MEMORANDUM

Overview of Design Considerations and Design Criteria for the Donner Summit Waste Water Treatment Plant

To: **Board of Directors**
From: **Gene Bowles, Vice President of SLCWD Board**
Subject: **Overview of Design Considerations and Design Criteria for Donner Summit PUD Wastewater Treatment Plant**
Date: **December 11, 2010**

Purpose

Sierra Lakes County Water District has received questions from property owners and summit stakeholders relative to the level of added capacity being enabled by the proposed upgrade and expansion of the DSPUD wastewater treatment plant (WWTP). The basic concern is that our efforts to provide for additional users (Equivalent Dwelling Units or EDUs) may be inadvertently adding capacity that will accommodate large numbers of extra EDUs paid for by us, not future developers.

Three Stage Process

Addressing these concerns involves a review of the decision process used in determining the technology and planned capacity for the new plant. The proposed upgrade and expansion of the WWTP has involved a three-stage decision process (performed largely in parallel), each stage of which will be discussed in turn, with its implications for the ultimate plant capacity.

Technology Selection

The first major decision was related to the processing technology to be utilized. Because the State Water Quality Control Board has mandated more stringent controls on the levels of ammonia and nitrates in the plant's effluent, it was determined that the existing biological and treatment processes would have to be substantially upgraded. This results from the fact that the current Accu-Web process has not been able to consistently meet the previous mandates, which were significantly less stringent. Table 2-10 of the DSPUD Wastewater Facilities Plan ranked the various upgrade alternatives on a number of criteria. The Joint DSPUD/SLCWD Committee considered this information and visited three other treatment plants (Colfax, Truckee and Kirkwood) to discuss technologies, permit compliance and operational issues with the plant operators before deciding that a Membrane-Bio-Reactor/Ultra-Violet system best met the current and future needs of the Districts. Specific changes that improved sewage treatment effectiveness included:

- Expanding the front-end influent equalization storage by 350%, from .20 million gallons to .90 million gallons. This change was calculated to allow a smoothing of high weekend flows with lower weekday flows, facilitating a more constant processing rate through the plant, even during "peak week" conditions. This is

important because biological processes must be metered at relatively constant rates to achieve their highest efficiency.

- Incorporating propane heaters to elevate the temperature of the influent during cold winter months. By maintaining the influent temperature above 7° C, the bacteria in the biological reactor basins are able to maintain a high population density and can perform their function at an increased level of effectiveness.
- Changing to a Membrane-Bio-Reactor (MBR) process. This allows higher processing concentrations in the biological reactor basins and utilizes specialized filtering to prevent suspended solids from inadvertently escaping in the effluent. Kirkwood Resort has used an MBR process very successfully for several years in circumstances similar to ours: difficult weather conditions coupled with major weekly and seasonal load variations.
- Replacing the current chlorine disinfection process with UV light disinfection, resulting in a more straightforward process flow, without the complications and complexities associated with chlorine disinfection.

Treatment Plant Loading – increased capacity

With these process improvements in place, the next step was to size the plant to handle the increased number of EDUs. This step involves matching the biological processing capabilities to the projected biological loads and flows of the current plus future EDUs. That is, the proposed plant must be able to treat the fundamental sewage loads from the planned number of future EDUs (for the build-out of the Serene Lakes subdivision in the case of SLCWD). Because of the improvements incorporated in the processes (as detailed above), it was determined that the existing biological reactor basins were sufficient in size to process effectively the projected loads, with modeling calculations indicating less than 10% additional throughput available after full build-out. Put another way, the treatment process upgrades provided both the capability of meeting the new state requirements and the planned increase in EDUs without the need to invest in expensive new reactor basins. This was another reason that the MBR process was attractive. From a biological processing perspective, the proposed facility incorporates only modest additional expenditures to handle the increased loads due to more EDUs in the future.

Treatment Plant Hydraulics – handling peak flows

The third step involves sizing the plant to handle projected hydraulic flows in terms of gallons per day. In this case, the estimated flows from the EDUs must be combined with the peak flows of winter storms and springtime snow-melts. Storms and snow-melts produce runoff that infiltrates the sewer collection system, as much as doubling the weekly hydraulic flow that must be accommodated by the plant. This requirement is substantially independent of the biological loads mentioned above, because during these high flow events, the concentration of the sewage is greatly reduced. Lower concentrations allow the biological processes to keep pace, even with the higher flows. Sizing the hydraulic load capacity focuses on ensuring that key flow-oriented components of the plant (such as pipe diameters, pump sizes, the number of MBR filters, the UV disinfection flow capability, etc.) can handle peak storm and snow-melt events from a gallons-per-day perspective without becoming overwhelmed. These changes do

not increase the number of EDUs that can be handled by the underlying biological processes. So, although the maximum weekly flow capacity is being increased from roughly 400K gallons per day to 800K (to ensure effective processing to meet state requirements during peak flow events), this does not mean that the number of serviceable EDUs is being doubled. As mentioned earlier, the number of EDUs that can be serviced is constrained by the size of the biological reactor basins, which are not being expanded.

Of course, there are many other factors being taken into consideration by our consulting engineers from Eco:Logic. Many of these revolve around the weekly, seasonal and holiday variations in the loads and flows that must be accommodated. To determine the plant's required capacity, Eco:Logic analyzed actual plant data from 2002 to 2010, with the data adjusted to incorporate increased requirements due to the planned expansion in EDUs. The resulting statistical variability is very substantial, and, therefore, an appropriate safety margin must be designed into the process to ensure the ability to meet state requirements over a wide range of operating circumstances. To evaluate the sizing of the proposed plant, Eco:Logic utilized an industry-standard software simulator called Bio-Win to determine the most economic solution that would meet the challenging circumstances on Donner Summit with an appropriate margin for error.

Summary

In summary, a review of the decision-making process used in developing the proposed upgrade/expansion of the DSPUD wastewater treatment plant leads to the conclusion that it was logical and objective. At every juncture, economic considerations were balanced against the difficult task of meeting new, more stringent State requirements in the context of difficult weather conditions and challenging demand fluctuations. There is no evidence that it will enable significant additional capacity (above the planned increase in EDUs) that would be available to future developers at little cost.

For further detailed technical discussion of the relevant issues, please refer to Bill Quesnel's memorandum of December 11, 2010 entitled "Summary Design Considerations and Design Criteria for Donner Summit PUD Wastewater Treatment Plant."