



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

STAFF SUBMITTAL

For the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

November 14, 2001
Wailuku, Maui

Maui Meadows Homeowners Association
C/o James Williamson, Vice President
Recommendation for Continuance on the
Petition for Ground Water Management Area Action
Iao & Waihee Aquifer Systems
Wailuku, Maui

PETITIONER:

Maui Meadows Homeowners Association
C/o James Williamson, Vice-President
P.O. Box 1935
Kihei, HI 96753

DESCRIPTION: Location of aquifers: Exhibit 1; Historic Pumpage: Iao (Exhibit 2); Waihee (Exhibit 3)

BACKGROUND:

From February 1986 to August 1997, various Board of Land and Natural Resources and Commission initiated designation proceedings, investigations, findings of fact, and reports transpired and culminated in the Commission's latest action on August 13, 1997 to not designate the Iao Aquifer System. Although not designated, the Commission added the condition that if the 12-month moving average of pumpage from the aquifer ever exceeded 20 million gallons per day (mgd) in the future, the aquifer would automatically be designated.

On July 12, 2001 Maui Meadows Homeowners Association submitted a petition to the Commission requesting designation of the Iao and North Waihee Aquifer Systems as ground water management areas. A copy of the petition is attached as Exhibit 4.

On August 6, 2001 staff mailed letters to the Mayor, County Council, and the Department of Water Supply for the County of Maui requesting comments to the petition.

On August 15, 2001, the Commission extended the 60-day chairperson recommendation deadline (September 10, 2001) under designation proceedings to today's November Commission meeting to give the various agencies of the County of Maui more time to review and offer comments on the petition.

Approved by Commission on
Water Resource Management
at the meeting held on

NOV 14 2001

(amended)

Item 3

On September 10, 2001, the Maui County Council Member, Charmaine Tavares, submitted a letter requesting more information about the Iao Aquifer System (Exhibit 5). On the same day, Maui County Council Member, Michael Molina, faxed a letter requesting more information about the Iao Aquifer System (Exhibit 6).

On September 11, 2001, the Maui Department of Water Supply (MDWS) faxed their petition comments to the Commission (Exhibit 7).

In brief, the process for taking action on a petition to designate a water management area is as follows:

Summary of Water Management Area Designation Process

- (1) Petition filed with the Commission.
- (2) Consultation with Mayor, County Council, and County Water Board.
- (3) Comments received from Mayor, County Council, and County Water Board.
- (4) Chairperson makes a recommendation to the Commission to accept or reject petition within 60 days of receipt of the petition to continue the designation process.
- (5) Commission accepts or rejects petition. Commission shall render final decision within 90-days.
- (6) Publication notice of public hearing.
- (7) Public hearing held.
- (8) Completion of staff investigation in cooperation with county and federal agencies.
- (9) Completion of findings of fact.
- (10) Consultation with Mayor, County Council, and County Water Board.
- (11) Recommendation to Commission action for or against designation.
- (12) Commission final action within 90-days of chairperson recommendation in step 5.

ISSUES/ANALYSIS

The current petition procedural status is at step (4). The chairperson must make a recommendation to continue the designation process the Iao and Waihee Aquifer Systems. To date, only the MDWS offered comments to the petition and those comments were limited to Iao Aquifer System. No other county comments have been submitted to the Commission.

County of Maui Comments

To date, only comments have been offered by MDWS (Exhibit 7). In general, MDWS does not believe the Iao Aquifer System is being harmed and has altered pumping patterns and brought alternative sources outside of Iao. Additionally, MDWS states rules are in place that require mandatory cutbacks should unacceptable water quality concerns arise.

Other Significant Events Since 8/13/97 Commission Action

Before addressing the petition issues, a chronology of significant events since the last Commission action on the Iao designation is helpful. These are summarized as follows:

In 1998, United States Geological Survey (USGS) published a report; WRI-97-4244, Water Budget for the Iao Area, Island of Maui, Hawaii. This report investigated mean monthly calculations of ground-water recharge using Geographic Information System (GIS) technology, which spatially distributed monthly recharge over the Iao Aquifer System. The conclusion of this report stated that over the period

of 1986-1995 average annual recharge is about 36 mgd. Under natural conditions, with no agricultural return-irrigation, recharge is <34 mgd.

On January 22, 1998, MDWS received approval from the State Department of Health (DOH) to use Iao Stream as a drinking water source.

March 29, 1999, MDWS notified the Commission that the Maui County Council Supply adopted the Iao Water Management Rule, Resolution 99-32, on March 5, 1999 and became effective March 15, 1999 under Title 16, Chapter 9 of the Maui Board of Water Supply Rules. This rule identifies pumpage and chloride conditions that determine caution, alert, and critical conditions in Iao and subsequent restrictions and penalties on users of the MDWS distribution system and allocations limit imposed on private wells. The rule is attached as Exhibit 8.

March 31, 1999, MDWS notified DOH that they ceased using Iao Stream. To reactivate the source, DOH approval would be required.

In May 1999, three additional sources in the Waihee Aquifer System were drilled to alleviate pumpage from the Iao Aquifer System. These wells are Kanoa 1 & 2 (Well Nos. 5731-02 & 04) and Kupaa 1 (Well No. 5731-03). A pump was installed in Kanoa 1 and a pump installation permit awarded for Kanoa 2. Kanoa 1 awaits completion of the HRS §343 environmental review process before a pump installation permit application can be accepted.

On February 13, 2001, the USGS submitted two Reports: 1) WRI-00-4223, The Response of the Iao Aquifer to Ground-Water Development, Rainfall, and Land-Use Practices between 1940 and 1998, Island of Maui, Hawaii; and 2) WRI-00-4224, Analytical Versus Numerical Estimates of Water-Level Declines Caused by Pumping, and a Case Study of the Iao Aquifer, Maui, Hawaii. Both reports stress the importance of distributing pumpage in the aquifer. The first report concludes that well optimization is necessary to obtain maximum development of the resource (i.e. 20 mgd sustainable yield), while the second report concludes that a numerical model is necessary to better understand the aquifer and current well infrastructure flow system.

On August 18, 2001 an aquifer-wide pump test was performed whereby all pumpage from Iao Aquifer ceased between 22:00 8/18/01 to 13:00 8/19/01. This provided a continuous 15-hour span of water-level recovery to help ascertain the aquifers response to this sudden change.

On September 6, 2001, a report from hydrologist John Mink summarized the results of the August 18, 2001 recovery pump test. The conclusion drawn was that "...water level[s] were a function of pumping rather than 'head' in balance with underlying sea water."

On September 10, 2001, the petitioner submitted a follow-up letter providing additional information and review of the most recent quarterly update of data from the USGS. No new issues were raised.

On September 26, 2001, a letter from the MDWS to its Board summarized the water availability from its Central Maui Water System that relies on the Iao and Waihee Aquifer Systems. It concluded that 3.6 mgd is available based on the sustainable yields from the aquifer systems, Iao Tunnel usage, and current pumpage from wells of 22.59 mgd into the Central Maui Water System (Exhibit 9). Staff did not receive this information until October 1, 2001.

On September 28, 2001, MDWS received approval to reactivate their use of Iao Stream water from DOH.

On October 5, 2001, the petitioner submitted a follow-up letter requesting the CWRM's position regards to the MDWS position on additional surplus water in the Central Maui Water System.

On October 17, 2001 MDWS invited the staff to attend the MDWS Board meeting scheduled for October 22, 2001 to discuss the Central Maui water availability.

On October 22, 2001, staff attended a MDWS Board meeting to discuss the Iao sustainable yield and designation questions. Staff reiterated the 20 mgd sustainable yield and previous Commission action regarding automatic designation for Iao, the connectivity between Iao and Waihee Aquifer Systems are not independent, the Sustainable Yield for Waihee is currently 8 mgd, and the Iao Tunnel has not and is not counted against the Iao sustainable yield.

On October 24, 2001, staff received a copy of a 10/20/01 letter (Exhibit 10) from the USGS to the Maui Board of Water Supply stating, amongst other things, that the current distribution of pumpage does not appear to be sustainable at the 20 mgd level and that the Iao and Waihee Aquifer Systems are not independent.

1998 to the present 2001 there has been a significant and continuous drought in the Iao Aquifer System area.

Issues Raised in 7/12/01 Petition

There are five main issues raised in the petition and they are summarized as follows:

- 1) Evidence from the USGS reports show that the Iao Aquifer Sustainable is less than 20 mgd and Waihee Aquifer System does not add additional sustainable yield.
- 2) Alternative well sources in the Waihee Aquifer System do not constitute sufficient spreading of pumping to relieve stress on the Iao Aquifer System.
- 3) Chloride concentrations from Waiehu and Mokuhaui Wells are rising significantly faster.
- 4) Water levels are at record lows despite lower pumpage and not because of the 4-year drought. The petitioner points out that the rain gage at Puu Kukui is at the long-term mean.
- 5) Development pressure from the Central Maui Source Joint Venture and continued approval of water meters for development within and outside of the Iao Aquifer System is placing greater reliance on the Iao Aquifer System.

Issue 1) USGS Reports and Sustainable Yield(s)

Staff concurs with the conclusions of the USGS reports that distribution of pumping in Iao, or any other aquifer system for that matter, is important in determining the sustainability of a **given configuration of pumpage**. Staff internally uses the term **Well-Infrastructure Yield** to define what a given pumpage configuration can produce from a given aquifer. However, the estimated **Sustainable Yield** as determined in the Commission's Water Resource Protection Plan (WRPP) is the maximum rate at which water can be withdrawn based upon an optimal spacing of wells, which is a critical assumption of the analytical RAM model used for all sustainable yields in the WRPP. Sustainable yield in the Code is defined as:

§ 174C-3 "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.

The Commission could certainly explore changing its regulatory scheme from sustainable yield to the well infrastructure yield definition. However, it has not done so in past re-evaluations of sustainable yield

on Iao, Lanai, or Kualapuu Aquifer System re-evaluations. To a certain extent in the Pearl Harbor Aquifer Sector the Commission has considered a well infrastructure yield type of change in the sustainable yield, but this area has much more data and several numerical model analysis upon which the Commission could base its modification. However, it should be noted that the Commission did not adopt the results from the well infrastructure yield model but instead used a combination of sustainable yield and well infrastructure yield to arrive at a new sustainable yield for the Pearl Harbor aquifer. Lanai has a numerical model but sustainable yield remains unchanged from the WRPP estimation. Iao or Waihee Aquifer Systems do not have numerical models to better predict pumpage distribution impacts.

If the full sustainable yield were withdrawn from too few sources, localized effects would reduce the length of time those sources can be used. This is what is being observed with the current MDWS infrastructure. This does not mean the entire Iao Aquifer System is in imminent danger. However, to better predict an optimize pumpage distribution on an **aquifer system scale** a numerical model would be required.

Numerical models would have to assess every source as calibration points and will take years to develop. Currently, there are 47 tunnel, caprock and basal sources in the Iao Aquifer System. The entities that own these wells are: Maui BWS, Maui County Parks and Recreation Department, Wailuku Agribusiness, HC&S, the USGS, the Army, the State, Baldwin High School, and a private citizen. There are 14 sources in the Waihee Aquifer System. The entities that own these sources are: Maui BWS, Island Shores, HC&S, and four (4) private citizens. Tunnel and caprock sources would not be deducted from the sustainable yield from either aquifer system. Fortunately, a GIS recharge analysis has been done for Iao, but the USGS is also currently considering revising their GIS methodology to re-estimate ground-water recharges statewide.

Exhibit 11 compares critical MDWS well depths to the location of the transition zone in Iao. There is currently at most about 250 feet of fresh water below the bottom of the deepest well, Waiehu Heights 1 (Well No. 5430-01) and the top of the transition zone. Localized upcoming effects undoubtedly affect concentrated pumping, as exemplified in Exhibit 12, but this can be remedied by optimizing well distribution in both the horizontal and vertical directions. The speed of movement of the transition zone affects the time left before the wells start to draw higher chloride water. The midpoint of the transition zone (9,500 ppm chlorides) has been rising at the same rate since 1997 and perhaps even at a slower rate in the most recent months Exhibit 13. The USGS concurs with this observation.

The Waihee Aquifer System is a separate, but not independent, hydrologic unit that is a region where additional ground-water flux can be captured to relieve pumpage on the Iao Aquifer System. Staff is confused why the independence issue continues to be raised when it is clear in the WRPP that such aquifer systems communicate with each other. The Waihee sustainable yield is also currently set at 8 mgd as defined in the WRPP. The WRPP management scheme of aquifer systems and sustainable yields is a simple and rough way of spreading the pumpage to optimize and prevent concentrating pumpage in fewer locations which makes economic sense but not hydrologic sense on a **regional scale**. The sustainable yield here represents this regions share of the Wailuku Aquifer Sector sustainable yield of 38 mgd and can be thought of as a first cut in optimizing and spreading ground-water development based on hydrologic evidence. At issue is whether the pumpage from the five (5) MDWS sources in Waihee should be counted against Iao Sustainable Yield since sources are so close to the Iao-Waihee boundary. Exhibit 1 clearly shows that although close to the boundary these wells are spreading pumping on a regional scale and should be counted against the Waihee Aquifer System Sustainable Yield.

In summary, there is no disagreement between staff and the USGS that the current distribution of pumpage is limiting the optimal development of the sustainable yield as determined by the Commission. Continued close monitoring of the situation and the inclusion of another deep monitor well in the

southern portion of Iao are important in analyzing the behavior of the transition zone. It is also clear that the Waihee Aquifer System is separate, but not independent. There is even less data and experience in the Waihee Aquifer System although staff is confident in its current sustainable yield estimate of 8 mgd. At its August 13, 1997 meeting the Commission directed staff to reevaluate the sustainable yield for the Waihee Aquifer System. Staff is currently employed a consultant to do this as part of a re-evaluation of all sustainable yield numbers in the WRPP.

Issue 2) Alternative Water Sources in Waihee

This issue is related to issue 1, but more in terms of optimization within the Waihee Aquifer System. Exhibit 3 shows that the increased pumpage from Waihee Aquifer System sources since 1997 is significant. However, the development within the Waihee Aquifer System could be better optimized by further spreading well locations throughout the aquifer.

A numerical model is a tool that would help the MDWS determine an optimal spreading of limited well sources both in Iao and Waihee. However, concentrating pumpage near the Iao - Waihee Boundary is not a wise idea and the implied total pumpage of 7 mgd from these sources per the MDWS 9/26/01 letter (Exhibit 9) does not represent optimization on an **aquifer system scale**. If pumpage is not spread out further north in Waihee, then the MDWS is setting itself up to a constrained optimal development of sustainable yield similar to Iao in terms of well configuration.

In terms of alternative sources, MDWS has recently reactivated their interest in using Iao Stream. This alternatives viability is discussed further in Issue 5.

Issue 3) Rising Chlorides in Waiehu Heights and Mokuahu Wells

Chlorides have increased in Waiehu Heights and Mokuahu Wells (Exhibit 14) but have remained relatively stable in the other Iao wells. This is expected, as the problem wells also happen to be the deepest wells. Staff is more concerned with the movement of the transition zone as it relates to increases in well chlorides. Data collected by staff indicates that the current rate of rise in the top of the transition zone is 1 ft per year, which is less than the 10 ft per year at the time of the last Commission action. Although it may take decades for the top of the transition zone to reach all wells from an aquifer standpoint, there will be localized chloride problems long before that due to upconing (Exhibit 12). However, these rates of increases in chlorides are no different than that observed by the Commission back at its August 13, 1997 decision.

Of concern is the lack of evidence of action by MDWS in enforcing its chloride constraints as defined in its Iao Water Management Rule (Exhibit 8). Staff is familiar with the Iao Water Management Rule under the MDWS and does not see evidence that MDWS is enforcing this rule. Under the rule, MDWS is required to notify various government agencies, including the Commission, when caution, alert, and critical conditions exist in Iao. By its own definition, current Mokuahu and Waiehu well chloride concentrations dictate that at least caution and alert conditions existed in 2000, yet no notification has been given to the Commission. It is not known if restrictions, penalties, or controls on private water use defined under the rules have been or are currently enforced by MDWS.

Issue 4) Water Levels and Drought

The petition states that water level data are the lowest levels ever and not because of the perceived drought. The staff and USGS concur that a severe 4-year drought has occurred since 1997 although it appears to be nearing its end (see Exhibit 15). Therefore, the drought could be a significant cause of current water level declines. Again what is assuring is that despite the drought, the rise in the transition

zone has not accelerated and appears to be significantly slowing in recent quarters. If the current drought conditions abate, there should be and even greater recovery of water levels in the aquifer and at individual wells.

From the 1997 Commission action, safe water levels for each well were presented to the Commission. They are again attached in Exhibit 16.

Issue 5) Increased Reliance on Iao from continued MDWS allocations

The Commission is familiar with this issue. The 1996 Findings of Fact identified that future authorized use, from the Maui Water Use and Development Plan 1990, identified 31.1 mgd of total future demand and did not include state projects to be serviced by the Central Maui Water System. At the time of designation, Iao certainly could not meet these demands. Likewise, both Iao and Waihee combined cannot meet these projected demands alone given the current estimate of sustainable yields and well configurations.

Based on the MDWS 9/26/01 letter (Exhibit 9), it would appear that reliance on Iao has somewhat shifted more to the Waihee Aquifer System. Although this is a step in the right direction in terms of reducing reliance on Iao, pumping over 85% of that aquifers sustainable yield through the limited number of wells may not be prudent.

Another alternative that has not been used very much is the surface water source from Iao Stream. Previous DOH approvals suggest the MDWS has addressed treatment concerns yet MDWS has not used the source, but has reactivated its interest in doing so. It is not clear if interim instream flow standards (IIFS) would need to be amended for this use as the source diversion has been historically active for agricultural use. However, there is no doubt that a quantified IIFS would need to be set. Additionally, the Supreme Court's Waiahole decision casts a new perspective in terms of the Public Trust doctrine. Domestic use, stream restoration, and traditional and customary practices for native Hawaiians have been identified as public trust purposes.

Summary

Overall, the Iao Aquifer System situation remains the same as it was in 1997. However, alternate sources in the Waihee Aquifer System have come online to relieve some of the demand on Iao and overall pumpage from the Iao Aquifer System has been reduced. These are improvements in the ground-water management scheme since 1997. Despite the 4-year drought, the recent rates of transition zone rise have slowed and the rate of rise in the top of the transition zone is even slower than the mid-point rise as the system moves towards equilibrium. Staff views these events as encouraging towards protecting the Sustainable Yield of the aquifer and better management of the Safe Yield of the aquifer.

However, recent chloride increases in Waiehu 1 and Mokuahu Wells are of concern. Of equal concern is the lack of MDWS to enforce its own rules related to such increases though the Commission has no authority to enforce MDWS rules. Staff believes continued monitoring of the transition zone and additional deep monitor well in southern Iao will provide additional management tools.

With drought, lag-time response of the aquifer, and reduced pumpage, it cannot be determined if the sustainable yield of the Iao Aquifer System should be decreased either. Surface water alternatives have not been used as planned and do provide additional sources other than groundwater. Rates of rise in the top and mid-point of the transition zone indicate that there is time to optimize the well configuration system to realize the 20 mgd sustainable yield in Iao. Less is known about the Waihee Aquifer System but pumpage is far under sustainable yield as compared to Iao.

There is no real disagreement between government agencies on the behavior of the aquifers and all agree that no further reliance on the Iao Aquifer System for future demands is prudent given the current well configuration. Also, alternative sources outside of the Iao Aquifer System, primarily in the Waihee Aquifer System need to be optimally placed least the same man-made constraints on realizing sustainable yield in Iao are repeated. Ideally, a numerical model will help to better determine safe yields of the current well infrastructure but this will take several years of analysis and substantial costs. Staff would welcome such additional analysis but cannot afford the effort required to do this higher level of analysis at this time. The Commission welcomes the MDWS or any other government agency to undertake such a study but because of the enormity of the task in terms of, time and money, does not order MDWS to do so at this time. Meanwhile, the Commission is moving forward to drill an additional deep monitor well in the southern portion of Iao in the near future and continue to increase monitoring and data collection.

Since there really is only one major water user in Iao, competition for water will not be like that experienced on Molokai or Oahu. Competition for Iao and Waihee water are more similar to Lanai where there is only one major user of ground-water. Staff feels at this time that efforts are better placed in increasing monitoring of the situation rather than imposing allocation limits on a single major user and continuing to encourage alternative sources to reduce reliance on Iao.

RECOMMENDATION:

That the Chairperson recommend to the Commission:

1. Deny the continuance of the Petition to designate both Iao and Waihee Aquifer Systems.
2. To continue with its August 13, 1997 decision that requires automatic designation of the Iao Aquifer System should the 12-month moving average reach 20 mgd.

Respectfully submitted,



Linnel T. Nishioka
Deputy Director

Exhibit 1	Iao and Waihee Aquifer System Map
Exhibit 2	Iao Aquifer System Pumpage
Exhibit 3	Waihee Aquifer System Pumpage
Exhibit 4	Petition
Exhibit 5	Maui County Council Member Tavares 9/6/01 letter
Exhibit 6	Maui County Council Member Molina 9/7/01 letter
Exhibit 7	Maui Department of Water Supply 9/10/01 letter comments to petition
Exhibit 8	Maui Department of Water Supply 3/15/99 Iao Water Management Rule
Exhibit 9	Maui Department of Water Supply 9/26/01 letter on Central Maui Water System
Exhibit 10	USGS 10/20/01 letter to Maui Board of Water Supply
Exhibit 11	Well Depths vs. Transition Zone Depths
Exhibit 12	Localized Upconing Impacts
Exhibit 13	Transition Zone movement
Exhibit 14	Chloride increases in Iao Sources
Exhibit 15	Waiehu Camp Rainfall Departures: evidence of continuous 4-year drought
Exhibit 16	Iao Wells: Safe water levels



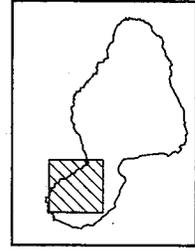
State of Hawaii
 Department of Land and Natural Resources
 Division of Water Resource Management

IAO & WAIHEE AQUIFER

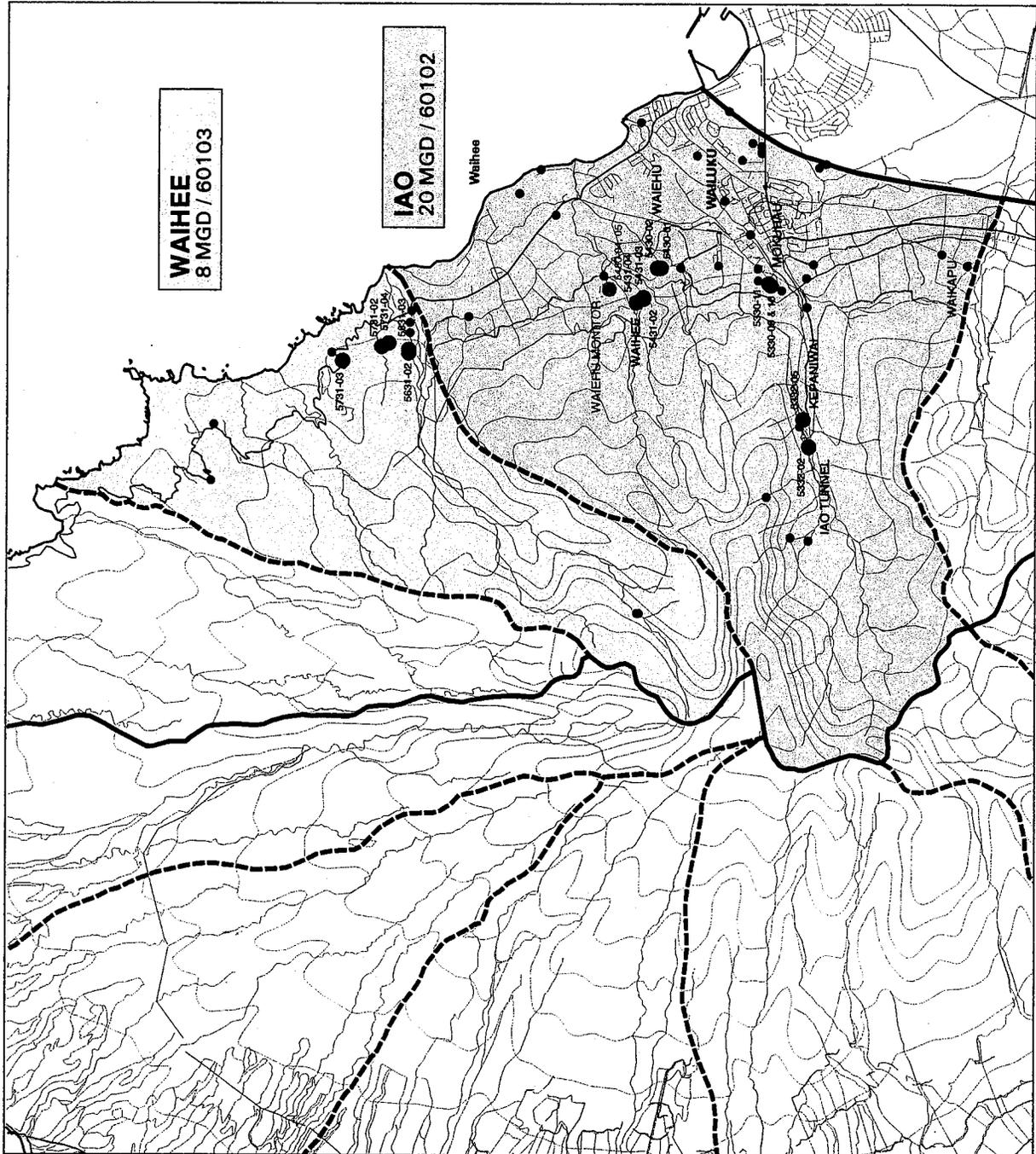


SCALE 1:70,000

- AQUIFER SECTOR BOUNDARY
- - - AQUIFER SYSTEM BOUNDARY
- OTHER WELLS
- MAUI DWS WELL
- MONITOR WELL
- PERENNIAL STREAM
- - - DITCH
- MAJOR ROAD
- ROAD
- CONTOUR (500 FT INT.)



LOCATION MAP

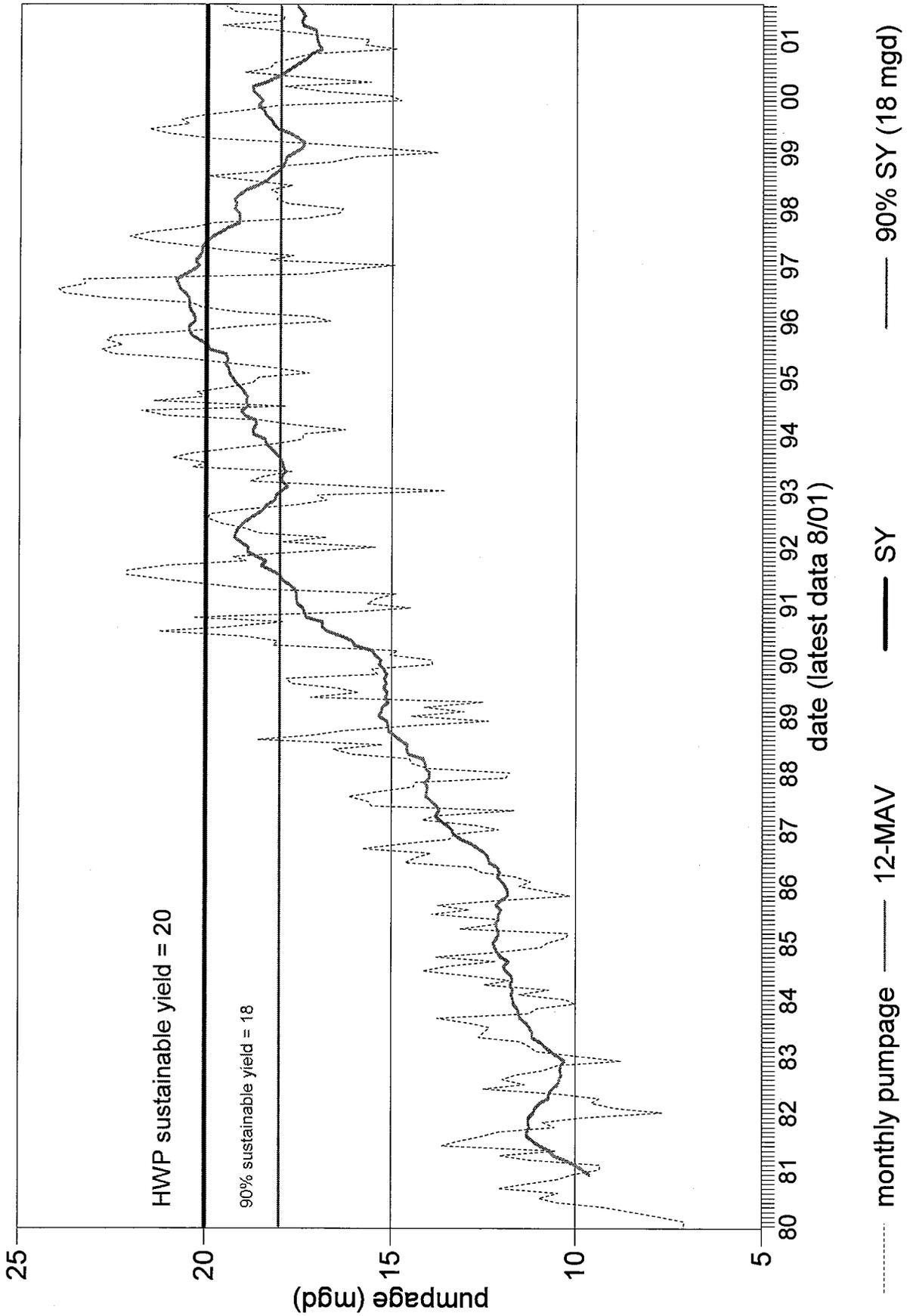


Map Projection: Universal Transverse Mercator

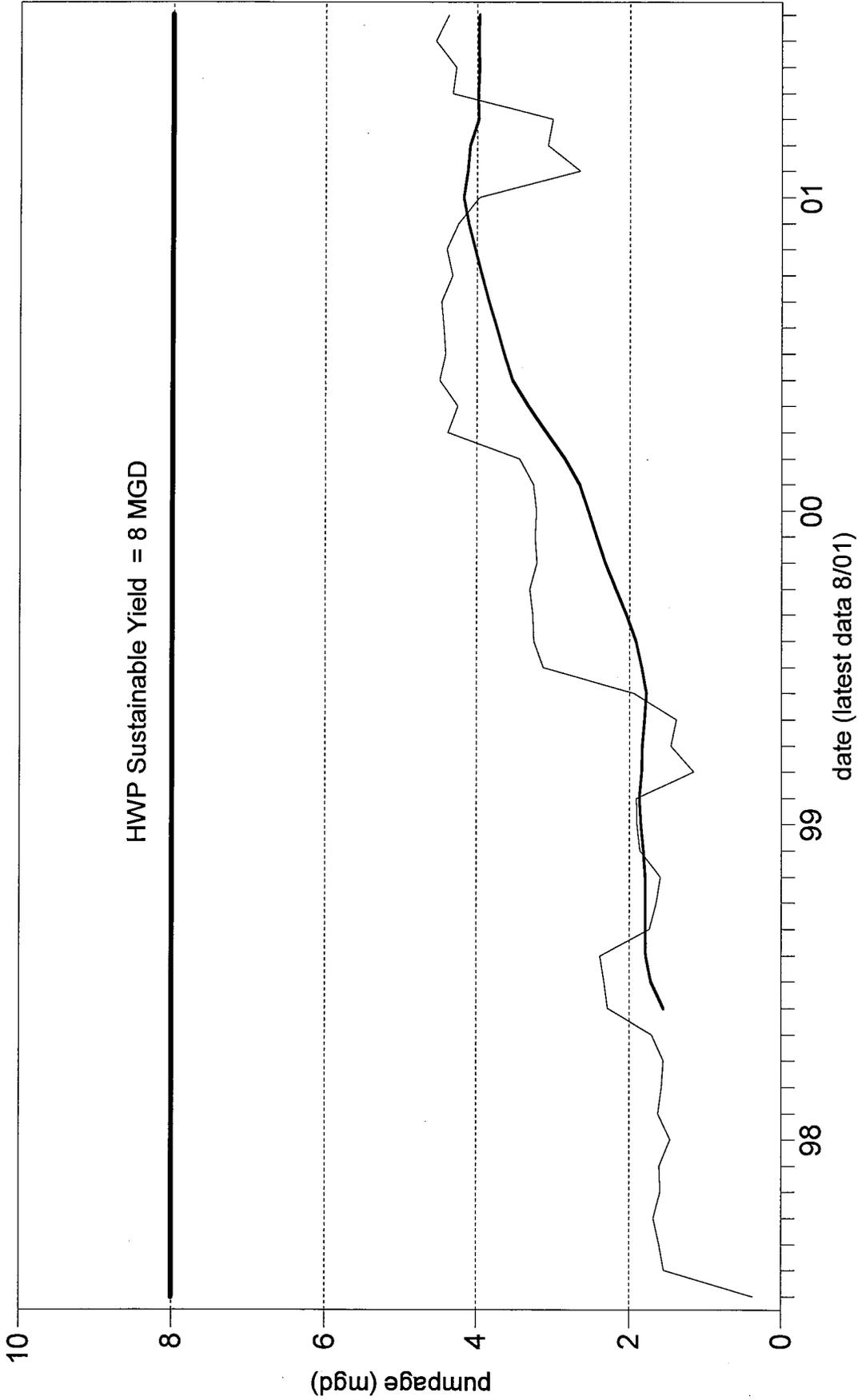
11/07/2001

Maui BWS Monthly Pumpage

Iao Aquifer System (1980 - 2001)



Maui BWS Pumpage
Waihee Aquifer System (1997-2001)



— monthly pumpage — 12-MAV — SY = 8 MGD

Form WMA-FET1



STATE OF HAWAII
COMMISSION ON WATER RESOURCE MANAGEMENT
DEPARTMENT OF LAND AND NATURAL RESOURCES

RECEIVED

01 JUL 12 410:34

OFFICE OF WATER RESOURCE MANAGEMENT

PETITION
FOR
WATER MANAGEMENT AREA ACTION

for

Ground Water Surface Water

Instructions: Please print in ink or type and send completed petition with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. For assistance, call the Regulation Branch at 587-0225.

1. PETITIONER

Firm/Name: Maui Meadows Homeowners Association
Contact Person: James Williamson, Vice Pres. Ph: 874-6151
Address: P.O. Box 1935, Kihei, Maui, HI 96753

2. PROPOSED WATER MANAGEMENT AREA(S)

Island: Maui
Aquifer Sector(s): _____
Aquifer System(s): Iao-North Waihee
Watershed(s): West Maui mountains

3. PROPOSED ACTION (Check one only): DESIGNATION MODIFICATION RESCINDMENT

4. JUSTIFICATION FOR PROPOSED ACTION ON WATER MANAGEMENT AREA(S)

Please attach a sheet to state reasons why the above hydrologic unit(s) under item 2 should be designated as a ground and/or surface water management area(s) or the boundaries of an existing water management area(s) modified or rescinded. If petition is for water management area designation, please state which criteria specified by 13-171-7 and/or 13-171-8, HAR, are met and why (see back of form). If petition is for modifying or rescinding existing water management area boundaries, please establish your standing to petition (13-171-10 HAR). Complete and detailed explanations are encouraged.

The attached letter dated 7/19/01 from James Williamson to Dorothy Williams, explains why our Association is requesting that the Iao Aquifer be designated as a water management area.

Submitted by (print) Dorothy R. Williams Title President
Signature Dorothy R. Williams Date 7/11/01

**RELEVANT SECTIONS OF 13-171, HAR & 174C, HRS
REGARDING WATER MANAGEMENT AREA PETITIONS**

§13-171-3 Initiation by chairperson. The designation of a water management area by the commission may be initiated upon recommendation by the chairperson. In addition to this prerogative, it shall be the duty of the chairperson to make the recommendations from time to time when it is desirable or necessary to designate a water management area for the purposes stated in this chapter and there is data for a decision by the commission. [Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-41)

§13-171-4 Initiation by petition. (a) The designation of a water management area by the commission may also be initiated by any interested person by written petition to the chairperson proposing the designation of a specified area and presenting the reasons for such designation. The petition for designation of a water management area shall be made on forms provided by the commission. It shall be the duty of the chairperson, after consultation with the appropriate county mayor and county water board, to act upon the petition by making a recommendation for or against the proposed designation to the commission within sixty days after receipt of the petition or additional time as may be reasonably necessary to determine whether there is factual data to warrant the proposed designation.

(b) Designated ground water areas established under chapter 177, HRS, the Ground Water Use Act, and remaining in effect at the effective date of this chapter shall continue as water management areas. [Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-41)

§13-171-7 Ground water criteria for designation. In designating an area for ground water use regulation, the commission shall consider the following:

- (1) Whether an increase in water use or authorized planned use may cause the maximum rate of withdrawal from the ground water source to reach ninety percent of the sustainable yield of the proposed water management area;
- (2) That the rates, times, spatial patterns, or depths of existing withdrawals of ground water are endangering the stability or optimum development of the ground water body due to upconing or encroachment of salt water;
- (3) That the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses;
- (4) Whether excessive preventable waste of water is occurring;
- (5) There is an actual or threatened water quality degradation as determined by the department of health;
- (6) Serious disputes respecting the use of ground water resources are occurring;
- (7) Whether regulation is necessary to preserve the diminishing ground water supply for future needs, as evidenced by excessively declining ground water levels; or
- (8) Whether water development projects that have received any federal, state, or county approval may result, in the opinion of the commission, in one of the above conditions.

Notwithstanding an imminent designation of a water management area conditioned on a rise in the rate of ground water withdrawal to a level of ninety percent of the area's sustainable yield, the commission, when such level reaches the eighty percent level of the sustainable yield, may invite the participation of water users in the affected area to an informational hearing for the purposes of assessing the ground water situation and devising mitigative measures. [Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-44)

§13-171-8 Surface water criteria for designation. In designating an area for surface water use regulation, the commission shall consider the following:

- (1) Whether regulation is necessary to preserve the diminishing surface water supply for future needs, as evidenced by excessively declining surface water levels, not related to rainfall variations, or increasing or proposed diversions of surface waters to levels which may detrimentally affect existing instream uses or prior existing off stream uses;
- (2) Whether additions to or the diversions of stream waters are reducing the capacity of the stream to assimilate pollutants to an extent which adversely affects public health or existing instream uses; or
- (3) Whether serious disputes respecting the use of surface water resources are occurring.

[Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-45)

§13-171-10 Modifying and rescinding designated areas. The modification of the boundaries or the rescinding of existing water management areas by the commission may be initiated by the chairperson or by a petition to the commission by any person with proper standing. The procedure for modifying the boundaries of an existing water management area or for rescinding an existing water management area shall be as provided in subchapter 2 for the designation of a water management area. [Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-47)



Maui Meadows Homeowners Association

P.O. Box 1935, Kihei, Maui, HI 96753

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Fax: (808) 874-5305

July 9, 2001

Dorothy R. Williams, President

Subject: Designation of the Iao Aquifer

As you requested, I have prepared the following analysis which explains the reasons why the Maui Meadows Homeowners Association has decided to petition for designation of the Iao Aquifer system as a state water management area.

For some time now our Association has expressed its concern to the Maui county Water Department (Department) director, David Craddick, and also to the Board of Water Supply (Water Board), on the integrity of the Iao Aquifer (Aquifer) system which serves central and south Maui, including Paia. Our concern relates to the ability of the Aquifer to continue to supply sufficient and good quality potable water to our area. Most of the Water Board members agreed that the Aquifer needs to be supplemented by a new source but no action has been taken to achieve this goal. Director Craddick on the other hand states that there is no source problem, and that the situation can be resolved by spreading out pumping in new wells in the nearby North Waihee aquifer. We have come to believe that the concerns of the public can only be addressed by intervention of the state through the designation process.

Background

In July 1977, the Commission on Water Resource Management (Commission) considered designation of this Aquifer. It did not do so on the condition that the Department not pump any more than the estimated sustainable yield based on: "If additional wells are drilled at some distance (emphasis added) from the existing pumping center, and the pumpages are readjusted, Iao Aquifer may sustain 20 mgd." The Department has developed four new wells in the vicinity of North Waihee, two in 1977 and two last year, which can produce 4 to 4.5 mgd, and as a result has been able to reduce pumpage from the Iao Aquifer proper to about 17.5 mgd to meet the combined demand of 21.5 to 22 mgd.

The heading numbers below refer to those items enumerated on the petition application form under Section 13-171-7.

Items 1 and 2

Despite the reduction in pumpage from the Aquifer proper, the latest USGS data report for the first quarter of this year, is far from reassuring. It shows that the high water levels in the observation wells are either about the same or have fallen by as much as 1.21 ft.. Of equally as great a concern is that the altitude of the mid-point of the transition zone has risen by 2 ft. in 3 months. On an annual basis the salt level is rising some 8 ft..

Earlier this year the USGS issued two reports expressing its concern about the serious overdrafting of the Aquifer (the attached Exhibits A and B are copies of abstracts of these reports). One report questions whether the estimated sustainable yield of 20 mgd established in 1990, is too high. My simplified analysis derived as follows, also shows a lower sustainable yield. All the observation wells show water levels increasing to 1990, and then decreasing at a relatively uniform rate (see Exhibits C and D). The average pumping rate in 1990 was 16 to 17 mgd, which well maybe the range of the sustainable yield and not 20 mgd..

The North Waihee wells are within 1/2 to 1-1/4 miles from the estimated boundary of the Iao Aquifer, which is about 10 miles wide at this location. Hence it is easy to understand that, with no physical barrier, this "new" aquifer is really only an extension of the Iao Aquifer, and the total pumping of 21.5 to 22 mgd is being applied to the combined Iao and North Waihee system. So even a sustainable yield as high a 20 mgd is being exceeded by close to 10%. The result is that water levels continue to drop and the elevation of the transition zone rises. I agree with the USGS that spreading the pumping is only a short term solution because the local underground sources are interconnected. It won't change the ultimate consequence of destruction of the Aquifer unless the demand on it is reduced considerably by developing a completely separate source as soon as possible.

Item 3

The chloride concentrations of water pumped from the Waiehu Heights and Mokuhaul group of wells, have been increasing for some years. The concentration has now reached 200 to 250 mg/L. However, other wells including North Waihee, have low chloride concentrations which have been relatively stable. Hence blending of these discharges results in an acceptable chloride concentration. This of course has to be viewed in the context of a steadily rising transition zone.

Item 6

The Central Maui Source Joint Venture agreement expired at the end of 1999. A controversial attempt to renew it, was made by a Water Board committee by agreeing, without public input, to increase the joint venture draw on the Aquifer by 3 to 4 mgd. In the face of a pending law suit the Water Board did not renew the agreement.

In the view of some county attorneys this matter may not be completely settled because of perceived commitments to the joint venture. There is a real question whether the Water Board has the authority to settle any such agreement, since all water in Hawaii is a public trust and the state is the trustee. The subject will no doubt be a significant issue in the permitting procedure for the Makena Resort development now before the county council. This project would use almost 2 mgd of potable water.

Item 7

The Department evidently recognizes that the Aquifer has not fully recovered. It states, however, that there is no source problem. In its review of permit applications for development, it has standard language that "no guarantee of water is granted or implied as a result of related comments". This statement is applied even if the developer has a water meter in hand. As stated previously, the Department maintains it can solve any problem with the Aquifer by spreading the pumping with an increased number of North Waihee wells, and has no interest in developing a completely independent source.

In the Department's view the overpumping is necessary as a result of a period of less than normal rainfall. However, the USGS data shows that at the highest elevation rainfall gage (Puu Kukui) the 12 month precipitation since 1998 is near the long term mean. I have verified this conclusion with data from the National Weather Service in Honolulu. Admittedly less than normal rainfall has prevailed for lower elevation gages, over the same period. But by far most of the contribution to the Aquifer comes from the higher elevations. Further, by definition the sustainable yield should be available during low rainfall periods.

A USGS Recent Hydrologic Conditions Report for Hawaii (updated June 26, 2001), shows water levels in Waiehu Test Hole B, to be at record lows for March, April and May. These are the lowest recorded levels for these months (since 1980). This follows similar reports for prior months. The previously mentioned Exhibits C and D, show the almost uniform decline in water levels in the Waiehu Deep Monitor well and Test Hole B, since 1990. The water level for Shaft 33 was 8.45 ft. on April 3, 2001, which is the lowest level since measurements resumed in 1996.

As stated above the North Waihee well field has been expanded in the hope that the Iao Aquifer would improve. It is not working since the new wells are too close to the Aquifer boundary, with obviously considerable interconnection, and probably because the estimated sustainable yield is too high. A relatively remote source has to be developed promptly to relieve overpumping of the Aquifer. On the other hand the Department's proposed CIP budget for next year provides for more of the same: development of the Kupaa wells, and exploration of the Maluhia wells. Both are in the North Waihee field and are relatively close to the Aquifer boundary.

At a hearing on the Water Board's budget, I recommended that exploratory wells be drilled at locations well on the way to Kahakuloa, to remove or at least considerably reduce their influence on the Aquifer. If the north trending inferred dike is close to the Kahakuloa road, the best location for these wells could be mauka of the dike, to further isolate them from the existing well field for the Iao Aquifer. The budget should be used for this purpose instead of further expanding the North Waihee system. To develop this new source including transmission facilities, it will probably be necessary to float a new bond issue for financing.

A final long range plan should involve hydrological modeling, not only of the Kahakuloa plan but also covering other prospective sources to serve central and south Maui.

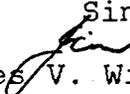
Item 8

Many housing and commercial projects have been approved, or are in the permit review stage, for which a firm potable water source is not available. The Department's consistent statement about not being able to guarantee water availability is apparently designed to avoid liability, but is I believe misleading and even dishonest. The Water Board has handed out water meters to hundreds of new homes and developments in Kihei - Wailea - Makena, which for 20 years now has been the fastest growing part of the state. I seriously wonder if the Department is able to document how many water meters are outstanding and how much water is represented by them. At the same time the county planning department/planning commission, continue to approve development in south Maui without any inkling of the availability of water and the impact on those of us who already live here. We are in a crisis: the Aquifer levels are dropping, while promises for more development than the system can handle have already been made.

The conclusion from all of this is that there is absolutely a water supply source problem. Spreading the pumping is advisable but it won't change the ultimate impact on the Aquifer unless new wells are developed promptly to reduce the Aquifer pumpage, and which are adequately separated from it. It has been said that the Water Department is living on the float - depending on the lag time it takes for salt water to intrude into to the fresh water lens where the wells are located. For example Wailuku Shaft, a major contributor, has a safe water level of 11 ft. and it is now measured at 8.5 ft.. Once salt water intrusion occurs it is irreversible! We will have lost the principal source of water supply for central and south Maui. It would be a complete disaster, far worse than the upcountry situation.

If you have any questions please ask.

Sincerely,


James V. Williamson, P.E.
Vice-President

-4-



Water Resources of Hawaii & the Pacific

The Response of the Iao Aquifer to Ground-Water Development, Rainfall, and Land-Use Practices Between 1940 and 1998, Island of Maui, Hawaii

By William Meyer and Todd K. Presley

The complete report is available as an Adobe Acrobat (.pdf) file (2,226 Kb).

The complete report requires Adobe Acrobat Reader (free) to be viewed.



Abstract

Ground water pumped from the Iao aquifer has been used for agricultural purposes since 1948, and domestic purposes since 1955. In 1990, the Hawaii State Commission on Water Resource Management established a value of 20 million gallons per day for the sustainable yield of the aquifer. Water-level data from observation wells throughout the aquifer and information on the depth to and thickness of the transition zone between freshwater and saltwater at the Waiehu deep monitor well indicate that pumping rates near the sustainable yield value of 20 million gallons per day could result in salt-water intrusion in some pumped wells.

Since the introduction of pumpage in 1948 and the reduction of recharge in 1980, water levels have declined, chloride concentrations of the pumped water have increased, and the transition zone between freshwater and saltwater has risen. Water levels declined by about 18 feet between 1940 and 1998 in the area near Iao Stream, and by as much as 6 feet between 1977 and 1997 in the vicinity of the major well fields near Waiehu Stream. Chloride concentrations of pumped water have risen at all the well fields, but are presently below the U.S. Environmental Protection Agency recommended standard of 250 milligrams per liter. The chloride concentration of water pumped from Mokuhaul 2, however, was 460 milligrams per liter in late 1996 when pumping was halted at this well. The midpoint of the transition zone, as measured at the Waiehu deep monitor well, rose by about 108 feet between 1985 and 1998.

CONTENTS

- Abstract
- Introduction
 - Purpose and Scope
 - Well-Numbering System
 - Previous Geohydrologic Studies
 - Description of the Study Area
 - Physical Setting
 - Climate, Rainfall, and Fog Drip
 - Irrigation Ditches



Analytical Versus Numerical Estimates of Water-Level Declines Caused by Pumping, and a Case Study of the Iao Aquifer, Maui, Hawaii

By Delwyn S. Oki and William Meyer

The complete report is available as an Adobe Acrobat (.pdf) file (587 Kb).

The complete report requires Adobe Acrobat Reader (free) to be viewed.



Abstract

Comparisons were made between model-calculated water levels from a one-dimensional analytical model referred to as RAM (Robust Analytical Model) and those from numerical ground-water flow models using a sharp-interface model code. RAM incorporates the horizontal-flow assumption and the Ghyben-Herzberg relation to represent flow in a one-dimensional unconfined aquifer that contains a body of freshwater floating on denser saltwater. RAM does not account for the presence of a low-permeability coastal confining unit (caprock), which impedes the discharge of fresh ground water from the aquifer to the ocean, nor for the spatial distribution of ground-water withdrawals from wells, which is significant because water-level declines are greatest in the vicinity of withdrawal wells. Numerical ground-water flow models can readily account for discharge through a coastal confining unit and for the spatial distribution of ground-water withdrawals from wells.

For a given aquifer hydraulic-conductivity value, recharge rate, and withdrawal rate, model-calculated steady-state water-level declines from RAM can be significantly less than those from numerical ground-water flow models. The differences between model-calculated water-level declines from RAM and those from numerical models are partly dependent on the hydraulic properties of the aquifer system and the spatial distribution of ground-water withdrawals from wells. RAM invariably predicts the greatest water-level declines at the inland extent of the aquifer where the freshwater body is thickest and the potential for saltwater intrusion is lowest. For cases in which a low-permeability confining unit overlies the aquifer near the coast, however, water-level declines calculated from numerical models may exceed those from RAM even at the inland extent of the aquifer.

Since 1990, RAM has been used by the State of Hawaii Commission on Water Resource Management for establishing sustainable-yield values for the State's aquifers. Data from the Iao aquifer, which lies on the northeastern flank of the West Maui Volcano and which is confined near the coast by caprock, are now available to evaluate the predictive capability of RAM for this system. In 1995 and 1996, withdrawal from the Iao aquifer reached the 20 million gallon per day sustainable-yield value derived using RAM. However, even before 1996, water levels in the aquifer had declined significantly below those predicted by RAM, and continued to decline in 1997. To halt the decline of water levels and to preclude the intrusion of salt-water into the four major well fields in the aquifer, it was necessary to reduce withdrawal from the aquifer system below the sustainable-yield value derived using RAM.

WAIEHU DEEP MONITOR WELL

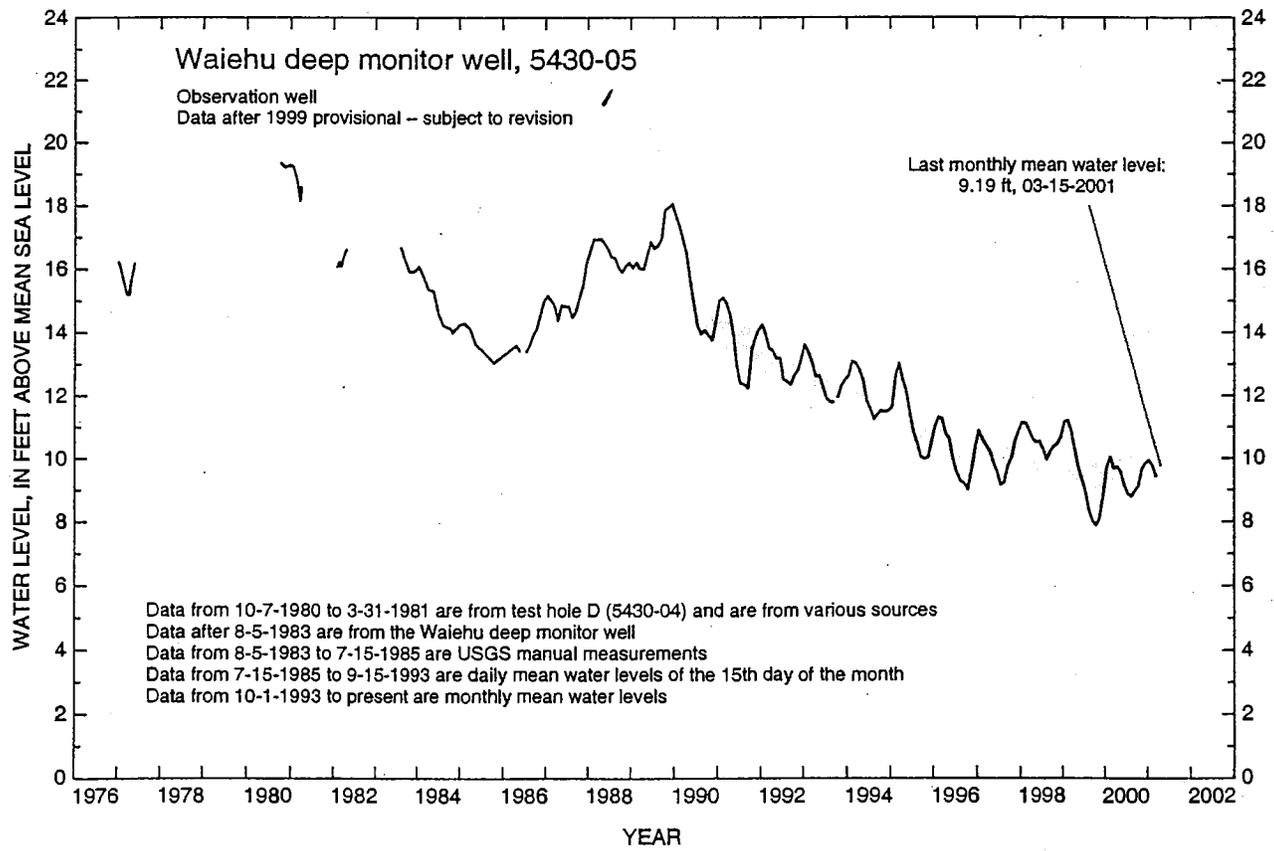
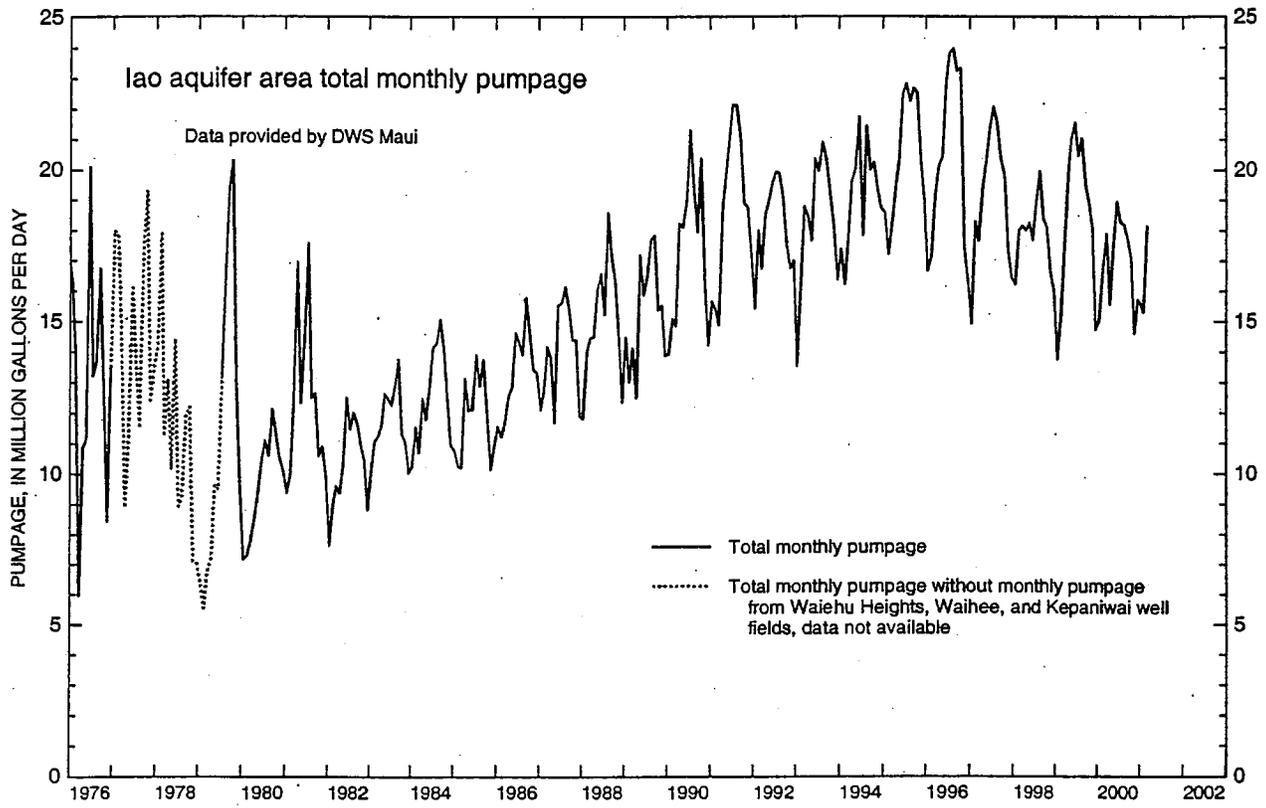


Figure 8

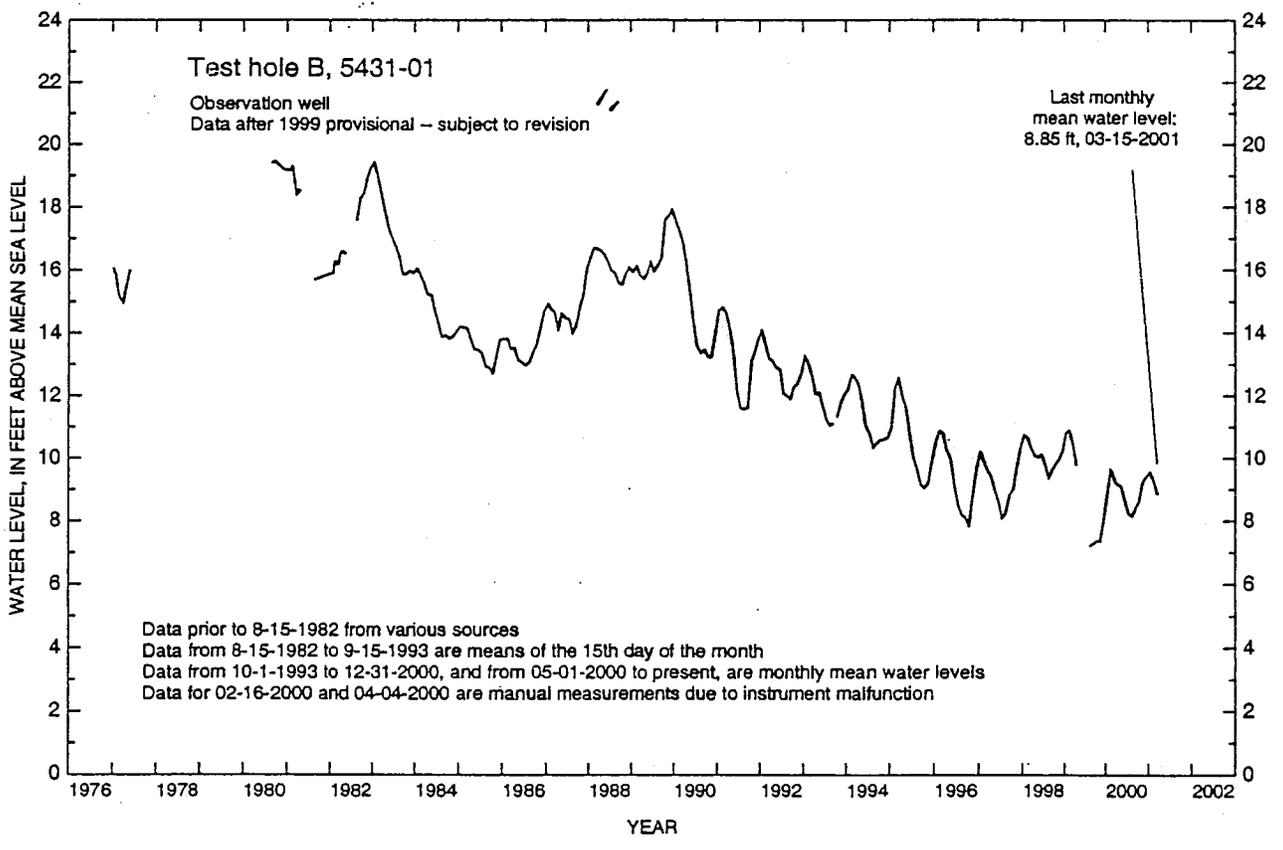
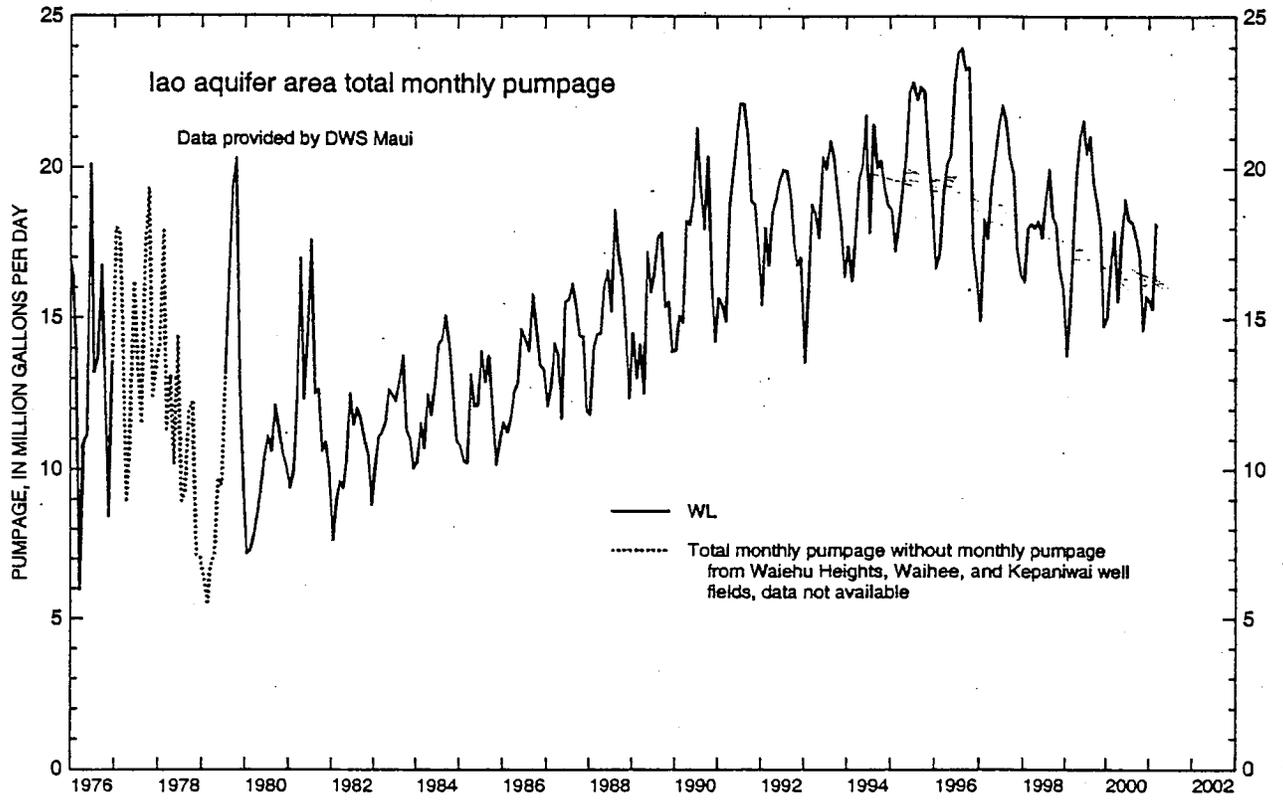


Figure 9

Council Chair
Patrick S. Kawano

Council Vice-Chair
Dain P. Kane

Presiding Officer Pro Tempore
Charmaine Tavares

Council Members
Alan M. Arakawa
Robert Carroll
G. Riki Hokama
Jo Anne Johnson
Michael J. Molina
Wayne K. Nishiki



COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

Director of Council Services
Ken R. Fukuoka

RECEIVED

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COMMISSION ON WATER
RESOURCE MANAGEMENT

September 6, 2001

Linnel T. Nishioka, Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Nishioka:

**SUBJECT: PETITION FOR GROUND WATER MANAGEMENT
DESIGNATION ACTION ON THE IAO AQUIFER SYSTEM**

The Maui County Council has not had the opportunity to meet to review the subject petition. I am responding as an individual Councilmember.

The Iao Aquifer is a critical resource for the people of Maui. It is very important that the aquifer be preserved so that it can provide water for generations to come.

Water studies done in the past have led the Maui County Department of Water Supply to state that the Iao Aquifer has a sustainable yield of 20 million gallons a day. The Department of Water Supply reports that slightly less than 20 mgd is drawn from the aquifer, measured by a 12-month rolling average. If the sustainable yield is truly 20 mgd, then the water levels in the aquifer should not be steadily declining. The August 6, 2001 report of the U. S. Geological Survey reports that water levels in two locations at Iao Aquifer are the lowest on record. The report also notes that three wells had high individual chloride concentration measurements during second quarter 2001. (See attached.) This information, combined with similar data in earlier reports, should put us all on alert.

I would like to request that the Commission on Water Resource Management focus some of its resources on preserving the Iao Aquifer. We need to know what the actual sustainable yield is. Is it 20 mgd or is it less than

EXHIBIT 5

Councilmember Charmaine Tavares
September 6, 2001

2

that? Is the aquifer in danger or not? If studies and models result in conflicting opinions, is there a way to determine the actual sustainable yield by digging wells that more accurately monitor the health of the aquifer? We need to know in clear language the well levels and chloride levels that will protect and preserve the lao Aquifer. We need to know the boundaries of the aquifer. With answers to these questions, our county government and the Board of Water Supply can make better decisions regarding current or future draws on the lao Aquifer.

Please investigate and help determine the lao Aquifer's sustainable yield so that Maui County can better manage this important resource. It would also be helpful if the Commission can recommend effective conservation methods to guide Maui County Board of Water Supply.

Sincerely,

A handwritten signature in cursive script that reads "Charmaine Tavares". The signature is written in black ink and has a long, sweeping underline that extends to the right.

Charmaine Tavares
Councilmember

Attachment

Council Chair
Patrick S. Kawano

Council Vice-Chair
Dain P. Kane

Presiding Officer Pro Tempore
Charmaine Tavares

Council Members
Alan M. Arakawa
Robert Carroll
G. Riki Hokama
Jo Anne Johnson
Michael J. Molina
Wayne K. Nishiki



Director of Council Services
Ken R. Fukuoka

COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

September 7, 2001

Mr. Linnel T. Nishioka
State of Hawaii
Department of Land & Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

**SUBJECT: PETITION FOR WATER MANAGEMENT AREA ACTION FOR
GROUND WATER/MAUI MEADOWS HOMEOWNERS
ASSOCIATION**

Dear Mr. Nishioka:

In reference to Maui Meadows Homeowners Association's petition for water management area action for groundwater, I would like to submit the following:

1. May I have the most recent potable water level findings from the State?
2. If you accept this recommendation, how will this affect the County of Maui's Water Department's role with regard to the pumping at the Iao Aquifer?

If you have any questions, please call my office at (808) 270-5507.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael J. Molina".

MICHAEL J. MOLINA
Councilmember

MJM:cmc

EXHIBIT 6

**DEPARTMENT OF WATER SUPPLY**

COUNTY OF MAUI

P.O. BOX 1109

WAILUKU, MAUI, HAWAII 96793-6109

TELEPHONE (808) 270-7816 • FAX (808) 270-7833 • www.mauiwater.org

September 10, 2001

Ms. Linnel T. Nishioka, Deputy Director
State of Hawaii
Department of Land & Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Nishioka:

Subject: Petition for Ground Water Management Designation Action on Iao Aquifer System

We feel it is not necessary at this time to designate Iao aquifer as a water management area. The following are reasons why we feel designation is not necessary.

1. The State Constitution requires a trust responsibility from all its political subdivisions. We take this responsibility very strongly and do all that can be done, given our economic situation to protect the aquifer for future generations. Drilling of another monitor well south of Iao Stream, which can be done without designation, would be welcomed assistance from the CWRM.
2. We continue to monitor the water and chloride levels in conjunction with CWRM and USGS. These results are made available to the general public so they also can monitor what is going on.
3. We realize that there has been a fairly lengthy time of low rainfall during which water levels have responded accordingly. Rainfall patterns should not translate to a need for designation.
4. The Waiehu Heights well that has increased chloride levels due to a deeper open hole and the easier transmission of higher chloride water into the pumped water. This isolated case can be managed by running the low chloride well more of the time and should not be used as a reason for designation.

*"By Water All Things Find Life"***EXHIBIT 7**

Ms. Linnel T. Nishioka

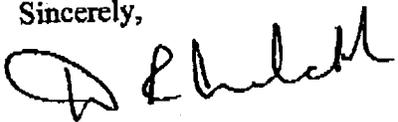
Page 2

September 10, 2001

5. The Mokuhaui wells do not exceed the 200 ppm level for the combined output of the wells and we are no longer pumping the middle well which has resulted in lower chlorides for the pump station.
6. The perception that the Central Maui Joint Venture agreement expired is incorrect. The agreement, however, does allow for the disbanding of the CMJV group after December 1999. Nothing prevents them from reorganizing and continuing its organization. We continue to operate the CMJV wells as called for in the agreement. Previous CWRM administrators said the state would not get involved in allocations for individual wells. Bulk allocations would not have any effect on the agreement as we would still need to resolve the matter ourselves.
7. We intend to continue exploration to the north of Waihee Stream toward Kahakuloa and have been successful in providing 1000-1200 gpd from these wells. We expect to develop another two wells in the next two - three years.
8. The results of our aquifer test show an 83-day recovery time for the aquifer water levels to reach agreement with the 1 to 40 density ratio. The 17.5 foot head that is showing in the Waikapu well, which is part of Iao aquifer, would then match the midpoint of -699 feet. The theory that the midpoint just has not had time to rise is somewhat misleading given the test information.
9. We now have a rule in place that requires mandatory cutbacks should water quality deteriorate in the aquifer.
10. We are still the primary water purveyor using Iao aquifer and as such are able to do what is necessary to protect the aquifer to avoid any future deterioration of water quality.
11. The Board will be convening a special review of alternative sources for Iao.

We look forward to working with you to allay any community fears that the aquifer is being harmed when it is not. Thank you for your concern in this matter.

Sincerely,



David Craddick, Director
DC/jaw



DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
TELEPHONE (808) 243-7816 • FAX (808) 243-7833

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COMMUNICATIONS SECTION
MAY 1999

March 24, 1999

Edwin T. Sakoda
Acting Deputy Director
State of Hawaii
Department of Land & Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Sakoda:

Subject: Iao Water Management Rule - Maui Board of Water Supply

The Iao Water Management Rule became effective March 15, 1999 (copy enclosed).

Your comments on the Iao Water Management Rule will be kept for future reference. These comments were received the night before the final Council vote on the matter and were not considered. Comments are necessary before the Board finalizes the rule and sends it to the Mayor and Council. The Council cannot make changes at its level; it can only vote to approve or disapprove the rule. In the future, we will try to get your input earlier.

Thank you for taking the time to review the rule and for your comments.

Sincerely,

David Craddick, Director
DC/jaw
Enclosure

EXHIBIT 8

"By Water All Things Find Life"



TITLE 16

BOARD OF WATER SUPPLY
COUNTY OF MAUI

CHAPTER 9

IAO WATER MANAGEMENT RULE

- §16-9-1 Purpose
- §16-9-2 Definitions
- §16-9-3 Caution low groundwater condition 95% sy
- §16-9-4 Alert low groundwater condition 98
- §16-9-5 Critical low groundwater condition 100
- §16-9-6 Mandatory restrictions related to Alert low groundwater condition
- §16-9-7 Mandatory restrictions related to Critical low groundwater condition
- §16-9-8 Surcharge Penalties for Alert and Critical low groundwater conditions
- §16-9-9 Penalties
- §16-9-10 Procedures for control of water use during Alert or Critical low groundwater level conditions
- §16-9-11 Termination of Caution, Alert or Critical low groundwater level conditions
- §16-9-12 Exemption of private wells within designated groundwater control areas
- §16-9-13 Effective date

§16-9-1 Purpose. The purpose of the rule is to prevent overdraft of Iao aquifer. [Eff. 03/15/99] (Auth: HRS 54-33) (Imp: HRS §54-33)

§16-9-2 Definitions. The definitions as set forth herein, and in Board of Water Supply Rules and Regulations Rule Sections 1-2, 16-8-2 and 16-7-3 shall apply in these rules unless another meaning is plainly evident from the context. If there is any conflict between definitions it is intended that the broader or more inclusive definition apply. If a word or phrase is not defined the commonly accepted definition of that word or phrase shall apply.

"Base period water use" or "base period" means the monthly average water use based on water usage for the immediately preceding full twenty-four (24) month billing cycle at the time of the caution low groundwater declaration. Partial billing cycles are not to be included in the determination of the monthly average.

"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 on Water Resources Management. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-3 Caution low groundwater condition. (a) A caution low groundwater condition exists:

- (1) At any time the 12 month moving average pumpage of gallons of water withdrawn from the Iao Aquifer exceeds 95% of the sustainable yield of the Iao Aquifer; or
- (2) Whenever chloride content reaches the absolute limit in ppm chloride shown in Column A in Schedule 1 in more than one area based on a 3 month moving average.

(b) The board shall at any time during the period in which a caution low groundwater condition exists inform the public that a caution low groundwater condition exists. Thereafter the director shall:

- (1) Conduct an intensive public appeal for water conservation through the mass media;
- (2) Institute voluntary irrigation and other water use schedules to reduce water consumption;
- (3) Send letters to large consumers and other private well operators asking them to cut back their usage; and
- (4) Notify the Mayor, Maui County Council and the state Commission on Water Resources Management.

(c) The goal for draft reduction is 5% of Iao Aquifer sustainable yield as determined by the Commission on Water Resources Management.

(d) Consumers shall be given a target of a 10% reduction of their base period water use as the goal for reduction of water use in the caution low ground water condition.

(e) No new applications for water meters or payment of the water system development fee shall be accepted by the Department at any time when the combination of actual pumpage from the Iao Aquifer plus the amount of water estimated to be used, based on paid for meter reservations for meters which have not been physically installed, equals or exceeds 98%.

(f) The following procedure shall be followed to issue meters after the caution low ground water condition is lifted:

- (1) The director shall establish a system to put all such requests on a master list in the order in which they are received;
- (2) When applications for meters may be accepted the director shall contact the persons on the master list in the order which the request was received and inform them that they may file an application. The application and payment of the fee must be submitted within 90 days of notification;
- (3) If the person does not apply for a meter and pay the fee within this period the person is removed from the list and must reapply in the normal course of business; and
- (4) No new applications for meters shall be accepted until all of the persons on the list have first been offered a meter and have either applied for a meter and paid the fee or have not applied within the period specified in subsection (3), above.

(g) The director shall, at each board meeting while a caution low groundwater condition exists, report to the board:

- (1) The status of the chloride levels of the department's facilities listed in Schedule 1;
- (2) The weekly average of daily pumpage; the effectiveness of the voluntary conservation measures being advocated; increase or decrease in public appeals to conserve water; and
- (3) Such other information which the board may require from time to time to evaluate the status of the low condition and make modification to the voluntary conservation measures being advocated.

[Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-4 Alert Low Groundwater Condition. (a) An alert low groundwater condition exists:

- (1) At any time the 12 month moving average pumpage of gallons of water withdrawn from the Iao Aquifer reaches 98% of the sustainable yield of the Iao Aquifer; or
- (2) Whenever chloride content reaches the absolute limit in ppm chloride shown in Column B in Schedule 1 in more than one area based on a 3 month moving average.

(b) The board shall at any time during the period in which an alert low groundwater condition exists declare that an alert low groundwater condition exists. Thereafter the director shall:

- (1) Implement mandatory restrictions pursuant to section 16-9-6 of these rules;
- (2) Take appropriate action against those person(s) failing to comply with these provisions as permitted within these and the other Board Rules and Regulations;
- (3) Take any action authorized to be taken pursuant to section 16-9-3 of these rules; and
- (4) Notify the Mayor, Maui County Council and the state Commission on Water Resources Management.

(c) Private wells.

- (1) During an alert low groundwater condition period the Board shall ask owners of private wells that adversely affect the Iao Aquifer sustainable yield to comply with maximum monthly water allotments established for each private well or battery of private wells. Such allotments shall be stated as a percentage of the highest average daily draft for each month of the year over the last five years prior to the effective date of the alert low groundwater condition as declared by the board.

Example:

John Doe Well - Average Daily Pumpage Each Month

	1993	1992	1991	1990	1989
Jan	2.3 mgd	1.7 mgd	*2.4 mgd	2.0 mgd	1.9 mgd
Feb	1.8 mgd	1.9 mgd	1.8 mgd	*2.0 mgd	1.8 mgd
Mar	*1.9 mgd	1.8 mgd	1.8 mgd	1.7 mgd	1.8 mgd
Apr	2.2 mgd	2.0 mgd	*2.6 mgd	2.3 mgd	2.3 mgd
etc	etc	etc	etc	etc	etc

*Highest Average Daily Pumpage for Each Month of the Year Over the Last 5 years for John Doe Well.

Jan - 2.4 mgd
Feb - 2.0 mgd
Mar - 1.9 mgd
Apr - 2.6 mgd
etc - etc

- (2) In no case shall the allotment be less than 90% of the highest average daily draft for each month of the year over the last five years;
- (3) Any Owner of two or more separate wells may regulate the draft of their wells so that aggregate monthly draft will not exceed the combined monthly allotment for all of their wells;
- (d) The goal for draft reduction is 10% of Iao aquifer sustainable yield as determined by the Commission on Water Resources Management.
- (e) Consumers shall be given a target of a 15% reduction of their base period water use as the goal for reduction of water use in the alert low ground water condition.
- (f) The director shall, at each board meeting while an alert low groundwater condition exists, report to the board:
 - (1) The status of the chloride levels of the department's facilities listed in Schedule 1;
 - (2) The weekly average of daily pumpage; the restrictions and allotments in force; plans to increase or decrease public appeals to conserve water; and
 - (3) Such other information which the board may desire or require from time to time to evaluate the status of the low groundwater condition and make modification to the mandatory conservation measures being advocated. [Eff. 03/15/99]
(Auth: HRS §54-33) (Imp: §54-33)

§16-9-5 Critical Low Groundwater Condition. (a) A critical low groundwater condition exists:

- (1) At any time the 12 month moving average pumpage of gallons of water withdrawn from the Iao Aquifer reaches 100% of the sustainable yield of the Iao Aquifer;

- (2) Whenever chloride content reaches the absolute limit in ppm chloride shown in column C in Schedule 1 in more than one area based on a 3 month moving average.
- (b) The board shall at any time during the period in which a critical low groundwater condition exists declare that a critical low groundwater condition exists. Thereafter, the director shall;
 - (1) Implement mandatory restrictions within the scope of these rules and regulations;
 - (2) Take appropriate action against those person(s) failing to comply with these provisions as permitted within these and the other Board Rules and Regulations;
 - (3) Take any action authorized to be taken pursuant to section 16-9-3 and 16-9-4 of these rules; and
 - (4) Notify the Mayor, Maui County Council and the state Commission on Water Resources Management.
 - (c) Private wells.
 - (1) During a critical low groundwater condition period, the board shall ask owners of private wells that adversely affect the Iao Aquifer sustainable yield to comply with maximum monthly water allotments established for each private well or battery of private wells. Such allotments shall be stated as a percentage of the highest average daily draft for each month of the year over the last five years prior to the effective date of the critical low groundwater condition as declared by the board. The board may, from time to time, increase or decrease the initial percentage limit set for each well or battery of wells provided that in no case shall the percentage be less than 70% of the highest average daily draft for each month of the year over the last five years.
 - (2) Any Owner of two or more separate wells may regulate the draft on their wells so that the aggregate monthly draft will not exceed the combined monthly allotment for all of their wells.

(d) The goal for draft reduction is 15% of Iao aquifer sustainable yield as determined by the Commission on Water Resources Management.

(e) Consumers shall be given a target of a 20% reduction of their base period water use as the goal for reduction of water use during a critical low ground water condition.

(f) The director shall, at each meeting while a declared critical low groundwater condition as provided herein is in effect, report to the board:

- (1) The status of the chloride levels of the department's facilities listed in Schedule 1 ;
- (2) The weekly average of daily pumpage; the restrictions and allotments in force; plans to increase or reduce restrictions and allotments; and
- (3) Such other information which the Board may require from time to time to evaluate the status of the low groundwater condition and make modifications to the restrictions and allotments imposed.

[Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-6 Mandatory restrictions related to alert low groundwater condition.

(a) Board of water supply consumers. During an alert low groundwater condition period, the director may set lawn and ground cover water irrigation restrictions on any of the department's consumers. Such restrictions shall relate to the time when such irrigation may take place and the quantity of water used and may be different for the various classes of the department's consumers as the director shall determine. In addition, the director shall establish water allotments for consumers which shall not be less than 90% of the base period water use, but not less than 400 gallons/day for single family and duplex residences.

(b) During an alert low groundwater condition no meter applications shall be accepted and no meters shall be installed.

(c) Department personnel may issue warnings and citations for violations of mandatory restrictions [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-7 Mandatory restrictions related to critical low groundwater condition. (a) Board of water supply consumers. The director shall declare that one or more of the following restrictions apply to any or all classes of the department's consumers. Such restrictions may relate to the time when the uses listed in this paragraph may occur and the quantity of water used and may be different for the various classes of the department's consumers as the director may determine.

(b) The restrictions include the following:

- (1) Limits on lawn and ground cover water irrigation;
- (2) Limits on plant and garden irrigation;
- (3) Limits on the washing of cars, boats, trailers, and other vehicles;
- (4) Limits on the filling of swimming pools and other types of pools and ponds;
- (5) Limits on the washing of sidewalks, walkways, driveways, patios, parking lots, tennis courts, and other hard-surfaced areas; and
- (6) Limits on the operations of fountains.

(c) Department personnel may issue warnings and citations for violations of mandatory restrictions set by the director. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

Section 16-9-8. Surcharge Penalties for Alert and Critical Groundwater Conditions (a) During alert and critical low groundwater condition periods, a surcharge schedule for excess water use shall be established according to the following procedure. The director shall set water allotments per billing period for each class of the department's consumers. Such allotments shall be stated as a percentage (which may be greater than 100% but not less than 70%) of the base period water use. In addition, the allotment shall not be less than 400 gallons per day for single family and duplex residences.

(b) The base period water use as defined in section 16-9-2, above, shall be used to determine surcharge penalties. This amount is not a moving average but is intended to be used for the duration of any Alert or Critical Groundwater condition.

(c) Surcharge penalties shall be charged as follows during Alert and Critical Groundwater conditions:

1. Usage between the allotment as set forth in section 16-9-8(a), above, and the base period water usage shall be subject to a surcharge of three (3) times the current highest block rate;

2. Usage above the base period water usage shall be charged at twenty (20) times the current highest block rate; and

3. Consumers who use more than the base period water usage are also subject to the installation of a flow restriction device and/or the discontinuation of water service, including removal of the meter.

(d) Surcharges shall be assessed each consumer after receipt of the first water bill following the establishment of allotments by the board. Upon termination of allotments by the board, surcharges shall cease.

[Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-9 Penalties. Any violation by any person of the restrictions declared by the board under Sections 16-9-6 and 16-9-7 of this chapter or who consumes water in excess of the amount designated for their class shall be subject to the installation of a flow restriction device by the department and punishable according to these rules and regulations and section 3-26 of the rules and regulations of the department of water supply. An offender shall pay the actual cost for the installation and removal of a flow restriction device by the department, which cost shall be billed at the prevailing wage rate(s) plus costs for equipment and materials. Water service may be discontinued for an offense committed after the installation of a flow restrictor in accordance with section 3-12 of the rules and regulations of the department of water supply. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33).

§16-9-10 Procedures for control of water use during Alert or Critical low groundwater conditions.

(a) Declaration of low groundwater level condition. The Director shall inform the public and the department's consumers of the declaration of an alert or critical low groundwater condition by publishing such declaration in a newspaper of general circulation on the island of Maui at least once a day for three consecutive days. The alert or critical low groundwater condition shall begin at midnight on the third day of the publication

declaring such condition. The following notices shall be issued during an alert or critical low groundwater condition:

- (1) Notice of restrictions. The Director shall inform the public and the department's consumers of the restrictions being imposed because of an alert or critical low groundwater condition by publishing such restrictions in a newspaper of general circulation on the island of Maui at least once a day for three consecutive days. The restrictions shall begin at midnight on the third day of publication declaring such condition and shall terminate at midnight on the first day of a publication terminating such condition;
- (2) Notice of water allotment to consumers. Each consumer shall be notified of their water allotment per billing period by printing such amount on their water bill or by direct mail to the consumer. In cases where a water bill is not sent directly to the person using the water, the consumer shall be responsible for informing the user of the water allotment per billing period applicable to them; and
- (3) Notice of maximum monthly water allotment to private well operators. Private well operators shall be notified by mail of their monthly water allotment.

(b) Exceptions. Consideration of written applications for exceptions regarding the allotment system or regulations and restrictions on water use shall be set forth in this chapter. Written applications for exceptions shall be accepted, and may be granted, by the director. The director shall report to the Board at each Board meeting a list of all exemptions requested and exceptions granted by consumer class since the previous meeting. Grounds for granting such exceptions are:

- (1) Failure to do so would cause an unnecessary and undue hardship to the applicant, including but not limited to adverse economic impacts such as loss of production or jobs;
- (2) Failure to do so would cause an emergency condition affecting the health, sanitation, fire protection, or safety of the applicant or the public;
- (3) For single family residences with more than four persons permanently residing in the home, if a written

application for exception is granted as provided herein, the applicable allotment shall be increased by 40 gallons per person per day for each person permanently residing in the home in excess of four persons;

- (4) For multiple residential units with more than two dwelling units where the allotment is less than 280 gallons per day per dwelling unit, if a written application for an exception is granted as provided herein, the applicable allotment shall be 280 gallons for each unit; and
- (5) Denial of an application for exception may be appealed in writing to the board, which shall consider the appeal as a contested case pursuant to Board of Water Supply Rules of Practice and Procedure, Title 16, Chapter 2.

(c) The director shall inform the public and the department's consumers of the termination by the Board of an alert or critical low groundwater condition by publishing such termination in a newspaper of general circulation on the island of Maui at least once a day for three consecutive days. The alert or critical low groundwater condition and all restrictions and allotments associated therewith shall terminate at midnight on the first day of a publication terminating such condition.

[Eff. 03/15/99] (Auth: HRS §54-33). (Imp: HRS §54-33)

§16-9-11 Termination of Caution, Alert or Critical low groundwater conditions. The board may terminate a declared Caution, Alert or Critical Low Groundwater Condition whenever chloride content and moving annual average pumpage over three consecutive months at sources that caused the declared low groundwater level conditions to exist are appropriately reduced below their respective amounts. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-12 Exemption of private wells within designated groundwater control areas. New and existing private wells within designated groundwater control areas only shall be exempt from the provision of these rules and regulations. However, owners of private wells shall be asked to comply with any allotments set by the board for private wells. Control and regulation of such wells shall be subject to state statutes, rules, regulations,

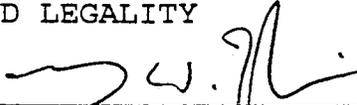
directives, and standards as currently exist and as may, from time to time hereafter, be amended. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-13 Relationship between designation of the Iao Aquifer for management and the Iao Water Management Rule. Upon designation of the Iao Aquifer by the appropriate state agency the Board shall meet and consider the reasons for designation and independently determine whether the criteria for declaring either a caution, alert or critical low groundwater condition exists and, if so, to declare the appropriate low groundwater condition as existing. Nothing in this rule shall require the Board to declare that any such low groundwater condition exists, even though the Iao Aquifer may be so designated by a state agency. [Eff. 03/15/99] (Auth: HRS §54-33) (Imp: HRS §54-33)

§16-9-14 Effective date. This rule shall become effective ten (10) days after it is filed with the county clerk of the county of Maui. [Eff. 03/15/99] (Auth: HRS §91-4) (Imp: HRS §54-33)

Adopted on the 14th day of January, 1999, by the Board of Water Supply of the County of Maui.

APPROVED AS TO FORM
AND LEGALITY



GARY W. ZAKIAN
Deputy Corporation Counsel
S:\ATTORNEY\GWZ\BWS\WTRMGMT.CLN

MAUI COUNTY BOARD OF
WATER SUPPLY



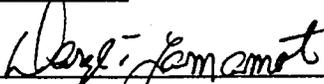
Robert K. Takitani
Its Chairperson

Approved this 6 of
Feb., 1999.



JAMES H. APANA
It's Mayor

Received this 5th, day
of March, 1999.



DARYL T. YAMAMOTO
County Clerk
County of Maui

CERTIFICATION

I, DAVID CRADDICK, in my capacity as Director of the Department of Water Supply, County of Maui, do hereby certify:

1. That the foregoing is a full, true and correct copy of the Rules and Regulations of the Board of Water Supply of the County of Maui Relating to the Iao Water Management Rule.
2. That the notice of public hearing on the foregoing Rules and Regulations, which notice included the substance of such Rules and Regulations, was published in the Maui News on March 22, 1998, and that a public hearing was held on April 24, 1998 in Kahului, with video link to Hana, Maui and to Kaunakakai, Molokai.



David Craddick, Director
Department of Water Supply
County of Maui

LOW GROUNDWATER
SCHEDULE 1

COLUMN A ("Caution" Low Ground- Water Condition)		COLUMN B ("Alert" Low Ground- Water Condition)		COLUMN C ("Critical" Low Ground- Water Condition)	
Central District		Central District		Central District	
Area	Absolute Chloride Level ppm	Area	Absolute Chloride Level ppm	Area	Absolute Chloride Level ppm
Wailuku Shaft	80	Wailuku Shaft	100	Wailuku Shaft	120
Mokuhau	160	Mokuhau	180	Mokuhau	200
Waiehu Heights	160	Waiehu Heights	180	Waiehu Heights	200
Waiehu	80	Waiehu	100	Waiehu	120
Kepaniwai	40	Kepaniwai	60	Kepaniwai	80

**DEPARTMENT OF WATER SUPPLY**

COUNTY OF MAUI

P.O. BOX 1109

WAILUKU, MAUI, HAWAII 96793-6109

TELEPHONE (808) 270-7816 • FAX (808) 270-7833 • www.mauewater.org

September 26, 2001

Chairman and Members
BOARD OF WATER SUPPLY
County of Maui
Wailuku, Hawaii 96793

Dear Chairman and Members:

Subject: Request Confirmation of Water Availability for the Central Maui Water System

I would like the Board to confirm water availability for the central Maui water system. The numbers are 30 MGD safe yields for the Iao and Waihee aquifers. The 12-month average water use in June was 22.6 MGD. If we say we are only going to use 90% of safe yield and make a 0.7 MGD allowance for the 7% of meters issued, but not being used, and 0.08 MGD for reservations in the central system, these numbers total 3.8 MGD. When we add this to the use number, we have 26.4 MGD to serve existing commitment. Taking this from the 30 number, we are left with 3.6 MGD available for use.

This request is made to clarify and give notice to the public what the numbers are.

Two ground water aquifers supply water to the central system. Iao has a sustainable yield of 20 MGD and Waihee has a sustainable yield of 8 MGD. Iao tunnel yields 2.0 MGD which is a gravity fed, high level, ground water system. The total for the three sources is 30 MGD.

The sustainable yield numbers are from the State CWRM. The tunnel water is the number that we can use from the source. On the average, we have recently been using 1.5 MGD due to rainfall patterns and the desire to avoid customer complaints due to low water pressure conditions. There may be some discretionary thought that can go into the number. Without plausible data provided to show why these numbers may be incorrect, we ask that they be accepted.

There are various theories expounded regarding pumping outside of Iao effecting Iao safe yields. We do know current water levels reflect withdrawals outside of Iao aquifer.

"By Water All Things Find Life"

EXHIBIT 9

20
10

**Chairman and Members
BOARD OF WATER SUPPLY
Page 2
September 26, 2001**

There are also different views about the pumping head being the actual equilibrium head for the aquifer. This argument is based on models using assumptions that make the model work in the noted fashion but don't reflect actual conditions.

Our recent test of the Iao aquifer shows the aquifer would take 82 days to recover to a head of seventeen and a half feet, corresponding to the salt /fresh water midpoint observed in the state monitor well. The 17.5 foot water level head is also close to the observed water level in the Waikapu well, which is located away from pumping centers. This information is based on real time test information gained from the aquifer test done in August 2001 and January 2000.

The test information shows that the pumping head observed in test hole B within the pumping area of 7.54 feet above sea level does not correspond to the storage head of 17.5 feet above sea level.

The midpoint level is still rising but the rate of rise is slowing. The rate of rise was 10 feet per year 15 years ago; now, it is rising 5 feet per year. This fact is indicative of conditions stabilizing rather than getting worse.

To the staff this information means the 20 MGD safe yield of Iao aquifer is a reasonable number to use at this time as all the information is based on readings after many years of drought.

The 8 MGD from N. Waihee aquifer has little pumping information at this time. We recommend relying on the state number of 8 MGD until more data is available.

July pumping information that was provided to the Board and the CWRM and USGS is correct to the best of our knowledge. That number is 22.59 MGD

The difference between 30 and 22.59 is 7.41 MGD. If we discount the 7.41 MGD number for the 7% of meters in the central system that are unused, and if used, would demand 0.7 MGD. As of June, there was 0.08 MGD in reservations, and if we want to keep pumping at 90% of the safe yield or deduct 3 MGD for unknowns, then we would deduct 3.8 MGD from 7.41 MGD leaving 3.6 MGD available for use.

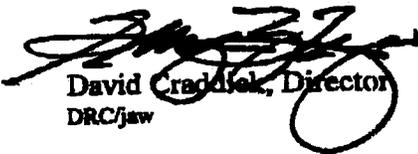
This 3.6 MGD number we feel is available, is very conservative and the number we are requesting confirmation. If you, as a Board member, feel more discounting should occur based on factual information is preferable, then by all means further discount it.

The 3.6 MGD does not include surface water that may be of a temporary nature. Demand has been going up about 0.5 MGD over the last six years.

**Chairman and Members
BOARD OF WATER SUPPLY
Page 3
September 26, 2001**

Available for use means just that. It is only available; it does not mean the system can safely deliver the available water on an average day basis with equipment down for repair. However, we are not asking for confirmation of a safe deliverable number as that gets into the whole CMJV matter and is much more controversial until the Board takes a position on it.

Sincerely,


David Craddick, Director
DRC/jaw



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Water Resources Discipline
677 Ala Moana Blvd., Suite 415
Honolulu, Hawaii 96813

make
copies for:
branch chiefs
Chorley
Sienu

October 20, 2001

Chairman and Members
Board of Water Supply
County of Maui
Wailuku, Hawaii 96793

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

of pages **2**

To Linnel Nishioka	From Steve Anthony
Dept./Agency WRM	Phone # 587-2406
Fax # 587-0219	Fax # -2401

NSN 7540-01-317-7368 5098-101 GENERAL SERVICES ADMINISTRATION

Dear Chairman and Members:

Thank you for inviting the U.S. Geological Survey (USGS) to speak on the very important subject of water availability from the Iao Aquifer. I am sorry that I was unable to attend your meeting on October 22, 2001, but my colleagues Steve Anthony and Steve Gingerich are fully prepared to present information on the status of the aquifer and answer any questions. As you may be aware, the USGS is not a regulatory agency and as such does not make water resource management recommendations or decisions. However, it is within our mission to provide unbiased scientific information to facilitate informed and effective management and policy decisions in the public interest. As a result, there are several points that I would like to make with regard to water availability from the Iao Aquifer.

First, it is important to distinguish between the regulatory level of sustainable yield and the amount of ground water of acceptable quality that can actually be pumped over the long term given an existing infrastructure. A number on paper does not necessarily translate into reality.

Second, there is no single fixed value for sustainable yield. The amount of ground water that can be pumped over the long term depends on many factors. Some of these factors include the distribution of pumpage, the dynamic flow of ground water, and climatic variability. Current values are based on an analytical model with simplifying assumptions that ignore these factors.

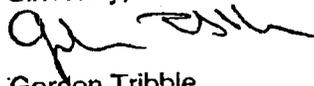
Third, under the current distribution of pumpage the regulatory level of 20 million gallons per day for the Iao aquifer does not appear to be sustainable. This is based on an assessment of available water level and chloride data collected during periods of high pumpage and an evaluation of the method used by the State Commission on Water Resource Management to set sustainable yield values in Hawaii (Source: USGS Water Resources Investigations Reports 00-4223 and 00-4244, respectively).

Fourth, the delineated aquifers in the State Water Resources Protection Plan are not independent, and pumpage from one aquifer can affect another. As a result, pumping from areas adjacent to the lao aquifer will affect water levels, and the availability of water, within that aquifer.

Finally, although the recent test involving the shutdown of Maui Department of Water Supply wells in the lao area illustrates that water levels are affected by pumpage, it is not relevant to the long-term sustainability of the aquifer.

These comments are offered as starting points for discussion on how to better assess the amount of water that can be pumped from the lao area. A presentation of existing information should allow you to judge for yourselves how the aquifer has historically reacted to different levels of pumpage, and see current trends and conditions. Additional information can refine the estimates of water availability from the area. Thank you again for inviting us to give this presentation.

Sincerely,



Gordon Tribble
District Chief

EXHIBIT 10

Iao Aquifer System, Maui

Mid-Pt. & TTZ Elev. @ Waiehu Mon. Well

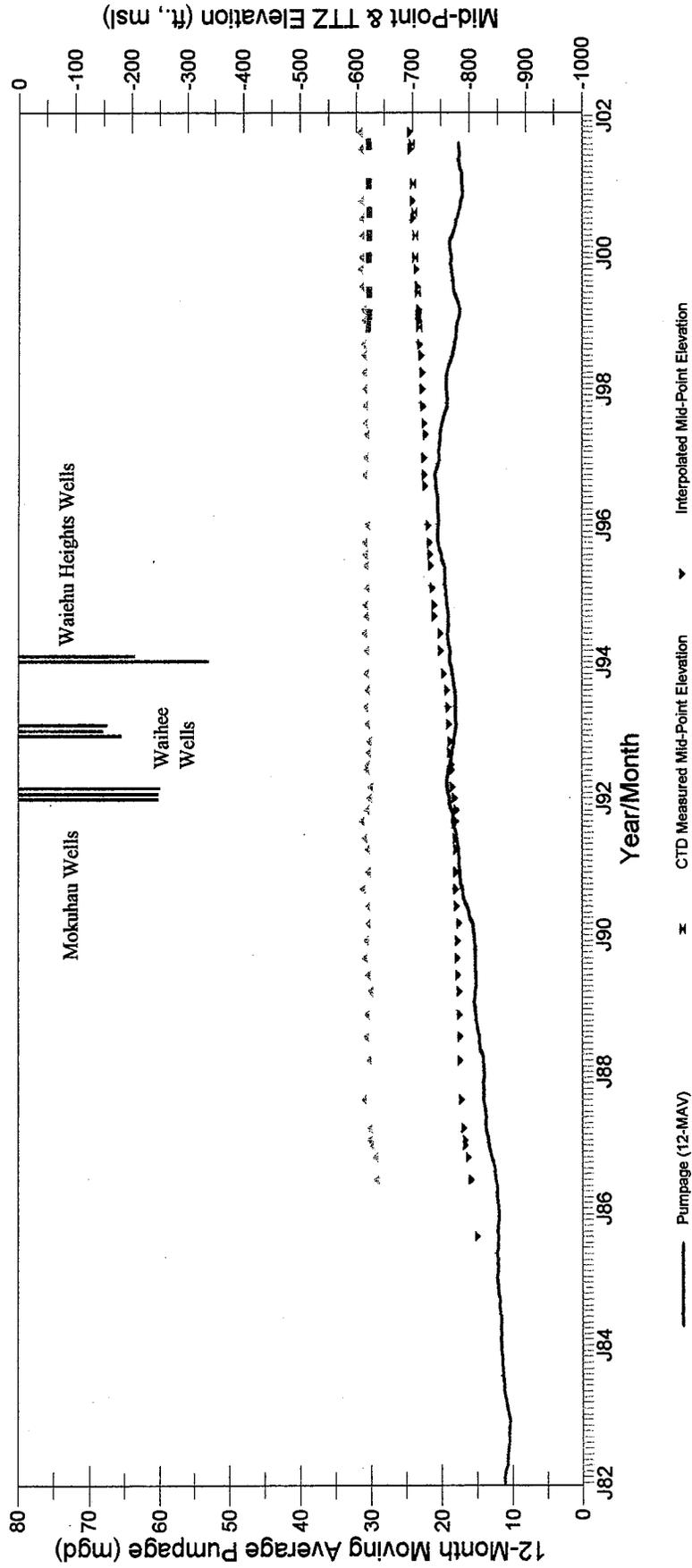


EXHIBIT 11

FIGURE 2

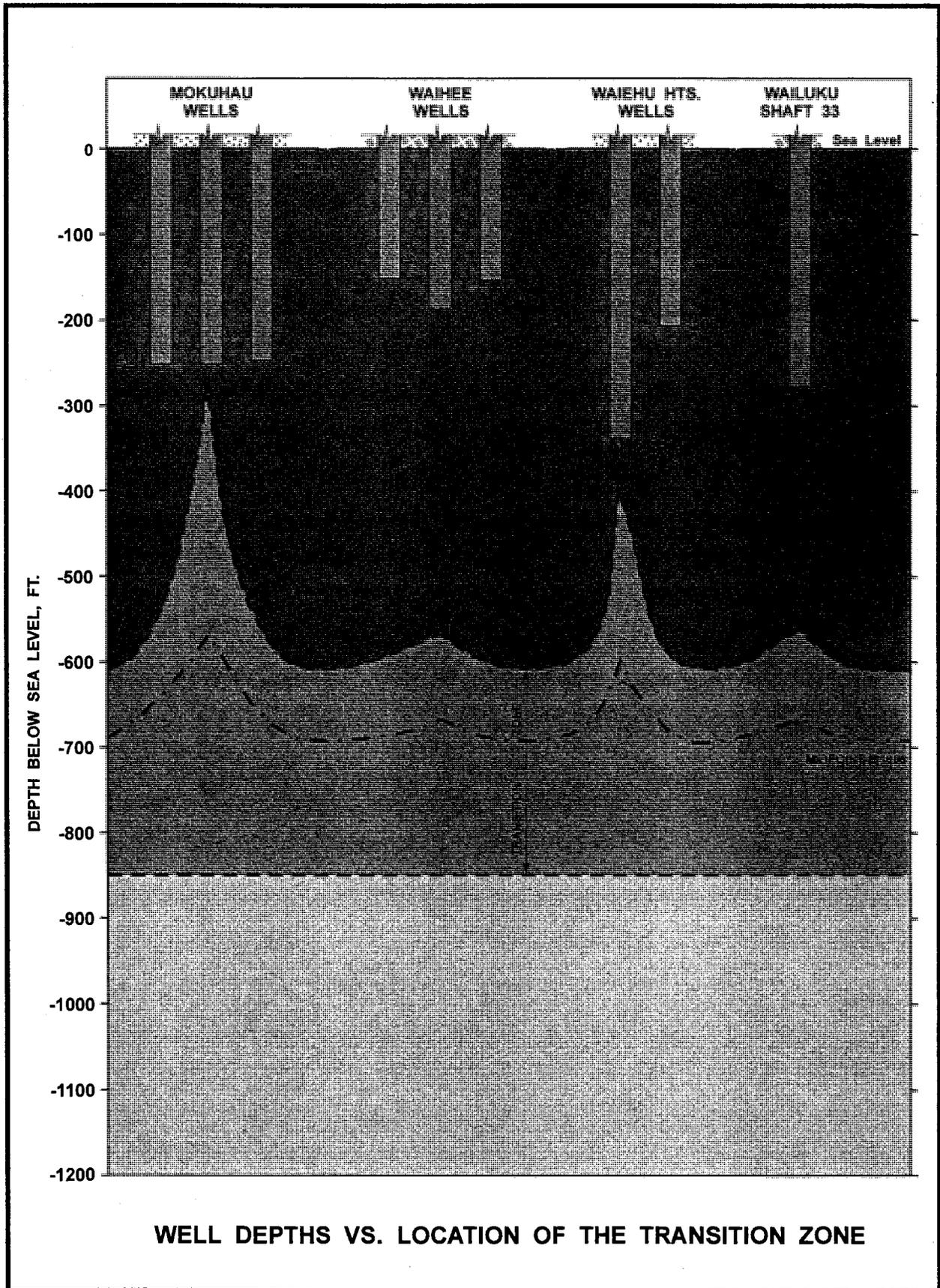


Figure 5

Waiehu Deep Monitor Well, Iao Aq. Sys. Pumpage & Movement of TZ Mid-Point

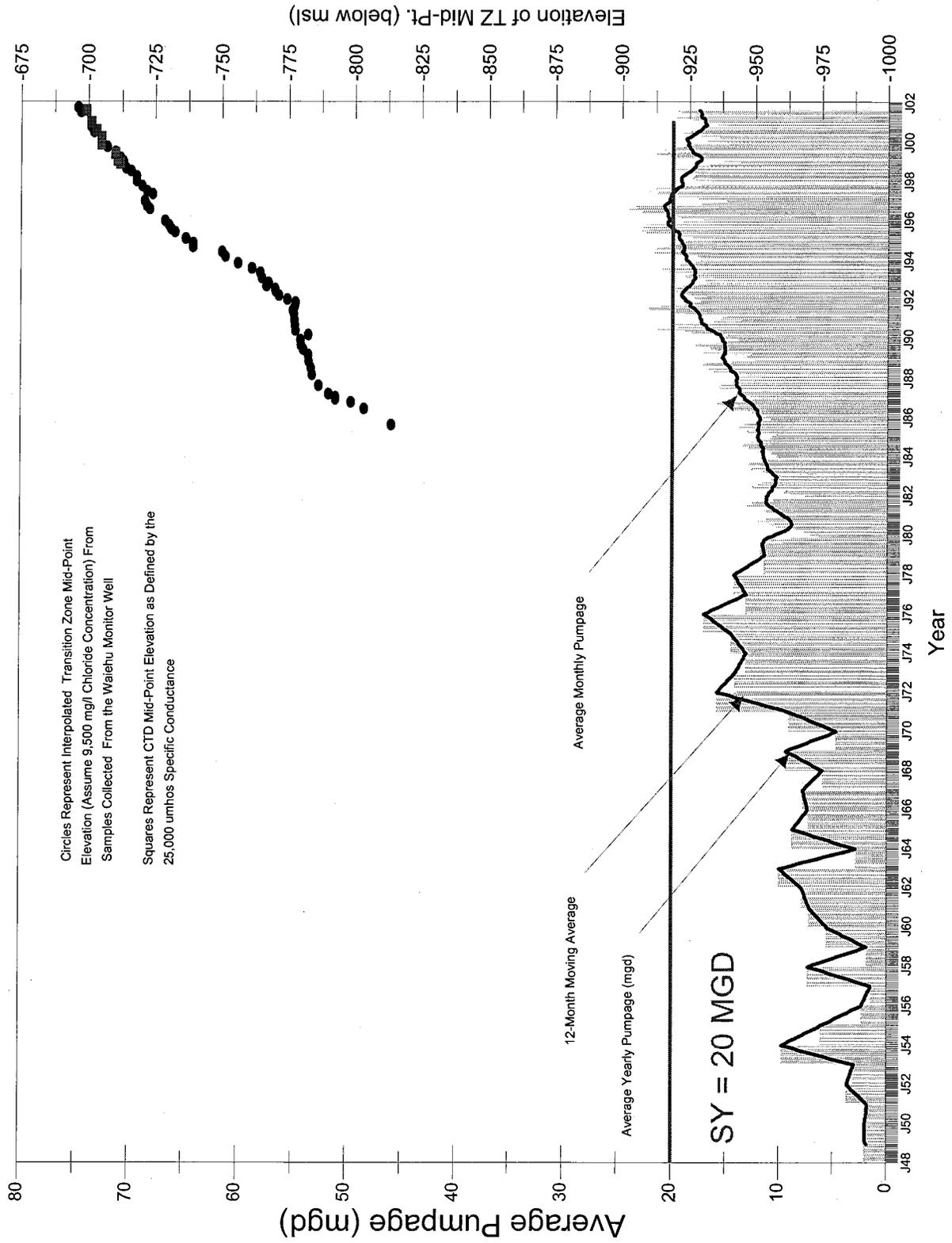
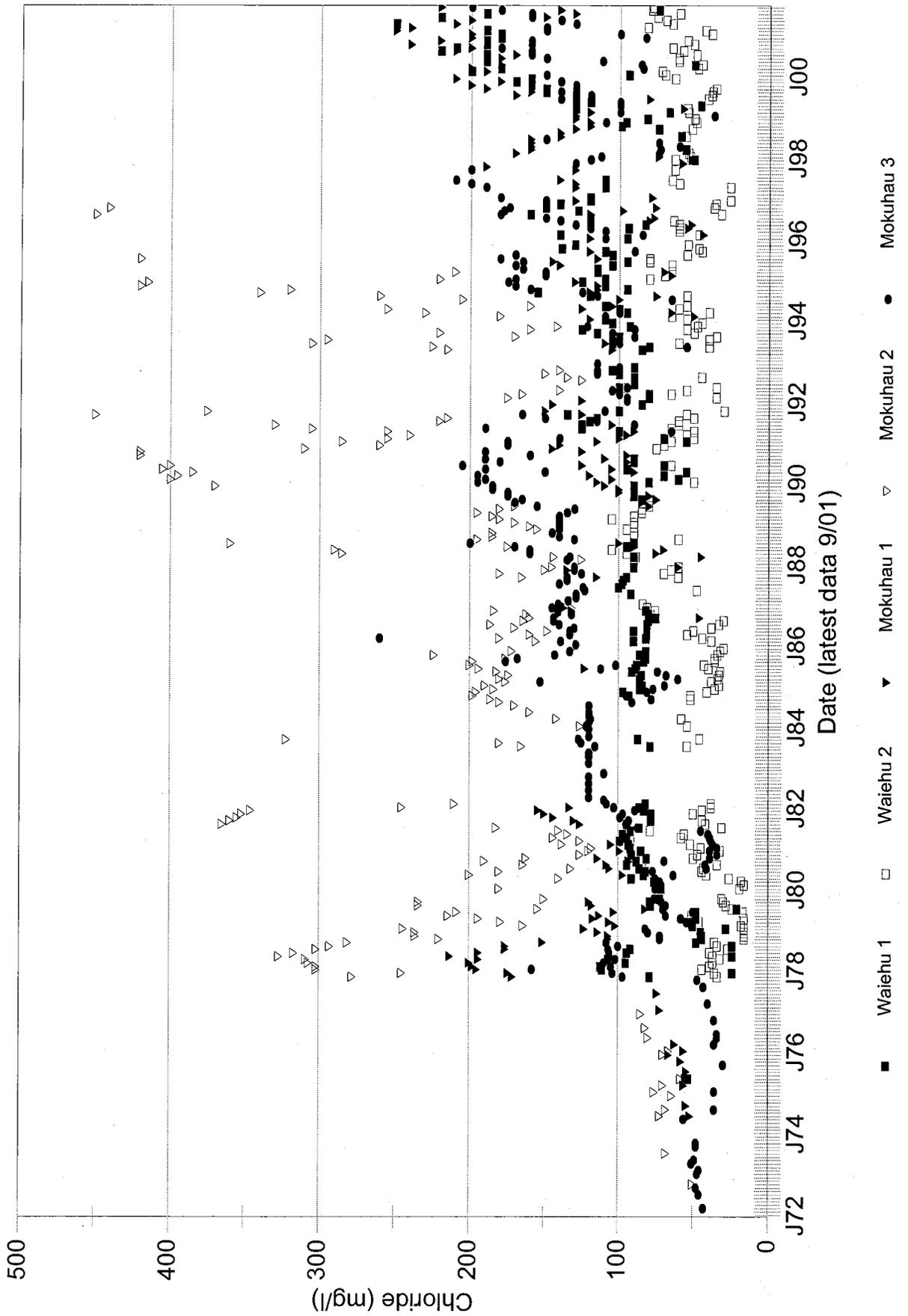


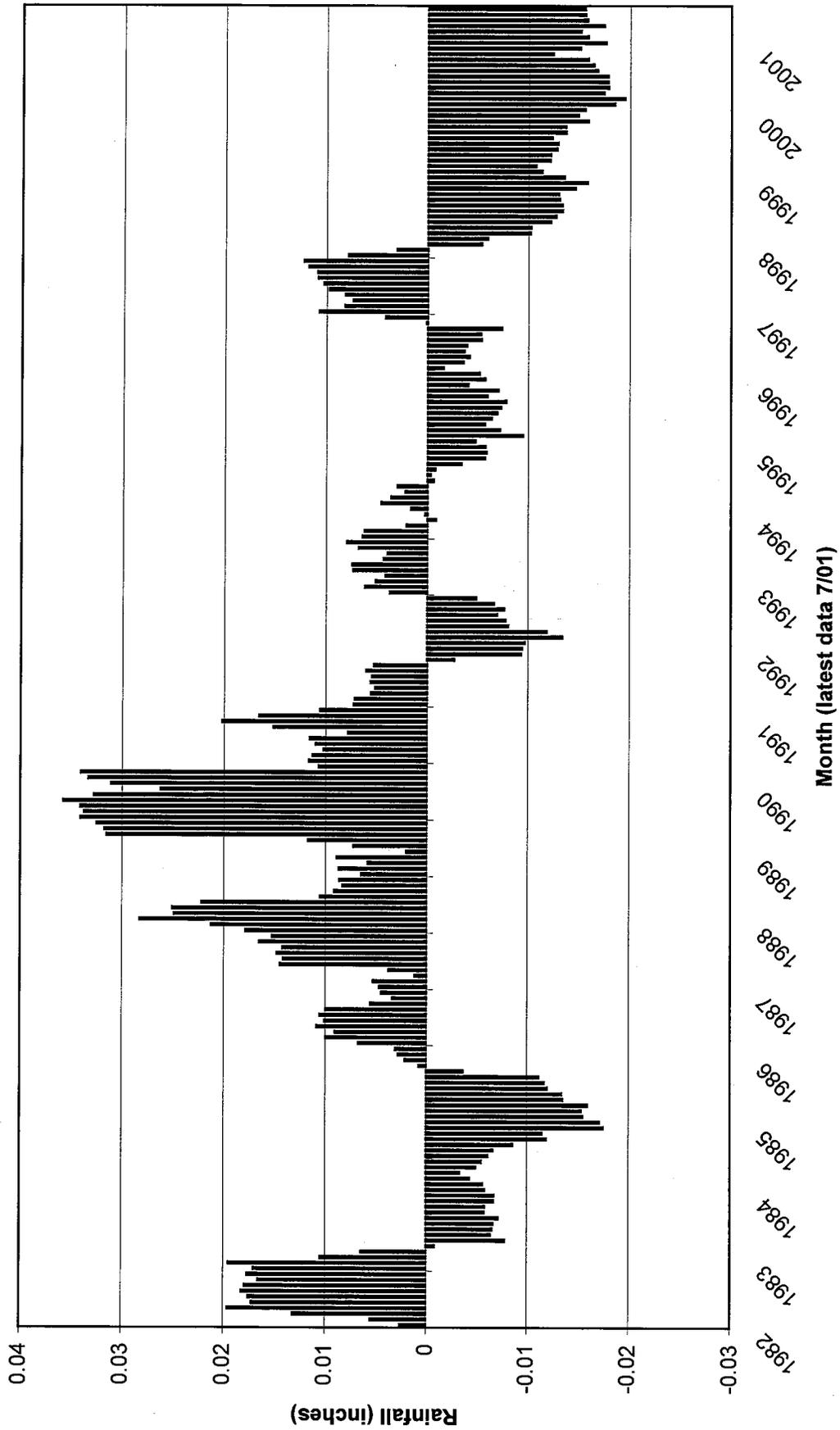
EXHIBIT 13

FIGURE 3

Iao Aquifer System Pumping Well Chlorides



Waiehu Camp 12-Month Average of Monthly Rainfall Departures



■ 12-month Average of the Monthly Departure From Mean Rainfall

Iao Aquifer System				
Safe Water Levels vs. Current Water Levels (feet msl)				
Well Field	Safe Water Level	1997 Water Level	Revised Safe Water Level (a)	2001 Current Water Level
Waiehu Heights	9	9	11.0	9.22 (b)
Shaft 33	11	9	9.5	7.97 (c)
Mokuhau	9	N/A	8.8	10.44 (d)
Waihee	N/A	9	7.0	7.73 (e)
N. Waihee	7	7	5.1	5.18 (f)

- (a) Long-term water level based on assuming the top of the transition zone intersects bottom of deepest well in well field
- (b) August 2001 water level from Waiehu TH-E (5430-03) provided by USGS
- (c) August 2001 water level from Shaft 33 Well 1 (5430-03) provided by USGS
- (d) August 2001 water level from Mokuhau 3 (5330-11) provided by Maui BWS
- (e) August 2001 water level from Waihee TH-B (5431-01) provided by USGS
- (f) August 2001 water level from N. Waihee 2 (5631-03) provided by Maui BWS