being 701 acres so that the remaining 87% of the valley is mountain slopes and uplands. The Olympic Valley Groundwater Basin (Basin # 6-108 by the Cal DWR) (hereinafter "basin") consists of unconsolidated, predominantly alluvial sediments, which the WSA divides into three units (WSA, p 5-4). In general, unit one in the west is very shallow, up to 20 feet below ground surface (bgs), and consists of fine sand and silt. Unit 2 is below unit 1 and composed of gravel and sand becoming finer to the east, toward the meadow. It somewhat grades into unit 3 in the eastern portion of the basin in the meadows.

There is an upward gradient from depth for flow to Squaw Creek, with average water levels in piezometers more than 100 feet below ground surface in May 1986 being up to six feet above Squaw Creek on both the north and south sides of the creek (Figure 1). In the western portion of the valley including the well fields, high water levels vary annually more than six feet (Figures 2 and 3). There is typically significant seasonal drawdown but 1994-1995 provides an example of how widely groundwater levels may vary in a calendar year. During fall 1994 after a dry year, the drawdown was up to ten feet below the normal drawdown but after a very wet winter a substantial recovery occurred in spring 1995, with groundwater levels up to six feet above the normal levels (Figures 2 and 3). During most years aquifer water level recovery is not to a completely full condition which occurs only during very wet years.

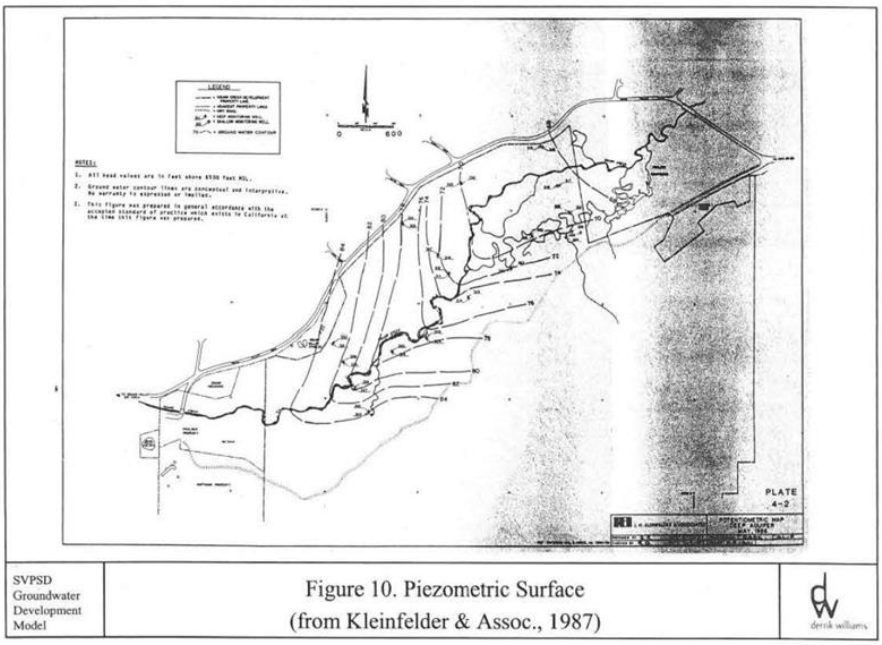

Figure 18: Figure 10 from Williams (2001) showing peizometric surface for the Olympic Valley aquifer, mostly on the east end of the valley. The 2-foot contours show a distinct flow pattern from the aquifer toward the creek reflecting a gaining stream. The highest contour, in the southwest end is 6184 feet above mean sea level.

08a-71 cont.

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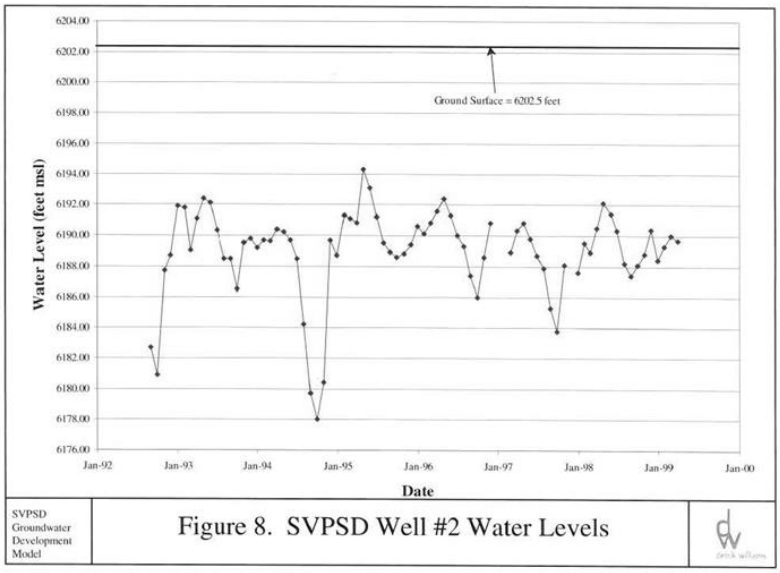

Figure 19: Figure 8 from Williams (2001) showing groundwater levels for SVPSD well #2.

O8a-71 cont.

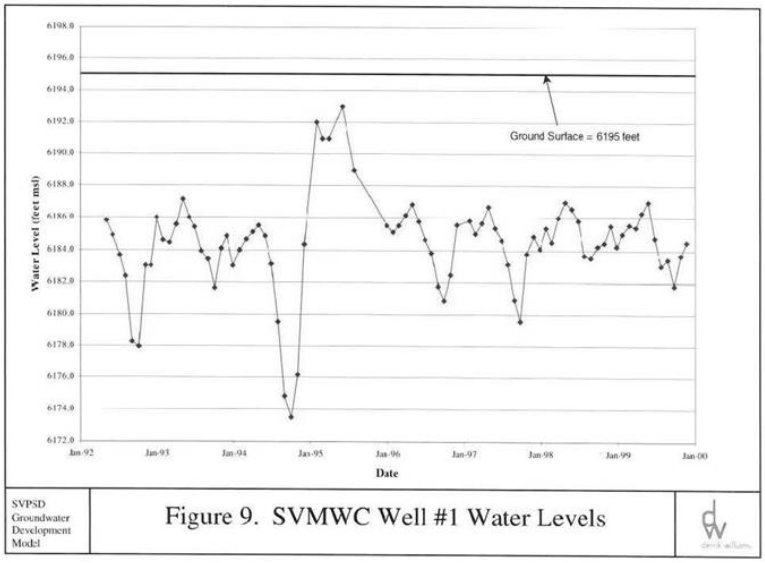

Figure 20: Figure 9 from Williams (2001) showing groundwater levels for SVPSD well #2.

5

Precipitation

The high mountain precipitation reported in the WSA, Table 3-1, is grossly wrong. The table claims the high mountain precipitation, as snowwater equivalent, is 263 inches per year for 1993 through 2011. The actual data from the snotel site, Squaw Valley at 8029 feet[2], shows that that the annual averages for the periods 1981-2014, 1981-2011, and 1993 -2011 are 73.3, 75.9, and 80.6 in/y, respectively. Attachment 1 shows a summary of the data. Note that 263 inches is 21.9 feet of precipitation which at a 1:10 ratio would be 219 feet of snow. It is not clear where the WSA obtained such high values, but they are clearly wrong. The choice of years used in the WSA, 1993 – 2011, is the wettest of the actual record. This extreme precipitation has been used in all of the studies cited in the WSA since 2011. An annual precipitation map for Olympic Valley in 2007 (Hydrometrics 2007a) shows that annual precipitation varies from about 43 in/y in the east to 57 in/y in the higher elevation western portion. O8a-72

In the climate change discussion, the WSA (p 7-2) uses the wrong precipitation estimates to estimate there is 60,194 af/y of precipitation in the overall watershed which over 5146 acres the depth would be 11.7 feet. The WSA argues that because snowmelt is this high, significant changes due to climate change would not affect the availability of water. Because the precipitation estimate is grossly wrong, this argument is based on grossly wrong assumptions and should be rejected. O8a-73

Recharge

Recharge is precipitation or snowmelt that percolates through the soil to the groundwater table. In general, the precipitation either runs off the soil because it falls faster than it can infiltrate into the soil or it enters the soil. Infiltrating water either evapotranspires or passes the root zone to enter the groundwater as recharge. Precipitation also runs off because the soil pores are full as rejected recharge.

Recharge to the alluvial aquifer in Squaw Valley occurs in several ways. There is precipitation that recharges where it falls, percolation from streams flowing across the basin, and at the mountainfront where runoff from the mountains encounter high permeability unconsolidated sediments. Figure 4 shows a general circulation of groundwater recharging on the streambanks and mountain front. The Olympic Valley basin also has numerous anthropogenic sources including recharge of irrigation water and leaks from pipes (WSA). O8a-74

[2] http://www.wcc.nrcs.usda.gov/nwcc/site?sitenum=784. The data were obtained as monthly values for each year since 1980. The annual averages were for water years, October through September.

6

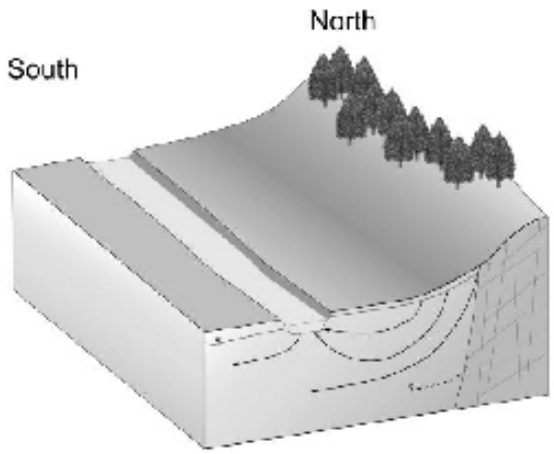

Figure 10: Conceptual Diagram of Stream/Aquifer Interaction during Late Spring and Early Summer

Figure 21: Figure 10 from Hydrometrics (2014). Hydrometrics (2014) suggests mountain front recharge on the north side of the valley circulates to different levels, with some inflowing to Squaw Creek, but only on the north side. Water seeps from the creek and continues southward from the stream; this is supported by the water loss surveys. More water enters than leaves the stream, so synoptic surveys find the stream is gaining in these reaches. There is no evidence that water at depth, flowing from the north, continues southward under the creek.

O8a-74 cont.

Mountainfront recharge occurs in zones around the valley at near 6350 feet and, based on isotope and geochemical analyses (Moran 2013), provides the largest proportion of basinwide recharge. Upward gradients observed in deep piezometers reflect the deeply circulating mountain front recharge that ultimately discharges to the creek (Hydrometrics 2014) (Figure 4). No evidence supports the idea that the upward gradient also means that deep groundwater does not flow upward due to there being "some level of confinement in the deeper aquifer" (Hydrometrics 2014, p 3).

Water recharges from Squaw Creek into the aquifer during runoff periods, mostly in the western portion of the aquifer (Hydrometrics 2014). During late summer and fall after groundwater levels have risen sufficiently groundwater discharges to the creek. As groundwater draws down, recharge may begin again if there is any remaining runoff; if not, the stream becomes dry.

The third natural recharge source is precipitation and snowmelt directly on the alluvial aquifer, which is distributed recharge. The rate can be specified as a percent of the precipitation usually distributed evenly across the basin. Additional recharge sources are anthropogenic, including irrigation return flow, pipe losses, and sewer inflow and outflow (Hydrometrics 2013, Table 2).

The WSA does not present an estimate of recharge to the basin, although it notes the various components and the likely temporal variability. Hydrometrics (2007b) revises the groundwater model recharge zones and indicates the recharge rates are changed accordingly, but does not specify the new

O8a-75

7

rates. Hydrometrics (2007a) discusses that planning objectives must include the identification of recharge zones and rates. Later documents suggest that mountain front recharge is most important (WSA, Hydrometrics 2014). Only the earlier documents actually estimate recharge. O8a-75 cont.

West-Yost (2003) and Williams (2001) estimated annual recharge to the basin to equal 688 af/y, but do not explain the estimate. Williams (2001) used the model HELP (Hydrologic Evaluation of Landfill Performance) for the estimate. As may be suspected from its title, HELP is not commonly used for watershed scale recharge estimates – it used for estimating seepage through a landfill cover. HELP simply does a water balance calculation among layers assuming one-dimensional vertical flow without considering unsaturated flow through the soil. Being one-dimensional, it does not account for differing conditions around the area or for recharge of water that has flowed downhill. Figure 4-7 in West-Yost (2003) shows monthly recharge estimates from 1992 through mid-1999, which are similar to the output expected from HELP. The monthly variation indicates the annual estimate has a large variability. O8a-76

The recent studies do not include a water balance estimate for the aquifer, but the earlier studies do and include the 688 af/y recharge estimate (West-Yost 2003, Williams 2001). They combine it with other recharge sources and pumping estimates to estimate a groundwater discharge to Squaw Creek equal to 434 af/y. They acknowledge a huge uncertainty due to all of the inflow values being gross estimates. Recharge varies substantially from year to year (Figure 4-7, West-Yost 2003), therefore the idea of a steady state annual water balance is not very useful.

Stream/Aquifer Interactions

The exchange of water between groundwater and Squaw Creek indicates how groundwater pumping will affect flow in the creek. Hydrometrics (2013b) used temperature probes and piezometers to estimate seepage rates and gradients across the stream bottom in Squaw Creek near the parking lot in western part of the valley. Water temperature variations can show where groundwater flows into the creek because it causes measurable temperature changes. Piezometers measure water levels at specific levels in the aquifer near the stream so that gradients to or from the stream can be estimated.

Seepage rates estimated with temperature are highly variable since the temperature data varied even across a cross-section. This suggests that groundwater may be entering the stream on one side and discharging from the stream on the other side, as suggested on Figure 4. The piezometers and stilling basins in the channel estimated mostly small head drops, either up or downward until the stream dries at which point the water levels dropped to as much as seven feet beneath the stream bottom. The conductivity values estimated with Darcy's law using the estimated seepage and gradients ranged from 0 to 40 feet/day. O8a-77

The summary is that in the west part of Olympic Valley, near most of the municipal wells and where the creek is in a trapezoidal channel, the water from the stream percolates to groundwater when the streamflow is relatively high or when the groundwater is drawn down. During late summer, the stream may go dry and the water table may fall below the bottom of the stream. At this point the stream also recharges the aquifer if it contains water.

Pump tests show that the groundwater in Squaw Valley is connected to the creek. The transmissivity is high, although the tests as performed and analyzed were inaccurate. For one, the tests are completed near the creek so the pumping clearly drew water from the creek during the early season test when the creek was flowing. A second test, when the creek was empty, showed signs of the limiting size of the

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aquifer, with a no flow boundary on the far (north) side of the creek. Although the authors acknowledged these issues, they analyzed the pump test data with the standard Theis (1935) method which does not account for boundaries or stream leakage (Hydrometrics 2013b). The conductivity estimates ranged from 235 to 755 ft/d, which is probably too high due to the issues with the tests just identified, although a proper analysis would still likely result in estimates of the same magnitude . O8a-77 cont.

The WSA claims the groundwater is percolating rather than flowing in a subterranean stream (WSA, p 5-7), but does not support this contention. Groundwater flowing in the Olympic aquifer appears to be flowing in a subterranean stream, as described in the Garrapata decision[3], in that (1) there is a subsurface channel present, (2) the channel has relatively impermeable bed and bands, (3) the course of the channel is known, and (4) groundwater flows in the channel[4]. As described above, the Olympic Valley aquifer is alluvium that lies in a glacial-carved valley of granitic bedrock. The granitic bedrock forms a subsurface channel and defines its banks. Williams (2001) shows profiles and cross-sections that show the maximum depth to bedrock is about 150 feet over its approximate one and half mile length and quarter mile width. Cross-sections also show alluvium confined on both side and underneath[5]. O8a-78

Groundwater flows through the aquifer from west to east where it discharges to Squaw Creek or the Truckee River. Groundwater originates almost exclusively from recharge into the alluvium from snowmelt or runoff in Squaw Creek or a tributary. Moran (2013) showed the age of shallow groundwater was less than a year. Upward gradients in the alluvium show that water through the entire section of the aquifer eventually circulates to the stream, even though the travel time may be a few years.

Very little groundwater enters the aquifer from bedrock fractures in the alluvium. Horizontal wells intersect bedrock fractures above the alluvial aquifer and produce about 70 af/y (WSA 2014). This fracture flow is not recharge to the aquifer because it occurs above the basin aquifer, not within it. Williams (2001, p 12) used the flow rate from these wells to estimate an "average annual recharge from bedrock fractures" (Id.) to be 436 af/y. Williams presents no data to show that similar flow rates occur in the fractures that do not have horizontal wells. Even if flows occur, they would be springs above the valley floor, not discharges into the alluvium. Moran (2013) showed geochemically that there is not a strong connection between the basin and fractured bedrock groundwater system which means the geochemical signature of bedrock water did not appear in the alluvial groundwater. The WSA acknowledged there is "little connection between the Basin and fractured bedrock groundwater" (WSA, p 5-3). Because the bedrock is generally impervious and the bedrock fractures provide spring flow above the valley floor rather, the bedrock contributes almost no flow to the aquifer. The earlier (2001) estimates of bedrock inflow to the aquifer should be disregarded. O8a-79

[3] Decision 1639, In the Matter of Application 29664 of Garrapata Water Company, State of California State Water Resources Control Board.
[4] These four criteria were presented on page 4 of the Garrapata decision, note 3.
[5] Garrapata also defined the channel as alluvium. Note 3, p 5.

9

Water Supply Sufficiency

The WSA considers water supply sufficiency rather than a safe or perennial yield for the basin[6]. None of the previous studies have found the basin to be in overdraft (WSA, p 5-1), but the WSA does not define what "overdraft" would be. The WSA implies that the aquifer is small compared to the amount of water fluxing through it and that recharge essentially fills the aquifer each year regardless of drought conditions (2014 and 2015 may ultimately be an exception). This is not accurate as discussed above regarding Figures 2 and 3. Also, simulations of existing pumping (Hydrometrics 2014) show that groundwater levels in the western portion of the aquifer (the well field) recover to different levels after a pumping season. Groundwater levels recover to a similar level each year only in the eastern portion of the aquifer[7]. The west end of the valley where most of the recharge occurs refills to levels that vary among years during the springtime peak. O8a-80

This also means the WSA overplays the idea of "rejected" recharge in the Olympic Valley aquifer. A full aquifer will "reject" potential recharge during periods of high recharge because aquifer volume limits storage. Because much of the aquifer in the eastern meadow portion of the aquifer is full, some potential recharge may be rejected there but since there are few wells there and none of the new wells are proposed there, there is little opportunity to increase the recharge. O8a-81

The water supply sufficiency of the aquifer to the proposed project pumping and increased pumping is mostly discussed in a memorandum from Todd Groundwater (Taylor et al. 2014). Basically, Taylor et al. (2014) determined that it was necessary to maintain saturated thickness at 65% of the maximum saturated thickness. The maximum saturated thickness "occurs when water levels are the highest" (WSA, p ES-3, p 6-5, Taylor et al. 2014, p 14). Maximum saturated conditions represent "current average pumping conditions (WSA, p ES-3, p 6-5). Taylor et al. specify that "maximum saturated thickness values at specific locations do not change, and were derived from model simulations representing historical actual pumping conditions" (Taylor et al. 2014, p 14) which they also refer to as "baseline conditions". "Maximum saturated thickness is the highest groundwater elevation minus the Basin bottom elevation. The maximum saturated thickness values at specific locations do not change, and these **values were derived for the existing and new well locations** from **model runs representing historical actual pumping conditions** in the calibrated model" (Taylor et al. 2014, p 16, emphases added). This establishes that the maximum saturated thickness therefore depends on historical conditions with pumping, there is apparently no consideration of whether the aquifer is currently stressed by those existing pumping conditions. In other words the method assumes that baseline, existing conditions, are not causing overdraft in the basin and may be compared against by conditions going forward with future development. O8a-82

Taylor et al. (2014) decided on 65% after a literature search because that was the deepest drawdown recorded in the past at existing wells and it did not cause a problem at any wells as far as they

[6] California conflates safe yield with perennial yield, defining the latter as "the maximum quantity of water than can be withdrawn annual from a groundwater resources under a given set of conditions without causing an undesirable result" (Bachman et al. 2005, p 268). Continuing the "phrase undesirable result is understood to refer to a gradual lowering of the groundwater levels resulting eventually in depletion of the supply, subsidence, increased energy costs, dessicated wetland or degraded water supply" (Id.).

[7] Hydrographs for Wells RSC-328, -304, -308, -321, and -307 recover to almost the same level each year regardless of recharge (Hydrometrics 2014). All wells in the east recover to similar levels.

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understood. Thus, 65% is an operational limit because it is simply the necessary saturation to maintain well pumping efficiency[8] and is meaningless with respect to basinwide groundwater management. The guidance has nothing to do with maintaining a yield or not causing other deleterious impacts to the basin, such as lowering discharge to streams and springs

The baseline (maximum saturated thickness) is determined at the new and proposed well locations based on simulated historic drawdown at those locations. In other words, they run the groundwater model with existing pumping, recharge, and all other conditions to determine the groundwater levels for each time step; this would be the same period they used to calibrate the model. The baseline at the existing wells is therefore the simulated drawdown at the pumped well and at the new wells will be the drawdown as caused only by pumping the existing wells. If a proposed well is beyond the drawdown of existing wells, its baseline will be background aquifer water levels. The baseline is existing conditions over the 1993 to 2011 period. As noted above, comparing future pumping to this definition of existing conditions establishes or implies that there is no overdraft or basinwide problems with the existing pumping. O8a-82 cont.

Taylor et al. test for water supply sufficiency by simulating pumpage at the expected 2040 demand from existing and proposed new wells. They simulate pumping the same demand regardless of drought conditions because there has been no decrease in the past due to drought – this is reasonable; I review the projected water demand below. However, the WSA identified that six new wells would be need to meet demand by 2040 (Taylor et al. 2014, p 11), but the simulations of future conditions placed wells "in all of the locations identified as being favorable for groundwater production" (Id.). For modeling, they placed new wells "in locations where no Project buildings are planned and were selected to take advantage of deep and productive areas, maintain distance between wells to minimize interference, maximize distance from Squaw Creek, and distribute pumping over a large area to reduce cumulative drawdown effects in any one area" (Id.). Taylor et al. Table 2 shows nine proposed new municipal wells and Table 3 shows that all of the wells, existing and new with one exception, were simulated to pump the same rate, 54.7 af/y; other entities' wells pump at other rates based on their specific conditions but mostly at rates proportional to their historic pumping. In other words, water supply sufficiency, assessed based on drawdown, was simulated using more wells than is actually proposed for the project. This spreads the pumpage over three extra wells and leads to simulated pumping rates that are almost half the current historic pumping rates (Taylor et al. 2014, p 12). "Existing SVPSD Basin groundwater production from four wells was approximately 3809 AFY on average (95 AFY per well). In the modeled 2040 pumping scenario there are 14 SVPSD wells producing a total of 700 AFY, or 50 AFY per well" (Id.). O8a-83

The WSA therefore simulates operational demands by pumping less from each well than was pumped from the existing wells, historically. Their simulation shows that the 65% criteria is met on average over the well field and for individual wells although percent saturation varies widely (Figure 5). The average percent saturation hardly drops below 80%. The decrease in percent saturation in their chosen dry year, 2007, is similar to that in other "wetter" years such as 2008 and less than 1994. Their three-year dry

[8] A peer review letter prepared for the water supply assessment explains in detail the need to maintain the operational thickness. Letter from Dwight Smith, Interfluve, Inc. to Mike Geary, Squaw Valley Public Services District, Re: Preliminary review of sufficiency of supply memorandum dated May 15, 2014. May 29, 2014.

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periods, 1999-2001, caused much lower percent saturation than did the driest year[9] (Figure 5). During no year does percent saturation return to 100%. O8a-83 cont.

Any MODFLOW-based groundwater model estimates drawdown over a model cell, not specifically at the well bore. This is because groundwater models operate by completing water balance calculations for each cell and the change in storage (ie from pumping) is averaged over the cell. It is possible that actual drawdown at a well will be higher than reported in the WSA[10] O8a-84

The period 1993-2011 does not include the driest years the area could experience because it does not include the 1987-92 drought or the ongong 2012-15 period, which may turn out to be the driest period on record. Also, changing climatic conditions expected in the 21st century renders bare reliance on the recent historical record insufficient to assure adequate future supplies. The WSA should acknowledge this fact and simulate groundwater pumping under conditions representative of future climate change scenarios. Once data is available through 2015, the model should again be run and the WSA rewritten to better assess and describe the water supply sufficiency under drought conditions. It would be useful to add years without recalibrating the model to verify the model calibration and conceptual model (Anderson and Woessner 1992). O8a-85

[9] Peer reviews by Dwight Smith have noted that 1999 is not generally considered a drought year in the Truckee River watershed. Review file: Draft_Village_at_Squaw-Valley_Specific_Plan_WSA_6-17-14_DSmith.pdf.

[10] Peer reviews also raised this issue. Letter from Dwight Smith, Interfluve, Inc. to Mike Geary, Squaw Valley Public Services District, Re: Preliminary review of sufficiency of supply memorandum dated May 15, 2014. May 29, 2014. From p 2 of 4: "In estimating saturated thickness at specific pumping wells, the model output also will overpredict the saturated thickness available to the well. This is because the pumping water level in the well can only be based on the water level in the model cell in which the well is located. The model cell represents an area surrounding the well. In reality, there is a cone of water level depression with a focal point at the well."

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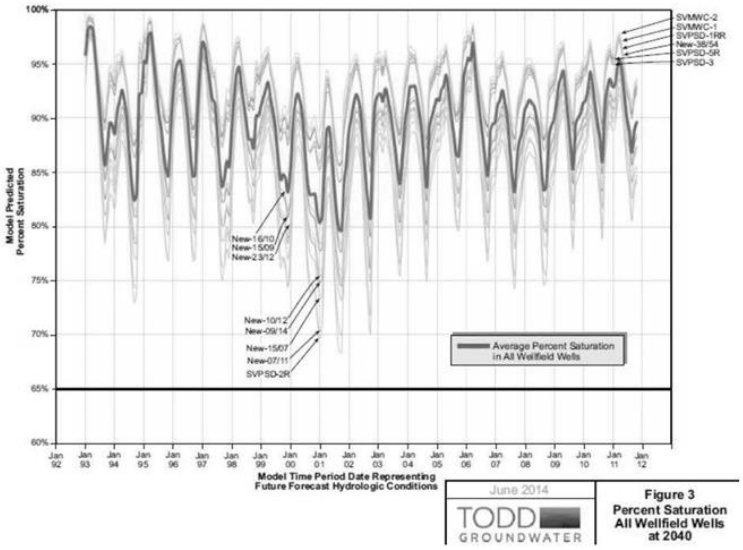

Figure 22: Figure 3 from Taylor et al. (2014) showing the percent simulated saturation at all wells.

The analysis of 1993 through 2011 indicates three things. First, the aquifer does not fill every year so which refutes the WSA's discussion of full recovery; recharge has not refilled the aquifer if the water level never returns to the baseline condition. Second, drawdown from each well must overlap such that a well pumping just 50 af/y is drawn down more than it was when it pumped 95 af/y (the baseline was set based on existing wells pumping 95 af/y). Third, because percent saturation was lower in the three-year dry period than in the one-year dry period, there is carry-over drawdown affecting water level recovery in the longer dry period. O8a-86

Model predicted saturated thickness varies up to twenty feet annually and the aquifer thickness is quite variable, varying from about 50 to over 150 feet (Figure 6). It would be more useful to provide a map showing water levels and one showing drawdown for a dry year. This would show where the pumping draws water from and where the aquifer may be most stressed. Additionally, they should provide a hydrograph of recharge from different areas, pumping, and discharge to Squaw Creek to show the effect that development has on other parts of the aquifer. O8a-87

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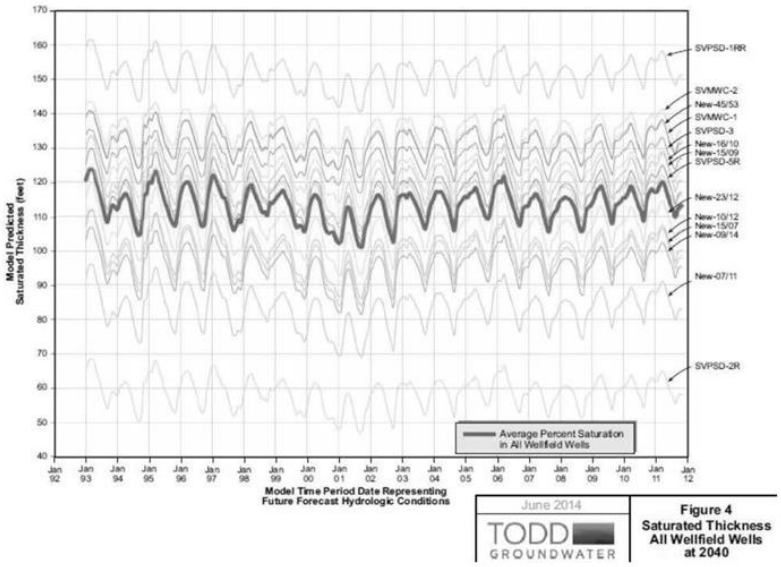

Figure 23: Figure 4 from Taylor et al. (2014) showing the saturated thickness at all wellfield wells.

Overall, Taylor et al's (and the WSA) analysis of water sufficiency does not account for:

- Changes in streamflow. There is a connection between surface and groundwater such that drawdown could decrease streamflow, both during dry and wet periods. As the water table lowers, it will draw water from the creek as long as water is available in the creek. Increasing pumpage will increase the time periods during which the creek has low or no flow as well as increase the lengths of stream that actually go dry.
- Changes in wetland conditions: The allowable loss in aquifer saturation would lower the water table beneath wetland areas as well. The proposed project would exacerbate the drawdown in the meadows and lengthen the time period that the meadows are dry.

O8a-88

Baseline as analyzed herein is the legal definition for CEQA and does not consider predevelopment conditions. It would be useful to consider predevelopment conditions with no pumping in the valley because the current baseline assumes there are no problems with the current water supply system. Comparison with predevelopment conditions would allow an assessment of just how much predevelopment natural conditions have changed. This could be simulated with the model with just recharge without return flow and pipe leakage and discharge to the stream. The simulation would establish groundwater levels that could be considered the maximum saturation level. Analysis of pumping should consider two levels of development. First would be existing conditions and second would the proposed 2040 development conditions. Percent saturation then may be quite a bit less than currently determined because the maximum saturation would be a thicker aquifer with less annual variability.

O8a-89

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Additional Groundwater Development Considerations

The WSA estimates that a municipal well pumping at a "customary 8-hour pumping cycle" would capture only 2% of its flow from Squaw Creek. The estimate of the amount of water drawn from Squaw Creek is likely too low because the calculation does not account for cumulative effects because it assumes that at the beginning of any pumping cycle the amount being drawn from the creek is zero. Hydrometrics used a standard formula (Hunt 1999) to estimate the amount of water that pumping draws from the creek (Hydrometrics 2013a, p 17). Assuming they applied the method properly, they estimated that after 51 hours of pumping (test #1), 17% of the amount being pumped was being drawn from Squaw Creek. Hydrometrics minimized the importance of this by estimating the amount drawn from the creek over the entire 51-hour period as less than ½ percent of the creek's total flow during that period. Over an eight-hour pumping cycle, the amount captured was much less. The method does not account for water drawn from the creek due to drawdown that remains when pumping stops; this drawdown fills by pulling water from storage elsewhere in the aquifer and from the creek, either by reversing discharge to the creek or by directly drawing from the creek. Ultimately changes in streamflow are necessary to fill the drawdown because all pumping is a new discharge from the aquifer which must be taken from another discharge from the aquifer. O8a-90

There is no consideration of climate change with future simulations, although it is likely to affect precipitation and snowmelt timing in ways that will lengthen the dry, or no-recharge, period of a year. As the snow shifts to rain and snowmelt occurs earlier, there will likely be longer periods during the summer during which there is not runoff recharging the aquifer. Recharge replaces pumping discharge during spring, but not during later summer and early fall; that period will likely increase in length so the drawdown will likely increase. O8a-91

Water Demand

Most of the water demand analysis in the WSA was completed by Hunt and van Dyne (2014), a memorandum attached to the WSA as Appendix A. Hunt and van Dyne rely on a memorandum prepared by MacKay and Somps (Giberson 2014) to support their estimates.

The WSA estimated project and non-project water demands for the next 25 years, commencing in 2015. Total demand for the valley in 2040 would be 1205 af/y (Hunt and van Dyne 2014, p 2) but existing horizontal bedrock wells will continue to produce 70 af/y through 2040. Because the WSA assumes, appropriately, the bedrock wells are separate and independent from the valley groundwater system, the WSA subtracts this bedrock production to establish demand equal to 1135 af/y. In five-year intervals from 2015 through 2040, the project demand is 0, 82, 129 175, 210, 234 af/y while the total valley water demand is 772, 880, 975, 1044, 1100, 1135 af/y, respectively. O8a-92

The WSA estimates water use for single family residences (SFR) as 550 and 400 gpd/connection for the SVPSD and SVMWC areas, respectively. They also assume full build-out of empty lots by 2040, so there is a total 74 af/y of SFR demand. Hunt and van Dyne (2014) distribute that demand over the year in a "bell curve pattern" (Id., p 9) which results in 40% of the annual demand being required from July through September. Much of the SFR demand occurs during the season when less water recharges the aquifer, so meeting the demand stresses the aquifer more. These estimates are reasonable.

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The WSA estimates occupancy based on 2009 through 2011; at full build-out it is projected to be just 55.2% annually varying from 26% in November to 72% in March (Table 1, Giberson 2014). For commercial use, the demand per sf is reduced based on the occupancy rate (Id.). No justification is given for using 2009 through 2011, and the choice should be questioned because those years were at the peak of an economic slow-down when travel to resorts was likely at a low point as compared with pre-recession or even now.

The occupancy combines with the usage per capita for lodging to create a resort demand (not including irrigation). Hunt and van Dyne (2014) used 100 gpd/capita with two people per room (although Giberson (2014) used 90 gpd/capita). They also used a 9.8% factor of safety to account for unbilled water losses.

Commercial water use is the second largest demand, rated at 0.24 gpd/sf (Hunt and van Dyne 2014, Table 10). It is used throughout the demand tables in Giberson (2014). This was based on observed commercial demand from 2005 through 2012, but there is no description of how the estimate was made. A simple estimate of water use by area would not account for occupancy. O8a-93

Hunt and van Dyne (2014) combine water used based on bedroom occupancy and commercial area development. They estimate project water demand for 2040 at 55,471 for full occupancy, based on 2 per bedroom and 100 gpd/capita and 0.24 gpd/sf for 80,500 sf commercial development (Hunt and van Dyne 2014, Table 10). They then adjust this amount based on the occupancy rates discussed above.

The two largest obvious sources of potential error are in the occupancy rate and the 0.24 gpd/sf/capita estimates. Occupancy could be up to 80% higher than the estimated rate. This is based on full occupancy being a little more than an 80% increase. There is too little disclosure of how 0.24 gpd/sf was estimated to assess its potential variability. Because the occupancy could increase as much as 80% the future demand should be considered in a variable fashion. In other words, the water supply sufficiency estimates should be based on much higher potential demand even if the underlying estimates are accepted as accurate.

Another issue regarding demand is timing, as in the distribution of demand through the year. Much of the current and projected demand occurs during late summer from July through September after recharge has decreased. The existing basis for distributing total demand among months has many uncertainties, but is probably more uncertain for the existing and non-project used because it involves various types of irrigation. When considered annually it might appear there is sufficient groundwater to meet demand but due to the small aquifer volume and the lack of recharge during late summer, pumpage may lower groundwater levels and cause significant environmental damage to streamflows or riparian vegetation. If climate change further lengthens the time period without recharge, the potential impacts could increase. Groundwater drawdown could exceed the 65% criteria established for water supply sufficiency. O8a-94

Conservation could decrease demand on the system. The WSA suggests a variety of water-saving devices, including: "installation of high-efficiency fixtures and fittings, use of recirculating hot water systems, implementing graywater system applications, minimizing water intensive landscape, and use of smart irrigation controllers" (WSA, p 4-5); the WSA also notes that it is difficult to assign conservation saving to a specific use, so the demand as analyzed does not account for conservation. Also, much of the non-consumptive use returns to the aquifer as wastewater discharge. O8a-95

Groundwater Model

The WSA uses a numerical groundwater model (Hundt and Williams 2014, Hydrometrics 2013, West-Yost 2003, Williams 2001) to assess the ability of the aquifer to meet demand by determining how proposed pumping will affect the percent saturation of the aquifer. Williams (2001) developed the model initially; there have been several updates since then (Hydrometrics 2014, 2013, 2007a and b). The model is difficult to review because no one report thoroughly documents its current structure and accuracy. However, the important aspect is how well it performs today.

Three aspects of the model are problematic for its intended purpose - to assess water supply sufficiency. First, recharge rates were estimated in a very unusual way and are distributed evenly across the model domain rather than attempting to account for actual sources, with the exception of some mountainfront recharge. The temporal distribution of recharge (Hundt and Williams 2014) also makes more water available to the aquifer at inappropriate times. Second, general head boundaries allow inflow from the bedrock to the basin aquifer which will inappropriately maintain groundwater levels in the basin aquifer. These original model structures have survived mostly intact until now. Third, recent revisions converted the aquifer property estimation to a use of pilot points which does not account for prior knowledge of the formation boundaries. The following paragraphs expand these issues. O8a-96

Figure 7 shows how Williams defined recharge zones and Figure 8 shows the most recent (Hundt and Williams 2014) variation. Recharge zones are specified flux boundaries, meaning the modeler specifies the rate in length/time, or ft/d in Figure 7 (also Table 1), that water enters the model distributed evenly over the area of the zone. Recharge as applied to the model apparently includes many sources of water, including distributed recharge from precipitation on the spot, irrigation, leaks from sewer pipes, and others. Williams (2001) explains that they estimated "infiltration from rainfall and snowmelt" (section 2.5.1.1)[11] using the HELP model, as discussed and criticized above in the recharge section.

Table 2: Recharge rates for recharge zones in Figure 7.

Zone	ft/d	ft/dy	in/y
2	3.08E-03	1.12	13.49
3	8.42E-04	0.31	3.69
4	8.42E-04	0.31	3.69
5	2.24E-02	8.18	98.11
6	2.18E-02	7.96	95.48
7	7.76E-03	2.83	33.99
8	8.46E-03	3.09	37.05
9	2.54E-03	0.93	11.13
10	1.17E-02	4.27	51.25

O8a-97

[11] Throughout the reports they authors frequently interchange infiltration and recharge. Infiltration is precipitation that enters the soil through the soil surface; it may become soil water and be evapotranspired. Recharge is the infiltration that flows through the soil layer to the groundwater table.

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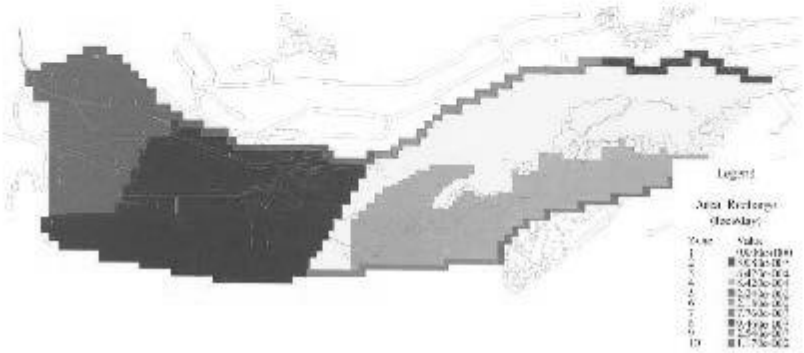

Figure 24: Williams, Figure 32 showing recharge zones.

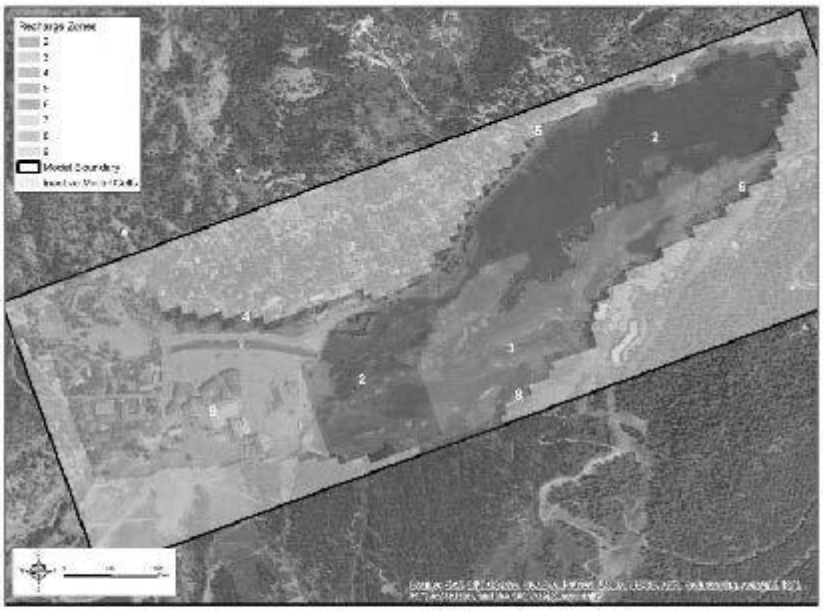

Figure 25: Hundt and Williams (2014) recharge zones.

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Figure 7 shows zones along the edge of the basin which apparently add runoff from the mountains as recharge to model, but the report does not describe how the flux rate for those zones was determined. The rates shown on Figure 7 for zones 5 and 6 (and Table 1) are substantially higher than those used over the rest of the model area, as they should be if they truly represent mountainfront recharge, but they cover such a small area that the total recharge would not be much. O8a-97 cont.

The distribution of recharge through the year depends on the availability of precipitation or snowmelt, so Hundt and Williams (2014) distributed precipitation availability during winter as 50% of precipitation during the month it occurs and 25% in the following two months. All precipitation which falls in December is available to recharge by the end of February; all precipitation in February is available for recharge by the end of April. March percentages are 60 and 40%, respectively, so all March precipitation is also available to recharge by the end of April. From April through November, all recharge occurs during the month the precipitation falls. I use "available" with recharge because it will runoff if there is no soil moisture capacity available. It seems unreasonable to assume that all December precipitation melts and recharges by the end of February; this could cause the simulated water levels to recover too soon. O8a-98

Williams (2001, p 19) simulated inflow from the bedrock using general head boundaries (GHBs). The discussion above has shown that recent studies have concluded little water enters the basin from the bedrock, simulating this with a GHB is inappropriate. A GHB allows groundwater to enter or leave the basin based simply on the difference in water level between that simulated for the aquifer and specified for the boundary and the conductance of the boundary. Williams located the GHBs at fractures where flow could have entered. A GHB artificially maintains the water levels in the aquifer at a specified level which is inappropriate and could make the calibration appear more accurate than it actually is. It also artificially limits the drawdown predicted by the model. O8a-99

Third, Hundt and Williams (2014) estimated conductivity using pilot points, a method which essentially establishes parameter fields across the model domain. The methodology is interesting, but needs more description than provided in the report (Hundt and Williams 2014, p 11). The number of wells used for calibration does not seem to be sufficient to create up to 78 pilot points per layer for calibration (p 11). The resulting parameter fields do not resemble hydrogeologic patterns, however, as can be seen on the circular patterns shown on Figures 9 and 10. Figure 9 shows circular areas with horizontal conductivity exceeding 100 ft/d in the middle of areas with conductivity much less than 100 ft/d. Vertical anisotropy has fewer circular zones, but those that occur in layers 2 and 3 are areas where the model will simulate very little vertical flow. It is also very unusual to have the very high anisotropy in surface layers (layer 1 in Figure 10) because surface formations tend to be sorted rather than exhibiting continuous layers. O8a-100

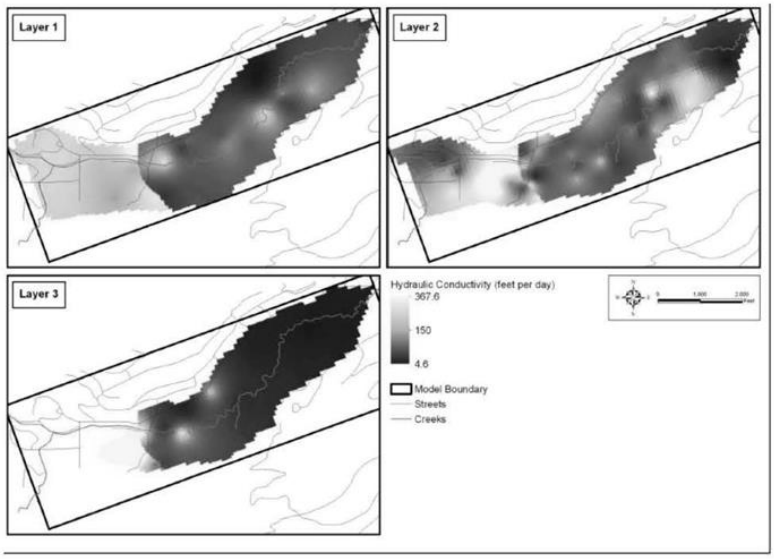

Figure 26: Figure 12 from Hundt and Williams (2014) showing the distribution of horizontal hydraulic conductivity.

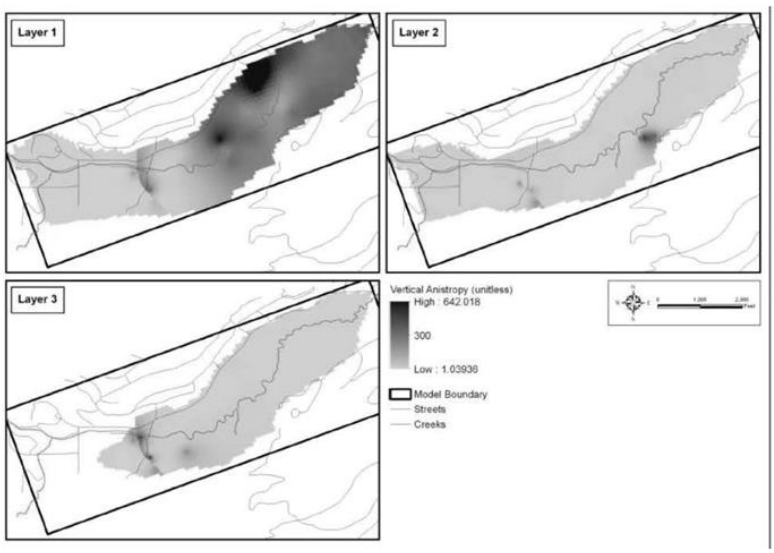

Figure 27: Figure 13 from Hundt and Williams (2014) showing vertical anisotropy, or the ration of horizontal to vertical conductivity.

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The model calibration also reveals inaccuracies in the model. Hundt and Williams (2014) considered the model "calibrated when simulated results match the measured data within an acceptable measure of accuracy, and when successive calibration attempts did not notably improve the calibration statistics" (p 10). Usually, calibration is considered complete when various test statistics are minimized to less than a specified value. Hundt and Williams Figure 11 and the test statistics show that the new calibration is pretty good, although they utilized more than one observation from each well which raises questions about the independence of the observations. Groundwater levels at a well are highly autocorrelated which means individual observations are not independent. Using a set of observations for each well may be a form of pseudoreplication which could artificially improve the test statistics, especially if the observations are made frequently. O8a-101

Hydrographs of simulated water levels are best used for simple graphical comparison. The hydrographs often indicate potential problems not indicated by calibration test statistics or scatter plots. Simulated water levels in some wells are consistently higher or lower than the observations, apparently by as much as ten feet. This is a problem if the areas of over or underestimation affects flows to the creek or the thickness of the saturated zone. There is insufficient information to assess these effects.

The discussion on stream conductance is very confusing – the statement "[t]he final values obtained from calibration equate to average streambed hydraulic conductivity values of 1.1×10^{-3} feet per day and 1 foot per day" (Hundt and Williams 2014, p 12). It is impossible to know what these values refer to – the two values differ by three orders of magnitude. There is no information provided regarding discharge to the stream, which conductance would control, so the value must be based on groundwater levels. Conductance would be highly insensitive to these values. O8a-102

Hundt and Williams (2014) Figure 1 shows the aquifer is much thinner in the west; layer 3 is most useful in the eastern sections where the valley is gouged up to 100 feet deeper. This simply means that project pumping occurs in layer 2, although I also note that the model descriptions do not adequately describe the depth of pumping in the model. O8a-103

The model report should present final water budget amounts, including recharge, pumping, and discharge to the stream. A graph showing where the model simulates flow to or from the stream is essential, and should be completed for representative time periods (wet conditions, late summer baseflow conditions). There is no information regarding this potential flux in the model. The model reports should also show drawdown plots for several times during the simulation so that the reader can assess from where the water is drawn rather than just the proportion of saturated aquifer. O8a-104

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Farr West Engineering, Hydrometrics, Todd Groundwater (2014) Village at Squaw Valley Specific Plan, Water Supply Assessment, Prepared for Placer County and Squaw Valley Public Service District, July 3, 2014

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Hunt B (1999) Unsteady stream depletion from ground water pumping. Ground Water 37(1):98-102

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Hydrometrics (2013b) Technical Memorandum on Seasonal Creek/aquifer Interactions. Prepared for Squaw Valley Public Service District. November 2013.

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Hydrometrics (2007b) Resort at Squaw Creek Phase II Development Revised Water Supply Modeling, report to Squaw Valley Public Service District, April 2007.

Moran JC (2013) Examination of Groundwater Inflow to Squaw Creek using Radon and Other Tracers. Prepared for Squaw Valley Public Service District. Task 4.3 in Hydrometrics (2014)

Taylor C, Hundt D, Williams D (2014) Technical Memorandum: Sufficient of Supply Assessment for Village at Squaw Valley and Other Growth, Squaw Valley California. Todd Groundwater, Alameda CA. June 25 2014

Theis CV (1935) Relation between the lowering of piezometric surface and the rate and duration of discharge of a well using groundwater storage. Trans AGU 16:519-524

West – Yost Associates (2003) Squaw Valley Groundwater Development and Utilization Feasibility Study Update, Prepared for Squaw Valley Public Service District. August 14 2003.

Williams D (2001) Groundwater Development and Utilization Feasibility Study, Groundwater Model Report. Prepared for: West-Yost Associates, June 2001. Squaw Valley Public Service District.

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Attachment 1

http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca8474

SQUAW VALLEY, CALIFORNIA (048474)

Period of Record Monthly Climate Summary

Period of Record: 10/13/1955 to 10/31/1975

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	39.5	41.9	44.6	50.8	61.6	71.7	80.1	79.1	72.1	61.4	48.5	41.0	57.7
Average Min. Temperature (F)	14.6	15.8	20.3	23.9	30.9	37.5	42.1	41.3	35.5	27.7	22.4	15.3	27.3
Average Total Precipitation (in.)	9.74	7.64	6.58	3.44	1.62	1.15	0.67	0.83	0.91	2.84	6.58	9.01	51.02
Average Total SnowFall (in.)	54.9	49.8	36.4	21.8	7.8	0.3	0.0	0.0	0.6	4.3	23.9	46.9	246.6
Average Snow Depth (in.)	33	44	40	21	3	0	0	0	0	0	4	19	13

Percent of possible observations for period of record.
Max. Temp.: 90.1% Min. Temp.: 90.3% Precipitation: 91.3% Snowfall: 85.5% Snow Depth: 83.9%
Check Station Metadata or Metadata graphics for more detail about data completeness

692298.1

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08a

Sierra Watch, Attachment 1
Tom Myers PhD, Hydrologic Consultant
July 13, 2015

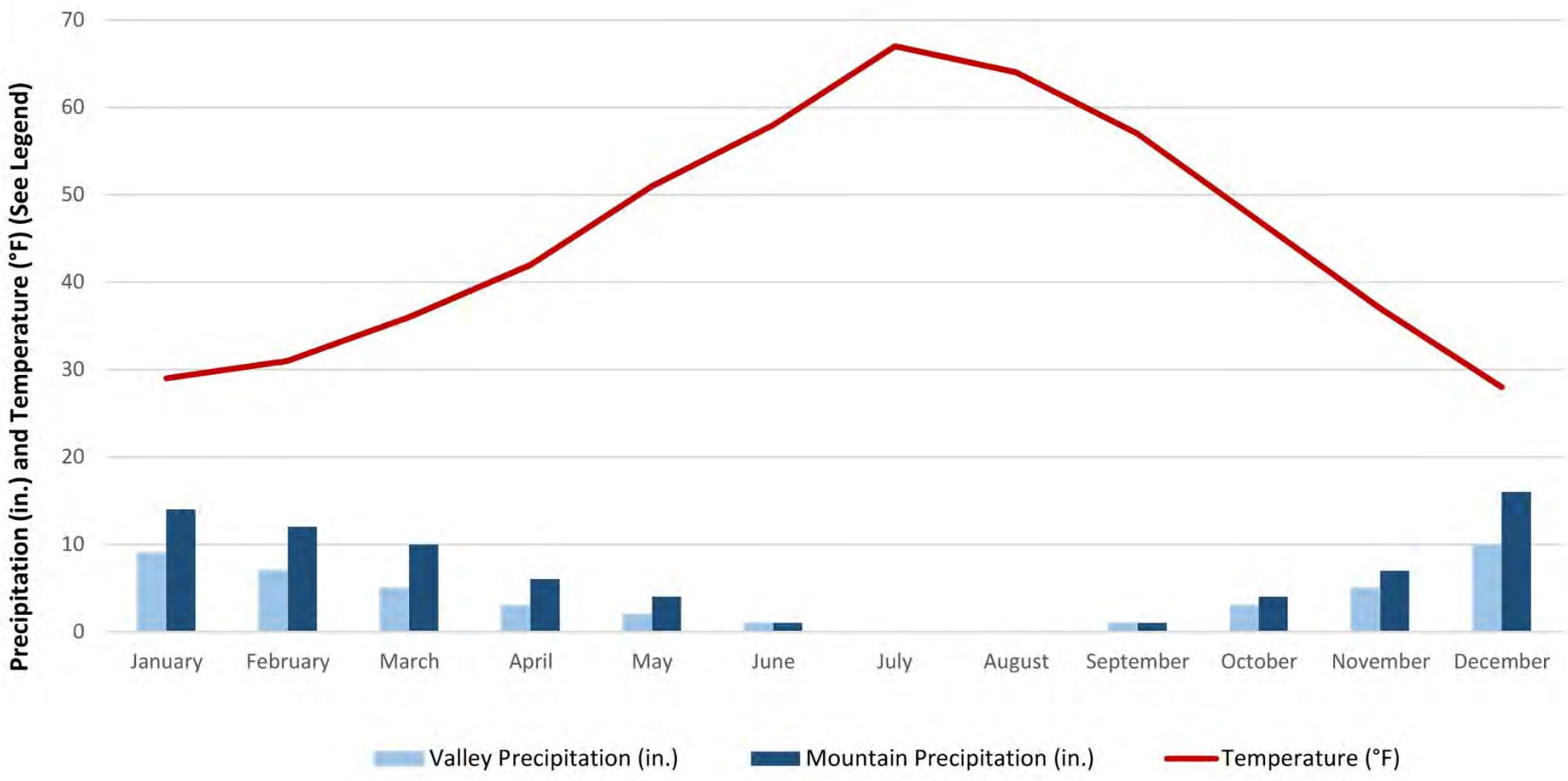
08a-1 The comment provides a summary of detailed comments provided below. See responses to the detailed comments below.

08a-2 The comment is correct that the precipitation estimate for the mountain was incorrectly stated in the DEIR. However, this misstatement did not affect the analysis of groundwater supply because mountain precipitation is not one of the variables used to develop the numerical groundwater model or to perform model runs. The July 2015 WSA Update (Farr West et al. 2015) presents the corrected data. In addition, the annual mountain precipitation data presented in the DEIR Exhibits 13-3 and 13-4 are revised to reflect the incremental precipitation for the SNOTEL Gold Coast Squaw Valley station, as shown in Figure 3-1 from the WSA Update. As stated in the DEIR (page 13-13), the numerical model did not use these data to estimate mountain front recharge in either the historical calibration period or the future predictive period used to simulate project impacts. The recharge to the model is based on precipitation on the valley floor and urban return flow. The precipitation on the floor of Squaw Valley used in the numerical groundwater model is measured at the Squaw Valley Fire Station and shown correctly in Exhibit 13-4 of the DEIR. The range of annual recharge in the model is due to the varying hydrologic conditions observed at the Fire Station, not different data sources; 2001 was a dry year and 2011 a relatively wet year. Neither the numerical groundwater model nor the effects of increased groundwater production assessed using the model is changed as a result of the revision to the SNOTEL precipitation information.

The comment notes that recharge changed in the model. The model has been updated many times since it was first conceptualized and parameterized in 2001. Importantly, numerous exploratory drilling, well construction, well and aquifer testing, streamflow gaging, and aquifer-stream interactions studies have been completed since the model was first developed in 2001. These studies have resulted in a more complete understanding of the recharge, occurrence, and flow of groundwater within Squaw Valley than was available when the model was first developed over 14 years ago. In addition, the collection of groundwater elevations, precipitation data, and streamflow measurements over the past 14 years has provided significant and important model calibration and input information representing a wider range of hydrologic conditions in Squaw Valley. The inclusion of these data as model inputs and calibration targets has resulted in a model that is more representative and accurate than the original model. See the WSA, Section 6.1.

08a-3 The comment is correct that the DEIR indicates that the 2040 demand could be served by only six new wells (DEIR page 13-55). However, the model simulates nine wells to include additional wells that could be added to add supply redundancy and provide operational flexibility. As stated in the DEIR (page 13-55), the nine locations were chosen based on geology, geometry, hydrostratigraphy, aquifer capacity and planned development in the western part of the OVGWB. The DEIR (page 13-63) also recognizes that, if different wellfield construction or operations are ultimately implemented, groundwater availability and wellfield operations could be adversely affected, which could result in well performance issues.

Mitigation Measure 13-4 requires the applicant to work with SVPSD to develop and implement a Pumping Management Plan that continues to monitor groundwater, wellfield system operations, and the need for additional wells. SVPSD currently implements a monitoring plan for existing wells and would extend this monitoring



Source: Cardno 2015, using data from Farr West Engineering and Others, July 2015

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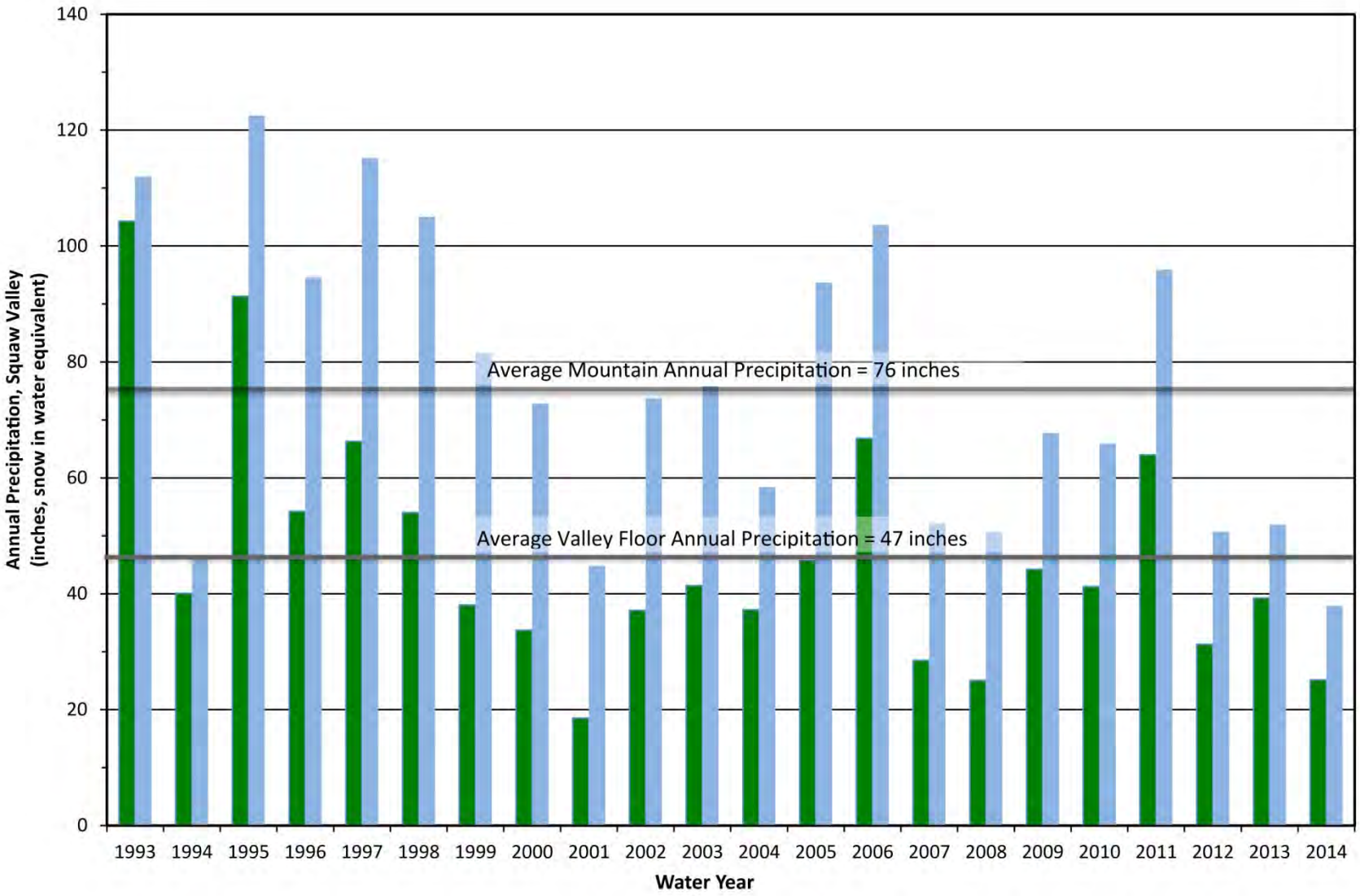
[Revised] Exhibit 13-3 **Squaw Valley Monthly Precipitation and Monthly Temperature Averages: 1992–2011**



Source: Farr West Engineering, Hydrometrics WRI, and TODD Groundwater, July 2016

X11010091 03 038

[Revised] Exhibit 13-4

Annual Precipitation in the Squaw Valley Watershed: 1993–2011

plan to new wells. The DEIR concludes the implementation of Mitigation Measure 13-4 would reduce the uncertainty associated with well system design and operation, and would assure that drawdown effects are managed to avoid insufficient groundwater elevations and meet standards identified in the WSA.

Additional model simulations using six wells for future conditions have been completed and are described in the Master Response regarding water supply and in the Todd Groundwater memorandum dated October 16, 2015 (Todd Groundwater 2015).

08a-4a The comment expresses an opinion about potential occupancy rates but does not provide a reference for this estimate. Information regarding occupancy rates is provided in the Master Response regarding occupancy assumptions. The 80 percent increase in project demand assumes 100 percent occupancy of the project, year-round. This assumption is not supported by evidence and is not considered realistic.

The July 2015 Updated WSA presents a revised analysis and documentation to reflect more recent data, specifically the Village at Squaw Valley USA occupancy data for fiscal years 2008 through 2014. This longer occupancy rate information shows very similar annual occupancy rates to those used in the DEIR. The additional years of data added approximately one percent to the cumulative (2008 to 2014) historic occupancy data compared to what was used in the original WSA (and EIR) for the years 2009 to 2011. The additional occupancy rate information was used in the estimation of demands for the WSA Update. The WSA added 1.3 percent to the average occupancy assumed in the DEIR and discussed in the Master Response regarding occupancy assumptions, assuming 56.3 percent annual average occupancy.[1] In addition, future snowmaking demand estimates were increased to reflect more recent water use data and potential future increases in snowmaking water use. These occupancy rate and snowmaking changes resulted in an increase of 49 acre-feet per year (AFY) of future water demand as compared to the 2014 version of the WSA. The WSA Update used an updated version of the groundwater model with an extended time period through the end of 2014. The analysis in the WSA Update showed sufficient supply to meet the project and non-project future water demands during normal, dry, and multiple dry years.

The comment addresses distribution of water demand and drawdown impacts especially in late summer. The WSA (see Section 6.4 Modeling Results) and DEIR (see discussion of Impact 13-4 and 13-5) provide discussions of monthly distribution of demand and simulated impacts of pumping on seasonal groundwater elevations and duration of stream flow and the length of the dry stream channel. With regard to considering a range of water demands, the impacts evaluation is based on evaluation and modeling of a particular wellfield configuration with certain operating parameters. If different wellfield construction or operations are ultimately implemented, impacts would be different. Therefore, impacts are indicated to be potentially significant. Mitigation Measures 13-4 and 13-5 are presented to verify the performance of the well system design and operation to manage groundwater pumping such that water supply is adequate and pumping effects on groundwater elevations and associated resources are not substantial.

[1] This may suggest a discrepancy in the occupancy rate between the WSA and the DEIR. There is not. The DEIR bases occupancy on a reasonable set of projections based, in part, on historic occupancy in the project area, and on industry data, then adds a significant "cushion" of 10 percent additional occupancy to this rate. This approach is explained in the Master Response regarding occupancy assumptions. The slightly higher rate assumed in the WSA, 56.3 percent instead of 55 percent, provides a greater level of conservative analysis regarding water supply availability. This FEIR also examines a scenario with a single-year occupancy over 61 percent because, as explained in the Master Response regarding occupancy assumptions, a similar occupancy rate occurred for one year in one comparable set of North American properties (see the Master Response for a complete discussion). This issue affects little of the analysis in the DEIR, because average occupancy is not a metric or variable that plays a role in that analysis. Rather, much of the DEIR's analysis is based on land disturbance (examples: biology, cultural resources) or on peak (up to 100 percent) occupancy (examples: traffic, noise, air quality) rather than on average occupancy. Average occupancy is used to evaluate water supply, energy consumption, and greenhouse gas analysis, and the 55 percent annual average occupancy assumption is a reasonably foreseeable rate upon which to base these analyses, as described in the Master Response regarding occupancy assumptions.

08a-4b The comment addresses the validity of the numerical groundwater model and the analyses performed with it, specifically questioning model recharge estimates, model aquifer parameters, and simulated future demands.

As discussed in response to comment 08a-2, the erroneous SNOTEL data was not used to develop model recharge, and the DEIR never drew this link. The calibrated model transmissivities are reasonable and within the range of values expected for the hydrogeologic conditions present in the Olympic Valley Groundwater Basin. The comment does not provide specific information regarding concerns on the aquifer properties. The number of wells to serve future demand is addressed in response to comment 08a-3.

The comment also addresses the handling of future climate change in the DEIR. Limited information exists on how climate change will affect precipitation patterns in Squaw Valley. As such, the future model simulations repeated past observed hydrologic conditions to simulate recharge and streamflow volumes and timing. While insufficient detail exists on climate change to simulate in the numerical model, climate change was considered and relevant information regarding predictions for future climate change and the relationship between precipitation in the watershed and groundwater recharge was discussed in Section 7 of the WSA. The WSA references available studies that have quantified changes in future precipitation in the Sierra Nevada Mountains and the Tahoe Basin. The analysis in the WSA concludes that even the most conservative estimates of annual runoff reduction have a limited effect on the availability of potential recharge to the Basin. However, the mechanisms and timings of recharge in the Basin are complex and while total annual potential recharge is important, it is not the sole factor in groundwater water supply availability.

Any more detailed quantitative analysis of the specific effects of climate change on Squaw Valley groundwater conditions without specific information on how climate change will affect specific precipitation patterns in Squaw Valley would be speculative, unsubstantiated, and uncertain. According to Section 15145 of the CEQA Guidelines, if, after thorough investigation, the County finds that an impact is too speculative to be evaluated, then this should be noted and the discussion of the impact terminated. Therefore, the EIR provides only as much evaluation as can be reasonably undertaken without undue speculation.

The WSA Update corrects the quantitative assessment of current annual precipitation for discussion of climate change in the Squaw Creek Watershed by using corrected SNOTEL data. As stated in the DEIR (page 13-13), the numerical model did not use these data to estimate mountain front recharge in either the historical calibration period or the future predictive period used to simulate project impacts. The recharge to the model is based on precipitation on the valley floor and urban return flow. The precipitation on the floor of Squaw Valley used in the numerical groundwater model is measured at the Squaw Valley Fire Station and shown correctly in Exhibit 13-4 of the DEIR.

The WSA Update addresses the potential for changes in water reliability due to climate change in Section 7, which includes presentation of calculations of total average precipitation in the Squaw Creek watershed that could potentially be available for groundwater recharge. This calculation shows that an average of 25,341 AFY of precipitation falls within the watershed (Farr West et al. 2015:7-2). The WSA Update compares total precipitation and total groundwater demand; groundwater demand in 2040 is estimated to be 1,186 AFY (Table 5-2), which amounts to 4.7 percent of the total precipitation on the watershed. Therefore, the correction does not substantially alter the findings of the EIR. The low ratio of groundwater development to precipitation suggests that the total amount of precipitation and potential climate variations are not direct controlling factors in groundwater supply and development and that future climate variation can be accommodated through active monitoring, modeling and management of the OVGB (see Mitigation Measure 13.4).

The first paragraph on page 13-7 of the DEIR is revised as follows to address the correct SNOTEL precipitation and recent valley floor precipitation records:

> In addition to the distinct seasonal patterns of temperatures and precipitation, conditions also vary year to year as a result of regional weather conditions. Furthermore, the nearly 3,000 foot elevation difference between the valley floor (~6,200 feet) and ridge crests (~9,000 feet) produces local climate diversity. The average total annual precipitation on the valley floor is 47 inches, while the average for surrounding mountains is ~~263~~76 inches ~~(expressed as "snow in water equivalent" meaning the inches of water both as rain and if all snow were melted)~~, and both of these precipitation values represent combined measured precipitation as snowfall and rainfall (Exhibit 13-4). The year-to-year variability in total precipitation for the valley and mountains is large relative to its average~~, while the variability of total precipitation (including snow in water equivalent) on the mountain is extreme (a minimum around 120 inches and a maximum over 500 inches)~~. The pattern of years with high versus low precipitation is not consistent for the mountain and valley locations (Exhibit 13-4), which has mixed effects on surface runoff production and groundwater recharge potential.

Exhibits 13-3 and 13-4 (also included as Figure 3-1 of the WSA) of the DEIR are revised to reflect the change in SNOTEL data and recent data on valley floor precipitation.

08a-4c The DEIR analysis of water supply is based on the WSA, which provides extensive quantitative analysis. Impacts related to groundwater elevation are also based on additional quantified analyses. For the drawdown effects from pumping, the DEIR presents hydrographs that show the groundwater elevations at the pumping wells, which are the locations where the most drawdown is predicted to occur (Exhibits 13-18 through 13-21). The DEIR also provides a table of the changes in groundwater percent saturation for baseline and all future scenarios. In addition, the WSA provides additional information on groundwater elevations at these key locations (Farr West et al. 2015: Figure 6-2). For the riparian area, hydrographs of groundwater elevations are shown at 11 locations (DEIR Exhibits 13-23 through 13-27). Additional hydrographs are presented in the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014), which was the source of the information assessed in the DEIR. This report is listed in the references in comment letter 08a. Evaluation of changes in Squaw Creek flow simulated for future conditions by stream reach is also included in the Fisheries and Aquatic Resources report.

Hydrographs are an accepted way to present groundwater elevations over time. The length of time that the groundwater elevations fall below the acceptable threshold can be read from the presented graphics. A tabulation of the effects of groundwater declines on the affected refugia pools is presented in Table 13-13 of the DEIR.

08a-5 Wellfield management will be developed by project applicant in coordination with the SVPSD and will be described in detail in the Pumping Management Plan as indicated in Mitigation Measure 13-4. The comment suggests two modeling scenarios with wells near to and far from the creek respectively to assess impacts. For the modeling scenarios described in the DEIR, simulated wells were located to take advantage of the best hydrogeologic conditions, to provide reasonable spacing among wells, to comply with State-required distances from sources of contamination, and to maintain State-recommended distances from surface water bodies. In addition, wells were located outside of the projected building footprints. Application of these criteria resulted in the locations that were used to site new wells for purposes of modeling groundwater impacts. The suggested scenarios include only one criterion (distance from the creek); accordingly, the analysis of such scenarios would not improve upon the analysis prepared for the WSA.

08a-6 This comment includes several distinct statements about the DEIR analysis, which are summarized and then addressed individually, below.

The commenter states that the "DEIR does not assess quantitatively the impacts of channel restoration on Squaw Creek."

Table 6-1 of the DEIR shows the acreages of wetlands and waters that may be disturbed during implementation of the project, including channel restoration, and states that approximately 6.33 acres of sensitive habitat would be potentially disturbed or removed. The total footprint of the restoration project is approximately 9.4 acres.

The Channel Restoration Design Basis Report completed by Balance Hydrologics (2014a) outlines a series of analyses, iterations, and design review process by which the channel restoration design was developed. The design is based on an analysis of historical aerial photography, geomorphic indicators such as channel substrate in comparison to bank substrate, 2-dimensional hydraulic and sediment transport modeling, conclusions drawn during prior geologic investigations, comparisons to nearby functional stream systems, and technical review by outside geomorphologists with experience in channel restoration design. The 2-dimensional hydraulic model, in particular, was used to quantitatively establish impacts associated with the design, included an analysis of fish habitat suitability changes and sediment transport changes.

The commenter states that the "DEIR makes unproven claims about the new channel decreasing suspended sediment in the stream."

2-dimensional hydraulic modeling was carried out to evaluate changes in sediment transport characteristics for a range of sediment grain sizes. The Channel Restoration Design Basis Report (Balance Hydrologics 2014, p.23 and Figure 6) summarizes the results of this analysis, and shows the modeled changes in shear stress at a relatively common (2-year) peak flow (250 cfs), and highlights the anticipated increase in areas of low-velocity, depositional environments where accumulation of sediment smaller than 2mm in diameter is anticipated to occur. This grain size represents the size of sediment typically transported in suspension at high flows.

The commenter states that the "new channel will decrease sediment entering the meadow reach which could increase the erosive capacity through the meadow and cause more erosion in the meadow."

Section 13.1.2 of the DEIR outlines the current understanding of geomorphic functioning of Squaw Creek, as based on Balance Hydrologics (2014) design basis report and previous investigations by others (c.f. Phillip Williams & Associates 2007; Sound Watershed Consulting 2013). Multiple lines of evidence consistently point to a chief cause of erosion in the meadow under current conditions, as described in the DEIR (p.13-9): "Past channel modifications altered historical channel processes, increasing sediment transport locally and depositing materials further east. Modified sediment transport characteristics in the trapezoidal channel reach have contributed to channel instability downstream." Based on this understanding, the conclusion is logically drawn that decreased sediment entering the meadow is anticipated to increase channel stability.

The restoration design and the finding that fine sediment will be deposited on the floodplain should not be confused with "Hungry Water," a term that has been coined in the literature to describe the effects of dams and gravel mining on river channels (c.f. Kondolf 1997), which, unlike the proposed channel restoration design, capture the entirety of the bedload (gravel- and cobble-sized) sediment, and prevent it from being transported to downstream areas.

The commenter states that the DEIR has not considered sediment transport impacts, "but could do so by including a water surface profile analysis that considers sediment transport."

2-dimensional hydraulic and sediment transport modeling presented in the Channel Restoration Design Basis Report (Balance Hydrologics 2014) was carried out with the specific objectives of evaluating impacts associated with modified hydraulics and sediment transport capacity. Presentation of hydraulic model output as a water surface profile is possible, but since the modeling was carried out in 2-dimensions, a simple water profile would not convey the spatial variability in water depths, velocities, and stream competence that the 2-dimensional model is able to simulate. The mapped model output included in the Design Basis Report and used in the DEIR presents much more detailed information than can be conveyed in the single dimension of a water surface profile, and indicates that sediment depositional environments would be increased on newly-created floodplain surfaces, and that a mobile gravel and cobble bed would be maintained in the main channel allowing for maintenance of sediment transport continuity in most locations, with identified areas to be improved upon during final design of the project.

The commenter states that a "reduction in sediment transport from residential/commercial areas from 200 to 175 tons/year is a small proportion of the almost 39,000 tons/year generated by the watershed"

The source of this watershed-wide sediment production rate (39,000 tons/year) is not cited, but it may be in reference to the 37,900 tons per year reported by the Lahontan Water Board in the TMDL document and listed in Table 13-7 of the DEIR.

Malholland (2002) showed that, of the 35,770 tons/yr of sediment generated within the watershed, approximately 29,331 tons/yr goes to in-channel storage, leaving 6,000 tons per year transported out of the watershed, similar to the total load allocation for Squaw Creek outlined in the Truckee River Suspended Sediment TMDL (p.13-36).

Table 13-7 on page 13-33 of the DEIR also shows that annual sediment delivery from residential/commercial areas is estimated to be 200 tons/year. Reductions in sediment loading are reported in the DEIR in terms of loadings during design flows.

Regarding the comment about reductions in sediment load from 200 to 175 tons per year, the commenter does not state where this is sited in the DEIR, and no such citation can be located. Therefore, no further response is possible.

08a-7 See response to comment 08a-4b.

08a-8 The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

Regarding the statement that the baseline conditions were not based on the date that the Notice of Preparation was released, the CEQA Guidelines Section 15125(a) states:

> This environmental setting will *normally* constitute the baseline condition by which the lead agency determines whether an impact is significant. (emphasis added)

In the case of groundwater conditions, a single point in time is not the best representation of the *normal* condition, because the groundwater system is so dynamic. Therefore, rather than relying on a single day or month in a single year, the WSA and DEIR provide a baseline that covers multiple years and therefore conditions.

See response to comment 08a-44 regarding the baseline scenario.

08a-9 The comment is an introductory statement regarding the assessment of biological resources and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-10 Exhibits 6-1 and 6-2 in the DEIR illustrate the common habitats found within the plan area. These habitats are described on pages 6-3 through 6-14 of the DEIR. Sensitive habitats are described on pages 6-10 through 6-14 of the DEIR. These descriptions are intended to characterize existing conditions within the plan area, with particular focus on habitat types that are protected by State and/or federal law, such as wetlands, and/or that provide habitat for protected species, such as alderleaf coffeeberry scrub. The definitions are accurate and adequate for this purpose. Further, the habitat types are not characterized solely by whether their vegetation depends upon ground or surface water. In fact, some plant species will occur in more than one habitat type, and many plants use a combination of surface and groundwater.

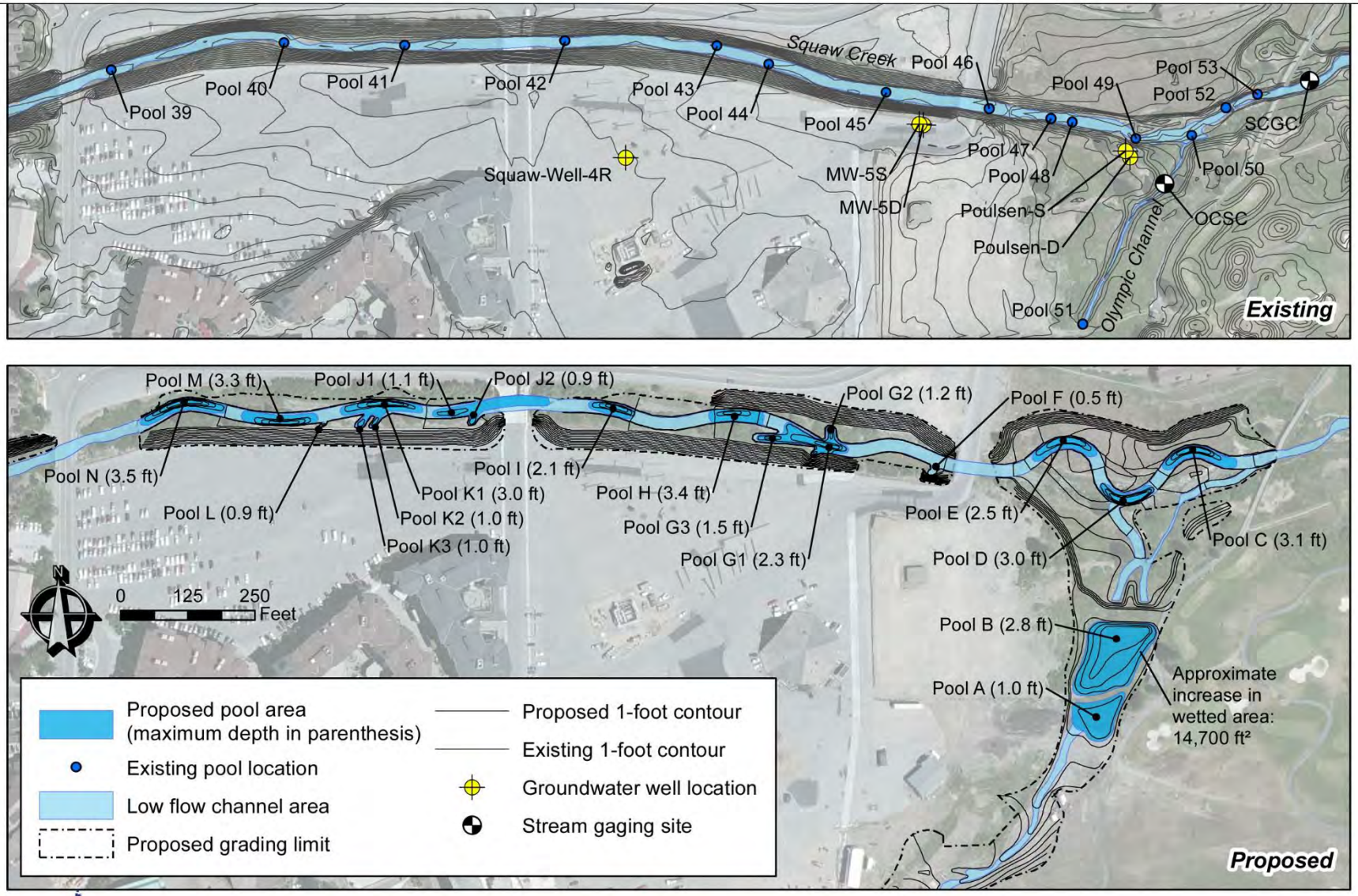
The vegetation types that could be affected by groundwater levels are evaluated in Impact 6-1, on pages 6-42 through 6-44 of the DEIR.

With regard to biological resources, the comment requests description of average depth to groundwater in spring and fall. Chapter 13 of the DEIR presents hydrographs of simulated groundwater elevations at specific locations along the length of the creek in the model area, including refugia pools and selected sites that support riparian vegetation. These provide year-round information, while provision of streambed elevation allows visual review of depth to groundwater.

08a-11 Table 6-2 in the DEIR is intended to identify special-status species that could exist within the habitats that are located in the plan area. The source of water for these plants is only one factor that affects whether the species could be present and sometimes it is irrelevant. The potential for the project to affect special-status species that could exist within plan area habitats is addressed in Impacts 6-1 and 6-8. Similarly, Table 6-4 in the DEIR is intended to quantify the amount of wetlands that could be located within the plan area. The primary effect that the project would have on wetlands would be the loss of wetland acreage due to grading, excavation, trail construction, vegetation removal, and creek restoration, as discussed on page 6-40 of the DEIR. Wetlands within the plan area do not have a specific groundwater requirement that could be quantified within a table as suggested by the comment. Rather, wetlands, such as Squaw Creek, are fed by surface and/or ground water depending on a number of factors, such as time of year and precipitation levels in any given year. The potential for groundwater pumping to affect these habitats is evaluated in Impacts 6-1, 6-8, and 6-13 in the DEIR.

08a-12 The stream reaches including the trapezoidal channel are shown Exhibit 6-1 of the DEIR, and described on pages 6-14 through 6-16. Additional information is provided in the GANDA report, which served as the basis for much of the DEIR analysis of impacts on fisheries. This report was cited in the DEIR and available for review upon request. Therefore, further response cannot be provided.

Although this exhibit is not needed for preparation of the analysis in support of the EIR, Balance Hydrologics, a consultant to the applicant that specializes in hydrology and stream restoration, has carried out an additional field investigation of low-flow conditions in the channel, including a detailed map showing pools and baseflow hydrology of the stream reaches from the bedrock canyons on the North and South Forks of Squaw Creek to the mouth of Squaw Creek at the Truckee River (Balance Hydrologics 2015b). This information was prepared to establish baselines to be used for future monitoring pursuant to Mitigation Measure 6-1(a-d). The investigation by Balance Hydrologics is consistent with the DEIR analysis. The exhibit is provided in this FEIR as Exhibit 08a-1.



Balance Hydrologics, Inc.

Figure 1. Data collection points and existing and proposed pool locations, Village at Squaw Valley Specific Plan, Placer County, California

Sources: ESRI ArcGIS Online and data partners, Andregg Geomatics

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Exhibit O8a-1

Data Collection Points and Existing and Proposed Pool Locations

ASCENT ENVIRONMENTAL

O8a-13 The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

O8a-14 Chapter 13 of the DEIR presents hydrographs of groundwater depth over time at eleven specific locations along the length of the creek in the model area, including refugia pools and selected sites that support riparian vegetation. They depict groundwater elevations for baseline, project-only, non-project, and 2040 WSA conditions, including different seasons and wet and dry years. The existing creek bed or bottom is provided as reference.

The DEIR provides groundwater elevation hydrographs at specific sensitive locations including refugia pools and selected sites along the creek, including areas with riparian vegetation. The comment requests a map showing areas where groundwater elevations would drop beneath certain thresholds for specific time periods. The groundwater model used in the DEIR covers a time period of 19 years with monthly time steps. This means that the model simulates 228 unique groundwater elevation conditions throughout the aquifer. Since pumping occurs throughout the model at varying volumes, no single time period represents the most severe groundwater elevation condition for all areas of the model. As a result, minimum groundwater elevations in specific areas occur at different times, thereby necessitating preparation of such a number of maps as to render them unusable. Accordingly, the DEIR identified the areas and structures likely to be affected by decreased groundwater elevations and assessed the provided groundwater elevation hydrographs at specific locations including refugia pools and selected sites along the creek, areas with riparian vegetation, and existing production wells. These hydrographs show the effects of drawdown for the entire model time period in the identified sensitive locations.

Regarding the comment that the DEIR does not support its conclusions with respect to meadow plant behavior, the County disagrees. The analysis in the DEIR is based on the citations included in the analysis and the experience of the biologists who conducted the work and are substantially experienced in montane habitats. The analysis explains meadow plant biology, response to water availability, the timing as to when modeling suggests water will be available, documentation, and observations. It also expresses uncertainty with respect to the ability to draw conclusions, and ends with the CEQA determination that, because of uncertainty, the impact is potentially significant. See pages 6-44 and 6-45 of the DEIR. As a result of the uncertainty, the DEIR recommends an extensive monitoring and response program to respond to groundwater effects; see Mitigation Measures 6-1c and 13-4. The comment that the DEIR does not support its conclusion is argumentative and provides no evidence why the conclusions are not supported by the analysis provided.

O8a-15 Cottonwoods were observed along Squaw Creek during field surveys. Groundwater elevations were identified in the 2014 WSA and GANDA 2014 reports; thus, the biologists were able to connect the filed observations with published data. Regarding the reliance on studies of cottonwood, shinning willows and mountain alders and depth to groundwater, see response to comments O8b-17 and O8b-18.

O8a-16 The comment requests the provision of graphs showing the relationship between groundwater elevations and ground surface for Baseline and post-project (WSA 2040) conditions. Graphs showing simulated groundwater elevations and the relative streambed elevation for ten locations in the western portion of the groundwater basin and three locations in the eastern portion of the basin are shown in DEIR Exhibits 13-23 through 13-27. Additional hydrographs for 11 other locations in the eastern portion of the groundwater basin are shown in the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014) and cited in the DEIR.

As stated on page 6-43 of the DEIR, Exhibits 13-23 through 13-27 in Chapter 13, “Hydrology and Water Quality,” of the DEIR, show modeled groundwater levels for baseline (existing) and

future pumping scenarios (2040 WSA cumulative, Project Only, Non-Project Only). This information was used to determine whether increased groundwater pumping would adversely affect the establishment of seedlings and saplings. For example, as discussed on page 6-43 of the DEIR, and shown in Figures 13-23 through 13-26, under baseline conditions, groundwater levels in the West cells are shown to drop below 3.3 feet for all or almost all modeled years.

The periods in which groundwater levels reach surface levels are also shown in Exhibits 13-23 through 13-27 in the DEIR.

08a-17 See response to comment 08a-4c.

08a-18 The analysis provided on page 6-43 of the DEIR does quantify the frequency of groundwater levels dropping below baseline conditions as a result of increased groundwater pumping, using the data provided in Exhibits 13-23 through 13-27 and the 2014 GANDA report. Additional graphic presentation would not alter the DEIR conclusions.

08a-19 The comment is correct that the DEIR indicates that the 2040 demand could be served by only six new wells (DEIR page 13-55). However, the model simulates nine wells to include additional wells that could be added to add supply redundancy and operational flexibility. As stated in the DEIR (page 13-55), the nine locations were chosen based on geology, geometry, hydrostratigraphy, aquifer capacity and planned development in the western part of the OVGWB. The DEIR (page 13-63) recognizes that, if different wellfield construction or operations are ultimately implemented, groundwater availability and wellfield operations could be adversely affected, which could result in well performance issues.

Mitigation Measure 13-4 requires the applicant to work with SVPSD to develop and implement a Pumping Management Plan that continues to monitor groundwater, wellfield system operations, and the need for additional wells. SVPSD currently implements a monitoring plan for existing wells and would extend this monitoring plan to new wells. The DEIR concludes the implementation of Mitigation Measure 13-4 would reduce the uncertainty associated with well system design and operation, and would assure that drawdown effects are managed to avoid insufficient groundwater elevations and to meet standards identified in the WSA.

Additional model simulations using six wells for future conditions were performed; for further information, see the Master Response regarding water supply.

The comment requests maps of drawdown to identify potential effects on habitat areas. Drawdown is a term relating to the change induced in groundwater as the result of pumping. As noted above, the groundwater model used in the DEIR covers a time period of 19 years with monthly time steps. This means that the model simulates 228 unique groundwater elevation conditions throughout the aquifer. Since pumping occurs throughout the model at varying volumes, no single time period represents the most severe drawdown condition for all areas of the model. As a result, maximum drawdowns in specific areas occur at different times, thereby necessitating preparation of such a number of maps as to render them unusable. Accordingly, the DEIR identified the areas and structures likely to be affected by decreased groundwater elevations and assessed the provided groundwater elevation hydrographs at specific locations. These hydrographs show the effects of drawdown for the entire model time period in the identified sensitive locations.

08a-20 This comment includes several distinct statements about the DEIR analysis, which are summarized and then addressed individually, below.

The comment states that the "DEIR does not quantify the potential pollution associated with potentially increased stream instability resulting from potential loss of riparian habitat resulting from potential groundwater drawdown." While the groundwater model may reliably predict changes in groundwater conditions imposed by variations in both aquifer management and climate, using the model to predict changes in riparian cover would be inexact at best. Further extrapolation to quantify changes in bank stability would be unreliable, and even further extrapolation in an attempt to quantify changes in sediment loading would compound the error even more, making such attempts at accurately quantifying this potential pollution pointless. The DEIR does, however, acknowledge that the potential linkages are real and provides for measurement and correction of this potential impact, through the implementation Mitigations Measures 6-1a, 6-1b, and 6-1c. In particular, Mitigation Measure 6-1b calls for "Any riparian habitat lost to be replaced with native vegetation that will stabilize the streambank and prevent sediment mobilization.... until 80 percent survivorship is achieved among new plantings." Since the DEIR was published, Mitigation Measure 6-1c has been further clarified and refined. Modifications to Mitigation Measure 6-1c are reflected in Section 2.3, Revisions to the DEIR.

Since the potential impact will be monitored and corrected through mitigation identified in the DEIR, including standards that must be met, quantification of the potential degree of pollution associated with this impact is not necessary because it will not be allowed to occur.

The commenter states that the "project will not change total suspended sediment or other quality parameters flowing [through the] site substantially because there will be little change in impervious area." The DEIR (Table 13-14) lists the anticipated reductions in constituent loading associated with the project, as predicted by Balance Hydrologics (2013, as cited in the DEIR). Impervious area is not the only driver of water quality production and transport at this project site. In particular, the DEIR also accurately notes that Balance's (2013) predictions do not take into account additional treatment benefits of water quality features or stream restoration and floodplain enhancement, and therefore, the project is anticipated to result in a reduction in sedimentation, which is an improvement compared to baseline conditions related to water quality.

The commenter states that the "DEIR discusses that the restoration should decrease sediment transport but does not quantify the amount." The net impact of the floodplain restoration project on sediment load is expected to be positive, so quantification of the long-term sediment retention and release is not considered to be necessary. This is an environmental benefit. Furthermore, the absolute volume of sediment retained by the channel restoration will vary by year and by flow event. The Channel Restoration Design Basis Report (Balance Hydrologics 2014, p.23 and Figure 6; cited in the DEIR) shows the modeled changes in shear stress anticipated to result from the restoration of Squaw Creek at a commonly-occurring peak flow of 250 cfs, and highlights the anticipated increase in areas of low-velocity, depositional environments where accumulation of sediment smaller than 2mm in diameter is predicted to occur. This grain size represents the size of sediment typically transported in suspension at high flows.

The comment states that the "DEIR suggests that the areas of deep pools at low flow will increase, but this could be countered by the additional [groundwater] drawdown." As explained in the DEIR (p. 13-67), groundwater pumping influences from the project are anticipated to result in lower late-summer groundwater levels along the trapezoidal channel (West Cells) and to a lesser extent downstream of the Far East Bridge (East Cells A, B, and C). Since the groundwater level almost always falls well below the trapezoidal channel in the late summer, differences in the late summer groundwater elevation will not affect whether pools in the reach go dry or not. The applicant's hydrology consultant, Balance Hydrologics, examined the rate at which groundwater declines relative to the existing channel bed during

summer 2015 (the fourth consecutive dry year), and concluded that the deeper pools associated with the channel restoration design are anticipated to increase the duration of pool inundation by an average of 24 days (Balance Hydrologics 2015a).

Downstream of the Far East Bridge, the model predicts late season groundwater elevations associated with the Valley buildout to be on the order of 0 to 2.5 feet below baseline conditions. Since pools in this area are anticipated to be 1.6 to 2.8 feet deeper than existing pools, the effects of additional groundwater drawdown are anticipated to be offset (Balance Hydrologics 2015a).

08a-21 The comment suggests that Mitigation Measure 6-1c should extend monitoring from beyond the current cut-off period, 5 years following full buildout, to a time following full buildout when a significant drought occurs. Significant droughts in California are relatively common, but random occurrences. According the California Department of Water Resources (DWR), the most significant droughts in California since robust data collection started, early in the 20th century, occurred from 1928-1934, 1976-1977, 1987-1992, and 2007-2009 (DWR 2015). Information on the current drought was not provided. Given this frequency, it is likely that one or more significant droughts will occur during the 25-year period over which the project is expected to buildout plus the additional 5 years of monitoring suggested in the mitigation, a total of 30 years. Over this time period, it is expected that water use will gradually increase in response to project and cumulative demands. Thus, it is highly likely that the mitigation, as currently drafted, will allow monitoring of project (and cumulative development) effects on groundwater, including during drought. This is a reasonable amount of time to monitor for drought conditions or, if drought conditions do not occur, it is a reasonably certain timeframe during which below average precipitation would be expected. Also as stated above in response to comment 08a-21, since the DEIR was published, Mitigation Measure 6-1c has been further clarified and refined. A consolidated source for all modifications to Mitigation Measure 6-1c is provided in Section 2.3, "Revisions to the DEIR."

Regarding the substitution of modeling for monitoring, as described in the mitigation measure, the commenter does not explain why this is insufficient. No further response can be provided.

08a-22 The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-23 The comment regarding BMPs does not consider the cross reference to Mitigation Measures 13-1 and 13-2 of the DEIR. See the discussion of these measures on pages 13-49 through 13-52 for a description of the details of the measures and their effectiveness.

08a-24 The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-25 See response to comment 08a-3.

08a-26 The comment regarding the lowering of the stream bed increasing groundwater discharge from the streambed is not clear; however, we interpret it as follows: "If the stream bottom is lowered substantially, the rate of shallow groundwater discharge to the stream could increase."

The Conceptual Channel Restoration Plans included in the Design Basis Report referenced in the DEIR shows that riffle crests, or high points between the pools, will be the same or very close to (within 1 foot of) the elevation of the existing channel (aside from the location of the sewer crossing, which will be improved for water quality protection and maintenance of sediment transport continuity). Since these high points in the channel control the water-

surface elevations when the stream is flowing, they also control the hydraulic floor of the aquifer when groundwater is discharging to the creek. These streambed elevations will not change substantially as part of the restoration project, so the restoration project is not anticipated to result in more effective, quicker, or deeper draining of the aquifer.

With respect to the statement that geomorphic restoration would reduce fine sediment supply and transport, increase average substrate size, and decrease embeddedness requires verification, 2-dimensional hydraulic and sediment transport modeling presented in the Channel Restoration Design Basis Report (Balance Hydrologics 2014) was carried out with the specific objectives of evaluating changes in sediment transport dynamics and resulting channel conditions. The mapped model output included in the Design Basis Report presents detailed information which indicates that sediment depositional environments will be increased on newly-created floodplain surfaces, and that a mobile gravel and cobble bed will be maintained in the main channel allowing for maintenance of sediment transport continuity in most locations, with identified areas to be improved upon during final design of the project.

These findings are consistent with many studies and textbook descriptions of floodplains, which by definition are depositional features composed of material deposited from the suspended load of overbank floodwaters (Knighton 1997). Balance Hydrologics' sediment transport modeling is also consistent with measurements presented by 2ndNature (2011), in which suspended sediment loading was measured to be reduced by 20 and 94 metric tons in water years 2009 and 2010, respectively, as a result of sediment deposition on the Upper Truckee River floodplain in South Lake Tahoe.

Mitigation Measure 6-1b calls for monitoring the success of the restoration project through the development and implementation of mitigation implementation and monitoring programs. In response to this comment, a portion of Mitigation Measure 6-1a found in the second bullet on page 6-47 of the DEIR is modified as follows:

- An annual monitoring report for a minimum period of 5 years from the date of installation, prepared by the above-cited professional, shall be submitted to the Planning Services Division for review and approval. Any corrective action shall be the responsibility of the applicant. <u>The report shall include baseline (pre-restoration) and post-restoration measurements of suspended sediment concentration, streamflow, and turbidity as described on page 27 of the Channel Restoration Design Basis Report (Balance Hydrologics 2014).</u>

These additions to the mitigation measure will allow for verification of the modeling and/or adaptive management of the project.

Regarding the statement that the benefits of the creek restoration may not be realized if not done properly, the DEIR provides mitigation to ensure that there are performance criteria for creek restoration, along with monitoring, adaptive management and funding, which would reduce the potential adverse impacts of the restoration to a less-than-significant level (DEIR page 13-76). These measures would also verify that the creek restoration has a beneficial effect on the creek system.

08a-27 The comment is correct that the precipitation estimate for the mountain from the SNOTEL climate station was overstated in the DEIR and WSA. However, this did not affect the analysis of groundwater supply because the mountain precipitation was not included in the numerical groundwater model. The annual mountain precipitation data presented in the DEIR Exhibits 13-3 and 13-4 will be revised to reflect the incremental precipitation for the SNOTEL Gold Coast Squaw Valley station. The WSA Update (Farr West et al. 2015) presents the corrected data. As stated in the DEIR (page 13-13), the numerical model did not use precipitation from

the SNOTEL mountain site to calculate groundwater recharge in the numerical groundwater model. This source of precipitation records was not used in either the historical calibration period or the future predictive period used to simulate project impacts. The recharge to the model is based on precipitation on the valley floor and urban return flow. Precipitation on the floor of Squaw Valley used in the numerical groundwater model is measured at the Squaw Valley Fire Station and shown correctly in Exhibit 13-4 of the DEIR. Neither the numerical groundwater model nor the effects of increased groundwater production assessed using the model is changed as a result of the revision to the SNOTEL precipitation information.

08a-28a The commenter draws conclusions regarding overall basin conditions from Exhibit 13-8, which shows groundwater elevations at pumping locations. However, even in these wells, which would result in the most drawdown, the average groundwater elevation recovers to 95 percent of saturated conditions in all but two years.

The comment rightly notes that the use of the term *full* when describing the groundwater basin is not well defined. The first paragraph on page 13-17 of the DEIR is revised as follows:

> The WSA for the proposed project (Farr West Engineering et al. 2014) concludes that in all years there is ample runoff produced in the watershed, but much of it is generated during times when the groundwater basin is already 'full' and therefore it is rejected as recharge and leaves the watershed as surface runoff in Squaw Creek. Regardless of some uncertainty about how readily and completely recharge occurs under various water year types, no studies of the OVGB indicate that the aquifer has been or is now experiencing overdraft. <u>Rejected recharge could occur due to two mechanisms: high groundwater elevations and/or limited soil or sediment permeability relative to potential rainfall, snowmelt or surface water recharge rate. When groundwater elevations are at or near ground surface, limited storage capacity is available in the soil or unsaturated zone for additional inflow to the aquifer. Soil moisture does not need to be uniformly at 100 percent saturation for extended periods of time for this to occur. High groundwater elevations could temporarily be high due to recent rains or locally high due to inflow from the creek or other recharge source. While the model was developed to simulate rejected recharge, it only adjusted recharge on a monthly time step. Small daily variations in flow that prevent additional recharge would be smoothed.</u>
>
> <u>During high flows and/or heavy precipitation events, the potential recharge rate may exceed the percolation rate at a specific location resulting in additional runoff.</u>

As noted on in the WSA Update, this small groundwater system has a very high volume of water flowing through the watershed on an annual basis, which far exceeds the volume of groundwater storage or use (Todd Groundwater 2012). This is clearly illustrated by the large volume of rejected recharge that has been identified by HydroMetrics and others (HydroMetrics 2014b, Todd Groundwater 2012).

08a-28b The comment addresses the WSA and estimation of municipal well capture of flow from Squaw Creek. It should be noted that the WSA addresses overall water supply and demand, and does not evaluate impacts of groundwater capture from Squaw Creek as a result of pumping municipal wells. Such potential impacts are addressed in the DEIR.

The comment also addresses the assessment of impacts to Squaw Creek in the DEIR. The comment refers to analyses that HydroMetrics (2014b) performed to assess the relationship between the existing wells and Squaw Creek. These analyses used results of pumping tests in an existing SVPSD well and a standard formula for unsteady stream depletion from groundwater pumping (Hunt 1999) to show that during active pumping over a typical eight hour cycle less than three percent of the water produced from the tested well came directly

from Squaw Creek. It should be noted that three percent is the correct value as documented in the HydroMetrics errata sheet that was provided with the referenced report. The results of this assessment were described in the Environmental Setting portion of the DEIR (See pages 13-17 through 13-19) as background information on groundwater-surface water interactions. The text clearly indicates that the results are relevant to relatively short-term pumping tests on a specific existing well. As described in the Impacts section of the DEIR, the impacts assessments used the numerical groundwater model to simulate future pumping and the relative changes in groundwater conditions. The numerical groundwater model does account for cumulative effects of pumping on the groundwater system, including flow into and out of Squaw Creek.

To provide additional context on how pumping can affect streamflow, the paragraph on pages 13-18 and 13-19 of the DEIR is revised as follows:

> Aquifer tests have indicated that pumping from existing wells during periods when Squaw Creek is flowing ~~(typically winter/spring/early summer)~~ captures only a small amount of extracted water directly from the creek (<2 percent, <0.2 cfs) (HydroMetrics 2013a)~~; that is, during periods of the year when the creek is flowing, pumping of groundwater from existing wells results in only a small amount of creek surface flows being "pulled" into the groundwater aquifer. Under these conditions, current groundwater pumping does not substantially alter stream flow However, during periods when there are lower flows in the creek (typically summer and fall), pumping from existing wells would capture a higher overall percentage of the reduced flow and existing pumping operations can have a greater influence on observed stream surface flows~~. However, pumping may induce flow from Squaw Creek to groundwater when water elevations in the creek (winter to late spring) are higher than surrounding groundwater elevations. The rate of flow in Squaw Creek during these times is generally high, and the rate of recharge from the creek to the aquifer is small as a percentage of the overall flow (HydroMetrics 2013a). In periods when there are lower flows in the creek (typically summer and fall), pumping from existing wells would capture a higher overall percentage of the reduced flow and existing pumping operations can have a greater influence on observed stream surface flows.

08a-29 The application of best fit lines used in the analysis to estimate TSS loading is consistent with USGS methods outlined by Glysson (1987), in which sediment transport rates are dependent on flow magnitude. The origin of the data is from multiple sources, and derived from samples that were not necessarily collected for the purposes of calculating loads. In most circumstances, flows were not measured, but estimated during sampling. The project hyrdrologist therefore decided to follow USGS Techniques of Water Resource Investigations guidance and simply group all the data together to establish a relationship.

The variability associated with this analysis does not translate to error in the evaluation of impacts, because the analysis conservatively assumes that this relationship will not change with implementation of the project. In other words, the variability in the TSS transport at high flows is consistently applied to both pre- and post- project conditions. The DEIR (Table 13-14) lists these anticipated reductions in constituent loading associated with the project. The DEIR also accurately notes that the predictions do not take into account additional treatment benefits of water quality features or stream restoration and floodplain enhancement, and therefore, the project is anticipated to result in a reduction in sediment discharge and a positive impact on water quality.

08a-30 Because the data were not collected for the purposes of calculating loads, hydrograph position of the samples was not documented at the time of sampling, and streamflow gages are not available for most locations. It is therefore impossible to account for hysteresis (time-

based dependence) introduced by position on the hydrograph, but the available data has nevertheless been used to its maximum potential for the specific purposes of calculating changes in loadings from pre- to post-project. This analysis is considered to be reliable because the relationship, including any inherent variability, is consistently applied to both pre-project and post-project conditions.

08a-31 See response to comment 08a-30.

08a-32 See response to comment 08a-30.

08a-33 Measurement error occurs at a range of flows. Low estimates are included as valid, in order to provide a conservative estimate of increased constituent loading at these flows.

The relationships and their associated "error" are applied consistently to pre- and post-project conditions, making the analysis of change from pre-project to post-project conditions consistent.

08a-34 Regarding the comment that total suspended sediment from the site is underestimated and this could lead to faulty design of the channel through the site, the calculations of suspended sediment loadings cited in the Shaw and Roberts (2013) water quality analysis have not been used as a basis for design of the channel restoration project. Sediment transport estimates summarized in Table 1 of the Design Basis Report cited in the DEIR (Balance Hydrologics 2014) and 2-dimensional hydraulic modeling presented in Figure 6 and p. 23 of the Design Basis Report (Balance Hydrologics 2014) are used to evaluate the feasibility of the conceptual design, potential impacts associated with the conceptual design, and opportunities for improvement of the restoration approach upon final design.

Regarding the comment that the loss of sediment settling to erosion, the restoration design and the finding that fine sediment will be deposited on the floodplain should not be confused with "Hungry Water," a term that has been coined in the literature to describe the effects of dams and gravel mining on river channels (c.f. Kondolf 1997), which, unlike the proposed channel restoration design, capture the entirety of the bedload (gravel- and cobble-sized) sediment, and prevent it from being transported to downstream areas.

As described in the DEIR (page 13-9):

> Past channel modifications altered historical channel processes, increasing sediment transport locally and depositing materials further east. Modified sediment transport characteristics in the trapezoidal channel reach have contributed to channel instability downstream.

Based on this understanding, the conclusion is logically drawn that decreased sediment entering the meadow is anticipated to increase channel stability.

Regarding the comment that sediment budget issues for the channel restoration portion of the project are not considered and this could lead to an incorrect underestimate of the project impacts to the stream channel in the meadow east of the site, refinement of the estimates of suspended sediment loading would not change channel design, since settling of suspended sediment is driven by channel hydraulics, and not small differences in rates that might result from refinement of these estimates.

The restoration design report does acknowledge that sediment deposition areas identified by sediment transport modeling (methods different than the analysis discussed here), indicate potential areas of deposition in a portion of the designed channel. In order to address this, final design iterations will include channel features to maintain hydraulics and sediment

transport through the reach. This approach will also address any issues with underestimation of sediment transport rates.

08a-35 The relationships between phosphorus and nitrate loads are based on a power function that has the best fit to the water quality data used in the analysis (Shaw and Roberts 2013; cited as Balance Hydrologics 2013 in the DEIR). This is a statistical best fit to the best available data. Nitrate nitrogen and total phosphorous were found to provide the most reliable relationships, and are considered to be representative of a range of constituents.

The water quality analysis report provided by Shaw and Roberts (2013) makes clear that these relationships are subject to uncertainty, and that the calculated loadings are reliable for use in evaluating change associated with the project. The data analysis indicates that the project will have no negative impacts on water quality, but rather that the project will result in a small positive impact on water quality through modification of the site hydrology alone. Any changes to the constituent-to-streamflow relationship would potentially affect the total loading calculations, but would continue to show a reduction in nutrient loading associated with the project. As stated above, the relationships used are a statistical best-fit, but even if adjustment of the relationship was warranted, this would not change the conclusion of the study since the relationships, including any inherent variability, are consistently applied to both pre-project and post-project conditions.

08a-36 The only times when construction could encounter the need for dewatering would be during construction of parking structures when groundwater is relatively high and during instream work. No other dewatering is expected during normal construction activities. As described in response to comment 02-66, project structures would not meaningfully reduce groundwater basin capacity. Regarding disposal of dewatered groundwater, the discussion on page 13-51 makes clear that a dewatering plan would be submitted to the Lahontan RWQCB for approval, and describes the plans required elements and performance standards. The comment does not explain why this is insufficient and the significant impacts that are not addressed.

08a-37 The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-38 The comment addresses the effects of land cover changes on recharge. The numerical groundwater model takes impervious land cover into account. The modeled recharge rate for the western portion of the groundwater basin is 60 percent of the recharge rate in the eastern portion to account for the impervious area in the west. Impervious land cover does not completely prevent recharge, but may change where the percolation occurs so long as the entire area is not covered by impervious surfaces. See response to comment 02-10 regarding impervious areas.

The memorandum documenting the numerical model (Farr West et al. 2015: Appendix B, page 2) details how recharge rate inputs to the numerical model were developed.

The noted SNOTEL data error did not affect the evaluation of recharge in the numerical groundwater model. The model used precipitation on the valley floor to calculate recharge; data for precipitation on the mountain were not used in the model. See response to comment 08a-2 for additional information on this topic.

08a-39 The comment addresses land use changes to the East Parcel and effects on recharge. As stated in the DEIR on page 13-53, the East Parcel is not located in a groundwater recharge zone of importance to the OVGB. Exhibit 13-6 in the DEIR shows the areas of the DWR Designated Groundwater Basin and the Groundwater Management Area developed by the SVPSD. While the East Parcel is in the DWR designated groundwater basin, it is located

outside of the groundwater management area in a region of the valley where no productive groundwater exists (HydroMetrics 2007a, Todd Groundwater 2012).

The presence of the additional impervious surface beyond a recharge zone indicates that recharge would be relatively limited and that a substantial portion of the rainfall or snowmelt occurring on this 4.24 acres would have become runoff with or without the project. As described in the DEIR, the East Parcel (parking and employee housing) does not currently contain any drainage improvements. In the proposed condition, parking lot runoff will be captured and treated by hydrodynamic separators, sedimentation trap storm drain inlets, and a storm filter before discharging into Squaw Creek. Virtually no change to flow in the Truckee River would result.

08a-40 The comment concerns increases in water demand with the project and projected to 2040.

The WSA (see Section 6.4 Modeling Results) and DEIR (see discussion of Impact 13-4 and 13-5) provide discussions of monthly distribution of demand and simulated impacts of pumping on seasonal groundwater elevations and duration of stream flow and length of dry stream channel. Impacts are indicated to be potentially significant. Mitigation Measures 13-4 and 13-5 are presented to verify the performance of the well system design and operation to manage groundwater pumping such that water supply is adequate and pumping effects on groundwater elevations and associated resources are not substantial.

08a-41 The comment expresses an opinion regarding the occupancy rates used in estimating water demands for the project, but no reference for alternative occupancy rates are provided. Occupancy rates were adjusted in the WSA Update (Farr West et al. 2015) to reflect available information for six resort properties in Squaw Valley from 2008 through 2014. Even though the WSA was adjusted to assume a slightly higher occupancy rate, the rate used in the DEIR is supported by substantial evidence, and there is no new information that impeaches the integrity of the data used to project a 55 percent occupancy rate. For additional information regarding occupancy assumptions, see the Master Response regarding occupancy assumptions.

08a-42 The commenter is correct that project demand peaks in July and August when the volume of recharge to the groundwater basin is decreasing. The volume and timing of demand is documented in Appendix A of the WSA Update (Farr West et al. 2015). As described in Appendix A to the WSA, historic occupancy (adjusted to include 2008-2014) for the month of July was increased by 5 percent and August was increased by 10 percent in applying expected occupancy to the project, accounting for the increased amenities the project would add to the area. The comment provides no rationale or evidence to suggest this assumption is incorrect or should even be reconsidered, other than a recession (which ended in 2009) influenced historic occupancy. The more robust dataset used in the 2015 WSA and the information included in the Master Response regarding occupancy assumptions suggests that, not only was the information in the DEIR (55 percent occupancy) supported by evidence, it is likely a very conservative (over estimate) of potential average annual occupancy.

The demands detailed in Appendix A of the WSA Update (as well as the original WSA used in the DEIR) were simulated on a monthly basis, along with hydrologic conditions, and the modeling results determined there would be adequate water within the Olympic Valley Groundwater Basin to supply the project and other cumulative development in 2040. Thus the seasonal peak demand and available water supply were simulated to quantify the estimated impacts. See response to comment 08a-4b for additional information regarding climate change.

O8a-43a The comment is an introductory statement and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

O8a-43b See response to comment O8a-3.

O8a-44 The DEIR does describe conditions in the project area existing at the time the NOP was published (or, for studies commended just prior to the NOP or reasonably after the NOP, those conditions were disclosed, but they meet the intent of this CEQA provisions). This is not to be confused with the baseline. As further described in the paragraph partially excerpted from the DEIR (*emphasis added*):

> An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting *will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant*.

The word "normally" is not accidental or immaterial to CEQA. In some instances, use of the exact physical conditions in place at the NOP is published would be misleading. That may be particularly true where the resource at issue is dynamic, and changes from year to year. A riverine system is one example of a dynamic system. For example, the character of a riverine system may be quite different during a year with relatively high precipitation or run-off. In this case, if the publication of the NOP happened to coincide with a wet year, or with the highest month of springtime runoff in Squaw Creek, and this was represented as the sole hydrologic condition, commenters would have likely pointed out—appropriately—that the DEIR mislead the public by choosing only a singular condition, when it is well known that both wet and dry conditions influence the hydrology (and biology) of the system. In fact, this comment letter elsewhere criticizes the use of existing conditions at the time the NOP was released. See, for example, comment O8a-4a, in which the commenter criticizes use of the occupancy rate from around the time the NOP was published as "too low" because an economic recession had preceded this timeframe. (See the Master Response regarding occupancy assumptions for a full discussion of the issue raised in the response to comment O8a-4a). This example illustrates the fact that commenters may criticize an EIR's description of the environmental setting regardless of which time frame is used. The fact that a dynamic system changes from year to year further complicates this issue. Under such circumstances, the lead agency (here the County) has discretion to determine what constitutes the "baseline" condition, and that determination will be upheld if supported by substantial evidence.

Because hydrologic conditions are highly variable from year to year, the baseline must represent this variability in order to determine if the project, overlain on these conditions, would result in adverse effects. Not only is this appropriate under CEQA and the CEQA Guidelines as quoted in the full excerpt of the paragraph above, any other approach would place blinders on the environmental conditions—other than the immediate time of the NOP—with an environmental conditions that naturally fluctuates, and would irresponsibly mislead decision makers. The issue of CEQA baseline has been addressed may times in legal proceedings, and the EIR uses a baseline on this, and all issues, that complies with CEQA and CEQA case law.

The EIR and WSA use an appropriate baseline period that represents recent operating conditions in the basin (e.g., existing wells and pumping) and includes variable hydrologic conditions over a period of several years. The baseline time period is the same for the entire groundwater basin and includes average, wet, and single and multiple year dry periods. This baseline period is consistent with the standard of practice in assessing hydrologic and hydrogeologic conditions and with the California Water Code requirements for WSAs. The

comparison of groundwater elevations in baseline periods to those in future simulated conditions is a standard technique for assessing the effects of any proposed change to a groundwater system. The baseline period has recently been extended in the WSA Update (Farr West et al. 2015) to include the recent drought period from 2012 through the end of 2014.

See responses to comments 08a-3 and 08a-19 for information regarding the simulation of nine wells as opposed to six wells, and 08a-9 regarding baseline.

08a-45 The saturated thickness criteria were used in the WSA and the DEIR to assess the ability of the groundwater basin to meet water future water demands in Squaw Valley, as detailed in Appendix C of the WSA (Farr West et al. 2015: Appendix D). Additional evaluations were included in the DEIR to assess the effects of increased groundwater pumping on sensitive habitats identified by other technical reports, i.e., biology and hydrology. The results of these additional evaluations are discussed at length in Chapters 6 and 13 of the DEIR.

The numerical groundwater model simultaneously simulates pumping from all wells. Therefore, the effect of overlapping drawdown from wells is accounted for in model simulated groundwater elevations for each future scenario.

Mitigation Measure 13-4 has been designed to provide mechanisms to address differences between future wellfield construction and operation and those simulated in the WSA and DEIR. This mitigation measure requires the project applicant to provide verification prepared by the SVPSD (or other water provider) consistent with a Development Agreement and all applicable groundwater plans. The verification must show that water demands can be met with existing or planned infrastructure before any and all Improvement Plans are accepted by Placer County. The details of this verification requirement are included on pages 13-63 through 13-64 of the DEIR.

08a-46 Mitigation Measure 13-4 requirements that installation and operation of wells meet project demands is consistent with all applicable existing and future groundwater plans, and it is SVPSD's existing practice to regularly update these plans and the groundwater model based on the results of ongoing monitoring and management of the groundwater basin (DEIR page 13-64). Implementation of this mitigation measure will require the applicant to work with the SVPSD to incorporate data and information collected from ongoing monitoring into the groundwater plans and groundwater model for verification of water supply sufficiency.

The comment presents an opinion that the groundwater model cannot be used to predict future conditions because future pumping exceeds historical pumping. The increase in pumping does not fundamentally change the conceptualization of the groundwater system or the numerical groundwater model. The model as constructed has been characterized as a reasonable tool for simulating future groundwater conditions by several certified hydrogeologists (Interflow 2014, HydroMetrics 2014 and 2015, Todd Groundwater 2012). The commenter does not proffer any alternative approaches to predicting project effects as well as management concepts that provide greater assurance that effects would not occur. No further response can be provided.

08a-47 The comment expresses an opinion regarding presentation of model simulated flow between Squaw Creek and groundwater. The requested information was presented and analyzed in the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014), which was the source of the information assessed in the DEIR. This report is a reference cited in the DEIR. The comment also opines that the modelers should have calibrated flow to the creek and states that data were sufficient to do so. Data were not sufficient; required data would include at a minimum monthly measurements of flow at numerous points along the creek plus measurements of inflow from tributaries. It should be

noted that the existing three gages were installed only in 2004 and accordingly, do not provide data for the first twelve years of the modeling period. The comment also states that the DEIR should present simulated flux to/from the seven reaches rather than the stream as a whole. Such a presentation would be predicated on previous calibration to the creek; as clarified above, insufficient data are available for reach-by-reach calibration.

08a-48 The comment presents an opinion that more description of the DEIR Exhibits 13-23 through 13-27 should be included. The presentation of detailed hydrographs representing groundwater elevation changes in baseline and future conditions presented in the referenced exhibits are a quantified analysis of the effects of the project. These hydrographs represent simulated groundwater elevations in 11 locations over the entire 228 month period of the model for baseline and all future condition simulations. These simulated groundwater elevations are compared to quantitative criteria relevant to potential aquatic and vegetative impacts in Chapters 13 (pages 13-65 through 13-74) and 6 (pages 6-42 through 6-45 and 6-78 through 6-79) of the DEIR.

The comment also presents an opinion that the model does not properly simulate the relationship between groundwater and Squaw Creek in the vicinity of the stream cells identified as West Cell B and West Cell D. The comment is correct that the hydrographs shown on Exhibits 13-23 demonstrate that, in many years, groundwater elevations in West Cells B and D are below the streambed. This does not indicate either an error in conceptualization or inaccurately simulated stream recharge in this location. There are two monitoring wells directly adjacent to Squaw Creek near the locations of West Cells B and D (SVPSD-PlumpjackS and SVPSD-PlumpjackD, HydroMetrics 2015, Figure 4). Measured and simulated groundwater elevations from these wells are shown in the recent model documentation report prepared as part of the WSA Update (HydroMetrics 2015:28). The measured groundwater elevation data from these wells show that groundwater is only rarely above the modeled elevation of the bottom of the stream (6,199.5 feet above sea level).

08a-49 As stated on page 13-55 of the DEIR: “The nine [new well] locations were chosen based on geology, geometry, hydrostratigraphy, aquifer capacity and planned development in the western part of the OVGWB.” In addition, the well locations comply with State-required distances from sources of contamination and maintain State-recommended distances from surface water bodies. Application of criteria resulted in few possible locations—the locations that were used.

The WSA further indicates that new well locations were selected to be as far from Squaw Creek as possible while still being in the productive portion of the aquifer. The suggestion of locating wells further east would not be feasible, and therefore such wells were not simulated. The portion of the aquifer east of the existing public water supply wells is of low production capacity and poor quality, as indicated on pages 13-11 and 13-25 of the DEIR and in the WSA.

The comment also suggests consideration of pumping from further away from Squaw Creek in the mid-summer. Simulations testing this were completed where SVPSD Well 5R was not pumped during the summer and fall months (Todd Groundwater 2015). Well 5R is the closest SVPSD well to the creek the closes to the model stream cells that show drying of refugia pools (i.e., East Cells A through C). While these simulations did show small increases in groundwater elevations beneath the selected stream cells, the increases were too small to result in any difference in pool drying as compared to the simulations where all wells were pumping throughout the year. Mitigation Measure 13-4 of the DEIR requires the applicant to work with SVPSD to develop and implement a Pumping Management Plan that continues to monitor groundwater, wellfield system operations, and the need for additional wells. SVPSD currently implements a monitoring plan for existing wells and would extend this monitoring plan to new wells. SVPSD may opt to consider varying the location of pumping in relation to

Squaw Creek as part of the Pumping Management Plan. The DEIR concludes the implementation of Mitigation Measure 13-4 would reduce the uncertainty associated with well system design and operation, and would assure that drawdown effects are managed to avoid insufficient groundwater elevations and meet standards identified in the WSA. See also response to comment 08a-3 regarding alternate wellfield configurations.

08a-50 The suggested analysis was completed as part of the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014), which was the source of the information assessed in the DEIR and was cited as such. This analysis showed three locations where future simulated changes were shown to have an effect on wet refugia in Squaw Creek. A matrix of drying frequency in each of the simulated future scenarios is presented in Table 13-13 of the DEIR. The information from the remaining refugia pools in the eastern portion of the numerical groundwater model was not shown in the DEIR because no additional drying of these pools was indicated. The complete analysis is shown in the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014).

As discussed in the Master Response regarding water supply, the updated 2015 WSA and additional analyses did not alter the location in which refugia pool drying could occur.

08a-51 Future model scenarios take into account changes in stream geometry that will result from the stream restoration that is proposed as part of the project. The wider, lower gradient and more sinuous stream that is proposed to replace the existing Olympic Channel reach has been included in all numerical groundwater model simulations that include the project. The simulated groundwater elevations shown in Exhibits 13-25 and 13-26 take the proposed stream restoration into account. It was not assumed, as suggested in the comment, that a lowered streambed would mean that the stream will be wet more frequently; rather, the numerical model simulations demonstrated that a lowered streambed would increase its frequency.

08a-52 Groundwater elevation data in the stream cells referenced in the comment were presented and assessed in the Fisheries and Aquatic Resources report prepared by Garcia and Associates (GANDA 2014), which was the source of the information assessed in the DEIR. Exhibit 13-27 focuses on the portion of the meadow where increased groundwater pumping could reduce groundwater elevations enough to affect refugia pools (i.e., East Cells A through C) according to the criteria established by GANDA (2014). East of East Cell C, groundwater elevations rarely drop below the creek bed and are never low enough to dry refugia pools based on GANDA's criteria (GANDA 2014). In addition, groundwater elevations east of East Cell C show little or no change as a result of increased pumping. Therefore, while these exhibits were reviewed during preparation of the DEIR, they were not reproduced in the impact analysis.

See response to comment 08a-50.

08a-53 See response to comment 08a-46.

08a-54 As the comment points out, the channel restoration design includes features and channel configurations that will slow flow velocities and allow sediment to be retained within the restored channel and floodplain. In order to verify this conceptual understanding of the proposed restoration benefits, extensive hydraulic, geomorphic, and habitat analyses have been carried out, and indicate that the area of slow-moving and shallow water will be increased, such that fine sediment will be deposited on newly-created floodplain surfaces. These analyses support the conceptual understanding of the effects of the proposed design.

Hydraulic and sediment-transport analyses also indicate that sediment-transport continuity will be maintained or improved, such that sediment transport to downstream areas will not be eliminated, and "hungry water" effects will not be induced. Since the DEIR was released,

additional analysis has been carried out to better quantify the ways in which potential impacts of the project on downstream areas may be offset (Balance Hydrologics 2015a). The results of the analysis are consistent with the DEIR conclusions.

The DEIR, however, does not assume that the design objectives will be met. The DEIR notes that "While successful implementation would be a beneficial impact, without monitoring, adaptive management, and assurances of ongoing funding to support these activities, creek restoration efforts might not provide the anticipated benefits…." The DEIR therefore establishes Mitigation Measures 6-1a (as modified in response to comment 08a-26) and 6-1b, which call for monitoring the success of the restoration project through the development and implementation of mitigation implementation and monitoring programs. Proposed monitoring metrics will allow for verification of the modeling and/or adaptive management of the project.

08a-55 Regarding the concept of "Hungry Water," see response to comment 08a-34.

The restoration project is designed to maintain or increase flood conveyance capacity, such that flood elevations do not increase as the result of the project. In this case, flood capacity is increased through widening of the channel and inset-floodplain corridor, such that increased vegetation and a larger cross-sectional flow area will allow for slower velocities at the same or lower flood elevation. As a result the restoration project is anticipated to create a nominal increase in flood storage and detain more water, such that the passage of floodwaters to the meadow will be attenuated.

08a-56 The Mountain Interception and Conveyance System simply routes off-site runoff around the Specific Plan area. As a result, the same sediment load is anticipated to reach Squaw Creek as currently reaches the creek under existing conditions, notwithstanding anticipated reductions in sediment production on the mountain from mountain restoration activities (separate from the VSVSP project) or additional treatment and removal of suspended sediment in the restored Olympic Channel. In other words, the sediment load delivered from the Mountain System is anticipated to remain the same or be reduced, and channel restoration features are anticipated to further reduce the load.

The onsite system will consist of low-impact development (LID) features designed for treatment of urban stormwater and runoff from the development and will not be sized or appropriate for treatment of the significantly higher flows which emanate from off-site areas. Mixing of water within the on-site system could compromise the integrity of the proposed stormwater BMPs; however, waters from both the onsite and offsite systems will be mixed and treated within the Specific Plan area by water quality features associated with Squaw Creek restoration.

08a-57 The comment does not address specific discussions in the DEIR, so a specific response is difficult. Nevertheless, the DEIR describes numerous LID enhancements that would not only result in high quality runoff water from the project, but would also likely improve water quality runoff from the already paved site. Pages 13-77 through 13-79 of the DEIR describe new runoff treatment systems that would capture runoff and treat it on site, including construction of sediment traps, vegetative rock bowls, hydrodynamic separators, and modification of existing drainage systems to add swales and filtration prior to discharge to Squaw Creek.

08a-58 The comment provides a summary of information presented in the DEIR and does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-59 The comment provides a summary of the numerical groundwater model information provided to the commenter for review and used in the analyses for the DEIR and does not address the content, analysis, or conclusions in the DEIR. The comment describes how the model includes over 19 years of daily data, even including leap years, and 237 time steps. The DEIR

recognizes that the modeling was comprehensive and robust. No further response is provided here.

08a-60a The comment provides a summary of the numerical groundwater model information provided to the commenter for review and used in the analyses for the DEIR. As described in the WSA (Section 6) and in the DEIR Impact 13-4, the MODFLOW numerical model was developed for SVPSD in 2001 to simulate groundwater conditions. The model has been updated over the years and calibrated to existing conditions. It has been used as a tool for managing groundwater supply, planning for future growth, and evaluating potential water supply sources for various developments in Squaw Valley. The model was updated most recently in 2015 to expand the time period and include recent hydrologic conditions, including the dry years of 2012 through 2014. This most recent update included processing and incorporation of groundwater elevation, streamflow, and climate data through January 2015. In addition, the methodology for calculating recharge from precipitation was modified to account for limited infiltration during summer storm events, effectively reducing summer month infiltration. The current version of the model was assessed and found to adequately simulate groundwater elevations for the period from May 1992 through January 2015.

08a-60b The comment addresses specific aspects of the numerical groundwater model. As noted in response to comment 08a-60a, the model has been updated and used for years as a tool by SVPSD for managing groundwater supply, planning for future growth, and evaluating potential water supply sources for various developments in Squaw Valley. The current model also was applied to evaluation of impacts of the proposed project. As described in the WSA (Section 6), the current model was assessed by the SVPSD consultant and found to adequately simulate groundwater elevations for the period from May 1992 through January 2015. It is a good tool for simulating changed conditions and management practice alternatives.

08a-60c Impervious cover of the western portion of the basin was taken into account. The recharge rate in Recharge Zone 9 is 60 percent of that in undeveloped areas of the model where land cover is primarily pervious. See response to comment 08a-38 for more information of the relationship between impervious area and model simulated recharge in this area of the model.

08a-60d The lagged distribution time calculations were developed from measured monthly average temperatures and observed seasonal patterns of snow cover on the valley floor. The exact timing and volume of snow melt is highly variable and based on temperature, new precipitation, elevation, pressure, solar radiation, and other variables. The simplified approach was used to incorporate some information about the timing of available recharge to the aquifer. The temporal distribution methodology is conservative in that it results in snowmelt early in the winter and spring months at a time when potential recharge to the aquifer is abundant. The result is that more water leaves the model as runoff than would if snowmelt was lagged for longer periods, which would result in more potential recharge water availability later in the spring months. Importantly, the numerical groundwater model shows good seasonal correspondence between observed and simulated groundwater elevations (known as calibration). This indicates that the temporal application of recharge to the model is consistent with how the groundwater system functions.

The comment refers to precipitation estimates and recharge estimates. Response to comment 08a-2 provides additional information and a correction with regard to the error in the SNOTEL data presentation. This error in data presentation did not affect the model recharge calculation, as the SNOTEL mountain precipitation data were not used for the calculation of recharge in the model.

08a-60e The comment addresses the range of recharge represented in the numerical groundwater model. The 20 plus year model period includes a range of hydrologic conditions, including average, wet, dry, and multiple dry years. The range in the volume of recharge to the model is a result of precipitation on the valley floor and return flows from irrigation and water supply losses. The volume of recharge estimated from these sources varies on a monthly basis in response to precipitation and the volume of water that is used in the Valley, as described on page 13-3 of the DEIR. The numerical model adequately simulates the conceptualization of groundwater in the Olympic Valley Groundwater Basin and includes reasonable estimates of recharge.

As explained in response to comment 08a-2, the error in the SNOTEL data presentation did not affect the model recharge calculation, as the mountain precipitation data were not used for the calculation of recharge in the model.

08a-60f General head boundaries are used to simulate limited flow from bedrock fractures into the Olympic Valley Groundwater Basin. The comment correctly indicates that these boundaries provide only very small inflow to the model. However, these boundaries have been included in the model to simulate observed upward groundwater gradients in specific locations. While these boundaries do not result in a large volume of flow, they are a part of the well calibrated model.

08a-60g The comment addresses specific aspects of the numerical groundwater model. As noted in the responses to comments 08a-60a and 08a-60b, the model has been updated and used for years as a tool by SVPSD for managing groundwater supply, planning for future growth, and evaluating potential water supply sources for various developments in Squaw Valley. The specific parameters representing storage and flow of groundwater within the model (i.e., storage properties, hydraulic conductivity, and anisotropy) are within the range of those expected for the hydrogeologic conditions present in the Olympic Valley Groundwater Basin.

The numerical model was calibrated using pilot points. This method allows the model developer to incorporate known information about aquifer parameters and observed groundwater level data to determine the optimal aquifer properties to simulate the observed water elevations. The aquifer is heterogeneous, meaning that there is wide variation in aquifer properties both spatially and vertically. All available information regarding aquifer properties was used to calibrate the model and the range of values used in the model is consistent with this type of depositional environment. The model as constructed has been characterized as a reasonable representation of the tool for simulating future groundwater conditions by several certified hydrogeologists (Interflow 2014, HydroMetrics 2014 and 2015, Todd Groundwater 2012).

08a-60h The comment addresses the model calibration. Calibration of a numerical groundwater flow model refers to a demonstration that the model is capable of simulating groundwater elevations (heads) that closely match measured (or observed) groundwater elevations from existing wells within the model area. The SVPSD Squaw Valley model is a transient flow simulation; meaning it is a model in which the inflows and outflows to the system vary over time, resulting in variations in heads over time. Calibration of transient flow models is assessed by comparing all of the available observed heads in a well or wells to simulated heads produced from the model in the same location and time. Comparing simulated heads to all available observed heads from a well or wells provides the variation in hydrologic conditions and related groundwater elevation responses that allow a model to adequately simulate average, wet, and dry conditions. These comparisons can include both qualitative and quantitative assessment. Qualitative assessment of model calibration can include graphical evaluation of observed versus simulated hydrographs or scatterplots. Quantitative assessment of model calibration commonly includes presentation of model calibration statistics and comparison of those statistics to accepted standards (Anderson and Woessner 1992).

HydroMetrics prepared a report documenting modifications and calibration for the version of the model that was used for the analyses presented in the DEIR, and another report for the recently modified version of the model that was used in the WSA Update (HydroMetrics 2014 and 2015). Both of these reports included presentation and discussion of model calibration information, including both qualitative and quantitative comparison on observed versus simulated heads. The qualitative assessments of model calibration in the HydroMetrics reports included both scatterplots and observed versus simulated hydrographs. Qualitative measures included presentation of model calibration statistics and comparison of those statistics to common criteria. These comparisons showed the calibration statistics to be well within acceptable limits (HydroMetrics 2014 and 2015, Appendices B and C of the WSA Update).

The comment states that simulated groundwater elevations in some wells are consistently higher or lower than observations, apparently by as much as ten feet. Simulated groundwater elevations are consistently lower by about ten feet than observations in wells RSC 309, RSC 310, and RSC 332. All of these wells are located in the eastern meadow portion of the groundwater basin at considerable distance from the pumping wells. Groundwater elevations in this area do not change substantially with pumping as indicated in DEIR Exhibits 13-22 through 13-27. Note that the simulations are lower than observed, a conservative estimate.

08a-60i The comment addresses stream conductance. Values for stream conductivity change over different cells in the model based on the size of the cell and the geometry of the creek. The referenced values from the model documentation report (HydroMetrics 2014) are for a select portion of Squaw Creek, and a range of values are presented to show how conductance changes in these stream reaches.

08a-61a The comment indicates that the model report should present final water budget amounts. This comment relates to the model documentation reports prepared by HydroMetrics (2014). It does not directly address the content, analysis, or conclusions in the DEIR; nonetheless, the model developed for use by SVPSD was also used for DEIR analyses. While details of the water budget were not presented in the model report, the report does present comparisons of the calibrated model simulated heads to observed groundwater elevations in the form of hydrographs, scattergrams, and standard model calibration statistics. These comparisons show that the model adequately simulates groundwater elevations; calibration statistics are consistent with industry standards.

08a-61b The comment compares the water budget in the current model to that in the 2001 version of the model. The model has been updated multiple times since 2001 and now includes data from a longer period. The current 20-plus-year model period includes a range of hydrologic conditions, including average, wet, dry, and multiple dry years. The range in the volume of recharge to the model is a result of precipitation on the valley floor and return flows from irrigation and water supply losses. The volume of recharge estimated from these sources varies on a monthly basis in response to precipitation and the volume of water that is used in the Valley, as described on page 13-3 of the DEIR. The numerical model adequately simulates the conceptualization of groundwater in the Olympic Valley Groundwater Basin and includes reasonable estimates of recharge.

Response to comment 08a-2 provides additional information on precipitation estimates. As noted, the error in the SNOTEL data presentation did not affect the model recharge calculation, as the SNOTEL mountain precipitation data were not used for the calculation of recharge in the model.

08a-61c The comment provides a summary of the water balance outputs of the numerical groundwater model. The model (which has been calibrated; see response to comment 08a-61a) has been applied to the estimated demands of the proposed project and cumulative

conditions. While additional pumping may be considered in the future, this DEIR already addresses cumulative conditions as reasonably foreseen through 2040. In addition, it is anticipated that the model will be updated and improved in the future in accordance with Mitigation Measure 13-4.

08a-61d The comment refers to recharge in the model; see responses to comments 08a-2, 08a-38, 08a-60d, 08a-60e, and 08a-61b.

The comment points out that recharge in the cumulative model run increases over baseline. Additional irrigation and sewer flow that will occur as a result project and non-project of growth within the Valley will result in additional return flows from these water budget elements. The numerical groundwater model includes return flows from irrigation and sewer losses as a component of recharge to groundwater (Farr West et al. 2014 and 2015 and HydroMetrics 2007a, 2007b, 2014a, and 2015).

08a-61e The comment provides a summary of the storage and streamflow outputs of the numerical groundwater model. It does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-62 The comment refers to recharge in the model and the mountain precipitation error. The DEIR incorrectly presented SNOTEL data for the mountain precipitation. However, the numerical model was developed using precipitation data from the Fire Station on the Valley floor, not the SNOTEL data. See responses to comments 08a-2, 08a-38, 08a-60d, 08a-60e, and 08a-61b.

The comment also compares selected outputs from the version of the model used in the DEIR with summary report values from the originally conceptualized versions of the model developed in 2001 and 2003. The model has been updated many times since it was first conceptualized and parameterized. Importantly, numerous exploratory drilling, well construction, well and aquifer testing, streamflow gaging, and aquifer-stream interactions studies have been completed since the model was first developed in 2001. These studies have resulted in a more complete understanding of the occurrence and flow of groundwater within Squaw Valley than was available when the model was first developed over 14 years ago. In addition, the collection of groundwater elevations, precipitation data, and streamflow measurements over the past 14 years has provided significant and important model calibration and input information representing a wider range of hydrologic conditions in Squaw Valley. The inclusion of these data as model inputs and calibration targets has resulted in a model that is more representative and accurate than the original model.

08a-63 The comment addresses climate change. The WSA Update corrects the quantitative climate change analysis to use the corrected SNOTEL records for mountain precipitation (Farr West et al. 2015:7-2). A simple calculation of available recharge from precipitation on the watershed indicates that current precipitation in the Squaw Creek watershed averages 25,341 AFY. The WSA further quantifies climate change by comparing total water demand with total precipitation, which shows that total demand at project buildout represents 4.7 percent of total precipitation on the watershed. The low ratio of groundwater development to precipitation suggests that future climate variation could be easily accommodated.

See also response to comment 08a-4b.

Attachment 1 of the comment letter provides SNOTEL data, which has been addressed in several responses, above. Attachment 2 of the comment letter addresses the WSA, which was prepared for the SVPSD. Although the WSA has been prepared for a different agency than Placer County, and the WSA is not the DEIR, responses are provided to these comments because the DEIR relies on the WSA as substantial evidence in support of the hydrology, biology, and water supply analyses in the EIR.

08a-64 The comment provides a summary of the conceptual model and does not directly address the content, analysis, or conclusions in the WSA. See responses to the detailed comments below.

08a-65 The comment concerns water demand estimates. See response to comment 08a-4a for additional information regarding occupancy rates. With regard to commercial water demand, Appendix A of the original WSA and WSA Update (Farr West et al. 2014 and 2015) indicated the source of the commercial water demand unit rate. The 0.24 gpd/sf rate was based on actual water meter data from SVPSD for its commercial customers for the time period 2005-2014. With regard to seasonal water demands, see response to comment 08a-42; water demands were simulated on a monthly basis (along with hydrologic conditions) to quantify potential impacts on water supply.

08a-66 The comment addresses the evaluation of water supply sufficiency in the WSA. See responses to comments 08a-3 and 08a-45.

CEQA requires that the effects of a project be assessed against a baseline, which normally would be the conditions that exist at the time that the NOP is released. As discussed in responses to comments 08a-9 and 08a-44, in this case, the "normal" existing condition is not well represented by a single point in time because the groundwater system is dynamic. Therefore, the model simulates every month from May 1992 through January 2015 (including the month and year in which the NOP was released). The years included in the model represent a period in which development had already been well established in Squaw Valley. In fact, a "pre-development" baseline would need to predate the 1960 Olympics when the creek and surrounding area were substantially altered. Even if such a task were technically possible, such a scenario would bear no resemblance to "existing conditions" and therefore would not be an appropriate baseline against which to measure project impacts.

08a-67 The comment refers to estimation of recharge in the model and the SNOTEL mountain precipitation error. The mountain precipitation data were not used for estimating recharge to the numerical groundwater model. See responses to comments 08a-2, 08a-38, 08a-60d, 08a-60e, and 08a-61b.

08a-68 See response to comment 08a-28b; the pumping test was summarized in the "Environmental Setting" portion as background information on groundwater-surface water interactions. The impacts assessment of the DEIR used the numerical groundwater model to simulate future pumping and the relative changes in groundwater conditions.

08a-69 The comment addresses climate change and model simulations; see response to comment 08a-4b.

The comment also addresses the present drought. The July 2015 WSA Update presents a revised analysis and documentation to reflect more recent data, specifically the WSA Update used an updated version of the groundwater model with an extended time period through the end of 2014. The analysis in the WSA Update showed sufficient supply to meet the project and non-project future water demands with the extended time period, including the recent drought.

08a-70 The comment characterizes the groundwater aquifer as a subterranean stream. While the source of recharge is generally from precipitation on the valley and upper watershed, the water flows and is stored in porous sediments. DWR has designated the Olympic Valley Groundwater Basin as a groundwater basin (Number 6-108) in accordance with Bulletin No. 118 (DWR 2003). The official DWR groundwater basin description cites no mention of subterranean streams in the Olympic Valley Groundwater Basin, nor does it characterize the basin as under the sole influence of the creek.

08a-71 Most of the comment provides a summary of the conceptual model and does not directly address the content, analysis, or conclusions in the WSA or DEIR.

The comment also addresses drawdown and recovery, with reference to completely full conditions. See response to comment 08a-28a with regard to the descriptive term *full.* The term *full* as used in the WSA and DEIR is a lay term used to illustrate that groundwater elevations reach a maximum elevation that is relatively consistent from year to year (HydroMetrics 2007a). The term full has been clarified in the WSA Update to indicate that it refers to locally or nearly maximum conditions in wet years.

This comment appears to be based on an assessment of outdated groundwater elevation hydrographs in two active pumping wells (one of which no longer exists). Active pumping wells are not the best illustration of this pattern, as groundwater elevations within them are influenced by ongoing production. However, groundwater elevations in pumping wells do recover to over 95 percent of the historical maximum saturation in all years, and it is expected groundwater elevations not subject to pumping drawdowns would recover similarly or to higher elevations.

08a-72 See responses to comments 08a-2, 08a-38, 08a-60d, 08a-60e, and 08a-61b.

08a-73 See responses to comments 08a-4b and 08a-69.

08a-74 The comment provides a summary of the conceptual model, specifically recharge, and does not directly address the content, analysis, or conclusions in the WSA or DEIR. See responses to the detailed comments below.

The comment also includes mention of statements relating to the conceptual hydrogeologic model made in a document prepared by HydroMetrics (2014b) that is referenced in the DEIR. Specifically, the comment states that there is no evidence to support the idea that deep groundwater from north of Squaw Creek flows under the creek towards the south. This recently developed refinement to the conceptualization of flow pathways at specific locations in the aquifer do not have a direct role in the analyses that were completed for the WSA or DEIR. The analyses used in the WSA and DEIR used the numerical groundwater model.

08a-75 The comment notes that the WSA does not present an estimate of recharge to the basin. Recharge zones are shown in the WSA and WSA Update (Appendix B and Appendices B and C, respectively). Recharge rates vary by month for each of the recharge zones shown in the appendices to the WSA. These recharge rates are calculated as a function of valley floor precipitation and estimated return flows. These rates are calculated for each month of the model time period using methodologies described in previously completed model documentation reports (HydroMetrics 2007a, 2007b, 2014a, 2014b, and 2015). Mountain front recharge is not directly accounted for in the model; while addressed in one study, its significance (locations and volumes) have not been sufficiently quantified for incorporation as monthly flow inputs to the model. The model will be updated and improved in the future in accordance with Mitigation Measure 13-4 in the DEIR.

08a-76 The comment provides a summary of previous studies with regard to recharge and the water balance. While the comment does not address the content, analysis, or conclusions in the DEIR or WSA, it is noted that the comment recognizes the variability of recharge from year to year and the idea that a steady-state annual water balance is not very useful. Accordingly, the DEIR and WSA apply a dynamic groundwater modeling tool.

08a-77 The comment provides a summary of previous studies and does not address the content, analysis, or conclusions in the DEIR. Specifically, previously completed aquifer testing performed by HydroMetrics (2014b) assessed the degree and nature of the connection

between existing SVPSD wells and the trapezoidal channel portion of Squaw Creek. The comment questions the results and analyses of the tests, and indicates that alternative evaluation would yield estimates of the same magnitude. These previously completed background studies are relevant to the WSA only in that they inform model parameters that relate to aquifer conductivity and stream bed conductance. Noting that estimates would likely be of the same magnitude, no further response is warranted.

08a-78 The comment concerns the definition of groundwater as percolating or as a subterranean stream. The Garrapata decision referred to in the comment states:

> The burden of proof is on the person asserting that groundwater is a subterranean stream flowing through a known and definite channel.

And:

> …absent evidence to the contrary, groundwater is presumed to be percolating groundwater, not a subterranean stream.

While one source of recharge is from overlying surface water, other recharge sources include direct percolation of precipitation on the valley floor, limited recharge from bedrock fractures, and recharge from return flows and sewer losses. In most years, there is more outflow to the creek than recharge from the creek into the aquifer.

See also response to comment 08a-70.

08a-79 The comment addresses bedrock inflow and provides a summary of previous studies. The comment misquotes the WSA; the WSA Update on page 5-3 provides a summary of an earlier study and indicates that the study implies that there is not a strong connection between fractured bedrock groundwater occurring in the mountains above the Basin and the Olympic Valley Groundwater Basin. To clarify, the discussion on page 5-3 of the WSA Update addresses potential water supply from bedrock and concludes that project demand will be met with water from the groundwater basin and not bedrock. Nonetheless, the general conceptual model of the basin acknowledges some connection between the Basin and fractured bedrock and a small inflow from bedrock to the basin.

08a-80 The comment addresses water supply sufficiency, safe or perennial yield, and overdraft. As defined in California Department of Water Resources Bulletin 118:

> Overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin. Overdraft is characterized by groundwater elevations that decline over a period of years and never fully recover, even in wet years. Overdraft can lead to increased extraction costs, land subsidence, water quality degradation, and environmental impacts.

No previous study has presented a professional opinion that the Olympic Valley Groundwater Basin is in overdraft. With regard to basin refilling and recovery, see responses to comments 08a-28a and 08a-71.

08a-81 The comment discusses full aquifers and rejected recharge; see response to comment 08a-28a.

08a-82 The comment addresses water supply sufficiency and baseline conditions. The DEIR and WSA use an appropriate baseline period that includes variable hydrologic conditions. The baseline time period is the same for the entire groundwater basin and includes average, wet,

and single and multiple year dry periods. This baseline period is consistent with the standard of practice in assessing hydrologic and hydrogeologic conditions and with the California Water Code requirements for WSAs. The comparison of groundwater elevations in baseline periods to those in future simulated conditions is a standard technique for assessing the effects of any proposed change to a groundwater system. The baseline period has recently been extended in the WSA Update (Farr West et al. 2015) to include the recent drought period from 2012 through the end of 2014.

The saturated thickness criteria were used in the WSA and the DEIR to assess the ability of the groundwater basin to meet future water demands in Squaw Valley, as detailed in Appendix C of the WSA (Appendix D of the WSA Update. Farr West et al. 2015). Additional evaluations were included in the DEIR to assess the effects of increased groundwater pumping on sensitive habitats identified by other technical reports (i.e., biology and hydrology). The results of these additional evaluations are discussed at length in Chapters 6 and 13 of the DEIR.

08a-83 The comment concerns water supply sufficiency and pumping from existing and proposed new wells. The 2040 peak water demands could be served by only six new wells, as indicated in the WSA and DEIR (pages 4-4 and 13-55). However, the model simulates nine wells to include additional wells that could be added to add supply redundancy. As stated in the DEIR (page 13-55), the nine locations were chosen based on geology, geometry, hydrostratigraphy, aquifer capacity and planned development in the western part of the OVGWB.

The DEIR and WSA both recognize that differences between planned and actual wellfield construction and operations may result in differences in the effects of increased groundwater production. Mitigation Measure 13-4 from the DEIR requires the applicant to work with the SVPSD to develop and implement a Pumping Management Plan that continues to monitor groundwater, wellfield system operations, and the need for additional wells. SVPSD currently implements a monitoring plan for existing wells and would extend this monitoring plan to new wells. The DEIR concludes the implementation of Mitigation Measure 13-4 would reduce the uncertainty associated with well system design and operation, and would assure that drawdown effects are managed to avoid insufficient groundwater elevations and meet standards identified in the WSA. Also see response to comment 08a-28a.

Additional model simulations using six wells for future conditions was evaluated and is described in the Master Response regarding water supply.

The comment includes discussion regarding the classification of dry and multiple dry years in the WSA. The discussion of hydrologic conditions in the WSA Update (Farr West et al. 2015) has been modified to present weather patterns on a water year basis. A water year is a 12 month period beginning October 1st and ending September 30th. As a result of this change in calendar basis, the driest single year in the model time period is 2001 and the driest multiple year period is 2000 through 2002. These assessments are based on valley floor precipitation records from the Squaw Valley Fire Station.

08a-84 Modeled groundwater elevations in cells with active pumping wells may be higher than actual elevations of operational wells during pumping. This reflects the fact that groundwater elevations will be lower in the pumping well than in the surrounding aquifer because of near-well drawdown effects and well inefficiency. The intent of the model is not to simulate pumping water elevations in individual wells, but rather the effects in the surrounding aquifer.

The Sufficiency of Supply Memorandum (Todd Groundwater et al. 2014 and 2015, WSA and WSA Update Appendix D, page 17) states:

> These criteria should not be taken as recommendations for operational practices. New wells will need to be designed and constructed to maximize operational reliability and flexibility, based on location-specific hydrogeology. While there is no lower limit to percent saturation proposed for the short exceedances of the 65 percent threshold, in practice saturated thicknesses in any given month are affected by the preceding months, so extreme exceedance of this threshold in any month or months will result in exceedances of longer than the 3 consecutive month allowance.
>
> While the criteria were developed in consideration of the elements presented in Section 4.3.1, they do rely on model simulated results. The SVPSD Basin model is, like all groundwater models, an approximation of reality. The model has grid cells ranging from 625 to 10,000 square feet in area. Simulated groundwater elevations in any location represent an average over the entire area and thickness of the particular cell. The model was developed to simulate volumetric flow in the Basin, but lacks the granularity to predict exact and absolute differences in groundwater elevations at discrete locations such as wells.

It is standard practice for water purveyors to consider pumping water levels as one of many criteria in their wellfield operations.

08a-85 The WSA Update (Farr West et al. 2015) extends the model time period assessed through the end of December 2014 to include the most recent drought years. Groundwater elevations during the recent drought from 2012 through 2014 are higher than those observed and simulated during the multiple year drought from water years 2000 through 2002.

See response to comment 08a-4b for information regarding climate change.

08a-86 See responses to comments 08a-28a and 08a-71 in regard to the aquifer filling.

The numerical groundwater model simultaneously simulates pumping from all wells. Therefore, the effect of overlapping drawdown from wells is accounted for in model simulated groundwater elevations for each future scenario.

The comment rightly points out that in the multiple dry year period of water year 2000 through 2002 there was carryover drawdown from year to year. This is an expected local or regional groundwater response to multiple dry year periods, as reflected in the model.

08a-87 The comment provides opinions regarding presentation of additional maps of groundwater elevations or drawdown for future pumping conditions. A map showing groundwater elevations or drawdown for a particular month in a particular year would not adequately represent the range of conditions represented by the groundwater model. Accordingly, the WSA presents hydrographs of groundwater elevations in the water supply portion of the aquifer. These adequately represent the range of conditions to allow assessment of sufficiency of supply to meet estimated demands.

08a-88 The commenter states that the sufficiency of supply analysis in the WSA does not include assessment of changes in stream flow or wetland conditions. This statement is correct. The purpose of a WSA is to document water supply and demand and evaluate sufficiency. Assessment of changes to groundwater conditions affecting Squaw Creek are provided in Chapters 6 and 13 of the DEIR.

08a-89 The comment provides opinions regarding the baseline time period used in the WSA and DEIR. The DEIR and WSA use an appropriate baseline period that includes variable hydrologic conditions. See response to comment 08a-44 regarding the CEQA baseline. The baseline time period is the same for the entire groundwater basin and includes average, wet, and single and multiple year dry periods. This baseline period is consistent with the standard of practice in assessing hydrologic and hydrogeologic conditions and with the California Water Code requirements for WSAs. The comparison of groundwater elevations in baseline periods to those in future simulated conditions is a standard technique for assessing the effects of any proposed change to a groundwater system. The baseline period has recently been extended in the WSA Update (Farr West et al. 2015) to include the recent drought period from 2012 through the end of 2014.

See also response to comment 08a-66.

08a-90 The comment addresses the WSA and estimation of municipal well capture of flow from Squaw Creek. It should be noted that the WSA addresses overall water supply and demand, and does not evaluate impacts of groundwater capture from Squaw Creek as a result of pumping municipal wells. Such potential impacts are addressed in the Impacts section of the DEIR, using the numerical groundwater model to account for cumulative effects of pumping on the groundwater system, including flow into and out of Squaw Creek. See response to comment 08a-28b.

08a-91 The comment addresses climate change. See responses to comments 08a-4b and 08a-69.

08a-92 The comment provides a summary of water demand estimates used in the WSA and DEIR and finds the estimates to be reasonable. The comment does not address the content, analysis, or conclusions in the DEIR. Therefore, a response is not provided here.

08a-93 The comment addresses water demand estimates; see responses to comments 08a-4a and 08a-65.

08a-94 The commenter states that water demand and water supply should be considered monthly not annually. The County agrees. Both the WSA and DEIR assess pumping and resulting groundwater effects on a monthly basis. The WSA states on page 4-1 that Future Project and non-project demands were estimated on a monthly basis. Similarly, page 6-1 states that this water sufficiency analysis is based on monthly projections using the existing Model. These monthly pumping projections are shown on Table 6-2 of the WSA. The existing demands are documented in Appendix A of the WSA.

See responses to comments 08a-4b and 08a-69 regarding climate change.

08a-95 The comment provides a summary of the discussion on water conservation and does not directly address the content, analysis, or conclusions in the WSA or DEIR. Therefore, a response is not provided here.

The comment assumes that non-consumptive use of water returns to the groundwater basin in the form of wastewater discharge. This assumption is incorrect. All wastewater produced in Squaw Valley is exported to the Truckee Tahoe Sanitation Agency for treatment and discharge.

08a-96 The comment provides a summary of detailed comments provided below. See responses to the detailed comments below.

08a-97 The comment addresses recharge zones. Recharge zones 5 and 6 do not represent mountain front recharge. The different zones represent different water purveyors and

expected return flow rates, as detailed in various model documentation reports prepared for the model (HydroMetrics 2006, 2007a, 2007b, 2014a, 2014b, and 2015).

Footnote 11 comments on the definitions of infiltration and recharge and the use of these terms in the WSA. The definition of infiltration in the footnote is incorrect. Infiltration is that process by which precipitation moves downward through the surface of the earth and replenishes soil moisture, recharge aquifers, and ultimately supports streamflow during dry periods (see Viessman and Lewis 1996).

O8a-98 The comment addresses distribution of recharge through the year. See response to comment O8a-60d.

O8a-99 The comment addresses bedrock inflow. See response to comment O8a-60f.

O8a-100 The comment addresses hydraulic conductivity values. See response to comment O8a-60g.

O8a-101 The comment concerns model calibration. See response to comment O8a-60h.

O8a-102 The comment addresses stream conductance. Values for stream conductivity change over different cells in the model based on the size of the cell and the geometry of the creek. The referenced values from the model documentation report (HydroMetrics 2014) are for a select portion of Squaw Creek, and a range of values are presented to show how conductance changes in these stream reaches.

O8a-103 The comment addresses model layers and pumping. Pumping does occur in Layer 2 of the model. Vertical pumping distribution (i.e., depth of pumping) is handled by the multimode well package (MNW2), which is a MODFLOW module that handles pumping in a groundwater model. The MNW2 package uses screen elevations to assign vertical pumping by layer in the model. New wells are assumed to be screened in Layer 2. Existing wells were simulated to pump from existing screens.

O8a-104 The comment provides opinions regarding presentation of additional graphs in the modeling report that is a source of information used in the WSA. The comment indicates that the model report should present final water budget amounts, specifically flows to or from the stream. This comment relates to the model documentation reports prepared by HydroMetrics (2014). It does not directly address the content, analysis, or conclusions in the WSA; nonetheless, the model developed for use by SVPSD was also used for WSA analyses. While details of the water budget were not presented in the model report, the report does present comparisons of the calibrated model simulated heads to observed groundwater elevations in the form of hydrographs, scattergrams, and standard model calibration statistics. These comparisons show that the model adequately simulates groundwater elevations; calibration statistics are consistent with industry standards. Fluxes to and from the stream are not criteria for water supply sufficiency in the WSA; potential impacts to the stream are addressed in the DEIR.