ECO:LOGIC Responses to Comments by Joseph Gray
June 17, 2010

(Responses in Red Italics Following Each Comment or Group of Comments, as Appropriate)

Comments on Eco:Logic's "DSPUD Wastewater Facility Plan" of May 2010
Joseph Gray June 8, 2010

Eco:Logic's proposed 20.2 million dollar plant upgrade may be elegant, but it is also very expensive. A sufficient and affordable alternative would be to fix the plant, not expand it. Once fixed, a better understanding of the plant's capacity and a better use of equalization may lead to the desired 21% increase in future EDUs.

In addition to bringing the plant into compliance for existing connections, both DSPUD and SLCWD plan to accommodate a modest number of new connections, most of which would occur on existing approved lots. There would be no increase in the existing permit capacity for the plant.

An analysis must be completed to determine what portions of project costs are for upgrades for existing users versus expansion for new users. The intent is for each class of user to pay their fair share cost of the project. With new users included in the project, there should be economies of scale that would result in a lower cost to existing users as compared to a project that would upgrade the plant for existing users, but not provide capacity for any new connections.

There are Cheaper Alternatives
If one looks at fixing the current plant to meet the new Ammonia and Nitrate limits without increasing the capacity of the plant, then the cost is less than half the expense Eco:Logic is proposing. One comes to this conclusion by assuming a better use of equalization and by scaling back Eco:Logic's cost estimates to reflect current flows.

This suggested $8.3M "Just Fix It" solution includes many of Eco:Logic's proposals, including equalization, influent heating during the winter months, improved ammonia/methanol/soda feeding systems, reuse of the existing AccuWeb frames in a four stage process, and the use of UV disinfection. This "Just Fix It" solution saves money because it doesn't require new clarifiers, sludge handling improvements or any filtering upgrades.

The bottom line is that a careful read of Eco:Logic's report leads to an $8.3M "Just Fix It" solution, not the $20.2M solution they've proposed.

The suggestion that the plant can be "fixed" for existing users at a cost of $8.3M is not based on appropriate wastewater engineering analyses and cannot be presumed correct.

The Wrong Approach
One wonders, when reading Eco:Logic's plan for fixing and expanding DSPUD's treatment plant, whether a cost effective solution was actually ever considered. The report is well written, very persuasive, but misleading. If one reads the report while searching for what would it take to fix the existing plant, not expand it, then one would be disappointed. Fixing the existing plant, or even considering what capacity the existing plant could provide, is not addressed. In addition, the report doesn't take full advantage of the flow and load limiting potential of equalization.

As previously noted, both DSPUD and SLCWD plan to add a modest number of new connections, and that is the basis of the facilities plan. The study of an option to fix the plant for existing users was not included in the scope of work for facilities plan

preparation.

The facilities plan takes full advantage of equalization storage, subject to appropriate cautions and safety factors based on the uncertainties associated with future peak flows and the real-world difficulties involved in managing peak flow events as they unfold.

The expansion numbers are wierd
The assumptions for expansion do not make sense. DSPUD and SLCWD have asked for a 21% increase in EDUs,but Eco:Logic wrote the report assuming a 32% increase in peak flow and loading. Logic dictates that a 21% increase in hookups should be a 21% increase in peak flow and peak loading, not 32%. The 32% increase is not justifiable. In fact, as the existing peak flow includes I&I, and since one can assume that I&I will not increase with new hookups, then the peak flow should increase much less than 21%. Eco:Logic's 32% load increase assumption has driven Eco:Logic's cost estimates through the roof.

DSPUD is projecting an increase from 818 to 1150 EDUs. SLCWD is projecting an increase from 817 to 897 EDUs. Based on the combined totals, that is an overall 25 percent increase.

In the facilities plan, the maximum week flow and load are projected to increase by 21 percent and 33 percent, respectively, based on the additional flows and loads from the new connections in winter (ski season) peak flow events, when infiltration and inflow are minimal. The projected future peak hour flow of 1.7 Mgal/d is the same as the existing peak hour flow, presuming that both Districts will hold the line on infiltration and inflow as new connections are added.

The additional flows and loads related to new connections were calculated separately for each district, based on actual per-EDU flow and load characteristics for the two districts determined in the Joint Engineering Study on Wastewater Flows and Loads completed in June 2004. As documented in that study, per-EDU flows and loads are somewhat different between the two districts. A simple proportional increase in flows and loads based on the total number of EDUs for both districts would not have reflected these differences.

While the 33 percent increase in projected load is somewhat greater than the 25 percent increase in total EDUs, the 21 percent increase in flow is somewhat lower. It is noted that the difference between the load projection in the facilities plan and a load projection proportional to the total number of EDUs would be only 6 percent (1.33 vs 1.25). The slightly more conservative load projection used in the facilities plan is believed to be appropriate and would not result in a substantial increase in project costs compared to an EDU-proportional assumption as suggested.

The $12 million Expansion, Who Pays for it?
Eco:Logic's assumption that the plant needs to process 32% more loading to handle a desire for 21% more EDUs more than doubles the cost from the "Just Fix It" $8.3M solution to Eco:Logic's proposed $20.2M solution. Do the rate payers really want to pay $11.9 million for future expansion?

If DSPUD plans to charge the $11.9 million to new ratepayers, then each new hookup will cost $30,000. Will there be buyers for these new EDUs? Will DSPUD "bankroll" the $11.9 million expansion until someone buys the new hookups?

As noted previously, the cost of a “Just Fix It” solution cannot be presumed to be $8.3M

and costs will be appropriately allocated between new and existing users.

SLCWD should pay less for the Upgrade/Expansion
The report also claims that each new DSPUD hookup contributes twice the peak flow and peak load than each new SLCWD hookup contributes. Why is this? Does Eco:Logic assume Serene Lakes Cabins are somehow more efficient than DSPUD cabins? Is Eco:Logic assuming that new DSPUD hookups will be resort/commercial hookups and those are somehow more "loaded"? This lopsided flow/loading per EDU does not make sense. A new EDU should be a new EDU, independent of its SLCWD or DSPUD source.

The statements regarding relative flows and loads are incorrect (see Table 1-5 of Technical Memorandum No. 1 in Appendix A). See previous response regarding the determination of per-EDU flows and loads for each district.

If one does use Eco:Logic's EDU numbers, then SLCWD's share of the flow and load expansion is only 10% of the total flow/load increase. This means that SLCWD should only pay 10% of the $11.9M expansion cost. Add SLCWD's contractual 46% share of the "Just Fix It" upgrade cost of $8.3M to 10% of the $11.9M expansion cost, and SLCWD's share of the project is only $5 million. DSPUD needs to pick up the remaining $15.2 million.

The conclusion is, if DSPUD pursues the $20.2 million upgrade/expansion, then SLCWD should only pay $5M as its share.

See previous responses regarding allocation of costs.

What is the "just fix it" upgrade?
The objective of the "Just Fix It" upgrade described here is to look at what can be done to make the current plant meet the new effluent quality limits while assuming that the current flow and influent loading doesn't change.

The needed improvements, according to Eco:Logic's report, are: to add equalization, to heat the influent as necessary, to improve the ammonia/methanol/soda feeding equipment, to switch to a four stage biological process, and to improve disinfection. What Eco:Logic does not address is how the current plant can be retrofitted to meet these goals without adding expensive new structures and equipment.

If one assumes the current flows remain unchanged, and equalization is added to limit peak flows, then the current plant should easily handle the improved four stage biological process using the existing AccuWeb frames and without building new clarification basins. The existing clarifiers in the center of the plants are reused, and the fourstage process is implemented by dividing the outer ring basins of each plant into four basins to handle the fourstage anoxic-aerobic-anoxic-aerobic processing steps.

Most of Eco:Logic's other suggestions for improving the operation or for enhancing the safety of the plant are incorporated in this "Just Fix It" solution, but scaled back to reflect the reduced peak equalized flows.

The "Just Fix It" upgrade and its costs are outlined below.

It cannot be presumed that reconfiguring the existing reactor volumes and continuing to use the webs would allow the plant to meet discharge requirements for existing users. This is discussed further in a subsequent response.

Peak flow and Loading after equalization
Eco:Logic shows in the equalization study (included in the report's appendix) that peak flows over the last 10 years can be drastically limited using equalization. They show that, with the exception of the 2005/2006 rain on snow event that caused I&I flooding through the system, the peak flow can be reduced to below 0.4MG/day by adding only 500,000 gallons of equalization storage (see figure A9 of the equalization report). Therefore, a 0.4MG/day peak flow limit seems quite reasonable considering the 700,000 gallons of equalization storage being proposed by Eco:Logic.

The unusually high flow event that occurred over the 2005/2006 holidays should be considered a 10 to 20 year anomaly. That year the daily peak flow spiked to around 1MG/day due to a freak "rain on snow" event. This unusuall event would be handled using what Eco:Logic describes in the report as the current plant's emergency plan:

As an example of emergency provisions for high flows, the DSPUD plant design in 1985 was

based on an equalized peak 3-day flow of 0.52 Mgal/d. However, the plant was designed to hydraulically pass the projected peak hour flow rate of 1.7 Mgal/d, in case the equalization storage tank was prematurely filled. In the event of such high emergency flows, treatment performance could be severely impacted, including the need to partially or fully bypass the filters. Any noncompliant final effluent could be routed to the emergency storage tank (for storage and subsequent re-treatment) until that tank is filled, but then would have to go to the river discharge.

The emergency plan should remain, i.e., if equalization storage is getting full, then treatment flows through the plant needs to be increased, even if full treatment can not be sustained. The partially treated effluent is stored in the1.6MG emergency storage tank and then routed back through processing when the peak flows subside. Note that even Eco:Logic's proposed $20.2M plan could not have handled the 2005/2006 event and would have to use this same emergency "overflow" procedure.

All of the relevant factors mentioned above, including the "unusual" nature of the 2005/2006 event were incorporated in the facilities plan analysis of flow equalization. Because the 2005/2006 event was rare, a safety factor that would normally be applied for a more common event was not applied to the volume determined from the 2005/2006 event.

Eco:Logic's proposed equalization technique unnecessarily increases peak flows

Eco:Logic has proposed using the equalization storage to perform "seven day flow averaging" instead of performing "peak flow limiting" as described in their previous report. Their flow "averaging" approach, which is much harder for plant operators to implement, results in higher post-equalization peak flows than are needed. There is very little justification given for this new "averaging" approach other than it was used for the simulation of their "pet" four stage MBR process. Eco:Logic's proposed flow "averaging", when scaled by 32% to allow for growth, results in a peak flow of 0.72 MG/day, much higher than the 0.4MG/day achieved by simply peak flow limiting. Even if the 0.4MG/day limit is scaled up by 32% to allow for growth, the limit should be 0.52MG/day, not 0.72MG/day.

As a result, Eco:Logic analyses the wastewater treatment options assuming 0.72 MG/day as the post equalization peak flow. In contrast, the "Just Fix It" design assumes a peak flow of 0.4MG/day, thereby drastically reducing the cost of the upgrades.

The peak flow equalization also limits the peak BOD loading. Rather than the 1100Lb/day loading used by Eco:Logic in their simulation (see Figure 9-19), the peak loading for a "Just Fix It" solution is only 500Lb/day.

There has been no change in the proposed use of equalization storage. Equalization storage is used for two important functions: 1) to smooth out the normal hourly and day-to-day flow and load variations that the plant must process; and 2) to limit the maximum flow through the plant in peak flow events. The first function greatly improves plant reliability and ease of operation continuously throughout the year. The second function only occurs during extreme peak flow events.

As discussed in the facilities plan, if the equalization tank were used only to trim peak flows in excess of plant capacity, it would remain idle most of the time and may not be used at all in a given year. In essence, the District would not be taking advantage of a valuable resource. The concept proposed in the facilities plan is consistent with best wastewater treatment practices and is the current mode of operation.

Regardless of whether the equalization tank is used continuously for flow and load smoothing or used only for peak flow trimming, the theoretical volume requirement would be the same for the same peak flow assumption. However, it is agreed that a larger operational safety factor would be appropriate in the former case. Nevertheless, we do not understand the basis of the assertion that the flow could be limited to 0.4 Mgal/d based on peak flow trimming as suggested. Limiting the plant design flow to 0.4

or 0.52 Mgal/d is considered to be highly risky and inappropriate.

We do not understand the basis of the assertion that the peak BOD load would be 500 lb/d under the "Just Fix It" solution. With the large difference between peak week and peak month loads, it would be risky and inappropriate to design the plant only for the peak month average load.

Equalization Cost
The 700,000 gallon equalization storage system proposed by Eco:Logic is more than sufficient to limit the flows to 0.4MG/day. Eco:Logic's capital cost estimate of $950k is used for equalization.

Influent heating Cost
The influent heating system proposed by Eco:Logic is included at a cost of $740k. The actual cost may be much lower when scaled to heat a 0.4MG/day flow rather than a 0.72MG/day flow.

Ammonia/Methanol/Soda Feeding Cost
The ammonia/methanol/soda feeding system improvements proposed by Eco:Logic are included at a cost of $420k.

Biological Treatment Cost
Eco:Logic examined two treatment options that used fixed media technology (IFAS) and one option using their "pet" MBR technology system. These options were examined with the 0.72MG/day peak flow and 1100Lb/day peak loading assumptions, not the lower 0.4MG/day peak flow and 500Lb/day peak loading of the "Just Fix It" goal. This means that the biological basin sizings in the report can be scaled back by 0.4/0.72 for flow or 500/1100 for loading to match the "Just Fix It" requirements.

The appropriate design peak BOD load (peak week average) for existing users only would be 780 lb/d, compared to 1035 lb/d with new users added (Table 4-1). Thus, the ratio is 780/1035, not 500/1100.

Eco:Logic determined that the IFAS processing options needed 511M gallons of reactor volume to meet the new effluent limits. When this volume is scaled back to reflect the "Just Fix It" flows and loads, the needed reactor volumes are between 232MG (scaled for load) and 289MG (scaled for flow). Since the current plant has 340MG of reactor volume in the outer treatment rings, the IFAS processing can fit into the outer rings and don't need to use the inner clarifier basins. This means that either IFAS option would fit easily into the current plant without the need to build new clarifiers.

The load ratio of 780/1035 should be used as noted above.

Eco:Logic emphasizes that treatment is a function of total suspended solids inventory as shown in table 9-5 of their report. When their "pet" MBR design's suspended solids inventory of 39,000Lbs is scaled back to reflect the lower peak loading of the "Just Fix It" goal, the MBR solids requirement drops to 17,000Lbs. An estimate of the current solids inventory for the existing AccuWeb frames (30 frames at 250 Lb/frame according to Brentwood, plus the suspended liquor solids of 7500Lbs) shows that the existing plant has around 15,000Lbs of solids, roughly equivalent to the scaled back MBR system. If the mixed liquor concentration is increased from 3,000mg/L to4,000mg/L, as Eco:Logic says is possible for the IFAS systems, then the current system will even have more suspended solids than the MBR system.

Having an adequate solids inventory is an important prerequisite to providing reliable treatment. However, solids inventory alone does not assure good treatment. The nature of the solids and the environment they exist in are critical. A vibrant population of desirable microorganisms in an environment that provides proper nutrients and other conditions for their growth is needed. Accumulations of undesirable microorganisms, dead biomass and inert solids can result in the desired solids inventory without providing desired treatment results. In the end, it is treatment performance that counts. At this time, adequate treatment performance with the webs cannot be assured.

Finally, there is no rational reason to get rid of the existing AccuWeb frames. Brentwood has discontinued them because of the redworm problem, but as DSPUD does not have a redworm problem, and due to DSPUD's climate and location, is not likely to ever have one, the existing frames are fine and should be reused in the new four stage configuration.

Eco:Logic also doesn't mention that IFAS systems are considered better for DSPUD's conditions because the large attached biological growths are more robust during wide temperature swings, and are less susceptible to washing out during peak flows.

The "Just Fix It" biological treatment cost can be estimated, using Table 9-4 as a guide, as: demolition and modification ($150,000), new anoxic mixer ($90,000) and new aeration facilities ($250,000). This total is $490,000.

These comments make unfounded presumptions regarding the treatment capacity available from the webs. It is not possible to predict the capacity and performance of the existing web-based IFAS system. The original system manufacturer, Brentwood Industries, states that they do not have a reliable model and that they have not developed calibration parameters and procedures that would allow the webs to be simulated using BioWin or other process simulation software. Furthermore, Brentwood discontinued offering the webs due to unreliable performance, particularly in regards to nitrification and the impacts of red worms. Red worms have been seen in the DSPUD system and, although they may not have developed to the extent noted in other problem plants, that risk still exists at DSPUD. Furthermore, whether due to red worms or other factors, the webs have not performed satisfactorily in the years they have been in use at DSPUD, leading to many permit violations for ammonia and nitrate. The other manufacturer of web-based IFAS systems, Entex Technologies, was invited to propose on developing an upgrade/expansion project for DSPUD, but, after careful consideration, Entex declined, indicating that a loose-fill media (such as the New IFAS alternative in the Facilities Plan) would be preferred. It is clear that the wastewater treatment experts that know the most about the capabilities of the webs, even those that would have a potential economic incentive to promote the use of the webs if it were believed they would be successful, are not recommending the webs.

Based on all of these factors, it would not be prudent for DSPUD to rely on the webs as it proceeds to upgrade its wastewater treatment plant.

Sludge Handling Cost
As the existing sludge handling and drying beds are adequate for the existing flows, no improvement cost is needed.

Filtering Cost
Eco:Logic's report only proposes additional filtering costs to add a backwash storage system. As the backwash storage system is only needed to prevent disruption during chlorine disinfection, and UV disinfection is being proposed for the "Just Fix It" solution, then no filtering improvement cost is required.

Disinfection Cost
DSPUD needs to avoid the byproduct contaminants introduced by their current chlorine disinfection system. In addition, as a safety issue, it is desirable to get rid of chlorine altogether. UV disinfection has no byproducts and requires no chlorine, and is better for the South Yuba River, and should be adopted. With the reduced equalized flows, the closed vessel UV system described by Eco:Logic will work for the proposed non-MBR solution. The closed vessel UV system also reduces the physical footprint of the disinfection system. Eco:Logic's cost of the closed vessel UV system ($700,000) is included.

It is agreed that UV would be effective in eliminating disinfection byproducts. However, it may be possible to mitigate disinfection byproducts at a lower cost using

chloramination, which the District is currently considering for testing. Both UV and chloramination remain as possible options.

UV disinfection does not remove contaminants of emerging concern, such as endocrine disrupting compounds and pharmaceuticals and personal care products. Ozonation is an effective treatment method for these contaminants and may be needed in the future. Therefore, it may make sense to use chloramination (if found to be effective) in the near-term future and then switch to ozonation in the long-term future.

Reduction in Miscellaneous Costs
The report does not justify the need for more office/shop space ($75,000) or a new standby power system ($300,000) which have been added to the Eco:Logic cost summary (Table 2-11). These should only be included ina "Just Fix It" solution if they are needed to meet the new effluent requirements.

The shop and office space needs have been established by the District and included in the facilities plan, as requested. With new electrical loads being added to the plant, new standby power facilities will undoubtedly be required. Also, the plant has two existing standby power systems, which were installed in the 1970s and 1980s and are at the end of their useful lives and must be replaced.

"Just Fix It" Summary
The total cost for the "Just Fix It" option is:

Item	Cost ($)
Equalization	950,000
Heating	740,000
Feeding	420,000
Biological	490,000
Disinfection	700,000
Total Capital	3,300,000
Electrical (25%)	825,000
Sitework (5%)	165,000
Site Plumbing (10%)	330,000
Subtotal	4,260,000
General Conditions, OH, profit (20%)	852,000
Subtotal	5,544,000
Contingencies (20%)	1,109,000
Subtotal	6,653,000
Engineering, Admin, Environ (25%)	1,663,000
Total	8,316,000

Based on the responses to comments provided herein, the costs developed above are based on unfounded presumptions and cannot be validated.

Conclusions
Unless DSPUD can find someone to pay for the $20.2 million upgrade, Eco:Logic's proposal should be thrown out in favor of a "Just Fix It" solution. DSPUD and SLCWD rate payers do not need to pay an extra $12 million for a modest amount of extra EDUs. The rational approach should be to fix the plant, and then see how many more EDUs it can handle.

In fact, the desired 21% expansion may be possible with the "Just Fix It" upgrade because the proposed 700,000 gallons of equalization storage is more than 21% greater than the 500,000 gallons needed for the 0.4MG/day flow limit. The additional equalization storage should be enough to absorb the 21% higher peak flows and still keep the flow through the plant below 0.4MG/day.

The question is: *Do ratepayers want to pay $20.2 million for elegant and expensive, or $8.3 million for adequate \and affordable? I think I know how the ratepayers would vote!*

The project proposed in the facilities plan has been developed based on sound engineering principles and with extensive input, review and guidance from both DSPUD and SLCWD. Although it would be possible to consider lower cost options, it is believed that the long-term interests of both districts are best served by pursuing a wastewater management system that is proven reliable and will provide the best performance reasonably possible for meeting existing and future regulations. Further experimentation with the web-based IFAS system is not recommended.

Both districts desire to serve existing users as well as a moderate number of new users. Future evaluations will be completed to determine appropriate cost allocations to all users to be served.