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June 21, 1995
RG:0120

Mr. Manabu Tagomori
Department of Land and Natural Resources
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Tagomori:

Draft Summary Report
Ala Wai Canal Improvement Project
Well Drilling, Installation and Testing Program
Honolulu, Oahu

In response to your letter and request of June 2, 1995, we have reviewed the Draft Summary Report of the Ala Wai Canal Improvement Project Well Drilling, Installation and Testing Program. This report describes the testing program undertaken to examine the feasibility of using deep, salt water wells, from along Kapahulu Avenue next to the Honolulu Zoo, as a source of water to improve the flushing and water quality of the Ala Wai Canal.

This review was completed with the assistance of Frank Peterson, Geology and Geophysics; Hans-Jurgen Krock, Ocean Engineering; and Tom Hawley, Environmental Center.

General Comments

One of the general comments frequently expressed by those reviewing the various environmental documents and feasibility studies of the Ala Wai Improvement study has been the lack of specific water quality goals against which the multiple flushing schemes can be evaluated. Certainly setting some specific goals is essential to establishing parameters on which to evaluate the feasibility of the various pumping schemes to meet the necessary water quality parameters. In the many meetings of the technical committee, a generic standard was used that revolved around establishing conditions similar to the present ambient conditions off the Ala Wai Boat Harbor. The present Draft Summary Report makes no mention of specific objectives regarding the water quality of the Ala Wai Canal and refers to the initial goals of the project "to standards acceptable for water-based recreational activities such as canoeing, kayaking, and fishing". Unfortunately, without reference to some specific water quality indicators, it is unclear how the proposed salt water flushing would contribute to a given level of water quality in the

canal. As we have discussed in our meetings, to truly clean up the Ala Wai Canal, three separate issues must be addressed: (1) quality of the water column, (2) toxic sediments and trash on the canal bottom and (3) input of sediments, trash and toxic chemicals throughout the drainage basin. The present well pumping tests were designed to address the first issue only. Given that the salt water flushing project will entail considerable initial capital costs plus very high energy costs to operate, it is imperative that tangible water quality goals for the project be formulated before work begins.

Of particular concern, with regard to setting these goals and evaluating predicted modifications to existing water quality conditions, is the model used to describe the existing situation and predict the expected conditions with respect to the chlorophyll-a concentrations in the canal. As was noted in the model report, the model did not successfully describe the existing chlorophyll-a data. A closer look at the extensive and excellent data base produced for this study by the Oceanic Institute shows that high chlorophyll-a levels are associated with high fresh water inflow and low chlorophyll-a levels are associated with background fresh water inflow (i.e., non-flood flow). This pattern is opposite of what would be predicted by applying the assumptions used in the model (light limitation and residence time limitation, but no nutrient limitation). During high surface flow, the water in the Ala Wai is highly turbid and has a short residence time--conditions that the model predicts should result in low chlorophyll-a concentrations. A probable explanation for the high chlorophyll-a concentrations actually observed during this time is that the chlorophyll-a is coming in with the surface flow from the stream water, the stream bed, and from land plants.

This means that the chlorophyll-a data taken during times influenced by significant surface flow should not be lumped together with the data taken during background flow conditions. Furthermore, this means that the model used to evaluate the potential effectiveness of the proposed salt water flushing system is not appropriate and that answers derived from that model are unlikely to be accurate. For example, an evaluation using the model of the effect of reducing the volume of the Kapahulu end of the Ala Wai by reducing the average depth of this section from about 3.5 m to about 2.0 m showed no improvement with respect to chlorophyll-a concentration. However, in reality, such a reduction in the "dead volume" of this section of the canal would, logically, clearly increase the fraction of water exchanged due to the tide, reduce the residence time of the entire canal, and thereby must reduce the chlorophyll-a content.

The overall result of this set of water quality studies associated with the Ala Wai is that the large majority of the water quality problems are land derived. The proposed flushing system would be ineffective in addressing such problems, rather, the effort (and money spent) should be focused on water shed management, as well as, street and stream cleanup.

Well Drilling, Installation and Testing Program

Some serious questions have been raised by our reviewers with regard to the interpretation of the results of the test borings (Appendix A) report. We have serious

reservations that an 8-hour pumping test, at rates of well less than 10% of the intended design extraction rate, is sufficient to evaluate subsidence potential for the area. Secondly, monitoring well data show some inconsistency with the concept of a deep aquifer effectively separated from shallow groundwater. For example, tidal efficiencies are consistent with increasing distance of the monitor wells from the ocean (that is the highest efficiency in MW6 and lowest in MW5), however, mean heads and salinity profiles are consistent with both MW6 and MW5 being close to a source of ocean water. This could be explained by the proximity of MW5 to the Ala Wai Canal and hence possible communication with the sea water in the canal. However, since the canal is shallow and certainly well above the deep groundwater body where the heads and salinity profile data were obtained, it is unclear how this communication with the Ala Wai Canal water can be explained unless there is communication between the shallow and deep groundwater in the vicinity of MW5. These conflicting results are not explained in the Tom Nance report.

Also, the final well design assumes a deep aquifer extraction zone from about 150-350 feet. What assurance is there that the highly permeable coralline material encountered from 150-250 feet extends to 350 feet? Are there well logs to substantiate this? This issue needs to be clarified, as does some of the methodology used to extrapolate final design values of well size, depth and discharge from the pump test data. It is not clear how these values were obtained.

Based on the results of the pump tests and our continued concern as to credibility of the model predictions, we remain greatly concerned that the volumes of water that have been estimated to be required, may not be correct, may not significantly improve the water quality of the canal, and could lead to damaging subsidence in adjacent areas. Furthermore, the results of these studies strongly suggests that the risks and costs associated with the proposed salt water flushing system may significantly outweigh the possible benefits, especially since the predictions of those benefits are made with a model that is questionable.

Sincerely,

Jacquelin N. Miller

Jacquelin N. Miller
Chairman, Ala Wai Technical Committee
Associate Environmental Coordinator

cc: OEQC
Roger Fujioka
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