group has no production records for this producer. The Authority's production records show that groundwater production by Jumper Street Co-op was 5.01 AF in 2019, which closely matches the production of 4.83 AF reported in the Questionnaire with a discrepancy of 0.18 AF. Annual groundwater production for the Base Period (from 2010 to 2014) as reported in the Questionnaire, are shown on Table F-2. Due to the lack of available groundwater production records from the Cooperative Group, a comparison of groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table F-2.

The Jumper Street Co-op does not apply extracted groundwater for agricultural purposes; therefore, extraction estimates based on land usage were not performed. In addition, verifications of groundwater production based on power consumption data and/or empirical equations were not performed due to the lack of data provided in the response to the Questionnaire.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period (Table F-2) is the average annual groundwater production for the period between 1988 and present; therefore, the lowest annual Base Period groundwater production cannot be properly determined. It should be noted that the Authority production records show that groundwater production by Jumper Street Co-op was 5.01 AF in 2019, which closely

Appendix F: Pumping Verification Report for Jumper Street Water Cooperative

matches the production of 4.83 AF reported in the response to the Questionnaire. In addition, the Authority's 2019 production record for the Jumper Street Co-op also reasonably matches the average annual production of 6.24 AF provided in the response to the Questionnaire.

J:\2652 IWVGA\Pumping Verification Reports\Whole Report\Appendix Text - Revised_JMM\Appendix F - JumperStCoop_jmm.docx

**Table F-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
1	1985	250	N/A	110	N/A	N/A	5	N/A	N/A	N/A	Active

Notes:

- Jumper St. Water Co-op extracted groundwater to provide potable water to customers with Permit # 0005800.
- Groundwater extraction starting year is unknown, but the Permit was initiated in 1988.
- An annual average groundwater production (6.236 AFY) was provided based on total production from 1988 through 2020.

Table F-2
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	1	6.24	0.52	N/A	N/A	N/A	N/A	N/A	N/A
2011	1	6.24	0.52	N/A	N/A	N/A	N/A	N/A	N/A
2012	1	6.24	0.52	N/A	N/A	N/A	N/A	N/A	N/A
2013	1	6.24	0.52	N/A	N/A	N/A	N/A	N/A	N/A
2014	1	6.24	0.52	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Jumper reported an average groundwater production of 4.83 AF in 2019. The Authority has a record of 5.01 AF in 2019.

- The discrepancy is approximately 3.7 % (the Authority record is 0.18 AF more than the Jumper reported production).

APPENDIX G
Verification Report for
Kern County Public Works Department

Appendix G: Pumping Verification Report for Kern County Public Works Department

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from the Kern County Public Works Department for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

The Kern County Public Works Department (Department) Offices are located in the Kern County Public Services Building in Bakersfield, California. The Department manages solid waste facilities on approximately 505 acres of property that is located within the Basin boundary. Groundwater has been extracted for a variety of purposes at the Department's solid waste facilities, including dust control, fire suppression, and onsite sanitary facilities that have been operating since 1968. The Department indicated that groundwater extractions may have occurred prior to 1968 due to the need for water during landfill construction activities. There is one (1) active well and one (1) inactive well on the property owned by the Department. Extracted groundwater has been reportedly not used for agricultural purposes.

Description of Facilities

There is one (1) active well and one (1) inactive well owned by the Department. Both wells are located on Kern County Assessor Parcel Number (APN) 341-072-40. The active well has a submersible pump rated 50 horsepower installed at a depth of 550 feet below ground surface (bgs). As indicated by the Department, the inactive well may have been installed prior to 1968. This well became inactive in 2010 due to poor well condition and performance. General information on well construction, water level, well pumps, and service status is provided in Table G-1.

Groundwater Production

According to the responses to the Questionnaire, the Department kept a log of water truck loads (with capacity and volume of each water truck) for the period between 1983 and 2015 to record groundwater extraction. A McCrometer turbine meter was installed in 2015 and has since been used to measure groundwater extraction. Groundwater extraction data prior to 1983 was not provided in the response to the Questionnaire; however, the Department indicated that groundwater extraction prior to 1983 was also measured based on the counting of water truck loads. Though the quantity of groundwater extractions between 1983 and 2015 was not provided in the response to the Questionnaire, the Department indicated in the response to the Questionnaire that the average annual groundwater extraction is approximately 20 acre-feet (AF) and provided supporting monthly groundwater extraction datasheet between August 2018 and January 2020. The supporting monthly extraction data is provided in Appendix G-1.

Verification Data and Information

All of the data provided in the response to the Questionnaire that can be utilized in the verification of the groundwater production are described below.

Groundwater Production Questionnaire

The Department indicated in the responses to the Questionnaire that the average annual quantity of groundwater extracted between 1983 and present day is approximately 20 AFY. The Department's supporting documentation only provides monthly groundwater extractions between August 2018 and January 2020, measured through the use of a turbine meter.

Basis of Verification

The available data discussed in the "**Verification Data and Information**" section was considered in the verification of groundwater production.

Records of Groundwater Production from the Authority and Cooperative Group

The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) does not have records of groundwater production for the Department. The Authority has partial record that groundwater extractions by the Department during 2019 were approximately 13.94 AF (missing November 2019 data). Although the Authority's 2019 extraction record is not complete, it reasonably matches the Department's 2019 estimated groundwater extraction of 15.8 AF (see Appendix G-1). Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the Questionnaire are shown on Table G-2. Due to the lack of available groundwater production records from the Cooperative Group, a comparison of groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table G-2.

Review of Methods and Verification and Conclusions

Although the reported groundwater production in the response to the Questionnaire covers the period between 1983 and 2019, verifications of groundwater production from the Cooperative Group were not performed because the Cooperative Group has no production records for the Department. The Authority's production records show that groundwater production by the Department was approximately 13.94 AF in 2019 (missing November 2019 extraction data), which reasonably matches the 2019 production of 15.8 AF reported in the response to the Questionnaire and the estimated annual average production of 20 AF reported in the response to the Questionnaire.

The Department does not apply extracted groundwater for agricultural purposes; therefore, an extraction estimate based on land use was not performed. In addition, verifications of groundwater production based on power consumption data and/or empirical equations were not performed due to the lack of data provided in the response to the Questionnaire.

Appendix G: Pumping Verification Report for Kern County Public Works Department

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. The Department provided average annual groundwater extractions for the period between 1983 and present day in the response to the Questionnaire; therefore, the lowest annual Base Period groundwater production cannot be properly verified. It should be noted that the Authority's production records show that groundwater production by the Department was approximately 13.94 AF (missing November 2019 extraction data) in 2019, which reasonably matches the average annual production of 20 AF reported in the response to the Questionnaire.

J:\2652 IWVGA\Pumping Verification Reports\Whole Report\Appendix Text - Revised_JMM\Appendix G - KernCountyPublicWorks_jmm.docx

**Table G-1
Well Construction Information**

Well Name	Date Drilled	Well Depth	Casing Length	Static Water Level (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
1	1968*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
2	1983	606	585	340	550	Submersible	50	Grundfos (A15B70 - 300 gpm)	285 gpm	4/5/2005	Active

Notes:

- Kern County Public Works provided documentation for one active well.

* The inactive well estimated to be installed prior to 1968, and became inactive in 2010.

Table G-2

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	1	20	1.7	N/A	N/A	N/A	N/A	N/A	N/A
2011	1	20	1.7	N/A	N/A	N/A	N/A	N/A	N/A
2012	1	20	1.7	N/A	N/A	N/A	N/A	N/A	N/A
2013	1	20	1.7	N/A	N/A	N/A	N/A	N/A	N/A
2014	1	20	1.7	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Kern County Public Work reported groundwater extraction of about 15.8 AF in 2019.
- The IWVGA report also has a record of 13.94 AF (missing November reading in 2019).
- The discrepancy is 11.6 %; however, November extraction is missing in the IWVGA reported 2019 extraction.

APPENDIX G-1

Kern County

Public Works Department

Supporting Monthly

Extraction Data

Ridgecrest Water Meter Reading for Groundwater Extraction Fee
 Indian Wells Valley Groundwater Authority

<u>Date</u>	<u>Meter Reading</u> <u>(x100 gallons)</u>	<u>Monthly Usage</u> <u>(acre-feet)</u>	<u>Days</u>	<u>Ave. Daily Usage</u> <u>(x100 gal.)</u>
08/15/2018	83383			
09/11/2018	89002			
09/25/2018	91720	2.559		
10/08/2018	93895	1.502	27	181.22
11/01/2018	98216			
11/06/2018	99428	1.698	29	190.79
12/04/2018	103394	1.217	28	141.64
01/02/2019	106196	0.860	29	96.62
02/01/2019	108525	0.715	30	77.63
03/01/2019	110310	0.548	28	63.75
04/02/2019	113466	0.969	32	98.63
05/01/2019	117246	1.160	29	130.34
06/01/2019	122336	1.562	31	164.19
07/01/2019	128502	1.892	30	205.53
08/01/2019	134641	1.884	31	198.03
09/01/2019	141253	2.029	31	213.29
10/01/2019	146798	1.702	30	184.83
11/01/2019	152720	1.817	31	191.03
12/03/2019	156602	1.191	32	121.31
01/06/2020	157562	0.295	34	28.24
01/31/2020	160621	0.939	25	122.36

APPENDIX H
Verification Report for
Meadowbrook Dairy

Appendix H: Pumping Verification Report for Meadowbrook Dairy

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Meadowbrook Dairy for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Meadowbrook Dairy (Meadowbrook) reports that the total area being served groundwater extractions from the Basin is approximately 1,277 acres with approximately 891 acres being dedicated to agricultural purposes (alfalfa approximately 685 acres, giant Bermuda approximately 184 acres, olives approximately 22 acres). The predecessor owners of Meadowbrook's properties have reported groundwater production starting in 1975, with production possibly occurring prior to 1975. There are currently fourteen (14) wells drilled on the Meadowbrook properties, but no information was provided regarding any additional wells existing on the properties prior to 1975. Extracted groundwater has been reportedly used for domestic and agricultural (irrigation of alfalfa, giant Bermuda, and olives) purposes. A significant portion of the total extracted groundwater has been used for agricultural purposes, though the annual volume of water applied to each crop depends on the acreage dedicated during that year.

Description of Facilities

There are currently eleven (11) active wells and three (3) inactive wells located within Meadowbrook's properties. Extracted groundwater is either fed into a drip irrigation system or a center pivot irrigation system with down-spray nozzles for agricultural irrigation, or sent to homes for domestic uses. General information provided by Meadowbrook on the installation date, static water level, well pumping depths, and service status of Meadowbrook wells is provided in Table H-1.

Groundwater Production

Historical groundwater production based on metered records are not available because flow meters were not installed on the Meadowbrook wells until 2018. In the response to the Questionnaire, Meadowbrook provided the estimated combined groundwater production for years 1975 to 2019 from all wells that were active during each year. Prior to 2018, estimates of production were determined using power consumption and pump test data. Details of the production estimates are discussed in the following sections. The annual groundwater production estimates, as reported by Meadowbrook, between 1975 and 2019 are provided on Table H-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by Meadowbrook from the Basin.

Groundwater Production Questionnaire

Meadowbrook provided the combined total annual groundwater production of the active wells for each year between 1975 and 2019. Meadowbrook estimated the groundwater production based on power consumption records and pump test data for the years 1975 through 2017 and from flow meters for 2018 and 2019. The power consumption and pump test data attached to the response to the Questionnaire were summarized and are attached to this Report as Appendix H-1 and Appendix H-2, respectively.

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the response to the Questionnaire are shown on Table H-3. Between 2010 and 2014, annual groundwater production reported in the response to the Questionnaire ranged from 6,840 acre-feet (AF) in 2011 to 8,920 AF in 2014.

The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) reported groundwater production estimates from 1975 to 2016 for

Meadowbrook. A comparison between the Cooperative Group's records and the production reported in the Questionnaire is shown on Table H-4.

Power Consumption and Pump Test Data

Electric power consumption (see Appendix H-1) and pump test data (see Appendix H-2) from the Southern California Edison Company (Edison) for the current eleven (11) active wells submitted with the response to the Questionnaire were summarized and tabulated. The data shown in Appendix H-1 includes monthly power consumption for all active wells (excluding Coyote Trails Well and HQ Well). The data shown in Appendix H-2 includes monthly power usage (in kilowatt-hours, kWh), and power usage rate data taken from pump tests (kWh per AF) for all active wells (excluding Coyote Trails Well and HQ Well). Pump tests were conducted at various dates throughout the year for the different wells. For an analysis of pump efficiency, the most conservative value was selected (least kWh per AF) across all pump tests for a well in a given year.

No power consumption or pump test data was provided for Well 4R, which was drilled in February 2020.

Basis of Verification

The available data discussed in the "**Verification Data and Information**" section was considered in the verification of groundwater production by Meadowbrook.

Records of Groundwater Production from the Authority and Cooperative Group

The Cooperative Group presented groundwater production estimates for Meadowbrook from 1975 to 2016. A comparison between the Cooperative Group's records and the production reported in the response to the Questionnaire during this time period is shown in Table H-4. During the Base Period, discrepancies between the Cooperative Group's production estimates and Meadowbrook's reported values ranged

from 16% to - 44%. During the Base Period, the largest discrepancy was in 2011, where Meadowbrook reported an annual production of 6,840 AF and the Cooperative Group presented a production of 9,827 AF.

Power Consumption Data

Based on the data shown in Appendices H-1 and H-2, the annual groundwater production can be determined by totaling the monthly power consumption (kWh) for each well, and dividing it by their respective power usage rates (kWh/ AF). However, due to the limited hydraulic test and power consumption data provided, groundwater production for the Coyote Trails Well and the HQ Well was unable to be estimated. Therefore, the annual groundwater production from all active wells could not be approximated or compared against reported values from the Cooperative Group.

Review of Methods and Verification and Conclusions

Meadowbrook reports the total area being served by groundwater extractions from the Basin is approximately 1,277 acres with approximately 891 acres being dedicated to agricultural purposes (alfalfa approximately 685 acres, giant Bermuda approximately 184 acres, olives approximately 22 acres)

The Cooperative Group presented groundwater production estimates from 1975 to 2016, and a comparison between the Cooperative Group's records and the production reported in the response to the Questionnaire was performed. Throughout this time period, there were discrepancies reaching as high as 79% (see Table H-4). Electric power consumption and pump test data from Edison was submitted in the response to the Questionnaire, but because there was no data provided for the Coyote Trails Well and HQ Well, total annual production could not be approximated.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater

Appendix H: Pumping Verification Report for Meadowbrook Dairy

production reported in the response to the Questionnaire during the Base Period are shown in Table H-3. As reported in the response to the Questionnaire, Meadowbrook's lowest annual Base Period groundwater production of 6,840 acre-feet (AF) occurred in 2011, estimated using available power consumption records.

J:\2652 IWVGA\Pumping Verification Reports\Whole Report\Appendix Text - Revised_JMM\Appendix H - Meadowbrook_jmm.docx

Table H-1

Well Construction Information

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
Well 1 (North)	1979/Apr	N/A	N/A	247.4	271.6	N/A	200	N/A	N/A	2/10/2015	Active
Well 2 (Big Horn)	2008/Mar	N/A	N/A	262.0	283.0	N/A	400	N/A	N/A	3/8/2016	Active
Well 3 (New)	2006/Feb	N/A	N/A	215.6	251.1	N/A	200	N/A	N/A	4/4/2017	Active
Well 4	1981/May	N/A	N/A	188.9	227.8	N/A	150	N/A	N/A	4/4/2017	Active
Well 4R	2020/Feb	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 5	1976/Mar	N/A	N/A	160.2	190.3	N/A	150	N/A	N/A	4/4/2017	Active
Well 6	1980/Jan	N/A	N/A	147.5	178.1	N/A	150	N/A	N/A	4/4/2017	Active
Well 7	1980/Jan	N/A	N/A	130.0	151.3	N/A	150	N/A	N/A	3/8/2016	Active
Well 8	1979/Dec	N/A	N/A	164.5	179.9	N/A	150	N/A	N/A	4/4/2017	Active
Coyote Trails Well	1980/Feb	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
HQ Well	2014/May	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Old Well 2	1979/Apr	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Old Well 3	1977/Mar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Old HQ Well	1970/Jun	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

Notes:

- MeadowBrook Dairy indicated the predecessor owners reported groundwater production starting in 1975
- Production may have occurred prior to 1975.

Table H-2
Data Source Used For Groundwater Production Estimation

Year	Groundwater Production (acre-foot)	Estimate Method
1975	1,516	Power Consumption and pump efficiency test
1976	1,494	Power Consumption and pump efficiency test
1977	2,702	Power Consumption and pump efficiency test
1978	3,216	Power Consumption and pump efficiency test
1979	3,275	Power Consumption and pump efficiency test
1980	12,700	Power Consumption and pump efficiency test
1981	12,700	Power Consumption and pump efficiency test
1982	12,700	Power Consumption and pump efficiency test
1983	9,960	Power Consumption and pump efficiency test
1984	9,800	Power Consumption and pump efficiency test
1985	9,850	Power Consumption and pump efficiency test
1986	9,850	Power Consumption and pump efficiency test
1987	6,640	Power Consumption and pump efficiency test
1988	6,830	Power Consumption and pump efficiency test
1989	7,064	Power Consumption and pump efficiency test
1990	6,187	Power Consumption and pump efficiency test
1991	6,737	Power Consumption and pump efficiency test
1992	7,104	Power Consumption and pump efficiency test
1993	7,701	Power Consumption and pump efficiency test
1994	7,504	Power Consumption and pump efficiency test
1995	7,427	Power Consumption and pump efficiency test
1996	7,807	Power Consumption and pump efficiency test
1997	7,800	Power Consumption and pump efficiency test
1998	7,800	Power Consumption and pump efficiency test
1999	6,030	Power Consumption and pump efficiency test
2000	6,990	Power Consumption and pump efficiency test
2001	6,160	Power Consumption and pump efficiency test
2002	5,210	Power Consumption and pump efficiency test
2003	6,410	Power Consumption and pump efficiency test
2004	6,460	Power Consumption and pump efficiency test
2005	5,350	Power Consumption and pump efficiency test
2006	7,010	Power Consumption and pump efficiency test
2007	7,590	Power Consumption and pump efficiency test
2008	7,680	Power Consumption and pump efficiency test
2009	8,760	Power Consumption and pump efficiency test
2010	6,880	Power Consumption and pump efficiency test
2011	6,840	Power Consumption and pump efficiency test
2012	7,660	Power Consumption and pump efficiency test
2013	8,070	Power Consumption and pump efficiency test
2014	8,920	Power Consumption and pump efficiency test
2015	8,030	Power Consumption and pump efficiency test
2016	7,580	Power Consumption and pump efficiency test
2017	6,301	Power Consumption and pump efficiency test

Table H-2
Data Source Used For Groundwater Production Estimation

Year	Groundwater Production (acre-foot)	Estimate Method
2018	4,755	Flowmeter
2019	4,403	Flowmeter

Notes:

- Monthly power consumption is listed in Appendix H-1: Power Consumption Data
- Total annual power consumption and pump efficiency test data is listed in Appendix H-2: Pump Efficiency and Estimated Annual Production

**Table H-3
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)**

Year	Number of Wells	Annual Production - Questionnaire 1*	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %	Annual Production - Verification*	Monthly Average	Discrepancy %
2010	11	6,880	573.3	N/A	N/A	N/A	9,437	786.42	-37.2%	6,053	504.38	12.0%
2011	11	6,840	570.0	N/A	N/A	N/A	9,827	818.92	-43.7%	5,763	480.22	15.8%
2012	11	7,660	638.3	N/A	N/A	N/A	9,876	823.00	-28.9%	6,818	568.15	11.0%
2013	11	8,070	672.5	N/A	N/A	N/A	9,354	779.50	-15.9%	6,852	570.98	15.1%
2014	11	8,920	743.3	N/A	N/A	N/A	7,524	627.00	15.7%	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA,\ Cooperative\ Group,\ or\ Verification)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

* Using available Edison monthly power consumption (kWh) and energy efficiency from pump tests (kWh/AF), annual groundwater extractions between 2010 and 2013 were recalculated (Appendix H-2) by dividing power consumption by energy efficiency. Pump test records were not provided for 2014, so annual production was unable to be verified

- Results indicate the recalculated extraction are slightly less than the reported extraction (GW extracted estimate excludes Coyote Trails Well and HQ Well due to no hydraulic test and power consumption data)

- Meadowbrook reported groundwater production of 4,403 AF in 2019. The IWVGA report also has a record of 4,403 AF in 2019. The discrepancy is 0.0%

Table H-4
Reported Annual Groundwater Production Between 1937 and 2016 (unit: acre-foot)

Year	Number of Well	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
1937-1974	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1975	N/A	1,516	126.3	N/A	N/A	N/A	1,516	126.3	0.0%
1976	N/A	1,494	124.5	N/A	N/A	N/A	1,494	124.5	0.0%
1977	N/A	2,702	225.2	N/A	N/A	N/A	2,702	225.2	0.0%
1978	N/A	3,216	268.0	N/A	N/A	N/A	3,216	268.0	0.0%
1979	N/A	3,275	272.9	N/A	N/A	N/A	3,257	271.4	0.5%
1980	N/A	12,700	1,058.3	N/A	N/A	N/A	7,515	626.3	40.8%
1981	N/A	12,700	1,058.3	N/A	N/A	N/A	10,036	836.3	21.0%
1982	N/A	12,700	1,058.3	N/A	N/A	N/A	10,324	860.3	18.7%
1983	N/A	9,960	830.0	N/A	N/A	N/A	10,087	840.6	-1.3%
1984	N/A	9,800	816.7	N/A	N/A	N/A	10,312	859.3	-5.2%
1985	N/A	9,850	820.8	N/A	N/A	N/A	10,100	841.7	-2.5%
1986	N/A	9,850	820.8	N/A	N/A	N/A	5,389	449.1	45.3%
1987	N/A	6,640	553.3	N/A	N/A	N/A	4,141	345.1	37.6%
1988	N/A	6,830	569.2	N/A	N/A	N/A	5,255	437.9	23.1%
1989	N/A	7,064	588.7	N/A	N/A	N/A	7,064	588.7	0.0%
1990	N/A	6,187	515.6	N/A	N/A	N/A	6,187	515.6	0.0%
1991	N/A	6,737	561.4	N/A	N/A	N/A	6,737	561.4	0.0%
1992	N/A	7,104	592.0	N/A	N/A	N/A	7,104	592.0	0.0%
1993	N/A	7,701	641.8	N/A	N/A	N/A	7,701	641.8	0.0%
1994	N/A	7,504	625.3	N/A	N/A	N/A	7,504	625.3	0.0%
1995	N/A	7,427	618.9	N/A	N/A	N/A	7,427	618.9	0.0%
1996	N/A	7,807	650.6	N/A	N/A	N/A	7,807	650.6	0.0%
1997	N/A	7,800	650.0	N/A	N/A	N/A	7,800	650.0	0.0%
1998	N/A	7,800	650.0	N/A	N/A	N/A	7,800	650.0	0.0%
1999	N/A	6,030	502.5	N/A	N/A	N/A	7,800	650.0	-29.4%
2000	N/A	6,990	582.5	N/A	N/A	N/A	7,800	650.0	-11.6%
2001	N/A	6,160	513.3	N/A	N/A	N/A	8,150	679.2	-32.3%
2002	N/A	5,210	434.2	N/A	N/A	N/A	8,460	705.0	-62.4%
2003	N/A	6,410	534.2	N/A	N/A	N/A	9,420	785.0	-47.0%
2004	N/A	6,460	538.3	N/A	N/A	N/A	9,370	780.8	-45.0%
2005	N/A	5,350	445.8	N/A	N/A	N/A	9,580	798.3	-79.1%
2006	N/A	7,010	584.2	N/A	N/A	N/A	9,460	788.3	-35.0%
2007	N/A	7,590	632.5	N/A	N/A	N/A	9,270	772.5	-22.1%
2008	N/A	7,680	640.0	N/A	N/A	N/A	8,957	746.4	-16.6%
2009	N/A	8,760	730.0	N/A	N/A	N/A	9,536	794.7	-8.9%
2010	N/A	6,880	573.3	N/A	N/A	N/A	9,437	786.4	-37.2%
2011	N/A	6,840	570.0	N/A	N/A	N/A	9,827	818.9	-43.7%
2012	N/A	7,660	638.3	N/A	N/A	N/A	9,876	823.0	-28.9%
2013	N/A	8,070	672.5	N/A	N/A	N/A	9,354	779.5	-15.9%
2014	N/A	8,920	743.3	N/A	N/A	N/A	7,524	627.0	15.7%
2015	N/A	8,030	669.2	N/A	N/A	N/A	6,517	543.1	18.8%
2016	N/A	7,580	631.7	N/A	N/A	N/A	6,387	532.3	15.7%

APPENDIX H-1

Power Consumption

Data

Appendix H-1: Power Consumption Data

Year	Service Address	Power Consumption (kWh)											
		January	February	March	April	May	June	July	August	September	October	November	December
2008	112 Plant W1 Inyokern, CA	6,495	21,375	102,897	100,449	80,880	60,244	50,480	56,887	58,674	50,047	8,878	0
	113 Plant W2 Inyokern, CA	586	3,648	13,923	16,127	4,604	0	7	0	0	0	0	0
	114 Plant W7 Inyokern, CA	15	18,965	60,708	33,848	54,913	59,748	53,405	47,291	57,677	46,687	11,856	37
	117 Plant W6 Inyokern, CA	18	10,990	40,780	27,099	38,870	47,457	52,162	46,614	40,343	42,869	7,724	48
	115 Plant W8 Inyokern, CA	1	9,923	34,050	23,904	34,330	38,010	41,367	38,090	36,110	31,563	6,792	45
	7650 Brown Rd W5 Inyokern, CA	37	20,363	54,718	29,078	57,308	59,667	56,672	54,224	46,744	62,992	10,045	61
	127 Plant W4 Inyokern, CA	25,672	39,968	31,403	55,473	60,318	57,975	8,738	44,783	42,113	63,576	9,998	16
	105 Plant W3 Inyokern, CA	2,430	26,751	77,601	49,367	61,683	68,464	67,748	58,426	64,572	54,274	14,833	126
	8902 N Bighorn Inyokern, CA	N/A	N/A	N/A	N/A	N/A	31,784	101,068	412	52,503	53,780	12,250	99
	Total	35,254	151,983	416,080	335,345	392,906	423,349	431,647	346,727	398,736	405,788	82,376	432
2009	112 Plant W1 Inyokern, CA	0	96	14,329	11,225	23,905	48,939	51,532	24,556	0	87,895	41,511	0
	113 Plant W2 Inyokern, CA	0	0	0	0	0	0	0	0	0	9,957	4,943	0
	114 Plant W7 Inyokern, CA	38	6,677	53,393	69,024	54,903	57,069	64,161	50,825	64,378	37,462	20,543	21
	117 Plant W6 Inyokern, CA	46	8,210	49,448	56,162	37,347	47,872	64,503	62,754	50,444	33,805	21,093	44
	115 Plant W8 Inyokern, CA	880	6,061	24,160	47,968	36,555	40,446	47,532	43,488	44,052	30,258	14,511	38
	7650 Brown Rd W5 Inyokern, CA	54	8,077	42,620	66,426	54,746	56,948	52,456	62,111	68,239	39,869	24,047	35
	127 Plant W4 Inyokern, CA	14	3,063	62,492	52,853	62,613	57,873	61,203	59,198	62,673	45,647	24,270	15
	105 Plant W3 Inyokern, CA	9,448	26,452	63,165	84,373	50,084	85,400	65,214	14,232	79,834	62,365	34,972	121
	8902 N Bighorn Inyokern, CA	127	12,094	113,645	168,976	110,476	62,041	95,889	102,084	135,924	531	325	104
	Total	10,607	70,730	423,252	557,007	430,629	456,588	502,490	419,248	505,544	347,789	186,215	378
2010	112 Plant W1 Inyokern, CA	0	11,107	70	0	4,137	42,772	77,589	45,959	52,394	62,349	13,535	7,275
	113 Plant W2 Inyokern, CA	0	997	0	0	0	0	44	0	0	3,138	1,922	1,006
	114 Plant W7 Inyokern, CA	3,112	9,131	47,633	39,316	49,242	50,374	56,851	54,504	52,452	50,002	4,457	33
	117 Plant W6 Inyokern, CA	36	9,678	52,541	45,076	41,423	49,841	58,776	49,771	56,631	41,524	552	41
	115 Plant W8 Inyokern, CA	1,853	3,218	23,131	31,123	31,276	46,181	45,762	43,573	35,672	22,030	4,628	1,542
	7650 Brown Rd W5 Inyokern, CA	0	32	47,190	41,992	57,880	24,367	65,439	4,993	35,578	31,970	2,099	3,390
	127 Plant W4 Inyokern, CA	15	22	47,136	41,067	49,582	30,287	11,463	108	21,908	28,345	9,535	3,666
	105 Plant W3 Inyokern, CA	965	10,010	55,312	54,023	46,012	63,461	80,935	79,194	52,850	35,786	16,292	8,788
	8902 N Bighorn Inyokern, CA	110	4,634	103,387	84,140	91,892	73,205	67,736	78,472	64,421	41,092	199	165
	Total	6,091	48,829	376,400	336,737	371,444	380,488	464,595	356,574	371,906	316,236	53,219	25,906
2011	112 Plant W1 Inyokern, CA	0	3,206	92	6,196	12,145	1,032	1,250	22,291	0	25,195	0	0
	113 Plant W2 Inyokern, CA	0	0	0	0	0	0	0	0	0	0	0	0
	114 Plant W7 Inyokern, CA	32	11,857	17,931	32,705	30,299	54,093	35,955	57,222	6,037	28,486	14,511	4,760
	117 Plant W6 Inyokern, CA	4,804	12,707	17,247	34,046	23,139	51,311	30,404	42,609	20,169	26,605	15,871	4,806
	115 Plant W8 Inyokern, CA	38	1,150	15,836	35,846	29,985	32,383	38,750	42,692	41,028	27,022	6,573	11
	7650 Brown Rd W5 Inyokern, CA	50	2,715	32,143	49,459	34,898	54,412	43,782	59,649	55,790	39,564	16,993	2,516
	127 Plant W4 Inyokern, CA	2	2,514	38,234	46,146	34,421	51,301	56,731	52,281	61,423	35,709	14,038	3,228
	105 Plant W3 Inyokern, CA	87	4,198	44,441	57,308	47,076	60,620	53,107	65,241	65,092	46,657	16,015	3,502
	8902 N Bighorn Inyokern, CA	110	3,389	81,551	91,614	103,269	118,830	117,766	130,918	125,927	81,320	40,720	6,759
	Total	5,123	41,736	247,475	353,320	315,232	423,982	377,745	472,903	375,466	310,558	124,721	25,582
2012	112 Plant W1 Inyokern, CA	0	1,280	0	0	0	0	2,643	5,446	0	0	0	0
	113 Plant W2 Inyokern, CA	0	0	0	0	0	0	663	825	0	0	0	0
	114 Plant W7 Inyokern, CA	3,197	12,157	41,156	55,030	56,099	64,303	59,431	43,751	60,403	32,082	19,598	2,725
	117 Plant W6 Inyokern, CA	3,216	22,619	35,738	57,900	53,730	63,237	58,440	57,389	64,667	36,950	15,238	6
	115 Plant W8 Inyokern, CA	2,911	13,432	13,490	10	18,986	45,788	31,754	25,965	12,877	15,185	9,839	2,538
	7650 Brown Rd W5 Inyokern, CA	44	19,594	39,859	49,970	60,249	62,749	56,660	56,317	61,982	36,036	12,370	46
	127 Plant W4 Inyokern, CA	13	11,954	40,995	45,184	58,357	56,494	59,636	51,705	59,873	42,879	9,770	14
	105 Plant W3 Inyokern, CA	118	26,875	45,731	46,439	63,575	69,446	68,292	56,982	70,607	58,360	8,492	122
	8902 N Bighorn Inyokern, CA	118	51,451	102,665	70,327	159,453	141,346	139,128	133,374	129,920	123,770	7,511	107
	Total	9,617	159,362	319,634	324,860	470,449	503,363	476,647	431,754	460,329	345,262	82,818	5,558
2013	112 Plant W1 Inyokern, CA	0	0	68	0	0	0	0	0	0	0	0	0
	113 Plant W2 Inyokern, CA	0	0	0	0	0	0	0	0	0	0	0	0
	114 Plant W7 Inyokern, CA	20	5,527	49,329	52,080	64,308	60,605	62,983	63,438	56,717	50,882	9,360	8
	117 Plant W6 Inyokern, CA	61	17,678	54,846	46,317	63,450	59,759	60,807	67,927	53,805	50,909	12,282	46
	115 Plant W8 Inyokern, CA	1,575	7,359	17,647	22,031	3,497	32,007	38,137	30,643	27,930	30,214	2,973	25
	7650 Brown Rd W5 Inyokern, CA	117	15,292	52,917	48,656	64,672	62,406	59,838	60,140	52,826	42,140	11,649	51
	127 Plant W4 Inyokern, CA	69	15,635	55,292	52,925	75,988	65,283	56,060	53,811	47,984	38,291	11,893	945
	105 Plant W3 Inyokern, CA	121	12,492	59,865	57,671	338	38,506	69,307	86,193	71,161	37,437	12,475	15,331
	8902 N Bighorn Inyokern, CA	3,363	37,958	105,836	127,629	170,677	80,213	87,581	99,770	110,735	94,193	27,487	7,179
	Total	5,326	111,941	395,800	407,309	442,930	398,779	434,713	461,922	421,158	344,066	88,119	23,585
2014	112 Plant W1 Inyokern, CA	0	0	0	0	6,703	5,524	0	0	0	0	0	0
	113 Plant W2 Inyokern, CA	0	0	0	1	0	0	0	0	0	0	0	0
	114 Plant W7 Inyokern, CA	4,220	17,804	62,761	43,308	65,143	65,939	71,552	53,065	55,382	49,021	3,869	12
	117 Plant W6 Inyokern, CA	3,998	18,730	64,827	50,471	65,255	69,059	72,819	57,906	48,505	50,364	3,108	23
	115 Plant W8 Inyokern, CA	1,801	7,020	26,223	22,729	31,937	31,429	38,540	31,324	30,474	27,498	3,622	19
	7650 Brown Rd W5 Inyokern, CA	4,145	20,395	65,018	54,812	49,987	67,600	61,063	57,423	55,168	42,643	4,808	3,463
	127 Plant W4 Inyokern, CA	2,954	286	46,487	59,015	58,451	61,081	74,764	55,703	49,554	30,172	2,771	13
	105 Plant W3 Inyokern, CA	20,454	61,850	91,835	70,412	68,184	73,790	16,113	169	85,411	58,393	20,671	113
	8902 N Bighorn Inyokern, CA	15,166	52,929	148,542	121,710	146,391	155,019	162,339	132,291	161,197	129,463	7,137	255
	Total	52,738	179,014	505,693	422,458	492,051	529,441	497,190	387,881	485,691	387,554	45,986	3,898
2015	112 Plant W1 Inyokern, CA	0	94	0	0	8,653	0	0	0	0	0	0	0
	113 Plant W2 Inyokern, CA	0	0	0	0	779	0	0	0	0	0	0	0
	114 Plant W7 Inyokern, CA	31	24,803	60,061	46,098	58,525	65,225	58,332	58,679	49,275	14,627	14,106	41
	117 Plant W6 Inyokern, CA	2,649	27,496	57,711	46,144	54,526	66,745	56,409	64,838	49,951	15,119	6,308	67
	115 Plant W8 Inyokern, CA	9	10,623	23,885	22,796	30,348	33,621	28,866	30,942	25,989	7,778	5,230	1,314
	7650 Brown Rd W5 Inyokern, CA	10,075	34,021	61,158	19,161	57,641	77,7						

APPENDIX H-2
**Pump Efficiency and
Estimated Annual Production**

Appendix H-2: Pump Efficiency and Estimated Annual Production

	Well Name/Number	Date Drilled	Service Status	Date of Pump Test	Power Usage (kWh per AF)	Total Power Consumption (kWh)	Estimated GW Extraction (AF)
2009	Well 1 (North)	1979/Apr	Active	2/10/2009	571	303,988	532
	Well 2 (Big Horn)	2008/Mar	Active	2/10/2009	526	802,216	1,525
	Well 3 (New)	2006/Feb	Active	N/A	N/A	575,660	N/A
	Well 4	1981/May	Active	1/29/2009	588	491,914	837
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	1/29/2009	465	475,628	1,023
	Well 6	1980/Jan	Active	1/29/2009	672	431,728	642
	Well 7	1980/Jan	Active	1/29/2009	469	478,494	1,020
	Well 8	1979/Dec	Active	1/29/2009	757	335,949	444
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						6,023
2010	Well 1 (North)	1979/Apr	Active	3/4/2010	640	317,187	496
	Well 2 (Big Horn)	2008/Mar	Active	3/4/2010	566	609,453	1,077
	Well 3 (New)	2006/Feb	Active	3/4/2010	464	503,628	1,085
	Well 4	1981/May	Active	3/4/2010	498	243,134	488
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	3/4/2010	470	314,930	670
	Well 6	1980/Jan	Active	3/4/2010	426	405,890	953
	Well 7	1980/Jan	Active	3/4/2010	472	417,107	884
	Well 8	1979/Dec	Active	3/4/2010	725	289,989	400
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						6,053
2011	Well 1 (North)	1979/Apr	Active	3/7/2011	603	71,407	118
	Well 2 (Big Horn)	2008/Mar	Active	3/7/2011	570	902,173	1,583
	Well 3 (New)	2006/Feb	Active	3/7/2011	516	463,344	898
	Well 4	1981/May	Active	3/8/2011	509	396,028	778
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	3/8/2011	477	391,971	822
	Well 6	1980/Jan	Active	3/7/2011	500	283,718	567
	Well 7	1980/Jan	Active	3/8/2011	492	293,888	597
	Well 8	1979/Dec	Active	3/8/2011	680	271,314	399
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						5,763
2012	Well 1 (North)	1979/Apr	Active	2/28/2012	579	9,369	16
	Well 2 (Big Horn)	2008/Mar	Active	2/28/2012	534	1,059,170	1,983
	Well 3 (New)	2006/Feb	Active	2/28/2012	524	515,039	983
	Well 4	1981/May	Active	2/28/2012	491	436,874	890
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	3/6/2012	460	455,876	991
	Well 6	1980/Jan	Active	3/6/2012	553	469,130	848
	Well 7	1980/Jan	Active	3/6/2012	521	449,932	864
	Well 8	1979/Dec	Active	3/6/2012	795	192,775	242
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						6,818
2013	Well 1 (North)	1979/Apr	Active	2/27/2013	584	68	0
	Well 2 (Big Horn)	2008/Mar	Active	2/27/2013	541	952,621	1,761
	Well 3 (New)	2006/Feb	Active	2/27/2013	652	460,897	707
	Well 4	1981/May	Active	2/27/2013	456	474,176	1,040
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	3/12/2013	464	470,704	1,014
	Well 6	1980/Jan	Active	10/29/2013	474	487,887	1,029
	Well 7	1980/Jan	Active	3/12/2013	551	475,257	863
	Well 8	1979/Dec	Active	3/2/2013	489	214,038	438
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						6,852
2015	Well 1 (North)	1979/Apr	Active	2/10/2015	616	8,747	14
	Well 2 (Big Horn)	2008/Mar	Active	2/10/2015	573	1,089,944	1,902
	Well 3 (New)	2006/Feb	Active	2/17/2015	599	566,409	929
	Well 4	1981/May	Active	2/10/2015	564	441,751	783
	Well 4R	2020/Feb	Active	N/A	N/A	N/A	N/A
	Well 5	1976/Mar	Active	2/10/2015	471	372,221	790
	Well 6	1980/Jan	Active	2/17/2015	522	447,963	858
	Well 7	1980/Jan	Active	2/17/2015	563	449,803	799
	Well 8	1979/Dec	Active	2/17/2015	501	221,401	442
	Coyote Trails Well	1980/Feb	Active	N/A	N/A	N/A	N/A
	HQ Well	2014/May	Active	N/A	N/A	N/A	N/A
	Old Well 2	1979/Apr	Inactive	N/A	N/A	N/A	N/A
	Old Well 3	1977/Mar	Inactive	N/A	N/A	N/A	N/A
	Old HQ Well	1970/Jun	Inactive	N/A	N/A	N/A	N/A
	Total						6,518

Notes:

- Pump test records for 2014 were not provided
- Least power usage (kWh per AF) value chosen if multiple tests occurred on a single date or throughout year
- GW extracted estimate excludes Coyote Trails Well and HQ Well due to no hydraulic test and power consumption data
- Total Power Consumption data obtained from Appendix H-1
- Estimated Groundwater Extraction obtained by dividing Total Power Consumption (kWh) by power usage (kW per AF).

APPENDIX I
Verification Report for
Patricia Davis (Amberglow)

Appendix I: Pumping Verification Report for Patricia Davis (Amberglow)

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Ms. Patricia Davis (i.e. Amberglow Ranch) for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Ms. Davis owns 12 acres of property in Ridgecrest, California (APNs: 352-510-01, 352-510-05, and 352-510-06). The property is located within the Basin boundary. Ms. Davis reports that the property deed includes appurtenant water rights. Groundwater extraction started in 1968 for household use only, and expanded to agricultural use in 1983. There are three (3) wells located on this property. There is no information to suggest that any wells existed on this property prior to 1968. According to the response to the Questionnaire, groundwater is extracted from a well drilled under a Kern County Permit; however, the Permit Number was not provided. Currently, most of the extracted groundwater is used for agricultural purposes (pistachios), though the annual volume of water used for irrigation varies depends on the size of the pistachio orchard.

Description of Facilities

There are currently two (2) active wells (Wells 1 and 2) and one (1) inactive well (Well 3) located within this property. According to the well construction data provided by Ms. Davis, Well 1 was drilled in 1987 with a total depth of 350 feet and a static water level of 242 feet below ground surface (bgs). Well 2 was drilled in 2016 with a total depth of 462 feet and a static water level of 280 feet bgs. Ms. Davis indicated in the response to the Questionnaire that the well driller reports for both active wells have been submitted to the County; however, the well driller reports were not provided in the response to the Questionnaire. The inactive well was drilled in 1968, and groundwater extraction began at this well in 1968. The inactive well ceased extraction in 1987 due to well collapse. Ms.

Appendix I: Pumping Verification Report for Patricia Davis (Amberglow)

Davis installed a drip irrigation system in 1983 to minimize the waste of extracted groundwater for pistachio tree irrigation. Groundwater extractions were not monitored until 2019 when flow meters were installed at the wells. Information on the year the wells were drilled, well depth, static water level, and service status for the three (3) wells is provided in Table I-1.

Groundwater Production

The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) do not have records of groundwater production at this property. The Authority also does not have reported monthly groundwater production from Ms. Davis. According to the response to the Questionnaire, Ms. Davis provided the combined estimated and metered groundwater production for the period between 1983 and 2019. Table I-2 summarizes the annual groundwater production estimates. Groundwater production between 1983 and 2018 were estimated based on the total number of irrigated trees and the total number of hours irrigated, while the 2019 groundwater production was based on meter reading records. It should be noted that Ms. Davis reported that a total of 1,700 pistachios trees have been located on her property every year since 1983. As documented in a 2015 study¹ conducted by the University of California Cooperative Extension, approximately 128 pistachio trees may be planted per acre of land. The number of pistachio trees reported by Ms. Davis is reasonable for 12 acres of property.

Verification Data and Information

All of the data described below were used in the verification of groundwater production by Ms. Davis from the Basin.

¹ *Sample Costs to Establish and Produce Pistachios*. University of California Cooperative Extension, 2015.

Groundwater Production Questionnaire

Historical annual groundwater production between 1983 and 2019 were estimated by Ms. Davis by taking the product of the number of trees, the flow rate of the drip irrigation system [in gallon per hour,(GPH)], irrigation hours per day, and irrigation days per year. The data provided in the response to the Questionnaire were tabulated and are presented in Table I-2. Though a breakdown of extracted groundwater for agricultural and domestic use was not provided in the response to the Questionnaire, most of the extracted groundwater has been used for agricultural purposes. Between 2010 and 2014, annual groundwater production reported in the Questionnaire ranged from a minimum of 67.58 AF (between 2012 and 2014) to a maximum of 75.09 AF (between 2010 and 2011)

Land Use Data

Generally, groundwater production can be approximately estimated by applying crop water requirements to the total irrigated acreage. Groundwater production estimates based on this approach may vary significantly due to various uncertainties in weather conditions, tree growth stage, irrigation efficiency, etc. However, this approach provides a general understanding of the potential annual water requirement for pistachio trees irrigation in a given year. According to the response to the Questionnaire, the total pistachio orchard acreage owned by Ms. Davis has been 12 acres since 1983; therefore, it is expected that the annual volume of groundwater extracted each year over the period between 1983 and 2019 would be relatively similar.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by Ms. Davis.

Groundwater Production Questionnaire

Although the data presented in Table I-2 for annual groundwater production estimates (e.g. number of pistachio trees, irrigation flow rate, and irrigation time per year) cannot be verified, annual groundwater production estimates can be reproduced between 1983 and 2018 based on the methodology provided by Ms. Davis. Table I-2 shows a comparison and the annual production differences between the annual groundwater production estimated by Ms. Davis and the reproduced annual groundwater productions based on Ms. Davis's methodology. The annual production differences between 1983 and 2018 shown on Table I-2 indicate that the reported annual groundwater production can be reproduced relatively accurately. There are minor discrepancies between the reported production in the response to the Questionnaire and the reproduced production, likely due to errors caused by rounding of conversion factors. It should be noted that the 2019 groundwater production of 50.23 AF (Table I-2) was reported through meter reading. If Ms. Davis' methodology is applied to 2019, the annual groundwater production estimate would be 45.08, which still shows reasonable similarity.

Verifications of groundwater production reported in the response to the Questionnaire using records of groundwater production from the Authority and the Cooperative Group were not performed due to the lack of available production data for Ms. Davis from these entities.

Land Use Data

Pistachios are generally considered to be crops with a high volume of irrigation water demand. Typically, the annual water requirement to grow pistachio trees is approximately three (3) to four (4) AF per acre of pistachio orchard. If this range of water requirement (3 AF to 4 AF) is applied to the 12 acres of pistachio orchard owned by Ms. Davis, the annual groundwater production would be between 36 AF and 48 AF. Based on this approach, the estimated annual groundwater production reported in the response to the Questionnaire for the period between 1997 and 2007, as well as 2018 and 2019, were in reasonable agreement with this approach. However, it appears that the reported groundwater production of less than 10 AFY prior to 1989 was significantly

underestimated, and the reported groundwater production of greater than 90 AFY for the period between 2008 and 2008 was overestimated.

Review of Methods and Verification and Conclusions

Ms. Davis (i.e. Amberglow Ranch) reports that groundwater extraction started in 1968 mainly for household use, and expanded to agricultural use in 1983. Although the reported groundwater production in the response to the Questionnaire covers the period between 1985 and 2019, verification of groundwater production with data collected from the Authority and the Cooperative Group were not performed because records of groundwater production for Ms. Davis were not available from these entities.

The annual groundwater production reported in the response to the Questionnaire between 1983 and 2018 were estimated based on the number of pistachio trees, the irrigation flow rates, and irrigation time per year. The estimated groundwater production based on the methodology used by Ms. Davis may be subject to significant uncertainty due to the lack of available data on various factors such as weather conditions, tree growth stage, irrigation efficiency, etc. If an annual water requirement of 3 AF to 4 AF per acre of pistachio orchard is assumed and applied to the 12-acre pistachio orchard owned by Ms. Davis, the estimated annual water requirements (between 36 AF and 48 AF) to meet the pistachio orchard water demands are inconsistent with the reported groundwater productions and land use estimates in the response to the Questionnaire. Specifically, the reported annual groundwater production of less than 10 AF prior to 1989 appears to be significantly underestimated, and the reported annual groundwater production for the Base Period (between 2010 and 2014) ranging from 67.58 AF (between 2012 and 2014) and 75.09 AF (between 2010 and 2011) appears to be slightly overestimated.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table I-2. As reported in the response to the Questionnaire, Ms. Davis's lowest

Appendix I: Pumping Verification Report for Patricia Davis (Amberglow)

annual Base Period groundwater production of 67.58 AF occurred in 2010 and 2011, estimated using the product of the number of pistachio trees, the irrigation flow rate, and the irrigation time per year provided by Ms. Davis.

J:\2652 IWVGA\PUMPING VERIFICATION REPORTS\PATRICIA DAVIS\PUMPING VERIFICATION REPORT (DAVIS).DOCX

**Table I-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer' s Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
1	1987	350	N/A	242	N/A	N/A	N/A	N/A	N/A	N/A	Active
2	2016	462	N/A	280	N/A	N/A	N/A	N/A	N/A	N/A	Active
3	1968	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

Notes:

- Ms. Davis indicated she obtained the well permit to drill Wells 1 and 2 on her property.
- Extraction started in 1968 for household and expanded for pistachio trees (12 acres) in 1983.

**Table I-2
Annual Groundwater Production Estimates Between 1937 and 2019**

Year	Extracted Groundwater Estimates Provided in the Questionnaire						Water Use Recalculation		
	Number of Trees (1)	Drippers GPH (2)	Time Watered hours (3)	Days Watered per Year (4)	Total Production (gallon)	Total Production (AF)	Water Use per year (gallon) [(1) x (2) x(3) x(4)]	Groundwater Production (AF)	Production Difference** (AF)
1937 to 1983	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983	1700	1	2	180	612,000	1.88	612,000	1.88	0.00
1984	1700	1	2	180	612,000	1.88	612,000	1.88	0.00
1985	1700	1	3	180	918,000	2.82	918,000	2.82	0.00
1986	1700	1	3	180	918,000	2.82	918,000	2.82	0.00
1987	1700	1	4	180	1,224,000	3.75	1,224,000	3.76	0.00
1988	1700	1	4	180	1,224,000	3.75	1,224,000	3.76	0.00
1989	1700	1	8	180	2,448,000	7.51	2,448,000	7.51	0.00
1990	1700	2	8	180	4,896,000	15.02	4,896,000	15.03	0.01
1991	1700	2	10	180	6,120,000	18.77	6,120,000	18.78	0.01
1992	1700	2	10	180	6,120,000	18.77	6,120,000	18.78	0.01
1993	1700	2	12	180	7,344,000	22.53	7,344,000	22.54	0.01
1994	1700	2	12	180	7,344,000	22.53	7,344,000	22.54	0.01
1995	1700	2	14	180	8,568,000	26.28	8,568,000	26.29	0.01
1996	1700	2	14	180	8,568,000	26.28	8,568,000	26.29	0.01
1997	1700	2	16	180	9,792,000	30.04	9,792,000	30.05	0.01
1998	1700	2	16	180	9,792,000	30.04	9,792,000	30.05	0.01
1999	1700	2	18	180	11,016,000	33.79	11,016,000	33.81	0.02
2000	1700	2	18	180	11,016,000	33.79	11,016,000	33.81	0.02
2001	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2002	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2003	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02

Table I-2
Annual Groundwater Production Estimates Between 1937 and 2019

Year	Extracted Groundwater Estimates Provided in the Questionnaire						Water Use Recalculation		
	Number of Trees (1)	Drippers GPH (2)	Time Watered hours (3)	Days Watered per Year (4)	Total Production (gallon)	Total Production (AF)	Water Use per year (gallon) [(1) x (2) x(3) x(4)]	Groundwater Production (AF)	Production Difference** (AF)
2004	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2005	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2006	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2007	1700	2	24	180	14,688,000	45.06	14,688,000	45.08	0.02
2008	1700	4	24	180	29,376,000	90.11	29,376,000	90.15	0.04
2009	1700	4	24	180	29,376,000	90.11	29,376,000	90.15	0.04
2010	1700	4	20	180	24,480,000	75.09	24,480,000	75.13	0.03
2011	1700	4	20	180	24,480,000	75.09	24,480,000	75.13	0.03
2012	1700	4	18	180	22,032,000	67.58	22,032,000	67.61	0.03
2013	1700	4	18	180	22,032,000	67.58	22,032,000	67.61	0.03
2014	1700	4	18	180	22,032,000	67.58	22,032,000	67.61	0.03
2015	1700	4	18	180	22,032,000	67.58	22,032,000	67.61	0.03
2016	1700	4	16	180	19,584,000	60.07	19,584,000	60.10	0.03
2017	1700	4	16	180	19,584,000	60.07	19,584,000	60.10	0.03
2018	1700	4	14	180	17,136,000	52.56	17,136,000	52.59	0.02
2019*	1700	4	12	180	16,376,145	50.23	14,688,000	45.08	-5.16

Note:

- Ms. Davis only provided production estimates between 1983 and 2019.

* 2019 groundwater production was obtained through meter readings.

** Production difference is the difference between the recalculated groundwater production and the reported groundwater production in the Questionnaire.

**Table I-3
Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)**

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %	Annual Production - Verification*	Monthly Average	Discrepancy %
2010	2	75.13	6.26	N/A	N/A	N/A	N/A	N/A	N/A	75.13	6.26	0.0%
2011	2	75.13	6.26	N/A	N/A	N/A	N/A	N/A	N/A	75.13	6.26	0.0%
2012	2	67.61	5.63	N/A	N/A	N/A	N/A	N/A	N/A	67.61	5.63	0.0%
2013	2	67.61	5.63	N/A	N/A	N/A	N/A	N/A	N/A	67.61	5.63	0.0%
2014	2	67.61	5.63	N/A	N/A	N/A	N/A	N/A	N/A	67.61	5.63	0.0%

Note:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA,\ Cooperative\ Group,\ or\ Verification)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Patrica Davis's groundwater extraction can be verified between 1983 and 2018 based on the data provided.

- Patrica Davis's metered groundwater extraction was 45.08 AF in 2019. The estimated groundwater extraction was 50.26 AF in 2019.

- The discrepancy is about -10% which indicates the estimated extraction is about 10 AF more than the metered extraction in 2019.

APPENDIX J
Verification Report for
Quist Farms

Appendix J: Pumping Verification Report for Quist Farms

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Quist Farms for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Quist Farms is located in Ridgecrest, California with a total land size of approximately 150 acres. Mr. Donald Quist indicated that the land is located within the Basin boundary, and groundwater has been extracted for beneficial use since 1973. There are currently seven (7) active wells drilled within this property, and there is no information to suggest that any wells existed on this property prior to 1973. Extracted groundwater has been reportedly used for domestic, livestock, and agricultural purposes, though the quantities of extracted groundwater for domestic and livestock purposes were not specified in the response to the Questionnaire. The annual volume of water used for irrigation varies depending on the amount of agricultural land in production and crop types.

Description of Facilities

Quist Farms started groundwater extraction mainly for agricultural purposes in 1975. The agricultural land size gradually expanded from one (1) acre in 1975 to 150 acres in 2019. Similarly, crop types have also changed from alfalfa in 1975 to pistachios (both bearing and non-bearing pistachios) in 2019. There are currently seven (7) active wells and no inactive wells located within these properties:

- East Well
 - Kern County Assessor Parcel Number (APN) 352-300-10-00-2;
- Center Well

Appendix J: Pumping Verification Report for Quist Farms

- APN 352-300-11-00-5;
- West Well
 - APN 352-300-19-00-9;
- B, C, D and E Wells
 - APN 352-261-16-00-6

The Center Well was the first well owned by Quist Farms. The Center Well was drilled in 1974 and later deepened to the current depth of 404 feet in 1994. There are seven (7) submersible pumps installed for these wells. The pump power ratings range from 5 horsepower to 30 horsepower, and pump flow rates range from 37 gallons per minute (gpm) to 285 gpm (see Table J-1). Pump tests were performed at the East Well, the West Well, and the D well in 1991, 1991, and 2015, respectively. Extracted groundwater is fed into a double line drip irrigation system with computer-automated controls.

Information on the County permit for groundwater extraction from these wells was not provided in the response to the Questionnaire. The well driller reports for these seven (7) wells are provided in Appendix J-1. General information on well construction, water level, well pumps, and service status is provided in Table J-1.

Groundwater Production

According to the response to the Questionnaire, groundwater extraction at Quist Farms started in 1973, though the first well owned by Quist Farms (Center Well) was not drilled until 1974. Groundwater extraction data for 1973 and 1974 was not provided in the response to the Questionnaire. The first record of groundwater production provided in the response to the Questionnaire was in 1975, and the extracted groundwater water was mainly for drought-tolerant but high-water requirement alfalfa. The volume of groundwater extraction has gradually increased since 1975 due to the increase in land in agricultural production. For example, the total groundwater production in 1975 was 8 acre-feet (AF); however, groundwater production in 2019 was 637.5 AF. Historical crop types and annual groundwater production as provided in the response to the Questionnaire for Quist Farms for the period between 1975 and 2019 is provided in Table J-2. During the Base Period

(between 2010 and 2014), annual groundwater production ranged from 410.9 AF in 2011 to 496.4 AF in 2014.

Verification Data and Information

All of the data provided in the Questionnaire that can be used in the verification of groundwater production are described below.

Groundwater Production Questionnaire

Quist Farms provided combined annual groundwater production data between 1975 and 2019. Historical crop types, corresponding irrigated acres, and total annual groundwater production is shown on Table J-2. In the response to the Questionnaire, Quist Farms estimated annual groundwater production based on irrigated acreage and anticipated water use for the years 1975 to 2008 and power consumption records for years 2009 to 2019.

A breakdown of irrigated acres by crop and total estimated water use between 2010 and 2014 is provided in Table J-3. Between 2010 and 2014, annual groundwater production reported in the Questionnaire ranged from 410.9 AF in 2011 to 496.4 AF in 2014.

Power Consumption

Tabulated electric power consumption records (see Appendix J-2) from the Southern California Edison Company (Edison) for the property was submitted with the response to the Questionnaire. The data shown in Appendix J-2 includes monthly power consumption and monthly solar power usage (in kilowatt-hours, kWh) for the Quist Farms property for the years 2009 to 2019.

Land Use Data

In the response to the Questionnaire, Quist Farms reported that annual groundwater production estimates were based on pump curves and logged time data. However, in reporting the annual production for the bearing pistachio and nonbearing pistachio crops, it appears that the amount of irrigated land, crop type, and their corresponding water requirements were used for the period between 1975 and 2008, and power consumption data was used for years 2009 to 2019. Annual groundwater production (acre-feet) was obtained by multiplying the irrigated land for alfalfa, bearing pistachio trees, and nonbearing pistachio trees (acres) by their respective water requirement that year (acre-feet/ acre) and taking their summation.

Quist Farms' annual irrigated acreage between 1975 and 2008 is shown on Table J-2. The irrigated lands were initially used for alfalfa in 1975, and gradually changed to bearing and non-bearing pistachio trees. Generally, groundwater production can be estimated by applying the crop water requirement to the total irrigated acreage. Therefore, the annual volume of extracted groundwater should correlate to the acreage of irrigated land. For alfalfa, Quist Farms has had 1 acre of land for alfalfa between 1975 and 1979, 10 acres between 1980 and 1985, 7 acres between 1986 and 1987, and no agricultural land for alfalfa thereafter. Quist Farms started to plant pistachios in 1984. The acreage of pistachio orchards (non-bearing pistachio) in 1984 was 2 acres, increasing gradually after 1984 with a mixture of both bearing and non-bearing pistachio trees. In 2019, the total irrigated acreage for pistachio orchard was 150 acres, which includes 136.8 acres for bearing pistachio trees and 7.2 acres for nonbearing pistachio trees.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by Quist Farms.

Records of Groundwater Production from the Authority and Cooperative Group

The Cooperative Group's records of groundwater production indicate that Quist Farms extracted groundwater at 750 AF per year between 2002 and 2016. The differences between the Cooperative Group's records and the reported production in the response to the Questionnaire range from 218.4 AF (2016) to 376 AF (2002, 2003, and 2004). In general, the production data recorded by the Cooperative Group for Quist Farms is significantly higher than the reported production in the response to the Questionnaire. A comparison of groundwater production as provided in the response to the Questionnaire to records of groundwater production from the Cooperative Group are provided on Table J-4.

The Authority does not have production records for Quist Farms prior to August 2018. However, groundwater production data reported to the Authority in 2019 was 636.3 AF, which is essentially equal to the reported production of 637.5 AF in the response to the Questionnaire with a discrepancy of about 0.18 percent.

Land Use Data

Quist Farms estimated groundwater productions based on irrigated acreage for the period between 1975 and 2008 and power consumption records for years 2009 to 2019. However, Quist Farms also provided annual groundwater production estimates for years 2009 to 2019 using the irrigated acreage estimation method.

As shown in Table J-5, the reported annual groundwater extractions as provided in the response to the Questionnaire are generally slightly higher when estimating production using irrigated land, crop type, and their corresponding water requirements. For example, a crop water requirement of 421.9 AF was estimated for the bearing and nonbearing pistachio orchards with land sizes of 79.2 acres and 55.8 acres, respectively, in 2010; the 2010 reported groundwater production based on power consumption records was 443.8 AF, a difference of approximately 22 AF. Similarly, the differences between the estimated water requirement based on irrigated acreage and reported groundwater

production based on power consumption for 2011, 2012, 2013 and 2014 are 11 AF, 16 AF, 63 AF, and 24 AF, respectively. The comparison suggests that the reported groundwater production from Quist Farms prior to 2009 reasonably represents the crop water requirements based on the irrigated acreage provided in the response to the Questionnaire, when potential variations in weather conditions are considered.

Power Consumption Data

Based on the data shown in Appendix J-2, the annual groundwater production can be determined by totaling the monthly power consumption (kWh) in a single year, and dividing it by the kWh required to pump 1 AF of water. In estimating the kWh required to pump 1 AF, several operating parameters were assumed such as motor efficiency, pump efficiency, and drawdown. In 2019, the Authority's production records show the groundwater production by Quist Farms was 636.3 AF in 2019, which is consistent with the 637.5 AF estimated from power consumption data.

Review of Methods and Verification and Conclusions

Though the Cooperative Group has records of groundwater production for the period between 2002 and 2016, the production records from the Cooperative Group may be questionable as the production data is a constant number (750 AFY) for the entire reported period. The Authority's production records show that groundwater production by Quist Farms was 636.3 AF in 2019, which is essentially equal to the production of 637.5 AF as reported in the response to the Questionnaire.

The annual groundwater production reported in the response to the Questionnaire between 2010 and 2014 was estimated based power consumption records. For the Base Period, Quist Farms provided annual groundwater production estimates based on irrigated acreage and from power consumption. The comparison between the two estimation methods suggests that the reported groundwater production in Quist Farms' response to the questionnaire is fairly consistent between both methods.

Appendix J: Pumping Verification Report for Quist Farms

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table J-3. As reported in the response to the Questionnaire, the lowest annual Base Period groundwater production of 410.9 AF occurred in 2011 at Quist Farms, estimated using power consumption records.

J:\2652 IWVGA\Pumping Verification Reports\Quist Farms\APP-J_Pumping Verification Report (Quist).docx

**Table J-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
East Well	1991/Apr	405	400	226	294	Submersible	10	89	250 gpm	1991/Apr	Active
Center Well ¹	1974	404	399	262	320	Submersible	5	37	N/A	N/A	Active
West Well	1991/May	405	400	232	273	Submersible	10	85	300 gpm	1991/May	Active
Well B ²	1994/Mar	450	450	263	315	Submersible	30	267	N/A	N/A	Active
Well C	1994/Mar	457	455	240	315	Submersible	30	285	N/A	N/A	Active
Well D	2015/Mar	500	500	271	315	Submersible	30	285	300 gpm	2015/Mar	Active
Well E ³	1995/Sep	455	455	272	315	Submersible	30	285	N/A	N/A	Active

Notes:

¹ Center well was drilled in 1974 and was deepened in 1994. Static water level was measured on 7/18/2018.

² Well B static water level was measured on 7/1/2018.

³ Well E static water level was measured on 4/4/2014.

**Table J-2
Annual Groundwater Production Estimates Between 1937 And 2019**

Year	Crop	Questionnaire				
		Irrigated Acreage (acre)	Groundwater Production (AFY)	Estimate Method	Average Water Use per Acre (AF)	Total Groundwater Production (AFY)
1937 to 1974	NA	NA	NA	NA	NA	NA
1975	Alfalfa	1.0	8.0	Irrigation Land	8.00	8.0
1976	Alfalfa	1.0	8.0	Irrigation Land	8.00	8.0
1977	Alfalfa	1.0	8.0	Irrigation Land	8.00	8.0
1978	Alfalfa	1.0	8.0	Irrigation Land	8.00	8.0
1979	Alfalfa	1.0	8.0	Irrigation Land	8.00	8.0
1980	Alfalfa	10.0	80.0	Irrigation Land	8.00	80.0
1981	Alfalfa	10.0	80.0	Irrigation Land	8.00	80.0
1982	Alfalfa	10.0	80.0	Irrigation Land	8.00	80.0
1983	Alfalfa	10.0	80.0	Irrigation Land	8.00	80.0
1984	Alfalfa	10.0	80.0	Irrigation Land	8.00	80.4
	Nonbearing Pistachio	2.0	0.4		0.20	
1985	Alfalfa	10.0	80.0	Irrigation Land	8.00	84.4
	Nonbearing Pistachio	11.0	4.4		0.40	
1986	Alfalfa	7.0	56.0	Irrigation Land	8.00	63.5
	Nonbearing Pistachio	15.0	7.5		0.50	

**Table J-2
Annual Groundwater Production Estimates Between 1937 And 2019**

Year	Crop	Questionnaire				
		Irrigated Acreage (acre)	Groundwater Production (AFY)	Estimate Method	Average Water Use per Acre (AF)	Total Groundwater Production (AFY)
1987	Alfalfa	7.0	56.0	Irrigation Land	8.00	68.0
	Nonbearing Pistachio	15.0	12.0		0.80	
1988	Nonbearing Pistachio	20.6	24.7	Irrigation Land	1.20	24.7
1989	Nonbearing Pistachio	20.6	43.3	Irrigation Land	2.10	43.3
1990	Nonbearing Pistachio	20.6	68.0	Irrigation Land	3.30	68.0
1991	Nonbearing Pistachio	20.6	98.9	Irrigation Land	4.80	98.9
1992	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	99.0
1993	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	106.2
	Nonbearing Pistachio	14.3	7.2		0.50	
1994	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	119.1
	Nonbearing Pistachio	28.7	20.1		0.70	
1995	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	133.4
	Nonbearing Pistachio	43.0	34.4		0.80	
1996	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	167.8
	Nonbearing Pistachio	57.3	68.8		1.20	
1997	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	207.9
	Nonbearing Pistachio	57.3	108.9		1.90	

**Table J-2
Annual Groundwater Production Estimates Between 1937 And 2019**

Year	Crop	Questionnaire				
		Irrigated Acreage (acre)	Groundwater Production (AFY)	Estimate Method	Average Water Use per Acre (AF)	Total Groundwater Production (AFY)
1998	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	265.2
	Nonbearing Pistachio	57.3	166.2		2.90	
1999	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	316.7
	Nonbearing Pistachio	57.3	217.7		3.80	
2000	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	351.1
	Nonbearing Pistachio	57.3	252.1		4.40	
2001	Bearing Pistachio	20.6	99.0	Irrigation Land	4.81	374.0
	Nonbearing Pistachio	57.3	275.0		4.80	
2002	Bearing Pistachio	77.9	374.0	Irrigation Land	4.80	374.0
2003	Bearing Pistachio	77.9	374.0	Irrigation Land	4.80	374.0
2004	Bearing Pistachio	78.0	374.0	Irrigation Land	4.79	374.0
2005	Bearing Pistachio	78.1	375.0	Irrigation Land	4.80	375.0
2006	Bearing Pistachio	78.3	376.0	Irrigation Land	4.80	376.0
2007	Bearing Pistachio	78.3	376.0	Irrigation Land	4.80	376.0
2008	Bearing Pistachio	79.2	380.0	Irrigation Land	4.80	380.0
2009	Bearing Pistachio	79.2	442.9	Power Consumption	NA	442.9
	Nonbearing Pistachio	55.8				

**Table J-2
Annual Groundwater Production Estimates Between 1937 And 2019**

Year	Crop	Questionnaire				
		Irrigated Acreage (acre)	Groundwater Production (AFY)	Estimate Method	Average Water Use per Acre (AF)	Total Groundwater Production (AFY)
2010	Bearing Pistachio	79.2	443.8	Power Consumption	NA	443.8
	Nonbearing Pistachio	55.8				
2011	Bearing Pistachio	79.2	410.9	Power Consumption	NA	410.9
	Nonbearing Pistachio	55.8				
2012	Bearing Pistachio	81.0	426.0	Power Consumption	NA	426.0
	Nonbearing Pistachio	55.8				
2013	Bearing Pistachio	81.0	429.3	Power Consumption	NA	429.3
	Nonbearing Pistachio	55.8				
2014	Bearing Pistachio	81.0	496.4	Power Consumption	NA	496.4
	Nonbearing Pistachio	55.8				
2015	Bearing Pistachio	81.8	492.7	Power Consumption	NA	492.7
	Nonbearing Pistachio	55.8				
2016	Bearing Pistachio	81.8	531.6	Power Consumption	NA	531.6
	Nonbearing Pistachio	55.8				
2017	Bearing Pistachio	81.8	509.2	Power Consumption	NA	509.2
	Nonbearing Pistachio	55.8				

**Table J-2
Annual Groundwater Production Estimates Between 1937 And 2019**

Year	Crop	Questionnaire				
		Irrigated Acreage (acre)	Groundwater Production (AFY)	Estimate Method	Average Water Use per Acre (AF)	Total Groundwater Production (AFY)
2018	Bearing Pistachio	136.8	648.8	Power Consumption	NA	648.8
	Nonbearing Pistachio	7.2				
2019	Bearing Pistachio	136.8	637.5	Power Consumption	NA	637.5
	Nonbearing Pistachio	7.2				

Notes:

- Power Consumption was estimated by kWh data provided by Southern California Edison and assumed operating parameters such as motor efficiency, pump efficiency, and drawdown.

**Table J-3
Summary of Land and Water Use**

Year	Agricultural			Domestic Usage (AF)	Commercial Usage (AF)	Industrial Usage (AF)	Total Water Usage (AF)
	Crop	Irrigated Acreage (acre)	Water Use (AF)				
2010	Bearing Pistachio	79.2	443.8	N/A	N/A	N/A	443.8
	Nonbearing Pistachio	55.8					
2011	Bearing Pistachio	79.2	410.9	N/A	N/A	N/A	410.9
	Nonbearing Pistachio	55.8					
2012	Bearing Pistachio	81.0	426.0	N/A	N/A	N/A	426.0
	Nonbearing Pistachio	55.8					
2013	Bearing Pistachio	81.0	429.3	N/A	N/A	N/A	429.3
	Nonbearing Pistachio	55.8					
2014	Bearing Pistachio	81.0	496.4	N/A	N/A	N/A	496.4
	Nonbearing Pistachio	55.8					

Table J-4

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	7	443.8	36.98	N/A	N/A	N/A	750	62.5	-69.0%
2011	7	410.9	34.24	N/A	N/A	N/A	750	62.5	-82.5%
2012	7	426.0	35.50	N/A	N/A	N/A	750	62.5	-76.1%
2013	7	429.3	35.78	N/A	N/A	N/A	750	62.5	-74.7%
2014	7	496.4	41.37	N/A	N/A	N/A	750	62.5	-51.1%

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Quist Farms reported groundwater production of 637.5 AF in 2019.

- The Authority has a record of 636.3 AF in 2019. The discrepancy is 0.18 %.

Table J-5

Comparison of Estimation Methods for Groundwater Usage Between 2009 and 2019

Year	Crop Type	Irrigated Acreage (acre)	Estimation Method: Irrigation Land (AF)	Estimation Method: Power Consumption (AF)	Difference (AF)
2009	Bearing Pistachio	79.2	380.0	442.9	21.0
	Nonbearing Pistachio	55.8	41.9		
	Subtotal:	135.0	421.9		
2010	Bearing Pistachio	79.2	380.0	443.8	21.9
	Nonbearing Pistachio	55.8	41.9		
	Subtotal:	135.0	421.9		
2011	Bearing Pistachio	79.2	380.0	410.9	11.0
	Nonbearing Pistachio	55.8	41.9		
	Subtotal:	135.0	421.9		
2012	Bearing Pistachio	81.0	389.0	426.0	16.0
	Nonbearing Pistachio	55.8	53.0		
	Subtotal:	136.8	442.0		
2013	Bearing Pistachio	81.0	389.0	429.3	62.9
	Nonbearing Pistachio	55.8	103.2		
	Subtotal:	136.8	492.2		
2014	Bearing Pistachio	81.0	348.0	496.4	23.5
	Nonbearing Pistachio	55.8	171.9		
	Subtotal:	136.8	519.9		
2015	Bearing Pistachio	81.8	344.0	492.7	44.9
	Nonbearing Pistachio	55.8	193.6		
	Subtotal:	137.6	537.6		
2016	Bearing Pistachio	81.8	335.0	531.6	35.5
	Nonbearing Pistachio	55.8	232.1		
	Subtotal:	137.6	567.1		
2017	Bearing Pistachio	81.8	327.0	509.2	49.9
	Nonbearing Pistachio	55.8	232.1		
	Subtotal:	137.6	559.1		
2018	Bearing Pistachio	136.8	657.0	648.8	16.1
	Nonbearing Pistachio	7.2	7.9		
	Subtotal:	144.0	664.9		
2019	Bearing Pistachio	136.8	629.0	637.5	2.7
	Nonbearing Pistachio	7.2	5.8		
	Subtotal:	144.0	634.8		

Notes:

- Quist Farms provided groundwater production estimates based on irrigated land and based on power consumption records for the years 2009 to 2019.

APPENDIX J-1

Well Drillers Report

TRIPPLICATE
Owner's Copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. 351047

Notice of Intent No. 25044
Local Permit No. or Date 04/01/91

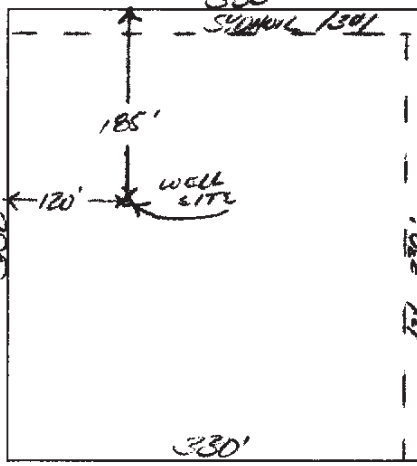
State Well No. _____
Other Well No. _____

(1) OWNER: Name DONALD QUIST
Address 3751 SYDNOR AVE.
City RIDGECREST, CA. ZIP 93555

(12) WELL LOG: Total depth 405 ft. Completed depth 400 ft.
from ft. to ft. Formation (Describe by color, character, size or material)

(2) LOCATION OF WELL (See instructions):
County KERN Owner's Well Number 1
Well address if different from above _____
Township 26-S Range 39-E Section 26-P
Distance from cities, roads, railroads, fences, etc. _____
APN: 352-300-10-00-2

0-120 - SAND, BRN. CLAY, GRAVEL
120-300 - SAND, BRN. CLAY, SM. ROCKS
- GRAVEL
300-340 - SAND, BRN. CLAY
340-405 - BRN. CLAY, SAND, SM. ROCKS



(3) TYPE OF WORK:
New Well Deepening
Reconstruction
Reconditioning
Horizontal Well
Destruction (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic
Irrigation
Industrial
Test Well
Municipal
Other (Describe)

(5) EQUIPMENT:
Rotary Reverse
Cable Air
Other Bucket

(6) GRAVEL PACK:
Yes No Size 3/8" S&A
Diameter of bore 12.5"
Packed from 50 to 405 ft.

(7) CASING INSTALLED:
Steel Plastic Concrete

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+1	339	8	S-21	339	279	.040
279	319	8	S-21	319	299	.040

(9) WELL SEAL:
Was surface sanitary seal provided? Yes No If yes, to depth 50 ft.
Were strata sealed against pollution? Yes No Interval _____ ft.
Method of sealing CEMENT GROUT

(10) WATER LEVELS:
Depth of first water, if known 226 ft.
Standing level after well completion 226 ft.

(11) WELL TESTS:
Was well test made? Yes No If yes, by whom? DRILLER
Type of test Pump Bailer Air lift
Depth to water at start of test 226 ft. At end of test U/R ft.
Discharge 250 gal/min after 12 hours Water temperature _____
Chemical analysis made? Yes No If yes, by whom? _____
Was electric log made Yes No If yes, attach copy to this report

Work started 04/08 1991 Completed 04/19 1991

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed _____ (Well Driller)
NAME KIRSCHENMAN'S WELL DRILLING
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 119
City INYOKERN ZIP 93555
License No. 308367 Date of this report 04/25/91

WATER CODE SEC. 13752
INSTRUMENT REPORT
1111 HWY 99 - 351047
NEW HWY NO. 351047

TRIPPLICATE

Owner's Copy

Page 1 of 1

Owner's Well No. 1

Date Work Began 12/19/94, Ended 12/22/94

Local Permit Agency

Permit No. Permit Date

STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 396047

DWR USE ONLY - DO NOT FILL IN. STATE WELL NO./STATION NO., LATITUDE, LONGITUDE, APN/TRS/OTHER.

GEOLOGIC LOG and WELL OWNER sections. Includes orientation, depth to first water, well location, activity, and completion details.

Table with columns for Depth from Surface, Bore-hole Dia., Casing(s) (Type, Material/Grade, Internal Diameter, Gauge or Wall Thickness, Slot Size), and Annular Material (Type, Cement, Bentonite, Fill, Filter Pack).

- ATTACHMENTS (x)
- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analyses
- Other

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME: Kirschner's Well Drilling
ADDRESS: P.O. Box 119, Truckee, CA 96167
Signed: [Signature], DATE SIGNED: 12/23/94, C-57 LICENSE NUMBER: 384367

TRIPPLICATE
Owner's Copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. 351046

Notice of Intent No. 250454
Local Permit No. or Date 04/01/91

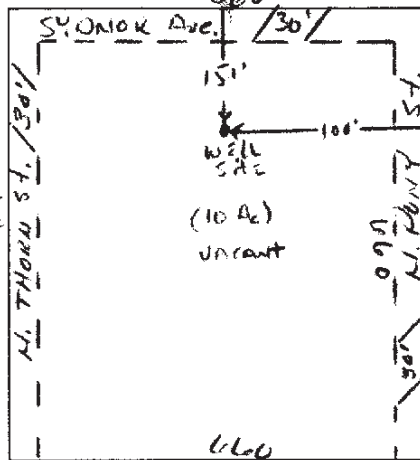
State Well No. _____
Other Well No. _____

(1) OWNER: Name DONALD QUIST
Address 3751 SYDNOR
City RIDGECREST, CA. ZIP 93555

(12) WELL LOG: Total depth 405 ft. Completed depth 400 ft.
from ft. to ft. Formation (Describe by color, character, size or material)

(2) LOCATION OF WELL (See instructions):
County KERN Owner's Well Number 2
Well address if different from above _____
Township 26-S Range 39-E Section 26-P
Distance from cities, roads, railroads, fences, etc. _____
APN: 352-300-19-00-9

0-320 - SAND, BRN. CLAY, SM. ROCKS
320-360 SAND, BRN. CLAY
360-405 SAND, BRN. CLAY, WHITE CLAY



(3) TYPE OF WORK:
New Well Deepening
Reconstruction
Reconditioning
Horizontal Well
Destruction (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic
Irrigation
Industrial
Test Well
Municipal
Other (Describe)

WELL LOCATION SKETCH

(5) EQUIPMENT:
Rotary Reverse
Cable Air
Other Bucket

(6) GRAVEL PACK:
Yes No Size 1/8" PEA
Diameter of bore 10.5"
Packed from 50 to 405 ft.

(7) CASING INSTALLED:
Steel Plastic Concrete

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+1	239	8	S-21	239	279	.040
279	339	8	S-21	339	399	.040

(9) WELL SEAL:
Was surface sanitary seal provided? Yes No If yes, to depth 50 ft.
Were strata sealed against pollution? Yes No Interval _____ ft.
Method of sealing CEMENT GROUTE

Work started 04/22 19 91 Completed 05/06 1991

(10) WATER LEVELS:
Depth of first water, if known 232 ft.
Standing level after well completion 232 ft.

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

(11) WELL TESTS:
Was well test made? Yes No If yes, by whom? DRILLER
Type of test Pump Bailer Air lift
Depth to water at start of test 232 ft. At end of test U/R ft.
Discharge 300 gal/min after 12 hours Water temperature _____
Chemical analysis made? Yes No If yes, by whom? _____
Was electric log made Yes No If yes, attach copy to this report

Signed _____ (Well Driller)
NAME KIRSCHENMAN'S WELL DRILLING
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 119
City INYOKERN ZIP 93555
License No. 308367 Date of this report 06/06/91

TRIPPLICATE
Owner's Copy

North

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Page 1 of 1

Owner's Well No. unk

No. **463866**

Date Work Began 2-22-94, Ended 3-15-94

Local Permit Agency Kern County Health Services

Permit No. E4-153-94 Permit Date _____

GEOLOGIC LOG

ORIENTATION (✓)		DEPTH TO FIRST WATER		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
<input checked="" type="checkbox"/> VERTICAL	<input type="checkbox"/> HORIZONTAL	_____ (Ft.)	_____ (Ft.)	
DEPTH FROM SURFACE				
Ft.	to	Ft.		
0	10	80	small rocks (cobblestone)	
10	80	80	cut up cobble stone	
80	120		hard packed sand	
120	300		cut up cobble stone & sand	
300	320		sand with 5% brown clay	
320	360		sand	
360	370		sand with 5% white clay	
370	415		sand	
415	457		sand with 3% cobble stone	

TOTAL DEPTH OF BORING 457 (Feet)
TOTAL DEPTH OF COMPLETED WELL 455 (Feet)

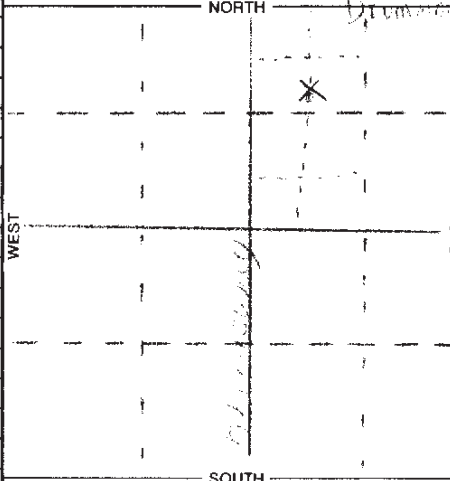
WELL OWNER

Name Don Quist
Mailing Address 3751 Sydnor Ave
Ridgecrest CA 93555
CITY STATE ZIP

WELL LOCATION

Address 3751 Sydnor Ave.
City Ridgecrest
County Kern
APN Book _____ Page _____ Parcel 352-261-16
Township 26S Range 39E Section 35-D
Latitude _____ Longitude _____
DEG. MIN. SEC. NORTH DEG. MIN. SEC. WEST

LOCATION SKETCH



ACTIVITY (✓)
 NEW WELL
 MODIFICATION/REPAIR
 ___ Deepen
 ___ Other (Specify)

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S)
(✓)
___ MONITORING

WATER SUPPLY
 Domestic
___ Public
 Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

DRILLING METHOD Rotary FLUID Bentonite
WATER LEVEL & YIELD OF COMPLETED WELL
DEPTH OF STATIC WATER LEVEL _____ (Ft.) & DATE MEASURED _____
ESTIMATED YIELD* _____ (GPM) & TEST TYPE _____
TEST LENGTH _____ (Hrs.) TOTAL DRAWDOWN _____ (Ft.)
* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE Ft. to Ft.	ANNULAR MATERIAL			
		TYPE (✓)			MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS		SLOT SIZE IF ANY (Inches)	TYPE		
		BLANK	SCREEN	CONDUCTOR				FILL PIPE				CE- MENT (✓)
0	235	15"	x			PVC	8"	200				6 sack
235	455	15"	x			PVC	8"	200	1/8x7x8Rows			
											x	gravel

NOTE: Centralizers installed at 235', 275', 315', 355', 395', and 435'.

ATTACHMENTS (✓)

- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analyses
- Other _____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Randall N. Wallis
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P.O. Box 1400 Barstow CA 92312
ADDRESS CITY STATE ZIP

Signed Randall Wallis WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED _____ C-57 LICENSE NUMBER _____

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Page ___ of ___
Owner's Well No. 4 No. **463922**
Date Work Began 8/21/95, Ended 9/8/95
Local Permit Agency Kern County Environmental Health Services
Permit No. PH 107-95 Permit Date 6/14/95

GEOLOGIC LOG

ORIENTATION (∠) VERTICAL HORIZONTAL ANGLE (SPECIFY)

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	10	Small rocks & cobblestones
10	50	Cobblestone
50	90	Traces of brown clay & sand
90	300	Cobblestone & sand
300	350	Sand
350	420	Sand & cobblestone
420	455	(slow) Sand & cobblestone

Describe material, grain size, color, etc.

WELL OWNER

Name Don Quist
Mailing Address 3751 Sydner Ridgecrest CA 93555
CITY STATE ZIP

WELL LOCATION

Address _____
City _____
County _____
APN Book _____ Page _____ Parcel 352-261-16
Township 268 Range 39E Section 35
Latitude _____ Longitude _____
DEG. MIN. SEC. NORTH WEST

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (∠)

NEW WELL
 MODIFICATION/REPAIR
 Deepen
 Other (Specify) _____

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (∠)
 MONITORING

WATER SUPPLY

Domestic
 Public
 Irrigation
 Industrial
 "TEST WELL"
 CATHODIC PROTECTION
 OTHER (Specify) agricultural

DRILLING METHOD rotary FLUID bentonite

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL _____ (Ft.) & DATE MEASURED _____
ESTIMATED YIELD* _____ (GPM) & TEST TYPE _____
TEST LENGTH _____ (Hrs.) TOTAL DRAWDOWN _____ (Ft.)
* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING(S)					ANNULAR MATERIAL				
Ft.	to Ft.		TYPE (∠)	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	DEPTH FROM SURFACE	TYPE			
Ft.	to Ft.						Ft.	to Ft.	CE-MENT (∠)	BEN-TONITE (∠)	FILL (∠)	FILTER PACK (TYPE/SIZE)
0	245	15	<input checked="" type="checkbox"/>	PVC	8		0	70	<input checked="" type="checkbox"/>			5 ok S&S
245	455	15	<input checked="" type="checkbox"/>	PVC	8	1/8x7/8 8 rows	70	240				crushed gravel
							240	455				naturally rounded gravel

ATTACHMENTS (∠)

Geologic Log
 Well Construction Diagram
 Geophysical Log(s)
 Soil/Water Chemical Analyses
 Other _____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Randall N. Wallis
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P.O. Box 1400 Barstow CA 92312
ADDRESS CITY STATE ZIP

Signed Randall N. Wallis DATE SIGNED _____
WELL-DRILLER/AUTHORIZED REPRESENTATIVE 515955 C-57 LICENSE NUMBER

APPENDIX J-2
Power Consumption
Data

APPENDIX K
Verification Report for
Searles Valley Minerals

Appendix K: Pumping Verification Report for Searles Valley Minerals

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Searles Valley Minerals for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Searles Valley Minerals (SVM) reports that it has extracted groundwater continuously from the Basin since 1930, when one of SVM's predecessor companies, Westend Chemical Company (WCC), began full-scale operation in 1926 and drilled its first well in the Basin near Windy Acres Ranch in 1930. SVM reports that its start date of groundwater extraction within the Basin may have occurred prior to 1930. In 1942, another predecessor company, American Potash & Chemical Corporation (APCC), acquired land near Bonewits Ranch, which contained an operational well that was drilled in 1912 (Well 22). Both predecessor companies came under the same ownership when Kerr-McGee Corporation acquired APCC in 1967 and WCC in 1974. An extended history of SVM's predecessor companies and associated ownership changes is included in Appendix K-1.

Groundwater extracted by SVM is used for industrial and municipal purposes. SVM owns and operates five (5) metered wells that produce Basin groundwater, which is transported to Searles Valley for use at production facilities for minerals recovery and production processes. Searles Domestic Water Company (SDWC), a wholly owned subsidiary of SVM, was established in 1943 and currently serves the municipal needs of approximately 800 households in the Trona area in Searles Valley. SVM and SDWC have an annual purchase agreement under which SVM supplies "surplus water" to SDWC in an amount not to exceed 200 million gallons (614 acre-feet) per year.

Description of Facilities

There are currently eleven (11) inactive or destroyed wells (Well 22, Well 23, Well 34, WE1, Windy Acres Well, WE3, 4A1, 4A2, 5A1, 5B1, and 5H1) in the Basin that are or were under the ownership of SVM. According to SVM's response to the Questionnaire, Wells 5A1, 5H1, and 4A2 were destroyed shortly after being drilled for unknown reasons. Well 5B1 was discovered to be dry after being drilled, and there is no readily available information for Well 4A1. The Windy Acres Well became inactive due to poor water quality during pumping. SVM stated that additional research is needed to determine whether Wells 4A1, 4A2, 5A1, 5B1, and 5H1 have historically been in service. All other wells became inactive due to sanding, low flowrates, or replacement by other wells. Well construction details for the inactive wells are shown on Table K-1.

There are currently five (5) metered, active wells (IW30, IW35, IW36, WE2, and WE4) in the Basin under the ownership of SVM located on these properties:

- Well IW30
 - Kern County Assessor Parcel Number (APN) 352-095-08;
- Well IW35
 - APN 454-080-01;
- West IW36
 - APN 352-095-27;
- Well WE2
 - APN 478-020-15;
- Well WE4
 - APN 508-030-04

There are two pipeline systems that convey water from the Basin to Searles Valley: the Westend System and the Indian Wells System. Wells WE2 and WE4 are on the Westend System and have production capacities of 700 gallons per minute (gpm) and 1,500 gpm, respectively. Wells IW30, IW35, and IW36 are on the Indian Wells System and have production capacities of 430 gpm, 750 gpm, and 1,200 gpm, respectively.

Appendix K: Pumping Verification Report for Searles Valley Minerals

According to the data reported by SVM, Well WE2 was drilled in 1940 to replace the Windy Acres Well (drilled in 1930). Well WE2 has a total depth of 375 feet, a static water level of 116 feet below ground surface (bgs) (measured in 1948), and is equipped with a submersible pump installed at 131 feet bgs. Well IW30 was drilled in 1951 to replace Well 22 (drilled in 1912). Well IW30 has a total depth 387 feet, a static water level of 180 feet bgs at the time it was drilled, and is equipped with a submersible pumped installed at 184 feet bgs. IW36 was drilled in 1990 to replace Well 34 (drilled in 1953). IW36 was drilled and deepened to a total depth of 1,145 feet, had a static water level of 249 feet bgs at the time it was deepened, and has a submersible pump installed at 410 feet bgs.. Well WE4 was drilled in 1965 to a total depth of 866 feet. Well WE4 had a static water level of 214 feet bgs at the time it was drilled, and is equipped with a submersible pump installed at 231 feet bgs. Well IW35 was drilled in 1989 to a total depth of 850 feet, had a static water level of 233 feet bgs at the time it was drilled, and has a submersible pump installed at 290 feet bgs. Well construction details for the active wells are provided in Table K-1.

Groundwater Production

SVM's reported historical groundwater production dating back to 1931 is shown in Appendix K-2. From historical reports submitted with the Questionnaire response, SVM's production was estimated based on pumping capacity with all wells pumping continuously prior to 1942. SVM reported that SDWC has had meters on all customer service connections since 1944. In the response to the Questionnaire, SVM submitted records from The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) showing groundwater production for SVM from the years 1975 to 2016. SVM has referenced these records for their estimated groundwater production during these years.

Verification Data and Information

All of the data described below were used in the verification of the groundwater production by SVM from the Basin.

Groundwater Production Questionnaire and Historical Production Reports

SVM provided combined groundwater production numbers for its active wells from 1931 to 1974. The groundwater production reported in the response to the Questionnaire was obtained from various historical reports that have estimated production based on either pumping capacity with continuous pumping, or metered records. The production provided by SVM was reviewed and verified to be consistent with the historical reports. SVM has referenced the Cooperative Group's recorded groundwater production estimates for the years 1975 to 2016.

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the response to the Questionnaire, is shown on Table K-2. (The production was previously recorded by the Cooperative Group.)

Basis of Verification

The available data discussed in the "**Verification Data and Information**" section was considered in the verification of groundwater production by SVM.

Records of Groundwater Production from the Authority and Cooperative Group

SVM provided combined groundwater production for its active wells from 1931 to 1974. The groundwater production reported in the response to the Questionnaire was obtained from various historical reports that have estimated production based on either pumping capacity with continuous pumping, or metered records. The production provided by SVM was reviewed and verified to be consistent with the historical reports.

The Cooperative Group has presented groundwater production for SVM from the years 1975 to 2016, and SVM has referenced this production record as their estimated production during these years. SVM provided internal water production records that showed estimated production values for 2016 through 2019 based on average monthly

pumping rates. In 2016, the Cooperative Group presented an annual groundwater production of 2,377 AF, and SVM's internal water production records for 2016 indicate an estimated production of 2,374 AF. In the response to the Questionnaire, SVM referenced their internal records and reported an annual groundwater production of 2,708 AF for 2019, exactly matching the Authority's 2019 records.

Review of Methods and Verification and Conclusions

In the response to the Questionnaire, SVM reported that production from the Basin began in 1930 at a well near Windy Acres Ranch. The existence of this well and its production operations have been documented in two (2) reports that were attached to SVM's response to the Questionnaire:

- *X-19 Indian Wells Valley Water*
 - Prepared by American Potash and Chemical Corporation Research and Development Department, February 1942
- *Bulletin No. 91-9: Data on Water Wells in Indian Wells Valley Area, Inyo, Kern, and San Bernardino Counties, California*
 - Prepared for State of California, Department of Water Resources
 - Prepared by United States Department of Interior Geological Survey

There are currently two pipeline systems that convey groundwater produced by SVM from the Basin to Searles Valley: the Westend System and the Indian Wells System. Extracted groundwater is used by SVM for industrial (minerals recovery and production processes) and municipal (households in communities near Trona, Searles Valley) purposes. SDWC has an annual purchase agreement with SVM under which SVM supplies "surplus water" to SDWC in an amount not to exceed 200 million gallons (614 acre-feet) per year. There was no reported use of groundwater for agricultural irrigation by SVM.

Reported groundwater production prior to 1975 was verified against the historical reports submitted with the response to the Questionnaire. Production values obtained

Appendix K: Pumping Verification Report for Searles Valley Minerals

from various historical reports have estimated production based on either pumping capacity with continuous pumping, or metered records. The Cooperative Group has recorded groundwater production from 1975 through 2016 for SVM, and SVM has referenced these numbers as their estimated production during these years in the response to the Questionnaire. SVM also provided internal production records that estimated groundwater production for the years 2016 through 2019. Based on the estimates in SVM's internal production records, SVM reported a production of 2,374 AF for 2016, while the Cooperative Group's recorded production was 2,377 AF. Based on the estimates in SVM's internal production records, SVM reported a production of 2,708 AF for 2019, which is consistent with production recorded by the Authority in 2019.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table K-2. As reported in the response to the Questionnaire, SVM's lowest annual Base Period groundwater production of 2,458 AF occurred in 2011, as presented by the Cooperative Group.

Table K-1
Well Construction Information

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static Water Level (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
IW30	1951	387	N/A	180	183.75	N/A	100	N/A	N/A	N/A	Active
IW35	1989	850	850	233	290	N/A	N/A	N/A	1500 gpm	1989/May	Active
IW36	1990	1145	982	249	410	N/A	N/A	N/A	2000 gpm	1990/Aug	Active
WE2 ¹	1940	375	278	116	131	N/A	N/A	N/A	N/A	N/A	Active
WE4	1965	866	555	214	231	N/A	N/A	N/A	N/A	N/A	Active
Well 22 ²	1912	N/A	N/A	175	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Well 23	1942	300	300	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Well 34 (Pribus)	1953	402	370	153	193.5	N/A	100	N/A	N/A	N/A	Inactive
WE 1	1931	185	N/A	114	119	N/A	N/A	N/A	125 gpm	1979/Mar	Inactive
Windy Acres Well	1930	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
WE3	1946	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
4A1	1959	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
5B1	1959	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

Notes:

- Searles Valley Minerals Inc currently owns 5 active wells, extracted groundwater is not for agricultural purposes.

- All inactive wells stopped groundwater extraction prior 1991 due to various reasons, including poor WQ, new well replacement, sanding issues, or unknown.

¹ WE2 static water level and pumping depth were measured in March 1948.

² Well 22 static water level was measured in February 1947.

Table K-2

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	N/A	2,586.6	215.55	N/A	N/A	N/A	2,586.6	215.55	0.0%
2011	N/A	2,457.5	204.79	N/A	N/A	N/A	2,457.5	204.79	0.0%
2012	N/A	2,743.0	228.58	N/A	N/A	N/A	2,743.0	228.58	0.0%
2013	N/A	2,706.0	225.50	N/A	N/A	N/A	2,706.0	225.50	0.0%
2014	N/A	2,679.0	223.25	N/A	N/A	N/A	2,679.0	223.25	0.0%

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- SVM reported groundwater production of 2,708 AF in 2019. The IWVGA report has a record of 2,708 AF. The discrepancy is 0%.

APPENDIX K-1

Timeline History of Searles Valley Minerals Inc.

Timeline History of Searles Valley Minerals Inc.:

1873 – John Searles and three partners stake claims to 640 acres in Searles Valley and form the San Bernardino Borax Mining Company (SBBM).

1895 – The Pacific Coast Borax Company (PCBC) buys SBBM.

1908 – California Trona Company is formed and leases buildings and equipment from SBBM to mine 258 claims.

1913 – California Trona Company becomes American Trona Corporation.

1914 – The Trona Railway Company completes 31 miles of track from Trona to the Searles Station junction with the Southern Pacific Railroad.

1914 – American Trona Corporation establishes the company-owned town of Trona, CA.

1916 – PCBC and The Solvay Company form the Borosolvay Company.

1916 – The Borosolvay Company forms the town of Borosolvay, CA south of Trona

1918 – PCBC leases land to build the Westend Chemical Company.

1926 – American Trona Corporation becomes American Potash & Chemical Corporation (APCC).

1926 – Westend Chemical Company (WCC) begins full-scale operation.

1930—WCC drills its first well near Windy Acres Ranch in IWVGB and begins transporting water to Searles Valley via a 19-mile long drill steel pipe, supplying water for both industrial and municipal uses in Searles Valley.

1931—WCC drills its second well (Well 1) in IWVGB near Fox Ranch and extends its 19-mile long pipeline to Well 1.

1940—WCC drills its third well (Well 2) in IWVGB near its second well (Well 1). This well (Well 2) is still in use today.

1942—APCC acquires land near Bonewits Ranch containing an operational well that was drilled in 1912 and begins transporting potable water to Searles Valley via a pipeline through the China Lake gap area (Well 22).

1942—APCC drills a second well (Well 23) near its first well (Well 22).

1946—WCC drills its fourth well (Well 3) in the IWVGB.

1950—APCC drills Well 30 in the IWVGB, completes work in 1951.

1953—APCC drills Well 34 also known as Pribus Well in the IWVGB.

1956 – Stauffer Chemical Company acquires Westend Chemical Company (WCC).

1965—Stauffer drills Well 4 in the IWVGB.

1967 – Kerr-McGee Corporation acquires APCC.

1974—Kerr-McGee buys the Westend Chemical Company from Stauffer Chemical Company.

1989—Kerr-McGee drills Well 35 in the IWVGB.

1990—Kerr-McGee drills Well 36 in the IWVGB.

1990 – D. George Harris and Associates acquires the Soda Products Division of the Kerr-McGee Chemical Corporation (both the Trona and Westend plants) and forms the North American Chemical Company.

1998 – IMC Global, Incorporated acquires North American Chemical Company.

2004 - Sun Capital acquires IMC Chemicals, Incorporated and renames the business Searles Valley Minerals, Incorporated.

2008 - Nirma Ltd. acquires Searles Valley Minerals, Incorporated.

APPENDIX K-2
**Reported Groundwater
Production (Questionnaire)**

Year	WCC/Stauffer	APCC/Trona	Total Company	Reference/Notes
	AFY	AFY	AFY	
1930	unknown			Ritchie, 1942
1931-1939	At least 291		At least 291	Moyle, 1963
1940	565		565	Ritchie, 1942
1941	565		565	Ritchie, 1942
1942	565	161	726	Turnbull, 1952 , Ritchie, 1942
1943	565	649	1213	Turnbull, 1952
1944	565	651	1215	Turnbull, 1952
1945	565	628	1192	Turnbull, 1952
1946	565	626	1190	Turnbull, 1952
1947	565	674	1238	Turnbull, 1952
1948	unk	577	unk	Turnbull, 1952
1949	unk	537	unk	Turnbull, 1952
1950	unk	368	unk	Turnbull, 1952
1951	unk	346	unk	APCC Internal Production Report
1952	unk	345	unk	APCC Internal Production Report
1953	unk	375	unk	APCC Internal Production Report
1954	837	392	1230	Mulqueen 1979, APCC Internal Production Report
1955	unk	370	unk	APCC Internal Production Report
1956	unk	398	unk	Stauffer Chemical bought WCC
1957	unk	433	unk	APCC Internal Production Report
1958	1212	396	1609	Mulqueen 1979, APCC Internal Production Report
1959	1328	411	1740	Mulqueen 1979, APCC Internal Production Report
1960	1339	370	1710	Mulqueen 1979, APCC Internal Production Report
1961	1369	469	1839	Mulqueen 1979, APCC Internal Report
1962	1474	601	2076	Mulqueen 1979, APCC Internal Report
1963	1486	650	2137	Mulqueen 1979, APCC Internal Report
1964	1257	660	1918	Mulqueen 1979, APCC Internal Report
1965	1539	unk	unk	Mulqueen, 1979
1966	1677	786*	2464	Mulqueen 1979, APCC Internal Report
1967	1642	899	2543	Mulqueen 1979, APCC Internal Report
1968	1649	999	2649	Mulqueen 1979
1969	unk	1069*	unk	APCC internal prod rept
1970	1640	1028	2668	APCC Int. prod rept, Sonia, Bornemann ltr 1971
1971	unk	1178	unk	APCC internal prod rept
1972	unk	1117	unk	APCC internal prod rept
1973	unk	1210	unk	Mulqueen 1979
1974	1741	1119	2860	Mulqueen 1979 Kerr McGee buys Westend
1975			2781	IWVGA Spreadsheet
1976			2911	IWVGA Spreadsheet
1977			3315	IWVGA Spreadsheet
1978			3081	IWVGA Spreadsheet
1979			3081	IWVGA Spreadsheet
1980			2887	IWVGA Spreadsheet
1981			3065	IWVGA Spreadsheet
1982			2887	IWVGA Spreadsheet
1983			2476	IWVGA Spreadsheet
1984			2307	IWVGA Spreadsheet
1985			2397	IWVGA Spreadsheet
1986			2557	IWVGA Spreadsheet
1987			2560	IWVGA Spreadsheet
1988			2560	IWVGA Spreadsheet
1989			2320	IWVGA Spreadsheet
1990			2505	IWVGA Spreadsheet
1991			2406	IWVGA Spreadsheet
1992			2528	IWVGA Spreadsheet
1993			2607	IWVGA Spreadsheet
1994			2607	IWVGA Spreadsheet
1995			2710	IWVGA Spreadsheet
1996			2620	IWVGA Spreadsheet
1997			2522	IWVGA Spreadsheet

Year	WCC/Stauffer AFY	APCC/Trona AFY	Total Company AFY	Reference/Notes
1998			2527	IWVGA Spreadsheet
1999			2537	IWVGA Spreadsheet
2000			2701	IWVGA Spreadsheet
2001			2732	IWVGA Spreadsheet
2002			2564	IWVGA Spreadsheet
2003			2561	IWVGA Spreadsheet
2004			2470	IWVGA Spreadsheet
2005			2504	IWVGA Spreadsheet
2006			2591	IWVGA Spreadsheet
2007			2530	IWVGA Spreadsheet
2008			2521	IWVGA Spreadsheet
2009			2535	IWVGA Spreadsheet
2010			2587	IWVGA Spreadsheet
2011			2458	IWVGA Spreadsheet
2012			2743	IWVGA Spreadsheet
2013			2706	IWVGA Spreadsheet
2014			2679	IWVGA Spreadsheet
2015			2518	IWVGA Spreadsheet
2016			2377	IWVGA Spreadsheet
2017			2706	Internal Water Production Records
2018			2679	Internal Water Production Records
2019			2708	Internal Water Production Records

Notes:

- Prior to 1975, annual extraction is the sum of WCC and APCC due to separate ownership.

APPENDIX L
Verification Report for
Sierra Shadows Ranch

Appendix L: Pumping Verification Report for Sierra Shadows Ranch

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Sierra Shadows Ranch for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

Sierra Shadows Ranch's initial response to the Questionnaire, postmarked March 2, 2020, was submitted by Mr. John T. Conaway and was received by Authority staff on March 4, 2020. Historical pumping data provided in the initial response included only two items: (1) a copy of the Cooperative Group's recorded production data from 1975 to 2017, on which Sierra Shadows Ranch is not listed explicitly by name, and (2) a bar graphic showing the history of parcel acquisition by Sierra Shadows Ranch since its establishment in 1972. Based on the information contained in the initial response to the Questionnaire, a pumping verification for Sierra Shadows Ranch was not conducted, and a write-up on Sierra Shadows Ranch's response to the Questionnaire was included in the appendix for pumpers with insufficient information to verify pumping.

A letter from Brownstein Hyatt Farber Schreck, LLP on behalf of Mojave Pistachios, LLC, the Nugent Family Trust, and Sierra Shadows Ranch (collectively referred to as "Mojave" in the letter) was submitted to the Authority on May 29, 2020. The letter included historical pumping and crop data for Sierra Shadows Ranch but was not considered in this Report because it was not submitted in a reasonably timely manner and was not provided to Authority staff for the purpose of commenting on the draft report released on June 3, 2020.

After release of the draft Report for comments on June 3, 2020, Mr. John T. Conaway provided Authority staff with additional files of historical groundwater use by Sierra Shadows Ranch since establishment. The files largely overlapped with the data provided in the letter from Brownstein Hyatt Farber Schreck, LLP, but other data that was not included in the letter was also provided by Mr. Conaway. **Only the files provided directly by Mr. Conaway were considered during the preparation of this Report.**

History

Sierra Shadows Ranch owns a total of 200 acres of land within the Basin boundaries and reports that groundwater extractions from the Basin began in 1972. In the response to the Questionnaire, Sierra Shadows Ranch reported owning and operating seven (7) active wells and one (1) inactive well. The lands owned by Sierra Shadows Ranch are mainly used for agricultural production. Ten (10) acres of land were used for apricot production for the period between 1972 and 1982. Agricultural production changed from apricots to pistachios in 1983, and 200 acres of land have been used for pistachio production since 1983.

Description of Facilities

There are currently seven (7) active wells and one (1) inactive well located on Sierra Shadows Ranch's properties. The inactive well was active prior to 2000 but was made inactive due to maintenance issues. Sierra Shadows estimates the construction date for the inactive well to be sometime in the 1960s. Information on well construction, static water level, and pump information are not available due to a local fire that occurred at the well driller's facilities. Information on permits for all groundwater wells were not provided except for one (1) well located on parcel number 352-260-16 drilled under County Permit Number WP14551. Extracted groundwater is fed into a closed-loop, constant-pressure drip system for agricultural purposes. The Sierra Shadows Ranch parcel acquisition information (31 parcels) between 1971 and 2014 as provided in the response to the Questionnaire is shown on Appendix L-1.

Groundwater Production

Groundwater production at Sierra Shadows Ranch began in 1972. In the response to the Questionnaire, Sierra Shadows Ranch attributed their current agricultural practices and groundwater production trends to three developmental individual phases. In the first developmental phase from 1972 to 1982, apricot trees were planted and Sierra Shadows

Appendix L: Pumping Verification Report for Sierra Shadows Ranch

Ranch decided to transition to pistachio farming, ceasing all irrigation of the existing apricot trees. In the second developmental phase from 1983 to 2003, pistachios were interplanted within the same apricot fields and environmentally-friendly farming practices were researched and designed for. In the last developmental phase, an intergraded modular irrigation system was installed in the years 2010 to 2016.

The reported annual groundwater production values between 1972 and 2019 are provided on Table L-2. Sierra Shadows Ranch provided the combined groundwater production of the active wells in the response to the Questionnaire and reports total production is estimated from the number of trees and corresponding required drip emitters. Water usage information specific to the irrigation drips was not provided.

The Authority and The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) do not have historic reported groundwater production specific to Sierra Shadows Ranch; however, the Authority has groundwater production records from September 2018 to December 2019.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by Sierra Shadows Ranch from the Basin.

Groundwater Production Questionnaire

Sierra Shadows Ranch provided the combined groundwater production of its active wells in the response to the Questionnaire, estimated from number of trees and drip emitters. Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the response to the Questionnaire are shown on Table L-3. Due to the lack of available groundwater production records from the Cooperative Group, a comparison of groundwater production as reported in the response to the Questionnaire and as documented by the Cooperative Group was not performed in Table L-3. The Authority

does not have production records prior to September 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by Sierra Shadows Ranch.

Records of Groundwater Production from the Authority and Cooperative Group

The Authority does not have historic reported groundwater production specific to Sierra Shadows Ranch, except for the Authority’s monthly groundwater production records between September 2018 and December 2019. In their response to the Questionnaire, Sierra Shadows Ranch reported an annual groundwater production of 501.14 AF for 2019, whereas the Authority has a record of 457.32 AF. It should be noted that the Authority’s records for calendar year 2019 show Sierra Shadows Ranch producing 0 AF of water for the months January through April and October through December.

Review of Methods and Verification and Conclusions

Sierra Shadows Ranch owns a total of 200 acres of land within the Basin boundaries and uses extracted groundwater for agricultural purposes (irrigation of apricot trees and pistachio orchards). Ten (10) acres of land were used for apricot production for the period between 1972 and 1982. Agricultural production changed from apricots to pistachios in 1983, and 200 acres of land have been used for pistachio production since 1983.

Reported groundwater production in the response to the Questionnaire covers the period between 1972 and 2019. The Indian Wells Valley Cooperative Groundwater

Appendix L: Pumping Verification Report for Sierra Shadows Ranch

Management Group (Cooperative Group) does not have historic reported groundwater production specific to Sierra Shadows Ranch and the Authority has groundwater production records from September 2018 to December 2019. Sierra Shadows Ranch reported an annual groundwater production of 501.14 AF for 2019, whereas the Authority has a record of 457.32 AF.

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table L-3. Sierra Shadows Ranch's lowest annual Base Period groundwater production is about 241.68 acre-feet, estimated from number of trees and drip emitters.

J:\2652 IWVGA\23 - Pumping Verification Reports\1_Final Report\Revised_July2020\Sierra Shadows Ranch\Appendix L - Sierra Shadows Ranch.docx

**Table L-1
Well Construction Information**

Well Name/ Number*	Date Drilled	Well Depth	Casing Length	Static Water Level (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
Well 1	N/A	N/A	N/A	N/A	N/A	N/A	200	N/A	N/A	N/A	Active
Well 2	N/A	N/A	N/A	N/A	N/A	N/A	50	N/A	N/A	N/A	Active
Well 3	N/A	N/A	N/A	N/A	N/A	N/A	15	N/A	N/A	N/A	Active
Well 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 8	1960's	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

Notes:

- Well names and ID's were not provided in the response to the Questionnaire.
- Sierra Shadows Ranch stated that a well installed in the 1960's was made inactive in 2000 due to the well requiring maintenance.
- No other well construction details were provided.

Table L-2
Data Source Used For Groundwater Production Estimation

Year	Crop	Irrigated Acreage	Groundwater Production (acre-foot)	Estimate Method
1972	Apricot	10	5	Number of Trees and Drip Emitters
1973	Apricot	10	N/A	Number of Trees and Drip Emitters
1974	Apricot	10	10	Number of Trees and Drip Emitters
1975	Apricot	10	N/A	Number of Trees and Drip Emitters
1976	Apricot	10	24	Number of Trees and Drip Emitters
1977	Apricot	10	N/A	Number of Trees and Drip Emitters
1978	Apricot	10	24	Number of Trees and Drip Emitters
1979	Apricot	10	N/A	Number of Trees and Drip Emitters
1980	Apricot	10	24	Number of Trees and Drip Emitters
1981	Apricot	10	N/A	Number of Trees and Drip Emitters
1982	Apricot	10	24	Number of Trees and Drip Emitters
1983	Pistachio	200	N/A	Number of Trees and Drip Emitters
1984	Pistachio	200	30	Number of Trees and Drip Emitters
1985	Pistachio	200	55	Number of Trees and Drip Emitters
1986	Pistachio	200	76	Number of Trees and Drip Emitters
1987	Pistachio	200	76	Number of Trees and Drip Emitters
1988	Pistachio	200	161.68	Number of Trees and Drip Emitters
1989	Pistachio	200	161.68	Number of Trees and Drip Emitters
1990	Pistachio	200	161.68	Number of Trees and Drip Emitters
1991	Pistachio	200	161.68	Number of Trees and Drip Emitters
1992	Pistachio	200	161.68	Number of Trees and Drip Emitters
1993	Pistachio	200	161.68	Number of Trees and Drip Emitters
1994	Pistachio	200	161.68	Number of Trees and Drip Emitters
1995	Pistachio	200	161.68	Number of Trees and Drip Emitters
1996	Pistachio	200	161.68	Number of Trees and Drip Emitters
1997	Pistachio	200	161.68	Number of Trees and Drip Emitters
1998	Pistachio	200	161.68	Number of Trees and Drip Emitters
1999	Pistachio	200	161.68	Number of Trees and Drip Emitters
2000	Pistachio	200	161.68	Number of Trees and Drip Emitters
2001	Pistachio	200	201.68	Number of Trees and Drip Emitters
2002	Pistachio	200	201.68	Number of Trees and Drip Emitters
2003	Pistachio	200	201.68	Number of Trees and Drip Emitters
2004	Pistachio	200	241.68	Number of Trees and Drip Emitters
2005	Pistachio	200	241.68	Number of Trees and Drip Emitters
2006	Pistachio	200	241.68	Number of Trees and Drip Emitters
2007	Pistachio	200	241.68	Number of Trees and Drip Emitters

**Table L-2
Data Source Used For Groundwater Production Estimation**

Year	Crop	Irrigated Acreage	Groundwater Production (acre-foot)	Estimate Method
2008	Pistachio	200	241.68	Number of Trees and Drip Emitters
2009	Pistachio	200	241.68	Number of Trees and Drip Emitters
2010	Pistachio	200	241.68	Number of Trees and Drip Emitters
2011	Pistachio	200	241.68	Number of Trees and Drip Emitters
2012	Pistachio	200	241.68	Number of Trees and Drip Emitters
2013	Pistachio	200	288.00	Number of Trees and Drip Emitters
2014	Pistachio	200	299.14	Number of Trees and Drip Emitters
2015	Pistachio	200	370.14	Number of Trees and Drip Emitters
2016	Pistachio	200	390.14	Number of Trees and Drip Emitters
2017	Pistachio	200	433.14	Number of Trees and Drip Emitters
2018	Pistachio	200	461.14	Number of Trees and Drip Emitters
2019	Pistachio	200	501.14	Number of Trees and Drip Emitters

Table L-3

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	7	241.68	20.1	N/A	N/A	N/A	N/A	N/A	N/A
2011	7	241.68	20.1	N/A	N/A	N/A	N/A	N/A	N/A
2012	7	241.68	20.1	N/A	N/A	N/A	N/A	N/A	N/A
2013	7	288.00	24.0	N/A	N/A	N/A	N/A	N/A	N/A
2014	7	299.14	24.9	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

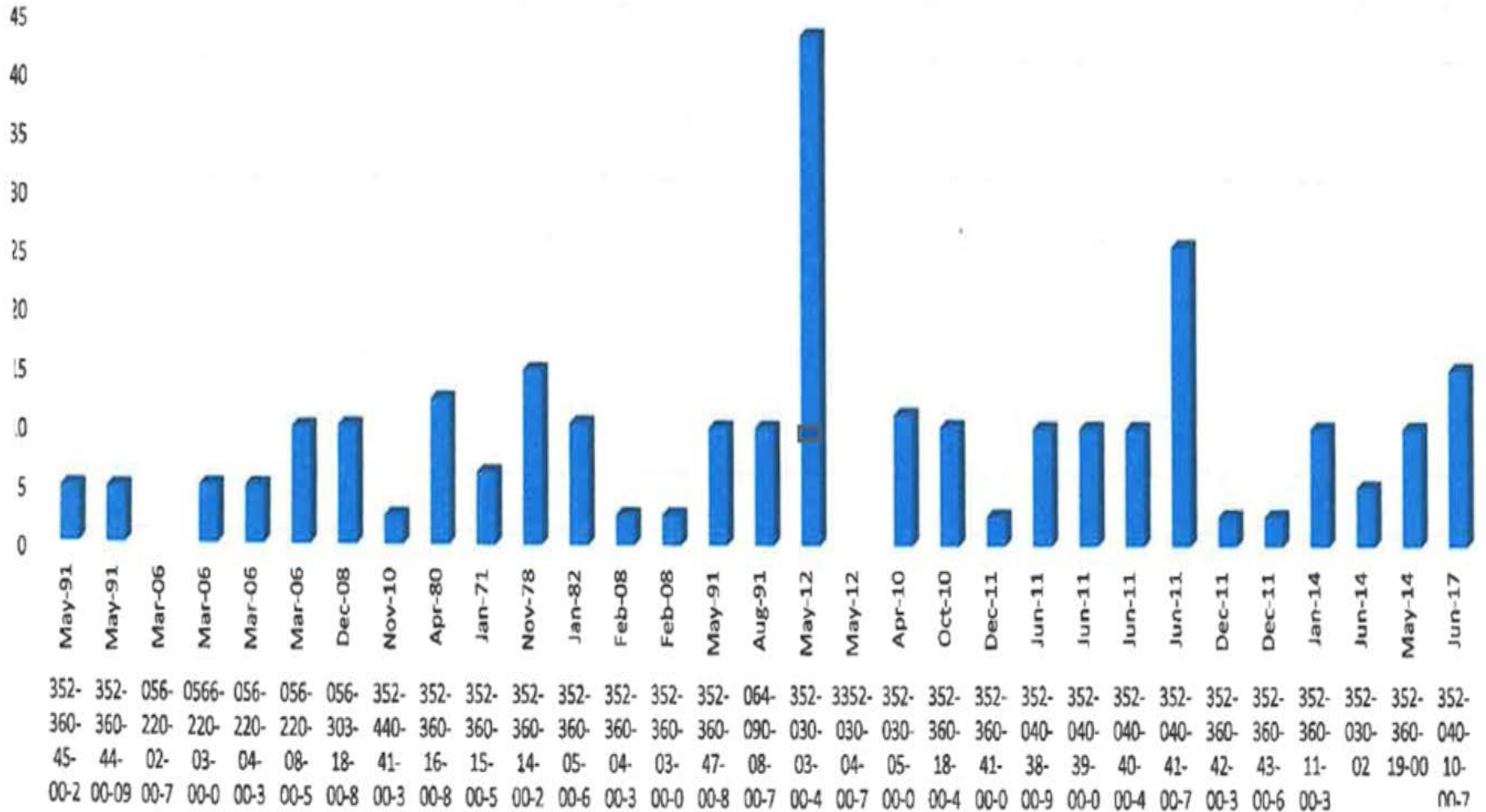
$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Sierra Shadows Ranch reported groundwater production of 501.14 AF in 2019. The IWVGA report has a record of 457.32 AF.

APPENDIX L-1

Fifty-Year Period of Sierra Shadows Ranch Parcel Acquisition and Assessor Parcel Numbers

Sierra Shadows Ranch Parcel Acquisition (Acres) Fifty-Year Period



APPENDIX M
Verification Report for
Simmons Farms

Appendix M: Pumping Verification Report for Simmons Farms

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Simmons Farms for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Simmons Farms owns a total of 168 acres of land within the Basin boundaries. One hundred thirty-three (133) acres of land use extracted groundwater for agricultural purposes, and thirty five (35) acres of land use extracted groundwater for non-agricultural purposes. Simmons Farms reports that its property was purchased in the summer of 2010. The property included two wells that were drilled in 1960 by the previous owner but are still currently used by Simmons Farm. Simmons Farms' groundwater extractions from the Basin began in summer of 2010, though pumping for agricultural irrigation did not begin until the larger agricultural well was drilled in 2012. In the response to the Questionnaire, Simmons Farms reported owning and operating a total of three (3) active wells. Extracted groundwater has been reportedly used for domestic, landscaping, and agricultural (irrigation of alfalfa and grain hay) purposes. Alfalfa has been grown and irrigated from 2012 to 2019, and grain hay was grown and irrigated from 2012 through 2017.

Description of Facilities

There are currently three (3) active wells and no inactive wells located on Simmons Farms' properties. The Small Ag Well and Domestic well were drilled in early 1960, and the Large Ag Well was drilled in 2012 (see Table M-1). The exact drilling dates of the Domestic Well and Small Ag Well were not provided, and no groundwater extraction records for these two wells were provided in the response to the Questionnaire. The Large Ag Well has a flowmeter installed, though neither the Domestic Well nor the Small Ag

Well have flowmeters installed. No additional information was provided regarding well construction, water levels, or pumps. Extracted groundwater is either fed into wheel lines or a center pivot irrigation system for agricultural purposes.

Groundwater Production

Groundwater production at Simmons Farms began in summer of 2010, so there are no historical production records prior to this. The Authority does not have historic reported groundwater production specific to Simmons Farms, except for the Authority's monthly groundwater production records between September 2018 and December 2019. The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) has recorded groundwater production estimates for Simmons Farms from the years 2013 to 2016.

Simmons Farms provided the combined groundwater production of the three (3) active wells in the response to the Questionnaire and reports that total production was estimated from the installed meter on the Large Ag Well. It is unclear how annual production from the Small Ag Well and Domestic Well factor in to the total production estimate. A methodology for annual groundwater production estimates for 2010 and 2011 was not provided. The reported annual groundwater production values between 2010 and 2019 are provided on Table M-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by Simmons Farms from the Basin.

Groundwater Production Questionnaire

Simmons Farms provided the combined groundwater production of its active wells in the response to the Questionnaire, estimated from the installed meter on the Large Ag Well. Annual groundwater production during the Base Period (from 2010 to 2014) as

reported in the response to the Questionnaire are shown on Table M-3. Due to the lack of available groundwater production records from the Cooperative Group from 2010-2012, a comparison of groundwater production as reported in the response to the Questionnaire and as documented by the Cooperative Group was not performed in Table M-3 for 2010-2012. The Authority does not have production records prior to September 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by Simmons Farms.

Records of Groundwater Production from the Authority and Cooperative Group

The Authority does not have historic reported groundwater production specific to Simmons Farms, except for the Authority’s monthly groundwater production records between September 2018 and December 2019. The Cooperative Group has recorded groundwater production estimates for Simmons Farms from the years 2013 to 2016. As reported in the response to the Questionnaire, all annual groundwater production is identical to the values reported by the Cooperative Group for the years 2013 through 2016. Annual groundwater production during 2019 was 471 AFY, as reported in the response to the Questionnaire. Groundwater production data during 2019 as recorded by the Authority was 471 AF. Due to the lack of other available production data for Simmons Farm, the years 2010, 2011, 2012, 2017, and 2018 were unable to be verified.

Review of Methods and Verification and Conclusions

Simmons Farms owns a total of 168 acres of land within the Basin boundaries. One hundred thirty-three (133) acres of land use extracted groundwater for agricultural

Appendix M: Pumping Verification Report for Simmons Farms

purposes, and thirty five (35) acres of land use extracted groundwater for non-agricultural purposes. Extracted groundwater has been reportedly used for domestic and landscaping purposes since 2010, and for agricultural purposes (irrigation of alfalfa and grain hay) since 2012. Alfalfa has been grown and irrigated from 2012 to 2019, and grain hay was grown and irrigated from 2012 through 2017.

Reported groundwater production in the response to the Questionnaire covers the period between summer 2010 and 2019. The Cooperative Group reported groundwater production estimates for the years 2013 through 2016, and production was reported for 2019 to the Authority. Based on the respective 2013 through 2016 and 2019 records, Simmons Farm's reported groundwater production was identical (see Table M-3).

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table M-3. As reported in the response to the Questionnaire, Simmons Farm did produce groundwater continuously during the entirety of the Base Period (i.e. domestic and landscaping pumping began during summer 2010, though pumping for agricultural irrigation did not begin until 2012); therefore, Simmons Farms' lowest annual Base Period groundwater production is 56 acre-feet in 2010.

**Table M-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth	Casing Length	Static Water Level (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
Domestic Well	Early 1960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active
Small Ag Well	Early 1960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive
Large Ag Well	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive

Notes:

- Simmons Farms has three active wells. Groundwater extraction for Simmons Farms usage started in 2010.
- Simmons Farm reported three wells serving four legal parcels with no additional details.
- The Domestic Well and the Small Ag Well wer drilled in early 1960, but there were no extraction records to confirm when production started.

Table M-2
Data Source Used For Groundwater Production Estimation

Year	Groundwater Production (acre-foot)	Estimate Method	Remark
2010	56	N/A	
2011	58	N/A	
2012	918	Flowmeter	Flowmeter installed on Large Ag Well
2013	918	Flowmeter	Flowmeter installed on Large Ag Well
2014	1087	Flowmeter	Flowmeter installed on Large Ag Well
2015	1003	Flowmeter	Flowmeter installed on Large Ag Well
2016	918	Flowmeter	Flowmeter installed on Large Ag Well
2017	625	Flowmeter	Flowmeter installed on Large Ag Well
2018	389	Flowmeter	Flowmeter installed on Large Ag Well
2019	471	Flowmeter	Flowmeter installed on Large Ag Well

Table M-3

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	2	56	4.7	N/A	N/A	N/A	N/A	N/A	N/A
2011	2	58	4.8	N/A	N/A	N/A	N/A	N/A	N/A
2012	3	918	76.5	N/A	N/A	N/A	N/A	N/A	N/A
2013	3	918	76.5	N/A	N/A	N/A	918	76.5	0.0%
2014	3	1087	90.6	N/A	N/A	N/A	1087	90.6	0.0%

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

- Simmons reported groundwater production of 471 AF in 2019. The IWVGA also has a record of 471 AF in 2019.

APPENDIX N
Verification Report for
Terese Farms

Appendix N: Pumping Verification Report for Terese Farms

The purpose of this Pumping Verification Report (Report) is to verify and certify to the extent possible, all groundwater production from Terese Farms for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing Annual Pumping Allocations and determining eligibility for the Transient Pool. An analysis of the verification data, the methods of verification, and findings on the Producer's pumping are presented herein.

History

Terese Farms owns 80 acres utilizing extracted groundwater for agricultural purposes and 110 acres for non-agricultural purposes for a total of 190 acres within the Basin boundaries. Terese Farms claims groundwater production began in 1984. In the response to the Questionnaire, Terese Farms reported owning and operating five (5) active wells, but only provided static water level information, construction details, and well names for four (4) wells. Extracted groundwater has been reportedly used for domestic and agricultural (irrigation of pistachio orchards) purposes, though the quantity of extracted groundwater for domestic purposes was not specified in the response to the Questionnaire.

Description of Facilities

There are currently five (5) active wells and no inactive wells located within Terese Farms' property. In the response to the Questionnaire, Terese Farms reported owning and operating five (5) active wells, but only provided information for four (4) wells. According to the well construction data provided by Terese Farms, the North Well was drilled in 1982 with a total depth of 500 feet, a static water level of 390 feet below ground surface (bgs), and a submersible pump installed at 450 feet bgs. The East Well was drilled in 1998 with a total depth of 600 feet, a static water level of 420 feet bgs, and a submersible pump installed at 500 feet bgs. The South Well was drilled in 2015 with a total depth of 622 feet and a static water level of 431 feet. The Bow Well was drilled in 2009 with a total depth of 401 feet and a static water level of 229 feet. Information for the

fifth well was not provided. General information provided by Terese Farms on well construction, water level, well pumps, and service status of Terese Farms wells is provided in Table N-1.

Groundwater Production

Historical groundwater production based on metered records are not available because flow meters are not installed on the Terese Farms wells. The Indian Wells Valley Cooperative Groundwater Management Group (Cooperative Group) and the Authority do not have historic reported groundwater production specific to Terese Farms, except for the Authority's monthly groundwater production records between December 2018 and December 2019. Terese Farms provided the estimated combined groundwater production of the active wells in the response to the Questionnaire. Estimates of production were determined from the amount of acreage irrigated and from pistachio water use rates from a referenced report prepared by the University of California Davis. Details of the production estimates are discussed in the following sections. The annual groundwater production estimates between 1984 and 2019 are provided on Table N-2.

Verification Data and Information

All of the data described below were utilized in the verification of the groundwater production by Terese Farms from the Basin.

Groundwater Production Questionnaire

Terese Farms provided the combined groundwater production of the active wells between 1984 and 2019. Groundwater production for the period between 1984 and 2019 was estimated based on the irrigated acreage and water use rates of pistachio trees. Terese Farms' estimation of water usage per acreage for pistachios referenced a study done by the University of California, Davis (Beede et al., 2008). It is unclear whether Terese Farms has used or currently uses the irrigation methods mentioned in the study.

Appendix N: Pumping Verification Report for Terese Farms

Annual groundwater production during the Base Period (from 2010 to 2014) as reported in the Questionnaire, are shown on Table N-3. Due to the lack of available groundwater production records from the Cooperative Group, a comparison of groundwater production as reported in the Questionnaire and as documented by the Cooperative Group was not performed in Table N-3. The Authority does not have production records prior to December 2018; therefore, a comparison between the reported production in the Questionnaire and the data documented by the Authority was not performed either.

Power Consumption Data

Terese Farms submitted electric power consumption data from the Southern California Edison Company (Edison) in their response to the Questionnaire. The data includes monthly power usage (in kilowatt-hour, kWh) for the years 2009 through 2018. Because pump test data was not available and no pumping rates were provided, groundwater production is not able to be estimated. It should be noted that the power consumption data submitted with the response to the Questionnaire may include power consumption for agricultural pumping, domestic, and other uses.

Basis of Verification

The available data discussed in the “**Verification Data and Information**” section was considered in the verification of groundwater production by Terese Farms.

Records of Groundwater Production from the Authority and Cooperative Group

Records of groundwater production from the Authority and the Cooperative Group were not available for this property except for monthly groundwater production reports submitted to the Authority between December 2018 and December 2019. As reported in

the response to the Questionnaire, Terese Farms' annual groundwater production during 2019 was 320 AF; groundwater production data reported by the Authority in 2019 was 322 AF. The discrepancy is approximately 0.63%.

Power Consumption Data

Monthly electric power consumption data from Edison for Terese Farms was submitted with the response to the Questionnaire. Summarized annual power consumption data can be found in Appendix N-1. Assuming that the power consumption data in Appendix N-1 is solely for agricultural irrigation, it can be assumed that a positive correlation should exist between power usage and groundwater production amount; larger power consumption should result in increased amounts of production. From the Edison data and reported production values provided by Terese Farms, there seems to be no clear relationship between power consumption and groundwater extraction. It should be noted that power consumption shown in Appendix N-1 was only provided for the period between 2009 and 2018, so the analysis described above only applies to the period between 2009 and 2018.

Review of Methods and Verification and Conclusions

Terese Farms owns 80 acres utilizing extracted groundwater and 110 acres for non-agricultural purposes for a total of 190 acres within Basin boundaries. Extracted groundwater has been reportedly used for domestic and agricultural (irrigation of pistachio orchards) purposes, though the quantity of extracted groundwater for domestic purposes were not specified in the responses of the Questionnaire.

Although the reported groundwater production in the response to the Questionnaire covers the period between 1984 and 2019, verifications of groundwater production between data collected from the Cooperative Group and the response to the Questionnaire were not performed because the Cooperative Group has no production records for this property. Groundwater production by Terese Farms was reported in the response to the Questionnaire for 2019, and the reported 2019 production in the response

Appendix N: Pumping Verification Report for Terese Farms

to the Questionnaire is approximately equal to the 2019 production reported to the Authority (see Table N-2).

The annual groundwater production reported in the response to the Questionnaire between 1984 and 2019 was estimated based on the acreage of the pistachio orchard and approximate water requirements for pistachios. The method to estimate groundwater production based on acreage and water requirements is generally subject to uncertainty due to unknown factors such as irrigation schedule and irrigation management. Reported power consumption data was used view potential relationships between electricity use and groundwater production, but none were found (see Appendix N-1).

Finally, in accordance with the Sustainable Groundwater Management Act (SGMA) and California water law, the period between January 2010 and December 2014 has been considered by the IWVGA to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment. Annual groundwater production reported in the response to the Questionnaire during the Base Period are shown in Table N-3. As reported in the response to the Questionnaire, Terese Farm's lowest annual Base Period groundwater production of 260 acre-feet (AF) occurred in 2010, estimated using approximate water requirements and acreage.

**Table N-1
Well Construction Information**

Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static Water Level (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor Horsepower	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status
North	1982	500	N/A	390	450	N/A	N/A	N/A	N/A	N/A	Active
East	1998	600	N/A	420	500	N/A	N/A	N/A	N/A	N/A	Active
South	2015	622	N/A	431	N/A	N/A	N/A	N/A	N/A	N/A	Active
Bow	2009	401	N/A	229	N/A	N/A	N/A	N/A	N/A	N/A	Active
Well 5*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active

Notes:

- It is stated in the Questionnaire response that there are 5 active groundwater wells serving the property.
- Photos of the South and Bow wells were included as a Questionnaire attachment and indicated the drill date.
- * Information for 4 of the 5 wells was provided. The remaining well was not given a well name.

**Table N-2
Data Source Used For Groundwater Production Estimation**

Year	Crop	Questionnaire				
		Irrigated Acreage (acres)	First Planting Groundwater Use (ft/ac)	Second Planting Groundwater Use (ft/ac)	Third Planting Groundwater Use (ft/ac)	Estimated Groundwater Production (AFY)
1937 to 1983	N/A	N/A	N/A	N/A	N/A	N/A
1984	Pistachios	20.0	1.5	--	--	30.0
1985	Pistachios	20.0	2.0	--	--	40.0
1986	Pistachios	20.0	2.3	--	--	46.0
1987	Pistachios	20.0	3.1	--	--	62.0
1988	Pistachios	20.0	3.5	--	--	70.0
1989	Pistachios	20.0	3.9	--	--	78.0
1990	Pistachios	20.0	4.0	--	--	80.0
1991	Pistachios	20.0	4.0	--	--	80.0
1992	Pistachios	20.0	4.0	--	--	80.0
1993	Pistachios	20.0	4.0	--	--	80.0
1994	Pistachios	20.0	4.0	--	--	80.0
1995	Pistachios	20.0	4.0	--	--	80.0
1996	Pistachios	20.0	4.0	--	--	80.0
1997	Pistachios	20.0	4.0	--	--	80.0
1998	Pistachios	20.0	4.0	--	--	80.0
1999	Pistachios	50.0	4.0	1.5	--	125.0
2000	Pistachios	50.0	4.0	2.0	--	140.0
2001	Pistachios	50.0	4.0	2.3	--	149.0
2002	Pistachios	50.0	4.0	3.1	--	173.0
2003	Pistachios	50.0	4.0	3.5	--	185.0
2004	Pistachios	50.0	4.0	3.9	--	197.0
2005	Pistachios	50.0	4.0	4.0	--	200.0
2006	Pistachios	50.0	4.0	4.0	--	200.0
2007	Pistachios	50.0	4.0	4.0	--	200.0
2008	Pistachios	50.0	4.0	4.0	--	200.0
2009	Pistachios	80.0	4.0	4.0	1.5	245.0
2010	Pistachios	80.0	4.0	4.0	2.0	260.0
2011	Pistachios	80.0	4.0	4.0	2.3	269.0
2012	Pistachios	80.0	4.0	4.0	3.1	293.0
2013	Pistachios	80.0	4.0	4.0	3.5	305.0
2014	Pistachios	80.0	4.0	4.0	3.9	317.0
2015	Pistachios	80.0	4.0	4.0	4.0	320.0
2016	Pistachios	80.0	4.0	4.0	4.0	320.0
2017	Pistachios	80.0	4.0	4.0	4.0	320.0
2018	Pistachios	80.0	4.0	4.0	4.0	320.0
2019	Pistachios	80.0	4.0	4.0	4.0	320.0

Notes:

- Estimation Method: COST AND RETURNS TO PRODUCE PISTACHIOS; Robert H. Beede, Craig E. Kallsen, Mark W. Freeman, Brent A. Holtz, UC Davis; Pistachio Irrigation, Determining Water Needs and Managing Drought; David Doll UCCE Merced County.

Table N-3

Reported Annual Groundwater Production Between 2010 and 2014 (unit: acre-foot)

Year	Number of Wells	Annual Production - Questionnaire 1	Monthly Average	Annual Production - IWVGA	Monthly Average	Discrepancy %	Annual Production - Cooperative Group	Monthly Average	Discrepancy %
2010	5	260	21.7	N/A	N/A	N/A	N/A	N/A	N/A
2011	5	269	22.4	N/A	N/A	N/A	N/A	N/A	N/A
2012	5	293	24.4	N/A	N/A	N/A	N/A	N/A	N/A
2013	5	305	25.4	N/A	N/A	N/A	N/A	N/A	N/A
2014	5	317	26.4	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- Discrepancy % is calculated by using

$$Discrepancy \% = \left[1 - \frac{Reported\ Extraction\ (IWVGA\ or\ Cooperative\ Group)}{Reported\ Extraction\ (Questionnaire\ 1)} \right] \times 100\%$$

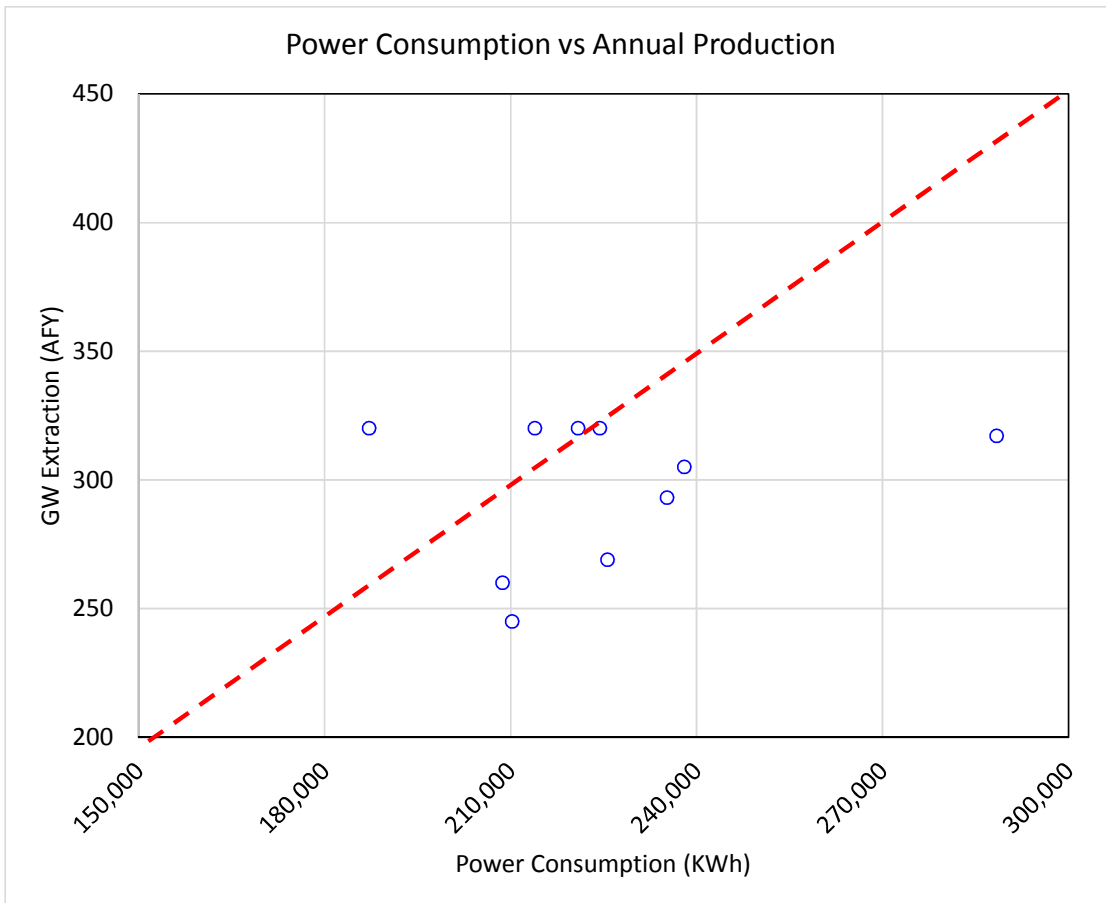
- Terese reported groundwater production of 320 AF in 2019. The IWVGA report has a record of 322 AF in 2019. The discrepancy is -0.63%.

APPENDIX N-1

Annual Power

Consumption Data

Year	Total Usage (KWh)	Annual GW Extraction (AFY)
2009	210,265	245
2010	208,724	260
2011	225,639	269
2012	235,246	293
2013	238,018	305
2014	288,393	317
2015	220,894	320
2016	213,942	320
2017	187,201	320
2018	224,401	320



Derived from electric power consumption data from the Southern California Edison Company (Edison) that Terese Farms submitted with the Questionnaire

APPENDIX O
Verification Report for
Pumpers with Insufficient Information Reported in the
Response to the Questionnaire

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

The purpose of this appendix is to summarize pumpers who did not provide sufficient information for the verification and certification of groundwater production for the years between 1937 and 2019, with particular emphasis on the Base Period for use in establishing the Annual Pumping Allocation and determining eligibility for the Transient Pool. Pumpers who did not provide adequate groundwater production information in the response to the Questionnaire are tabulated in Table O-1. This appendix summarizes and presents the information collected from the pumpers' responses to the Questionnaire. Verification of groundwater production for these pumpers was generally not performed due to a lack of relevant information provided in the response to the Questionnaire. Table O-1 summarizes groundwater usage and information on well construction, water level, well pumps, and well service status for the all pumpers discussed in this appendix.

Carey Marvin

Mr. Carey Marvin owns 2.52 acres of property in Inyokern, California (APN: 352-390-12-00-5), and the property is located within the Basin boundary. This property was established in 1980, and Mr. Marvin purchased this property in 2016. There is one (1) groundwater well located within this property; however, well construction information is not available. Mr. Marvin indicated in the response to the Questionnaire that the well had existed on this property prior to the establishment of the dwelling. The groundwater well is currently active, and extracted groundwater is for domestic water use (residential indoor and outdoor uses). Mr. Marvin did not provide annual groundwater production data or any other information that may assist in estimating groundwater production. In addition, records of groundwater production from the Cooperative Group are not available either.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Crestview Water

According to the response to the Questionnaire, Mr. Kessler moved to this property in 1986 with a well located on the property, suggesting that groundwater extractions may have started prior to 1986. Mr. Kessler indicated that the property deed includes appurtenant water rights. The groundwater service area is approximately 20 acres with eight (8) customer connections served by eight (8) extraction wells; however, only six (6) connections are currently active to receive potable water service. Information on well construction, static water level, pump, and historical groundwater extractions were not provided. Estimates of groundwater production by Crestview Water were not provided in the response to the Questionnaire, and records of groundwater production from the Cooperative Group and the Authority are not available either.

Dixie Water Company

Dixie Water Company is located in Ridgecrest, California (APN not available). Groundwater has been extracted at this property to provide potable water to customers since March 1985; however, it is not clear if groundwater extraction is regulated or if extracted groundwater is produced by a well under a county Permit. The service area is approximately 40 acres with 12 service connections. There is one (1) well owned by Dixie Water Company. Well construction, static water level, and pump flow rate and intake location were not provided; however, the pump is manufactured by Grundfos (Model No. 40S50-a) and rated 5 horsepower. Dixie Water Company indicated in the response to the Questionnaire that flow meters have been using to monitor groundwater extraction since 1985, and the average annual groundwater production is approximately 350,000 gallons (1.07 AFY); however, annual groundwater production records are not provided. The average annual groundwater production estimate provided in the response to the Questionnaire cannot be verified because records of groundwater production from the Cooperative Group are not available. In addition, the Authority has a partial record of the 2018 and 2019 groundwater production (between October 2018 and January 2019), and the total groundwater production during this period is 1.32 AF.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Donna Sue Water Company

Donna Sue Water Company is a 501C12 nonprofit organization located in Inyokern, California (APN: 084-242-30-00). Groundwater has been extracted to provide potable water service by a well drilled under Kern County Permit Number 802746 since January 1990. The total service area is approximately 40 acres with 14 service connections. There is one (1) well located on this property. The well was drilled in 1988 with a static water level of 356.5 feet below ground surface (bgs), measured while the pump was installed, and a total depth of 450 feet bgs. The pump is manufactured by Goulds (model number 701), and the groundwater intake is located at 360 feet bgs. There is a master flow meter installed in a well house to monitor groundwater extraction; however, the owner of the pump does not know how to read the flow meter. Consequently, annual groundwater production is not available. Records of groundwater production from the Cooperative Group are not available; however, the Authority has a 2019 groundwater production record of 2.63 AF for Donna Sue Water Company.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Hammer Water Cooperative

Hammer Water Cooperative is located in Inyokern, California (APN not available). The Secretary of Hammer Water Cooperative claimed that Hammer Water Cooperative

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

is a De Minimis water extractor per Water Code Section 10721(e). Groundwater has been extracted from this property by a well under Kern County Permit Number WA0002719. The beginning date of groundwater extraction at this property is not available. There is one (1) well located in this property. The well was drilled in 1980 with a total depth of 289 feet bgs, but the static water level is not available. The manufacturer of the pump and groundwater intake location were not provided; however, the pump is rated 5 horsepower with a 50 gallons per minute (gpm) flow rate. The pump flow meter was installed in 2018 to monitor groundwater extraction; however, groundwater production is not provided in the response to the Questionnaire. Records of groundwater production from the Cooperative Group are not available; however, the Authority has a 2019 groundwater production record of 0.78 AF for Hammer Water Cooperative.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Heritage Village Master Community Association

Heritage Village Master Community Association (HVMCA) is located in Ridgecrest, California (APN: N/A). The property lot size is approximately 3.5 acres and located within the Basin boundary. The manager of the Heritage Village Master Community Association indicated in the response to the Questionnaire that there is one (1) groundwater well located within the Heritage Village Master Community Association property, and that extracted groundwater is not used for customer service or for agricultural purposes. Information regarding well construction, pump, use of flow meters, and annual groundwater production is not provided. Records of groundwater production from the Cooperative Group are not available.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Inyokern Community Services District

Inyokern Community Services District (Inyokern CSD) is located in Inyokern, California (APN: N/A). Groundwater has been extracted by a well drilled under Kern County Permit Number 86-016 to provide potable water to customers since 1985. The service area is approximately 141 acres with 277 metered service connections. According to the SWRCB online database, Inyokern CSD owns a total of four (4) wells: one (1) active well, one (1) pending well, and two (2) inactive wells. Information on well construction, static water level, and pump data is not provided except for the active well. The active well was drilled in 1995 with a static water level of 292 feet bgs measured while the well was drilled, and a total well depth of 500 feet bgs. The manufacturer of the pump is not provided; however, the pump is rated 35 horsepower and groundwater intake is located at 450 feet bgs. Inyokern CSD indicated in the response to the Questionnaire that the annual groundwater production is 48,282 cubic feet (approximately 1.11 AFY); however, it is not clear whether the annual groundwater production is an average or the groundwater production for any specific year. The Authority has a record of 148.1 AFY of groundwater extracted in 2019; and the Cooperative Group also has records of annual groundwater productions for the period between 1975 and 2016 as shown in the table below.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

Records of Annual Groundwater Production for Inyokern CSD from the Cooperative Group (in acre-feet)

Year	Production	Year	Production	Year	Production	Year	Production
1975	300.0	1986	300.0	1997	139.0	2008	118.0
1976	300.0	1987	300.0	1998	102.0	2009	118.0
1977	300.0	1988	173.0	1999	104.0	2010	118.0
1978	300.0	1989	175.0	2000	111.0	2011	118.0
1979	300.0	1990	170.0	2001	97.0	2012	117.9
1980	300.0	1991	150.0	2002	115.6	2013	117.7
1981	300.0	1992	141.0	2003	126.0	2014	108.0
1982	300.0	1993	150.0	2004	118.4	2015	90.5
1983	300.0	1994	146.0	2005	135.0	2016	102.3
1984	300.0	1995	125.0	2006	135.0		
1985	300.0	1996	134.0	2007	90.7		

There is a significant discrepancy between the groundwater production (1.11 AFY) reported in the response to the Questionnaire and the groundwater production records from the Authority and the Cooperative Group, suggesting that further investigation is needed to verify groundwater production.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined due to the inconsistent groundwater production data between the Inyokern CSD reported production and the production records from the Authority and the Cooperative Group.

Larry Schiller

Mr. Larry Schiller owns 4 acres of property in Ridgecrest, California (APN not available), and the property is located within the Basin boundary. There is one (1) groundwater well located within this property. The well was drilled in 1969 with a static water level of 210 feet bgs, measured while the well was constructed, and a total well

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

depth of 279 feet bgs. The pump was manufactured by Grundfos (Model No. 25330-15), rated 3 horsepower with a flow rate of 25 gpm. The well is currently active, and the extracted groundwater is used for domestic water purposes (residential indoor and outdoor uses). Annual groundwater extractions were not provided; however, Mr. Schiller indicated in the response to the Questionnaire that the estimated annual groundwater extraction is between 2 AF and 3 AF. Records of groundwater production from the Cooperative Group are not available, and the Authority does not have a record of groundwater production for Mr. Schiller.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Life Water Cooperative

Life Water Cooperative is located in Inyokern, California (APN not available). There is one (1) active well owned by Life Water Cooperative. According to the SWRCB online database, it appears Life Water Cooperative owns two (2) groundwater extraction wells, one (1) active and one (1) standby; however, Life Water Cooperative only provided the active well information in the response to the Questionnaire. The active well was drilled in 2010 with a static water level of 325 feet bgs, measured while the well was constructed, and a total depth of 500 feet bgs. The manufacturer of the pump and the pump flow rate were not provided; however, the pump is rated 7.5 horsepower.

Groundwater has been extracted by a well drilled under Kern County Permit Number WP11908 to provide potable water to customers since 1980. The service area is approximately 60 acres with 18 service connections. Individual flow meters have been installed at each service connection to monitor groundwater extractions; however, Life Water Cooperative did not provide groundwater extraction data except for 2019. Life Water Cooperative indicated in the response to the Questionnaire that the 2019

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

groundwater production was 3,532,720 gallons (approximately 10.84 AF). Records of groundwater production from the Cooperative Group are not available for Life Water Cooperative; however, the Authority has the 2019 groundwater production record of 10.84 AF, which is the same as the 2019 groundwater production provided in the response to the Questionnaire.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Mirage St. Water Cooperative

Mirage St. Water Cooperative is located in Inyokern, California (APN not available). Mirage St. Water Cooperative indicated in the response to the Questionnaire that there is one (1) active well located within their property. The well was drilled in 1980 with a static water level of 313 feet bgs, measured while the well was constructed, and a total depth of 352 feet bgs. A submersible pump manufactured by Pentair (model number 40S50) is located 337 feet bgs. The pump is rated 5 horsepower, and the pump flow rate is not available.

Groundwater has been extracted by a well drilled under Kern County Permit Number WA0000553 to provide potable water to customers since April 1980. The service area is approximately 20 acres with 6 service connections. There is no flow meter installed to monitor groundwater extractions; however, Mirage St. Water Cooperative indicated that there was no groundwater extraction prior to 1980, and that the average annual groundwater production is equal to or less than 2 AF for the period between 1980 and present. Records of groundwater production from the Cooperative Group are not available for Mirage St. Water Cooperative; however, the Authority has the 2019 groundwater production record of 3.15 AF, which reasonably matches the reported production of approximately 2 AF in the response to the Questionnaire.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Northeast Leliter Water Cooperative

Northeast Leliter Water Cooperative was established in 1990 and is located in Inyokern, California (APN not available). Northeast Leliter Water Cooperative owns two (2) wells: Steve St. Well and Marvin Gardens Well. Steve St. Well was drilled in 1987 with a static water level of 120 feet bgs, measured during well construction, and a total well depth of 220 feet bgs. The pump associated with the Steve St. Well is rated 5 horsepower. Pump and flow rate data were not provided. Marvin Gardens Well was drilled in 1982 with a static water level of 132 feet bgs, measured during well construction, and a total well depth of 234 feet bgs. The pump associated with Marvin Gardens Well is rated 5 horsepower. Pump and flow rate data were not provided. Both wells were drilled under the same County Permit Number 2609 to provide potable water to customers since April 1990. The service area is approximately 75 acres with 14 service connections. Pump flow meters were installed in August 2018, and groundwater productions prior to August 2018 were not provided. Records of groundwater production from the Cooperative Group are not available for Northeast Leliter Water Cooperative; however, the Authority has the monthly groundwater production records for the period between September 2018 and present. According to the Authority records, the total groundwater production for the period between September 2018 and January 2020 is 33.33 AF, which is the same as the reported groundwater production of 1,451,970 cubic feet (approximately 33.33 AF) in the response to the Questionnaire.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Owens Peak Water Cooperative

The Owens Peak Water Cooperative provided no response to the Questionnaire except for a statement that reads as follows:

“The Owens Peak Water Cooperative is a De minimis water extractor per Water Code 10721(e)”.

Based on the previous well information submittal, the Owens Peak Water Cooperative owns one (1) active well. The well construction date is not provided; however, the well has a total depth of 336 feet bgs and a static water level of 306.5 feet bgs (date measured is not available). The pump associated with the well was manufactured by Berkeley with a 30 gpm flow rate and rated 5 horsepower. Records of groundwater production from the Cooperative Group are not available for the Owens Peak Water Cooperative; however, the Authority has monthly groundwater production records for the period from September 2018 to July 2019 and from October 2019 to December 2019, and the total groundwater production for this period is 9.36 AF.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Pinon Water Cooperative

Pinon Water Cooperative (PWC) is located in Inyokern, California (APN: 352-360-37-4). The name of the property owner was not specified in the response to the Questionnaire, though the owner indicated that this property was purchased in 1989.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

PWC indicated in the response to the Questionnaire that the previous property owner drilled a well on this property back in the late 1970's or early 1980's. Initial well construction data is not available; however, well construction was re-measured on December 4, 2006, showing a static water level of 119 feet bgs and a total well depth of 230 feet bgs. The pump was manufactured by Grundfos (rated 3 horsepower), and the groundwater intake is located at 160 feet bgs. The well has extracted groundwater for not-for-profit potable water usage (personal water usage) since the 1970's and 1980's. The service area is approximately 20 acres with 8 metered service connections.

Annual groundwater extractions were not provided in the response to the Questionnaire, except for approximately 3,000 cubic feet (0.069 AF) in 2019. Authority well registration records indicate that PWC water usage was approximately 3,738 cubic feet (0.086 AF) in 2016, and approximately 3,983 cubic feet (0.091 AF) in 2017. Records of groundwater production from the Cooperative Group are not available for PWC; however, the Authority has a 2019 groundwater production record for PWC of 2.42 AF. Because the extracted groundwater is for personal/domestic water usage, the reported groundwater production in the response to the Questionnaire may possibly be underestimated (0.069 AF versus 2.42 AF). According to the United States Environmental Protection Agency (EPA) study, the average family of 4 uses 400 gallons per day, or approximately 0.45 AF of water per year. PWC has 8 service connections, so the total annual water usage would be approximately 3.6 AF, which reasonably matches the 2019 Authority production record of 2.42 AF.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Southern California Edison

Southern California Edison (SCE) indicated in the response to the Questionnaire that the SCE performed field checks and confirmed that no SCE wells or groundwater extraction facilities exist in the Basin. Records of groundwater production from the Cooperative Group and the Authority also indicate no groundwater extraction by the SCE. Consequently, determination of the lowest annual Base Period groundwater production for the SCE is not necessary.

TNT Western Home, Inc.

The TNT Western Home, Inc. is located in Inyokern, California (APNs: 352-440-9-00, 352-440-10-00, 352-440-11-00, 352-440-36-00, 352-440-37-00, 352-440-38-00, 352-440-39-00, 352-440-45-00, 352-440-46-00). There are two (2) wells (1 active and 1 inactive) owned by the TNT Western Home, Inc. The active well was drilled in July 2007 with a static water level of 116 feet bgs, measured while the well was constructed. The total depth of the well is not provided. The manufacture data of the active well is not known, but the groundwater intake of the active well pump is located at 163 feet bgs. The inactive well was also drilled in July 2007 with a static water level of 116 feet bgs measured while the well was constructed. The depth of the inactive well, manufacture of the pump, and pump depth are not provided. The inactive well is used as a backup well. The service area is approximately 23 acres with 9 service connections, and the service area is located within the Basin boundary. Historical groundwater production records were not provided. The TNT Western Home, Inc is planning to install flow meters at each service connection in the near future. Records of groundwater production from the Cooperative Group and the Authority for the TNT Western Home, Inc. are not available.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

Welfl's Mini Mart

The Welfl's Mini Mart is a 2-acre convenience store located in Inyokern, California (APN: N/A). There is one (1) well owned by the Welfl's Mini Mart, and the well has two (2) service connections for general store usage. The response to the Questionnaire indicated that the Welfl's Mini Mart started to extract groundwater in 1974; however, information of well construction, static water level, pump, and historical groundwater extractions were not provided. Records of groundwater production from the Cooperative Group and the Authority for the Welfl's Mini Mart are not available.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

West Valley Mutual Water Cooperative

The West Valley Mutual Water Cooperative (WVMWC) was founded in 1978 as a volunteer organization without a physical address. The WVMWC owns two (2) wells. One well was drilled in 1978 and the other well was drilled in 2008. Groundwater extractions started in 1978 and both well have been operating intermittently to provide potable water to customers. There is a master flowmeter installed to measure groundwater extractions; however, the installation date of the master flowmeter is not provided and the master flowmeter has been discovered highly inaccurate. According to the response to the Questionnaire, flowmeters were later installed at each customer connection; however, groundwater extractions of these two (2) wells are very limited and not reliable. Annual groundwater productions between 1978 and 2019 are provided below.

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

Year	Groundwater Production (AF)
1978 to 1988	N/A
1989	106.0
1990	N/A
1991	109.5
1992 to 2018	N/A
2019	20.0

Records of groundwater production from the Cooperative Group and the Authority for the WVMWC are not available. According to the response to the Questionnaire, the WVMWC appears to extract groundwater for an unknown usage; however, information of starting year of groundwater pumping, historical groundwater extraction, well construction, static water level, and well pump is either scattered, unorganized, and/or not available. Records of groundwater production from the the Cooperative Group for the West Valley Mutual Water Cooperative are not available; however, groundwater production record from the Authority shows the total groundwater production between September 2018 and February 2019 is 8.9 AF.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined due to scattered and unreliable groundwater production data.

Yellow Bird Water Cooperative

The Yellow Bird Water Cooperative is located in Ridgecrest, California (APN: N/A). Groundwater has been extracted by a well drilled under Kern County Permit Number 0005789 to provide potable water service since 1986. There is one (1) well owned by the Yellow Bird Water Cooperative. The well was drilled in 1984 with a total depth of 353 feet bgs. The static water level measured while the well was constructed is not available; however, a water level of 310 feet bgs was measured on January 12, 2016. The submersible pump was manufactured by Grundfos (rated 3 horsepower); however, the

Appendix O: Pumping Verification Report for Pumpers With Insufficient Information

location of the groundwater intake is not provided. The service area is approximately 20 acres with 8 service connections. According to the response to the Questionnaire, the quantity of extracted groundwater is monitoring by a flow meter installed at the pump and individual flow meter install at each service connection; however, historical groundwater productions are not provided. Records of groundwater production from the Cooperative Group for the Yellow Bird Water Cooperative are not available; however, the Authority the 2019 groundwater production record of 2.71 acre-feet (AF) for Yellow Bird Water Cooperative.

In accordance with SGMA and California water law, the period between January 2010 and December 2014 has been considered by the Authority to be the Base Period for the purpose of evaluating groundwater production that occurred prior to SGMA enactment; however, the lowest annual Base Period groundwater production cannot be determined based on the data provided in the response to the Questionnaire.

**Table O-1
Well Construction Information for Pumpers with Insufficient Well/Extraction Information**

Owner/Contact	Well Name/ Number	Date Drilled	Well Depth (feet)	Casing Length (feet)	Static WL (ft, bgs)	Pumping Depth (ft, bgs)	Pump Type	Motor HP	Manufacturer's Pump Rating (gpm)	Pump Test	Date of Pump Test	Service Status	Questionnaire Groundwater Production (AFY)	Lowest Annual Production in Base Period (AFY) ¹	Year of Lowest Base Period Production ¹
Carey Marvin	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active	NA	N/A	N/A
Crestview Water	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active	NA	N/A	N/A
Donna Sue Water Company/ Jim Tooker	1	1988	450	N/A	356.5	360	N/A	7.5	Goulds 701	N/A	N/A	Active	2.63 AF in 2019 (Authority Record)	N/A	N/A
Hammer Water Cooperative/ John W Ayers	1	1980	289	N/A	N/A	N/A	N/A	3	50	N/A	N/A	Active	0.78 AF in 2019 (Authority Record)	N/A	N/A
Dixie Water Company/ Michael R. Haynes	1	N/A	N/A	N/A	N/A	N/A	N/A	5	Grundfos (40S50-1)	N/A	N/A	Active	1.07 AFY (annual average estimate)	N/A	N/A
Heritage Village Master Community/Sue Henderson	1	1985 or 1992	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active	NA	N/A	N/A
Inyokern Community Services District/William Dorcy	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive	1.11 AFY (yearly groundwater usage)	N/A	N/A
	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pending			
	3 (Well 3)	1995	500	N/A	292	450	N/A	35	N/A	N/A	N/A	Active			
	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Inactive			
Larry Schiller	1	1969	279	N/A	210	NA	Submersible	3	Grundfos 25 gpm	N/A	N/A	Active	NA	N/A	N/A
Life Water Cooperative/ Kerry Eikenskold	1	2010	500	N/A	325	N/A	N/A	7.5	N/A	N/A	N/A	Active	10.84 AF in 2019	N/A	N/A
	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Standby			
Mirage St. Water Cooperative/ Russell Gordon	1	1980	352	N/A	313	337	Submersible	5	Pentair (40S50)	N/A	N/A	Active	NA	N/A	N/A
Northeast Leliter Water Cooperative	Steve St. Well	1987	220	N/A	120	N/A	N/A	5	N/A	N/A	N/A	Active	33.33 AF between 09/2018 and 12/2019 (Authority Record)	N/A	N/A
	Marvin Gardens Well	1982	234	N/A	132	N/A	N/A	5	N/A	N/A	N/A	Active			
Owens Peak Water Cooperative/ John W Ayers	1	N/A	336	N/A	306.5	N/A	N/A	3	Berkeley (30 gpm)	N/A	N/A	Active	9.36 AF between 09/2018 and 12/2019 (Authority Record)	N/A	N/A
Pinon Water Company	1	Late 1970's/ Early 1980's	230	N/A	119	160	Submersible	3	Grundfos	N/A	N/A	Active	2.42 AF in 2019 (Authority Record)	N/A	N/A
Southern California Edison/ Eric A. Hodder	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A	N/A
TNT Western Home, Inc	1	Jul-07	N/A	N/A	116	163	N/A	N/A	N/A	N/A	N/A	Active	NA	N/A	N/A
	2	Jul-07	N/A	N/A	116	N/A	N/A	N/A	N/A	N/A	N/A	Inactive			
Welfi's Mini Mart	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active	NA	N/A	N/A
West Valley Mutual Water Cooperative/Kurt Weisbrich	1	1978	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active	20 AF in 2019 (metered)	N/A	N/A
	2	2008	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Active			
Yellow Bird Water Cooperative/ Robert Neves	1	1984	383	N/A	310	N/A	Submersible	3	Grundfos (MS 4000)	N/A	N/A	N/A	NA	N/A	N/A

Notes:

1) "N/A" indicates that the lowest annual base period production cannot be determined due to a lack of accurate/consistent production data, or because production data was assumed in the Questionnaire to be the same every year.