REVISED HYDROGEOLOGICAL ASSESSMENT REPORT

Maderas Golf Club
Poway, California

Presented to:

Mr. Tom Story
Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, California 92121

Presented by:

SCS ENGINEERS
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July 7, 2010
Project Number: 01203535.12

Offices Nationwide
www.scsengineers.com
July 7, 2010
Project Number: 01203535.12

Mr. Tom Story
Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

RE: Revised Hydrogeological Assessment Report
Maderas Golf Club

Site: Maderas Golf Club
Poway, California

Dear Mr. Story:

SCS Engineers (SCS) is pleased to present this Revised Hydrogeological Assessment Report (Report) based on our review of hydrogeologic data pertaining to the Site, and fracture trace analysis. This scope of work described in this Report was conducted in general accordance with the fully executed project number 01203535.12, dated November 13, 2008, and scope of services change number 3, fully executed April 17, 2009.

Should you have any questions regarding this Report, please do not hesitate to call the undersigned at (858) 571-5500.

Sincerely,

Charles E. Houser, CEG 2206
Senior Project Professional

cc: City of Poway

Enclosures

F:\Projects\203\500-550\535 (Sunroad)\01203535.12 (Maderas Golf Club)\Sunroad Enterprises-Maderas Golf Club\Hydrogeological Assessment Report\01203535.12.HydrogeologicalAssessmentReportFINAL.doc
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BACKGROUND

This report presents the results of SCS’s hydrogeological assessment of the Maderas Golf Club (Maderas) golf course facility (Site) located in the northeast portion of the City of Poway (City), San Diego County, California (Figure 1). It is our understanding that, based on concerns about possible influences of groundwater withdrawal at the Site on the onsite wetland and riparian habitats as well as possible decreases in groundwater levels in wells in the Site vicinity, a conditional use permit (CUP [90-13(2)]) for Maderas was modified so as to regulate and monitor groundwater usage at the Site.

Specifically, the second modification to the CUP, approved in August 2000, required the installation of eight shallow alluvial monitoring wells, four of which were required to be monitored on a monthly basis. In addition to the shallow alluvial monitoring wells, the static water in four bedrock wells (Maderas wells 2 and 4, Lower Sycamore Creek Test Well [LSCTW], and Old Coach Estates Test Well [OCETW]) is required to be measured.

The CUP includes threshold criteria “triggers” (i.e., lowered groundwater levels in certain monitoring wells) which, when reached, require Maderas to reduce or suspend groundwater withdrawal from Maderas’ production wells. Since 1999, a total of ten production wells have been drilled and installed in various locations at the Site (Figure 2). The most recent wells were well #9 and well #10 drilled in early 2009.

SCS understands that Maderas Golf Club seeks City approval of a CUP amendment to modify groundwater monitoring requirements based on over nine years of monitoring data compiled to date. The Client provided SCS groundwater monitoring and aquifer testing data for the Site since approximately 1999.

On March 11, 2009, SCS attended a meeting with Sunroad and the City to discuss amending the CUP. In that meeting, the City requested that a report summarizing the results and findings of the groundwater monitoring data since inception of the CUP be prepared and submitted.

APPROACH

The work conducted to date at the Site by SCS (literature review, aerial photolineament evaluation, field observations including fracture trace analysis) has allowed SCS to develop an understanding of the basic structure (joints and fractures) in the crystalline rock underlying the region of the Site. Hydrogeologic data collected to date includes:

- Data and literature review including the previously referenced reports and historical groundwater monitoring and trend data,
- Fracture trace data (locations and orientations of prevalent fractures),
- Locations of notable photolineaments, possibly indicative of fractures, on aerial photos obtained for the Site,
- Pumping and drawdown data from nearly ten years of monitoring by Maderas for the CUP triggers, and
• Hydrogeological observations of geologic materials, fractures, and discharge characteristics of the new Site wells.

OBJECTIVES

The objective of this report is to provide a written assessment of:

• The general characteristics of the occurrence, connectivity, and prevalence of groundwater at the Site and Site vicinity.
• Historical groundwater production and withdrawal rates at Maderas.
• Groundwater level data in observation wells and the possible influence of groundwater withdrawal and other variables on observation wells.
• The relationship of triggers in observation wells to seasonal fluctuations in regional groundwater, and to actual adverse consequences.
• The granitic rock fracture system, including the location and orientation of fractures that may be present at the Site and Site vicinity, and which may provide hydraulic connectivity between Maderas production wells and off-Site test wells.

In summary, the objectives of the proposed scope of services were to review and evaluate available hydrogeologic data for the Site and to assess whether, based on this data, restrictions in groundwater usage at Maderas Golf Club under the existing CUP might be reduced or modified.

The objectives and this study have incorporated specific information and analysis requested by the City of Poway (City). Scope of services change number 3 (SSC#3), submitted to the Client March 25, 2009, and executed April 17, 2009, incorporated the following scope for a hydrogeological assessment report:

<table>
<thead>
<tr>
<th>Hydrogeological Assessment Report Scope outlined in SSC#3</th>
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<tr>
<td>Summary of hydrogeological data from past reports</td>
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<td>Conclusions and recommendations, as appropriate</td>
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Prior to their approval, the Client provided SSC#3 to the City for their review and comments. Following is a summary of the specific recommendations the City made in an e-mail dated April 14, 2009, regarding the scope of this assessment:
<table>
<thead>
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<th>City Requested Scope</th>
<th>Location addressed in this Report</th>
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<td>An analysis and recommendation of how new wells will be evaluated for their potential impact on ground water levels in the residential wells located in the Old Coach and Lower Sycamore Canyon areas</td>
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<td>Analysis and recommendations regarding the continued monitoring of the test wells and the frequency with which that will occur in order to protect the surrounding properties in the Old Coach and Lower Sycamore Canyon areas from excessive groundwater withdrawals</td>
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<td>Recommendations on what steps, and the notification process, that should be been taken to resolve a breach of any threshold</td>
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<td>An evaluation on the priority and use of reclaimed water, raw water, groundwater and potable water</td>
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Please note that the last bullet item regarding evaluation of the use of reclaimed water, raw water, groundwater, and potable water is outside the scope of the work conducted by SCS. Based on our conversations with the Client, this evaluation will be done by the Client based on the information obtained during this hydrogeological evaluation and on-going groundwater withdrawal and monitoring data from Maderas.

SCS submitted a hydrogeological assessment report on December 22, 2009. This revised Report has been submitted at the request of the Client.

**SCOPE OF SERVICES**

The scope of services designed to meet the above objectives is summarized as follows:

- Review and evaluation of Client-provided historical reports and hydrogeological information.
- Aerial photo lineament analysis.
- Joint/fracture mapping.
- Fracture trace analysis.
- Data Evaluation/Report Preparation
DATA REVIEW/EVALUATION

Review of Historical Reports

SCS reviewed various reports and information provided by the Client. The following documents and information was provided and reviewed:

- **Hydrologic Study of the Sycamore Creek Sub-Basin**, prepared by Don Howard Engineers, dated July 28, 2000
- **VLF and Magnetic Survey for Maderas Golf Club, 17750 Old Coach Road, Poway, California**, prepared by Caribe Geophysics, dated November 2005
- **City of Poway Environmental Assessment and Conditional Use Permit (CUP) 90-13M(2), Sunroad Enterprises, Applicant**, accepted by applicant September 5, 2000
- **City of Poway Agreement Respecting Irrigation Water**, dated January 1, 1997

Based on our review of these documents, SCS has prepared the following summary of information regarding groundwater production.

**Hydrologic Study of the Sycamore Creek Sub-Basin**

- Aquifer testing on supply well #4 at Maderas produced notable and significant drawdown in the LSCTW.
- There is no apparent effect on riparian vegetation resulting from groundwater pumping at Maderas.
- Review of aerial photographs, taken in 1984, reveals:
  1) a faint northwest joint trend near the Maderas wells,
  2) photolineaments following a northwest and east-west trend in the tonalite tapped by the Maderas wells along Sycamore creek,
  3) a north-south photolineament trend along the west Site boundary north of Sycamore Creek, and
  4) a strong northeast joint trend east of the golf course along Thompson Creek.
- Fractures and joints are generally steeply dipping to vertical. This is supported by “the occurrence of only a few fractures being intersected by each vertical well.”

**VLF and Magnetic Survey**

- The report appears to have addressed only the northern portion of the golf course.
- Predominant interpreted geologic lineaments followed north-northwest and east-northeast trends.
- Four proposed well sites based on the very low frequency (VLF) and magnetic survey data, and six proposed well sites based on the interpreted lineaments, were presented in this report.
**Maderas Golf Club Groundwater Production and Monitoring Report**

- Under the terms of its conditional use permit (CUP), Maderas is obligated to cease groundwater production if water levels in test wells OCETW or LSCTW fall below 120\(^1\) feet or 100 feet below ground surface (bgs), respectively, or if water levels in either alluvial monitoring well (MW-2 or MW-4) fall below 15 feet bgs. They are to reduce pumping if water levels in either MW-2 or MW-4 fall below 10 feet bgs.
- During aquifer testing in March 2000 (reported in the Howard Engineering *Hydrologic Study of the Sycamore Creek Sub-Basin*), after five days of pumping well #4, groundwater levels in the “lower Sycamore Creek wells” declined 2 to 9 feet. After seven days of recovery, all 5 Maderas wells along Sycamore Creek were pumped for three days, producing a decline in water level in the LSCTW of approximately 18 feet.
- Based on the relative responses in the LSCTW during pumping of individual wells at Maderas, Wiedlin & Associates, Inc. recommended that Maderas wells #6 and #7 be permitted to continue pumping even when the water level in LSCTW drops below 100 feet.
- Wiedlin & Associates, Inc. also recommended that when the water level in LSCTW drops below 100 feet, Maderas be allowed to continue groundwater pumping when the water level rises above 100 feet bgs (as opposed to the current CUP which requires cessation of pumping until the level is above 40\(^2\) feet bgs), and that daily monitoring of the LSCTW water level cease once the water level is above 90 feet bgs.

**Summary**

The photolineament trend analysis of the Howard Engineers report (*Hydrologic Study of the Sycamore Creek Sub-Basin*) is generally consistent with the trend analysis of SCS, though we did observe a number of sub-horizontal fractures, as summarized below. Based on review of the VLF and magnetic survey report, it appears that new well #9 was drilled in the approximate location of a proposed drill site, identified in this report, near the eastern edge of the golf course, and new well #10 was drilled near the location of the intersection of two interpreted geologic lineaments, also identified in this report near the east edge of the golf course.

The Wiedlin & Associates, Inc. report (*Maderas Golf Club Groundwater Production and Monitoring; Poway, California*) provided summaries (in the form of hydrographs) of historical water monitoring data for off-Site test wells, a summary of aquifer test results from 2000, and a summary of the CUP restrictions.

**Historical Site Hydrogeological Data**

In addition to the above referenced reports, SCS reviewed well and water level data collected over the past approximately 10 years relative to the Site wells and off-Site test wells. The following information was provided to SCS:

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\(^1\) Please note the actual trigger depth, stated in the CUP, is 180 feet bgs.

\(^2\) Please note the required water level recovery is to 40 feet above the trigger depth, not 40 feet bgs.
- Drillers well logs and historic water usage data for Site wells #1 through #8.
- Historic groundwater depth data, presented as hydrographs, for the Lower Sycamore Creek Test Well (LSCTW), Old Coach Estates Test Well (OCETW), Alluvial monitor well MW-2, and Alluvial monitor well MW-4.
- Historical water usage data for Maderas golf course for the years 2000 through 2008.

Approximate well locations are depicted on Figure 2. Well logs for wells #1 through #7 were prepared by Fain Drilling. The log for well #8 was prepared by Stehly Brothers Drilling. These logs indicate that the Site is underlain by a relatively thin (3 to 20 feet thick) layer of surficial sands and alluvium, which is in turn underlain by granitic rock. The granitic rock is described in the logs as being weathered in the upper approximately 30 to 100 feet, with relatively unweathered rock below. The logs also describe fractures at intervals in the borings.

Hydrographs depicting groundwater depths, prepared by Wiedlin Associates, Inc., were provided to SCS by the Client. These hydrographs, included in Appendix A, were prepared for LSCTW, OCETW, and alluvial monitor wells MW-2 and MW-4. The hydrographs depict data beginning in 2000 and continuing through mid- to late-2008. The graphs also depict trigger depths established by the CUP.

SCS prepared hydrographs depicting groundwater depths for LSCTW, OCETW, MW-2, and MW-4 which are included as Figures 3, 4, 5, and 6, respectively. The hydrographs for these four wells depict data beginning approximately October 1, 2008, and continuing through approximately the end of September 2009. The hydrograph for OCETW depicts groundwater level data from September 2009 back to April 2006. The graphs also depict trigger depths established by the CUP. Exceedances since 2000, using groundwater level readings collected by Maderas, are summarized as follows.

<table>
<thead>
<tr>
<th>Well</th>
<th>Trigger Depth</th>
<th>No. of Exceedances</th>
<th>Maximum Exceedance Depth</th>
<th>Figure Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2008-2009</td>
<td>Total since 2000</td>
<td></td>
</tr>
<tr>
<td>LSCTW</td>
<td>100</td>
<td>0</td>
<td>11</td>
<td>Approximately 123 feet below ground surface (bgs) (June/July 2002)</td>
</tr>
<tr>
<td>OCETW</td>
<td>180</td>
<td>1</td>
<td>1</td>
<td>&gt;245 feet bgs (beginning August 2009)</td>
</tr>
<tr>
<td>MW-2</td>
<td>10/15</td>
<td>0/0</td>
<td>0/0</td>
<td>N/A</td>
</tr>
<tr>
<td>MW-4</td>
<td>10/15</td>
<td>2/0</td>
<td>5/0</td>
<td>Approximately 12 feet bgs (July through September 2009)</td>
</tr>
</tbody>
</table>

An exceedance of the depth triggers in OCETW occurred in August 2009. Groundwater withdrawal at Maderas ceased immediately upon Maderas personnel learning of the trigger breach. The water level in OCETW continued to drop after pumping at Maderas stopped, and by approximately the end of September 2009, the water level in this test well had dropped below the bottom of the well at approximately 245 feet bgs. The data suggests the exceedance of the depth
trigger in OCETW may be due to seasonal fluctuations or other factors, such as other supply wells not associated with Maderas.

During a visit to the Site and vicinity on October 16, 2009, a resident in the vicinity of the OCETW indicated to SCS and Maderas personnel that at least two new production wells were installed somewhere in the area north of OCETW and east of Maderas in the Old Coach Estates area sometime in 2009. On another occasion, Maderas personnel were told by one of the drilling companies that over 20 wells have been drilled in the area within the past year. Pumping of reported new wells, rather than or in addition to groundwater withdrawal at Maderas, could influence water levels in OCETW.

During water year October 1, 2008, through September 30, 2009, trigger depths were not exceeded in LSCTW or MW-2, and only the 10 foot bgs trigger was exceeded in MW-4, during October/early November 2008 and July through September 2009. Based on typical seasonal fluctuations observed in Maderas monitoring and test wells, it is likely that the exceedances of the 10 foot trigger depth in MW-4 are not due to pumping at Maderas, rather they may be due to slightly lower groundwater levels experienced in late summer and fall prior to the rainy season. The highest water readings in MW-4 (approximately 6.5 feet bgs) were in early March 2009 just after the highest recorded rainfall for the year (4.36 inches during February 2009). Summer and early fall are typically when water usage at the golf course is highest due to warm summer and fall temperatures. During summer 2009, Maderas reported that the water level in the LSCTW continued to rise while pumping of wells #1-#3, and #5-#8 had continued.

The anecdotal accounts of many new wells drilled in the vicinity of the golf course are consistent with data compiled by the Client in 2008 and 2009. In 2008, the County of San Diego Department of Environmental Health (DEH) provided the Client with a map depicting approximately 75 domestic production wells within approximately 1.5 miles of the golf course (Appendix B). In the fall of 2009, the Client compiled, from State and County records, a list of 67 permitted wells within approximately ½ mile of the golf course and OCETW (Appendix C). Of these 67 wells, approximately one third (23) were drilled after August 2000.

It is likely that ground water pumping from these wells affects groundwater levels at LSCTW and OCETW. It is beyond the scope of Maderas’ CUP and this annual report to collect and evaluate data on the surrounding domestic wells. Without this data, it is not possible to definitively identify which wells, Maderas’ or the adjacent domestic wells, influence groundwater fluctuations at either test well.

Water years are defined as October 1 of one year through September 30 of the following year. The water usage graph provided by the Client indicated that combined groundwater/raw water usage at Maderas has ranged from approximately 235 acre-feet per year in water year 2002/2003, to 359 acre-feet per year in water year 2001/2002. However, the actual well water (groundwater) usage has ranged from as low as 106 acre-feet in 2005/2006 to as high as 255 acre-feet in 2001/2002.

SCS has not attempted in this report to present an estimate of the sustainable yield for the aquifer underlying Maderas. It is noted that, according to information obtained from Wiedlin, water
levels in the OCETW prior to development of the gold course were lower on average than levels recorded since the golf course was constructed (see hydrograph for OCETW, Appendix A). This fact, coupled with relatively stable water levels recorded in monitoring and test wells since the golf course was built, suggests that the average groundwater usage at Maderas is not exceeding the sustainable yield of the aquifer relative to Maderas. However, further evaluation of the aquifer at Maderas would be needed to estimate the actual sustainable yield. The following table provides a summary of the groundwater usage and raw water purchases at Maderas since 2000.

<table>
<thead>
<tr>
<th>Water Year</th>
<th>Groundwater Usage</th>
<th>Raw Water Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/2001</td>
<td>173</td>
<td>70</td>
</tr>
<tr>
<td>2001/2002</td>
<td>255</td>
<td>99</td>
</tr>
<tr>
<td>2002/2003</td>
<td>177</td>
<td>58</td>
</tr>
<tr>
<td>2003/2004</td>
<td>134</td>
<td>131</td>
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<tr>
<td>2004/2005</td>
<td>163</td>
<td>132</td>
</tr>
<tr>
<td>2005/2006</td>
<td>106</td>
<td>130</td>
</tr>
<tr>
<td>2006/2007</td>
<td>109</td>
<td>175</td>
</tr>
<tr>
<td>2007/2008</td>
<td>131</td>
<td>140</td>
</tr>
<tr>
<td>2008/2009</td>
<td>173</td>
<td>164</td>
</tr>
</tbody>
</table>

* Potable water purchases of 24 acre feet in 2000/2001 and 5 acre feet in 2001/2002 are not included in this table.

Off-Site Test Well Triggers and Domestic Well Depths

Currently, the trigger depths of the OCETW and LSCTW are 180 feet bgs and 100 feet bgs, respectively. According to the 2000 hydrologic study report by Don Howard Engineers (Table 2 in that report), supply wells in the Old Coach Estates area range in depth from approximately 90 to 950 feet bgs. Supply wells in the Lower Sycamore Creek area (Table 3 of the Howard report) range in depth from approximately 125 to 570 feet bgs. Elevations of these supply wells relative to the test wells are not known. With one exception, neither are the depths of pump placement in the supply wells known.

AERIAL PHOTOLINEAMENT ANALYSIS

SCS personnel reviewed aerial photos at the County of San Diego Cartographic Services Department. Photos from 1953, 1973, 1978, and 1983 were reviewed. Where appropriate photos were available (1973, 1978, and 1983), photo pairs were reviewed with a stereoscope. In general, multiple lineaments following a variety of trends were visible in all photos reviewed. Copies of two photos from 1973 (Figures 7 and 8) are attached with our interpretation of photolineaments. Our findings, including a summary of lineament trends noted, are presented below.

JOINT AND FRACTURE MAPPING

SCS personnel conducted several days of surface geologic mapping consisting of field measurement of the orientation of joints and fracture planes, description of joint and fracture spacing, estimation of predominant joint and fracture sets based on frequency and spacing, and evaluation of joint and fracture orientations relative to prevalent photolineament strike directions.
The purpose of the mapping was to visually observe bedrock conditions and measure the orientation, frequency, and spacing of the joints and fractures. Mapping was conducted on the open-space hillside just northeast of the golf course in the area northeast of Old Coach Drive and east of Old Coach Way, on the southeast slope of the mountain west of the golf course, and along Old Coach Road just east of Old Coach Drive. Figure 9 depicts the areas around the golf course where mapping was conducted. Spacing of the joints and fractures was noted, where readily apparent, to assess the presence of primary and secondary joint and fracture sets. For purposes of this investigation, joint and fracture sets which were closely spaced and frequent were of greatest interest since these could represent paths for greater groundwater flow in the subsurface.

**WELL DRILLING OBSERVATION**

Two new wells were drilled at the Golf Course during February and March, 2009. Both wells (well #9 and well #10) are located generally in the east-northeast portion of the golf course. The approximate locations of these wells are depicted on Figure 9. While SCS’s observation of this activity was not continual, and we did not personally log the borings for these wells, we did review downhole video logs for each new well. It is our understanding that both wells were open-hole boring completed at a depth of approximately 640 feet, and that significant fractures and groundwater production was noted in the lower portion of each well. The boring logs included in Appendix D are based on our review of the video logs. Relatively large open fractures were visible on the video logs. Both logs were stopped at very large, open fractures with significant breakout of the rock within the fracture zone surrounding the boring. The well #9 log was terminated at a depth of approximately 547 feet where the camera encountered an obstruction. The well #10 log was terminated at a depth of approximately 472 feet in a very large, open fracture showing significant breakout of the rock surrounding the boring.

**FINDINGS**

The following sections present a summary of our findings from data reviewed during this investigation.

**GEOLOGY**

**Physiographic Setting and Regional Geology**

The Maderas Golf Club golf course lies within the foothills of the eastern San Diego County mountains approximately 24 miles north-northeast of San Diego and approximately 9 miles west of Ramona. The golf course is located approximately six miles north-northeast of downtown Poway. Topography at the Site slopes gently to moderately to the south with mountain highlands to the west and east. The elevation of the Site ranges from approximately 450 feet above mean sea level (msl) at the southwest edge to approximately 700 feet msl near the northeast corner.

The golf course is bounded by Old Coach Road and Old Coach Drive to the east, residential properties to the north, open space and an SDG&E power line easement to the west, and a creek valley to the south. According to Wiedlin & Associates, this creek is Sycamore Creek. Based on our review of the United States Geological Survey (USGS) Escondido 7.5” Quadrangle (1968,
photorevised 1975), this creek is un-named. For the purposes of this Report, the creek will be referred to as Sycamore Creek.

The Site is located within the Peninsular Ranges Geomorphic Province of Southern California. This province is typified by northwest to southeast-trending mountain ranges approximately parallel to San Andreas and related regional fault systems. The Peninsular Ranges are generally characterized by granitic rocks of the Peninsular Ranges Batholith and associated metamorphic rocks. Sedimentary rocks ranging in age from Cretaceous to Pleistocene form the San Diego embayment and coastal terraces west of the batholith.

SCS reviewed a map titled Geologic Map of the Escondido 7.5” Quadrangle, San Diego County, California, compiled by Siang S. Tan and Michael P. Kennedy under the Southern California Areal Mapping Project, United States Geological Survey (USGS) and California Division of Mines and Geology (CDMG), 1999. According to this map, the Maderas Golf Course is underlain by Cretaceous-aged Green Valley Tonalite, consisting of fine-grained tonalite with minor granodiorite, gabbro, and other basic igneous rocks. To the north, east, and west of the Site vicinity on this map is granodiorite of the Woodson Mountain Granodiorite.

Site and Site Vicinity Geology

Alluvial deposits are present along Sycamore Creek, which runs along the southern boundary of the golf course. During mapping conducted at the Site and Site vicinity by SCS, rocks exposed in outcrops were interpreted to include biotite granodiorite with minor gabbro. These rocks were generally moderately to highly fractured, with mafic dikes and inclusions as well as quartz-rich dikes/stringers present. Based on the drill cuttings observed during drilling of the wells and the downhole video logs reviewed by SCS, the granitic rock underlying the golf course consists generally of light brown to light gray, fine to medium-grained, biotite granodiorite to tonalite composition rock with quartz dikes and stringers up to an inch or more in thickness. Also observed on the video logs were several dark gray fine-grained mafic dikes up to approximately 5 feet or more in thickness. These mafic dikes were generally intruded by numerous light-colored quartz dikes and stringers up to several inches thick.

HYDROGEOLOGY

Beneficial Use Designation

Based on review of a document titled Water Quality Control Plan, San Diego Basin - Region 9, prepared by the San Diego Regional Water Quality Control Board (RWQCB), dated September 1994, the Site is interpreted to straddle the boundary between the Hodges Hydrologic Area (5.20) and San Pasqual Hydrologic Area (5.30), both located in the San Dieguito Hydrologic Unit (5.00). According the RWQCB, the groundwater in these hydrologic areas has been classified as having existing beneficial uses for municipal and domestic supply, agricultural supply, and industrial service supply purposes.
**Site Hydrogeology**

Based on historical groundwater monitoring data for the Site, groundwater has been encountered at depths as shallow as 5 to 10 feet in the alluvial test wells (MW-2 and MW-4) located along Sycamore Creek along the southern border of the golf course, and as deep as approximately 50 feet in recently drilled well #9 located in the east-central portion of the golf course. Although regional groundwater flow might be expected to be toward the southwest toward Sycamore Creek, local groundwater flow in fractured crystalline rock is wholly dependent on the direction and nature of the fractures. Fracture flow in the region of the Maderas Golf Course has been demonstrated by drawdown of the water in the LSCTW during pumping of Maderas wells #4 and #5. During recent drilling of wells #9 and #10, abundant water from fractures in the lower portions of these borings was demonstrated by groundwater discharge during drilling on the order of 200 gallons per minute (gpm) or more.

As the OCETW trigger was exceeded in August 2009 for the first time since monitoring began in 2000, there was concern that pumping from well #10 may have influenced the drop in water level. The water level began to drop substantially several days after pumping of well #10 began in early April 2009. However, after pumping of all Maderas wells including well #10 stopped in mid-August 2009, the water level in OCETW continued to drop and by October 16, 2009, had dropped below the bottom of the OCETW at approximately 245 feet bgs. Additionally, while monitoring the OCETW on October 16, 2009, SCS and Maderas personnel spoke with several neighbors who indicated that other residential supply wells had recently been constructed in the vicinity generally to the north of OCETW.

**SITE STRUCTURE - AERIAL PHOTOLINEAMENTS**

The predominant lineament orientation west, north, and east of the golf course is northwest, with some east-west lineaments and few northeast lineaments (Figures 7 and 8). Lineaments trending roughly north-south are present along the approximate east and west sides of the golf course. East of the golf course and north of Thompson Creek, several strong northeast trending lineaments were observed, along with one strong east-west trending lineament which appears to curve to the northwest and extend just north of the golf course. Also observed east of the golf course were multiple smaller northwest, east-west, and northeast-trending lineaments.

One curving and discontinuous lineament was observed through the approximate southern portion of the golf course along Sycamore Creek through the approximate locations of wells #4 and #5, and extending toward the west-northwest through the approximate location of the LSCTW. The orientation of this lineament is approximately N80W in the southern portion of the golf course, arcing to approximately N45W at the western-most extension observed in the photos. Please note that the golf course was not present in any of the aerial photos reviewed.

**SITE STRUCTURE - JOINT AND FRACTURE SETS**

As stated above, joint and fracture attitudes were measured in three areas around the golf course. Mapping was conducted on the open-space hillside just northeast of the golf course northeast of
Old Coach Drive and east of Old Coach Way, on the southeast slope of the mountain west of the
golf course, and along Old Coach Road just east of Old Coach Drive. Figure 9 depicts the areas
around the golf course where mapping was conducted. Following is a summary of the
orientations of the interpreted primary fracture sets in each of the mapped areas.

Hillside Northeast of Old Coach Road

- N45-60E dipping steeply northwest
- N30-45W vertical to steeply northeast dipping

West of Golf Course

- N-S vertical to steeply dipping east or west
- E-W +/- 30 degrees, vertical to dipping steeply northward
- Generally northeast-southwest with shallow (less than approximately 30 degrees)
northwestward dips

Old Coach Road

- N10-25W vertical to moderately to steeply dipping northeast
- N25-40E vertical
- E-W dipping moderately north to steeply south
- Shallow dipping fractures (less than approximately 25 degrees) with variable strike from
  northwest to north-south to east-west

Measured joint and fracture orientations were plotted and contoured on a stereonet (plane pole
point on lower hemisphere). In general, evaluating all orientations measured, primary joint and
fracture sets with the greatest frequency fall into four categories: N10E to N40W dipping steeply
west to moderately east; N30-60E vertical to dipping steeply northwest; East-West dipping
steeply south to moderately to steeply north; and shallow dipping joints and fractures (less than
approximately 30 degrees) with widely varying strikes. Figure 10 depicts the plotted pole points.
Copies of the field data and notes are included in Appendix E.

DISCUSSION

AQUIFER CHARACTERISTICS

The aquifer underlying the Site is fractured crystalline (granitic) bedrock, interpreted to be biotite
granodiorite with some mafic dikes. The rock is generally moderately to highly fractured. This
is shown both by the abundant fractures observed and measured in outcrops at the Site and Site
vicinity, and by fractures observed in the downhole video logs of new wells #9 and #10 at the
golf course. The highly fractured nature of the bedrock is also demonstrated by the volume of
groundwater discharge obtained from both new wells.
Fracture Connectivity

Fracture connectivity is demonstrated by the wide range of fracture set orientations observed. The stereonet contour plots included in Appendix F show at least four relatively distinct fracture sets with orientations approximately N10E to N40W dipping steeply west to moderately east; N30-60E vertical to dipping steeply northwest; E-W dipping steeply south to moderately to steeply north; and shallow dipping joints and fractures (less than approximately 30 degrees) with widely varying strikes.

Fracture connectivity is also demonstrated in the pumping data obtained from well #4 and, perhaps, well #5, and drawdown data from LSCTW. The response (drawdown) noted in the LSCTW during aquifer testing in 2000 demonstrates hydraulic connection between these wells. However, pumping of other Maderas wells appeared to produce little to no response on LSCTW, and more recently, the water level in LSCTW has continued to rise during pumping of Maderas wells #1, #6, #7, and #8, supporting a conclusion that there is minimal, if any, hydraulic connection between these wells and LSCTW.

Regarding connectivity between Maderas production wells and OCETW, prior to pumping from wells #9 and #10, fluctuations in the OCETW were seasonal and the depth trigger in this well was not exceeded since monitoring began in 2000. Notably, well #8 began pumping in July 2008. In spite of drought conditions in Southern California, it appears, based on the hydrograph depicted on Figure 4, that the water level in the OCETW may not have dropped below approximately 100 feet bgs in Fall 2008 before rising with rainfall. Based on the hydrograph for OCETW (Appendix A), seasonal fluctuations in this well brought water levels below 100 feet bgs in fall/winter of 2000, 2001, 2002, 2003, 2004, 2006, and 2007. Therefore, water level data for OCETW does not demonstrate connectivity between Maderas wells #1 through #8 and this test well.

The water level in OCETW began dropping with pumping of Maderas wells #9 and #10. However, based on the fact that the water level in OCETW continued to drop after all pumping at Maderas stopped, and information suggesting other new supply wells in the vicinity of OCETW, it is not apparent that OCETW is affected only by pumping at Maderas. Other groundwater withdrawal in the area not associated with Maderas likely also affects this well.

CURRENT AND FUTURE GROUNDWATER USAGE

Based on data provided by the Client, the average total groundwater withdrawal from the production wells at the Maderas Golf Club between 2000 and 2008 is approximately 158 acre-feet per year. The maximum and minimum recorded groundwater usages during this period are approximately 255 acre-feet per year (2001/2002) and 106 acre-feet per year (2005/2006), respectively. Maderas acknowledges that, during certain years, groundwater production has been and will need to be supplemented with supplied water to meet golf course needs.

CONDITIONS ASSOCIATED WITH NEW WELLS #9 AND #10

According to information provided by the Client regarding new wells #9 and #10, both wells were pumped throughout the month of July 2009 approximately 22 hours per day, 6 to 7 days per
week. While well #4 was also pumping, the water level in the LSCTW reportedly dropped from 89 feet bgs around the beginning of July to 95 feet bgs sometime after well #4 was shut off, and had recovered to approximately 93 feet. The drawdown on well #9 and #10 is reportedly a little over 300 feet.

Drawdown of the groundwater level in the LSCTW to 95 feet appears to be the result of pumping well #4. This conclusion is supported by the observation that the LSCTW has recovered while wells #9 and #10 continued pumping and well #4 was turned off. None of the Site wells except well #4 and, possibly, well #5, appear to cause drawdown of the LSCTW. Therefore, only Maderas well #4 demonstrates a notable influence on the water level in the LSCTW.

Regarding the OCETW, it has not been clearly demonstrated that the drawdown observed in this well since April 2009 was caused primarily by pumping at Maderas, including wells #9 and #10. The statement by residents that other supply wells had also recently been constructed in the area suggests that other influences, such as the reported new supply wells, in combination with seasonal variations and drought, might have an affect on the water level in OCETW. It is SCS’s understanding that the Old Coach Estates neighborhood generally has access to municipal water, so this area is not groundwater dependent.

**CONDITIONS ASSOCIATED WITH SHALLOW ALLUVIAL MONITORING WELLS MW-2 AND MW-4**

These two wells were designed, in part, to monitor the impact of groundwater pumping at Maderas on the riparian habitat along Sycamore Creek at the south edge of the golf course. According to a letter prepared by REC (Appendix G), fluctuations in the health of the riparian system at the Site “mimicked the changes observed on the offsite reference locations, indicating that any fluctuation was due to natural, seasonal, and hydrological regimes of the ecosystem.” They stated “No evidence was observed to suggest that use of the wells on the Maderas Golf Course caused riparian conditions to diminish unnaturally.”

**CONCLUSIONS**

As previously stated, one project objective was to assess whether the existing data can justify modifications to the groundwater monitoring requirements of the CUP. In addition, SCS conducted an analysis of the regional granitic fracture system, including the location and orientation of fractures that may be present at the Site and Site vicinity and to assess hydraulic connectivity between Maderas production wells and off-Site trigger wells. Based on the results of this investigation into the regional granitic fracture system, review of historic and current Site hydrogeological data provided by the Client, and our experience and professional judgment, SCS Engineers concludes with regard to LSCTW:

1. Pumping Maderas wells #1 through #3 and #5 through #10 has not resulted in demonstrable water level changes in LSCTW.
2. Only groundwater pumping from Maderas well #4 has clearly produced drawdown in the LSCTW.
3. Although it has not been clearly demonstrated that pumping of Maderas well #5 affects the water level in the LSCTW, because it is on the same lineament as Maderas well #4, to be conservative we have assumed that well #5 may affect the LSCTW.

4. Since 2000, the trigger depth in LSCTW has been exceeded approximately 11 times. These exceedances coincide with the late summer through early winter dry season for San Diego County.

SCS Engineers concludes with regard to OCETW:

5. Pumping Maderas wells #1 through #8 has not resulted in demonstrable water level changes in OCETW.

6. The trigger depth in the OCETW was exceeded in August 2009. While the drop in water level was coincident with pumping of new Maderas well #10, the drop continued after pumping at all Maderas wells stopped.

7. It is not possible to determine if pumping at Maderas wells #9 and #10 affects OCETW without controlling pumping at all off-Site wells in the vicinity of OCETW.

8. Other supply wells in the area, including at least 23 new wells drilled after August 2000, may affect the groundwater level in OCETW.

9. The trigger depth was exceeded once in the OCETW. This exceedance coincided with the late summer through early winter dry season for San Diego County.

SCS Engineers concludes with regard to shallow alluvial monitoring wells MW-2 and MW-4:

10. REC biologists report that riparian vegetation along Sycamore Creek has not been affected by groundwater withdrawal at Maderas.

SCS Engineers concludes with regard to groundwater usage:


12. Historic water levels in the OCETW coupled with relatively stable water levels in monitoring and test wells associated with Maderas suggests that the total groundwater usage at Maderas does not appear to exceed the sustainable yield of the aquifer relative to Maderas. Further evaluation of the aquifer at Maderas would be needed to estimate the actual sustainable yield.

13. Average annual total water usage (i.e., groundwater, raw water, and potable water combined) is approximately 283 acre-feet per year.

SCS Engineers concludes with regard to the regional granitic fracture system:

14. The crystalline bedrock under the Site and Site vicinity appears to be highly fractured, with primary fracture sets in preferred orientations including N10E to N40W dipping steeply west to moderately east; N30-60E vertical to dipping steeply northwest; E-W dipping steeply south to moderately to steeply north; and shallow dipping joints and fractures (less than approximately 30 degrees) with widely varying strikes.
15. The aquifer underlying the Site consisted of moderately to highly fractured crystalline granitic rock. Fracture connectivity is demonstrated by the wide range of fracture set orientations observed.
16. Groundwater flow in the fractured crystalline rock underlying the Site is largely dependent on the orientation, frequency, and nature of the fractures.

**RECOMMENDATIONS**

The following recommendations are based on the conclusions of this investigation:

1. Maderas wells #4 and #5 should continue to be monitored relative to LSCTW.
2. Based on nine years of data, there is no value in monitoring static water levels in Maderas wells #1, #2, #3, and #6. Therefore, monitoring of these wells should cease.
3. Based on nine years of data, there is no value in restricting pumping of Maderas wells #1 through #3 and #6 through #10 when the LSCTW trigger depth is exceeded. Therefore, no pumping restrictions relative to the water level in LSCTW should apply to these wells at Maderas.
4. The OCETW should be eliminated from the CUP monitoring requirements as:
   a). This test well is upgradient from Maderas,
   b). The exceedance of the trigger depth beginning in August 2009 cannot be clearly demonstrated to have been caused by pumping at Maderas because the water level in OCETW continued to drop after all pumping at Maderas stopped, and
   c). Properties east of Maderas generally have available municipal water and so are not solely dependant on groundwater for water supply.
5. Because the 15-foot trigger depths in the alluvial test wells have not been breached since monitoring began, and because vegetation along Sycamore Creek shows no obvious signs of distress due to drought or low groundwater, monitoring of the alluvial test wells is no longer necessary and should be eliminated from the monitoring requirements.

The following recommendations are in response to the City’s recommendation pertaining to the specific work scope item.

6. “An analysis and recommendation of how new wells will be evaluated for their potential impact on ground water levels in the residential wells located in the Old Coach and Lower Sycamore Canyon areas.” Monitoring of new wells at Maderas for their potential impact on the LSCTW should be required for the first year of groundwater production. If pumping of the new well(s) causes no significant drawdown of the LSCTW during the first year of monitoring, the monitoring requirement should be lifted.
7. “Analysis and recommendations regarding the continued monitoring of the test wells and the frequency with which that will occur in order to protect the surrounding properties in the Old Coach and Lower Sycamore Canyon areas from excessive groundwater withdrawals.” Based on the abundant data obtained over the past decade, and the fact that residential supply wells have not been compromised even when triggers have been exceeded, manual monitoring of the LSCTW should be conducted quarterly with automated data collection intervals set to weekly. If triggers are breached, pumping restrictions should apply until water levels are above trigger depths. Based on Site history, the only likely breach of triggers would occur in the LSCTW during pumping of well #4 and maybe #5 at Maderas. Under such a
trigger breach, only wells #4 and #5 should be turned off until the water level in LSCTW rises above the trigger depth of 100 feet.

8. “Content, format, and frequency of the monitoring reports sent to the City.” Monitoring reports will be prepared and submitted to the City of Poway on an annual basis, unless a trigger is exceeded, in which case an interim report will be submitted within 30 days of the time the trigger breach became known. The reports will include a brief description of the monitoring methods used, hydrographs depicting the test well data, rainfall data for the current and previous two monitoring periods, and discussion, as appropriate, of any trigger breaches and mitigation steps taken.

9. “An evaluation of utilizing an automated electronic, real time recordings (vs. manual) at all three monitoring sites to collect data and the ability to transmit that data to the City.” It is the understanding of SCS that current manual monitoring of the test wells is augmented by automated electronic monitoring using transducers installed in LSCTW, OCETW, alluvial monitoring well MW-2, and alluvial monitoring well MW-4. Technology exists that would allow real-time data to be transmitted to a monitoring station that could be set up at the Maderas golf course facilities. During the annual dry season, drought periods, or periods where breaches of the triggers are known to be occurring, more frequent monitoring of the test wells might be accomplished with such real-time and automated electronic monitoring capabilities. Such information could be transmitted to the City essentially as it is collected and evaluated.

10. “Recommendations on what steps, and the notification process, that should be been taken to resolve a breach of any threshold.” If a trigger exceedance occurs, upon review of the data indicating the breach, the City of Poway would be notified in writing of the exceedance within 30 days of Maderas’ knowledge of the exceedance. Manual monitoring frequency of the well with the breach would be increased to weekly, electronic monitoring would be increased to daily, and production decreased or suspended in wells hydrogeologically related to the “trigger” exceedance.

11. “An evaluation of the CUP threshold criteria and changes in groundwater usage created by increasing the depth of the existing LSC area wells.” The 100 foot trigger depth of LSCTW cannot be adequately compared to domestic supply wells depths and conditions without further information regarding actual supply well conditions such as well depth, pump depth, drawdown during pumping, and location and elevation relative to the off-Site test wells. With the depths of the shallowest supply wells potentially close to the trigger depth, no change in the trigger depths of the LSCTW is proposed at this time.

REPORT USAGE AND FUTURE SITE CONDITIONS

This Report is intended for the sole usage of the Client and parties designated by SCS. Use of this Report is subject to the provisions of the fully executed Contract between the Client and SCS. Any third party usage of this Report shall be subject to the provisions of the Contract and any unauthorized misuse of or reliance upon the Report shall be without risk or liability to SCS.

The conclusions of this Report are judged to be relevant at the time the work described in this Report was conducted. Future conditions may differ and this Report should not be relied upon to represent future Site conditions unless a qualified consultant familiar with the practice of geological and hydrogeological assessments in San Diego County is consulted to assess the necessity of updating this Report.
Figure 3
Groundwater Depth-Lower Sycamore Creek Test Well (manual readings)
Water Year October 2008 through September 2009
Maderas Golf Course

Groundwater Depth-Lower Sycamore Creek Test Well (manual readings)
Water Year October 2008 through September 2009
Maderas Golf Course

Date
0
River Current

Groundwater Depth (feet)
0

Action Criteria for LSCTW

Groundwater Depth
Action Level

Groundwater Depth
Action Level
Figure 4
Depth to Groundwater - Old Coach Estates Test Well
Maderas Golf Course

- Witch Creek Fire - Well monitoring equipment destroyed
- Well monitoring back on-line
- Sensor down for repairs between January 7 and April 7
- Began pumping well #9
- Began pumping well #10
- All wells shut off
Figure 5
Groundwater Depth MW-2 (manual readings)
Water Year October 2008 through September 2009
Maderas Golf Course

Groundwater Depth MW-2

Date

Groundwater Depth (feet)

Date

Action Criteria for MW-2

Groundwater Depth
Action Level
Figure 6
Groundwater Depth MW-4 (manual readings)
Water Year October 2008 through September 2009
Maderas Golf Course
EXPLANATION

- Photo Inversion
- Approximate boundary of golf course
- Approximate location of supply well
- OCTW Off-site Old Coach Road test well
- Natural drainage

Disclaimer: This figure is based on available data. Actual conditions may differ. All locations and directions are approximate.
EXPLANATION

- Photo Inment
- Approximate boundary of golf course
- Approximate location of supply well
- Off-site lower Sycamore Creek test well
- Natural drainage

Disclaimer: This figure is based on available data. Actual conditions may differ. All locations and dimensions are approximate.
Stereonet Plot

Sunroad Enterprises
Maderas Golf Club
17750 Old Coach Road
Poway, California

Explanations:
- Old Coach Road (green)
- West of golf course (red)
- Heritage hillside (black)

Disclaimer: This figure is based on available data. Actual conditions may differ. All locations and dimensions are approximate.
APPENDICES
APPENDIX A
Hydrographs
Lower Sycamore Creek Test Well
Groundwater Depth
Maderas Golf Club

Action Criteria for the LSCTW
Well is a Water Level Depth of 100 Feet
Old Coach Estates Test Well
Manual And Automated Groundwater Level Measurements
Maderas Golf Club

Action Criteria for the OCETW
Well is a Water Level Depth of 120 & 180 Feet
Alluvial Monitor Well MW-2
Manual & Automated Groundwater Level Measurements
Maderas Golf Club

Action Criteria for Monitoring Well MW-2 are Water Level Depths of 10 and 15 feet below ground surface.
Alluvial Monitor Well MW-4
Depth to Groundwater
Maderas Golf Club

Action Criteria for Monitoring Well MW-4 are water level depths of 16 and 15 feet below ground surface.
APPENDIX B
DEH GIS Map of Production Wells in Maderas Golf Course Vicinity
APPENDIX C
Client-Compiled Production Well Data
<table>
<thead>
<tr>
<th>Well Location</th>
<th>APN</th>
<th>Well Depth</th>
<th>Water Level Depth</th>
<th>Est. Yield</th>
<th>Planned Use</th>
<th>Activity</th>
<th>Completed</th>
<th>Owner</th>
<th>Well Contractor</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Bud's Lane &amp; Old Coach Rd.</td>
<td>277-020-15</td>
<td>800'</td>
<td>400+-/</td>
<td>8</td>
<td>Domestic</td>
<td>New Well</td>
<td>12/2/1997</td>
<td>Tom Carter</td>
<td>Fain Drilling</td>
<td>760-749-0701</td>
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<td>14160 Agusta Ct</td>
<td>277-220-17</td>
<td>615'</td>
<td>90' below surface</td>
<td>30</td>
<td>Irrigation</td>
<td>New Well</td>
<td>9/14/2005</td>
<td>Dr. Brad Cohen</td>
<td>Joe Edwards</td>
<td>760-749-0701</td>
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<td>18790 Heritage Dr.</td>
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<td>875'</td>
<td>155'</td>
<td>15</td>
<td>Irrigation</td>
<td>New Well</td>
<td>8/10/1989</td>
<td>Chris Coseo</td>
<td>Russ Anderson</td>
<td>760-789-7514</td>
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<tr>
<td>18540 Wild Horse Creek</td>
<td>277-020-18</td>
<td>500'</td>
<td>72' unknown</td>
<td></td>
<td>Domestic</td>
<td>New Well</td>
<td>8/10/1989</td>
<td>Manuel Da Silva</td>
<td>Mc Guffe Well Drilling</td>
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<td>277-200-08</td>
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<td>240'</td>
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<td>New Well</td>
<td>1/10/2000</td>
<td>Greg Agee</td>
<td>Franks Well Drilling</td>
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<td>180</td>
<td>400+</td>
<td>Domestic</td>
<td>New Well</td>
<td>3/19/1996</td>
<td>Roy Gilliland</td>
<td>Fain Drilling</td>
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<td>Bud's Lane &amp; Old Coach Rd.</td>
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<td>265</td>
<td>100</td>
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<td>New Well</td>
<td>11/5/1999</td>
<td>Larry T. Konzen</td>
<td>Fain Drilling</td>
<td>760-749-0701</td>
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<tr>
<td>approx. 3 mi. on Old Poway-Coach Rd off Espola Rd</td>
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<td>not listed</td>
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<td>Paul Kern</td>
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<td>New Well</td>
<td>2/28/1980</td>
<td>Juanita B Kinyon</td>
<td>Rex Anderson Corporation</td>
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<td>New Well</td>
<td>9/4/1996</td>
<td>Gary Sabin</td>
<td>John H Warden</td>
<td>789-2539</td>
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<td>Well Location</td>
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<td>Well Depth</td>
<td>Water Level Depth</td>
<td>Est. Yield</td>
<td>Planned Use</td>
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APPENDIX D
Borehole Logs
# BOREHOLE LOG

**Number:** B9

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12

**Location:** Maderas Golf Club  
**Sheet:** 1 of 1

**Drilling Company:** Stehly Brothers

**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary

---

**Drill Rig/Sampling Method:** Air Rotary

**Chuck Houser Sr. Project Professional**

---

## SAMPLE LOG

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**Completion Detail**
### BOREHOLE LOG

**Number:** B9

**Client:** Sunroad Enterprises

**Location:** Maderas Golf Club, Poway, California

**Job No:** 01203535.12

**Date Drilled:** 6/24/09

**Drill Rig/Sampling Method:** Air Rotary

**Number:** 547'

**Groundwater encountered at approximately 53 feet below grade.**

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<th>Sample Number</th>
<th>Lab results TPH (ppm)</th>
<th>Blows per foot</th>
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<th>Sample Log</th>
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**Logged by:** Chuck Houser

**Reviewed by:**

**Title:** Sr. Project Professional

**Date:**

**License no:**

**Date:**
**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Location:** Maderas Golf Club, Poway, California  
**Drilling Company:** Stehly Brothers

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<th>Completion Detail</th>
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**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary

**Geologic Description:** Quartz, biotite granodionite

**Bottom of casing at 125 feet below grade.**
Client: Sunroad Enterprises
Location: Maderas Golf Club
Poway, California

Drill Rig/Sampling Method: Air Rotary

Date Drilled: 6/24/09

Total Depth: 547'

Geologic Description:
Abundant quartz-filled fractures

60°, open, 1' wide some breakout

Sample Log

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Logged by: Chuck Houser
Title: Sr. Project Professional
Date: ____________

Reviewed by: ____________
License no: ____________
Date: ____________
**BOREHOLE LOG**

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Location:** Maderas Golf Club  
**Poway, California**

**Drilling Company:** Stehly Brothers

**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary

---

### SAMPLE LOG

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**Geologic Description:**
- Typical horizontal to near vertical quartz-filled fractures
- Mafic dikes with quartz stringers

---

**Completion Detail**

**Logged by:** Chuck Houser  
**Reviewed by:**  
**Date:**  
**Title:** Sr. Project Professional  
**License no:**  
**Date:**
# BOREHOLE LOG

**Number:** B9

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Location:** Maderas Golf Club  
**Poway, California**

**Drilling Company:** Stehly Brothers

**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary

---

**SAMPLE LOG**

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**Completion Detail:**

- Large open fracture with breakout

---

**Logged by:** Chuck Houser  
**Title:** Sr. Project Professional  
**Date:**

**Reviewed by:**  
**License no:**  
**Date:**
### BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club, Poway, California  
**Job No:** 01203535.12  
**Sheet:** 7 of 11  
**Number:** B9  
**Date Drilled:** 6/24/09  
**Date Drafted:** 7/12/09  
**Drill Rig/Sampling Method:** Air Rotary  

#### SAMPLE LOG

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#### Geologic Description:

- **Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.:**
  - Typical mafic inclusions with multiple quartz stringers
  - Highly fractured, little to no breakout
  - Quartz, biotite granodionite with abundant quartz stringers

**Reviewed by:** Chuck Houser  
**Reviewed Date:** 7/12/09  
**Logged by:** Chuck Houser  
**Logged Date:** 7/12/09  
**Title:** Sr. Project Professional  
**Reviewed by:** Chuck Houser  
**License No:** Chuck Houser  
**Reviewed Date:** 7/12/09
Client: Sunroad Enterprises  
Location: Maderas Golf Club  
Poway, California

Drilling Company: Stehly Brothers

Date Drilled: 6/24/09  
Drill Rig/Sampling Method: Air Rotary

Borehole Dia.:  
City of Backfill:  
Ground Surface Elev.:  
Total Depth: 547'

**BOREHOLE LOG**

<table>
<thead>
<tr>
<th>Number</th>
<th>B9</th>
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</table>

**Geologic Description:**
- Mafic dike - dark green, fine-grained, quartz stringers
- Open fracture with breakout
- Fracturing
- Quartz, biotite granodionite
- Contact approximately 85° between medium granodionite and fine-grained mafic dike with quartz stringers
- Contact approximately 60 - 70°
### SAMPLE LOG

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<th>Sample Number</th>
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<th>Blows per foot</th>
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**Geologic Description:**

- Single fracture, slightly open, approximately 75°
- Mafic inclusion at 428 feet below grade
- Large open fracture breakout, 80° - vertical Fe staining in zone
- Zone approximately 6° thick - highly fractured, little to no breakout
<table>
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Logged by: Chuck Houser  
Reviewed by:  
Title: Sr. Project Professional  
License no:  
Date:  

Client: Sunroad Enterprises  
Location: Maderas Golf Club Poway, California  
Drilling Company: Stehly Brothers  
Drill Rig/Sampling Method: Air Rotary  
Date Drilled: 6/24/09  

Completion Detail:  

Graph:  

Sample Log:  

Lab results TPH Gas/Diesel (ppm):  

Blows per foot:  

Depth (feet):  

Sample Point:  

USCS symbol:  

Geologic Description: Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.:  

Single steep, no breakout  

Vertical fracture, little breakout  

Fractured, little breakout Mafic dike with quartz stringers  

Single open 75°
# BOREHOLE LOG

## Client:
Sunroad Enterprises

## Job No:
01203535.12

## Sheet:
11 of 11

## Drilling Company:
Stehly Brothers

---

**Date Drilled:** 6/24/09  
**Date Drafted:**  
**Drill Rig/Sampling Method:** Air Rotary

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**Geologic Description:**
- Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.

**Graphic Log:**
- Large open breakout  
- Quartz dike, 75°±  
- Quartz biotite granodionite  
- Fractured, little to no breakout  
- Very large open fracture, much breakout, steep 80°+  
- Note - granodionite lighter  
- higher quartz and lower biotite  
- Appears to be 2nd parallel fracture

---

**Logged by:** Chuck Houser  
**Title:** Sr. Project Professional  
**Date:** ____________

**Reviewed by:**  
**License no:**  
**Date:** ____________
**BOREHOLE LOG**

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Location:** Maderas Golf Club  
**Drilling Company:** Stehly Brothers

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Lab results TPH</th>
<th>Blows per foot</th>
<th>Depth (feet)</th>
<th>Sample interval</th>
<th>USCS symbol</th>
<th>Graphic Log</th>
<th>Geologic Description</th>
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**Completion Detail**

Groundwater encountered at approximately 31 feet below grade.

---

Logged by: Chuck Houser  
Title: Sr. Project Professional  
Date: 

Reviewed by:  
License no:  
Date: 
<table>
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<th>Blows per foot</th>
<th>Depth (feet)</th>
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**Geologic Description:**
- Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.
- Quartz biotite granodionite
- Fe in fractures
- Open "breakout" fracture

**Bottom of casing at 62 feet below grade.**
### BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club  
**Drilling Company:** Stehly Brothers  
**Job No:** 01203535.12  
**Job No:** 01203535.12  
**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club  
**Drilling Company:** Stehly Brothers  
**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary  
**Lat.:**  
**Long.:**  
**Ground Surface Elev.:**

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**Completion Detail:**
- Sub horizontal breakout
- Fe in single fractures

**Logged by:** Chuck Houser  
**Title:** Sr. Project Professional  
**Date:**  
**Reviewed by:**  
**License no:**  
**Date:**  

**Date Drafted:**  
**Number:** B10  
**Sheet:** 3 of 10  
**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary  
**Lat.:**  
**Long.:**  
**Ground Surface Elev.:**  

**Borehole Dia.:**  
**City of Backfill:**  
**Total Depth:** 472'
BOREHOLE LOG

Client: Sunroad Enterprises
Location: Maderas Golf Club Poway, California

Job No: 01203535.12
Sheet: 4 of 10

Drilling Company: Stehly Brothers

Date Drilled: 6/24/09
Date Drafted: B10

Drill Rig/Sampling Method: Air Rotary

Date: 5/7/09

Sample Log

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Geologic Description:
Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.

Multiple breakout fractures

Large, open fractures approximately 45°

Multiple steep fractures, some breakout

Logged by: Chuck Houser
Title: Sr. Project Professional
Date: Date?
# BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Sheet:** 5 of 10  
**Location:** Maderas Golf Club, Poway, California  
**Drilling Company:** Stehly Brothers  
**Number:** B10

**Date Drilled:** 6/24/09  
**Date Drafted:**  
**Drill Rig/Sampling Method:** Air Rotary

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<th>Depth (feet)</th>
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<th>Geologic Description: Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.</th>
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<td>Open fracture with breakout &lt;45°</td>
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Logged by: Chuck Houser  
Title: Sr. Project Professional  
Date:  
Reviewed by:  
License no:  
Date:  

Chuck Houser Sr. Project Professional
### BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Location:** Maderas Golf Club, Poway, California

**Drill Rig/Sampling Method:** Air Rotary

#### SAMPLE LOG

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<td>Steep breakout</td>
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**Logged by:** Chuck Houser  
**Title:** Sr. Project Professional  
**Date:**

**Reviewed by:**

**License no:**

**City of Backfill:**

**Lat.:**

**Long.:**

**Ground Surface Elev.:**

**Borehole Dia.:**

**Total Depth:** 472'
# BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Sheet:** 7 of 10  
**Location:** Maderas Golf Club  
**City of Backfill:** Poway, California

**Client:** Sunroad Enterprises  
**Job No:** 01203535.12  
**Sheet:** 7 of 10  
**Location:** Maderas Golf Club  
**City of Backfill:** Poway, California

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<th>Depth (feet)</th>
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<td>60° breakout, Fe</td>
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<td>Breakouts</td>
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<td>Vertical and some breakout</td>
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**Geologic Description:** Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.

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**Date Drilled:** 6/24/09  
**Date Drafted:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary  
**Drilling Company:** Stehly Brothers

**Sample Number**  
**Lab results TPH Gas/Diesel (ppm)**  
**Blows per foot**  
**Depth (feet)**  
**USCS symbol**  
**Graphic Log**

**Logged by:** Chuck Houser  
**Title:** Sr. Project Professional  
**Date:**

**Reviewed by:**  
**License no:**  
**Date:**
# BOREHOLE LOG

**Job No:** 01203535.12  
**Sheet:** 8 of 10  
**Number:** B10

**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club, Poway, California  
**Drilling Company:** Stehly Brothers

**Date Drilled:** 6/24/09  
**Date Drafted:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary

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<th>Lab results TPH Gas/Diesel (ppm)</th>
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<tr>
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<td>Massive fracture zone, significant breakout and widening, Fe staining, ?? of rock.</td>
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<td>Fracture zone, significant breakout</td>
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<td>Single, steep approximately 80°</td>
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</table>
| 380           |                                 |                |             |             | 80°± significant breakout  
|               |                                 |                |             |             | Large fracture |
| 385           |                                 |                |             |             | 85° some breakout |
| 390           |                                 |                |             |             | 80°± some breakout |
| 395           |                                 |                |             |             |             |
| 400           |                                 |                |             |             |             |

**Geologic Description:** Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.

**Logged by:** Chuck Houser  
**Reviewed by:**  
**Title:** Sr. Project Professional  
**License no:**  
**Date:**
### BOREHOLE LOG

**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club, Poway, California  
**Job No:** 01203535.12  
**Drilling Company:** Stehly Brothers  
**Date Drilled:** 6/24/09  
**Date Drafted:**  
**Drill Rig/Sampling Method:** Air Rotary

#### SAMPLE LOG

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**Geologic Description:**
- Formation, soil type, color, grain, minor soil component, moisture, density, odor, etc.
- Near vertical - large zone, significant breakout
- Flat truncation
- Breakout fracture
- Mafic dike
- Breakout fracture

**Logged by:** Chuck Houser  
**Reviewed by:** (Blank)  
**Title:** Sr. Project Professional  
**License no:** (Blank)  
**Date:** (Blank)
**Client:** Sunroad Enterprises  
**Location:** Maderas Golf Club, Poway, California  
**Drilling Company:** Stehly Brothers  
**Date Drilled:** 6/24/09  
**Drill Rig/Sampling Method:** Air Rotary  
**Borehole Dia.:**  
**Completion Detail:**  
**Total Depth:** 472'  

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<th>Blows per foot</th>
<th>Depth (feet)</th>
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<th>USCS symbol</th>
<th>Graphic Log</th>
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**Logged by:** Chuck Houser  
**Reviewed by:**  
**Title:** Sr. Project Professional  
**License no:**  
**Date:**
APPENDIX E
Field Fracture Data
12/18 Heritage Hillside

1) Single, open, shallow dip (40°)
2) Zone 6" wide, 2-3 joints in zone
3) Wide spaced 10'-15' 6" wide
4) Single joints spaced 2'-10', 6" space o/c
5) Single wide

6) Single wide (breakaway)
7) Single ½" wide
8) Breakaway
9) Single, wide
10) Zone 2'-2 1/2" wide, breakaway zone - ridge block o/c
11) Zone sub-11 joints 1' spacing to 1 ½' spacing 8+joints N64°W/54°NE
12) Single, wide - breakaway
13) Single, breakaway, on single boulder o/c
14) Breakaway on some boulder
15) Single joint - o/c gives appearance of zone at this attitude [possible sub-horizontal joint]
16) Single, wide at edge of some o/c
17) Single 2" wide
18) Single - breakaway
19) "Zone" through outcrop of consistent spacing between o/c's, some possible breakaway showing dip
20) Sub-11 joints 18" to 24" 9+joints N63°E/75°E to N67°E/83°E
21) Outcrop w/multiple joints - single joints: N36°W/76°E, N76°E/81°E, N76°E/60°S
   L multiple joints (3+), 3' spacing Zone N25°W/77°E, 1'-wide, Fe
22) Linear o/c multiple forbears - no measurements
   Features steep
23) Zone 12'-14" wide, 2 joints N65°E/N
24) Multiple joints in o/c: Zone N36°W/68°NE Single 4' joint, Fe; N54°W/28°NE - Fe
   A-C N65°S/37°W/78°E, Fe mineralization up 6-2" wide
   N76°W/78°E Single, Fe to 6", Zone to 6'-16' 2 joints N30°W/71°E, Fe
   Single, breakaway N90°W/6°E, Zone N25°W/90°W/75°E, Fe
   Possible sub horizontal joint 5+joints 2'-6' spacing, Zone ±1'
Heritage Hillside

204 3

25) Vertical, N 46 E, 12" wide, mineralized (2 tone opalite)

26) Sub horizontal open fracture/joint w/seepage

27) Single to zone, 6" wide, E E 4' east of # 25

28) Single, open, N 33 E 63 NW
12/18/08  West of Caloosahatchee to NSW|B5W

1. NW\|B2W | sp. 6" - 5' - Several highly jointed zones
   3-4' wide, spacing 2"
   Single, mineralized NW\|B3SW, 24' thick
   N85E\|B5S, Single, 1-2' wide
   N65W\|B1SW - Pegmatite filled, 1' thick
   Single Joint N85W\|F1S

2. Joint, 4' apart N70E\|32NW
   Single N84E\|B85
   N-5\|V near east end of core
   Outcrop 75' - multiple NW\|B5W fracture zones with close spacing, up to 5'
   At east end exposure,horizon zone 8' wide
   Spacing 5' in core, highly fractured @ N13E\|72NW
   Cross fractures @ N75W\|63NE & N70E\|67NE
   Single breakdown @ N5W\|26SW

3. N85E\|77SE - Zone 4' wide, spacing 1' - several feet, Fe
   Drainage coincident

4. N65W\|V-78NW - Zone 8' wide, multiple joints, sp. 4" to 18"
   Sub horizontal fractures
   N23E\|45NW Single in Zone
   N46E\|21NW & N27E\|32NW
   N11W\|V4 Zone 2' apart, 20" apart
   N70E\|73NW Zone 2' wide
West of Calhoun:

3. N60E/160W:
- Single joint, discontinuous
- 1"-2" thick joint approx. 5'-60' above
- N-35°V, zone 16' wide
- 1 joint center 12'-15' wide
- 1.6' spacing
- Other single joints 1'-4' spacing
- NSW/6, N90W/75°S, SW zone sp. 4" to 18"

SHB: N70E/25°N:
- Port of shallow dip
- N10W/83.5°S, N70E/172 NW:
- Zone 5' wide
- sp. 6'-15"

SH:
- N87W/50°N: brokenway, zone up 6'-14' thick
- N85E/100°W: SH
- N-5°V

N35W/60SW: Single - 1'-2" wide
**West of Golf Course**

- **N 72° 65' S**
  - Multi/open feature - 2 fractures - 4 fractures over 10'
- **N 15° 31' W**
  - Multi/closed feature - 2 fractures - over 6''
- **N 17° 30' W**
  - Closed feature - 2 fractures - over 9''
- **N 22° 20' W**
  - Closed feature - single
- **N 15° 30' W**
  - Closed feature - 4 fractures over 12''
- **N 15° 20' W**
  - Single closed feature
- **N 15° 00' W**
  - Open fracture/closed fractures (1mm) - spread over 1''
- **N 5° 47' 36'' E**
  - Open fracture, carries on to adjacent boundary
- **N 5° 32' 36'' E**
  - Open fracture, highly intersected, 2mm spread over 3''
- **N 5° 23' 00'' E**
  - Fracture zone, 6-8'' zone
- **N 15° 30' W**
  - Single fracture, 8-10'' in, spacing to 1''
- **N 15° 00' W**
  - Fe mineralization
- **N 14° 30' 15'' W**
  - Nearly sub horizontal, Fe mineralization
- **N 25° 30' E**
  - 2 fractures, 1-2'' open
- **N 45° 00' W**
  - 2 fractures, open, 8-10'' spread
- **N 25° 30' W**
  - Fracture zone, closed 6-8'' spread
- **N 25° 30' W**
  - Fracture zone, crossing (1) . . . 10 - 12 spread
West of Golf Course

1. N 80°/1° NE - sub normal, 1', open fracture, single
2. N 56°/20 NW - normal, open
3. N 10°/85 NE - single fracture, open 1'
4. N 60°/85 NE - fracture zone, 15', multi-closed fractures
5. N 75°/37 NW - single fracture, closed, not weakened
6. E 90°/88 NE - single fracture, continuous over 100', open, single
7. N 80°/7 NE - closed fracture, open over 10' at cross cut by 22
8. N 10°/90° - multi-fracture zone, closed/open over 3'
9. N 55°/6 NW - Divine with fractures, spread over 5', minor Fe mineralization
   2 single
10. N 80°/55 NE - fracture zone, mixture of open/closed fractures, spread over 1'
11. N 80°/55 NE - 1' open fracture
12. N 2°/55 - 5 large fractures, 1/2' continuous, 2 closed, 4 open, 1-2' separation or open
13. N 70°/6 NE - 2 closed fractures, 7' separation between, trace Fe mineralization
14. N 75°/68 NW - open fracture, single
15. N 5°/7 NE - closed fracture
16. N 80°/85 NW - large fracture across outcrop, cross cuts, sub horizontal, extended 7'
17. N 5°/90° - open section, 2' separation / closed section 6' at length
18. N 5°/73 NW - open fracture zone, spread over 2'
19. N 5°/4 NE - large fracture, sub horizontal
20. N 5°/80 NW - fracture zone, over 10' area, open + ~ 1.5' separation
21. N 80°/39 NW - closed fracture / open portion highly weathered
A
1. N27W Sp 4'-6' Single
2. N140V Open, 4'-6" ankle
3. N30-37E V Zone 4'-6" wide, 6"-2' 6 joints, some QVE mineralization
4. N33E V Single approx 11'-12' NW Q
5. N34E V between 3'-4', discontinuous
6. N55W/BBN Single to 6' zone, 1-2 joints, Fe minor
7. N32E/V Single, part 3'-5'
8. N80W V Single, Fe
9. N25W 81NE Part of ±1 zone
10. N80E/71NW Single, truncates at
11. N40E/V Open, weathered zone has sporing of 6"-6' 8 wide exposed
12. N87W/75S Single, open, weathered
13. N20W/10 Open, weathered, continuous from 01c to 01c

B
14. N35E/V Open, single
15. N30E/V 11 210'5SE
16. N90E/44S Fe Min, Single
17. N75W/72N Single, Fe

C
18. N81E/84S Zone N75E/83S
19. N81E/82N
20. N85E/37S Single Breakaway Arkosar
21. Sub-morning through 01c N20W/16NW N83W/115
22. N51W/24NE
23. N81E/82NW Zone 6" wide, breakaway of part of 01c
24. N75E/84N 6'-8' Zone
25. N20W/55NE Single, discontinuous open ½", 2 joints 3' apart
27. N10W/12E
Olde Coach Road  Zuf 2

12/19/08  Fri

1. N 35°W 198'-fracture zone, open/closed fractures, 1.5 ft spread.

2. NE-SE/75°-3 fractures spread over 5 ft.

3. NSW/68°-Fracture single fracture, open 0.5 in., continuous over 10 ft.

4. NNEW/57.5°-Large single fracture, open 0.5 in.

5. NW 1W/75.5W-NW fractures,truncate thru overcrop, open 0.5 in., 10 ft spread.

6. EW/40N-Single fracture, follows stream cat path.

7. NE 3E/74.5E-open face, fracture continues into closed fracture, open face continues over 10 ft.

8. N 27E/60.5E-Highly weathered fracture zone, soil fill all along edges.

9. EW/65N-Dike fracture, volcanic, 10 ft exposure.

10. NW/80E-open fracture, continuous over 10 ft.


13. NW 20W/6E-open fracture, open 2-3 in., soil fill.

South side of Old Coach Rd. East of Madison CC


15. NW 10E/30-cross cut by 15, fracture zone, 3 closed fractures over 2 ft.


17. NBE/90-fracture zone, closed & open soil fill along fracture continuous over 25 ft.

18. NW/80E-open fracture, single.

19. NW 1W/70E-open face, continuous over 10 ft of overcrop.

20. NESW/83°-Closed/open fracture continues over 25 ft.

21. NNEW/85°-open fracture.

NWW/HOS-open similar to 20, 15 ft spread along.
APPENDIX F
Stereonet Contours
N = 39
Maximum density = 10.6
Minimum density = 0.00
Mean density = 1.86
Density calculation: Cosine sums
Cosine exponent = 20
Contour intervals = 10
From minimum to maximum

Equal angle projection, lower hemisphere

Stereo32, Unregistered Version
Equal angle projection, lower hemisphere

N = 77
Maximum density = 10.6
Minimum density = 0.00
Mean density = 1.86
Density calculation: Cosine sums
Cosine exponent = 20
Contour intervals = 10
From minimum to maximum
Equal angle projection, lower hemisphere

N = 51
Maximum density = 10.3
Minimum density = 0.08
Mean density = 2.43
Density calculation: Cosine sums
Cosine exponent = 20
Contour intervals = 10
From minimum to maximum
APPENDIX G
REC Letter
December 16, 2009

Tom Story
V.P. Development
Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

Subject: Maderas Golf Club CUP Groundwater Monitoring Program

Dear Mr. Story:

Per your request, REC Consultants, Inc. is providing a determination regarding hydrological monitoring and riparian health in both Sycamore and Thompson Creeks.

REC Consultants, Inc. has monitored well water depth and riparian health on the Maderas Golf Course and at two upstream reference locations (offsite and comparable areas of habitat) to ensure that the use of well water was not detrimental to the overall health of the riparian habitat. Monitoring was conducted from 2000 to 2004. Interim and annual monitoring reports were submitted to the City of Poway for review.

Although fluctuations were observed in general health of the riparian system onsite, these fluctuations mimicked the changes observed on the offsite reference locations, indicating that any fluctuation was due to natural, seasonal, and hydrological regimes of the ecosystem. No evidence was observed to suggest that use of the wells on the Maderas Golf Course caused riparian conditions to diminish unnaturally.

The Witch Creek Fire of 2007 extensively burned the riparian habitat corridor adjacent to the golf course. REC is currently monitoring four mitigation areas at Maderas Golf Course unrelated to the previous well monitoring. During our site visits we have observed the vigorous natural recovery of the riparian habitat corridor. The post-fire recovery appears to be consistent with a healthy ecosystem.

Please contact me if you have any questions. Thank you.

Sincerely,

Elyssa K. Robertson