GET Committee

From: James Kumagai <jskumagai@gmail.com>
Sent: Thursday, May 16, 2019 11:22 AM
To: GET Committee
Cc: Michael.Victorino@co.maui.hi.us; Maui_County Council_mailbox; Kelly King; Keani N. Rawlins; Tasha A. Kama; Riki Hokama; Mike J. Molina; Alice L. Lee; Tamara.Patlin@mauicounty.us; Shane M. Sinenci; Yukilei Sugimura
Subject: GET-26 - Hawaii Wildlife v. County of Maui
Attachments: Maui Injection Wells. Testimony. Kumagai, Krock, Moreland 5.16.19.pdf

See attached. Maui Injection Wells. Testimony. Kumagai, Krock, Moreland. 5.16.19

May 16, 2019

Mr. Michael Molina, Chair, GET Committee
Members of GET Committee
County of Maui Council
Email: Get.committee@mauicounty.us
County.clerk@mauicounty.us

Subject: GET-26 - Hawaii Wildlife v. County of Maui, U.S. Supreme Court Docket No. 18-260,
CC-19-224 and CC-19-225 - Hawaii Wildlife v. County of Maui

Dear Honorable Council Member Molina and Members of the GET Committee:

We are a science and engineering public interest group consisting of licensed engineers listed below that would like to offer our opinions on the use of injection wells for wastewater effluent disposal at the Lahaina Wastewater Reclamation Facility and on the permitting issue involving the injection wells.

While we are not familiar with the complete details of the subject Supreme Court case, we feel compelled to respond based on our experience and on our belief that the applicable scientific and engineering principles are being ignored in the deliberations. In addition to our advanced degrees in civil/sanitary/environmental engineering, we have long experience in planning, permitting and design of wastewater treatment and disposal systems. Our experience in wastewater engineering includes extensive research and evaluation of wastewater effluent disposal systems and their impacts to coastal water ecosystems. We collectively have over 120 years of experience in the water pollution control field. We currently are not involved in any work or contracts with the County of Maui and have no conflicts of interest.

We would like to preface our comments with some introductory remarks. We feel that it is helpful to look back and understand the underlying science and engineering that served as the basis for the environmental legislation enacted in the 1960s and actions that followed in the 1970s and beyond. We recommend a holistic approach in addressing wastewater disposal issues to identify and implement cost-effective actions that benefit all stakeholders and the environment. A holistic viewpoint considers all sources of pollution, not only the point sources, but the non-point source pollution (stormwater runoff), climate change impacts, and other diffused sources, and then looks at overall land/watershed integrated management. There is a clear need to "evaluate the entire forest rather than focusing on a single tree." We feel that all stakeholders can benefit from avoiding unproductive permitting bureaucracy and "tunnel vision" permit requirements that unnecessarily limit disposal and management options. We strongly believe what Barry Commoner stated decades ago regarding ecology and the environment is still relevant: "Everything is connected to everything else. Everything must go somewhere. Nature knows best. There is no such thing as a free lunch."

Background on Water Pollution Control in Hawaii and Use of Injection Wells on Maui.
In the 1960s, Oahu had major water quality problems stemming from wastewater discharges from the construction boom that occurred with statehood. There were more than 40 wastewater

treatment plants and disposal systems hurriedly constructed, many of which were discharging directly to streams, harbors, bays and nearshore waters. After comprehensive data gathering and analysis, the landmark "Water Quality Program for Oahu" (WQPO) study was completed in 1972. The identified solution evolved following Barry Commoner's "laws of ecology" by directing all wastewaters discharges where they will do the least harm to the environment or where they might do some good as in reclamation and reuse. Everything must go somewhere. The resulting management plan was elimination of all wastewater, including treated wastewater, that were being discharged to inland and nearshore waters and diverting them to the deep ocean regime or to applicable reuse systems. New regional plants with deep ocean outfalls were constructed. Adverse marine ecosystem impacts from the discharges were eliminated by allowing natural biodegradation of organic material and recycling of nutrients to occur far offshore away from the sensitive and ecosystems rather than relying on the application of technology alone. Nature knows best. The result was deemed to be the most cost-effectiveness for the major discharges recognizing that there is no such thing as a free lunch.

Maui took a different approach under Mayor Elmer Cravalho. Scale was a factor also. It was determined that treated municipal wastewater was a valued commodity that could be used for agricultural irrigation. The water was needed. In Lahaina, the Kaanapali Resort that was under development and required irrigation water for the resort landscaping and golf courses. Sugarcane bagasse was already being reclaimed for electric power generation and there was already a strong impetus for reclamation of wastewater for irrigation. A backup effluent disposal system was required, however, for periods when irrigation water was not required or when operational problems resulted in inadequate recycled water quality. Injection wells were identified as being cost-effective as the supplemental/backup effluent disposal system.

While irrigation is an ideal method for reusing treated wastewater, it is very challenging to reuse all of the effluent, all the time. A treatment plant that is able to meet peak dry season irrigation demands will have excess treated effluent during the wet season. Providing sufficient storage to balance seasonal demands is very costly and land intensive, and can also be problematic due to algal growth in reservoirs due to nutrients in the effluent. Treatment facilities employing cost-effective water reclamation effluent disposal require an alternate back-up disposal method, such as a deep ocean outfall or injection wells used intermittently, depending on the scale of operation.

Concerns and Impacts Associated with the Use of Injection Wells.
Unlike deep ocean outfalls that discharge far off shore and have turbulent mixing, the plume of treated effluent discharged to inland injection wells typically moves toward the shoreline with less mixing and dilution, but fundamentally undergoes further treatment through the porous medium or substrata as a function of residence time. As in the case of Lahaina, the effluent is expected to rise to the groundwater surface due to the lower density (salinity and temperature) than the ambient groundwater. Seepage of the effluent into nearshore water is clearly not ideal and is understandably a repugnant thought to the public. There are valid concerns and potential impacts associated with survival and entry of wastewater pathogens, nutrients, and possible "emerging contaminants" such as pharmaceuticals and endocrine disrupters leaking into the shoreline waters.

It is unfortunate that injection wells have been extensively and sometimes indiscriminately used for wastewater disposal in Hawaii. There are situations, such as in Lahaina, that definitely deserve attention and scrutiny. While we agree that there is a need to take action to address the issue of injection wells in Hawaii, we recommend avoiding a "one size fits all" approach. We feel it would not be prudent to use a "gray area" permit interpretation to essentially ban the use of injection wells statewide. There is a time and place for them to play essential roles in environmental quality management systems.

We do not support "no action" for the Lahaina injection wells at this point and feel that studies to identify the most cost-effective actions moving forward would be appropriate. Although we are not totally familiar with the past litigation and research studies, we felt it would be helpful to offer the following input from a scientific/engineering point of view for consideration:

- The effluent discharged to the injection wells in Lahaina generally meets the stringent R-1 quality recycled water quality. The effluent is subjected to advanced treatment processes involving both filtration and UV disinfection. The effluent is of a quality such that if there were a spill, it would not be considered a "sewage" spill. The R-1 quality recycled water is suitable for use for dust control on roads. On the north shore of Oahu and in other areas, this type of high quality effluent is used for irrigation of vegetable crops. The highly disinfected effluent would not be expected to pose a significant health risk from seepage to nearshore waters.

- The high quality effluent discharged into the injection wells is subject to still more treatment as it migrates in the porous media towards the shoreline. It is our understanding that the dye injected in the wells took approximately three months to reach the shoreline. We feel there would be additional biological degradation, including some nitrogen removal, occurring within the porous geology. Public health protection would be further assured due to pathogen die-off resulting from the travel time and exposure to saline groundwater.

  We would expect microorganisms to reside on surfaces of porous coral or other geologic formations due to the presence of oxygen and organic matter (food for microorganisms). Some reduction of nitrogen in areas of low oxygen would be expected due to the likely presence of "denitrifying" bacteria that are able to convert nitrogen in the form of nitrates to nitrogen gas. We understand that nitrogen gas bubbles have been observed exiting from the seepage points. We also understand that when the County chlorinated the effluent, the nitrogen levels at the seepage locations increased. If so, that can be attributed to destruction of the beneficial denitrifying bacteria that promotes nitrogen removal.

  In the 1970s, EPA promoted the use of the soil mantle as a cost-effective treatment unit to take advantage of the natural degradation processes that can provide effective wastewater treatment. In the 1990s, the City and County of Honolulu built a trench disposal system for the Honouliuli Wastewater Treatment Plant to investigate the level of treatment that could be achieved in the subsurface porous geological medium that existed on site. The system unfortunately was not activated. More current subsurface

treatment research has focused locally on seepage from cesspools and septic tanks system, which have been shown to enter both nearshore waters and drinking water supplies. It would be helpful to pursue research on degradation and transformation of injection well effluent constituents in the various geologic formations encountered in practice in the islands.

- While increasing reuse of the effluent would be ideal, consideration should be given to the ultimate fate of nitrogen, the primary nutrient of concern, under various reuse scenarios. Increased irrigation of crops, groves of trees, or other vegetation would be a means of reducing reliance on injection wells. Some of the nitrogen, however, would still potentially be returned to the groundwater or surface waters through the decay of leaves, branches, fruits and roots as they normally do in nature. Both effluent and organic matter from vegetation could be washed into streams and storm drainage channels that discharge to nearshore waters. We would expect corals to be stressed following storm events due to the increased sediment load and low salinity fresh water from brown water conditions. It would be highly counterproductive to further increase the stress on coral by allowing algal blooms from high nutrient loading spikes occurring near stream and drainage outlets. In Waimanalo, noticeable algal blooms have occurred sporadically near the mouth of streams following storm events due to increased nutrients from stormwater runoff.

- It should be verified whether nitrogen or other suspected constituents are indeed the cause of problems with coral growth near the identified seepage points. It is our understanding that the low salinity of fresh groundwater seepage may impact coral growth and that low levels of nutrients in groundwater seepage may be beneficial to coral growth. In east Honolulu, more robust coral growth was found in the vicinity of the Hawaii Kai wastewater ocean outfall contrary to expectations. It was concluded that the higher nutrient levels encouraged the growth of benthic algae which in turn maintained the population of sea urchins to keep the ecosystem in balance.

  Hawaii's extremely stringent water quality standards (WQS) for nutrients and other constituents has resulted in elimination of virtually all wastewater discharges to inland water bodies. In Hawaii's WQS (Chapter 11-54), the nitrogen limits are well below that of the drinking water standards. For example, the WQS specify a geometric mean limit of 5.0 micrograms/liter for nitrate+nitrite (two forms of nitrogen), whereas the drinking water standards have a limit of 10,000 micrograms/liter for nitrate alone. In theory, it would not be acceptable to discharge drinking water into the ocean. It should be noted that Hawaii's deep ocean outfalls are able to meet the stringent WQS due to design features that effectively disperses the effluent within the regulatory "zone of mixing." Some injection wells in Hawaii could potentially operate similarly to outfalls if the particular geology channels the effluent to discharge far offshore, for example, from basal aquifers underlying caprock.

  Hawaii's WQS are based on extensive research and analysis. James E. Maragos served as the chair of the technical committee responsible for developing recommendations for WQS revisions in the 1960s and 1970s. Mr. Maragos authored a paper titled, "Revision

of Hawaii's Water Quality Standards: An Ecological Perspective." In the paper, he had the following statements:

> "The standards will need to be set at levels higher (less stringent) than levels indicative of ambient or pristine conditions but lower (more stringent) than levels indicative of ecological stress, health hazard, and aesthetic problems. A maximum effort will be made to consult and evaluate available water quality data in order to establish background levels in healthy/pristine and unhealthy/polluted areas for each category."
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> "One of the major objectives of water quality management is the protection of natural, ecological systems. The standards (and violations thereof) will serve as a "red flag" or warning that ecological, health, or aesthetic water quality problems exist. It will then be the responsibility of the enforcing agency to determine whether the violation is caused by man and to decide whether the violations should be eliminated or exempted. The decisions will be based upon various "public interest" considerations, and decisions will probably be made on a case-by-case basis. Obviously, not all violations will lead to remedies nor will all be prohibited." It seems likely that some existing "violations" will be "grandfathered" for lack of reasonable ecologic alternatives and justification. A more realistic objective will be to use the revised standards to correct and prevent future violations and then work backwards towards rectifying significant existing water quality problems."

The above statements indicate that the original intent of the WQS was that violations would serve as a warning sign and that there would be some flexibility in addressing the violations. The standards are intended to promote holistic environmental quality management. An intent to eliminate all injection wells through restrictive permitting requirements based on the stringent WQS would be inconsistent with a cost-effective holistic approach to environmental management.

"Point" vs. "Non-point" Source Pollutant Emissions.

The issue regarding Maui's Supreme Court case centers around whether the detected nearshore seepages from the Lahaina injection wells are considered a point or non-point discharge. At the outset of the passage of the 1972 amendments to the Clean Water Act (CWA), the focus was clearly on point sources and there was no question as to what point sources were. Everything that was not a point source was classified as a non-point source.

The legislative history of the 1972 Amendments to the Water Pollution Control Act amply emphasized the importance of including non-point sources of pollution for a complete and integrated environmental management system. To serve that end, both DOH and EPA Region IX collaborated in the 1970s to address this important issue through the Section 208 provisions of the CWA. The Section 208 planning emphasized a holistic approach to waste management on

an areawide basis from input and recommended solutions from all stakeholders at the federal, state, and county levels of government and the private sector. However, the focus was on the immediate issues, and the effort fell short of dealing with the longer term problems. It appears that the time has come to revive this effort.

Ramifications of Requiring an NPDES Permit for Injection Wells.
We feel that NPDES permits that were originally intended for point discharges are not appropriate for regulating injection well discharges associated with seepage into coastal waters. Particularly due to Hawaii's extremely stringent WQS, point discharges are required to be provided with the mechanics of a "zone of mixing" within which the WQS can be exceeded. It is a creation of the regulatory system which works for the current receiving water environment. Monitoring to determine compliance is based on water quality samples taken at the boundaries of the zone of mixing and not at the end of pipe.

In contrast, identification of the precise location of injection well seepage points would be challenging, and the "zones of mixing" is simply not applicable. The science and engineering are significantly different. The application of end-of-pipe limits based on Hawaii's WQS will not work as a regulatory artefact. Ultimately, the result will be the need to utilize an alternative disposal method. The low limits that must be achieved would be virtually impossible and cost-prohibitive regardless of the treatment technology.

Reusing all or nearly all of the effluent from a treatment facility to eliminate use of injection wells would be very costly and difficult due to the need for an alternate wet weather backup disposal system (such as an ocean outfall) or extensive storage capacity. Moreover, an expanded reuse option would need to address the potentially adverse impacts associated with runoff from large irrigated sites during storm events. As a practical matter, reclamation and reuse will no longer be a viable option in wastewater management.

Any requirement that completely eliminates injection wells would have significant financial impacts, which in turn would have adverse environmental and social impacts. It is our understanding that eliminating the use of injection wells at the County's treatment plants could be well in excess of $100 million for the capital costs alone. This would likely result in funds being diverted from much needed non-point source pollution control efforts, for example, for reducing sediment loads in nearshore waters to benefit coral growth and coastal ecosystems.

Instead, watershed management and erosion control projects would be much less costly and may offer substantially more benefits than projects aimed at eliminating injection wells. Upper watershed management projects, such as fencing to reduce erosion from ungulates and restore native vegetation, can have multiple wide-ranging benefits such as reduction of erosion and sediments (cleaner water for tourists and ecosystem), improved groundwater recharge and stream flow, less flooding, and improved habitats for endangered species.

Moreover, higher sewer fees resulting from costly reuse projects to eliminate injection well use will have socio-economic impacts as financial stress on families. In turn, it can contribute to homelessness, hunger issues, and various social problems. The effects can be far-reaching.

It is best to keep open the injection wells as options for achieving and maintaining net positive gains in water quality management.

Recommendations Moving Forward.
We recommend that Maui not withdraw from the subject Supreme Court case. We understand that various EPA regions have different interpretations regarding the requirement for NPDES permit for injection wells and similar subsurface discharges. A ruling at the highest judicial level would eliminate confusion on this issue and avoid costly future litigation in Hawaii and elsewhere in the country. The requirement for injection well NPDES permits may severely restrict disposal and management options and may require significant expenditures for alternative systems that may result in little or no additional public health and environmental benefits, or at worst, cost more for less.

Regardless of the outcome of the Supreme Court case, we recommend that further investigations be conducted for the Lahaina injection wells. Some actions that could be considered include the following:

- Use the injection wells that did not show seepage of dye into coastal waters. These wells may be discharging effluent further offshore where impacts are minimal and acceptable. Monitor the identified seepage locations to determine if there are noticeable changes to the ecosystem over time. There is still more to learn from this experience.

- Conduct studies to better define the factors impacting coral in the vicinity of the seepage discharges. Investigate the impact of other coral health factors such as sediments from stormwater runoff, low groundwater discharge salinity, and emerging contaminants (pharmaceuticals and endocrine disrupters).

- Alternate the use of the injection wells as there may be less impacts from intermittent, rather than continuous seepage discharges to nearshore waters.

- Increase the reuse of recycled water where feasible and reasonably cost-effective to reduce the volume of injected effluent.

- Perform a holistic water quality evaluation involving all stakeholders. Implement EPA's new Integrated Planning Program (https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater), which was developed to improve allocation of limited funds as EPA recognizes that municipalities are faced with multiple water quality challenges and finite resources, and that the highest priority projects should be implemented first. This program promotes cooperative prioritization of funds and projects among agencies, regulators, lawmakers, environmental groups and the general public. The program is designed to empower local community stakeholders in setting priorities, evaluating affordability issues, and incorporating sustainable technology and green solutions

We would be happy to provide further input and respond to any questions that you may have. The primary contact for these comments is:

James S. Kumagai
Phone: 808-226-3779
Email: jkumagai@hawaii.rr.com

We appreciate the opportunity to provide input on this critical environmental issue.

Sincerely,

for:

James S. Kumagai, PhD, PE
Hans J. Krock, PhD, PE
Victor D. Moreland, PhD, PE

c: Michael.Victorino@co.maui.hi.us, Mayor Michael Victorino
County.council@mauicounty.us
Kelly.King@mauicounty.us, Council Chair
Keani.Rawlins@mauicounty.us, Council Vice-Chair
Tasha.Kama@mauicounty.us, Presiding Officer Pro Tempore
Riki.Hokama@mauicounty.us, Councilmember
Alice.Lee@mauicounty.us, Councilmember
Mike.Molina@mauicounty.us, Councilmember
Tamara.Paltin@mauicounty.us, Councilmember
Shane.Sinenci@mauicounty.us, Councilmember
Yukilei.Sugimura@mauicounty.us, Councilmember