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STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
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DAWN N.S. CHANG
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DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

Testimony of
DAWN N. S. CHANG
Chairperson

Before the House Committee on
FINANCE

Tuesday, February 28, 2023
10:00 AM
State Capitol, Conference Room 308 & Videoconference

In consideration of
HOUSE BILL 905, HOUSE DRAFT 1
RELATING TO SUSTAINABLE GROUNDWATER YIELDS

House Bill 905, House Draft 1 proposes to (1) require the University of Hawaiʻi (UH), in consultation with the Commission on Water Resource Management (Commission) of the Department of Land and Natural Resources (Department), to develop a scope of work and cost analysis to complete a flexible groundwater model that proposes methods for determining the needs of traditional and customary Native Hawaiian practices, climate change history and projections, and groundwater ecosystems; and (2) UH, in consultation with the Commission submit a report of its findings, recommendations, and scope of work and costs, including any proposed legislation, to the Legislature no later November 1, 2023. **The Department supports this measure and offers the following comments.**

The Commission regulates groundwater in the State of Hawaiʻi using aquifer sustainable yields as the basis to manage withdrawals from aquifers. The Commission has an affirmative duty to protect traditional and customary Native Hawaiian rights as provided for in article XII section 7 of the Hawaiʻi State Constitution and in Hawaiʻi Revised Statutes 174C-101. The Hawaiʻi Supreme Court in its seminal opinion in "*Waiāhole I*"[1] further clarified that the protection of traditional and customary Native Hawaiian rights is a public trust purpose. Additionally, in the case of *Ka Paʻakai O Ka ʻAina vs. the Land Use Commission*[2], the Hawaiʻi Supreme Court created an analytical framework for addressing the preservation and protection of customary and traditional native practices specific to Native Hawaiian communities. For the Commission to adequately fulfill its

[1] 94 Hawaiʻi 97 (2000)
[2] 94 Hawaiʻi 31 (2000)

constitutional duties and assess the Ka Paʻakai analysis, a better understanding of future projections of sustainable yield along with shoreline groundwater seepage impacts is critical.

Further, a preliminary United States Geological Survey (USGS) report indicates that mid-century rainfall and aquifer recharge will decrease, thus reducing the availability of fresh water in the aquifer and consequently coastal discharge, which then has the potential to impact groundwater dependent ecosystems that support traditional and customary Native Hawaiian practices.

Finally, in our collective research efforts with the UH Water Resources Research Center and USGS, we note that water modeling can be an intensive process that requires proper data sets to develop.

Mahalo for the opportunity to provide testimony in support of this measure.

HOUSE COMMITTEE ON FINANCE

February 28, 2023 10:00 AM Conference Room 308

In SUPPORT of HB905 HD1: Relating to Sustainable Groundwater Yields

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Aloha Chair Yamashita, Vice Chair Kitagawa, and Members of the Finance Committee,

On behalf of our 20,000 members and supporters, the Sierra Club of Hawai‘i **SUPPORTS** HB905 HD1**,** which would help to generate critically needed information to uphold the public trust in our water resources, and ensure the future resiliency of our islands.

Water is our most precious resource – as has been made abundantly clear through O‘ahu’s water contamination crisis, and in the growing impacts of the climate crisis on rainfall patterns, watershed integrity, and the water cycle. Our constitution accordingly establishes water as subject to the public trust doctrine, and the State Water Code requires the state to assess the “sustainable yield” of our groundwater resources to ensure that groundwater withdrawals do not unduly compromise the water needs of established public trust purposes, and of our future generations.

Unfortunately, as recognized in this measure, our islands’ often complex hydrogeology makes an accurate assessment of “sustainable yield” for groundwater difficult as a general matter, and the Water Commission’s past practices in establishing sustainable yields have also largely failed to account for water needed to sustain Native Hawaiian traditional and customary practices – a highly protected public trust purpose – as well as the projected impacts of climate destabilization. Notably, an accounting for the water needs of Native Hawaiian traditional and customary practices, such as kalo cultivation and the gathering of nearshore resources such as limu and fish, may be critical to perpetuating traditional ecological knowledge, practices, and values recognized by climate experts as the key to our islands’ food and water security. Moreover, an accounting of sustainable yield that ensures the availability of sufficient groundwater for Native Hawaiian traditional and customary practices will also ensure that the resources and ecosystems these practices rely upon – including our streams, watersheds, and reefs – remain intact, providing an additional necessary foundation of security, resiliency, and self-sustainability for our Hawai‘i nei.

Therefore, this measure’s proposed research investments and directives to develop a more accurate and fuller accounting of our groundwater resources may be critical not only to upholding our constitutional and statutory obligations and commitments under the public trust doctrine and State Water Code, but also to ensuring a livable, resilient, and sustainable

SIERRA CLUB OF HAWAI‘I

home for ourselves, our keiki, and future generations.

Accordingly, the Sierra Club of Hawai‘i respectfully urges the Committee to **PASS** HB905 HD1. Mahalo nui for the opportunity to testify.

<u>HB-905-HD-1</u>
Submitted on: 2/25/2023 11:24:18 AM
Testimony for FIN on 2/28/2023 10:00:00 AM

Submitted By	Organization	Testifier Position	Testify
Cards Pintor	Individual	Support	Written Testimony Only

Comments:

Aloha,

I support this bill.

Mahalo nui,

Cards Pintor

Restore the Commons

Monday, February 27, 2023, 11:30 am

House Committee on Finance

HOUSE BILL 905 – RELATING TO THE SUSTAINABLE GROUNDWATER YIELDS

Position: Opposition

Me ke Aloha, Chair Yamashita, Vice-Chair Kitagawa, and members of the House Committee on Finance:

HB905 HD1 calls for a study by "the University" to develop a "flexible" ground water model to accommodate native Hawaiian practices.

This bill reflects an ignorance of sustainable yield and the application of a ground water model to the management of water resources. As a 25 year veteran of the Commission on Water Resource Management, Ground Water Regulation Branch, I have regularly encountered individuals who are great advocates of traditional and customary Hawaiian practices but show poor understanding of ground water or surface water hydrology, and more often than not completely misplace their efforts. In the main cases of judicial precedent, imported and imprudent practices impinging on traditional and customary practices have been corrected by applying the remedies of the Water Code. Enforcement continues to be an issue.

It bears noting that traditional and customary practices are tied to surface water flows. Native Hawaiians did not use ground water, although they relied upon nearshore behaviors of plants and animals affected by nearshore ground water discharge, which are accordingly and statutorily protected by the ground water model used by the Commission staff in managing sustainable yield. It should also be noted that ground water dependent ecosystems were the subject of a special symposium in Keauhou, whose efforts are incorporated in the Water Resource Protection Plan (see also below). These are of clear connection to traditional and customary practices, but not related to ground water modeling.

A contested case properly concluded that nearshore fisheries are less affected by ground water withdrawals than by rainfall, while in some places they may be affected by excessive surface water withdrawals. They clearly are massively impacted by poor land management leading to polluted runoff, and by injection of wastewater. Someone is ignorant or confused, or has an axe to grind.

It may also be that mismanagement at the top, which has caused the Commission staff tremendous difficulties and untimely departures, has succeeded in the time-honored Repugnican way of debilitating a highly respected management system in order to substitute preferred conclusions, to "succeed" where earlier attempts to derail standard procedures have failed.

There is no such thing as a "flexible" ground water model. The Robust Analytical Model (RAM) currently in use and judiciously applied incorporates entirely half of the sustainable yield into a protected (unused) status. Staff has also worked extensively with modelers using other approaches, and deflected self-serving efforts to get lucrative contracts that produce no improvements. Bear in mind that very expensive numerical models have been developed that are only as good as the specific local data that goes in, and the result is merely another decimal point of confidence in what RAM already provides. For those curious about how "simple" this model is, John Mink's explanation of its derivation is appended below.

As actual water use approaches sustainable yield, there are statutorily-mandated discussions regarding how to manage available water without transgressing protected surface or ground water. In addition are statutorily-mandated thresholds for prohibiting additional use, following which are stern tests for competing applications. Certain land owners have run afoul of allotted use, creating a constant battle to protect native habitat and traditional Hawaiian practices. Certain other parties also dislike going through the process of conforming to standards applied equally across the board. The Commission has paved the way in water law to protect the Public Trust, with the welcome assistance of public trust lawyers. It has worked with Richardson Law School in protecting Hawaiian interests.

The Commission staff has worked for years with county water service departments to promote conservation – reflected in zero increased total use despite substantial population increase. Similarly, it has worked with county land planners to direct water use where it can be accommodated. Simultaneously, staff has promoted conservation, drought mitigation, rainfall modeling updates and integration into sustainable yields, and water shortage planning with all the interested players. Until recently, staff has kept ahead of the climate changes we are experiencing. All of these considerations and caveats, formulas and data, systems and processes are laid out in detail in the Water Resource Protection Plan, if you care to read and learn.

Mahalo for the opportunity to address this matter.

/s/ Charley Ice, senior Hydrologist 25 years, Commission on Water Resource Management, Ground Water Regulation Branch; previously DHHL planner 10 years, developer of water use program and liaison from the Chair to the Commission.

* * *

(from John Mink:

APPENDIX III

Derivation of the Robust Analytical Model

In porous media the governing equation of flow that combines the continuity relationship with Dar¬cy's Law is expressed as the following partial differ¬ential equation (for simplicity the equation is written in one dimension with constant hydraulic conductiv¬ity, k):

, r, , dhl d kh ,,

(1) t)

in which h is head of the water table above a pre¬scribed datum, X is distance along a streamline, k is hydraulic conductivity, S is specific yield, t is time, and W is a source-sink term. The term on the left contains the Darcy substitution for the mass balance relationship, which is

(2) S ■ S m «

in which q is specific flux.

In the above equation assume that all extractions, D, and sources, I, are independent of the x coordinate and operate such that the resultant groundwater flow is uniform throughout the extent of the aquifer, and further assume that ultimate leakage, L, at the coastline is a function of head. The source-sink term in equation (2) would then be expressed as W[I, D, L(h)]. The assumptions for D and I are not unreasonable for extensive basal aquifers of Hawaii in which transmissivity is very high and therefore the radius of influence of an extraction point is wide but shallow, and the major portion of recharge enters the aquifer from the wet mountain area. Leakage is known to be a function of head as explained below. Figure 1 illustrates the elements of the model for a basal lens.

The steady-state balance equation, given I>D, is

(3) Q = I - D = L

in which Q is total flow. Steady flow in a basal lens in conformance with Darcy's Law is

(4) Q = ky (B + 1) h

in which y is the constant width of the aquifer and B = gf/gs - gf, wherein gf is the density of fresh water and gs the density of salt water, so that in the normal ocean-fresh water system, B is approximately 40. In all ensuing equations (B + 1) will be replaced by 41, the constant employed commonly in Hawaii. Thus,

(5) Q = 41kyh g

for which, assuming discharge along a line at the sea coast (h = 0, X = 0), the solution is

Under steady-state conditions the assumption of a line discharge makes no material difference in com¬puted leakage at any vertical section along the parabolic extent of the lens. In equation (6) Q is con¬stant and is fixed by the relationship between x and h. At any given distance from the coast the equation may be written as:

(7) Q = Ch^

for which c = 41ky/2x = constant.

Given the assumptions shown in Figure 1. equation (7) may also be expressed

2

(8) L = ch

At initial conditions when D = 0,

(9) 1 - Oo - Io

and therefore the constant c at a selected section would be

(10)C = iy

This system relationship is necessary for the solution of the balance equations.

Returning to equation (2) and assuming no change in specific flux in the x direction, the left-hand side of the equation becomes dq/dx = 0, and the whole equa¬tion becomes:

L(h)] = 0

What the above says is that at any given time a steady flow exists, so that the solution of h = f(t) applies to a succession of steady-states at a particular location, e.g., an observation well.

Equation (11), written in total rather than specific terms, is:

(12)41SA = I - D - ch^

' ' at

in which A is the lateral area of the aquifer. Let b = 41 SA, then.

(13) [--------- --------J- = i f dt

J I - D - ch bJ

Taking as the average initial thickness of the lens ZQ = 41ho, and from the volume calculation bho = VQ, the value of the system constant is, b = Vo/ho.

Written in terms of changes over a specified time interval with the initial conditions taken at the start of the interval, equation (13) is written as:

$$(14)\quad \int_{h_i}^{h_{i+1}} \frac{dh}{I - D - ch^2} = \frac{1}{b}\int_{t_i}^{t_{i+1}} dt$$

This equation may be employed to determine the head change from hi at the start of the interval ti to hi+i for an average value of D in the interval. In effect, D is allowed to vary from one interval to another though it is constant within the interval. The value of I is the same for all intervals, and therefore the constant c = Uho^ does not change from one interval to another. The constant b depends on V and h at the start of each interval, but because the proportion Vo/ho = Vi/hi = Vi+Ai-n, the value of b is the same for every interval and is employed as Vo/ho, obtained from the original initial condition.

The solution of equation (14) for I>D is as follows:

(15) . rr-Bl'

In the above, the variables subscripted with i refer to values at the start of an interval and those with i-l-1 at the end of an interval, and the term tj+i — L is the length of the interval. The equation is in a form that readily utilizes the draft data collected in Hawaii for many years, particularly for Southern Oahu where average monthly and annual draft have been reliably reported since 1910. Solution of the equation gives storage head of the system at the end of each interval

The heads h, and h.+i are not steady-state heads. To obtain the equilibrium head for a set of conditimis prevailing in an interval, let t go to infinity and equa¬tion (15) becomes:

FT - nl

(16) h = h -

O L 1 J

A steady state is impossible for I^D.

Equation (15) provides the storage head (h,), that is, the parameter reflecting the vertical dimension of volume of fresh water for the given time. It differs from the operating head (hp), which is the head condi¬tion induced by pumping. The difference betift-een storage and operating heads is restricted to the top of the basal lens; when pumping ceases entirely, the head recovers to approach the true volumetric head. Indeed, the disparity between storage and operating head, in conjunction with the long transient stage of head decline, in large measure incorporates Wentworth's concept of bottom storage.

Although hydraulic conductivity in the basalt aquifers is extremely high, on an order greater than 1,000 ft./day, and drawdown cones due to pumping are shallow and radially extensive, operating beads are significantly lower than storage heads because all Hawaii aquifers are effectively bounded. For exam¬ple, the major basal aquifer of Southern Oahu has as its boundaries the Manoa Valley fill, the high level Schofield Aquifer, the rift zones of the Koolau and Waianae ranges, and the caprock wedge on the coas¬tal plain. The effect of these boundaries is to superim¬pose additional drawdown on the primarv' shallow drawdown cone, leading to an aquifer-wide operating head substantially lower than the true storage head given by equation (15)

Equation (14) may be solved for conditions of O<I<D and I = D. For O<I<D, the solution is

When I = D, the solution is

h. h V

1 o o

h V + h. I(t

O O 1

In the above, for h, = hp:

h V

(19) h = o t

This expression asserts that the sustainable yield of an aquifer can never be equal to total recharge became as t increases, h goes asymptotically to zero and never attains a steady state. Only when I>D can a sustaina¬ble yield be assigned to an aquifer.

Equations 15 through 19 are used to simulate and predict heads. In the equations D is measured, ho is reliably known, I has been determined by hydrologic budgeting and flow analysis, and VQ has been esti¬mated by assuming an aquifer porosity of 10 percent and specified subsurface boundaries. The least reli¬able assumption is the estimate of porosity. To test the effect of porosity on computed head, a sensitivity analysis was made for a range of porosities from one to 30 percent for the simulation period 1880 to 1980. Table 1 lists the results.

The difference in head over the century of simula¬tion between one percent porosity and 30 percent porosity is 8.8 feet, which is substantial but relatively small considering the thirty fold difference in initial storage. Between the one percent and 10 percent porosities the head difference is 4.6 feet, and between 10 percent and 30 percent it is 4.2 feet. Aquifer poros¬ity is not at all likely to be as high as 30 percent or as low as one percent. In the range where it probably falls — five percent to 20 percent — the maximum computed head difference is four feet for 100 years of simulation. Evidently head is not profoundly influ¬enced over a reasonable range of assigned porosities.

Table 1 continues the sensitivity analysis to the end of the century based on a steady net draft of 225 mgd starting in 1980 for Southern Oahu. Over the twenty year period the 30 percent porosity head ends up 4.8 feet higher than the one percent porosity head. For 10 percent porosity the head would be 1.6 feet lower than the 30 percent porosity head and 3.2 feet higher than the one percent porosity head. The final equilibrium head, he, would be 15 feet no matter what the porosity since VQ does not appear in the steady state equation (see equation (16)).

Another type of analysis is displayed in Figure 2. Here two different values of I for the Koolau portion of the Pearl Harbor region are coupled with different values of Vo, and the simulations are matched against the head record from 1916 to 1978. The poorest fits are for minimum I (170 mgd) and minimum Vo (150 X 10® ft.®), and maximum I (250 mgd) and maxi¬mum Vo (560 X 10® ft.®). Better fits are obtained for I = 250 mgd, Vo = 280 x 10® ft.®, and I = 170 mgd, Vo = 280 X 10® ft.®. By computing curves using com¬binations of reasonable values of I and D, a best simu¬lation is obtained, which in turn determines accepta¬ble values for these components. In fact, the hydro¬logic budget value for I and Vo based on porosity of 10 percent provides the best simulation.

Testimony against Bill HB 905, an Act relating to sustainable groundwater yields.

The authors of HB 905 are attempting to weave a social agenda into a scientific calculation. This never works out well in the end. The calculation will be wrong, and the consequences will be counterproductive and painful to the society as a whole.

Calculating sustainable yields is a complex process requiring input from experts in a variety of fields analyzing decades of data. But in the end it is simply a number, an estimate of how much water can be sustainably withdrawn from the aquifer. And in Hawaii we have the proud distinction of having calculated quite a conservative number that allows half of the ground water recharge to escape development and proceed on its natural course.

The wise effort that has gone into this calculation, the data and the processes employed, is thoroughly laid out in the Water Resources Protection Plan produced by the Commission on Water Resource Management in 2019. Methods, data, problem areas, and recommendations are all clearly presented in this foundational document. The values for sustainable yields included therein are the foundation of aquifer management, they determine how much water can be allocated. And the State Water Code is the set of rules for how the allocations are distributed. It is a mystery to me why the current Water Commission of 2023 would support this Bill.

By restricting the amount of water that can be withdrawn from the state's aquifers based on estimates of the sustainable yield, the Commission on Water Resource Management has protected these aquifers for over 40 years.

The authors of Bill HP 905 wish to scrap this process and introduce a new definition of sustainable yield that advances their societal goals of who and who should not have rights to the groundwater. Of course the tug and pull of who should get the water is an age-old conflict. As they say, whiskey is for drinking, water is for fighting.

That's fine, but at least we must know how much water we are fighting over. The work being proposed by the authors of this bill would untether the concept of "managed" water from the actual amount of water that nature has provided us. Water management would become an ungrounded/unbridled political process with no sound mechanism to protect the resource.

There is no "flexible groundwater model". The concept is a Chimera. In the real world we use the best science and the experience of our best people to come up with our best estimate of sustainable yield, i.e., how much water we have to work with. Then the balancing/distribution of that amount of water among of the needs of traditional and customary native Hawaiian practices and the accommodations for climate change and our municipal and commercial needs, and the needs of the natural environment will be established by the political process, not by a "flexible model" established in the vacuum of a university.

That this project is to be completed in one year is an indication that the outcome is pre-determined. It would be impossible to produce a sound piece of work that improves on the existing process in such a short time. And with full respect for the professors and students at the University of Hawaii, they do not have the experience nor the inclination to produce a piece of work with the breadth and depth that would be the foundation for managing Hawaii's aquifers, as is already provided by the Commission's Water Resources Protection Plan and the State Water Code.

Respectfully Submitted by,

Paul Eyre

House Committee on Finance

HOUSE BILL 905 HD1 – RELATING TO THE SUSTAINABLE GROUNDWATER YIELDS

Tuesday, February 28, 2023
TIME: 10:00 a.m.
PLACE: VIA VIDEOCONFERENCE
Conference Room 308
State Capitol
415 South Beretania Street

Position: Comments

Aloha Chair Yamashita, Vice-Chair Kitagawa, and members of the House Committee on Finance.

My name is Roy Hardy, a former Commission staffer of 33 years and groundwater regulation branch chief. I offer the following comments on HB905 HD1:

1. I support the effective date of this bill as June 30, 3000, as it encourages further discussion on the complex issue of assessing ground water dependent ecosystems without undermining the Commission's current authority under HRS 174C-3 where *""Sustainable yield" means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission"* [emphasis added].

2. I oppose the language in the HB950 HD1 that seems to imply Commission "simply" defaults to a *"...simple analytical model. Additionally, conventional approaches fail to account for uncertainties, especially those related to freshwater recharge"*. Since its inception in 1987 the Commission has done the tremendously difficult job of researching, determining, and managing sustainable yields to protect the utility of the public resource for all. Whether it was reducing sustainable yields inherited from the older ground water control areas due to the demise of large scale irrigation or updated recharge estimates, having public debates over sustainable yield estimates in numerous designation proceedings, continual research and funding with other agencies including the University of Hawaii and the U.S. Geological Survey, the Commission has always used the best information available in a collaborative manner when deriving sustainable yields. The most powerful testimony to this groundwater management effort can be found in the Commission's 2019 Water Resource Protection Plan WRPP. The WRPP is a foundational plan within the larger and overall Hawaii Water Plan used by other state and county agencies and their respective responsibilities and roles to collectively manage our public trust water resources. The 2019 Water Resource Protection Plan was a six-year effort approved in a multi-level stakeholder outreach process to understand the issues, questions, values, and priorities that Hawai'i's communities have regarding water. Approximately 114 pages in Appendix F of that document is dedicated to the complex strategies and derivation of setting sustainable yields based upon best information available, comparing the utility of various groundwater modeling methods, and using very conservative approaches that address the so-called failure to account for uncertainties of freshwater recharge as described in this bill. Please see more at the Commission's website on its efforts, strategies, and continuing implementation of the 2019 WRPP.

3. I support the intent of HB905 HD1 to study and define the needs of groundwater dependent ecosystems (GDEs). This was a major issue raised in the Keauhou Aquifer System Area designation proceedings that began in 2012 that resulted in the Commission's decision in 2017 not to designate but that many follow-up actions to address the uncertainties of groundwater coastal discharge and GDE impacts were outlined. This emerging GDE issue is included in the 2019 WRPP and continues in the Keauhou area. Specifically, Task 1.7.2 of the WRPP specifies the development of a pilot adaptive management plan for protecting ground water dependent ecosystems to include CWRM/USGS/ UH/National Park Service (NPS)/ Cultural Practitioners. Within the 2019 WRPP there is discussion on how adaptive management strategies in other parts of the world utilize ongoing monitoring and targeted research to determine ecological water requirements and thresholds of GDEs and uses best available information to inform management decisions. Please see the 2019 WRPP Appendix F for more information.

4. I oppose the intent of HB905 HD1 to address GDEs by 'simply' focusing on a groundwater model to address GDEs before the Commission completes its actions under the 2017 Commission decision and tasks under the WRPP within the Keahou Aquifer System Area. GDEs demands should be directly assessed first before any meaningful model can use that information as a foundation. The difficulties encountered through the collaborative efforts and direction in Keauhou should reveal the best approach to address protection of GDEs. Indeed, earlier testimony from one of the subjects of HB905 HD1; namely, **UH-WRRC Itself recommends that the bill be amended to provide support for developing scope of work rather than moving directly to the development of a new model.** In that spirit, I would recommend that the Natural Energy Laboratory of Hawaii Authority (NELHA) and its the multi-decadal work and experience of monitoring coastal ecosystem impacts also be included in the development of the scope of work, which should complement the Commission's adaptive management strategy.

In closing, I would like to point out an example of what a GDE model might look like. In 2013, the Commission developed an irrigation demand model called Irrigation Water Requirement Estimation Decision Support System (IWREDSS). This is a complex model that estimates localized irrigation demands based on daily rainfall, evapotranspiration, soils, crops, irrigation methods, planting methods, etc. and is used when assessing the reasonable and beneficial use needs for particular crops when the Commission is making decisions on water use permits. This is independent of any groundwater model though groundwater is used to meet these specific localized irrigation needs as determined by IWREDSS. However, the science of irrigation is much better known than the science of GDEs. With time and collaboration, a better foundation to create a similar GDE model may be possible. In the meantime, adaptive management strategies may be the best approach to protect GDEs.

Mahalo for the opportunity to submit and for considering my testimony.

Aloha,

W. Roy Hardy

House Committee on Finance

HOUSE BILL 905 HD1 – RELATING TO THE SUSTAINABLE GROUNDWATER YIELDS

Tuesday, February 28, 2023

TIME: 10:00 a.m.

PLACE: VIA VIDEOCONFERENCE
Conference Room 308
State Capitol
415 South Beretania Street

Position: Comments

Aloha Chair Yamashita, Vice-Chair Kitagawa, and members of the House Committee on Finance.

My sincere apologies for requesting an addendum to my earlier testimony submitted at 1:35am this morning before today's 10am deadline. After sleeping on it I realized that I failed to mention what I consider to additional important points to consider.

Again, my name is Roy Hardy, a former Commission staffer of 33 years and groundwater regulation branch chief. I offer the following additional comments (continuing from my earlier comment #4) on HB905 HD1:

5. For any groundwater model to be effective, the foundational conceptual flow model must be calibrated using actual and measurable data and observations. In addition to new GDE considerations, the 2019 WRPP also recognizes the existence of confined deep fresh groundwater aquifers, at least on the island of Hawaii. Because of this, there are several issues discussed in the WRPP regarding how this fundamentally affects any groundwater model and subsequent coastal discharges to the ocean, which ultimately may have some impact on GDEs. To my knowledge, no one has created or published a calibrated and validated analytical or numerical flow model addressing this reality. In fact, as part of the Keauhou designation decision, the Commission required construction of additional deep monitor wells to provide additional and critical data to continuously monitor this deep confined aquifer. This, in turn, would help develop flow models to assess how this affects the bigger picture of groundwater resources, sustainable yields, and coastal discharge. Further, the 2019 WRPP Task 1.8.1 highlights the need for more deep monitor wells, whose presence or absence also affects Commission adopted sustainable yield estimates. In short, there are complexities that have not been resolved in the flow modeling of discharge to the ocean to the localized precision that would make a groundwater model the appropriate method to assess impacts on GDEs. Again, this points to adaptive management techniques being the more appropriate path to address GDEs, which ultimately impact traditional and customary practices.

Mahalo for the opportunity to submit and for considering my additional testimony.

Aloha,

W. Roy Hardy