

EXHIBIT “A”

Date: December 17, 2012

To: File

From: David Dorrance, WDS II

RE: Summary of Groundwater Pumpage Documentation & Estimation Methods

This memorandum summarizes the methods that were used to estimate groundwater pumpage for WDS California II, LLC (WDS II) parcels in the Antelope Valley for the periods 2000-2004 and 2011-2012.

Results

Separately provided tables prepared as responses to Requests 1 and 2 of the Discovery Order for Phase 4 Trial (dated December 11, 2012) detail parcel-by-parcel results of the analysis summarized here. The following is a summation of those estimated annual groundwater pumpage volumes:

2000: 5,440 AF

2001: 4,758 AF

2002: 4,452 AF

2003: 5,465 AF

2004: 5,859 AF

2011: 2,244 AF

2012: 2,550 AF

Table 1 lists the WDS II parcels and Figure 1 depicts the locations of these parcels.

Methods

- 1) An inventory of all wells on WDS II parcels was performed. With the aid of former owners, tenants, the Department of Water Resources (DWR) and Southern California Edison (SCE), this inventory included a compilation of all available information, including:
 - a. Driller logs;
 - b. SCE pump tests;
 - c. DWR, SCE and owner/tenant measured water levels;
 - d. Flow meter readings;
 - e. Operational/maintenance logs; and
 - f. SCE power bills.
- 2) Where available, directly measured pumpage volumes were tabulated.

- 3) Where data were not available for Step 2 and the well under consideration was driven by an electric motor, monthly SCE power usage records were combined with well efficiency, dynamic depth to water and wellhead pressure data from well pump tests to estimate groundwater pumpage using the following methodology that was developed by the Arizona Department of Water Resources:
http://www.azwater.gov/azdwr/statewideplanning/drought/documents/estimating_water_use.pdf
- 4) Where data were not available for Step 2 or Step 3 (e.g. certain diesel wells and where the former owner/tenant did not keep pumpage records), the applied water requirements of crops grown on WDS II parcels were estimated and Antelope Valley East Kern Water Agency (AVEK) surface water deliveries were deducted to provide an estimate of groundwater pumpage as follows.
- 5) Where available, the crops that were grown on each parcel in each year were obtained from the then landowner (or tenant).
- 6) Kern County annual crop survey databases (<http://esps.kerndsa.com/gis/gis-download-data>) were downloaded, migrated into GIS (ArcMap 10.1) and overlain with the assessor parcel maps to fill in data gaps on croppage and to confirm data reported by landowners (or tenants).
- 7) The following imagery was inspected on a parcel by parcel basis to fill in data gaps and to confirm information from Steps 5 and 6:
 - a. Global Explorer (5/1/2000);
 - b. National Land Cover Dataset for 2001 (a Landsat 7 derived data set by the United States Geological Survey (<http://www.epa.gov/mrlc/nlcd-2001.html>));
 - c. Landsat 7 Imagery acquired on 7/26/2002 (band combinations 321 and 456);
 - d. Landsat 7 Imagery acquired on 7/5/2003 (band combinations 321 and 456) and Global Explorer Imagery acquired on 6/1/2003
 - e. Landsat 7 Imagery acquired on 7/7/2004 (band combinations 321 and 456).
 - f. Landsat 7 Imagery acquired on 7/3/2011 (band combinations 321 and 456).
 - g. Landsat 7 Imagery acquired on 7/5/2012 (band combinations 321 and 456).
- 8) AVEK surface water delivery records were obtained.
- 9) Total Applied Water requirements were estimated on a parcel-by-parcel basis using the following equation:

$$\text{Total Applied Water Requirement} = (AW_c) \times \text{Net Farmable Acreage}$$

Net Farmable Acreage (acres): The imagery cited in Step 7 was inspected on a parcel-by-parcel basis to determine the amount of "unproductive fringe". Based on this inspection a correction factor of 90% to 98% was used to reduce gross acreage to net farmable acreage.

AW_c (AF/acre): This is the unit applied water crop requirement for each crop type as developed by UC Davis & Nebecker (April 17, 2007) and US Davis (April 22, 2008). The only exceptions were: 1) a lower value of 2.0 AF/acre was assumed for grain crops (largely grown on the former Grimmway parcels). This lower assumed value was based on actual water application information reported by the farmer – which grew these crops on a truncated rotation that resulted in less water usage than on other farms in the area; and 2) a duty of 0.83 AF/parcel was assumed for parcels with residential or farm headquarter operations (all of which rely on WDS II domestic wells). This value was based on actual residential usage rates reported by Palmdale for the year 2005 in the City's 2010 Urban Water Management Plan.

- 10) In some cases, multiple parcels are served by single wells (And AVEK turnouts). These integrated irrigation systems were inspected and the former owners/tenants were consulted to determine which WDS II wells and turnouts served which parcels. The Total Applied Water requirement was summed for these parcel groups and the total AVEK deliveries to parcel groups were deducted from the Total Applied Water Requirement to obtain an estimated groundwater pumpage for the well being evaluated.

TABLE 1: WDS CAL II, LLC Parcels and Map Key

Map ID	APN/AIN
0	359-011-02
1	359-011-03
2	359-011-04
3	359-011-05
4	359-011-06
5	359-011-07
6	359-011-08
7	359-011-09
8	359-011-10
9	359-011-11
10	359-011-12
11	359-011-13
12	359-011-14
13	359-011-15
14	359-011-16
15	359-011-17
16	359-011-18
17	359-011-19
18	359-011-20
19	359-011-21
20	359-011-22
21	359-011-23
22	359-011-24
23	359-011-27
24	359-020-50
25	359-041-05
26	359-041-07
27	359-041-08
28	359-174-01
29	359-174-02
30	359-174-03
31	359-174-04
32	359-174-05
33	359-174-06
34	359-174-07
35	359-174-08
36	359-174-09
37	359-174-10
38	359-174-11
39	359-174-12
40	359-174-14

41	359-240-04
42	359-331-17
43	359-331-19
44	359-331-25
45	359-011-01
56	359-041-30
67	261-196-10
71	359-175-01
72	359-175-02
73	359-175-03
74	359-175-04
75	359-321-01
76	359-321-02
77	359-324-18
78	359-324-20
79	359-324-21
80	359-331-24
81	359-331-26
82	359-331-27
83	359-041-15
84	359-041-24
85	359-041-25
86	359-041-26
87	359-041-27
88	261-193-02
89	261-193-03
90	261-193-06
91	261-193-07
92	261-193-08
93	261-193-09
94	261-193-10
95	261-193-15
96	261-193-17
97	261-193-18
98	261-193-20
99	261-193-22
100	261-193-23
101	261-193-24
102	261-193-25
103	261-193-26
104	261-194-28
105	261-194-29

106	261-194-30
107	261-194-36
108	261-194-37
109	261-194-38
110	261-194-39
111	261-194-45
112	261-194-46
113	261-194-47
114	261-196-08
115	261-193-05
116	261-193-19
117	261-194-35
118	3258-001-038
119	3258-001-040
120	3261-001-004
121	3261-001-002
122	3261-001-003
123	3258-001-001
124	3258-001-024
128	3258-001-025

Note: in some cases the Map ID numbers are not consecutive



A vertical scale bar with markings at 0, 0.5, 1, and 2 Miles. The bar is black with white markings and text. The word "Miles" is at the top, and "0" is at the bottom. The numbers 0.5, 1, and 2 are placed between the markings.