First Quarter Groundwater Level Monitoring Report

Prepared for

First Solar Electric, LLC

April 2012

WEST YOST ASSOCIATES
Consulting Engineers

367-00-11-06

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CHAPTER 1
Introduction

This first quarter 2012 Groundwater Level Monitoring Report (GLMR), prepared by construction contractor First Solar Electric (California), Inc. (First Solar), on behalf of right-of-way grant holders Desert Sunlight 250, LLC and Desert Sunlight 300, LLC (Desert Sunlight), documents the first quarter 2012 groundwater monitoring event at the Desert Sunlight Solar Farm Project (project). This report was prepared in accordance with the Groundwater Level, Monitoring, Mitigation, and Reporting Plan (MMRP) stipulated by Mitigation Measure (MM-WAT-3) in the Final Environmental Impact Statement (FEIS) and modified in the Record of Decision (ROD) for the project. This GLMR fulfills the requirements for groundwater level monitoring during construction specified by MM-WAT-3, Section B, provides groundwater data and trend analysis from the wells in the monitoring-well network, defined as the project production well and wells within a three-mile radius of the project production well where the owners have opted to participate in the monitoring program.

The Desert Sunlight project is a 550-megawatt solar photovoltaic generating facility that was approved by Bureau of Land Management (BLM) in August 2011 and is presently under construction in the westernmost portion of the Chuckwalla Valley, Riverside County, California (Figures 1 and 2). Project water use during operation will be minimal (0.2 acre-feet per year [afy]) over the 30-year estimated project life for a total of six acre-feet (af). Project water use during construction of the project is expected to total between 1,300 and 1,400 af. The project is obtaining its water supply from groundwater. A groundwater modeling report to assess potential impacts associated with groundwater pumping during the construction phase of the project was completed by AECOM in 2010 (AECOM, 2010). A groundwater level monitoring plan was also prepared by AECOM in August 2011 (AECOM, 2011). Two water supply wells are approved for installation and use during construction. One well has been installed and is in use. One well will be operated during the operation phase.

Construction of the Desert Sunlight project began on August 15, 2011. The current production well was constructed in October 2011. Operation of the well for construction purposes began on October 27, 2011, and the well has been operated at pumping rates ranging from approximately 400 to 600 gallons per minute (gpm), Monday through Friday.

N:\Clients\367 First Solar Inc\00-11-06 Desert Sunlight-EPC Design & Project Services\GIS\Figures\Baseline Report\Fig1_LocationMap.mxd 3/2/2012

Legend

- Project Location
- California Roads
- California Counties
- State Boundary

N

0 15 30

Miles

FIGURE 1

First Solar Electric, LLC

Desert Sunlight Solar

Desert Center, CA

Location Map

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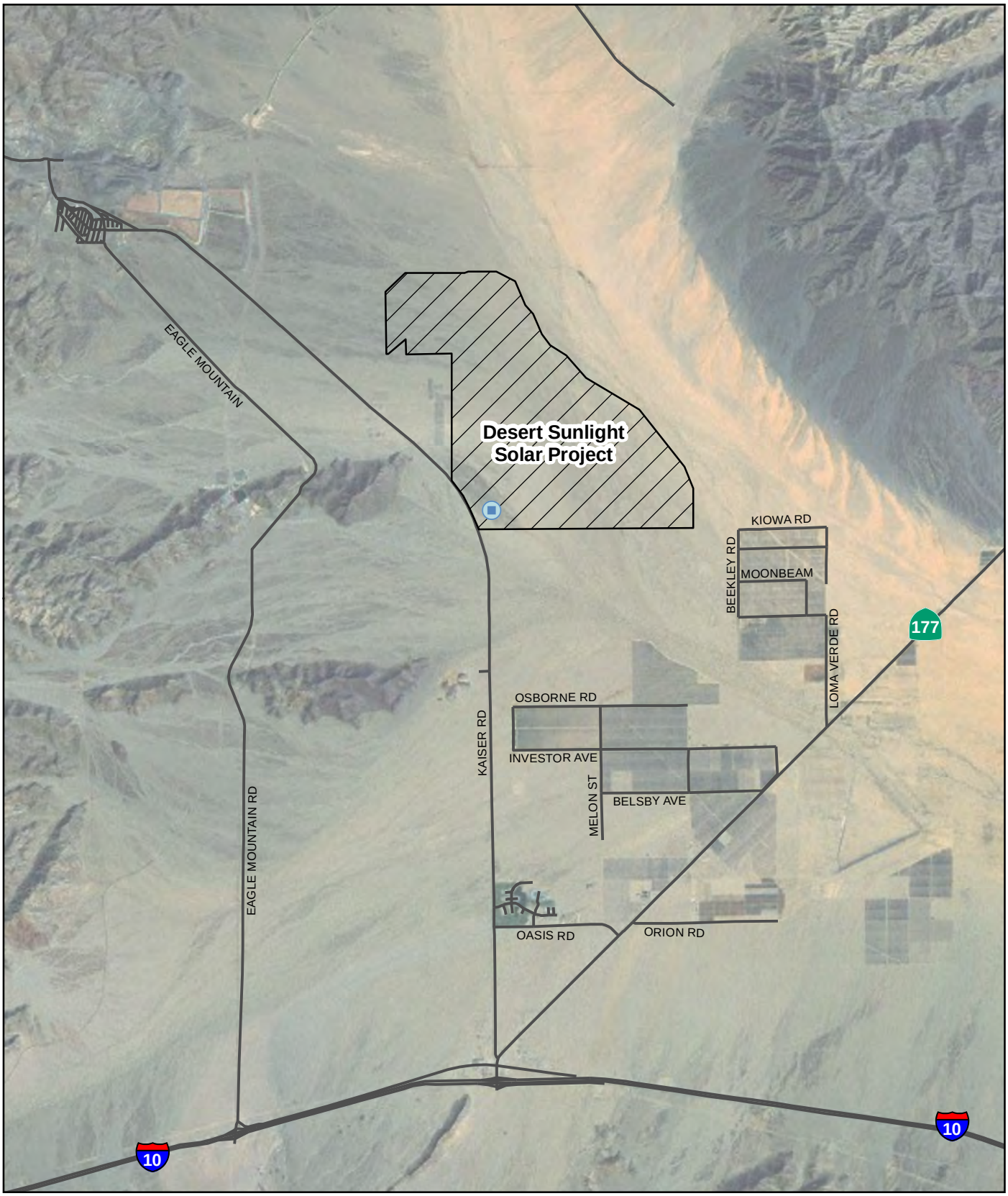
N:\Clients\367 First Solar Inc\00-11-06 Desert Sunlight-EPC Design & Project Services\GIS\Figures\Baseline Report\Fig2_Site Map.mxd 3/2/2012



LEGEND

Project Well

Project Area

N

0 1 2

Miles

FIGURE 2

First Solar Electric, LLC

Desert Sunlight Solar

Desert Center, CA

Site Map

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3.1 GROUNDWATER LEVEL MONITORING

The groundwater level monitoring network consists of on-site wells, off-site monitoring wells, and off-site background monitoring wells. On-site wells include those production or monitoring wells constructed by Desert Sunlight for the project. Off-site wells include privately owned wells within a three-mile radius of the project production well. Off-site background monitoring wells are those wells identified outside of the three-mile radius of the project production well, or within a three-mile radius of the project production well but outside of the area predicted to be affected by project pumping (AECOM, 2011).

3.1.1 On-site Network

Currently, the only on-site well is the project production well (Project Well 2) (Figure 3). Project Well 2 is currently in use as the water supply source for project construction.

3.1.2 Off-site Monitoring Network

Monitoring wells were identified using a three-mile distance from Project Well 2. Notices and access letters, including a map depicting the project site and the parcel potentially containing a well, were mailed to the relevant well or property owners requesting permission to access the properties and monitor groundwater levels. Participation in the monitoring program is voluntary, and those land owners who did not respond after the second notice are not part of the monitoring program. All four well owners that have responded to the well access letters are located within the three-mile radius of Project Well 2. These owners are:

- Donna and Larry Charpied (Jojoba Farm):

  Entered the program on November 21, 2011.

  Data collection started September 2011 (Quarter 3, 2011).

  The Charpied property contains one domestic pumping well, and three additional monitoring wells.
- Vince Samons (Date Grove property):

  Entered the program on December 22, 2011.

  Data collection started December 2011 (Quarter 4, 2011).

  The Samons property, an active date grove, contains one well, primarily used for agriculture.
- The Fraternal Order of Eagles (Private RV and Camp Site):

  Entered the program on December 7, 2011.

  Data collection started December 2011 (Quarter 4, 2011).

  The Fraternal Order of Eagles property contains one domestic well.
- Kaiser Ventures, LLC. (Former Eagle Mountain Mine mining operation):

  Entered the program on January 11, 2012.

  Data collection will start March 2012 (Quarter 1, 2012).

The Kaiser property includes five wells, three of which have been measured monthly for groundwater levels prior to implementation of monitoring under the project.

Figure 3 shows the locations of the wells owned by these parties in relation to the three-mile radial distance from the project well. Figure 3 also shows the contour line representing one-foot of simulated drawdown based on simulation of pumping in the project well in the groundwater flow model scenarios developed by AECOM (2011). The Charpied wells and Kaiser Well 4 are located within the area that is predicted to experience more than one-foot of drawdown in the modeling scenarios (AECOM, 2011). The Fraternal Order of Eagles well and the Date Grove well are near, but outside of, the one-foot contour of simulated drawdown. Because of their proximity to the simulated one-foot contour, these wells are provisionally grouped with the wells that could potentially experience drawdown of one-foot or greater due to project pumping. This group of wells consists of:

- Charpied Domestic Well
- Charpied MW-1
- Charpied MW-2
- Charpied MW-3
- Kaiser Well 4
- Fraternal Order of Eagles Domestic Well
- Date Grove Well

3.1.3 Background Monitoring Network

Three wells owned by the Kaiser Ventures, LLC are within the three-mile radius of Project Well 2 but are outside of the area simulated to experience one-foot or more of drawdown. These wells will be used for monitoring background groundwater levels, per the monitoring plan (AECOM, 2011). A fourth well owned by Kaiser Ventures, LLC (Kaiser Well 2) is located more than three miles from Project Well 2 but may provide useful background groundwater level information. The background monitoring wells are:

- Kaiser Well 1
- Kaiser Well 2
- Kaiser Well 3
- Kaiser Piezometer P12

3.2 GROUNDWATER USAGE MONITORING

Groundwater usage volumes were collected for Project Well 2 using a McCrometer propeller-type flow meter. The flow meter, installed on the discharge piping of the well, displays the instantaneous pumping rate and the total number of gallons pumped from the well. Flow totalizer values were recorded on a daily basis when the well was used.

N:\Clients\367 First Solar Inc\00-11-06 Desert Sunlight-EPC Design & Project Services\GIS\Figures\GWM_Network.mxd 4/11/2012

LEGEND

- Project Area
- 3 Mile Radius
- One Foot Drawdown Contour
- Project Well
- Background Wells
- Observation Wells

N

0 1 2

Miles

FIGURE 3

First Solar Electric, LLC
Desert Sunlight Solar
Desert Center, CA

Groundwater Monitoring Network

WEST YOST ASSOCIATES
Consulting Engineers

4.1 FIELD PROCEDURES

Owners of the off-site wells in the groundwater monitoring network were notified at least 24 hours prior to the quarterly monitoring event. Access to the Charpied and Kaiser Mine properties required the supervision of the owner or owner's representative. Access to the Samons and Fraternal Order of Eagles property was allowed with no supervision. Project well access required supervision by First Solar construction staff.

Depth to water measurements were collected using an electronic water level sounder. The water level sounder consists of a probe attached to the end of a 500-foot tape measure. At each location, the probe was lowered through an access port in the well until it reached the water surface. When the water surface was reached, the measurement was recorded manually from the tape measure at a permanently marked point at the top of each access port. All down-hole equipment was cleaned with a phosphate-free detergent and then rinsed with deionized water prior to use at each location.

4.2 GROUNDWATER LEVEL MONITORING

The first quarter 2012 groundwater monitoring event was conducted from March 12, 2012 to March 13, 2012. Depths to water measurements were collected from nine of the 12 wells listed in the groundwater monitoring network. First quarter 2012 and historical depths to water measurements are presented in Table 1.

4.2.1 On-Site Well

Groundwater depth in Project Well 2 was 204.47 feet below top of casing (btoc) on March 13, 2012. The project well was allowed to recover approximately three days before the depth to water measurement was collected.

4.2.2 Charpied Property

Groundwater depths were measured in all four wells on the Charpied property on March 13, 2012. Depth to groundwater for the first quarter of 2012 ranged from 280.20 feet btoc in Charpied MW-3 to 282.44 feet btoc in the Charpied Domestic Well.

Depth to water measurements from the wells located on the Charpied property may have been affected by pumping from their domestic well prior to collecting the measurements. Upon arrival to the Charpied property for the first quarter 2012 monitoring event, the Charpied Domestic Well had been pumping continuously at approximately 50 gpm for five consecutive days (Charpied, 2012). After the domestic well was shut off, the wells were allowed to recover approximately 20 to 40 minutes before water level measurements were collected.

4.2.3 Samons Property (Date Grove)

Depth to groundwater was measured in the Date Grove Well on March 12, 2012. A depth of 112.34 feet btoc was measured.

4.2.4 Fraternal Order of Eagles Property

Depth to water was not measured in the Fraternal Order of Eagles well during the first quarter 2012 monitoring event. A blockage in the well casing, most likely the pumping equipment, prevented the electronic water level sounder from reaching the water surface.

4.2.5 Kaiser Mine Property

Depth to water measurements were collected from Kaiser Well 1, Kaiser Well 2, and Kaiser Piezometer P12 on March 13, 2012. Kaiser Well 3 and Kaiser Well 4 were pumping during the first quarter 2012 monitoring event, and no depth to water measurements were collected. Depth to water in the Kaiser wells ranged from 274.00 feet btoc in Kaiser Well 1 to 350.92 feet btoc in Kaiser Piezometer P12.

4.3 GROUNDWATER USAGE

Pumping from the project well began on October 27, 2011. The well was regularly run from Monday through Friday with no pumping during the weekends; however, the pumping schedule may have varied slightly depending on construction operations. Total gallons pumped, displayed on a flow totalizer installed on the discharge piping for the well, was recorded on a daily basis. Based on the total volume of water pumped from the well between October 27, 2011 and March 31, 2012, and Monday through Friday operation for 12 hours per day, the average pumping rate was 507 gpm.

Regional water use in the Chuckwalla Valley groundwater basin for the first quarter of 2012 was not found to be available in a review of publicly available data sources. If information on regional water usage becomes available in the future, it will be incorporated into the monitoring reports.

5.1 GROUNDWATER LEVEL TRENDS

Table 1 displays depth to groundwater measurements collected from the wells in the groundwater monitoring network.

5.1.1 On-Site Well

During the first quarter 2012 monitoring event, Project Well 2 was allowed to recover approximately three days before the depth to water was measured. The depth to water measurement from the December 2011 monitoring event was collected after only 15 minutes of recovery, due to restrictions imposed by the construction needs of the project. Thus, the March 2012 monitoring event is the only representative depth to water measurement obtained from Project Well 2 to date. Depth to water measurements will continue to be collected quarterly from the Project Well 2. Additional analysis will be conducted when there is enough data to establish a trend.

5.1.2 Charpied Property

Groundwater depths increased slightly in three of the four wells located on the Charpied property between December 2011 and March 2012 (Table 1). The increases in groundwater depth ranged from 0.01 feet in Charpied MW-3 to 0.03 feet in the Charpied Domestic Well and Charpied MW-2. The depth to groundwater in Charpied MW-1 remained the same as the previous quarter. The magnitudes of the depth to water changes from December 2011 to March 2012 are too small to indicate significant trends.

Depth to groundwater in all four wells on the Charpied property increased between 0.30 and 0.38 feet between the September 2011 and March 2012 monitoring events. These increases could be attributed to pumping from the Charpied domestic well. The domestic well is used for irrigation of the jojoba farm from November through June. During the irrigation season, the well is pumped continuously for five consecutive days once each month (Charpied, 2012).

Due to a lack of historical depth to water measurements, it is not known whether the increase in groundwater depths over the previous two quarters was a result of the project groundwater use, irrigation season pumping by the property owners, or other seasonal groundwater level trend in the Chuckwalla Valley groundwater basin. Depth to water measurements will continue to be collected quarterly from the Charpied wells. Additional analysis will be conducted when there is enough data to establish a trend.

5.1.3 Samons Property (Date Grove)

Depth to water in the Date Grove Irrigation Well increased by 0.23 feet between December 2011 and March 2012. The well is used for irrigation of a date grove located on the property; however, the irrigation schedule and pumping volumes are not know at this time. Due to a lack of historical depth to water measurements, along with unknown water use by the property owners, reliable groundwater trends cannot be established at this time. Depth to water measurements will continue to be collected quarterly from the Date Grove Irrigation Well. Additional analysis will be conducted when there is enough data to establish a trend.

5.1.4 Fraternal Order of Eagles Property

Depth to water was not measured in the Fraternal Order of Eagles Domestic Well during the first quarter 2012 monitoring event. To date, only one depth to water measurement was taken at the well located on the Fraternal Order of Eagles property, and no historical data are available from the well owners. Depth to water measurements will continue to be collected quarterly from the Fraternal Order of Eagles Domestic Well. Additional analysis will be conducted when there is enough data to establish a trend.

5.1.5 Kaiser Mine Property

Depth to water in Kaiser Well 1 remained the same from December 2011 to March 2012, while an increase in depth to water of 1.92 feet was observed in Kaiser Piezometer P12 during the same period. The March 2012 monitoring event was the first depth to water measurement recorded from Kaiser Well 2.

Depth to water in Kaiser Well 1, Kaiser Well 3 and Kaiser Piezometer P12 has remained relatively stable over the past two years based on measurements provided by Kaiser. However, since the historical measurements were collected to the nearest half-foot, instead of the nearest hundredth of a foot, it is unknown whether there are any trends with less than a six-inch difference. The historical data is included in this report to give an approximate depth to groundwater prior to the start of project pumping.

Because this was the first monitoring event in which more accurate depth to water data were collected, groundwater trends cannot be established at this time. Depth to water measurements will continue to be collected quarterly from the Kaiser Wells. Additional analysis will be conducted when there is enough data to establish a trend.

5.2 MANN-KENDALL ANALYSIS

Statistical analyses of water level trends in the off-site wells from recent and readily available historic data using the Mann-Kendall test method were not performed for this report, as suggested by the groundwater monitoring plan (AECOM, 2011). There is not enough data collected from any of the wells in the monitoring network to allow the analysis to be performed. The Mann-Kendall analysis will be conducted when sufficient data have been collected.

Table 1. Monitoring Network Depth to Groundwater

Well Owner	Desert Sunlight	Charpied				Samons, Date Grove	Fraternal Order of Eagles	Kaiser				
Well Type/Name	Project Well 2	Domestic Well	MW-1	MW-2	MW-3	Irrigation Well	Domestic Well	Well 1	Well 2	Well 3	Well 4	P12
Date	**Depth to Water, Feet**											
May 2008	-	-	280.55	280.60	279.42	-	-	-	-	-	-	-
Jan 2010	-	-	-	-	-	-	-	272.0	-	259.5	-	349.0
Feb 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Mar 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Apr 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
May 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Jun 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Jul 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Aug 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Sep 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Oct 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Nov 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Dec 2010	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Jan 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Feb 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Mar 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Apr 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
May 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Jun 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Jul 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Aug 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Sep 2011[(a)]	-	282.08	281.05	280.92	279.90	-	-	274.0	-	259.5	-	349.0
Oct 2011	-	-	-	-	-	-	-	274.0	-	259.5	-	349.0
Nov 2011	-	-	-	-	-	-	-	274.0	-	259.0	-	349.0
Dec 2011[(b)]	245.00	282.41	281.35	281.27	280.19	112.11	312.87	274.0	-	259.0	-	349.0
Mar 2012[(c)]	204.47	282.44	281.35	281.30	280.20	112.34	-	274.00	321.74	-	-	350.92

(a) Measurements were collected September, 2011 from the Charpied wells as part of the monitoring program. Kaiser, Date Grove, and the Fraternal Order of Eagles were not yet participants in the monitoring program. The measurements shown for the Kaiser wells were collected as part of Kaiser's existing monitoring program. The project well was not yet operational in September, 2011.

(b) Measurements were collected December, 2011 from the Charpied wells, Date Grove well, and the Fraternal Order of Eagles well as part of the monitoring program. Kaiser was not yet a participant in the monitoring program. The measurements shown for the Kaiser wells were collected as part of Kaiser's existing monitoring program. Also, during the December 2011 monitoring event, the project well was not allowed to fully recover before the depth to water was measured.

(c) During the March 2012 monitoring event, a blockage in the Fraternal Order of Eagles well did not allow a measurement to be collected. Also, Kaiser wells 3 and 4 were currently pumping and no measurements were collected.

CHAPTER 6
Groundwater Program Evaluation Recommendations

6.1 MONITORING NETWORK

This report documents groundwater elevation and quality conditions near the Desert Sunlight project site. Monitoring of the wells included in the groundwater monitoring network will continue through construction and operation of the facility, as described in the MMRP and this report.

It is recommended that the Charpied domestic well be removed from the monitoring program due to risks associated with monitoring equipment damaging the pump. The three monitoring wells surrounding the domestic well provide adequate coverage on the Charpied property to assess any changes in groundwater levels around the Charpied domestic well. This recommendation will be implemented pending resolution of any BLM comments that may arise.

6.2 MONITORING EQUIPMENT

It is also recommended that a sonic water level meter be used for future monitoring events, instead of the electronic sounder currently being used. The sonic water level meters are less intrusive and pose no risk to damaging down-hole equipment in any of the currently used private wells in the groundwater monitoring network. Accuracy on the sonic water level meters is ±0.2 feet, which should be accurate enough to assess impacts caused by pumping from the project well. This recommendation will be implemented pending resolution of any BLM comments that may arise.

6.3 GROUNDWATER QUALITY MONITORING

As described in the Groundwater Baseline Data Report (West Yost Associates, 2012), it is recommended that groundwater quality monitoring of pH, temperature, and electrical conductance of the project well be conducted on a quarterly basis to assess potential changes in groundwater quality caused by project pumping. Groundwater quality monitoring should begin in the second quarter 2012 monitoring event. This recommendation will be implemented pending resolution of any BLM comments that may arise.

6.4 MONITORING AND REPORTING FREQUENCY

Groundwater levels will be continue to be measured on a quarterly basis in wells included in the groundwater monitoring network, as described in the MMRP and this report. Quarterly and annual monitoring reports will be prepared to document the monitoring results and any changes in groundwater level and quality conditions.

AECOM, July 2010, Numerical Groundwater Model of Proposed Project Groundwater Pumping

AECOM, August 2011, Groundwater Level Monitoring, Mitigation, and Reporting Plan, Desert Sunlight Solar Farm, Chuckwalla Valley, Riverside, California.

Charpied, L., 2012, Personal communication with Barrett Kaasa, West Yost Associates, March 13, 2012.

Modified Mitigation Measure MM-WAT-3, Appendix 2, Adopted Mitigation Measures, Desert Sunlight Solar Farm Project Final EIS and CDCA Plan Amendment, April 2011.

West Yost Associates, March 2012, Groundwater Baseline Data Report, First Solar Electric, LLC.