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MEMO

To: Ken LeBlanc
From: Ken Schmidt
Topic: Watershed Evaluation
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Pursuant to your request, following is a discussion of the water balance for the watershed and the potential groundwater that could be tapped. The water budget includes inputs and outputs. Precipitation on the watershed is the sole input. The outputs under pre-development conditions are plant evapotranspiration and streamflow runoff. That is, under pre-development conditions all of the precipitation is either consumed by evapotranspiration or leaves the area as streamflow. For developed areas, such as Yosemite West, an additional output is pumpage, and another input is sewage effluent. Developed areas also tend to have more runoff due to impermeable surfaces and less evapotranspiration because of plant removal (assuming minimal landscape use). Developed areas that perform significant forest thinning and fuel reduction programs increase runoff.

The average precipitation on the Indian Creek watershed is 45 inches per year, based on an isohyetal map prepared by the California Department of Water Resources. Evapotranspiration for a mountainous area at this elevation covered with conifer forests is indicated to be about 23 inches per year, based on studies in the Shaver Lake area in Fresno County (KDS, 1977). The difference between the precipitation and evapotranspiration (22 inches per year) would be surface water runoff (streamflow). Based on studies elsewhere in the Sierra Nevada, between 10 to 20 percent of the average runoff could be tapped by wells. For 900 acres of land in the Indian Creek watershed, this would range from about 165 acre-feet per year to 330 acre-feet per year of runoff.

The water supply for the existing Yosemite West development is from Well No. 9, located in the lower part of the Indian Creek watershed, which comprises about 2,560 acres. This watershed receives an average of about 9,600 acre-feet per year of precipitation. The runoff from this watershed would be 22 inches per year, or about 4,700 acre-feet per year. From 470 to 940 acre-feet per

year of groundwater could be tapped in the Indian Creek watershed by wells. In 2018, about 32.1 acre-feet were pumped from Well No. 9 and the sewage effluent was about 30.3 acre-feet. This was about 3.5 to 7 percent of the average groundwater available each year in the Indian Creek watershed. The net consumption was the difference or about 1.8 acre-feet. In 2019, about 40.0 acre-feet of water were pumped and there was 36.6 acre-feet of sewage effluent. The difference or net consumption was only about 3.4 acre-feet. The pumpage for 2018-19 averaged 36 acre-feet per year. To put this in perspective, this amount of water is the equivalent of what the evapotranspiration would be from about 20 acres of conifer forests. The net consumption of water for Yosemite West for 2018-19 averaged about 2.5 acre-feet per year, which is equal to the evapotranspiration from only about 1.3 acres of conifer forests. This small amount of water was more than made up for by the increased runoff due to impermeable surfaces and the decreased evapotranspiration due to plant removal when the area was developed. The existing pumpage from Well No. 9 is only about ten percent of the groundwater considered to be available for the 900 acres of private land.

For the Le Blanc/Scenic Wonders project, the projected water demand from well pumpage is 5.3 acre-feet (1,629,200 gallons) per year. Of this, about 4.9 acre-feet (1,498,900 gallons) would be returned as wastewater. Thus the net consumption would only be 0.4 acre-foot per year. This is only about 0.01 percent of the average available groundwater in the Indian Creek watershed. The small consumption of 0.4 acre-foot (130,300 gallons) per year would be made up for by the increased runoff due to impermeable surfaces and the decreased evapotranspiration due to plant removal for the project. The Le Blanc/Scenic Wonders project Phase 2 has committed to using the Aqua Recycle (or similar system) at the commercial laundry. This would reduce fresh water use by 80 percent. The reduced water demand would be 28,810 gallons per month, or about 1.06 acre-feet per year. The size of the watershed in the East Creek drainage that is tributary to the Le Blanc well is estimated to be about 20 acres. The estimated runoff from this watershed is 22 inches per year, or an average of about 37 acre-feet (12,056,500 gallons) per year. The amount of groundwater that can be developed in this watershed would be expected to be about 6 acre-feet (1,955,100 gallons) per year.

The best strategy for developing water wells in this area is to spread wells out in the watershed to the extent possible. The hardrock wells produce water from interconnected fractures in the hardrock, which are not considered to be an aquifer.

Evapotranspiration losses in the watershed can be decreased by clearing and/or thinning of vegetation. For example, clearing of 20 acres of conifers in the watershed could reduce evapotran-

spiration by about 23 inches per year, or 38-acrefeet per year on the 20 acres. This would increase the runoff to 45 inches per year, if no other plants were not allowed to grow. This would increase groundwater availability by about 23 inches per year times 10 to 20 percent. For the 20 acres, this would equal about 4 to 8 acre-feet per year.

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