Waihee 1&2
(Well No. 5631-02,03)
CHECKLIST

WELL CONSTRUCTION PERMIT  
PUMP INSTALLATION PERMIT

WELL NAME or LOCATION: North Kamehameha,  
WELL NUMBER: 5631-02803  
Tax Map Key: 3-2-01-4

OWNER/OPERATOR:  
Firm Name:  
Contact Person:  
Address:  
Phone:  

LANDOWNER:  
Firm Name:  
Contact Person:  
Address:  
Phone:  

Date application received: 9-21-92  
Date acknowledged receipt/request more info:  
Date application accepted:  
Suspense date (90 days):  
Date filing fee deposited:  

☑ Application sent to following:  

<table>
<thead>
<tr>
<th>Department</th>
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<th>Comments received</th>
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<tbody>
<tr>
<td>Dept. of Hawn Home Lands</td>
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<tr>
<td>Dept. of Health</td>
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<td>Office of Hawn. Affairs</td>
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<tr>
<td>State Hist Pres Div</td>
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<td>Dept/Bd of Water Supply</td>
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<td>Sierra Club L. D. F.</td>
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<td>Koolauloa NB #20 (Oahu)</td>
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<td>Dept Pub. Wrks (Hawaii)</td>
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<tr>
<td>Additional List (Molokai)</td>
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<tr>
<td>Eric Hirane</td>
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</tbody>
</table>

Date agenda due: 2 Dec 92  
Date submittal due: 2 Dec 92  
Date submittal sent to applicant:  

Date application approved or disapproved: 16 Dec 92  
Date applicant notified of decision:  

REMARKS:  
* also request a copy of filing fee (one fee per well)  
4/21/93 (C rd = receipt) per Mike Hansen  
4-22-93
Continued in Folder #2
CLOSING AGREEMENT

By and Between
BOARD OF WATER SUPPLY and
WAILUKU AGribUSINESS CO., INC.
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## AGREEMENT

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CLOSING AGREEMENT

This Agreement is made this 21st day of December, 1995, by and between the BOARD OF WATER SUPPLY of the County of Maui, 200 South High Street, Wailuku, Maui, Hawaii 96793 (the "BOARD") and WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, 90 Waiko Road, P.O. Box 520, Wailuku, Maui, Hawaii 96793 ("WAILUKU").

RECITALS: WAILUKU owns certain land in North Waihee Maui described in Exhibits "1" through "7" attached hereto and made a part hereof containing 2 improved wells and several well sites and easement areas, together with certain agreements, plans and specifications, and permits as further described in Exhibit "5" attached hereto. The purpose of this Agreement is to set forth the terms and conditions under which the parties shall close the transfer of certain real property title and other interests described in Section 5 below (collectively, the "Property") from WAILUKU to the BOARD for the consideration related below.

AGREEMENT: For valuable consideration WAILUKU and the BOARD mutually agree as follows:

1. Definitions. The following terms shall have the following means:

a. "Sector A Property" shall mean that real property comprising approximately 5,306 acres, identified as TMK 3-2-14:01, more particularly reflected on Exhibit "1" and shown in yellow and purple on Exhibit "2".

b. "Sector A-1 Property" shall mean that portion of Sector A Property comprising approximately 2,000 + acres, being sometimes referred to as the North Waihee Aquifer Recharge Area and shown in yellow on Exhibit "2".

c. "Sector A-2 Property" shall mean that portion of Sector A Property comprising approximately 3,000 + acres, sometimes referred to as the Conservation Easement area and shown in purple on Exhibit "2".

d. "Sector B Property" shall mean that real property comprising of approximately 380.318 acres, being that property sometimes referred to as the Well Field/Easement area, more particularly described in Exhibit "3" and shown in pink on Exhibit "2".

e. "Sector C Property" shall mean that real property referred to as the Pipeline Easement area, more particularly reflected in Exhibit "4" and shown in green on Exhibit "2".
f. "Personal Property" shall mean the two improved well sites on Sector B, the engineering studies, plans and specifications, permits, reports and other matters, all more particularly described and delineated on Exhibit "5".

g. "The Aquifer" or "The North Waihee Aquifer" shall mean the ground water resource(s) north of Waihee stream, including the recharge area of the North Waihee Aquifer as shown in yellow on Exhibit "2".

2. **Sale of Property.** WAILUKU agrees to sell and the BOARD agrees to purchase the Property on the terms and conditions set forth herein.

3. **Purchase Price.** The purchase price for the Property shall be approximately $3,820,000 (U.S. dollars), which shall be paid by the BOARD to WAILUKU in cash at closing. The price will be adjusted at closing to reflect the agreed upon reimbursement costs (currently estimated at $270,000).

4. **Closing Date.** For the purpose of this Agreement, closing shall be the date when all appropriate conveyance documents are recorded. WAILUKU and the BOARD agree to promptly execute appropriate and customary documents when requested by escrow to do so. The "scheduled closing date" shall be on or before February 15, 1996. There is no automatic right to extend. Time is of the essence and the "scheduled closing date" may not be extended unless both the BOARD and WAILUKU so agree in writing. This transaction shall be escrowed by Title Guaranty Escrow Services of Hawaii (Wailuku branch).

5. **Conveyances at Closing.** At closing, WAILUKU will convey the Property and the BOARD will pay to WAILUKU the total purchase price in cash, all as follows:

   a. **Sector A.** WAILUKU shall convey to the BOARD an undivided approximate 40% interest in Sector A, such that WAILUKU and the BOARD shall hold Sector A as tenants in common subject to all encumbrances and covenants

---

1 The price has been allocated as follows: $2,500,000 for Sector A Property; $700,000 for the existing improvements, including the two existing wells; $350,000 for the easements on Sectors B and C to be conveyed at closing; $270,000 representing the estimate of expenses expended by WAILUKU (or affiliates) to be reimbursed by the BOARD for all engineering and entitlement costs (plans, studies, governmental processing costs) the final expense to be determined during the due diligence period.
concerning the same and further subject to the tenancy in common agreement, further described below.

1. **Covenants Concerning Sector A.** The deed to Sector A Property to be executed by the parties will be subject to existing encumbrances including, but not limited to, the Deed of Exchange between Hawaiian Commercial and Sugar Company and Wailuku Sugar Company dated June 23, 1924, as amended by Agreement dated March 24, 1937 and will have the following covenants (and other covenants which may be agreed to by the parties prior to closing).

   a. Within Sector A, there will be a covenant that neither party will take any action including the creation of improvements, which would result in any significant negative impact to the surface or ground water resources within or emanating from the area. The parties would agree that there would be no further surface or ground water development by either party within Sector A without the mutual consent of both parties. The consent of either party shall not be unreasonably withheld, provided, it is agreed that consent is not unreasonably withheld, if the reason for the withholding is that the proposed activity will either have a significant negative impact on (1) the aquifer, or (2) the rights emanating from the aquifer, or (3) the ground or surface water sources and rights related to the aquifer, or (4) that the requesting party is in breach of its covenants relating to Sectors A, B or C.

      ("Significant negative impacts" shall be defined in the closing documents).

   b. For water source development within Sector A, WAILUKU will be granted a right of first refusal to participate in the source development on a pro rata (cost of development) basis up to 50 percent (50%) of the resource. Any joint development would be implemented consistent with the Board of Water Supply rules concerning source development and source credits.

   c. WAILUKU will have the right and ability to satisfy any rights and obligations to maintain the stream and the existing surface water system improvements within the area, at its discretion and consistent with past practices. WAILUKU would provide to the Board of Water Supply a periodic plan of surface water system maintenance within the area.
d. The parties would provide notice to each other if they wish to undertake any type of activity within the area other than WAILUKU’s on-going maintenance of the surface water systems within the area.

b. Sector B. WAILUKU shall grant easements to the BOARD encumbering Sector B Property with the well site easements, access easements, tank site easements and pipeline easements, as more particularly defined in Exhibits “6” and “7”.

At closing, WAILUKU and the BOARD will execute a declaration on Sector B Property reflecting that the BOARD, with the consent of WAILUKU, would have the ability to modify the location of the well site areas. WAILUKU’s consent would not unreasonably be withheld, and the obligation of the BOARD and WAILUKU would be to identify a needed relocated site which would have the least amount of impact on the utility of Sector B property. Within Sector B, WAILUKU would reserve and be granted the right of first refusal to participate in any ground water source development by the BOARD in excess of five million gallons per day from Sector B. The right of first refusal would be on a pro rata basis (cost of development) up to 50% of the resource, consistent with the BOARD’s rules and water source development and credits.

(The specifics of the right of first refusal for Sectors A and B, including the election period procedures, shall be provided in the closing documents).

c. Sector C. WAILUKU shall grant a pipeline easement to the BOARD encumbering Sector C Property with said pipeline easement as more particularly described in Exhibits “6” and “7”.

At closing WAILUKU would create a declaration on Sector C Property covenanting that it would not create new improvements or other activity within Sector C which would have a negative impact on the volume of ground water developed by the BOARD within Sector B.

d. Personal Property. WAILUKU shall convey and assign to the BOARD all of that personal property identified in Exhibit “5”.

e. Tenancy in Common Agreement. WAILUKU and the BOARD shall enter into a tenancy in common agreement concerning their joint interests in Sector A. The tenancy in common agreement will identify the rights and obligations of the parties concerning Sector A-1 and A-2, as well as providing for the subdivision of Sector A into Sectors A-1 and A-2 and the conveyance of A-1 Property from WAILUKU to the BOARD after the subdivision of Sector A-1 from
Sector A and the release by the BOARD to WAILUKU of its remaining undivided interest in Sector A-2. The tenancy in common agreement will provide for the grant of a conservation easement from WAILUKU to the BOARD concerning Sector A-2 Property after Sector A-2 is subdivided from Sector A. The agreement shall also authorize the BOARD to subdivide Sector A Property and will provide that the BOARD will perform all services and all acts and pay all costs necessary to create the referenced subdivision. The agreement will provide that the Property will remain in a tenancy in common status with the BOARD and WAILUKU maintaining their tenancy in common interests should the Property not be subdivided. The tenancy in common agreement will contain other covenants, as agreed upon between the BOARD and WAILUKU, concerning the respective rights, obligations and material declarations and covenants concerning Sector A.

6. Due Diligence. The BOARD shall have a "due diligence period" from the date of this Agreement to January 31, 1996, during which the BOARD may review all aspects of the Property, perform studies, tests, and generally to satisfy itself that the Property is acceptable to the BOARD in the BOARD’s discretion. During this period, the following will also occur:

a. Within five (5) days after the execution of this Agreement by both parties, WAILUKU will provide to the BOARD a copy of all WAILUKU’s studies, plans, surveys, environmental assessments, permits, approvals, and other reports relevant to the Property for the BOARD’s review.

b. The BOARD and its agents may enter the Property for the purpose of conducting surveys, tests and other work as the BOARD may deem appropriate, provided that if the ground is disturbed, the BOARD, at its expense, shall return the surface to the grade as existed prior to it being disturbed.

c. WAILUKU shall obtain and deliver to the BOARD a title report on the Property from Title Guaranty of Hawaii, Inc. (together with copies of all encumbrance documents).

d. Counsel for WAILUKU and the BOARD will prepare closing documents in the form satisfactory to each counsel, including the deed of the BOARD’s interest in Sector A from WAILUKU to BOARD; the deed shall convey title and warrant the same during the period WAILUKU has had title, subject to all encumbrances identified therein or shown on said title report or visible upon physical inspection of the Property. The closing documents shall also include the easements and the transfer of personal property as provided herein.

e. The BOARD and WAILUKU shall petition the Commission on Water Resource Management to transfer the pump installation permit from
WAILUKU to the BOARD such that, at closing, the BOARD shall obtain and hold said permit under terms satisfactory to the BOARD.

If the BOARD is not satisfied as to any matter referred to above or any other matter, whether related to the Property or not related to the Property, the BOARD may cancel this Agreement by written notice to WAILUKU no later than January 31, 1996, in which event this Agreement will terminate. If counsel for the BOARD and WAILUKU shall be unable to agree on the form and content of all closing documents, WAILUKU may cancel this Agreement by written notice to the BOARD no later than January 31, 1996. In each such instance, prior to February 1, 1996, the BOARD will return to WAILUKU all of WAILUKU’s studies, plans and other material in the BOARD’s possession and the parties shall be relieved from any liability hereunder.

7. Closing Costs.

a. WAILUKU will pay for the preliminary title report, cost of preparing the deed, Hawaii conveyance tax, one-half of the escrow fee and WAILUKU’s legal fees. BOARD will pay the cost of BOARD’s title insurance, recording fees for the deed, one-half of the escrow fee and BOARD's legal fees.

b. Although BOARD agrees to pay the purchase price in cash at closing, WAILUKU may request that BOARD participate in a Section 1031 tax deferred exchange for the benefit of WAILUKU. In that event, WAILUKU may assign its interest in this Agreement to a “qualified intermediary” (as defined in the Internal Revenue Code or IRS regulations) as part of an exchange agreement and BOARD agrees to cooperate in said transaction and participate with WAILUKU in accepting the tax-deferred exchange, provided, however, that: (a) BOARD shall not be required to pay any additional costs or assume any exposure of liability with respect to the exchange; and (b) BOARD shall have no liability concerning the legal or tax effects of the exchange.

8. Default/Remedies.

a. In the event BOARD fails to perform BOARD’s obligations under this Agreement, (WAILUKU not being in default), WAILUKU may (a) bring an action for damages for breach of contract, and (b) BOARD shall be responsible for any costs incurred in accordance with this Agreement.

b. In the event WAILUKU fails to perform WAILUKU’s obligations under this Agreement (BOARD not being in default), BOARD may (a) bring an action for damages for breach of contract, (b) seek specific performance of this
Agreement, and (c) WAILUKU shall be responsible for any costs incurred in accordance with this Agreement.

c. The foregoing shall not exclude any other remedies available under this Agreement to either WAILUKU or BOARD on account of the other party’s default.

d. In the event of default by a party and/or a legal action, the prevailing party shall be entitled to recover all costs incurred, including reasonable attorney’s fees. All expenses incurred by escrow shall be deducted from any deposited funds prior to any disbursement to the prevailing party.

9. Acceptance of Property As-Is. BOARD accepts the Property in completely "as-is" condition without any representations or warranties whatsoever by WAILUKU, express or implied, except as otherwise expressly provided in this Agreement.

10. Facsimiles. Fax (facsimile) copies of the executed Agreement shall be fully binding and effective for all purposes whether or not originally executed documents are transmitted to escrow. Fax signatures on documents will be treated the same as original signatures. However, each party agrees that it will promptly forward originally executed documents to each other. The parties understand that they must physically execute and deliver original conveyance and other recordable documents prior to closing.

11. Counterparts. This Agreement may be executed in counterparts and all counterparts together shall constitute the agreement among all of the parties hereto, in the same way as if the parties physically signed the same document.

12. Notices. Any notice by one party to the other shall be deemed effective: (a) personally delivered; (b) 36 hours after mailing by first-class U.S. mail, postage prepaid, to the other party at its address stated at the beginning of this Agreement; (c) or at such other address as said other party shall have notified the party giving the notice as the address for receiving notices hereunder. Notices sent by telex (fax) shall be effective when transmitted to the current fax number of the receiving party at the said address provided that the sending party shall receive the electronic confirmation that the fax transmission was received at the said number, and the sending party mails a confirming copy on the same date to the receiving party at said address.

13. Consent/Approval of Agreement. Whenever a party is requested herein, to consent to, to agree to, or to provide any approval of the actions, plans, or requirements of the other party, the party being requested to "consent/approve,
agree to" shall consider the same in good faith and shall not unreasonably withhold or delay such consent, approval or agreement.

14. **Survival of Warranties, Covenants and Representations.** The warranties, covenants and representations of WAILUKU and the BOARD shall survive the closing of the transaction and shall not be binding to any person or entity not a party to this Agreement other than the successors and assigns of the parties.

15. **Miscellaneous.** Time is of the essence of this Agreement. WAILUKU and the BOARD will comply with all requirements of HRPTA and FRPTA (if applicable) and the other applicable laws.

16. **Governing Law.** This Agreement shall be governed by the laws of Hawaii.

17. **Agreement Under Threat of Condemnation.** The parties hereto agree that this Agreement is being executed by the parties under its right of condemnation by the BOARD and the Agreement is entered into by WAILUKU in lieu of, and as a compromise alternative to, the condemnation proceedings threatened by the BOARD.

IN WITNESS WHEREOF, the parties have signed this Agreement on the date indicated above.

WAILUKU AGribusiness Co., Inc.
a Hawaii corporation

By

[Signature]
Its: Chairperson

By

[Signature]
Its: Vice President
APPROVED AS TO FORM AND LEGALITY:

By

Marie Kimmey

Chairperson

By

Its:

GARY M. SARTIN

Deputy Clerk to the Board
County of Maui
On this 21st day of December, 1995, before me personally appeared Kent T. Luke and W.K. Tallett, to me personally known, who, being by me duly sworn, did say that they are the Vice President and Vice President respectively, of Wailuku Agribusiness Co., Inc., a Hawaii corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Alphonse A. Marques
Notary Public, State of Hawaii.

My commission expires: 02/10/96
STATE OF HAWAI'I            )
COUNTY OF MAUI            ) SS.

On this 26th day of December, 1995, before me appeared MARIE KIMMEY, to me personally known, being by me duly sworn, did say that she is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said MARIE KIMMEY acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]

Notary Public, State of Hawaii

My commission expires: 4/19/96
STATE OF HAWAII

COUNTY OF MAUI

On this ___ day of __________, 1995, before me personally appeared ___________________________, to me personally known, who being by me duly sworn, did say that he is the Chairman of the Board of Water Supply of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument is the lawful seal of the said County of Maui, and that the said instrument was signed and sealed on behalf of said County of Maui, and the said officer acknowledged the said instrument to be the free act and deed of the said County of Maui.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

__________________________
Notary Public, State of Hawaii.

My commission expires: __________
STATE OF HAWAI'I   )
COUNTY OF MAUl   ) SS.

On this ___ day of ________, 1995, before me personally appeared 
________________________________________ and __________________________, to me 
personally known, who being by me duly sworn, did say that they are the Chairman 
and __________, respectively, of the Board of Water Supply of the County of 
Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the 
foregoing instrument is the lawful seal of the said County of Maui, and that the said 
instrument was signed and sealed on behalf of said County of Maui, and the said 
officers acknowledged the said instrument to be the free act and deed of the said 
County of Maui.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

________________________________________
Notary Public, State of Hawaii.

My commission expires: ___________
At the meeting on Maui on January 24, 1996, you asked the staff to look into the best way to include the North Waihee wells in the proposed Iao Aquifer ground water designation. The two options are described below along with time estimates:

1. DESIGNATE THE WAIHEE AQUIFER SYSTEM

Process:
- Recommendation to initiate designation by the chairperson at a regular meeting.
- Chair consults with Mayor and Board of Water Supply.
- Decision to proceed within 60 days.
- CWRM holds public hearing on Maui.
- Staff prepares Findings of Fact Report.
- Chair consults with Council and BWS.
- CWRM designates.

Time: 7 months plus

Analysis:

The criteria for ground water designation are listed in HRS §174C-44. The criterion that may be met is HRS §174C-44(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.

In the Windward Oahu designation, all areas of Oahu connected by water transmission infrastructure were included in the calculation of authorized planned use and sustainable yield. Similarly, the sustainable yields of both Iao and Waihee Aquifers should be included. The sustainable yield of Iao Aquifer is 20 mgd and for Waihee Aquifer it is 8 mgd, totalling 28 mgd.
Authorized planned use means the use or projected use of water by a development that has received the proper state land use designation and county development plan/community plan approvals. There are two possible ways to calculate the authorized planned use for the Maui situation: 1) the Board's water commitments, and 2) projected water use from land use plans.

The Board has notified the Commission that they have about 8.4 mgd in water commitments, which would put the authorized planned use at 101% of the combined sustainable yields for Iao and Waihee Aquifers (28 mgd). The Maui Water Use and Development Plan projects a demand of 25 to 30 mgd by the year 2010 for the Wailuku System. This would calculate to 89% to 107% of the combined sustainable yields of the Iao and Waihee Aquifers (28 mgd).

2. **AMEND THE BOUNDARY OF THE IAO AQUIFER TO INCLUDE THE NORTH WAIHEE WELLS**

**Process:**

- Hold a noticed public hearing to amend the Hawaii Water Plan (90 days notice required).
- Hold a decision-making meeting immediately after the hearing.

**Time:** 4 months

**Analysis:**

The reason to amend the boundary would have to be given. There appears to be no hydrologic reason why there should be separate Iao and Waihee aquifers. Although this method appears shorter, the CWRM may need to go through the entire Iao Aquifer designation process again because the boundaries are different.

2 I will appreciate your comments and thoughts on these options.
Ms. Marie Kimmey, Chairperson
Maui Board of Water Supply
P.O. Box 1109
Wailuku, Hawaii 96793-7109

Dear Ms. Kimmey:

Pump Installation Permit Transfer
North Waihee Wells 1 & 2
(Well Nos. 5631-02 & 03)

By your February 20, 1996 letter, the Commission on Water Resource Management acknowledges the transfer of the captioned permit from C. Brewer Properties, Inc. to the Maui Board of Water Supply.

Enclosed are copies of the permit and its extensions. Please be advised that the permit requires that work be started by May 14, 1996, and be completed by March 1, 1997. Should you be unable to meet those deadlines, please submit a request to extend them, showing cause why the permit should not be revoked.

Aloha,

Michael D. Wilson
Chairperson

Enclosures

C. Brewer Homes, Inc.
DATE: 2/29/94

TO: Rae Loui

Fax No. 808. 587.0719

Subject: NTP N. Waihee Wells

No. of Pages (including this transmittal): 2

REMARKS:

Transmitter: Draddick

NOTE: If you have not received all of the pages, please call

(808) 243-7816
February 29, 1996

Mr. Warren Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Maui, Hawaii 96793

Dear Mr. Unemori:

Subject: Independent Professional Services for the Development of North Waihee Wells

This letter constitutes NOTICE TO PROCEED for all work under the subject project.

You are hereby notified that the official commencement date of this project shall be February 29, 1996. The time allowed to complete the required services is specified in the contract, exclusive of time required for governmental review.

Please acknowledge receipt of this notice in the space provided below on the original and two copies and return them to the Department of Water Supply. Please keep the third copy of this letter for your files.

A copy of the fully executed contract will be forwarded for your files.

Sincerely,

David R. Craddick
Director

cc: DWS Fiscal
DWS Contractor
DWS Engineer
Director

NOTICE TO PROCEED RECEIVED
THIS 29TH DAY OF FEBRUARY
1996.

Warren S. Unemori
Selected critical path items for the four source alternatives are listed below:

<table>
<thead>
<tr>
<th>Source Alternative</th>
<th>Critical Path Items</th>
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<tr>
<td>Waihee/Iao Ditch</td>
<td>Obtain membranes by March 1, 1996&lt;br&gt;Reach land use agreement by April 1, 1996&lt;br&gt;Complete design, EA and permits by Aug 1, 1996&lt;br&gt;Bid line construction by Aug. 1, 1996&lt;br&gt;Award line construction bid by Nov. 1, 1996&lt;br&gt;Install membranes by Nov 1, 1996</td>
</tr>
<tr>
<td>North Waihee</td>
<td>Execute purchase agreement by February 15, 1996&lt;br&gt;Issue bid specs by July 1, 1996&lt;br&gt;Award Bid by Sept 1, 1996&lt;br&gt;Start pump installation by Nov. 1, 1996&lt;br&gt;Complete pump installation by March 1, 1997&lt;br&gt;Complete construction by Aug 1, 1997</td>
</tr>
<tr>
<td>Wailuku Shaft</td>
<td>Extend use agreement by Aug 1, 1996&lt;br&gt;Complete design by Feb 1, 1997&lt;br&gt;Obtain pipe easements by May 1, 1997</td>
</tr>
<tr>
<td>Waikapu Tank Well</td>
<td>Obtain well site agreement by June 1, 1996&lt;br&gt;Complete design by June 1, 1996&lt;br&gt;Complete EA by June 1, 1996&lt;br&gt;Issue bids by Sept 1, 1996&lt;br&gt;Award Bids by Nov 1, 1996&lt;br&gt;Complete construction by May 1, 1997</td>
</tr>
</tbody>
</table>

Status of C. Brewer agreement: (1/31/96 telecon with Dave Craddick)

- Purchase includes 3000 acres of a conservation easement, 2000 acres in fee simple. C. Brewer would retain about 400 acres at the mauka end.
- Due diligence extended to Feb. 7 from Jan. 31.
- C. Brewer asking for things that MBWS cannot agree to:
  1. MBWS can't transfer land interest after acquisition
  2. MBWS must underground electric lines
  3. C. Brewer wants to be the arbitrator if existing uses (C. Brewer's ditches and tunnels) are impacted
- Dave says it doesn't look good, expects to negotiate over the weekend for a special Board meeting on Tuesday, Feb. 6.
<table>
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<th>TO:</th>
<th>INIT.</th>
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<th>INIT.</th>
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<th>PLEASE:</th>
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<tr>
<td>BAUER, G.</td>
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<td>LOUI, R.</td>
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<td>YODA, K.</td>
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PLEASE: See Me
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01/96
February 20, 1996

Ms. Rae M. Loui
Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
(Well Nos. 5631-02 & 03)

Dear Ms. Loui:

Pursuant to your letter dated February 1, 1996 relative to the subject permits, we are writing to inform you that the transaction between Wailuku Agribusiness Co., Inc. and the Maui Board of Water Supply, has closed as of this date. This transaction, pursuant to the parties' earlier agreement, will enable the installation of the pumps, and construction of other improvements, by the Board of Water Supply, to augment the water resources of Central Maui.

As a result, we hereby respectfully request that you, as previously authorized by the Commission, transfer the subject permits to the Board of Water Supply, according to the terms of the agreement.

Thank you for your assistance in this matter.

Sincerely,

C. BREWER HOMES, INC.

By

Vice-President

By

Vice-President
Facsimile Transmittal

To Facsimile Number: 587-0219
Pages including this cover: 7
Please deliver directly to:
  Ms. Rae M. Loui
  Deputy Director
  State of Hawaii
  Department of Land and Natural Resources
  Commission on Water Resource Management
  P.O. Box 621
  Honolulu, Hawaii 96809

Date of Transmission: February 23, 1996
Regarding: North Waihee Wells 1 & 2
Client Matter Number:

From:
  Douglas W. MacDougal, Esq.
  Ashford & Wriston
  Telephone Direct Line
  Facsimile Direct Line

Comments:

See attached letter.

The information contained in this facsimile message is attorney privileged and confidential information intended only for use by the individual or entity named above. If the reader of this message is not the intended recipient, or employee or agent responsible to deliver it to the intended recipient, you are hereby notified that dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please immediately notify us by telephone, and return the original message to us at the above address via the U.S. Postal Service. Thank you.
February 23, 1996

VIA FACSIMILE

Ms. Rae M. Loui
Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Re: Pump Installation Permits for North Waihee Wells 1 and 2
(Well Nos. 5631-02 & 03)

Dear Ms. Loui:

Attached is a copy of the formal notification letter dated February 20, 1996 to the Commission on Water Resource Management confirming the closing of the County of Maui BWS/Wailuku Agribusiness North Waihee transaction. The letter is signed by C. Brewer Homes, Inc., Wailuku Agribusiness Company and the Maui Board of Water Supply.

The original of this letter will be forwarded to you for your files as soon as we receive it from escrow.

Yours truly,

Douglas W. MacDougal

DWM:met
Enclosure

cc: Mr. David Craddock (via facsimile)
    Gary Zakian, Esq. (via facsimile)
C. Brewer Homes, Inc.

February 20, 1996

Ms. Rae M. Loui
Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
(Well Nos. 5631-02 & 03)

Dear Ms. Loui:

Pursuant to your letter dated February 1, 1996 relative to the subject permits, we are writing to inform you that the transaction between Wailuku Agribusiness Co., Inc. and the Maui Board of Water Supply, has closed as of this date. This transaction, pursuant to the parties' earlier agreement, will enable the installation of the pumps, and construction of other improvements, by the Board of Water Supply, to augment the water resources of Central Maui.

As a result, we hereby respectfully request that you, as previously authorized by the Commission, transfer the subject permits to the Board of Water Supply, according to the terms of the agreement.

Thank you for your assistance in this matter.

Sincerely,

C. BREWER HOMES, INC.

By [Signature]
Senior Vice President

By [Signature]
its Vice-President
Ms. Rae M. Loui  
February 20, 1996  
Page 2

WAILUKU AGRIBUSINESS COMPANY

By [Signature]  
Its [Title]

BOARD OF WATER SUPPLY,  
COUNTY OF MAUI

By [Signature]  
Its [Title]
STATE OF HAWAII
CITY & COUNTY OF HONOLULU

On this 21st day of FEBRUARY, 1996, before me personally appeared CRAIG CHAMPION and G. C. WENTWORTH, to me personally known, who, being by me duly sworn, did say that they are the Senior Vice President and Vice President, respectively, of C. BREWER HOMES, INC., a Delaware corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

[Signature]
Notary Public, State of Hawaii

My Commission Expires: 1/2/97
STATE OF HAWAII

CITY & COUNTY OF HONOLULU

On this 21st day of FEBRUARY, 1996, before me personally appeared J. ALAN KUGLE and KATHLEEN F. OSHIRO, to me personally known, who, being by me duly sworn, did say that they are the Chairman of the Board and Secretary, respectively, of WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the true act and deed of said corporation.

[Signature]
Notary Public, State of Hawaii

My Commission Expires: 11-2-97
STATE OF HAWAII  
COUNTY OF MAUI  

On this 20th day of February, 1996, before me appeared BYRON WALTERS, to me personally known, who, being by me duly sworn, did say that he is a Member of the Board of Water Supply of the County of Maui, and was authorized by the BOARD OF WATER SUPPLY on February 15, 1996 to execute any and all documents as set forth in the COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION RELATING TO THE PURCHASE OF THE WAIMEE VALLEY PROPERTY, and that the said instrument was signed on behalf of the said Board of Water Supply, and the said BYRON WALTERS acknowledged the said instrument to be the true act and deed of the said Board of Water Supply.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]
Notary Public, State of Hawaii

My commission expires: 11/25/96
MANCINI, ROWLAND & WELCH

THE KAHULUI BUILDING
33 LONO AVENUE, SUITE 470
KAHULUI, MAUI, HAWAII 96732

TELEPHONE: (808)
FAX: (808)

FAX MEMORANDUM

DATE: February 22, 1996

TO: Charley Ice, Water Commission
    C. Brewer Homes: ATT: Val
    Milton Arakawa

FROM: Paul R. Mancini

SUBJECT: North Waihee Wells

This communication contains confidential and privileged information. It is exempt from disclosure under applicable law. If you received it in error, please notify the sender immediately by telephone or fax and return the original by mail.

TRANSMITTING THE FOLLOWING:

Copy of letter dated February 20, 1996 to Department of Land and Natural Resources, Commission on Water Resource Management from C. Brewer Homes, Inc.

FOR YOUR REVIEW AND COMMENT

FOR APPROVAL AND RETURN

FOR YOUR INFORMATION AND FILES

AS WE DISCUSSED

REMARKS:

PER YOUR REQUEST

SEE REMARKS BELOW

KAHULUI 11/8/96 11:111.121L
C. Brewer Homes, Inc.

February 20, 1996

Ms. Rae M. Loui  
Deputy Director  
State of Hawaii  
Department of Land and Natural Resources  
Commission on Water Resource Management  
P. O. Box 621  
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2  
(Well Nos. 5831-02 & 03)

Dear Ms. Loui:

Pursuant to your letter dated February 1, 1996 relative to the subject permits, we are writing to inform you that the transaction between Wailuku Agribusiness Co., Inc. and the Maui Board of Water Supply, has closed as of this date. This transaction, pursuant to the parties' earlier agreement, will enable the installation of the pumps, and construction of other improvements, by the Board of Water Supply, to augment the water resources of Central Maui.

As a result, we hereby respectfully request that you, as previously authorized by the Commission, transfer the subject permits to the Board of Water Supply, according to the terms of the agreement.

Thank you for your assistance in this matter.

Sincerely,

C. BREWER HOMES, INC.

By ____________________________  
Senior Vice President

By ____________________________  
Vice-President
Ms. Rae M. Loui  
February 20, 1996  
Page 2

WAILUKU AGribusiness Company

By ____________________________
By ____________________________
its CHAIRMAN OF THE BOARD  
its Authorized Signatory

BOARD OF WATER SUPPLY,  
COUNTY OF MAUI

By ____________________________  
itsAuthorized Signatory

By ____________________________
3 ts Secretary
STATE OF HAWAII  

CITY & COUNTY OF HONOLULU  

On this 21st day of FEBRUARY, 1996, before me personally appeared CRAIG CHAMPION and G. C. WENTWORTH, to me personally known, who, being by me duly sworn, did say that they are the Senior Vice President and Vice President, respectively, of C. BREWER HOMES, INC., a Delaware corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

[Signature]

Notary Public, State of Hawaii

My Commission Expires: 11/2/97
STATE OF HAWAII

CITY & COUNTY OF HONOLULU

On this 21st day of February, 1998, before me personally appeared J. ALAN KUGLE and KATHLEEN F. OSHIRO, to me personally known, who, being by me duly sworn, did say that they are the Chairman of the Board and Secretary, respectively, of WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

[Signature]
Notary Public, State of Hawaii

My Commission Expires: 11/2/97
STATE OF HAWAII  )
COUNTY OF MAUI  ) ss.

On this 20th day of February, 1996, before me appeared BYRON WALTERS, to me personally known, who, being by me duly sworn, did say that he is a Member of the Board of Water Supply of the County of Maui, and was authorized by the BOARD OF WATER SUPPLY on February 15, 1996 to execute any and all documents as set forth in the COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION RELATING TO THE PURCHASE OF THE WAIHEE VALLEY PROPERTY, and that the said instrument was signed on behalf of the said Board of Water Supply, and the said BYRON WALTERS acknowledged the said instrument to be the free act and deed of the said Board of Water Supply.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]

Notary Public, State of Hawaii

My commission expires: 11/25/96
WAILUKU AGRIBUSINESS COMPANY

By: J. Alan King
It's CHAIRMAN OF THE BOARD

BOARD OF WATER SUPPLY,
COUNTY OF MAUI

By: James Walter
It's Authorized Signatory
On this 21st day of February, 1996, before me personally appeared CRAIG CHAMPION and G. C. WENTWORTH, to me personally known, who, being by me duly sworn, did say that they are the Senior Vice President and Vice President, respectively, of C. BREWER HOMES, INC., a Delaware corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

Notary Public, State of Hawaii

My Commission Expires: 11/2/97
On this 21st day of February, 1996, before me personally appeared J. ALAN KUGLE and KATHLEEN F. OSHIRO, to me personally known, who, being by me duly sworn, did say that they are the Chairman of the Board and Secretary, respectively, of WAILUKU AGribusiness Co., Inc., a Hawaii corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

Notary Public, State of Hawaii

My Commission Expires: 11/2/97
STATE OF HAWAII  )
COUNTY OF MAUI   ) SS.

On this 20th day of February, 1996, before me appeared BYRON WALTERS, to me personally known, who, being by me duly sworn, did say that he is a Member of the Board of Water Supply of the County of Maui, and was authorized by the BOARD OF WATER SUPPLY on February 15, 1996 to execute any and all documents as set forth in the COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION RELATING TO THE PURCHASE OF THE WAIHEE VALLEY PROPERTY, and that the said instrument was signed on behalf of the said Board of Water Supply, and the said BYRON WALTERS acknowledged the said instrument to be the free act and deed of the said Board of Water Supply.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Notary Public Seal]

Notary Public, State of Hawaii

My commission expires: 11/25/96
Wailuku, Maui - on Thursday, February 15, 1996, the Maui Board of Water Supply approved the purchase of watershed land from Wailuku Agribusiness for 2000 acres north of Waihee Stream, and a conservation easement of 3000 acres south of the Waihee Stream in the Waihee watershed area.

In addition to the watershed purchase, the Board acquired two existing wells and easements for eight additional well sites, a reservoir site, and the transmission pipeline to develop water from the North Waihee Aquifer. The sustainable yield for North Waihee Aquifer is approximately 8 million gallons per day. The purchase price is $3.84 million.

The purchase represents long hours of work by Gary W. Zakian, Deputy Corporation Counsel, with the assistance of Douglas W. MacDougal and Jill M. Teutsch with the law firm of Ashford and Wriston, working for the Board, and local attorney Paul R. Mancini, representing Wailuku Agribusiness. The Board of Water Supply has held meetings over the past four years to conclude this agreement.

- end -
Mr. James M. Murray  
C. Brewer Homes, Inc.  
24 North Church Street, Suite 205  
Wailuku, Hawaii 96793

Dear Mr. Murray:

Extension of Start Date for Pump Installation Permits  
North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

At its January 24, 1996 regular meeting, the Commission granted relief from its revocation of the captioned permits and approved a four-month extension of the start date to May 14, 1996, contingent upon receipt of written confirmation by February 25, 1996 that the Agreement between Wailuku Agribusiness Co., Inc. and the Maui Board of Water Supply has been closed.

If confirmation is not received by that date, the permit shall be immediately revoked.

The Chairperson is authorized to transfer the pump installation permits to the agreed party, according to the terms of the Agreement, upon receipt of a petition properly signed by the Board, Wailuku Agribusiness, and the permittee's successor in interest C. Brewer Homes, Inc.

If you have any questions, please contact Charley Ice at [redacted]

Sincerely,

[Signature]

RAE M. LOUI  
Deputy Director

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

STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

January 24, 1996
Wailuku, Maui

C. Brewer Properties, Inc.
Request for Extension of Start Date
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1400 gpm Pumps for Domestic Use
TMK 3-2-1:4 Waihee, Wailuku, Maui

APPLICANT:
C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

LANDOWNER:
Wailuku Agribusiness Company, Inc.
P.O. Box 520
Wailuku, HI 96793

ACTION REQUESTED:

Permission to extend start date four months, from January 14, 1996 to May 14, 1996, for installing a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

WELL LOCATION/TAX MAP KEY:
The wells are located at Waihee Valley, Maui, at Tax Map Key: 3-2-1:4 (Exhibit 1).

BACKGROUND:

March 25, 1993
Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.

March 1, 1995
Pump Installation Permits were extended, with a new expiration date of March 1, 1997. The start date was set to expire in two months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.
each well. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd by the Maui Water Use and Development Plan, although the Plan acknowledges that withdrawals above 4 mgd would require justification through field demonstration.

**ANALYSIS:**

The well will develop fresh, basal water for municipal use; the applicant is negotiating dedication of the wells to the County. The wells tap an aquifer with a static head standing about 10 feet above sea level. John Mink has observed that, because the stream channel in this vicinity is 200 feet above sea level, the wells should have no effect upon it. Further, John Mink's assessment of the Pump tests is that the drawdown from heavy pumping is relatively minor, with full recovery nearly instantaneous. Salinity is very low.

**RECOMMENDATION:**

A. That the Commission grant relief from its revocation of the pump installation permits for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) and approve a four-month extension of the start date of the pump installation permits for North Waihee Wells to May 14, 1996, contingent upon receipt of confirmation, by February 25, 1996, that the Agreement between the parties has closed. If confirmation is not received by that date, the permit shall be immediately revoked.

B. That the Commission authorize the Chairperson to transfer the pump installation permits to the agreed party upon receipt of a petition properly signed by the Board, Wailuku Agribusiness, and the permittee's successor in interest, C. Brewer Homes, Inc.

Respectfully submitted,

[Signature]

RAE M. LOUI
Deputy Director

Attachments

APPROVED FOR SUBMITTAL:

[Signature]

MICHAEL D. WILSON, Chairperson
Mr. James M. Murray  
C. Brewer Homes, Inc.  
24 North Church St., Suite 205  
Wailuku, Hawaii 96793

Dear Mr. Murray:

Transfer of Pump Installation Permits

We received your letter of January 9, 1996, requesting confirmation of the process for transferring the pump installation permits for North Waihee Wells 1 & 2 (Well Nos. 5631-01 & 02) from C. Brewer Properties, Inc. to the Maui Board of Water Supply (Board).

You have indicated by phone that an escrow company will be handling the technical details of the "Closing Agreement" between the Board and Wailuku Agribusiness Co., Inc. upon conclusion of the due diligence period January 31, 1996, and wish to have confirmation from our office that the Commission on Water Resource Management (Commission) will officially transfer the pump installation permits to the Board upon fulfillment of procedural requirements.

The "Closing Agreement" states (item 6e, page 5) that, during the due diligence period, the Board and Wailuku Agribusiness Co., Inc. shall petition the Commission to transfer the pump installation permit from Wailuku (sic) to the Board such that, at closing, the Board shall hold the permit under terms satisfactory to the Board. The petition can be in letter form addressed to the Chairperson, in simple language, and should be signed by both parties to the Agreement, as well as by the permittee's successor in interest, C. Brewer Homes, Inc. Staff is recommending that the Chairperson be authorized to respond by letter upon receipt of such petition.

If you have any questions, please call Charley Ice at [redacted]

Sincerely,

RAE M. LOUI  
Deputy Director
IMMEDIATE ATTENTION

COMMISSION ON WATER RESOURCE MANAGEMENT

FROM: [Signature]

TO: INIT:

DATE: [Yll]

TO: INIT:

FOR:

SUSPENSE DATE:

PLEASE:

- Review & Comment
- Take Action
- Type Draft
- Type Final
- File
- Xerox ______ copies

Please:

See Me

REGULATION BRANCH

R. LOUI
J. UWAIN
F. CHING
S. SUBIA
K. YODA

E. SAKODA
D. HIGA
L. NAKAMA
C. ICE
R. JINNAI
S. SWANSON

APPROVAL SIGNATURE INFORMATION

PLANNING BRANCH

E. HIRANO
G. BAUER
R. HARDY
N. FUJII
M. OHYE
I. KUNIMURA

S. EDMUNDS
L. MIZUNO

Hand Carving

Yes

- pump test results submitted prior to last meeting
- "Closing Agreement", when finalized, will initiate implementation schedule showing pump installation elements, etc. submitted in "Agreement"

there's no permit until last night?

Correct
January 9, 1996

Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
(Well Nos. 5631-02 and 5631-03) Waihee, Maui, Hawaii

Dear Ms. Loui:

We have submitted to you a letter dated January 2, 1996 requesting that the subject pump installation permits be extended. As noted in the letter, the County of Maui Board of Water Supply and Wailuku Agribusiness Co. Inc. have executed a "Closing Agreement" which would allow the Board of Water Supply to be the responsible implementing entity for the project which includes the installation of pumps at North Waihee Wells 1 and 2. The "Closing Agreement" requires, in part, that the pump installation permits be transferred to the Board of Water Supply.

The applicant for the original pump installation permits was C. Brewer Properties, Inc. As discussed with the CWRM staff, we would like to confirm that, in order to transfer the permits, C. Brewer Homes, Inc. (the successor company to C. Brewer Properties, Inc.) and the County of Maui Board of Water Supply must write a letter requesting that the permits be transferred; and that, upon receiving the letter, CWRM staff will transfer the permits to the Board of Water Supply.
Please confirm your understanding of this process, and inform us in writing as soon as possible. The due diligence period for the "Closing Agreement" ends January 31, 1996. If you or your staff have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,

C. BREWER HOMES, INC.

James M. Murray
Project Manager

JMM:vp
cc: David Craddick, Director, Department of Water Supply
    Paul Mancini, Mancini, Rowland & Welch
    Milton Arakawa, Munekiyo & Arakawa, Inc.
To: Charley Ice  Fax No.: (808) 
Commission on Water Resource Management

From: Milton Arakawa  No. of Pages including Cover Letter: 3

Subject: Pump Installation Permit for North Waihee Wells 1 and 2

Attached is/are:

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<th>Date</th>
<th>Description</th>
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<td>1</td>
<td>1/9/96</td>
<td>Letter to Rae Loui, Deputy Director from James Murray, C. Brewer Homes</td>
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</table>

Comments: Charley, attached is a copy of the letter from C. Brewer Homes requesting a response from the CWRM staff regarding the transfer of the subject permits. An expedited response would be appreciated. If you have any questions, please feel free to call me. Thank you.

(Initials) 

If you have any problems or do not receive the entire fax, kindly call me at .

CONFIDENTIAL COMMUNICATION: This message is intended for the use of the designated recipient(s) named above. If you have received this message in error, kindly notify us immediately by telephone. Thank you.
January 9, 1996

Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
(Well Nos. 5631-02 and 5631-03) Waihee, Maui, Hawaii

Dear Ms. Loui:

We have submitted to you a letter dated January 2, 1996 requesting that the subject pump installation permits be extended. As noted in the letter, the County of Maui Board of Water Supply and Wailuku Agribusiness Co. Inc. have executed a "Closing Agreement" which would allow the Board of Water Supply to be the responsible implementing entity for the project which includes the installation of pumps at North Waihee Wells 1 and 2. The "Closing Agreement" requires, in part, that the pump installation permits be transferred to the Board of Water Supply.

The applicant for the original pump installation permits was C. Brewer Properties, Inc. As discussed with the CWRM staff, we would like to confirm that, in order to transfer the permits, C. Brewer Homes, Inc. (the successor company to C. Brewer Properties, Inc.) and the County of Maui Board of Water Supply must write a letter requesting that the permits be transferred; and that, upon receiving the letter, CWRM staff will transfer the permits to the Board of Water Supply.
Rae M. Loui, Deputy Director  
January 9, 1996  
Page 2

Please confirm your understanding of this process, and inform us in writing as soon as possible. The due diligence period for the "Closing Agreement" ends January 31, 1996. If you or your staff have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,

C. BREWER HOMES, INC.

[Signature]

James M. Murray  
Project Manager

JMM:vp  
cc: David Craddick, Director, Department of Water Supply  
    Paul Mancini, Mancini, Rowland & Welch  
    Milton Arakawa, Munekiyo & Arakawa, Inc.
C. Brewer Homes, Inc.

January 2, 1996

Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2 (Well Nos. 5631-02 and 5631-03) Waihee, Maui, Hawaii

Dear Ms. Loui:

At its regular meeting of November 8, 1995, the Commission on Water Resource Management (CWRM) considered the extension of the construction start date for the subject project. The CWRM determined that if two (2) conditions were met within 60 days, or by January 8, 1996, relief from revocation of the permit would be possible. The two (2) conditions imposed by the CWRM are:

1. C. Brewer Properties, Inc. and the Maui Department of Water Supply can document an agreement causing the initiation of the pump installation work and submit it to the CWRM; and

2. A schedule of actual installation work is provided by the permittee to the CWRM.

With regard to Condition No. 1, we have enclosed a copy of the "Closing Agreement" between the Board of Water Supply and Wailuku Agribusiness, Co. Inc. which sets forth the transfer of certain real property title and other interests from Wailuku Agribusiness to the Board of Water Supply. (For clarification purposes, Wailuku Agribusiness Co., Inc. is the landowner of the property and is a subsidiary of C. Brewer & Co., Ltd. At the time of application for the pump installation permit, C. Brewer Properties, Inc. was also a subsidiary of C. Brewer & Co., Ltd. Since then, C. Brewer Homes, Inc. was formed through a stock offering and is the successor company of C. Brewer Properties, Inc. However, C. Brewer Homes Inc. is not a subsidiary of C. Brewer and Company, Limited.)
The purpose of the transfer of property is to allow the Board of Water Supply to be the responsible implementing entity for the project which includes the use of Waihee Well Nos. 1 and 2, installation of production pumps (pursuant to the referenced permits), and appurtenant facilities, construction of a new 500,000 gallon water tank, and approximately 4.26 miles of underground waterline.

It should be noted that the "Closing Agreement" provides for a due diligence period which extends to January 31, 1996. Upon the subsequent closing of the transaction, the Agreement calls for the transfer of the pump installation permit to the Board of Water Supply. Refer to Item 6.e. of the Agreement.

With regard to Condition No. 2, we have attached a schedule of proposed construction for the project which includes the installation work for the pumps. The schedule has been developed by the Department of Water Supply. The schedule anticipates that pump installation for testing will be initiated by May 1, 1996. Thus, we request that construction start for the pump installation permits be extended to this date.

We respectfully request that the issue of extension of the permit be placed on the Commission's January 24, 1996 agenda. If you or your staff have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,

James M. Murray
Project Manager

cc:  David Craddick, Director, Department of Water Supply (with enclosures)
     cbhnww.ext.ie42
Mr. James Herberk  
C. Brewer Properties, Inc.  
P.O. Box 1437  
Wailuku, Hawaii 96793  

Dear Mr. Herberk:  

Revocation of Pump Installation Permits  
North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)  

At its regular meeting of November 8, 1995, at which a representative from C. Brewer Properties, Inc. was present, the Commission on Water Resource Management (CWRM) directed staff to notify the permittee that the permit shall be revoked on January 13, 1996. However, if two conditions were met within sixty (60) days, or by January 8, 1996, relief from revocation would be possible. The two conditions imposed by the CWRM are:

1. C. Brewer Properties, Inc. and the Maui Department of Water Supply can document an agreement causing the initiation of the pump installation work and submit it to the CWRM.

2. A schedule of actual installation work is provided by the permittee to the CWRM.

The next regularly scheduled CWRM meeting is January 24, 1996. The CWRM will reconsider this revocation matter on that date if conditions 1 and 2 are met by January 8, 1996.

Very truly yours,

Michael D. Wilson
**PROJECT:** North Delview Options  
**CURRENT DATE:** 12/18/95  
**AS OF DATE:** 01/01/96  

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**GANTT CHART REPORT**

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First 1 MGD On-Line  
Pump Installed with 1 MGD Phase  
UQ Data with 1 MGD Phase  
Preliminary Engineering Report submitted with 1 MGD Phase  
All 3 MGD On-Line
C. Brewer Properties, Inc. Request for Extension of Start Date
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1400 gpm Pumps for Domestic Use

Applicant: C. Brewer Properties, Inc.
Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 1437
Wailuku, HI 96793
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to extend start date two months, from November 14, 1995 to January 14, 1996, for installing a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

Well Location/Tax Map Key: The wells are located at Waihee Valley, Maui at Tax Map Key: 3-2-1:4 (Attachment A).

Background:
March 25, 1993
Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.

March 1, 1995
Pump Installation Permits were extended, with a new expiration date of March 1, 1997. The start date was set to expire in 2 months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.

May 5, 1995
The start date for work under the Pump Installation Permits was extended two months, from May 14, 1995 to July 14, 1995, following the applicant's request for a four-month extension.

July 19, 1995
The start date for work under the Pump Installation Permits was extended two months, from July 14, 1995, to September 14, 1995, following the applicant’s request for a six-month extension.
September 13, 1995
The start date for work under the Pump Installation Permits was extended two months, from September 14, 1995 to November 14, 1995, following the applicant's request for a six-month extension. The applicant and the Maui Department of Water Supply believed that the two parties were close to an agreement. The Commissioners expressed the inclination to deny further extensions if the matters under consideration were not resolved.

October 26, 1995
The applicant requested a two-month extension of the start date, from November 14, 1995 to January 14, 1995, stating that the parties had agreed "in principle" to purchase of land in fee, requisite easements, and reimbursements for certain development costs (See Attachment C). It was anticipated that a letter of intent by the Maui Board of Water Supply would be ready for action at a November 7, 1995 Board Meeting.

Well Description (See Attachment B):
- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 363 ft.
- Grouted annulus: 0 to 200 ft.
- Proposed pump capacity: 1400 gpm (each)

Water Availability: The wells are located in the Waihee System near the Waihee-Iao Aquifer System boundary of the Wailuku Sector of Maui. Sustainable yield for the Waihee Aquifer System is estimated at 8 mgd, while that of Iao is 20 mgd. There are no existing ground water uses from the Waihee Aquifer System at present. Total proposed use is 4 mgd; 2 mgd from each well. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd by the Maui Water Use and Development Plan, although the Plan acknowledges that withdrawals above 4 mgd would require justification through field demonstration.

Analysis: The well will develop fresh, basal water for municipal use; the applicant is negotiating dedication of the wells to the County. The wells tap an aquifer with a static head standing about 10 feet above sea level. John Mink has opined that pump tests from May 14 to 19, 1989 have demonstrated that the drawdown from heavy pumping is relatively minor, with full recovery nearly instantaneous, while salinity is very low during these tests. However, staff has only received pump test data from 1982.

According to § 13-168-12(j), HAR:

Every Well construction and pump installation permit issued or caused to be issued by the commission shall be for a specified period not to exceed two years, unless otherwise specified in the permit and shall contain the commencement and completion dates for the permitted activity. In determining the commencement and completion dates of the activity, the commission shall take into consideration the:

(1) Cost and magnitude of the project;
(2) Engineering and physical features involved;
(3) Existing conditions; and
(4) Public interest affected.

The commission may extend the completion dates of the activity prescribed in any permit upon a showing of good cause and good-faith performance. If the commencement or completion date is not complied with, the commission shall cause the permittee to be notified by certified mail that the permit shall be revoked within sixty days unless the permittee can show good cause that it should not be revoked.

Staff believes this rule implies that the well construction and pump installation permits and timelines are specifically aimed at the actual well construction and pump installation activities rather than the planning or negotiation stages of a ground water development project. Since the history of this permit has been more in the arena of planning and negotiations, staff believes that the permittee should reapply when they are ready to actually install their pump. However, staff has, again, been informed by the permittee that the actual installation date is near.

RECOMMENDATION:

That the Commission approve the extension of the start date of the pump installation permits for North Waihee Wells to March 14, 1996 if:

1. By November 8, 1995, both C. Brewer Properties, Inc. and the Maui Department of Water Supply can show that an agreement which will cause initiation of the pump installation work has been reached;

2. A schedule of actual installation work is provided by the permittee to the Commission.

3. All past pump test data for both wells is provided by the permittee to the Commission.

If items 1, 2, and 3 are not met by the permittee by November 8, 1995, then staff recommends that the Commission direct staff to notify the permittee that the permit shall be revoked on January 13, 1996, in accordance with §13-168-12(f), HAR.

Respectfully submitted,

RAE M. LOUI
Deputy Director

Attachments

APPROVED FOR SUBMITTAL:

MICHAEL D. WILSON, Chairperson
Waihee 1&2
(Well No. 5631-02,03)
PROPOSED SECTION OF WELL

Elevation at top of casing: 284 ft., msl.

Ground Elevation: 283 ft., msl*

Cement Grout: 200 ft.

Hole Diameter: 20 in.

Total Depth: 363 ft.

Rock Packing: 108 ft.

Solid Casing: ASTM Designation A-242
USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 289 ft.
Diameter 16 in.
Wall thickness 0.3125 in.

Casing: ☑ Perforated ☐ Screen
USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 20 ft.
Diameter 16 in.
Wall thickness 0.25 in.
Openings 100 sq. in./L.F.

Open Hole:
Length 79
Diameter 15 in.

*Approximate elevation at time of filing application. Final elevation (msl) by a surveyor licensed by the State must be submitted at start of construction.
October 26, 1995

Ms. Rae M. Loui, Deputy Director  
State of Hawaii  
Department of Land and Natural Resources  
Commission on Water Resource Management  
P. O. Box 621  
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihe'e  
Wells 1 and 2 (Well Nos. 5631-02 and 5631-03)  
Waihe'e, Maui, Hawaii

Dear Ms. Loui:

At its regular meeting of September 13, 1995, the Commission on Water Resource Management approved the extension of the start date for work on the pump installation permits for the subject wells to November 14, 1995. We would like to respectfully request an extension of the start date to January 14, 1996.

We are pleased to note that after a number of discussions with the County of Maui Board and Department of Water Supply, we have reached an agreement "in principle" with the Board on October 24, 1995. After a Board of Water Supply proposal and C. Brewer Homes, Inc. counter proposal were discussed in September and October, the agreement "in principle" involves Board of Water Supply purchase of land in fee simple, a perpetual conservation easement and other necessary easements, and reimbursement for engineering and other development costs expended thus far by C. Brewer Homes, Inc.

At this point, we are anticipating that a letter of intent will be drafted by the Department of Water Supply for review by C. Brewer Homes, Inc. It is hoped that the letter of intent can be accepted by C. Brewer Homes, Inc. and the acceptance confirmed by the Board of Water Supply at its November 7, 1995 meeting.

For your information, we have attached an updated chronology of the major project tasks which have taken place since the project’s inception, and a status report on the various permits required for development.

Attachment C
We ask that our pump installation permit extension request be placed on the Commission’s November 8, 1995 agenda. If you have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,

James M. Murray, Jr.
Project Manager

Attachments
cc: Milton Arakawa, Munekiyo and Arakawa, Inc.
To: Charley Ice  
Commission of Water Resource Management  

From: Milton Arakawa  

Subject: North Waihee Wells 1 and 2  

Attached Is/are:  

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<td>Appendix C - Excerpts from Central Maui Water Source Development</td>
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Comments: Charley, attached for your information is a copy of Appendix C which was included in the Final Environmental Assessment for the project.

(Initials) 

If you have any problems or do not receive the entire fax, kindly call me at [redacted].

CONFIDENTIAL COMMUNICATION: This message is intended for the use of the designated recipient(s) named above. If you have received this message in error, kindly notify us immediately by telephone. Thank you.
Appendix C

Excerpts from Central Maui Water Source Development, Norman Saito Engineering Consultants, Inc. and John F. Mink
Source Area 1: Waihee Aquifer System (Waihee to Kahakuloa)

The region between Waihee Valley and Kahakuloa Valley embraces about 12 square miles of humid, mountainous terrain where rainfall varies from an annual average of 40 inches at the coast to more that 300 inches at the headwaters of Waihee Stream. The combination of moderate to very high rainfall with geology featuring both poorly permeable and highly permeable rocks has created a complex suite of water resources. The major streams of Waihee, Makamakaole and Kahakuloa are perennial while lesser ones are not. Marshes form the headwaters of streams, and groundwater occurs in high level as well as basal aquifers.

Waihee Stream is one of the largest water courses in the State, discharging an average of 55 mgd and never experiencing a low of less than 14 mgd. The minimum flow of record (approximately 7 years) was 14.2 mgd in early 1985 following the most severe drought of the century. Below the USGS gaging station the river is diverted into the Waihee Ditch, and still further downstream into the Spreckels Ditch. The average combined flow of these ditches is 37 mgd on a 24 hour basis, placing Waihee among the most prolific sources of ditch water in the State.

The large base flow of Waihee is sustained principally by seepage from high level dike water and secondarily by headwater marshes. The low flow of Makamakaole, on the other hand, originates entirely in marshes and the perched aquifers that sustain them. Kahakuloa receives about equal volumes of low flow from perched water marshes and dike aquifers. Wailena is perennial at its origin where it is fed by perched water, but low flows are quickly lost by infiltration in the mid and lower reaches of the stream.

In contrast to the extraordinary discharges of Waihee Stream, those in Kahakuloa and Makamakaole are modest. The average flow at 330 feet elevation in Kahakuloa as measured at the USGS gage
station is 10 mgd, and the base flow, which is exceeded more than 90 percent of the time, is 3.5 mgd. For the Left Branch of Makamakaole at elevation 1500 feet the average is 1.9 mgd and the base flow is about 0.6 mgd. The large base flow of Waihee, about 20 to 25 mgd, and the smaller yet significant base flow of Kahakuloa are manifestation of the presence of voluminous dike impounded groundwater resources in the region. Nearer the coast basal aquifers occur.

Hydrogeology and Groundwater Occurrence

The primary geological formation underlying the entire region is basaltic lava of the Wailuku volcanic series. All major aquifers, both high level dike and basal, occur in this formation. The Wailuku series is analogous to the Honomanu series in East Maui and the Koolau series in Oahu, and like these formations it is extremely permeable. To the south the productive Iao aquifer consists of Wailuku basalt.

Over much of the region the Wailuku series is covered by the much paler Honolua formation. Composed of andesite and trachyte, the Honolua is normally dense, massive and light gray in contrast to the dark, more broken lavas of the Wailuku formation. Its permeability is significantly lower than that of the older basalt. It does not constitute major aquifers but carries the perched water that sustains marshes.

The Honolua formation forms a blanket, hundreds of feet thick at times, reaching from Eke to the coast. Its characteristics are most strikingly illustrated in the resistant trachyte dome of Puu Olai on the coast between Wailena and Waiolai Gulches. Other prominent trachyte domes are Eke, Puu Koae and Puu Olelo.

In the reach between Waihee and Makamakaole the Honolua may behave as a caprock on the Wailuku basalt aquifer, creating high heads a short distance inland. The head no more than 2000 feet
from the coast is 10 feet, which would be impossible in an unconfined basal aquifer. An alternative explanation for the high head is that groundwater flow is controlled by dikes.

Striking northerly from the original volcanic caldera in upper Iao Valley is a rift zone which passes through the Waihee Aquifer System, especially its northern part. The dikes trend from NNW to N to NNE but appear to favor the NNE strike. The rift formed during extrusion of the Wailuku formation, but dikes of the later Honolua series also follow the trend. The Wailuku dikes are normally one to two feet thick and black in fresh exposures. The Honolua dikes, which occur much less frequently, tend to be thicker and lighter in color.

The trachyte domes at Puu Koae and Puu Olai are contemporaneous with Puu Eke, which suggests that Honolua dikes cut through the region and may control groundwater movement even toward the coast. A large trachyte dike is exposed at the ditch intake on Waihee Stream, and its projected trace lies between Makamakaole and Waihee. Whether or not it affects groundwater behavior will be determined when a Makamakaole exploratory well is finally drilled.

As far as is known from experience elsewhere in West Maui, high level dike water is restricted to basalts of the Wailuku volcanic series and is far more voluminous than perched water in Honolua andesites. The seaward boundary of the high level aquifers by coincidence is about along the Forest Reserve line. In Kahakuloa a major spring (Kapuna Spring) overflows from a dike compartment where the stream leaves the Forest Reserve, and in Waihee the first visible dike spring cascades from the valley wall about two miles inland of the line. High level groundwater, however, seeps into the stream channel for a considerable distance downstream of this first dramatic canyon wall spring.
One or more basal aquifers exist seaward of the rift zone but are not hydraulically connected all the way from Waihee to Kahakuloa. These aquifers between Waihee and Makamakaole are probably confined at the coast, but beyond Makamakaole toward Wailena they are likely to be unconfined because the Honolua formation pinches out.

Groundwater Development

Aside from diversions to Waihee and Spreckels Ditches, only a small quantity of groundwater is being developed at this time, but not by wells, galleries or other common extraction techniques. Groundwater that collects as seepage in streams is withdrawn either at the source or, more often, downstream by users. The total volume taken is negligible, no more than thousands of gallons per day on the average.

Two successful wells were drilled on the north bank of Waihee in 1981 by C. Brewer Co. but have not yet been connected to a distribution system. These wells penetrated an aquifer of Wailuku basalt and produced low salinity (less than 50 mg/l chlorides) water at rates to 1700 gpm during the initial testing. In May of this year a more comprehensive test was conducted using one well for pumping while the other served as an observation well. Also used as an observation well was the monitor boring drilled at Kanoa during the field phase of the investigation. The recent test confirmed the earlier indications of the presence of a sizeable aquifer capable of being developed with high capacity pumps.

Pump Test Results

The test was conducted uninterruptedly between 12 noon May 15 and 12 noon May 19, a total of 96 hours. North Waihee Well 2 (makai well) was pumped at an average rate of 2450 gpm (3.5 mgd). North Waihee Well 1 (mauka well) and Kanoa served as principal observation wells. Each was equipped with a continuous water level recorder. A recorder was also placed on an unused well in Wailena
Gulch, and tape measurements of water levels were made in boring A-1 in the Iao basal aquifer. Neither the Wailena well nor A-1 exhibited fluctuations induced by pumping. Both are too far away from the North Waihee wells, and in the case of A-1 an effective barrier consisting of the Waihee Valley fill and possibly dikes separate the Iao aquifer from North Waihee.

Maximum drawdown at the pumping well was 6.85 feet when the rate was temporarily at 2900 gpm; at the steady rate of 2450 gpm it was stable at 5.1 feet. These were expected values on the basis of the original step drawdown test in 1981. When the pump was turned off, recovery to within a few tenths of a foot of the original static level was instantaneous.

The curve of drawdown at observation wells as a function of time at constant pumping rate yields fundamental information about aquifer characteristics. Data from observation wells are uncluttered by perturbations except for the harmonic tidal swing. Analyses of drawdown at both observation wells give an aquifer transmissivity of 320,000 sq.ft./day and storativity in the range of .05 to .30. Transmissivity is the measure of how easily water moves through an aquifer; the results indicate a highly permeable aquifer comparable in properties to the Iao and Lahaina aquifers. A further calculation gives hydraulic conductivity of approximately 2000 ft./day, which is capable of handling high capacity pumps. Storativity is equivalent to effective porosity, or the pore volume which gives up water to pumping. The high value is typical of unconfined conditions. The aquifer sector between the North Waihee wells and the Kanoa boring is not confined, but near the coast the cap of Honolua trachyte covering the Wailuku formation may be a confining stratum.

If aquifer barriers are encountered during a pump test, the drawdown curve will deflect so that the rate of drawdown will increase. No such deflections occur in the data from either North
Waihee 1 or Kanoa. Evidently potential impediments to groundwater flow, such as dikes, do not behave as barriers but are subsumed in the aquifer's global characteristics. This means that groundwater moves freely in the reach between North Waihee and Kanoa and for a considerable distance beyond. Application of groundwater hydraulics equations to the data suggest that the minimum distance to an effective barrier is more than a mile away.

Salinity of the pumped water was very low, less than 30 mg/l chloride, and did not vary over the period of the test. The low and invariant salinity in view of the high pump rate suggests that the fresh water portion of the aquifer is poorly connected to sea water.

The test was highly successful in providing fundamental information about aquifer characteristics as well as extent and exploitability.

Potential Development and Sustainable Yield

The North Waihee aquifer is highly permeable, enjoys a high static water level, and is extensive. It has never been forcibly drafted for municipal or irrigation needs. It presents an opportunity to add a significant increment of new water to the Central Maui Water System.

The recommended first phase in development of the aquifer is to drill two new wells to add to the already existing two North Waihee wells. The new wells will be in the reach between North Waihee and Kupaa Gulch. Access is easy and pipeline layout and construction should not pose unusual problems. Each well can be equipped with a 2 mgd (1400 gpm) pump, providing a total installed capacity of 6 mgd. However, average output of the aquifer on an annual basis must not exceed 4 mgd. The full capacity of the wells could be used temporarily during high demand periods as long as the annual average is held.
Another increment of several mgd is likely to be developable between Kupaa and Makamakaole, and several more beyond. Beyond Kupaa the cost of development and transmission construction will increase sharply because of the inhospitable terrain. The expectable sustainable yield in the 3.5 mile distance from Waihee to Kahakuloa is at least 10 mgd and may be 12 to 15 mgd. Not all of it may be feasibly developable, but in the next few years it should not be difficult to add an average of 4 mgd to the Central Maui network.
FACSIMILE COVER SHEET

November 2, 1995

To: Charley Ice
Commission on Water Resource Management

Fax No.: (808) 244-6729

From: Milton Arakawa

No. of Pages Including Cover Letter: 6

Subject: North Waihee Wells 1 and 2

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Comments: Charley, attached is a copy of the summary report of the North Waihee Wells Pump Test, as you requested.

cc: Jim Murray (Fax no. 244-6729)

(Initials) [Signature]

If you have any problems or do not receive the entire fax, kindly call me at 244-6729.
NORTH WAIHEE WELLS PUMP TEST
May 15 - 19, 1989

Summary Report

John F. Mink and Norman Saito Engineering Inc.
June 3, 1989

In 1981 two deep wells were drilled for C. Brewer on the north bank of Waihee Stream from an elevation of 282 feet, about 2300 feet upstream of Kahekili Highway. They were tested and proved capable of yielding more than 2 mgd per well but were never fitted with pumps and have remained idle since then. The aquifer which they penetrate appears to be so poorly connected to the main Iao-Waiehu aquifer as to be virtually independent of it. The northward extent toward Kahakuloa is uncertain but likely reaches to beyond Makamakaole. One of the objectives of the recent pump test was to determine whether low permeability boundaries constrain the size of the aquifer; no boundaries could be detected by analysis of the test results.

In 1987 a reconnaissance hydrological survey of the region from Waihee to Kahakuloa was made as part of an effort to identify additional water sources for Central Maui. A test boring was drilled at the nose of Kanoa Ridge about 2000 feet north of the North Waihee wells to measure fresh water head, and another was planned for a site where Makamakaole Stream crosses the highway. The Makamakaole boring has not been drilled because the State Department of Water Resources Management plans eventually to drill an exploratory well.
there, one large enough to be pumped. The water table in the Kanoa boring is about the same as at North Waihee, suggesting aquifer continuity between the two sites. The Kanoa boring was carefully monitored during the recent test and clearly established that continuity does indeed exist in the region.

The delay by the State in drilling the Makamakaole exploratory well denied the opportunity to ascertain whether the aquifer continued to and beyond Makamakaole Valley. Drilling a small diameter boring, which was originally planned by the Joint Venture, was raised again, but the cost seemed excessive for the type of data obtainable (water level and salinity). The alternative of a long term pump test, the results of which could be analyzed to give aquifer parameters and an estimate of extent, was selected instead.

**Pump Test and Results**

The test was conducted uninterruptedly between 12 noon May 15 and 12 noon May 19, a total of 96 hours. North Waihee Well 2 (makai well) was pumped at a rate of 2400 gpm (3.43 mgd) except for a period of 9 to 10 hours on May 18 when the rate was raised to 2900 gpm (4.1 mgd) in response to an incorrect belief that the steady rate had decreased. The average rate for the 96 hour period was 2450 gpm (3.5 mgd).

North Waihee Well 1 (mauka well) and Kanoa served as principal observation wells. Each was equipped with a continuous water level recorder. A recorder was also placed on the Wailena well, and tape measurements of water levels
were made in boring A-1 in the Waiehu-Iao aquifer. Neither the Wailena well nor A-1 exhibited fluctuations induced by pumping. Both are too far away, and in the case of A-1 an effective barrier consisting of Waihee Valley fill and perhaps dikes separates Waiehu-Iao from North Waihee.

Maximum drawdown at the pumping well was 6.85 feet when the rate was 2900 gpm; at the steady rate of 2400 gpm drawdown was stable at 5.1 feet. These were expected values on the basis of the original step drawdown tests in 1981. When the pump was turned off, recovery to within a few tenths of a foot of the original static level was instantaneous.

At North Waihee 1 the static head before the start of pumping was 11.45 feet. At the end of the test maximum drawdown was 0.70 feet. North Waihee 1 is just 178 feet from North Waihee 2. Water levels respond to sea tides, displaying a tidal efficiency of about 4 percent (range of .07 feet). Distance from the sea is 4000 feet.

The pre-test static water level at Kanoa was 12.42 feet. Maximum drawdown at the end of the test was 0.44 feet (tape measurement). The distance between North Waihee 2 and Kanoa is 2000 feet. Tidal efficiency is about 6 percent (range 0.11 feet), which is greater than at North Waihee 1 because Kanoa is only 2000 feet from the coast. Tidal efficiencies are interesting because they suggest the ease with which water moves through an aquifer. Manifestly the North Waihee aquifer is very permeable.
The curve of drawdown as a function of time at constant pumping rate yields fundamental information about aquifer characteristics. Data from observation wells are uncluttered by perturbations except for the harmonic tidal swing. Preliminary analyses of drawdown at both observation wells give an aquifer transmissivity of 320,000 sq.ft./day and storativity in the range .05 to .30. Transmissivity is the measure of how easily water moves through an aquifer; the results indicate a highly permeable aquifer comparable in properties to the Waiehu-Iao and Lahaina aquifers. A further calculation gives hydraulic conductivity of about 2000 ft./day, which is capable of handling high capacity pumps. Storativity is equivalent to effective porosity, or the pore volume which gives up water to pumping. The high value is typical of unconfined conditions. The aquifer sector between North Waihee 1 and Kanoa is not confined, but near the coast the cap of Honolua trachyte covering the Wailuku formation may be a confining stratum.

If aquifer barriers are encountered during a pump test, the drawdown curve will deflect so that the rate of drawdown will increase. No such deflections occur in the data from either North Waihee 1 or Kanoa. Evidently potential impediments to groundwater flow, such as dikes, do not behave as barriers but are subsumed in the aquifer's global characteristics. This means that groundwater moves freely in the reach between North Waihee and Kanoa and for a considerable distance beyond. Application of groundwater
hydraulics equations to the data suggest that the minimum distance to an effective barrier is more than a mile away.

The salinity of the pumped water was very low, less than 30 mg/l chloride as determined from Hach kit analyses, and did not vary over the period of the test. The low and invariant salinity in view of the high pump rate suggests that the fresh water portion of the aquifer is poorly connected with sea water.

In summary, the test was very successful in providing fundamental information about aquifer characteristics as well as extent and exploitability. The final report will include technical appendices dealing with the test protocol, data, analysis of results, and determination of aquifer properties and groundwater flow behavior.

Preliminary Conclusions and Recommendations

The North Waihee aquifer is highly permeable, enjoys a high static water level, and is extensive. This combination of features will allow it to be developed with moderately large wells yielding a total average of 4 mgd in the region between Waihee Valley and the land boundary just north of Kupaa Gulch. Four wells can be located in this region, two of which (North Waihee) already exist. Each well can be equipped with a 2 mgd (1400 gpm) pump. Average output of the aquifer on an annual basis must not exceed 4 mgd. The full capacity of the wells (8 mgd) can be used temporarily in high demand periods, however, so long as the annual average is held.
October 26, 1995

Ms. Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihe`e Wells 1 and 2 (Well Nos. 5631-02 and 5631-03)
Waihe`e, Maui, Hawaii

Dear Ms. Loui:

At its regular meeting of September 13, 1995, the Commission on Water Resource Management approved the extension of the start date for work on the pump installation permits for the subject wells to November 14, 1995. We would like to respectfully request an extension of the start date to January 14, 1996.

We are pleased to note that after a number of discussions with the County of Maui Board and Department of Water Supply, we have reached an agreement "in principle" with the Board on October 24, 1995. After a Board of Water Supply proposal and C. Brewer Homes, Inc. counter proposal were discussed in September and October, the agreement "in principle" involves Board of Water Supply purchase of land in fee simple, a perpetual conservation easement and other necessary easements, and reimbursement for engineering and other development costs expended thus far by C. Brewer Homes, Inc.

At this point, we are anticipating that a letter of intent will be drafted by the Department of Water Supply for review by C. Brewer Homes, Inc. It is hoped that the letter of intent can be accepted by C. Brewer Homes, Inc. and the acceptance confirmed by the Board of Water Supply at its November 7, 1995 meeting.

For your information, we have attached an updated chronology of the major project tasks which have taken place since the project’s inception, and a status report on the various permits required for development.
Ms. Rae M. Loui, Deputy Director  
October 26, 1995  
Page 2

We ask that our pump installation permit extension request be placed on the Commission’s November 8, 1995 agenda. If you have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,  

James M. Murray, Jr.  
Project Manager

Attachments  
cc: Milton Arakawa, Munekiyo and Arakawa, Inc.

NWW2
NORTH WAIHEE SOURCE/TRANSMISSION PROJECT
Chronology of Source Development Program

1981
North Waihee Wells (2) are drilled and pump tested by C. Brewer, proving water availability and quality.

1985-1990
Various discussions with DWS Directors regarding the development attractiveness of the Waihee source.

May 1989
Wells are pump tested again, confirming earlier results. 4 mgd initial development program recommended.

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Central Maui Water Study Part II estimates aquifer capacity (to Kahakuloa) at 10 mgd, up to 12 or 15 mgd.

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January 1991
First letter to DWS with draft business points.

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First substantive meeting towards joint venture.

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C. Brewer approached for private party joint venture.

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BWS approves business points; directs CBHI to work with staff to finalize details.

March 1993
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April 1993
BWS approves new source/transmission/storage fees.

August 1993
CBHI initiates engineering for transmission line.

January 1994
Draft agreement by Paul Mancini based on discussions.

April 1994
Project Environmental Assessment approved.

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Department of the Army Permit approved.

March 1993 to November 1994
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November 1994
CB initiates engineering for pump installation.

December 1994
Basic agreement on detail points (Dave Craddick/JMM).
January 1995  Paul Mancini provides revised draft with all new points
February 1995  BWS Technical & Planning Committee directs further work on draft agreement (2/17)
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(old road ROW at Waihee Stream)
BOARD OF WATER SUPPLY, COUNTY OF MAUI
SPECIAL MEETING

DATE: Tuesday, October 17, 1995
TIME: 9:00 a.m.
PLACE: Board of Water Supply Conference Room
County Building, Fifth Floor
200 South High Street
Wailuku, Maui, Hawaii

AGENDA

I. CALL TO ORDER

II. ATTENDANCE

III. DISCUSSION AND POSSIBLE ACTION ON C. BREWER’S RESPONSE TO THE OFFER MADE BY THE BOARD REGARDING THE NORTH WAIHEE AQUIFER.

For this matter, the board may convene in executive session pursuant to HRS 92-5(3) in order to deliberate concerning the authority of persons designated by the board to conduct labor negotiations or to negotiate the acquisition of public property, or during the conduct of such negotiations; and pursuant to HRS 92-5(4) in order to consult with its attorney on questions and issues pertaining to the board’s powers, duties, privileges, immunities, and liabilities.

IV. ADJOURNMENT

If you have special needs or require an accommodation that will assist in your successful participation in the meeting (i.e. large print, taped materials, Sign Language interpreter, accessible parking, etc.), please call Jerry Wells at [redacted] on or before October 12, 1995.
STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

September 13, 1995
Honolulu, Hawaii

C. Brewer Properties, Inc.
Request for Extension of Start Date
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1400 gpm Pumps for Domestic Use

Applicant: C. Brewer Properties, Inc.
Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 1437 P.O. Box 520
Wailuku, HI 96793 Wailuku, HI 96793

Action Requested: Permission to extend start date six months, from July 14, 1995 to January 14, 1996, for installing a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

Well Location/Tax Map Key: The wells are located at Waihee Valley, Maui at Tax Map Key: 3-2-1:4 (Attachment A).

Background:

March 25, 1993 Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.
March 1, 1995

Pump Installation Permits were extended, with a new expiration date of March 1, 1997. The start date was set to expire in two (2) months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.

May 5, 1995

The start date for work under the Pump Installation Permits was extended two (2) months, from May 14, 1995 to July 14, 1995, following the applicant's request for a four-month extension.

July 19, 1995

The start date for work under the Pump Installation Permits was extended two months, from July 14, 1995, to September 14, 1995, following the applicant's request for a six-month extension.

August 24, 1995

The applicant requested a six-month extension of the start date, to March 14, 1996, due to continuing discussions with the Maui Department of Water Supply. In response to Commission comments at the July 19, 1995 meeting, the applicant attached a chronology of the source development program and a table showing the status of various relevant permits (see Attachments C & D). Under separate cover, the applicant also sent construction drawings for the pump assembly (Attachment E). The letter also emphasizes that plans and specifications for well improvements and related facilities were transmitted to the Department of Water Supply on March 10, 1995.

Well Description: (See Attachment B)

- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 363 ft.
- Grouted annulus: 0 to 200 ft.
- Proposed pump capacity: 1400 gpm (each)
Water Availability: The wells are located in the Waihee Aquifer System near the Waihee-Iao Aquifer System boundary of the Wailuku Sector of Maui. Sustainable yield for the Waihee Aquifer System is estimated at 8 mgd, while that of Iao is 20 mgd. There are no existing ground water uses from the Waihee Aquifer System at present. Total proposed use is 4 mgd; 2 mgd from each well. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd by the Maui Water Use and Development Plan, although the Plan acknowledges that withdrawals above 4 mgd would require justification through field demonstration.

Hydrologic Analysis: The well will develop fresh, basal water for municipal use; the applicant is negotiating dedication of the wells to the County. The wells tap an aquifer with a static head standing about 10 feet above sea level. John Mink has observed that, because the stream channel in this vicinity is 200 feet above sea level, the wells should have no effect upon it. Pump tests have demonstrated that the drawdown from heavy pumping is relatively minor, with full recovery nearly instantaneous. Salinity is very low.

RECOMMENDATION: Not having heard any contrary indications

That the Commission approve the extension of the start date of the pump installation permits for North Waihee Wells to March 14, 1996. The conditions of the permit issued March 14, 1995 remain in effect except for the start date. Discussions and reviews described by the applicant may be reasonably expected to require six months for completion, prior to pump installation.

Respectfully submitted,

RAE M. LOUI
Deputy Director

MICHAEL D. WILSON, Chairperson
January 1995  Paul Mancini provides revised draft with all new points
February 1995  BWS Technical & Planning Committee directs further work on draft agreement (2/17)
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BWS offer needs to be more robust, as contained at present.

BWS agenda for next week will not meet.

Sept 19 meeting will be held on 22nd.
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**8/24/95**
Mr. James Herberg, Manager
Maui Operations
C. Brewer Properties
P.O. Box 1437
Wailuku, Hawaii 96793

Dear Mr. Herberg:

Request for Extension of Start Date of Pump Installation
North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

At its regular meeting of September 13, 1995, the Commission on Water Resource Management (Commission) approved the extension of the start date for work on the pump installation permit issued March 14, 1995.

By this letter, the start date is extended two months, from September 14, 1995 to November 14, 1995. The completion date remains March 14, 1997.

Any requests for additional extensions must be submitted for consideration by the Commission prior to November 14, 1995.

Aloha,

MICHAEL D. WILSON
BOARD OF WATER SUPPLY, COUNTY OF MAUI
RULES COMMITTEE MEETING

DATE: Thursday, September 14, 1995
TIME: 11:00 a.m.
PLACE: Board of Water Supply Conference Room
County Building, Fifth Floor
200 South High Street
Wailuku, Maui, Hawaii

A G E N D A

I. CALL TO ORDER

II. ATTENDANCE

III. APPROVAL OF MINUTES

IV. COMMITTEE DISCUSSION/ACTION

A. Com. 95-22. Request from Wayne Arakaki for a waiver of the subdivision requirements for water, Paehau Subdivision, TMK 2-1-08:3, SD 91-54.

B. Com. 95-28. Request from Greg Davidge for a waiver to install a domestic water storage tank and buy water to fill the tank, TMK 2-2-06:109, SD 95-21.

C. Com. 95-29. Request from Wayne Arakaki for a 50% reimbursement after the installation of the waterline for the Garrison Subdivision, TMK 2-4-5:73.

D. Com. 95-30. Request from Cindy Moelter for approval of a non-conforming private water system to satisfy the subdivision requirements for domestic use and fire protection, Pali Uli Subdivision, TMK 2-2-004:088, SD 95-2.

E. Com. 95-31. Request from Valerie Harte for a waiver of the shortage declaration, Virginia Caires Subdivision, TMK 2-7-014:062.

V. ADJOURNMENT

If you have special needs or require an accommodation that will assist in your successful participation in the meeting (i.e. large print, taped materials, Sign Language interpreter, accessible parking, etc.), please call Jerry Wells at [contact information] on or before September 12, 1995.
BOARD OF WATER SUPPLY, COUNTY OF MAUI
FINANCE COMMITTEE MEETING

DATE: Thursday, September 14, 1995
TIME: 1:00 p.m.
PLACE: Board of Water Supply Conference Room
County Building, Fifth Floor
200 South High Street
Wailuku, Maui, Hawaii

AGENDA

I. CALL TO ORDER

II. ATTENDANCE

III. APPROVAL OF MINUTES

IV. COMMITTEE DISCUSSION/ACTION

A. Discussion/possible action on proposed new rates.

B. Discussion/possible action on C. Brewer’s response to the offer made by the Board regarding the North Waihee Aquifer.

For this matter, the board may convene in executive session pursuant to HRS 92-5(3) in order to deliberate concerning the authority of persons designated by the board to conduct labor negotiations or to negotiate the acquisition of public property, or during the conduct of such negotiations; and HRS 92-5(4) in order to consult with its attorney on questions and issues pertaining to the board’s powers, duties, privileges, immunities, and liabilities.

V. ADJOURNMENT

If you have special needs or require an accommodation that will assist in your successful participation in the meeting (i.e. large print, taped materials, Sign Language interpreter, accessible parking, etc.), please call Jerry Wells at [redacted] on or before September 12, 1995.
Rae M. Loui, Deputy Director  
State of Hawaii  
Department of Land and Natural Resources  
Commission of Water Resource Management  
P. O. Box 621  
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihe`e Wells 1 and 2  
Well Nos. 5631-02 and 5631-03  
Waihe`e, Maui, Hawaii

Dear Ms. Loui:

At its regular meeting of July 19, 1995, the Commission on Water Resource Management approved the extension of the start date for work on the pump installation permits for the subject wells to September 14, 1995. We would like to respectfully request a six (6) month extension of the start date to March 14, 1996.

There has been a significant amount of work done on the project to date in securing permits and in engineering. For your consideration and review, we have included a chronology of the major project tasks which have taken place since the project’s inception, and a status report on the various permits required for development. We should also emphasize that the plans and specifications for the well improvements and related facilities were transmitted to the Department of Water Supply on March 10 of this year. These were prepared by Warren S. Unemori Engineering, Inc.

We are continuing to discuss our involvement in this project with the Department of Water Supply, and progress is being made in these discussions. Our intent is to continue working with the Department of Water Supply to bring this project to fruition. We ask that we be allowed to continue pursuing the implementation of this project through a further extension of the pump installation permits.
If you have any questions, please feel free to call me. Thank you for your consideration.

Sincerely,

James M. Murray, Jr.
Project Manager

Attachments
cc: Milton Arakawa, Munekiyo & Arakawa, Inc.
Date: August 25, 1995
To: Charles Ice - DLNR
From: Jim Murray
Re: Waihee Wells Pump Installation Permit Extension
Number of Pages (including this one): (6)

Attached is material I sent to Rae Loui yesterday on this subject; this fax copy is provided for your immediate use as required. Milton Arakawa had indicated that today is the deadline for submittals for the September 13 meeting.

If you have any questions, don’t hesitate to call me. Thanks for your help.
C. Brewer Homes, Inc.

August 24, 1995

Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission of Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

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James M. Murray, Jr.
Project Manager

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cc: Milton Arakawa, Munekiyo & Arakawa, Inc.
### NORTH WAIHEE SOURCE/TRANSMISSION PROJECT

**Chronology of Source Development Program**

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# North Waihee Wells, Storage & Transmission System

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for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

July 19, 1995
Honolulu, Hawaii

C. Brewer Properties, Inc.
Request for Extension of Start Date
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1400 gpm Pumps for Domestic Use

Applicant: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to extend start date six months, from July 14, 1995 to January 14, 1996, for installing a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

Well Location/Tax Map Key: The wells are located at Waihee Valley, Maui at Tax Map Key: 3-2-1:4 (Attachment A).

Background:

March 25, 1993 Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.

March 1, 1995 Pump Installation Permits were extended, with a new completion date of March 1, 1997. The start date was set to expire in 2 months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.
May 5, 1995

The start date for work under the Pump Installation Permits was extended two months, from May 14, 1995 to July 14, 1995, following the applicant's request for a four-month extension.

June 30, 1995

The applicant requested a six-month extension of the start date, to January 14, 1995, due to other ongoing, related regulation requirements. Preparation of a response to the Department of Health comments concerning a Section 401 Water Quality Certification and a still-pending application for a Coastal Zone Management Program Consistency Assessment are required before work can begin. A Department of the Army Permit and a Stream Channel Alteration Permit have been conditionally approved. Work on pump improvement design is nearing completion.

Well Description:

Ground elevation: 283 ft.
Casing diameter: 16 inches
Solid casing depth: 289 ft.
Screen casing depth: 309 ft.
Open hole: 79 ft.
Total depth: 363 ft.
Grouted annulus: 0 to 200 ft.
Proposed pump capacity: 1400 gpm (each)

Water Availability: The wells are located on the Waihee side of the Waihee-lao Aquifer System boundary of the Wailuku Sector of Maui. Sustainable yield for the Waihee Aquifer System is estimated at 8 mgd, while that of lao is 20 mgd. There are no existing ground water uses from the Waihee Aquifer System at present. Proposed use is 2 mgd from both wells together. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd by the Maui Water Use and Development Plan.

Hydrologic Analysis: The well will develop fresh, basal water for municipal use; the applicant is negotiating dedication of the wells to the County. The wells tap an aquifer with a static head standing about 10 feet above sea level. John Mink has observed that, because the stream channel in this vicinity is 200 feet above sea level, the wells should have no effect upon it.
RECOMMENDATION:

That the Commission approve the extension of the start date of the pump installation permits for North Waihee Wells to January 14, 1996. The conditions of the permit issued March 14, 1995 remain in effect except for the start date. Pending work described by the applicant may be reasonably expected to require six months for completion, prior to pump installation.

Respectfully submitted,

RAE M. LOUI
Deputy Director

Attachment

APPROVED FOR SUBMITTAL:

MICHAEL D. WILSON, Chairperson
Waihee 1\&2
(Well No. 5631-02,03)
TO: Charley Ice  
Commission on Water  
Resource Management  
1151 Punchbowl, Room 227  
Honolulu, Hawaii 96813

DATE: September 5, 1995

SUBJECT: Pump Installation Permit  
Extension for North Waihee  
Wells 1 & 2

Enclosed is/are:

Copies: 1  
Date: ---  
Description: Pump Unit and Piping Plan

( ) For approval  
( ) For your use  
(x) As requested  
( ) Returned for corrections  
( ) For your files

( ) For necessary action  
( ) For review and comment  
( ) For your signature  
( ) Returning

REMARKS: Attached is the Pump Unit and Piping Plan, as you requested. Please call me if you have any questions.

Signed: Milton Arakawa

MUNEKIYO & ARAKAWA, INC.
Planning - Environmental Studies - Project Management  
1823 Wells Street, Suite 3 - Wailuku, Hawaii 96793 - Phone: (808) 244-2015 - Fax: (808) 244-8729
TO:  Mr. Charley Ice  
Commission on Water Resource Management  
P. O. Box 621  
Honolulu, Hawaii 96809

DATE: August 28, 1995

SUBJECT: Waihee Wells Pump Installation Permit Extension

Enclosed is/are:

Copies  Date  Description
1  ---  Site Plan for Wells 1 and 2

( ) For approval  ( ) For necessary action
(x) For your use  ( ) For review and comment
(x) As requested  ( ) For your signature
( ) Returned for corrections  ( ) Returning
( ) For your files

REMARKS: The attached site plan is submitted pursuant to your request.

Signed:  
Milton Arakawa

Copy to:  Jim Murray (w/ enclosure)
FROM: E. Hirano
DATE: 7/6/85

TO: R. LOUI
INIT: J. UWAI NE
TO: F. CHING
INIT: S. SUBIA
TO: K. YODA

SURVEY BRANCH

TO: REGULATION BRANCH
INIT: E. SAKODA
TO: D. HIGA
INIT: L. NAKAMA
TO: C. ICE

APPROVAL
SIGNATURE
INFORMATION

TO: E. SAKODA
INIT: L. NAKAMA
TO: C. ICE
INIT: R. JINNAI
TO: S. SWANSON

PLANING BRANCH

TO: S. EDMUNDS
INIT: L. MIZUNO

PLEASE:
See Me
Review & Comment
Take Action
Type Draft
Type Final
File
Xerox copies

02/95
Rae M. Loui, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihe'e Wells 1 and 2
Wells Nos. 5631-02 and 5631-03
Waihe'e, Maui Hawaii

Dear Ms. Loui:

At its regular meeting of May 5, 1995, the Commission on Water Resource Management approved the extension of the start date for work on the pump installation permits for the subject wells to July 14, 1995. We would like to respectfully request an extension of the start date to January 14, 1996.

We are continuing to discuss our involvement in this project with the Department of Water Supply, but have not reached agreement regarding implementation of the project.

We have recently received comments from the State Department of Health regarding the Section 401 Water Quality Certification application on the project and will provide a response in order to seek final approval. The Coastal Zone Management Program Consistency Assessment application is still pending. Other permits, such as the Department of the Army Permit and the Stream Channel Alteration Permit have been conditionally approved.

We continue to pursue the engineering of the project, which has been contracted to Warren S. Unemori Engineering, Inc. Design of the pump improvements, and related facilities, is nearing completion.
Ms. Rae M. Loui  
June 30, 1995  
Page 2

We feel that implementation of this project is important to provide supplies of water needed to meet the near-term needs of Central and South Maui. We ask that we be allowed to continue pursuing the implementation of this project.

If you have any questions, please feel free to call me. Thank you for your kind consideration.

Very truly yours,

James M. Murray, Jr.  
Project Manager

JMM:jh
cc: Milton Arakawa, Munekiyo & Arakawa, Inc.

M-Water
Dear Mr. Blane:

Request for Extension of Start Date of Pump Installation

North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

At its regular meeting of July 19, 1995, the Commission on Water Resource Management approved the extension of the start date for work on pump installation for the permit issued March 14, 1995.

By this letter, the start date is extended two months, from July 14, 1995, to September 14, 1995. The completion date remains March 14, 1997.

Should delays prevent work from starting by September 14, 1995, additional extension must be approved by the Commission prior to that date. The Commission requires that such a request be accompanied by a written report of the status of the pump installation project, including a sketch of the pump improvement design.

Aloha,

Michael D. Wilson
ITEM 1  MINUTES OF THE JULY 5, 1995 MEETING

UNANIMOUSLY APPROVED. (NOBRIGA/GIRALD)

ITEM 2  OLD BUSINESS/ANNOUNCEMENTS

NONE.

ITEM 3  C. BREWER PROPERTIES, INC. REQUEST FOR EXTENSION OF START DATE, NORTH WAIHEE WELLS 1 & 2, (WELL NOS. 5631-02 & 03), REQUEST TO INSTALL 1400 GPM PUMPS FOR DOMESTIC USE, WAIHEE, WAILUKU, MAUI (TMK 3-2-1:4)

STAFF PRESENTATION: Mr. Charley Ice

STAFF RECOMMENDATION:

Staff recommended that the Commission approve the extension of the start date of the pump installation permits for North Waihee Wells to January 14, 1996. The conditions of the permit extensions issued March 14, 1995 remain in effect except for the start date. Pending work described by the applicant may be reasonably expected to require six months for completion, prior to pump installation.

TESTIMONIES:

Mr. David Craddick of the Maui Department of Water Supply stated that he would prefer a two month extension. Future requests for extension should include a status report, including construction drawings for the well and pump assembly.

AMENDMENT: Commissioner Nobriga moved to amend the staff's recommendation for an extension of the start date from six months to two months, and to require a status report, including construction plans.
UNANIMOUSLY APPROVED AS AMENDED. (NOBRIGA/GIRALD)

ITEM 4
WAIALUA SUGAR COMPANY VOLUNTARY REDUCTION OF PERMITTED WATER USE, PUMPS 25 & 26 (WELL NOS. 3203-01 & 02). WAIHAWA GROUNDWATER MANAGEMENT AREA, OAHU (TMK 6-4-03:1)

PRESENTATION OF SUBMITTAL: Ms. Lenore Nakama

STAFF RECOMMENDATION:

Staff recommended that the Commission:

1. Revoke the water use permit, permanently and in whole, for Pump 25 (Well No. 3203-01).

2. Require the owner or former operator of Pump 25 (Well No. 3203-01) to properly secure the well, in accordance with the requirements of Chapter 13-168, Water Use, Wells and Stream Diversion Works, Hawaii Administrative Rules, to prevent contamination of the groundwater aquifer.

3. Accept Waialua Sugar Company's voluntary permanent reduction in the allocation to Pump 26 (Well No. 3203-02) from 2.76 mgd to 1.72 mgd.

AMENDMENT: Staff requested to amend the staff recommendation by removing the word "permanently" and "permanent" in #1 and #3 to read as follows:

1. Revoke the water use permit, in whole, for Pump 25 (Well No. 3203-01).

2. Require the owner or former operator of Pump 25 (Well No. 3203-01) to properly secure the well, in accordance with the requirements of Chapter 13-168, Water Use, Wells and Stream Diversion Works, Hawaii Administrative Rules, to prevent contamination of the groundwater aquifer.

3. Accept Waialua Sugar Company's voluntary reduction in the allocation to Pump 26 (Well No. 3203-02) from 2.76 mgd to 1.72 mgd.
STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

July 19, 1995
Honolulu, Hawaii

C. Brewer Properties, Inc.
Request for Extension of Start Date
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1400 gpm Pumps for Domestic Use

Applicant:

C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

Landowner:

Wailuku Agribusiness Company, Inc.
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to extend start date six months, from July 14, 1995 to January 14, 1996, for installing a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

Well Location/Tax Map Key: The wells are located at Waihee Valley, Maui at Tax Map Key: 3-2-1:4 (Attachment A).

Background:

March 25, 1993
Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.

March 1, 1995
Pump Installation Permits were extended, with a new completion date of March 1, 1997. The start date was set to expire in 2 months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.
May 5, 1995
The start date for work under the Pump Installation Permits was extended two months, from May 14, 1995 to July 14, 1995, following the applicant's request for a four-month extension.

June 30, 1995
The applicant requested a six-month extension of the start date, to January 14, 1995, due to other ongoing, related regulation requirements. Preparation of a response to the Department of Health comments concerning a Section 401 Water Quality Certification and a still-pending application for a Coastal Zone Management Program Consistency Assessment are required before work can begin. A Department of the Army Permit and a Stream Channel Alteration Permit have been conditionally approved. Work on pump improvement design is nearing completion.

Well Description:

- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 363 ft.
- Grouted annulus: 0 to 200 ft.
- Proposed pump capacity: 1400 gpm (each)

Water Availability: The wells are located on the Waihee side of the Waihee-lao Aquifer System boundary of the Wailuku Sector of Maui. Sustainable yield for the Waihee Aquifer System is estimated at 8 mgd, while that of lao is 20 mgd. There are no existing ground water uses from the Waihee Aquifer System at present. Proposed use is 2 mgd from both wells together. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd by the Maui Water Use and Development Plan.

Hydrologic Analysis: The well will develop fresh, basal water for municipal use; the applicant is negotiating dedication of the wells to the County. The wells tap an aquifer with a static head standing about 10 feet above sea level. John Mink has observed that, because the stream channel in this vicinity is 200 feet above sea level, the wells should have no effect upon it.
RECOMMENDATION:

That the Commission approve the extension of the start date of the pump installation permits for North Waihee Wells to January 14, 1996. The conditions of the permit issued March 14, 1995 remain in effect except for the start date. Pending work described by the applicant may be reasonably expected to require six months for completion, prior to pump installation.

Respectfully submitted,

Michael D. Wilson, Chairperson

RAE M. LOUI
Deputy Director

Attachment

APPROVED FOR SUBMITTAL:

MICHAEL D. WILSON, Chairperson
Attachment A

Waihee 1 & 2

(Well No. 5631-02, 03)
Mr. David W. Blane  
C. Brewer Properties  
P.O. Box 1437  
Wailuku, Hawaii 96793

Dear Mr. Blane:

Request for Extension of Start Date of Pump Installation  
North Waihee Wells 1 & 2  
(Well Nos. 5631-02 & 03)

At its regular meeting of May 5, 1995, the Commission on Water Resource Management approved the extension of the start date for work on pump installation for the permit issued March 14, 1995.

By this letter, the start date is extended two months, from May 14, 1995 to July 14, 1995. The completion date remains March 14, 1997.

Should delays prevent work from starting by July 14, 1995, additional extension must be approved by the Commission prior to that date.

Sincerely,

RAE M. LOUI  
Deputy Director
1) Extend 2 mo. in keeping w/ our Rebriga's amendment?

2) Comment on "resource valuation"?

Clayboy - would you draft a submitted for May 5 tor 6/19.

Start date to Sept. 14, 1985. [see two options 1 & 2 for submission]

Rae M. Loui, Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Pump Installation Permits for North Waihe'e Wells 1 and 2
Well Nos. 5631-02 and 5631-03
Waihe'e, Maui, Hawaii

Dear Ms. Loui:

Pump installation permits for the subject wells were extended by the Commission on Water Resource Management on March 1, 1995. We have enclosed a signed copy of the extension for your files.

Condition No. 6 of the extension notes in part that the "permit may be revoked if work is not started within two (2) months after the date of issuance or if work is suspended or abandoned for two (2) months, unless otherwise specified."

Since the Commission action on March 1, 1995, we have met a number of times with the Board of Water Supply (BWS) regarding the implementation of this project. As you know, the project involves Waihe'e Well Nos. 1 and 2 as well as construction of a new 500,000 gallon water tank and approximately 4.26 miles of transmission lines to link with the existing County water system.

Although a joint venture with the BWS has been discussed over the past several years, an agreement has not been reached. The current approach favored by the BWS involves purchase of the wells and implementation of the entire project by the BWS. We are currently working with the BWS on the valuation of the well resource as well as the value of work done on the project thus far by C. Brewer Homes, Inc. and our consultants.
In the interim, construction plans for installation of the pumps have been submitted to the Department of Water Supply for approval.

We would like to request that the construction start date for Waihe'e Well Nos. 1 and 2 be extended to September 14, 1995 which is six (6) months after the issuance for the extension. We believe that progress is being made toward the implementation of this important project and we will continue to work with the BWS in coming up with a mutually agreeable solution.

If you have any questions, please feel free to call me. Thank you for your consideration of our request.

Very truly yours,

[Signature]
David W. Blane
Senior Vice President

Attachment - Pump Installation Permit Extension
cc: David Craddick, Department of Water Supply (w/attachment)
    Milton Arakawa, Munekiyo & Arakawa, Inc. (w/attachment)
EXTENSION
PUMP INSTALLATION PERMIT

for
North Waihee Wells 1 & 2
Well Nos. 5631-02 & 03
Waiehu, Maui

TO: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your request to extend the permit to install pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03), is approved subject to the following conditions:

STANDARD PUMP INSTALLATION PERMIT CONDITIONS

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, before any work covered by this permit commences.

2. The pump installation permits shall be for installation of a 1400 gpm capacity, or less, pump in each well. A means to accurately measure water levels, acceptable to the Commission, shall be provided.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall comply with all applicable laws, rules, and ordinances.

5. An approved flowmeter(s) must be installed to measure withdrawals and a monthly record of withdrawals, water-levels, salinity, and temperature must be kept and reported to the Commission on a monthly basis, which conforms with the Commission's September 16, 1992 direction on reporting requirements.
EXTENSION OF PUMP INSTALLATION PERMIT
Well Nos. 5631-02 & 03

6. The permit may be revoked if work is not started within two (2) months after the date of issuance or if work is suspended or abandoned for two (2) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

7. An as-built sectional drawing of the pump installation shall be submitted to the Commission within thirty (30) days after completion of work.

8. The pump installation permit application and staff submittals, approved by the Commission at its March 3, 1993 and March 1, 1995 meetings, are incorporated into the permit by reference.

Michael D. Wilson, Chairperson
Commission on Water Resource Management
Mar 14 1995
Date of Issuance

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant's Signature: ___________________________ Date: April 15/95
Printed Name: ___________________________ Firm or Title: ___________________________

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

cc: USGS
Department of Health
Safe Drinking Water Branch
Ground Water Protection Program
Wastewater Branch
Maui Department of Water Supply
EXTENSION
PUMP INSTALLATION PERMIT

for

North Waihee Wells 1 & 2
Well Nos. 5631-02 & 03
Waihee, Maui

TO: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your request to extend the permit to install pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03), is approved subject to the following conditions:

STANDARD PUMP INSTALLATION PERMIT CONDITIONS

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, before any work covered by this permit commences.

2. The pump installation permits shall be for installation of a 1400 gpm capacity, or less, pump in each well. A means to accurately measure water levels, acceptable to the Commission, shall be provided.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall comply with all applicable laws, rules, and ordinances.

5. An approved flowmeter(s) must be installed to measure withdrawals and a monthly record of withdrawals, water-levels, salinity, and temperature must be kept and reported to the Commission on a monthly basis, which conforms with the Commission's September 16, 1992 direction on reporting requirements.
EXTENSION OF PUMP INSTALLATION PERMIT
Well Nos. 5631-02 & 03

6. The permit may be revoked if work is not started within two (2) months after the date of issuance or if work is suspended or abandoned for two (2) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

7. An as-built sectional drawing of the pump installation shall be submitted to the Commission within thirty (30) days after completion of work.

8. The pump installation permit application and staff submittals, approved by the Commission at its March 3, 1993 and March 1, 1995 meetings, are incorporated into the permit by reference.

Michael D. Wilson, Chairperson
Commission on Water Resource Management

MAR 14 1995
Date of Issuance

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant's Signature: ___________________________ Date: ________________

Printed Name: ______________________________________________________

Firm or Title: _______________________________________________________

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

cc: USGS
Department of Health
Safe Drinking Water Branch
Ground Water Protection Program
Wastewater Branch
Maui Department of Water Supply
Request for Extension
C. Brewer Properties, Inc.
Request to Install 1400 gpm Pumps in
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
TMK 3-2-1:4 Waihee, Maui

Applicant: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to extend permit to install a 1400 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

Well Location/Tax Map Key: The wells are located at Waihee Valley, Maui at Tax Map Key: 3-2-1:4 (see attached map).

Well Description:

- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 363 ft.
- Grouted annulus: 0 to 200 ft.
- Proposed pump capacity: 1400 gpm (each)

Background: Pump Installation Permits for North Waihee Wells 1 & 2 were issued on March 25, 1993. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved. In December, the applicant inquired as to a preferred approach to the coming March permit expiration date, and consequently submitted this request to extend the permit.

Water Availability: The wells are located on the Waihee side of the Waihee-Iao Aquifer System boundary of the Wailuku Sector of Maui. Sustainable yield for the Waihee Aquifer System is estimated at 8 mgd, while that of Iao is 20 mgd. There are no existing ground water uses from the Waihee Aquifer System at present. Proposed use is 2 mgd from both wells together. Potential water use from the Waihee System by the year 2010 is estimated to be up to 8 mgd.
RECOMMENDATION:

That the Commission approve the extension of the pump installation permits for North Waihee Wells, subject to the same following original conditions:

STANDARD PUMP INSTALLATION PERMIT CONDITIONS

1. The Commission shall be notified before work commences.

2. The pump installation permits shall be for installation of a 1400 gpm capacity, or less, pump in each well. A means to accurately measure water levels, acceptable to the Commission, shall be provided.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall comply with all applicable laws, rules, and ordinances.

5. An approved flowmeter(s) must be installed to measure withdrawals and a monthly record of withdrawals, water-levels, salinity, and temperature must be kept and reported to the Commission on a monthly basis, which conforms with the Commission’s September 16, 1992 direction on reporting requirements.

6. The permit may be revoked if work is not started within six (6) months after the date of issuance or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

7. An as-built sectional drawing of the pump installation shall be submitted to the Commission within thirty (30) days after completion of work.

8. The pump installation permit application and staff submittal approved by the Commission at its March 3, 1993 and March 1, 1995 meetings are incorporated into the permit by reference.

Respectfully submitted,

RAE M. LOUI
Deputy Director
UNANIMOUSLY APPROVED AS AMENDED. (NOBRIGA/GIRALD)

ITEM 14
REQUEST FOR EXTENSION, C. BREWER PROPERTIES, INC., REQUEST TO INSTALL 1400 GPM PUMPS IN NORTH WAHEE WELLS 1 & 2 (WELL NOS. 5631-02 & 03), TMK 3-2-1:4, WAHEE, MAUI

PRESENTATION OF SUBMITTAL: Edwin Sakoda

AMENDMENT: Staff recommended approval with an amendment to delete the word "original" from the Recommendation, so as to read:

"That the Commission approve the extension of the pump installation permits for North Waihee Wells, subject to the same following conditions."

PRESENTATION BY APPLICANT: None; however, Mr. Jim Murray of C. Brewer Homes was present and available for questioning.

TESTIMONIES:

Mr. David Craddick of the Maui Board of Water Supply asked to have an amendment to the staff recommendation (#6) so that the applicant must face the Commission again for review if work is not started within six months.

QUESTIONS/CLARIFICATIONS:

Commissioner Nobriga wondered whether six months was too long.

Mr. Murray responded that, in regards to time table, they are in the "engineering" process for this project. They are also in the final stages of discussing, with the Board of Water Supply, the manner in which this will be developed. Also, C. Brewer anticipates that this will become the Board of Water Supply's project. He is very confident that the project will be started within the six months; less than that will be too "tight".

Commissioner Nobriga asked if the Board of Water Supply is ready to take over the project, once it's developed. He also asked why C. Brewer is taking so long to complete the project and turn it over to the Board of Water Supply.

Mr. Craddick replied that is what they are negotiating for. The Board meeting will be held on March 7, 1995 and the terms of the agreement will be discussed at that time. After the meeting, they will know whether they will be able to start the project within six months.

AMENDMENT: Page Two, Condition # 6 was amended from six (6) months to two (2) months.

UNANIMOUSLY APPROVED AS AMENDED. (NOBRIGA/NAKATA)
Briefly describe the proposed work:

Subject wells were drilled and tested between March and August 1981.

PROPOSED SECTION OF WELL

Elevation at top of casing: 284 ft., msl.

Cement Grout: 200 ft.

Hole Diameter: 20 in.

Total Depth: 363 ft.

Rock Packing: 108 ft.

Ground Elevation: 283 ft., msl

Solid Casing: ASTM Designation A-242 USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 289 ft.
Diameter 16 in.
Wall thickness 0.3125 in.

Casing: □ Perforated □ Screen
USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 20 ft.
Diameter 16 in.
Wall thickness 0.25 in.
Openings 100 sq. in./L.F.

Open Hole:

Length 79
Diameter 15 in.
Mr. David W. Blane  
C. Brewer Homes  
24 N. Church Street, #205  
Wailuku, HI 96793-1437

Extension of Pump Installation Permits  
North Waihee Wells 1 & 2 (5631-02, 03)  
Waihee, Maui

Dear Mr. Blane:

We have received your request for an eighteen (18) month extension of the pump installation permit approved by the Commission on Water Resource Management on March 25, 1993.

Please be advised that we intend to submit this request to the Commission at its regular meeting on March 1, 1995, in Honolulu. Please call Ed Sakoda at [redacted] if you have any questions.

Sincerely,

[Signature]

RAE M. LOUI  
Deputy Director

Cc: Mr. Milton Arakawa, Munekiyo & Arakawa
TO: Rae M. Loui  
Deputy Director  
Commission of Water Resource Management  
Department of Land & Natural Resources  
State of Hawaii  
P. O. Box 621  
Honolulu, Hawaii  96809

DATE: December 21, 1994

SUBJECT: Waihe'e Wells and Transmission System

Enclosed is/are:

<table>
<thead>
<tr>
<th>Copies</th>
<th>Date</th>
<th>Description</th>
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<td>Orig.</td>
<td>12/20/94</td>
<td>Letter from David W. Blane to Commission of Water Resource Management</td>
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</table>

For approval (X) For necessary action
( ) For your use ( ) For review and comment
( ) As requested ( ) For your signature
( ) Returned ( ) Returning
( ) For your files

REMARKS: Please refer to the attached letter.

Signed:__________________________
Milton Arakawa

Copy to: David W. Blane, C. Brewer Homes, Inc. (w/enclosure, via fax)
Warren Unemori, Warren S. Unemori Engineering, Inc. (w/enclosures, via fax)
David Craddick, Department of Water Supply (w/enclosure, via fax)
Rae M. Loui, Deputy Director  
Commission on Water Resource Management  
Department of Land and Natural Resources  
State of Hawaii  
P.O. Box 621  
Honolulu, Hawaii 96809

SUBJECT:  Pump Installation Permits for North Waihe'e Wells 1 and 2  
Well Nos. 5631-02 and 5631-03  
Waihe'e, Maui, Hawaii

Dear Ms. Loui:

Pump installation permits for the subject wells were issued with conditions by the Commission on Water Resource Management on March 25, 1993. Condition No. 8 of both permits note in part that the work must be started within six (6) months of the date of permit issuance. Moreover, construction must be completed within two (2) years of the date of permit issuance, or by March 25, 1995.

Extensions on the construction start date have been granted administratively, to January 25, 1995.

We would like to request a six (6) month extension of the construction start date to July 25, 1995 and an eighteen (18) month extension of the construction completion date to September 25, 1996.

As you recall, we are working with the County of Maui, Department of Water Supply (DWS), on improvements to the water system including two (2) additional wells to be drilled and equipped by the DWS, a water storage tank, and approximately 4.26 miles of waterline. Before we proceed with installation of the pumps, we would like to be reasonably certain that a connection to the County water system can be made and that applicable governmental approvals can be obtained in a timely manner. We have been working on securing the necessary permits to implement the entire project.

The Final Environmental Assessment for the project was filed in April 1994 and this process is completed.
Since the proposed waterline crosses five (5) streams or gulches, other permit requirements apply to the subject project. These include the U.S. Department of the Army permit, Section 401 Water Quality Certification, Coastal Zone Management (CZM) Consistency, and Stream Alteration Permit. The Army, Section 401, CZM and Stream Alteration Permit applications were submitted to the appropriate agencies in July 1994. A Department of the Army Provisional Nationwide Permit was issued on November 30, 1994. Action on the Section 401, CZM and Stream Alteration Permit applications are still pending.

In this regard, our requests for time extensions will allow us to continue working with the State Department of Health, the Office of State Planning and the Commission on Water Resource Management to secure the respective permit approvals for project implementation. If you or your staff have any questions, please feel free to call me. Thank you for your consideration.

Very truly yours,

C. BREWER HOMES, INC.

David W. Blane
Senior Vice-President

cc: David Craddick, Department of Water Supply
    Milton Arakawa, Munekiyo & Arakawa, Inc.
Mr. David W. Blane, Senior Vice-President
C. Brewer Homes, Inc.
P.O. Box 1437
Wailuku, HI 96793-1437

Dear Mr. Blane:

Request for Second Extension of Start of Construction Date for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

We acknowledge receipt of your letter requesting a ten-month extension of the start of construction date. By this letter we are extending your start date an additional ten months to January 25, 1995. Please note that the well should be completed by March 25, 1995, two years from the date the permit was issued.

Please notify the Commission on Water Resource Management, in writing, before any work covered by the permit begins, or if work cannot begin by January 25, 1995.

Sincerely,

RAE M. LOUI
Deputy Director

cc: Pete C. Moynahan, C. Brewer Properties, Inc.
    David Craddick, Maui Department of Water Supply
    Milton Arakawa, Munekiyo & Arakawa, Inc.
SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
Well Nos. 5631-02 and 5631-03
Waihee, Maui, Hawaii

Dear Ms. Loui:

We would like to request a ten (10) month extension (to January 25, 1995) on the start date for the above pump installation permits.

Permits for the subject wells were issued with conditions by the Commission on Water Resource Management on March 25, 1993. Condition No. 8 of both permits state in part that the "permit may be revoked if work is not started within six months of the date of issuance or if work is suspended or abandoned for six months." Accordingly, a six month extension on the start date was granted to March 25, 1994.

Our intent is to install the pumps in accordance with the other conditions of the permits, including the condition that construction be completed by March 25, 1995. Should difficulties arise regarding construction start and completion dates, we will notify the Commission in January 1995.

Before we proceed with installing the pumps, we would like some assurance that a connection to the existing County water system can be made and that applicable governmental approvals can be obtained in a timely manner. The pump installation permits are envisioned to be part of a larger project jointly undertaken by C. Brewer Homes, Inc. and the County of Maui, Department of Water Supply (DWS). This includes two additional wells to be drilled and equipped by the DWS, a water storage tank, and approximately 4.26 miles of waterline.

We have been working on filing the Final Environmental Assessment (EA) for the project. Public comments raised during the 30-day comment period of the Draft EA were
researched and addressed. The negative declaration was published in the Office of Environmental Quality Control Bulletin of April 8, 1994.

Work is also ongoing for several permits required for waterline crossings of five streams and gulches. These include the Corps of Engineers Permit, Section 401 Water Quality Certification, Coastal Zone Management Consistency, and Stream Channel Alteration Permit. Filing of these permits is anticipated in mid-1994.

If you or your staff have any questions, please feel free to call me.

Very truly yours,

[Signature]
David W. Blane
Senior Vice-President
C. Brewer Homes, Inc.

DWB:lt
cc: Pete C. Moynahan, C. Brewer Properties, Inc.
    David Craddick, Department of Water Supply
    Milton Arakawa, Munekiyo & Arakawa, Inc.
Mr. David W. Blane  
Senior Vice President  
C. Brewer Properties, Inc.  
P.O. Box 1437  
Wailuku, HI 96793-1437

Dear Mr. Blane,

Request for Extension of Start of Construction Date  
for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

We acknowledge receipt of your letter requesting a six-month extension of the start of construction date. By this letter we are extending your start date an additional six months to March 25, 1994. Please note that the well should be completed by March 25, 1995, two years from the date the permit was issued.

Please notify the Commission on Water Resource Management, in writing, before any work covered by the permit begins, or if work cannot begin by March 25, 1994.

Sincerely,

[Signature]

RAE M. LOUI  
Deputy Director

[Stamp]

Michael T. Munekiyo Consulting, Inc.  
David Craddick, Maui Department of Water Supply
September 8, 1993

Rae M. Loui
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. Loui:

SUBJECT: Pump Installation Permits for North Waihee Wells 1 and 2
Well Nos. 5631-02 and 5631-03
Waihee, Maui, Hawaii

Pump installation permits for the subject wells were issued with conditions by the Commission on Water Resource Management on March 25, 1993. Condition No. 8 of both permits state in part that the "permit may be revoked if work is not started within six (6) months of the date of issuance or if work is suspended or abandoned for six months."

We would like to request a six (6) month extension to the start date for the work on the subject wells. Our request would extend the start date for work on the wells to March 25, 1994. Our intent is to install the pumps in accordance with the other conditions of the permits. However, before we proceed with installing the pumps, we would like some assurance that a connection to the existing County water system can be made. The County is also interested in drilling additional wells in the area to the north of Well Nos. 5631-02 and 5631-03.

We are working with the County of Maui, Department of Water Supply (DWS), on improvements to the water system including two additional wells to be drilled and equipped by the DWS, a water storage tank, and approximately 4.36 miles of waterline. A Draft Environmental Assessment has been filed with the Office of Environmental Quality Control. The 30-day review period for the Draft EA started on August 23, 1993. Should there be no significant environmental impacts as a result of the project, then the EA process should be completed prior to March 1994. Our intent is to start work covered by the subject pump installation permits upon completion of the environmental review process.
If you or your staff have any questions, please feel free to call me. Thank you for your consideration.

Very truly yours,

[Signature]

David W. Blane
Senior Vice President
C. Brewer Properties, Inc.

cc: Pete Moynahan, C. Brewer Properties, Inc.
Michael T. Munekiyo, Michael T. Munekiyo Consulting, Inc.
David Craddick, Department of Water Supply
PUMP INSTALLATION PERMIT

for

North Waihee Well 2
Well No. 5631-03
Waihee, Maui

TO: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your application to install a pump in Waihee Well 2 for private/municipal use is approved, subject to the following conditions:

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified in writing before any work covered by this permit commences.

2. The permit shall be for installation of up to a 1400 gpm capacity pump in the well. The total pumpage from North Waihee Wells 1 & 2 shall average 2 mgd or less.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from the well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage. Water usage shall be measured on a monthly basis and reported to the Commission.
5. The permit application and staff submittal approved by the Commission at its meeting on March 3, 1993 shall be incorporated herein by reference.

6. The following shall be submitted to the Commission staff within 30 days after completion of the work:

   a. Well Completion Report.
   b. As-built sectional drawing of the installed pump.

7. The applicant shall comply with all applicable laws, rules, and ordinances.

8. This permit may be revoked if work is not started within six months of the date of issuance or if work is suspended or abandoned for six months. The work proposed in the permit application shall be completed within two years from the date of permit issuance.

KEITH W. AHUE, Chairperson
Commission on Water Resource Management

MAR 25 1993
Date of Issuance
I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant's Signature: [Signature]
Printed Name: [Printed Name]
Firm or Title: [Firm or Title]

Date: 3/29/93

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

Enc. (Well Completion Report form)
c: USGS
   Department of Health
       Safe Drinking Water Branch
       Ground Water Protection Program
   Maui Department of Water Supply
   Michael T. Munekiyo Consulting, Inc.
   Mink & Yuen, Inc.
TO:  C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your application to install a pump in Waihee Well 1 for private/municipal use is approved, subject to the following conditions:

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified in writing before any work covered by this permit commences.

2. The permit shall be for installation of up to a 1400 gpm capacity pump in the well. The total pumpage from North Waihee Wells 1 & 2 shall average 2 mgd or less.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from the well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage. Water usage shall be measured on a monthly basis and reported to the Commission.
5. The permit application and staff submittal approved by the Commission at its meeting on March 3, 1993 shall be incorporated herein by reference.

6. The following shall be submitted to the Commission staff within 30 days after completion of the work:
   a. Well Completion Report.
   b. As-built sectional drawing of the installed pump.

7. The applicant shall comply with all applicable laws, rules, and ordinances.

8. This permit may be revoked if work is not started within six months of the date of issuance or if work is suspended or abandoned for six months. The work proposed in the permit application shall be completed within two years from the date of permit issuance.

KEITH W. AHUE, Chairperson
Commission on Water Resource Management
MAR 25 1993
Date of Issuance
I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant’s Signature: ___________________________ Date: 3/29/93

Printed Name: ___________________________

Firm or Title: ___________________________

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

Enc. (Well Completion Report form)

C: USGS
Department of Health
Safe Drinking Water Branch
Ground Water Protection Program
Maui Department of Water Supply
Michael T. Munekiyo Consulting, Inc.
Mink & Yuen, Inc.
Chairperson and Members
Commission on Water Resource Management
State of Hawaii
Honolulu, Hawaii

Gentlemen:

C. Brewer Properties, Inc.
Application for Pump Installation Permits
North Waihee Wells 1 & 2, Waihee, Maui

Applicant: C. Brewer Properties, Inc.
Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 1437
P.O. Box 520
Wailuku, HI 96793
Wailuku, HI 96793

Action Requested: Permission to install 1400 gallons per minute (gpm) pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) for private/municipal use. The proposed total amount of use from both wells is 2,000,000 gallons per day (2 mgd).

Well Location/Tax Map Key: The wells are located at Tax Map Key: 3-2-01:4 (see attached map).

Well Description (typical):

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<th>Description</th>
<th>Value</th>
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<td>Ground elevation</td>
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<tr>
<td>Casing diameter</td>
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<tr>
<td>Solid casing depth</td>
<td>289 ft.</td>
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<tr>
<td>Screen casing depth</td>
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<tr>
<td>Open hole</td>
<td>79 ft.</td>
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<tr>
<td>Total depth</td>
<td>388 ft.</td>
</tr>
<tr>
<td>Proposed pump capacity</td>
<td>1400 gpm per well</td>
</tr>
</tbody>
</table>

Agency Review: The application has been sent to the Maui Department of Water Supply, the State Historic Preservation Division, the Office of Hawaiian Affairs, and to the State Departments of Health and Hawaiian Home Lands for review. There have been no objections to the project.

Analysis: The well will develop fresh, basal water, for private/municipal use. The wells tap a basal aquifer with a static head standing about 10 ft. above mean sea level. John Mink, in a letter to C. Brewer Properties, Inc. states, "The water table in the North Waihee wells lies 10 to 11 feet above sea level while the channel of the stream opposite the wells is 200 feet above sea level. A small depression in the water table caused by pumping will not
Water Availability: The wells are located in the Wailuku Sector, Waihee System of Maui. Sustainable yield of the Waihee System is estimated at 8 mgd. There is no pumpage from the aquifer. Ground water use from the aquifer system is expected to be about 4.2 mgd by the year 2010. The wells are listed for potential development in the Maui County Water Use and Development Plan.

RECOMMENDATION:

That the Commission approve the issuance of pump installation permits for North Waihee Wells 1 & 2, subject to the following conditions:

1. The Commission on Water Resource Management (Commission) shall be notified before work commences.

2. The permits shall be for installation of 1400 gpm capacity pumps in the wells. The total pumpage from both wells shall average 2 mgd.

3. The proposed uses shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. These permits or the authorization to pump water from the wells shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from each well could be reduced by the Commission in the future. These permits are not a commitment that the pump capacities permitted here or even some lesser amount are guaranteed in the future.

4. The applicant shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage. Water usage shall be measured on a monthly basis and reported to the Commission.

5. The following shall be submitted to the Commission within 30 days after completion of the work:
   a. Well Completion Reports.
   b. As-built sectional drawings of the pump installations.

6. The applicant shall comply with all applicable laws, rules, and ordinances.

7. These permits may be revoked if work is not started within six months of the dates of issuance or if work is suspended or abandoned for six months. The work proposed in these permit applications shall be completed within two years from the dates of permit issuance.

Respectfully submitted,
Mr. Nakata asked for the location of the wells in relation to the stream. Mr. Sakoda said the wells were about 400-500 feet from the stream but were on a slope. Discussion followed regarding the any relationship between the stream and the surrounding wetlands. Mr. Nakata was concerned about where the water for the wetlands was coming from and whether or not there was a relationship between the basal and the wetland. Mr. Sakoda explained that the water would come from the overflow of the dikes plus whatever recharge. In regards to the relationship, Mr. Sakoda said there must be a relationship but was not sure what it was. Mr. Bauer pointed out that the heads on the south side of the stream (the basal portion) was higher than the north side. Therefore, there are wetlands on the south side but not on the north.

Mr. Jim Murray of C. Brewer summarized the project and answered questions of the Commission. He stated that the water distribution system would be dedicated to the County Department of Water Supply and the final terms of the joint development agreement are being worked out. A meeting was scheduled for Friday, March 5th. Mr. Murray said the DWS had encouraged them to submit this application.

Mr. Ing asked Mr. Murray if he had seen Mr. Craddick’s letter of March 3 indicating that negotiations have not yet resulted in an agreement with C. Brewer and also commented that he would not want to see any action taken by the Commission that would infringe on the need to supply water to the area. Mr. Ing asked for the status of the negotiations. Mr. Murray had not seen the letter, but explained that a meeting was held last week and that there was a conceptual agreement on how to proceed on the development of the source. This conceptual agreement would be presented to the DWS Technical Committee.

Mr. Craddick explained that he was not asking that the application be deferred but that it be approved. Negotiations have been ongoing since 1986, although it has not resulted in any agreements. He hoped the agreement would be resolved this month then DWS may not need to drill their well and could look at other areas where a well would be more beneficial.

Discussion followed regarding locations of proposed DWS wells in the area, spacing, which aquifer systems they would impact. The applicant’s well would be located in Waihee aquifer while the proposed DWS well would be in the Iao aquifer with the Waihee Stream as the dividing point between the two aquifers (if streams can be that definitive). Mr. Craddick said it is known that the head on one side of the stream is 10 feet while the other side has a 14 foot head.

Ms. Loui added that the USGS model for Pearl Harbor showed that cones of depression can cross non-conformities so even if there is a difference in heads there could still be some effects. Mr. Craddick said that was the reason for his letter but he did not intend to stop the permit. He felt staff’s recommendations were sufficient to handle the situation mentioned by Ms. Loui.

Mr. Nakata asked if there would be any impact on the stream or wetlands from the proposed DWS well and if USGS had been asked to look at it. Mr. Sakoda did not think it would affect the stream but effects on the wetlands needs to be looked at more closely. The USGS were given copies of John Mink’s letter and they have not stated any objections. Ms. Loui added that not enough is known on whether or not the stream is gaining and where it's gaining, therefore Mr. Meyer from USGS
significant amount with the intent of having some reserved right to use the water. The nature of that right has not been determined but it would be a sharing of the source.

Mr. Craddick added that when an agreement is reached, DHHL would have water made available to them.

Staff recommendation unanimously approved (Fujimura/Lewin).

ITEM 5
EXTENSION: HUEHUE RANCH ASSOCIATES, L.P., PUMP INSTALLATION PERMITS, KUKIO IRRIGATION (K) WELLS 1 TO 3, KUKIO, NORTH KONA, HAWAII

Mr. Dustin Crimmins, representing the applicant, stated approval had been received for the Water Quality Monitoring and Management Plan from the Department of Health. A copy of the approved permit would be sent to the Commission's staff.

Staff recommendation unanimously approved (Fujimura/Ing).

ITEM 6
JOHN D. MOOD JR., APPLICATION FOR A STREAM CHANNEL ALTERATION PERMIT, A STREAM DIVERSION WORKS PERMIT, AND AN AMENDMENT TO THE INTERIM INSTREAM FLOW STANDARD FOR HUALOLO STREAM, NINOLE, HAWAII

Mr. Martin questioned whether or not the approval of all landowners adjacent to the streams was needed before the stream was restored. Ms. Loui said several letters were received from landowners who were in favor of restoring the stream. The first step would be to determine who built the diversion, then work with the landowners.

Staff recommendation unanimously approved (Nakata/Lewin).

ITEM 7
BOUNDARY RECLASSIFICATIONS WITHIN THE HONOLULU, PEARL HARBOR, AND WAIALUA GROUND WATER MANAGEMENT AREAS INCLUDING THE PEARL HARBOR CAPROCK AREA, OAHU

Mr. Hardy explained the boundaries and sectors being presented to the Commission.

Mr. Martin stated (testimony in Commission file) that in future refinement of the aquifer system and sector boundaries, the Commission should "utilize readily available additional output from USGS modelling that was not mentioned nor presented at the public information meeting."

Mr. Bowles cautioned that if boundaries and definition of rules and regulations become too rigid, the real purpose will be lost. Ground water modeling is helpful as a tool but field knowledge is equally, if not more important and that if modeling is not working it should be modified.

Since at the informational meeting the Windward area was numbers were left blank, Mr. Gary Lee asked if the information included on the map presented by Mr. Hardy was for information only or would the Commission be acting on that also. Mr. Hardy said it was just general information which was attached at the request of the Commission. The Windward area numbers were approved at an earlier
Mr. Nakata asked for the location of the wells in relation to the stream. Mr. Sakoda said the wells were about 400-500 feet from the stream but were on a slope. Discussion followed regarding the any relationship between the stream and the surrounding wetlands. Mr. Nakata was concerned about where the water for the wetlands was coming from and whether or not there was a relationship between the basal and the wetland. Mr. Sakoda explained that the water would come from the overflow of the dikes plus whatever recharge. In regards to the relationship, Mr. Sakoda said there must be a relationship but was not sure what it was. Mr. Bauer pointed out that the heads on the south side of the stream (the basal portion) was higher than the north side. Therefore, there are wetlands on the south side but not on the north.

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Mr. Craddick added that when an agreement is reached, DHHL would have water made available to them.

Staff recommendation unanimously approved (Fujimura/Lewin).

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Staff recommendation unanimously approved (Nakata/Lewin).

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Chairperson and Members
Commission on Water Resource Management
State of Hawaii
Honolulu, Hawaii

March 3, 1993

Gentlemen:

C. Brewer Properties, Inc.
Application for Pump Installation Permits
North Waihee Wells 1 & 2, Waihee, Maui

Applicant: C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, HI 96793

Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to install 1400 gallons per minute (gpm) pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) for private/municipal use. The proposed total amount of use from both wells is 2,000,000 gallons per day (2 mgd).

Well Location/Tax Map Key: The wells are located at Tax Map Key: 3-2-01:4 (see attached map).

Well Description (typical):

- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 388 ft.
- Proposed pump capacity: 1400 gpm per well

Agency Review: The application has been sent to the Maui Department of Water Supply, the State Historic Preservation Division, the Office of Hawaiian Affairs, and to the State Departments of Health and Hawaiian Home Lands for review. There have been no objections to the project.

Analysis: The well will develop fresh, basal water, for private/municipal use. The wells tap a basal aquifer with a static head standing about 10 ft. above mean sea level. John Mink, in a letter to C. Brewer Properties, Inc. states, "The water table in the North Waihee wells lies 10 to 11 feet above sea level while the channel of the stream opposite the wells is 200 feet above sea level. A small depression in the water table caused by pumping will not influence Waihee upstream of the wells. Nor is it likely that the stream will suffer in the future."
Water Availability: The wells are located in the Wailuku Sector, Waihee System of Maui. Sustainable yield of the Waihee System is estimated at 8 mgd. There is no pumpage from the aquifer. Ground water use from the aquifer system is expected to be about 4.2 mgd by the year 2010. The wells are listed for potential development in the Maui County Water Use and Development Plan.

RECOMMENDATION:

That the Commission approve the issuance of pump installation permits for North Waihee Wells 1 & 2, subject to the following conditions:

1. The Commission on Water Resource Management (Commission) shall be notified before work commences.

2. The permits shall be for installation of 1400 gpm capacity pumps in the wells. The total pumpage from both wells shall average 2 mgd.

3. The proposed uses shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. These permits or the authorization to pump water from the wells shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from each well could be reduced by the Commission in the future. These permits are not a commitment that the pump capacities permitted here or even some lesser amount are guaranteed in the future.

4. The applicant shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage. Water usage shall be measured on a monthly basis and reported to the Commission.

5. The following shall be submitted to the Commission within 30 days after completion of the work:
   a. Well Completion Reports.
   b. As-built sectional drawings of the pump installations.

6. The applicant shall comply with all applicable laws, rules, and ordinances.

7. These permits may be revoked if work is not started within six months of the dates of issuance or if work is suspended or abandoned for six months. The work proposed in these permit applications shall be completed within two years from the dates of permit issuance.

Respectfully submitted,
Meyer agrees w/ Minle on Wachee.

Go ahead.

 Rae
March 3, 1993

Mr. John Keppeler, II
Acting Director
Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Keppeler:

We are planning on constructing a well along the south side of N. Waihee stream at about the 200 foot elevation. The purpose of the well is to spread the pumping of Iao aquifer and to supply the new Department of Hawaiian Homes subdivision of Waiehu Kou and other Hawaiian Homes areas in Waiehu. Withdrawal would be in the amount of 1 MGD.

The County of Maui Board of Water Supply has been negotiating with Brewer on joint development of water in this area. These negotiations have not resulted in agreement at this time. We would not want any action taken here to infringe on our need to supply water to the areas listed above.

Thank you for your consideration in this matter.

Sincerely,

David Craddick, Director

DRC/ao/N Waihee wells

cc: Charles Ice, Dept of Hawaiian Home Lands
     David Blane, C. Brewer Properties
FACSIMILE TRANSMITTAL PAGE

Please deliver the following pages to:

Name: Bill Meyer
Company: USGS
From: Ed Sakoda
Date: 2/22/93 Time: 12:13 pm

Message: For your info & comments, Pump installation permits for Washoe Wells 1 & 2 tentatively scheduled for March 17, 1993, Commissioner meeting.

Total number of pages (including Transmittal Page): __4__

* * * * * * *

If you do not receive all of the pages legibly, please call back: (808) 587-0225

 Sending Facsimile Number: (808) ________________ Receiving Facsimile Number: (808) 341-3611

TRANSMISSION REPORT

THIS DOCUMENT (REDUCED SAMPLE ABOVE) WAS SENT

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# 4

*** SEND ***

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<th>COMMENT</th>
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</tr>
</tbody>
</table>

XEROX TELECOPIER 7020
Date: February 16, 1993

To: Ed Sakoda
Dept. of Land and Natural Resources

From: Michael T. Munekiyo

Fax No.: [Redacted]

Telephone No.: [Redacted]

No. of Pages Including Cover Letter: 4

Subject: C. Brewer Properties, Inc., North Waihee Wells No. 1 and 2

Comments: Ed, per our telephone conversation this morning, attached is John Mink's letter response regarding the effects of the North Waihee Wells on Waihee Stream flows. Please call me after you have had a chance to review to discuss placing this matter back on the Commission's agenda. Thank you.

cc: David W. Blane (242-7068)

If you have any problems or do not receive the entire fax, kindly call me at 244-2015.
February 12, 1993

David Blane
C. Brewer Properties, Inc.
PO Box 1437
Wailuku, HI 96793

Dear David:

Subject: Effect of North Waihee Wells 1 and 2 pumpage on Waihee Stream flow.

I understand that C. Brewer Properties, Inc. application for pump installation permits to install a 1400 gpm pump in each of the North Waihee wells (nos. 1 and 2) was delayed because a point was raised concerning the possible effect pumping the wells might have on Waihee stream flow. This is an exaggerated concern in view of the position of the water level in the aquifer with respect to the channel invert of Waihee Stream.

The water table in the North Waihee wells lies at 10 to 11 feet above sea level while the channel of the stream opposite the wells is 200 feet above sea level (see attached location map). A small depression in the water table caused by pumping will not influence Waihee upstream of the wells. Nor is it likely that the stream will suffer in the downstream direction because of the high invert of the channel compared to the position of the water table.

A pump test conducted between May 15 and May 19, 1989, using Well 2 as the pumping well and Well 1 along with a specially drilled boring at Kanoa (see map) as observation wells, showed that the aquifer is extensive and potentially very productive. Well 2 was pumped at 2480 gpm (3.57 mgd) and experienced drawdown of just 5 feet. Recovery was virtually instantaneous following 96 hours of continuous pumping. The salinity of the water was constant at less than 20 mg/l chloride.

Although each well will be fitted with a 1400 gpm pump (2 mgd) to give a total capacity of 4 mgd, during normal operations only 2 mgd will be pumped, and annually the
average will be 2 mgd. Eventually additional wells may be
drilled in the aquifer about half a mile north of the
existing wells to allow total average pumpage of 4 mgd.

Sincerely,

John F. Mink
TO: Mr. Ed Sakoda  
Department of Land and Natural Resources  
Water Resources Management  
P. O. Box 621  
Honolulu, HI 96809

DATE: February 4, 1993  
SUBJECT: C. Brewer Properties, Inc., Application for Pump Installation Permit, North Waihee Wells 1 & 2, Waihee, Maui

Enclosed is/are:

<table>
<thead>
<tr>
<th>Copies</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2/4/93</td>
<td>Check #2221 in the amount of $25.00 for permit fee</td>
</tr>
</tbody>
</table>

()- For approval  (x) For necessary action  
()- For your use  ( ) For review and comment  
()- As requested  ( ) For your signature  
()- Returned for corrections  ( ) Returning  
()- For your files

REMARKS: Ed, as we discussed we are enclosing the permit fee to cover the second well.

Signed: Michael T. Munekiyo, A.I.C.P.

Copy to:
PAY TO THE ORDER OF: Department of Land and Natural Resources

$25.00

***Twenty five and no/100***

First Hawaiian Bank
WAILUKU BRANCH
P.O. Box 7899
WAILUKU, HI 96793

CBP-N.Waihee Wells
Filing fee-Pump Inst. Permit

Feb. 4, 1993

Lori T. Munekay
TO Ed
DATE 2/2/73 TIME 0:08 a

WHILE YOU WERE OUT
Mike Shunkeiyo
(Maui)
Phone 267-2015

| TELEPHONED | PLEASE CALL |
| CALL TO SEE YOU | WILL CALL AGAIN |
| WANTS TO SEE YOU | URGENT |
| RETURNED YOUR CALL |

Message: Spoke w/Mike on 2/2/73. He will check on Calif & get back to me.

Operator

Signed: Stream effects
Ms. Rae Loui, 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. Loui:

SUBJECT: PUMP INSTALLATION PERMIT APPLICATION  
WAIHEE WELLS 1 AND 2  
STATE WELL NOS. 5631-02 AND -03  
WAIHEE, MAUI

Thank you for the opportunity to review and comment on the subject document. We have examined the application and have the following comments to offer:

1. The application indicates that the subject wells will be for domestic use. If the wells will serve 25 or more individuals at least 60 days per year or will have a minimum of 15 service connections, the applicant will be required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems.

2. Section 11-20-29 of Chapter 20 requires that a new source of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

3. The proposed wells are situated above the Underground Injection Control (UIC) line. Land areas above the UIC line are considered to contain underground sources of drinking water. Thus, it is essential that the wells be designed and constructed to prevent the possibility of groundwater contamination. For example, each well should have a concrete well pad and full grouting to prevent seepage or floodwaters from migrating down the well shaft.

4. If the wells are also used for irrigation purposes, adequate measures must be taken to eliminate cross-connections and backflow conditions. The potable and irrigation water systems should be clearly labeled and
physically separated by an air gap or an approved backflow preventer to avoid contaminating the potable water supply.

If you should have any questions, please contact Stuart Yamada of the Safe Drinking Water Branch at [redacted]

Sincerely,

[Signature]

THOMAS E. ARIZUMI, P.E., Chief
Environmental Management Division

SY:la

c: David Blane
C. Brewer Properties, Inc.
P.O. Box 1437
Wailuku, Maui, HI 96793
Mr. David Blane  
C. Brewer Properties, Inc.  
P.O. Box 1437  
Wailuku, HI 96793  

Dear Mr. Blane:

We have received your application and filing fee for a permit to install pumps in two wells (Well Nos. 5631-02,03) at Waihee, Maui, (TMK: 3-2-01:4). We are reviewing the application for completeness.

Should you have questions, please call the Commission on Water Resource Management staff at [redacted].

Sincerely,

RAE M. LOUI  
Deputy Director

JZ:ky
Honorable Hoaliku Drake  
Director  
Department of Hawaiian Home Lands  
State of Hawaii  
P.O. Box 1879  
Honolulu, Hawaii 96805

Dear Ms. Drake:

Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

<table>
<thead>
<tr>
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<td>5631-02,03</td>
<td>Pump Installation</td>
</tr>
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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact Rae M. Loui, Deputy Director, at 587-0214.

Very truly yours,

[Signature]

WILLIAM W. PATY  
DEPUTY

JZ:ky  
Enc.
Mr. Clayton H.W. Hee  
Chairman & Trustee At Large  
Office of Hawaiian Affairs  
711 Kapiolani Blvd., Suite 500  
Honolulu, Hawaii 96813-5249  

Attn: Ms. Linda Delaney, Land & Natural Resources Division  

Dear Mr. Hee:  

**Well Construction and Pump Installation Permit Applications**  

Transmitted for your review and comment are copies of the following permit applications:  

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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact Rae M. Loui, Deputy Director, at [ ]

Very truly yours,

[Signature]  
WILLIAM W. PATY  

JZ:ky  
Enc.
Mr. Thomas Arizumi, Chief
Environmental Management Division
State Department of Health
Five Waterfront Plaza
500 Ala Moana Blvd., Suite 250
Honolulu, Hawaii 96813

Attn: Mr. William Wong

Dear Mr. Arizumi:

Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact the Commission on Water Resource Management staff at [Redacted]

Sincerely,

RAE M. LOUI
Deputy Director

JZ:ky
Enc.
Ms. Marjorie Ziegler  
Sierra Club Legal Defense Fund, Inc.  
212 Merchant Street, Room 202  
Honolulu, Hawaii 96813

Dear Ms. Ziegler:

Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact the Commission on Water Resource Management staff at JZ:ky

Sincerely,

RAE M. LOUI  
Deputy Director

JZ:ky  
Enc.
MEMORANDUM

TO: Don Hibbard, Director
   Historic Preservation Program

FROM: Rae M. Loui, Deputy Director
       Commission on Water Resource Management

SUBJECT: Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact the Commission on Water Resource Management staff at [insert contact information].

JZ:ky
Enc.
Mr. Dave Craddick, Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, Maui, Hawaii 96793

Dear Mr. Craddick:

Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

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Please review the applications pursuant to your area of concern and submit your comments to us, orally or in writing, ten (10) working days from date of this letter.

Should you have any questions, please contact the Commission on Water Resource Management staff at

Sincerely,

RAE M. LOUI, P.E.  
Deputy Director

JZ:ky  
Enc.
Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

Well Construction and Pump Installation Permit Applications

Transmitted for your review and comment are copies of the following permit applications:

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Should you have any questions, please contact the Commission on Water Resource Management staff at

Sincerely,

RAE M. LOUI
Deputy Director
MEMORANDUM

TO: Rae M. Loui, Deputy Director
Commission on Water Resource Management

FROM: Don Hibbard, Administrator

SUBJECT: Historic Preservation Review of Well Construction and Pump Installation Permit Applications
Waihee, Wailuku & Wahikuli, Lahaina, Maui
TMK 3-2-1: 4 & 4-5-14: 14

October 27, 1992

We believe that both applications will have "no effect" on significant historic sites. The wells in Waihee already exist in farmed land and the proposed well in Wahikuli will be located along the highway, an area that has been previously disturbed. Both areas are not likely to contain historic sites.

Please call Annie Griffin at extension 7-0013 if you have any questions.

AG:aal
TO: Ed Sakoda
DLNR
Div. of Water Resources Management
P. O. Box 621
Honolulu, HI 96809

DATE: September 17, 1992

SUBJECT: Pump Installation Permit for North Waihee Wells

Enclosed is/are:

<table>
<thead>
<tr>
<th>Copies</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>---</td>
<td>Application for Pump Installation Permit with attachments</td>
</tr>
<tr>
<td>1</td>
<td>---</td>
<td>$25.00 Filing Fee</td>
</tr>
</tbody>
</table>

() For approval  (x) For necessary action
() For your use   () For review and comment
() As requested   () For your signature
() Returned for corrections
() For your files

REMARKS: The attached materials are submitted for processing. If there are any questions or if additional information is needed, please call me at
Thank you.

Signed: Michael T. Munekiyo, A.I.C.P.

Copy to: Planning • Environmental Studies • Project Management
2035 Main Street • Wailuku, Hawaii 96793 • Phone: (808) 470-2500 • Fax: (808) 470-2501
PAY TO THE ORDER OF: Department of Land and Natural Resources $25.00

***Twenty five and no/100***

First Hawaiian Bank
P.O. BOX 310
WAILUKU, HAWAII 96793

CBP-N. Wahiawa Hall [redacted]

[Signature]

Michael T. Munekiyo Consulting Inc.
APPLICATION FOR: □ Well Construction or □ Pump Installation PERMIT

Instructions: Please print or type and send completed application with attachments to the Div. of Water Resource Management, P.O. Box 373, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of $25.00 payable to the Dept. of Land and Natural Resources. (Filing fee waived for government agencies.) If necessary, phone [blank] Hydrology/Geology Section for assistance.

1. WELL LOCATION/NAME: State Well Nos. 5631-02 and 5631-03 Island Maui

   Address Waihee, Maui, Hawaii
   Tax Map Key 3-2-01:4

   (Attach a USGS map, scale 1"=2000', and a property tax map showing well location referenced to established property boundaries.)

2. (a) WELL OWNER:
   Firm Name C. Brewer Properties, Inc.
   Contact Person David Blane
   Address P. O. Box 1437
   Wailuku, HI 96793 Ph: [blank]

   (b) LANDOWNER:
   Firm Name Wailuku Agribusiness Company, Inc.
   Contact Person Stephen W. Knox
   Address P. O. Box 520
   Wailuku, HI 96793 Ph: [blank]

3. PROPOSED CONTRACTOR:
   Name Not available. Project to be
   bid following receipt of permit.
   Contractor's License No. [blank]

4. PROPOSED WORK: □ Drill New Well □ Deepen □ Redrill
   □ Alter □ Seal □ Abandon
   □ Install New Pump □ Replace Pump □ Modify Pump

   (Briefly describe the proposed work and fill in the diagram on the back of this form.)

5. PROPOSED USE:
   □ Municipal (including hotels, stores, etc.) □ Military
   □ Domestic (individual, noncommercial water sys.) □ Industrial
   □ Irrigation (specify) □ Other (specify)

6. PROPOSED AMOUNT OF WITHDRAWAL: 4.0 Million gallons per day Total
   (2.0 MGD per well)

7. PROPOSED PUMP INFORMATION:
   Pump Type: □ Vertical Turbine
   Motor: □ Diesel
   Rated Pump Capacity: Gallons per minute 1400
Briefly describe the proposed work:

Subject wells were drilled and tested between March and August 1981.

PROPOSED SECTION OF WELL

Elevation at top of casing: 284 ft, msl.

Cement Grout: 200 ft.
Hole Diameter: 20 in.
Total Depth: 363 ft.
Rock Packing: 108 ft.

Ground Elevation: 283 ft, msl

Solid Casing: ASTM Designation A-242
USS Cor-ten, Kaiser
Material: Steel Kaisaloy
Length: 289 ft.
Diameter: 16 in.
Wall thickness: 0.3125 in.

Casing: ☐ Perforated ☐ Screen
USS Cor-ten, Kaiser
Material: Steel Kaisaloy
Length: 20 ft.
Diameter: 16 in.
Wall thickness: 0.25 in.
Openings: 100 sq. in./L.F.

Open Hole:
Length: 79
Diameter: 15 in.
APPLICATION FOR: □ Well Construction or □ Pump Installation PERMIT

Instructions: Please print or type and send completed application with attachments to the Div. of Water Resource Management, P.O. Box 373, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of $25.00 payable to the Dept. of Land and Natural Resources. (Filing fee waived for government agencies.) If necessary, phone Hydrology/Geology Section for assistance.

1. WELL LOCATION/NAME: State Well Nos. 5631-02 and 5631-03 Island Maui
   Address Waihee, Maui, Hawaii Tax Map Key 3-2-01:4
   (Attach a USGS map, scale 1"=2000', and a property tax map showing well location referenced to established property boundaries.)

2. (a) WELL OWNER:
   Firm Name C. Brewer Properties, Inc.
   Contact Person David Blane
   Address P. O. Box 1437 Wailuku, HI 96793 Ph. 342-1067

   (b) LANDOWNER:
   Firm Name Wailuku Agribusiness Company, Inc.
   Contact Person Stephen W. Knox
   Address P. O. Box 520 Wailuku, HI 96793 Ph. ____________

3. PROPOSED CONTRACTOR:
   Name bid following receipt of permit. Contractor's License No.
   Address ____________________________ Ph. ____________________

4. PROPOSED WORK:
   □ Drill New Well □ Deepen □ Redrill
   □ Alter □ Seal □ Abandon
   □ Install New Pump □ Replace Pump □ Modify Pump
   (Briefly describe the proposed work and fill in the diagram on the back of this form.)

5. PROPOSED USE:
   □ Municipal (Including hotels, stores, etc.) □ Military
   □ Domestic (Individual, noncommercial water syst.) □ Industrial
   □ Irrigation (specify) □ Other (specify)

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USS Cor-ten, Kaiser

Material Steel Kaisaloy

Length 289 ft.

Diameter 16 in.

Wall thickness 0.3125 in.

Casing: ☐ Perforated ☐ Screen

USS Cor-ten, Kaiser

Material Steel Kaisaloy

Length 20 ft.

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Open Hole:

Length 79

Diameter 15 in.
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<tr>
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Dear Dr. Brown:

Waihee Valley Wells 1 & 2 (Well Nos. 5631-02 & 03)

Your letter indicates that you are looking for a way to require Wailuku Agribusiness to do an environmental assessment and an environmental impact statement before they draw any water from the Waihee Valley Wells.

The administrative rules of the State Water Code require only that a water user obtain a pump installation permit from the Commission on Water Resource Management prior to installing a pump in a well. In designated water management areas, an additional water use permit is required. Presently, there are no water management areas on Maui.

The State Water Code also provides for dispute resolution and citizen complaints for water-related matters whether or not they are in a water management area.

An environmental assessment and environmental impact statement are not required by the Commission on Water Resource Management prior to the owner or applicant using water from the Waihee Valley Wells. However, they must obtain a pump installation permit from the Commission. If there are any disputes or complaints about the issuance of such a permit, the Commission will hear them and act accordingly.

Call Ed Sakoda at [number redacted] if you have any questions.

Sincerely,

[Signature]

MANABU TAGOMORI
Deputy Director
June 13, 1990

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

Gentlemen:

Re: PUMP INSTALLATION PERMITS

Pursuant to your letter of May 30, 1990, we are submitting applications for pump installation permits for the following projects:

1. Honokahua-Well A, Repair of Controls.  
3. Waiehu Heights Pump #2, Pump Replacement.  
5. Kapalua Well, Pump Installation.  

Additional information requested are as follows:

1. Wakiu Wells "A" and "B" both have 40 horsepower motors and have capacities of 350 gpm.

2. Waihee Wells #1, #2, and #3 all flow through the same meter.

If any additional information is required, please contact us.

Sincerely,

Vince G. Bagoyo, Jr.  
Director

ab  
Enclosures
North Waihee Wells
Pump Test Protocol

John F. Mink
April 4, 1989

The pump rate will be held constant at 2000 gpm over a continuous period of 96 hours. The continuous rate may be prolonged another 24 hours at the discretion of the test supervisor.

In the Waihee-Kahakuloa sector water level measurements will be taken in the pumping well, the other North Waihee well, the Kanoa boring and the Wailena well. In the Waihee-Waiehu sector, measurements will be taken in Test Hole A-1. The unpumped North Waihee well is outfitted with a continuous water level recorder and in the Kanoa boring a bubbler will be installed. The Wailena well and A-1 are open. Manual measurements will be made with an insulated copper wire equipped with an electrode, or a steel tape.

Static water level measurements by steel tape or wire will be taken as follows.

1. Both North Waihee wells and the Kanoa boring.
   a. Three days before the start of the test in the A.M.
   b. One day before the start, also A.M.
   c. 30 minutes before the start.

2. Wailena well.
   a. Within five days of the start of the test.
   b. The day of the start of the test.

3. Test Hole A-1.
   a. Within five days of the start of the test.
   b. The day of the start of the test.

After the test is started, water level measurements will be taken as follows.

1. Pumping North Waihee well (manual measurements preferred; airline if manual not possible).
   a. 1 reading per minute for 5 minutes.
   b. 1 reading per 5 minutes for 25 minutes.
   c. 1 reading per 10 minutes for 60 minutes.
   d. 1 reading every hour thereafter.
2. Unpumped North Waihee well. Drawdowns will be traced on the continuous recorder, but manual measurements should be made as follows to check the reliability of the recorder:
   a. At 10 minutes
   b. At 30 minutes.
   c. Every hour thereafter.

3. Kanoa boring. Drawdowns will be determined by the bubbler arrangement but need to be checked manually. Recognizable drawdown of about 0.1 feet will not occur until 48 hours after the start of the test if the aquifer is unconfined and not narrowly bounded. If the aquifer is confined, drawdown will be measurable sooner. The sequence of readings should be:
   a. At 10 minutes.
   b. At 30 minutes.
   c. Every hour thereafter.

4. Wailena well. The Wailena well is so distant from North Waihee that drawdown of 0.1 feet and more isn’t likely to occur unless the aquifer is confined. Nevertheless, manual measurements should be made as follows.
   a. At 6 hours.
   b. At 24 hours.
   c. At 30 hours.
   d. At 48 hours.
   e. At 54 hours.
   f. At 72 hours.
   g. At 78 hours.
   h. At 96 hours.

   If a response is noted, the frequency of measurements will be increased as practicable.

5. Test Hole A-1. Same schedule as the Wailena well.

Recoveries will be measured after the pump is turned off. Recovery measurements at the pumped well, the unpumped North Waihee well and the Kanoa boring will follow the same schedule as the drawdown measurements over a period of 12 hours. Thereafter single measurements will be made in the A.M. for the following 5 days. Recovery measurements will be made at Wailena and A-1 only if these wells experienced measureable drawdown. The schedule for such measurements will be drawn up before the end of the test.
North Waihee, Maui, Hawaii

Memo To: Joint Venture
From: John F. Mink and Norman Saito Engineering
Re: Location of new well sites in aquifer north of Waihee Valley
Date: July 17, 1989

The aquifer starting at Waihee Valley and extending northward toward Makamakaole is capable of providing approximately 4 mgd on a sustained basis. To meet maximum demands pumpage can be greater temporarily, but over the long term the average draft should be restricted to 4 mgd. This is the sustainable yield that has been estimated from analysis of the successful pumping test conducted recently on one of the North Waihee wells.

The high groundwater head in the aquifer will allow withdrawal of potable water employing relatively high capacity pumps. Drawdowns during the test were modest and recovery was rapid. Pumps having a capacity of 2 mgd (1400 gpm) each are recommended for the existing two North Waihee wells and the proposed two new wells between Waihee and Kupaa Gulch.

Sites for the new wells are plotted on the accompanying map. Three sites have been selected, but only two new wells are recommended at this time. The remaining site should be reserved for a future well in the event the sustainable yield of the aquifer proves to be greater than the estimate of 4 mgd. The first new well should be drilled at Site 2, and the next at Site 3. Site 1 is the reserve location.
Site 2 is close by the Kanoa test boring where an unnamed gulch becomes too narrow to allow uncomplicated land development. The new well can be drilled within 150 feet of the test boring at an elevation of about 300 feet. The boring will be an important monitor to track behavior of the aquifer. The site is 2000 feet north of the North Waihee wells. An access road already exists.

Site 3, where the second new well should be drilled, is on the south bank of Kupaa Gulch where it is crossed by Kahekili Highway. The usable space is small but adequate for drilling operations and construction of a pumping station. Clearing and leveling will be required. Otherwise, north of Site 2 the terrain is difficult and elevation quickly rises above 400 feet. Elevation at the site is about 350 feet; distance north of Site 2 is 1000 feet.

The reserve location, Site 1, is 500 feet south of Site 2 and 1500 feet northeast of the North Waihee wells at elevation 300 to 350 feet. The site is on the slope forming the head of an attractive small valley.

Although four wells, each fitted with a 2 mgd pump, are proposed for the reach between Waihee valley and Kupaa Gulch, on the average only 4 mgd will be pumped. The total capacity of 8 mgd can be exercised during periods of unusual demand, but on an annual basis pumpage should be equivalent to 4 mgd.

The average of 4 mgd should not be taken from the two North Waihee wells alone. One of these wells should act as a standby except during the highest demand periods.
WAILENA WELL
ELEVATION = 608.23
(AT TOP OF PIPE)

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<thead>
<tr>
<th>DATE</th>
<th>TOP WATER ELEVATION</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td>02/17/89</td>
<td>x</td>
<td>Poor reading - chloride content 87.5 mg/l</td>
</tr>
<tr>
<td>03/01/89</td>
<td>6.63</td>
<td>Good results; 3:00 p.m. - NaCl 87.5 mg/l</td>
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<td>6.67</td>
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<td>6.44</td>
<td>4:00 p.m.; river not flowing</td>
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<tr>
<td>03/22/89</td>
<td>6.16</td>
<td>4:00 p.m.; river not flowing</td>
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<td>04/03/89</td>
<td>6.61</td>
<td>10:15 a.m.; no water in river</td>
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<tr>
<td>04/11/89</td>
<td>6.54</td>
<td>1:30 a.m.; 150 mg/l - river running strong</td>
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<td>04/17/89</td>
<td>6.20</td>
<td>9:00 a.m.; from chart</td>
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### Pump Test at Well A-1

**Elevation = 248.11**  
(Water Level In Feet)

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<th>TIME</th>
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<th>5/16/89</th>
<th>5/17/89</th>
<th>5/18/89</th>
<th>5/19/89</th>
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<td>18.05</td>
<td>17.99</td>
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**WELL A-1**

Elevation: 248.11 feet  
(Water Level in Feet)

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<td><strong>Saturday</strong></td>
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<td>18.01</td>
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<td>17.88</td>
<td>18.08</td>
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<td>10:40 am</td>
<td>18.04</td>
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<td>(noon-begin test)</td>
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<td>(noon-stop test)</td>
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<tr>
<td>2:30 pm</td>
<td>5:10 pm</td>
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<td>18.06</td>
<td>18.05</td>
<td>17.99</td>
<td>18.09</td>
<td>18.05</td>
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</tbody>
</table>

All measurements taken by steel tape.

The A-1 well is located far enough away from the test well, North Waihee #2, that any effect on A-1 would be doubtful.

A final reading of Well A-1 was taken on Monday, May 22, 1989 at 8:00 a.m. with a water level elevation of 18.08 feet above sea level.
TEST WELL DATA
NORTH WAIHEE WELL #2

Test well elevation at top of casing 281.98
Measure point at base of gearing 282.73
Pump location (-300 feet from M.P.) -17.27
Air line location (top of bowl assembly) -6.27
Pressure gauge reading at beginning of test (to 1/10) 17.5

Distance from North Waihee Well #1 to North Waihee Well #2 176 feet

Chloride readings were taken twice daily. All were between 37.5 mg/1 and 50 mg/1. NaCl measured with the HACH chloride test kit, Model 7-P, using low range measure 0-250 mg/1.
## PUMP TEST AT
NORTH WAUKEE WELL NO. 2

MP Elevation = 282.73 (Bottom of Housing)

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>PUMPING RATES X 100</th>
<th>RATE READING (GPM)</th>
<th>WATER LEVEL (FT.) (AT GAUGE)</th>
<th>WATER ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon, 5/15</td>
<td>Noon</td>
<td>Begin Pump Test</td>
<td>Begin. Level</td>
<td>17.10</td>
<td>11.2</td>
</tr>
<tr>
<td>Mon, 5/15</td>
<td>2:15 p.m.</td>
<td>409651</td>
<td>&gt; 2527</td>
<td>14.00</td>
<td>7.7</td>
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<td>Tues, 5/16</td>
<td>8:25 a.m.</td>
<td>436445</td>
<td>&gt; 2483</td>
<td>13.50</td>
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<td>Tues, 5/16</td>
<td>2:05 p.m.</td>
<td>444888</td>
<td>&gt; 2475</td>
<td>12.60</td>
<td>6.3</td>
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<td>Tues, 5/16</td>
<td>5:20 p.m.</td>
<td>449715</td>
<td>&gt; 2451</td>
<td>12.50</td>
<td>6.2</td>
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<td>Wed, 5/17</td>
<td>8:30 a.m.</td>
<td>472020</td>
<td>&gt; 2506</td>
<td>12.20</td>
<td>5.9</td>
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<td>Wed, 5/17</td>
<td>12:00 noon</td>
<td>477283</td>
<td>&gt; 2430</td>
<td>12.50</td>
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<td>481693</td>
<td>&gt; 2471</td>
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<td>485400</td>
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<td>Thur, 5/18</td>
<td>9:00 a.m.</td>
<td>Increased Pump Rotation 1700 rpm - 1900 rpm</td>
<td>12.20</td>
<td>5.9</td>
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<td>9:05 a.m.</td>
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<td>12.10</td>
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<td>Thur, 5/18</td>
<td>6:00 p.m.</td>
<td>Reduced Pump Rotation 1900 rpm - 1700 rpm</td>
<td>12.00</td>
<td>5.7</td>
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<td>8:00 a.m.</td>
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<td>12:00 noon</td>
<td>Stopped Pump Test</td>
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<td>17.20</td>
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<td>Date</td>
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<td>Totalizer (X's 100)</td>
<td>Pump Rate</td>
<td>Recorder Level</td>
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## NORTH WAIHEE WELL NO. 2
### PUMP TEST FIELD DATA
**5/15/89 TO 5/19/89**

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<tr>
<th>DATE</th>
<th>TIME</th>
<th>WATER METER TOTALIZER (X'S 100)</th>
<th>PUMP RATE</th>
<th>RECORDER LEVEL</th>
<th>WATER LEVEL ELEVATION</th>
<th>NaCl (mg/l)</th>
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<td>*Pumping</td>
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PUMP TEST AT
NORTH WAIHEE WELL NO. 2

MP Elevation = 282.73 (Bottom of Housing)

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<tr>
<th>DATE</th>
<th>PUMPING TIME</th>
<th>RATES X 100 READING</th>
<th>RATE (GPM)</th>
<th>WATER LEVEL (FT.)</th>
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<td>409651</td>
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<td>Tues. 5/16</td>
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<td>436445</td>
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(Increased Pump Rotation 1700 rpm - 1900 rpm)

Flow meter malfunction.

At 6 p.m. 5/18 reduced rpm's to 1700. Water level went up to 12.8

<table>
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<th>Depth to water = 0.4 miles. C x (water x 1 + water x 2) = 1766 ft.</th>
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<td>Start water:</td>
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<td>Pump reading @ 300 (17.27) DTW ~ 272 (L/1033)</td>
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<td>Start Test @ 1200 (188) DTW ~ 2400 (L/1000)</td>
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Water level @ 17.14 ft (below WT). L (12.20) = 2.8 A (12.40) = 3.4 A (12.20) = 3.1

Pump from 5/19/89 1200 A = 5.2 C = 3.27 A = 0.2 C = 0.12 L = 50 m.
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<th>WATER LEVEL</th>
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NORTH WAIHEE WELLS 1 AND 2
STEP DRAWDOWN PUMP TEST

APRIL 15, 1981 (WELL NO. 1)
AUGUST 3, 1981 (WELL NO. 2)
5/18/84  17:10
Cell from El Rancho

Bill Moon, meter not reading correctly,

\( Q = 2400 \text{ gpm} \) at 1700 RPM

\( Q = 2400 \text{ gpm} \) at 1900 RPM (for which change was made at 5/18/84)

Order to return to 1700 RPM. Will calculate flow
by other means.

5/19/84  07:30 Cell from El Rancho

Bill Moon calculated rate of 2900 gpm when RPM = 2000

Order to 5/18 1900 to 5/18 1700 (?) as this note. Cut back to
2400 gpm (1700 RPM). New pump breaks, i.e. pump should be
operating properly. Confusion caused by malfunction of meter.
The pump test at North Waihee Well #2 began on Monday, May 15, 1989, at noon.

Pumping was to be at a constant rate of 2,400-2,500 gpm for 5 days.

Between 6:00 p.m. on Wednesday, May 17 and 9:00 a.m. on Thursday, May 18 the in-line flow meter malfunctioned. Not knowing this, we increased the pump's rpm to keep up the 2,450 gpm rate.

The pumping was at this increased rate (1,900 rpm) from 9:00 a.m. on Thursday, May 17 to 6:00 p.m. on Thursday, May 17. At that time the pumping was reduced to approximately 2,450 gpm by reducing the pump rotation to the original 1,700 rpm. The remainder of the test was run at this rate.

Pumping at the test well was stopped at 12:00 p.m. (noon) on Friday, May 18, 1989.

Recovery was almost immediate and by 2:00 p.m. the pressure gauge at the test well read 17.2 feet. By 5:00 p.m., Friday it was back to the original 17.5 feet on the gauge.

On Saturday at 8:00 a.m. the water level at the test well was measured by tape to be 11.25 feet above sea level. At this time the gauge was at 17.5 feet.

With the air line at -6.27 feet and water level at 11.25 feet, the gauge reading should be at 17.52 feet. The gauge reading correlates well with these results.
# Kanoa Well

**Well Elevation**

305.94 ft. AT 2 1/2 IN. CASING

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**KANOA WELL**

**Elevation:** 305.94 feet  
**(Bubbler System)**

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<tr>
<td>6:00pm</td>
<td>12.10</td>
<td>6:00pm</td>
<td>12.10</td>
<td>5:30pm</td>
<td>12.20*</td>
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</tr>
<tr>
<td>8:30pm</td>
<td>12.31</td>
<td>12:00am</td>
<td>12:00am</td>
<td>12:00am</td>
<td>12.10</td>
<td></td>
</tr>
</tbody>
</table>

*Measured by steel tape.

On Monday, May 22, 1989, at 8:30 a.m. a final measure was taken by tape to read 12.35 feet.
# KANOA WELL

Elevation = 305.94
(Bubbler System)

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<th>5/16/89 Tuesday</th>
<th>5/17/89 Wednesday</th>
<th>5/18/89 Thursday</th>
<th>5/19/89 Friday</th>
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</tr>
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<td>ME.</td>
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JFL Field notes (Kanoa) = 305.94

Shiela: $h_0 = 12.42 - 0.6930 \times \text{time on } 14:30 \text{ when} \quad \text{at} \quad \text{field}.

5/19/89 $h = 11.98$ (by tape) $A = 12.42 - 11.98 = 0.44$

11:15 12.38 $d = 0.32$ Real time: 12:15

$A = 12.14$
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</tr>
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<td>11 am</td>
</tr>
<tr>
<td>12/29/89</td>
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<td>9 am</td>
</tr>
<tr>
<td>11/5/89</td>
<td>11.96</td>
<td>11 am</td>
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<td>11.55</td>
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<td>11.57</td>
<td>3 pm</td>
</tr>
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<td>1/24/89</td>
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<td>4 pm</td>
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<td>1/28/89</td>
<td>11.52</td>
<td>4 pm</td>
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<tr>
<td>1/8/89</td>
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<td>11.60</td>
<td>5 pm</td>
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<td>1/22/89</td>
<td>11.60</td>
<td>4 pm</td>
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<tr>
<td>2/1/89</td>
<td>11.48</td>
<td>2 pm</td>
</tr>
<tr>
<td>4/10/89</td>
<td>11.54</td>
<td>1:30 pm</td>
</tr>
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<td>5/13/89</td>
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<td>11:30 am</td>
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<td>5/15/89</td>
<td>12.92</td>
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<td>5/25/89</td>
<td>12.31</td>
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<td>5/26/89</td>
<td>12.14</td>
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<td>5/11/89</td>
<td>12.05</td>
<td>9 am (Chart reading)</td>
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NORTH WAIHEE WELLS

Site Description
Pump Test Results

JOHN F. MINK

Submitted to:
Hawaiiana Investment Co., Inc.
October 20, 1981
NORTH WAIHEE WELLS

Summary

The basal aquifer extending southward from Waihee Stream to Waikapu Stream, which is now referred to as the Waiehu aquifer, is being exploited nearly to the limit of its sustainable yield, and an additional significant contribution from it to Central Maui's water supply is not reasonable to expect. To develop more water different sources must be explored, and to this purpose an exploration-production well field was proposed in the region north of Waihee Stream where the aquifer was thought to be either separate or only poorly connected to the aquifer south of the valley. A separate aquifer would provide a new exploitable source of water supply, while proof of connection with the Waiehu aquifer would extend the limits of that aquifer and increase the overall allowable sustainable yield.

Two wells have now been drilled on the north side of Waihee Valley by Roscoe Moss Co. for Hawaiiana Investment Co., Inc. (See Figure 1 for location). Both have been successfully tested and have proved that a substantial, highly transmissive aquifer extends toward Kohakuloa from Waihee. A sustained rate of about 1,700 gpm over 48 hours was pumped from each well with very small drawdown and with no change in
the low initial salinity (15 mg/l chloride). Interpretation of the initial conditions and the pump test results indicate that the aquifer, to be referred to as the North Waihee aquifer, is essentially independent of the Waiehu basal aquifer. If a hydraulic connection exists, it is very weak.

The two wells can be safely fitted with 1,750 gpm pumps. The North Waihee aquifer is large enough to support more production than can be provided by the completed well field. The site of the next well is proposed in the small valley about 1,600 feet northward at a ground elevation of 400 to 500 feet.

North Waihee Aquifer

The region north of Waihee Stream toward Kohakuloa over a width of about two miles is probably underlain by a basal aquifer, perhaps modified by stray dikes, in the Wailuku volcanic series, a highly permeable basaltic formation. Dense trachytic flows of the Honolua series overlie the Wailuku series except in the deeper valleys where erosion has exposed the basaltic rocks. The trachytes do not constitute a principal aquifer and should be avoided if possible because they are difficult to drill through.

The North Waihee wells were located to avoid the trachyte but as a result had to penetrate about 100 feet of
talus and alluvium before striking the basalt. Drilling logs indicate that bedrocks of the Wailuku series was encountered 70 to 100 feet below ground surface. The deep alluvial fill of Waihee Valley was successfully avoided. Dikes were not observed in the vicinity of the well field but are known to occur about 3,500 feet upstream, approximately coincident with the forest reserve line. The rift zone is close enough to the wells that local geohydrologic conditions may be dike-basal rather than strictly basal.

The Wells

The North Waihee wells lie 2,150 feet inland of Kahekili Highway about 250 feet from the stream channel. Ground elevation is 280 to 283 feet. The wells are fitted with 16 inch casing and were drilled to a depth of 105 feet below sea level. The casing is perforated from five to 25 feet below sea level, and the remainder of the bore is open (uncased). The wells are on a line parallel to the stream, 178 feet apart. The most inland well is called North Waihee 1, the other is called North Waihee 2. They are identical in design and nearly so in performance. The first well was completed in March of 1981 and tested in April and June. The second well was completed in July and tested in August.
Step Drawdown

Step drawdown tests were conducted on North Waihee 1 on April 15 and June 3 and on North Waihee 2 on August 3. Initial head was nine to ten feet at each well and initial chloride about 15 mg/l. Behavior of the wells was similar during pumping; in each drawdown was small even at high rates of draft and recovery was instantaneous. The specific capacity of Well 1 was 450 gpm/ft. drawdown at 1,765 gpm, and of Well 2 550 gpm/ft. drawdown at 1,715 gpm. Tables 1 and 2 list the step drawdown results and Figure 2 shows a plot of $s = f(Q)$ for each.
### TABLE 1

**NORTH WAIHEE WELL 1**  
Step Drawdown Pump Test  
April 15, 1981

Ground elev. 283 ft.; Bowls set 309.5 ft.; Airline at 310 ft.; uncased.

<table>
<thead>
<tr>
<th>Time</th>
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<th>P.S.I.</th>
<th>D.D. Ft.</th>
<th>Rate GPM</th>
</tr>
</thead>
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<td>17.5</td>
<td>0</td>
<td>0</td>
</tr>
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<td>2</td>
<td>17.1</td>
<td>0.92</td>
<td>577</td>
</tr>
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<td>08:19</td>
<td>5</td>
<td>17.0</td>
<td>1.16</td>
<td>588</td>
</tr>
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<td>12</td>
<td>17.0</td>
<td>1.16</td>
<td>732</td>
</tr>
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<td>24</td>
<td>17.0</td>
<td>1.16</td>
<td>750</td>
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<td>29</td>
<td>17.0</td>
<td>1.16</td>
<td>769</td>
</tr>
<tr>
<td>08:48</td>
<td>34</td>
<td>17.0</td>
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</tr>
<tr>
<td>08:52</td>
<td>38</td>
<td>16.75</td>
<td>1.73</td>
<td>1071</td>
</tr>
<tr>
<td>09:00</td>
<td>46</td>
<td>16.75</td>
<td>1.73</td>
<td>1071</td>
</tr>
<tr>
<td>09:43</td>
<td>89</td>
<td>16.75</td>
<td>1.73</td>
<td>1071</td>
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<td>91</td>
<td>16.5</td>
<td>2.31</td>
<td>1364</td>
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<td>94</td>
<td>16.5</td>
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<td>1333</td>
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<td>119</td>
<td>16.4</td>
<td>2.54</td>
<td>1333</td>
</tr>
<tr>
<td>10:38</td>
<td>144</td>
<td>16.5</td>
<td>2.31</td>
<td>1333</td>
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<td>145</td>
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<td>149</td>
<td>15.8</td>
<td>3.93</td>
<td>1765</td>
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<td>10:51</td>
<td>157</td>
<td>15.8</td>
<td>3.93</td>
<td>1765</td>
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<td>15.8</td>
<td>3.93</td>
<td>1765</td>
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<td>184</td>
<td>17.5</td>
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## TABLE 2

NORTH WAIHEE WELL 2
Step Drawdown Test
August 3, 1981

Ground elevation 282.21 feet; airline set 304 feet; cased.

<table>
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<tr>
<th>Time</th>
<th>Min.</th>
<th>P.S.I.</th>
<th>D.D. Ft.</th>
<th>Rate GPM</th>
<th>Remarks</th>
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<td>13.75</td>
<td>0</td>
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<td>5</td>
<td>13.25</td>
<td>1.16</td>
<td>375</td>
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<tr>
<td>08:23</td>
<td>8</td>
<td>13.25</td>
<td>1.16</td>
<td>360</td>
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<tr>
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<td>20</td>
<td>13.50</td>
<td>0.58</td>
<td>346</td>
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<tr>
<td>08:38</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td>Increase rate</td>
</tr>
<tr>
<td>08:39</td>
<td>24</td>
<td>13.0</td>
<td>1.73</td>
<td>1,111</td>
<td></td>
</tr>
<tr>
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<td>26</td>
<td></td>
<td></td>
<td>1,071</td>
<td></td>
</tr>
<tr>
<td>08:47</td>
<td>32</td>
<td>13.0</td>
<td>1.73</td>
<td>1,111</td>
<td></td>
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<tr>
<td>09:00</td>
<td>45</td>
<td>13.0</td>
<td>1.73</td>
<td>1,071</td>
<td></td>
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<tr>
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<td>1.73</td>
<td>1,132</td>
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<td>1,500</td>
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<td>1,500</td>
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<td>2.89</td>
<td>1,715</td>
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<td>148</td>
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<td></td>
<td>Stop. Instant recovery.</td>
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</table>
Sustained Pump Test

Both wells were subjected to 48 hours of continuous pumping at a constant rate. The first well was tested before the second was drilled so that drawdown measurements were restricted to the pumping well. While Well 2 was being pumped, Well 1 was available for use as an observation well. Sustained pumping at Well 1 at 1,715 gpm for 48 hours was successful on the first try and the results indicated the aquifer to be highly transmissive. At Well 2, two attempts to sustain a constant rate for 48 hours failed, the first after 30 hours and the other after 26 hours, but the third attempt succeeded at a rate of 1,680 gpm. During all three attempts, drawdown measurements were taken at Well 1, a distance of 178$^{1/2}$ feet away. With these drawdown observation it was possible to compute the transmissivity and specific yield of the aquifer. Drawdown at Well 1 caused by draft at Well 2 and a summary of aquifer characteristics is given in Figure 3. The aquifer was proved to be extensive and highly transmissive, conditions needed for successful exploitation.

Drawdown at pumping wells during sustained tests give well efficiency but generally are not adaptable for calculating aquifer characteristics. The North Waihee wells are very efficient, having specific capacities in excess of
500 gpm/ft. drawdown. During the sustained test at Well 1 drawdown stabilized at 2.54 feet at 1,715 gpm and at Well 2 it stabilized at 3.0 feet at 1,680 gpm.

The drawdowns induced at Well 1 by constant pumping at Well 2 were carefully analyzed to determine, in addition to the aquifer constants, the following:

1. whether the aquifer is effectively closed by impermeable boundaries at short to moderate distances from the well field
2. whether the aquifer has unimpeded hydraulic connection with the Waiehu aquifer
3. whether the aquifer is extensive and effectively unconnected, or poorly connected, with the Waiehu aquifer.

The values for transmissivity and specific yield (effective porosity) were computed by employing the short form (Jacob's method) of the non-equilibrium well hydraulic formula. The short form is permissible because the drawdown data at Well 1 for sustained Test 1 at Well 2 includes early and late measurements that fall on a continuous curve expressed by:

\[ s = \frac{Q W(u)}{4\pi T} \]

in which \( s \) is drawdown, \( Q \) is constant pumping rate, \( T \) is transmissivity, and \( W(u) \) is the solution for the series
that expands the variable, \( u = \frac{r^2S}{4Tt} \), in which

\( r \) is distance between the pumping and observation wells, \( S \) is specific yield, and \( t \) is time. Units are in feet and days. Proof that the \( s = f(u) \) curve is continuous was demonstrated by assuming that the straight line portion of the plot (after about three hours) fit the Jacob criteria, then employing the computed \( S \) and \( T \) values in calculating the ratio, \( s/W(u) \), for the early part of the curve to check its values against the fixed value of \( Q/4\pi T \). The accord is good and thus it is permissible to conclude that all of the drawdowns fall along a continuous curve. Table 3 below summarizes the computations.

**TABLE 3**

Aquifer Characteristics by Jacob Method
Continuity of \( s = f(u) \)

\[(T = 320,000 \text{ ft}^2/d; \ S = .284; \ r = 178 \text{ ft.}; \ Q/4\pi T = .0737)\]

<table>
<thead>
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<th>Time Days</th>
<th>( u )</th>
<th>( W(u) )</th>
<th>( s(\text{ft.}) )</th>
<th>( s/W(u) )</th>
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</thead>
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<td>.11</td>
<td>.0805</td>
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<td>.0717</td>
</tr>
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<td>.0702</td>
</tr>
<tr>
<td>1.0</td>
<td>.0070</td>
<td>4.3874</td>
<td>.32</td>
<td>.0738</td>
</tr>
<tr>
<td>2.0</td>
<td>.0035</td>
<td>5.0770</td>
<td>.38</td>
<td>.0739</td>
</tr>
</tbody>
</table>
The aquifer parameters are comparable to those of the best aquifers in Hawaii. The transmissivity is about 320,000 ft$^2$/day, which implies a hydraulic conductivity of 2,000 to 3,000 ft./day, based on partial penetration of 100 feet in the saturated aquifer, and an average specific yield of at least .20.

Continuity of the early and later drawdown data implies that the aquifer is extensive. On the other hand, hydraulic connection between it and the Waiehu aquifer is, at best, very weak. The nearest test hole in the Waiehu aquifer is A-1, which lies 5,100 feet south of the North Waihee wells. Head in this test hole quickly responds to pumping by the Mokuhau and Waiehu wells in the Waiehu aquifer, and the speed of the response indicates that head changes are transmitted under confined aquifer conditions. No such response showed up on the recorder chart at A-1 as a result of the pumping at North Waihee. If continuous confined conditions existed between North Waihee and A-1, a drawdown of 0.1 feet would have been recorded at A-1 within 70 minutes of the start of each pump test.

For unconfined conditions between the two sites almost ten days would be required for transmittal of 0.1 feet of drawdown. The record at A-1 is too responsive to pumping starts and stops at the Mokuhau and Waiehu wells to unambiguously display any long term effects from North Waihee
if they occurred. Following is a summary of behavior at A-1 during the North Waihee tests.

### TEST 4

#### Head Changes at A-1

<table>
<thead>
<tr>
<th>Date</th>
<th>Time of Test</th>
<th>Type of Test</th>
<th>Rate (GPM)</th>
<th>Head-changes at A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/15/81</td>
<td>08:14 - 11:18</td>
<td>Step</td>
<td>1765</td>
<td>No change.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/3 - 5/81</td>
<td>07:30 - 07:30</td>
<td>Sustained</td>
<td>1715</td>
<td>No significant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well 1</td>
<td></td>
<td>change during test;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>slight gain in head</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/3-6/10; abrupt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>drawdown of 0.1 ft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>on 6/12, probably</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>caused by Mokuhau-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Waiehu pump start</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>up. Gradual increase</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>of .15 ft. by 6/18.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Head at A-1 20.5 to 21.0 ft.</td>
</tr>
<tr>
<td>8/3/81</td>
<td>08:15 - 10:43</td>
<td>Step</td>
<td>1715</td>
<td>No change.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/3 - 4/81</td>
<td>13:00 - 19:00</td>
<td>Sustained</td>
<td>1540</td>
<td>Head at A-1 about 15.5 ft. Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well 2</td>
<td></td>
<td>small head changes,</td>
</tr>
<tr>
<td>8/10 - 11/81</td>
<td>09:00 - 11:00</td>
<td>Sustained</td>
<td>1580</td>
<td>up and down. Same head at end</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well 2</td>
<td></td>
<td>of period as at start.</td>
</tr>
<tr>
<td>8/12 - 14/81</td>
<td>15:00 - 15:00</td>
<td>Sustained</td>
<td>1680</td>
<td></td>
</tr>
</tbody>
</table>

A more telling argument against free hydraulic connection between North Waihee and Waiehu is the large difference in head between A-1 and the new wells. At A-1 the head is about 20 feet when Mokuhau and Waiehu are not pumping,
or 15 to 16 feet when they are, while at North Waihee the head is nine to ten feet. The hydraulic gradient in the Waiehu aquifer is 1 ft./mile, but between A-1 and North Waihee it is five to ten feet per mile, an impossible gradient if free connection prevailed. Whatever connection exists is highly damped by the alluvial fill and weathered rock in Waihee Valley. For planning purposes it is reasonable to consider the North Waihee aquifer to be effectively separate from the Waiehu aquifer.

**Water Quality**

Analyses by Brewer Analytical Laboratories of water collected in April during the pump test at Well 1 and in August at Well 2 showed no change in chloride from 15 mg/l. A more complete analysis for Well 1 is given below.

**TABLE 5**

North Waihee Water Quality

- pH 7.58
- Conductance 272 micromhos
- Alkalinity as CaCO₃ 108 mg/l
- Sodium 9.43 mg/l
- Chloride 14.0 mg/l
- Nitrate-Nitrogen 2.03 mg/l
- Calcium 10.7 mg/l
- Magnesium 8.94 mg/l
The quality of the water is excellent for any purpose. Chloride content did not increase during the tests.

Conclusions and Recommendations

The North Waihee aquifer is extensive and potentially very productive. The aquifer consists of Wailuku basalt with hydraulic conductivity of 2,000 to 3,000 ft./day and specific yield of .20. The aquifer is basal, possibly affected by widespread dikes, with a static head of about ten feet. The two wells drilled to date are very efficient, displaying specific capacities in excess of 500 gpm/ft. drawdown at high pumping rates. Water quality is excellent.

The two wells at North Waihee could safely be outfitted with 1,750 gpm pumps to provide a potential field output of five mgd. Northward toward Kohakuloa more water could be developed from the aquifer. When an additional water supply is planned, a well field could be located in the next valley about 0.3 miles north of Waihee Stream at an elevation of 400 to 500 feet (See Figure 1).

JOHN F. MINK
SUSTAINED PUMP TEST
NORTH WAIHEE WELL FIELD, MAUI
WELL 2 PUMPING : WELL 1 OBSERVATION

<table>
<thead>
<tr>
<th>TEST</th>
<th>DATE</th>
<th>WELL?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>START</td>
<td>END</td>
</tr>
<tr>
<td>1</td>
<td>8/3 (1300)</td>
<td>8/4 (1900)</td>
</tr>
<tr>
<td>2</td>
<td>8/10 (600)</td>
<td>8/11 (1100)</td>
</tr>
<tr>
<td>3</td>
<td>8/12 (1500)</td>
<td>8/14 (1500)</td>
</tr>
</tbody>
</table>
NORTH WAIHEE WELLS 1 AND 2
STEP DRAWDOWN PUMP TEST
APRIL 15, 1981 (WELL NO. 1)
AUGUST 3, 1981 (WELL NO. 2)
Attached are copies of the sustained pump test results. Wells No. 1 & 2, North Waihee, Maui.
<table>
<thead>
<tr>
<th>Time</th>
<th>EVERY HR</th>
<th>GPM</th>
<th>Airline</th>
<th>Water Level (Direct)</th>
</tr>
</thead>
<tbody>
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<td>4:00</td>
<td>3</td>
<td>600</td>
<td>17.5</td>
<td>271</td>
</tr>
<tr>
<td>8:15</td>
<td></td>
<td>1000</td>
<td>17.4</td>
<td>273</td>
</tr>
<tr>
<td>8:30</td>
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<td>1700</td>
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<td>275</td>
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<tr>
<td>9:00</td>
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<td>1780</td>
<td>16.5</td>
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<td>16.5</td>
<td>275</td>
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<tr>
<td>11:30</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
<td>12:30</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
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<td>275</td>
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<td>2:00</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
<td>3:00</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
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<td>16.5</td>
<td>275</td>
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<td>1700</td>
<td>16.5</td>
<td>275</td>
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<tr>
<td>6:00</td>
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<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
<td>7:00</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
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<td>8:00</td>
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<td>1700</td>
<td>16.5</td>
<td>275</td>
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<td>9:00</td>
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</tr>
<tr>
<td>4:00</td>
<td></td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
</tr>
<tr>
<td>Time</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Start</td>
<td>1700</td>
<td>1700</td>
<td>1700</td>
<td>1700</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>16.5</td>
<td>16.5</td>
<td>16.5</td>
<td>16.5</td>
</tr>
<tr>
<td>PM</td>
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<td></td>
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</tr>
<tr>
<td>Int</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
<tr>
<td>Time (h)</td>
<td>GPM</td>
<td>Control</td>
<td>Water Fuel Drain</td>
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<tr>
<td>---------</td>
<td>-----</td>
<td>---------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1700</td>
<td>16.5</td>
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</tr>
<tr>
<td>6</td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
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</tr>
<tr>
<td>7</td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1700</td>
<td>16.5</td>
<td>275</td>
<td></td>
</tr>
</tbody>
</table>

End of Test
November 4, 1981

Mr. Warren A. Suzuki
Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street, Suite 403
Wailuku, Maui, Hawaii 96793

Dear Mr. Suzuki:

Thank you for sending the location maps for Waihee Valley Wells 1 & 2, State Well Numbers 5631-02 and 5631-03.

We appreciate your cooperation very much.

Very truly yours,

ROBERT T. CHUCK
Manager-Chief Engineer

ES:ko
October 19, 1981

Mr. Robert T. Chuck  
Manager - Chief Engineer  
State of Hawaii  
Dept. of Land and Natural Resources  
Division of Water and Land Development  
P. O. Box 373  
Honolulu, Hawaii 96809

Dear Mr. Chuck,

Subject: Request for Location of Waihee Valley Wells 1 & 2

As per your request, we are transmitting herewith:

1. Two (2) copies of map showing location of subject wells.
2) One (1) print location map.

If you need any additional information, please feel free to call me.

Mahalo,

Warren A. Suzuki

cc: Dave Wissmar
October 2, 1981

Mr. Warren S. Unemori
2145 Wells St., Suite 403
Wailuku, Maui, Hawaii 96793

Dear Mr. Unemori:

Request for Location of Waihee Valley Wells 1 & 2

Enclosed herewith is a map of the two Waihee Valley wells project. Please send us a surveyed plot plan of the wells, if available; or accurately mark the location of the wells on the enclosed map and return to our office. Thank you very much for your cooperation.

Very truly yours,

ROBERT T. CHUCK
Manager-Chief Engineer

RTC:MO:ko
Encl.
DATE OF REPORT: Sept. 3, 1981
PERSON FILING REPORT: Loran H. Runnells

A. OWNER: Hawaiian Invest.
WELL NAME: Waihee Valley # 1
ISLAND: Maui

B. GENERAL LOCATION:
Waihee

C. DRILLING COMPANY:
Roscoe Moss Company

D. TYPE OF RIG: 28L
DRILLING COMPLETED: 6-81
DRILLER: R. Bourn

E. ELEVATION, msl: Top of drilling platform: 281.35 ft.
Height of drilling platform above ground surface: 0 ft.

F. HOLE SIZE:
- 20 inch dia. to 320 ft. below drilling platform.
- 16 inch dia. to 387 ft. below drilling platform.

G. CASING INSTALLED:
- 16 in. I.D. x 312 in. wall solid section to 290 ft. below drilling platform.
- 16 in. I.D. x 312 in. wall perforated section to 310 ft. below drilling platform.

H. ANNULUS: Grouted 0 ft. to 160 ft. below drilling platform.
Gravel packed 0 ft. to 72 ft. below drilling platform.

I. PERMANENT PUMP INSTALLATION:
- Pump type, make, serial no.: Capacity: g.p.m.
- Motor type, H.P., voltage, r.p.m.
- Depth of pump intake setting: ft. below which elevation is ft.
- Depth of bottom of airline: ft. below which elevation is ft.

HYDROLOGY
J. INITIAL WATER LEVEL: 271 ft. below drilling platform.
Date of measurement: 6-81

K. INITIAL CHLORIDE: 25 ppm, total depth of well 387 ft. below drilling platform.
Sampling Date: 6-3-81

L. PUMPING TESTS:
Date: June 3, 1981
Reference point (R.P.) used: which elevation is ft.
Start water level: 271 ft. below R. P.
End water level: 271 ft. below R. P.
Depth of well: 387 ft. below R. P.

<table>
<thead>
<tr>
<th>Elapsed Time (hours)</th>
<th>Rate (gpm)</th>
<th>Draw-down (ft.)</th>
<th>Cl- (ppm)</th>
<th>Temp. F</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.40 to 8.15</td>
<td>600</td>
<td>0</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>8.15 to 8.30</td>
<td>1000</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.30 to 4</td>
<td>1700</td>
<td>4</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>48 hour test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SUBSURFACE FORMATION

M. DRILLER'S LOG:

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Rock Description &amp; Remarks</th>
<th>Water Level (ft.)</th>
<th>Depth (ft.)</th>
<th>Rock Description &amp; Remarks</th>
<th>Water Level (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4</td>
<td>hard</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 to 15</td>
<td>loose rock, clay</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 to 52</td>
<td>Mud rock</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 to 92</td>
<td>Puka rock</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92 to 112</td>
<td>Puka hard streak</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>112 to 116</td>
<td>Blue rock</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>116 to 372</td>
<td>Puka hard streak</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>372 to 380</td>
<td>Blue rock</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>380 to 387</td>
<td>Puka, Red</td>
<td></td>
<td>to</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FOR OFFICIAL USE
Latitude 20° 56' 51"W

FOR DRILLER'S USE
INSTRUCTIONS: Send three (3) copies to: Manager-Chief Engineer, Division of Water and Land Development, P. O. Box 373, Honolulu, Hawaii 96809.
REFERENCES: Chapter 178, entitled "Artesian Wells, Generally," HRS, as amended.
GENTLEMEN:

WE ARE SENDING YOU □ Attached □ Under separate cover via ______________ the following items:

□ Shop drawings □ Prints □ Plans □ Samples □ Specifications
□ Copy of letter □ Change order □ ______________

<table>
<thead>
<tr>
<th>COPIES</th>
<th>DATE</th>
<th>NO.</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Drillers Reports for Waihee Valley # 1 and 2</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED as checked below:

□ For approval □ Approved as submitted □ Resubmit____ copies for approval
□ For your use □ Approved as noted □ Submit____ copies for distribution
□ As requested □ Returned for corrections □ Return____ corrected prints
□ For review and comment □ ______________

FOR BIDS DUE ______________ 19____ □ PRINTS RETURNED AFTER LOAN TO US

REMARKS

COPY TO __________________________

SIGNED: __________________________
<table>
<thead>
<tr>
<th>Name</th>
<th>Initial</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert T. Chuck</td>
<td></td>
<td>See Me</td>
</tr>
<tr>
<td>Takeo Fujii</td>
<td></td>
<td>Take action by</td>
</tr>
<tr>
<td>James Yoshimoto</td>
<td></td>
<td>Route to your branch</td>
</tr>
<tr>
<td>Manabu Tagomori</td>
<td>✓</td>
<td>Review &amp; comment</td>
</tr>
<tr>
<td>George Morimoto</td>
<td></td>
<td>Draft reply by</td>
</tr>
<tr>
<td>Hong Fong Chang</td>
<td></td>
<td>For information</td>
</tr>
<tr>
<td>Herbert Morimatsu</td>
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<td>Xerox distributed</td>
</tr>
<tr>
<td>George Miyashiro</td>
<td></td>
<td>Acknowledge receipt</td>
</tr>
<tr>
<td>Harold Sakai</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leslie Asari</td>
<td></td>
<td></td>
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<tr>
<td>Albert Ching</td>
<td></td>
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<tr>
<td>George Matsumoto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daniel Lum</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Paul Matsuo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noboru Kaneshiro</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Edwin Sakoda</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \text{Date: } 23/11/81 \text{ rescinded to } 23/8/81 \text{ action held in } 7/9/82 \text{ with GHI.} \)

\( \text{Contacted } \text{Hon. Suzuki} \text{ will contact } \text{Hon. Suzuki} \text{ and send report data.} \)
December 15, 1980

Mr. Robert Chuck  
State of Hawaii  
Dept. of Water & Land Development  
P. O. Box 373  
Honolulu, HI 96809

Dear Mr. Chuck,

Subject: Well, Waihee, Maui, within Tax Map Key 3-2-01:1

The Department of Water Supply is requesting a copy of an "as-built" sectional drawing of the well, and a copy of the pumping test records. Your assistance and response would be appreciated concerning this matter.

Sincerely,

William S. Haines, Director

cc: Engr. File  
Waihee Well

Enclosure

"By Water All Things Find Life"
TO: Wailuku Sugar Company and its subsidiary, Hawaiiana Investment Co., Inc.  
2180 Main Street, Suite 417  
Wailuku, Maui 96793

Your application, received on October 14, 1980, for a permit to drill two wells within Tax Map Key 3-2-01:1 at Waihee, Maui, is approved subject to the following conditions:

1. That within 30 days after completion of the well, the applicant shall submit a completed Driller's Report, a copy of the Driller's logs, an "as-built" sectional drawing of the well, and a copy of the pumping test records.

2. That the user of the wells shall submit a monthly record of water pumpage and use.

3. That this well drilling permit does not confer or imply any rights regarding the use of water from the wells.

November 26, 1980  
Date of issuance

cc: Maui Dept of Water Supply
TO: Wailuku Sugar Company and its subsidiary, Hawaiiana Investment Co., Inc.
2180 Main Street, Suite 417
Wailuku, Maui 96793

Your application, received on October 14, 1980, for a permit to drill two wells within Tax Map Key 3-2-01:1 at Waihee, Maui, is approved subject to the following conditions:

1. That within 30 days after completion of the well, the applicant shall submit a completed Driller's Report, a copy of the Driller's logs, an "as-built" sectional drawing of the well, and a copy of the pumping test records.

2. That the user of the wells shall submit a monthly record of water pumpage and use.

3. That this well drilling permit does not confer or imply any rights regarding the use of water from the wells.

Susumu Ono, Chairman, Board of Land and Natural Resources

November 26, 1980
Date of issuance

cc: Maui Dept of Water Supply
November 17, 1980

Mr. Robert T. Chuck
Manager-Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
State of Hawaii
P. O. Box 373
Honolulu, Hawaii 96809

Dear Bob:

Subject: Application for Well Drilling Permit by Wailuku Sugar Company, TMK 3-2-01:

In response to your letter of November 3, 1980, the subject application is being coordinated with our office. We have been informed by Hawaiiana Investment Company that if the tests successfully show that the safe yield of the proposed wells is sufficient, the two completed wells will be dedicated to the Department of Water Supply, County of Maui, via a second Central Maui Joint Venture to which Hawaiiana Investment Company will be a party.

Hawaiiana Investment Company is anxious to proceed with the test drilling at the site as soon as possible in order to verify the quantity of water available prior to formulation of the Joint Venture. We are in agreement with this approach.

Sincerely,

William S. Haines, Director
Department of Water Supply
November 3, 1980

Mr. William Haines
Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Maui 96793

Dear Bill:

For your information, transmitted is a copy of the Application for Well Drilling Permit submitted to us by Warren S. Unemori Engineering, Incorporated on behalf of Wailuku Sugar Company and its subsidiary, Hawaiiana Investment Company.

We intend to issue them a permit under the provisions of Regulation 9. of the Department of Land and Natural Resources. Before we issue this permit will you please let us know if this proposal is being coordinated with your office.

Very truly yours,

ROBERT T. CHUCK
Manager-Chief Engineer

Encl.
ES:ai
APPLICATION FOR (check one)

☐ WELL DRILLING PERMIT ☐ WELL MODIFICATION PERMIT

Instructions: Send completed application and attachments to Department of Land and Natural Resources, P.O. Box 373, Honolulu, Hawaii 96809.

Reference: Regulation 9, Dept. of Land & Natural Resources.

Is the well located in a Designated Ground Water Control Area? ☐ Yes ☐ No

If "yes", application must be accompanied by a Water Use and/or Water Supply Permit and a non-refundable filing fee of $100 payable to the Department of Land & Natural Resources. However, if application is for minor modification of well, filing fee may be waived. If "no", no filing fee is required. Filing fee is waived for federal, state, and county government agencies.

1. WELL LOCATION: Island Maui Tax Map Key 3-2-01:1. Attach a plot plan showing well location referenced to established property boundaries.

2. WATER USER: subsidiary, Hawaiiana Investment Co., Inc. Telephone Address Suite 417, 2180 Main Street, Wailuku, Maui, HI. Zip Code 96793

3. PROPOSED DRILLING COMPANY: Water Resources International or Roscoe Moss Company

4. PROPOSED WORK: ☐ Drill new well ☐ Deepen ☐ Redrill ☐ Alter ☐ Seal ☐ Abandon ☐ Install new pump ☐ Replace pump ☐ Modify pump

Fill in the diagram and briefly describe the proposed work (use back of form if necessary):

PROPOSED SECTION OF WELL

Elevation at top of casing 321 ½ ft., msl.

Cement Grout 200 ft.

Hole Dia. 20 in.

Total Depth 420 ft.

Rock Packing 125 ft.

Ground Elev 320 feet, msl.

Solid casing Structural Carbon

Material Length 326 ft.

Diameter 16 in.

Wall thickness 0.3125 in.

Casing: ☐ Perforated Structural Carbon

Material Length 10 in.

Diameter 16 in.

Wall thickness 0.250 in.

Openings 85 sq. in. L.F.

Approximate elev. at filling. Final elev. (msl) by a surveyor licensed by the State must be submitted at start of construction.

5. PROPOSED USE: ☐ Municipal ☐ Military ☐ Agriculture ☐ Industrial ☐ Domestic ☐ Disposal ☐ Other (specify)

6. PROPOSED AMOUNT OF WITHDRAWAL: Check most appropriate box and fill in amount.

☐ Daily 4 million gallons total monthly ________ gallons ☐ Yearly ________ gallons

(2 M.C. or more per well)

7. PROPOSED PUMP OR FLOW CAPACITY: 1500 gpm per well for total of ________ gallons per minute
October 9, 1980

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

Gentlemen:

Re: Regulation 9, Dept. of Land and Natural Resources
Application for Well Drilling Permit

We are submitting herewith a well drilling permit application for our client, Wailuku Sugar Company and its subsidiary, Hawaiiana Investment Co., Inc., in accordance with Regulation 9. Also enclosed for your use are the following:

1. 2000 scale U.S.G.S. map which shows the approximate elevation of the proposed well site.

2. Two copies of tax maps.

3. One print of 100 scale survey map which shows the relative locations of the proposed well site to a known boundary corner.

We believe all the information needed for evaluation have been provided. If not, please call us. We will be working with Hydrologist, John Mink, on this project.

Very truly yours,

[Signature]

Warren S. Unemori

cc: Charles G. Street, Jr.
    John Mink
    Don Cataluna
APPLICATION FOR (check one)

☐ WELL DRILLING PERMIT ☐ WELL MODIFICATION PERMIT

Instructions: Send completed application and attachments to Department of Land and Natural Resources, P.O. Box 373, Honolulu, Hawaii 96809.

Reference: Regulation 9, Dept. of Land & Natural Resources.

Is the well located in a Designated Ground Water Control Area? Yes ☐ No ☑

If "yes", application must be accompanied by a Water Use and/or Water Supply Permit and a non-refundable filing fee of $100 payable to the Department of Land & Natural Resources. However, if application is for minor modification of well, filing fee may be waived. If "no", no filing fee is required. Filing fee is waived for federal, state, and county government agencies.

1. WELL LOCATION: Island Maui Tax Map Key 3-2-01:1. Attach a plot plan showing well location referenced to established property boundaries.

2. WATER USER Subsidiary, Hawaiiana Investment Co., Inc. Telephone __________ Address Suite 417, 2180 Main Street, Wailuku, Maui, HI. Zip Code 96793

3. PROPOSED DRILLING COMPANY: Water Resources International or Roscoe Moss Company

4. PROPOSED WORK: ☑ Drill new well ☐ Deepen ☐ Redrill ☐ Alter ☐ Seal ☐ Abandon ☐ Install new pump ☐ Replace pump ☐ Modify pump

Fill in the diagram and briefly describe the proposed work (use back of form if necessary):

---

PROPOSED SECTION OF WELL

- Elevation at top of casing 321' ft., msl.
- Ground Elev. 320'+- ft., msl.
- Solid casing: Material Structural Carbon Steel
  - Length 326 ft.
  - Diameter 16 in.
  - Wall thickness 0.3125 in.
- Casing: Perforated Structural Carbon Steel
  - Length 20 ft.
  - Diameter 16 in.
  - Wall thickness 0.250 in.
  - Openings 85 sq.in. L.F.
- Open Hole:
  - Length 75 ft.
  - Diameter 15 in.

* Approximate elev. at filing. Final elev. (msl) by a surveyor licensed by the State must be submitted at start of construction.

5. PROPOSED USE: ☐ Municipal ☐ Military ☑ Agriculture ☐ Industrial ☐ Domestic ☐ Disposal ☐ Other (specify) _________

6. PROPOSED AMOUNT OF WITHDRAWAL: Check most appropriate box and fill in amount.

☐ Daily 4 million gallons total ☐ Monthly gallons ☐ Yearly gallons

(2 M.G. or more per well)

7. PROPOSED PUMP OR FLOW CAPACITY: 1500 gpm per well for total of 3,000 gallons per minute
Mr. Jeffrey Eng, Director  
County of Maui  
Department of Water Supply  
200 South High Street  
Wailuku, HI 96793

Dear Mr. Eng:

Certificate of Pump Installation Completion for North Waihee Well I  
Well No. 5631-02 (TMK (2) 3-2-001:004)

We are pleased to inform you that the Pump Installation work permitted for the North Waihee Well I Well (Well No. 5631-02) is complete and acceptable. This certificate of pump installation completion allows you to continue pumping your well for reasonable & beneficial water use.

To protect Hawaii’s natural ground water resources for the benefit of all, the following requirements apply to the use of your well:

1. If the well is not in use it must be properly capped.

2. If the well is to be abandoned then the landowner must cause a licensed contractor to apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

3. In the event that the well operator and/or landowner changes, the Commission shall be notified prior to the change.

4. In the event the benchmark in the concrete base of the well is altered in any way, an updated version of the Well Elevation page of the Well Completion Report Part I shall be submitted to the Commission. If a licensed surveyor had estimated the original benchmark elevation then a licensed surveyor must establish the new benchmark elevation. The Well Elevation portion of the Well Completion Report Part I can be obtained by contacting Commission staff or at www.hawaii.gov/dlnr/cwrm/forms.htm.

5. Your approved pump has a capacity of **1050** gpm at a head of **420** ft. In the future, pump replacements of equal or lesser capacity will not require an additional permit from the Commission, but will require the submission of a Well Completion Report Part II by the licensed pump installer. If the pump replacement is greater than the existing pump, you will need to apply for a new pump installation permit.
6. The landowner shall cause the well operator to maintain the installed meter or other appropriate means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly basis, on forms provided by the Chairperson (attached), in accordance with §13-168-7, HAR. Blank water use report forms are also available at www.hawaii.gov/dlnr/cwrm/resources_permits.htm.

7. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. The authorization to drill a well and/or install a pump shall not constitute a determination of correlative water rights. The landowner and well operator are notified that the quantity of water taken from the well and/or the pump capacity could be reduced by the Commission in the future.

Because groundwater in Hawaii is a public trust, and adverse effects at one well may affect other water resources, any violation of the above conditions, or any other provision of the Hawaii Administrative Rules, may be subject to fines of up to $5,000/day. The Commission needs your help and asks that you do your part in utilizing this shared resource. We prefer to work with you in meeting the goal of protecting our ground water resources together.

If you have any questions, please contact Charley Ice of the Commission staff at [redacted] or toll-free at [redacted] (Maui), extension 70218.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

cc: Mel's Water Works
Edward Lusk
December 22, 2008

Mr. Mel Lima
Mel's Water Works
95-646 Lawena Street
Mililani, HI 96789

Dear Mr. Lima:

Well Completion Report Part II for Well No. 5631-02

We received your Well Completion Report Part II for the North Waihee Well 1 (Well No. 5631-02) on September 5, 2008 and acknowledge that it is complete.

This completes your obligations under the pump installation permit. A certificate of pump installation completion will be issued to the well operator/landowner and you will receive a copy. The certificate transfers responsibility of all aspects of well usage and maintenance from you to the well operator/landowner.

If you have any questions, please contact Charley Ice of the Commission staff at

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

Cc: Edward Lusk
Maui Department of Water Supply
**Pump Replacement for Well No. 5631-02** (regulation/survey route)

1. **Previous Pump Tests Check**
   - Charley/Denise/Ryan (initial)
   - Current Well Transmissivity in database? Yes
   - Current Well Specific Capacity in database? Yes

   For a "No" above, is there any previous Pump Test Data in the file? Yes No (circle one)

   IF DATA EXISTS, THEN GO TO 2. IF NO DATA EXISTS, THEN GO TO 3.

2. **Pump Tests Analysis**
   - Diane England (initial) take action based on above analysis
     - Step-Drawdown Test:
       - followed WCPI Stds
       - analysis attached
       - \( \square < 70 \text{ gpm} \) no test required
     - Aquifer Pump Test:
       - followed WCPI Stds
       - T & S analysis attached
       - proposed pump cap o.k.
       - \( \square < 51 \text{ gpm} \) no test required
     - Potential Well Interference
     - Potential Stream Impacts:
     - Additional Testing or Data Required
     - Pump Test Comments Attached

3. **Pump Installation Check**
   - Mitch Ohye (initial)
   - data complete? Yes No
   - elevation benchmark changed? Yes No
   - well database updated? Yes No

4. Charley/Denise/Ryan (initial) take action based on above analysis

   ATTACHMENTS FOR ACCEPTANCE:
   1. WCR2 ACCEPTANCE LETTER
   2. PUMP INST. COMPLETION CERTIFICATE
   3. METER INSTILL. REPORT (IF NECESSARY)
   4. WUR FORM (if necessary)
   5. USGS MAP UPDATED
   6. PARCEL CHECK
   7. WELL DATABASE INPUT CHECK
   8. PUMP TEST WORKSHEET
   9. PUMP AS-BUILT CHECK PRINT

   To be sent to driller
   To be sent to landowner/operator
   Staff internal checks

5. Roy (initial) check(Entered PICC accept date into database)
6. Susan Haagbin (initial) signature (initial) finalize
7. Ken (initial) signature
8. Charley/Denise/Ryan File
Assessed Values reflect tax year 2008.

Search criteria: TMK Taxkey 2-3-2-1-4

### PUBLIC RECORD DATA

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This information has been supplied by third parties and has not been independently verified by Hawaii Information Service and is, therefore, not guaranteed.

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Edward H. Lusk

tax bill address: 632 Mealahi St, Wailuku 96793
Hi Charley,

See attachment.

Mel wells 010.jpg  Test Curve NORTH WAIHEE WELL #1.pdf  North Waihee Well Completion.pdf  wells 006.jpg  wells 007.jpg
wells 008.jpg  wells 009.jpg
State of Hawaii  
COMMISSION ON WATER RESOURCE MANAGEMENT  
Department of Land and Natural Resources  
WELL COMPLETION REPORT - PART II  
Pump Installation

**Instrudlont:** Please print in ink or type and send completed report (with attachments, if applicable) to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. The Commission may not accept incomplete reports. This form shall be submitted within 60 days of the completion of work. For assistance, please consult the Hawaii Well Construction and Pump Installation Standards or call the Regulation Branch at 587-9225. For updates to this form or additional information, please visit our website at http://www.hawaii.gov/dlnr/cwm/.

### 1. State Well No.: 5631-02  
**Well Name:** North Waihee  
**Island:** Maui

### 2. Address: County of Maui  
**Tax Map Key:** (2) 3-2-004-004


### 4. Date Pump Installed: August 13, 2008

### 5. PERMANENT PUMP INFORMATION

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<td>Rated Capacity</td>
<td>1650 gpm at head of 420 ft</td>
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<tr>
<td>Motor Type, H.P., Voltage, rpm</td>
<td>Hitachi, 150 HP, 460 V, 1800</td>
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</table>

- [ ] Deep Well Turbine  
- [ ] Rotary  
- [x] Submersible  
- [ ] Rotary-Displacement  
- [ ] Reciprocating  
- [ ] Centrifugal  
- [ ] Rotary-Gear  
- [ ] Impulse

### 6. Method of flow measurement:

- [ ] Flowmeter w/ totalizer  
- [x] Other, explain and attach schematic  

**Manufacturer:** Ventura  
**Model No.:** 9x23  
**Size:** 12

### 7. Fill in the as-built section on the other side of this sheet.

### 8. Attach the rating curve for the installed pump.

### 9. Attach photograph of well clearly showing the benchmark on the concrete pad, the well head, and the method of flow measurement.

### 10. Well Owner  
**Company:** County of Maui  
**Contact:** Jeffrey Kaufer

**Address:** 200 S High Street  
**Phone:** 808-276-7814  
**Fax:** 808-276-7951

### 11. Land Owner  
**Company:**  
**Contact:**  
**Address:**  
**Phone:**  
**Fax:**

### 12. Remarks


### Pump Installation Contractor (print):  
**Hawaiian Water Works C-57/C-57A/A Lic No: 518784**

**Signature:**  
**Date:** August 13, 2008

WCRM Form 022/07 Page 1/1
Global Pumps & Equipment™
Engineered Products Division

Fluid In Motion

10-5031-02 NORTH WAIHEE 1

Customer: MEL'S WATER WORKS HAWK
PO: No Project: NORTH WAIHEE WELL #1 Order #: 69418
Date: 7/17/2008 11:01:19AM

Pump Model: 12CMC Pump Type: SUBMERSIBLE
Pump Number: 69418 Stages: 8
Upper Impeller Dia: 8.4375
Upper Impeller Qty: 8
Lower Impeller Dia: 0.0000
Lower Impeller Qty: 0

Design Flow (GPM): 1065.0 Design Head (Ft): 420.0
Efficiency (%): 85.1 Motor: HITACHI
Motor SN: DATE B08 Motor HP: 150.0

Specific Gravity: 1.0 Viscosity (SSU): 1.1
Water Temp (F): 78.0 Test Line: 6"
Upper Bowl Material: C.I. Lower Bowl Material: N/A
Upper Imp Material: SI-BRZ Lower Imp Material: N/A

Test Data

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*Motor HP from manufacturer’s curve minus losses.
**Design Point.

Converted Data

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NPSH Typical Catalog Data

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Certified Test
By: [Signature]
Title: Chief Engineer
Date: 7-17-08
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<td>0.36</td>
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<td>0.20</td>
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<td>150</td>
<td>240</td>
<td>280</td>
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</table>
Revised Measuring-Point Elevations for Selected Wells in the Waihee and Iao Aquifer Areas on the Island of Maui

The USGS has been working with the National Geodetic Survey (NGS) to update benchmark and well measuring-point elevations in central Maui as part of a ground-water availability study with the Maui Department of Water Supply. The purpose of this effort is to ensure that water-level monitoring wells used in this study are tied to a common and accurate vertical datum.

Benchmark and reference-mark elevations were determined by the NGS using differential GPS (Global Positioning System) methods during September 2-4, and November 18-20, 2003.

Well measuring-point elevations were determined by the USGS using vertical leveling surveys from NGS benchmarks and USGS reference marks during September 22-26, and December 15-19, 2003.

Measuring-point elevations for selected wells in the Waihee and Iao aquifer areas are provided below. The difference between the previously reported and the revised measuring-point elevation for each well is also provided. Leveling notes and photographs of the measuring points are available in well folders maintained by the USGS Water Resources office in Honolulu.

It is important to recognize that the revised well measuring-point elevations will result in a modification of the absolute water levels (referenced to mean sea level), but not the relative change in water levels measured over time (trend). Historical water levels measured in these wells may be revised pending further research into possible causes for the differences between the previously reported and the revised well measuring-point elevations. Future water-level measurements will be based on the revised well measuring-point elevations.

Related links:
Ground-Water Availability in Central Maui - Project description
Recent Hydrologic Conditions, Iao Aquifer area, Maui - Updated every three months

<table>
<thead>
<tr>
<th>Well name</th>
<th>Well no.</th>
<th>Revised¹</th>
<th>Previous</th>
<th>Difference ²</th>
<th>Notes regarding previous well measuring-point elevations ³</th>
</tr>
</thead>
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<tr>
<td>Kupaa 1</td>
<td>5731-03</td>
<td>638.77</td>
<td>639.37</td>
<td>-.60</td>
<td>C. Takumi Engineering report (1/31/00) provides MP elevation of 639.37 ft for top of casing, based on leveling from a benchmark elevation of 631.87 ft located about 200 ft from well (Exhibit A-1, Mink &amp; Yuen, 6/21/99). Driller's well-completion report provides MP elevation of 638.10 ft for top of casing (5/20/99). No record of MP survey notes and initial benchmark. Wailani Drilling and Ed Valera (surveyor) combined trigonometric leveling (using a total station and vertical angles) from Tanaka's work and a carpenter's level to get the initial height of casing.</td>
</tr>
<tr>
<td>Location</td>
<td>Survey Numbers</td>
<td>Top Elevation (ft)</td>
<td>MP Elevation (ft)</td>
<td>Difference (ft)</td>
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<tr>
<td>Kanoa TH</td>
<td>5731-05</td>
<td>303.56</td>
<td>305.22</td>
<td>-1.66</td>
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<tr>
<td>Kanoa 1</td>
<td>5731-02</td>
<td>306.14</td>
<td></td>
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<tr>
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<td>Kanoa 2</td>
<td>5731-04</td>
<td>280.48</td>
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<tr>
<td>North Waihee 1</td>
<td>5631-02</td>
<td>283.76</td>
<td>285.23</td>
<td>-1.47</td>
<td></td>
</tr>
<tr>
<td>North Waihee 2</td>
<td>5631-03</td>
<td>283.62</td>
<td></td>
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</tbody>
</table>

USGS reports MP elevation of 305.22 ft for top of casing, based on leveling from nearby RM - 1-inch pipe (1/22/03). RM elevation of 304.50 ft provided by C. Takumi Engineering. No record of RM survey notes and initial benchmark. K. Tanaka set the 1/2-in. pipe using trigonometric leveling (using a total station and vertical angles).

Driller's well-completion report has elevation of 309.15 ft for top of pump base plate (5/29/99). No record of MP survey or initial benchmark.

Driller's well-completion report has MP elevation 281.83 ft for top of sounding tube (6/7/00). C. Takumi Engineering report (Aug. 2000) has 281.38 ft for top of sounding tube (Exhibit A, Mink & Yuen, 7/12/00).

USGS reports MP elevation of 285.23 ft for top of measuring tube, based on leveling from nearby RM - 3/4 inch pipe (8/12/97). RM elevation of 266.63 ft given by W.S. Unemori Engineering. No record of RM survey notes and initial benchmark in well folder, however, Unemori confirms this elevation from their notes. From information provided by Reed Ariyoshi of W.S. Unemori, and Wendy Taomoto, MDWS, the best estimate of the difference between the top of the casing prior to pump installation and the measuring tube after installation is 1.01 ft (old casing higher in elevation). As a result, the old mp for data prior to August 1997, 284.78 ft, is very close to the new measuring tube elevation plus 1.01 ft (284.77 ft).

Height of measuring point modified after pump installation. Measuring tube modified twice since pump installation in 1997 and leveling on 8/12/97. USGS reports MP elevation of 284.39 ft for top of measuring tube on 8/12/97. USGS reports MP elevation of 284.33 ft for top of measuring tube on 3/30/99 after first modification, based on measuring up from base plate elevation of 284.11 ft. Previous leveling on 8/12/97 and 3/30/99 are based on RM (3/4-inch pipe) elevation of 266.63 ft provided by W.S. Unemori Engineering. No record of RM survey notes and initial benchmark in well folder, however, Unemori confirms this elevation.
<table>
<thead>
<tr>
<th>Well Name</th>
<th>Permit</th>
<th>Surveyed</th>
<th>Elevation</th>
<th>Surveyed to</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waihee TH D</td>
<td>5430-04</td>
<td>380.95</td>
<td>380.66</td>
<td>0.29</td>
<td>USGS reports MP elevation of 380.66 ft for top of 1.75-inch PVC casing, based on leveling from nearby RM - &quot;X&quot; chiseled in concrete at entrance to TH D shelter (8/23/85). RM elevation of 380.01 ft provided by Dan Lum, DOWALD (8/29/83). No record of RM survey notes and initial benchmark.</td>
</tr>
<tr>
<td>Waiheu Deep</td>
<td>5430-05</td>
<td>381.16</td>
<td>380.84</td>
<td>0.32</td>
<td>USGS reports MP elevation of 380.84 ft for top of 10-inch casing, based on leveling from RM - &quot;X&quot; chiseled in concrete at entrance to TH D shelter (8/23/85). RM elevation of 380.01 ft provided by Dan Lum, DOWALD (8/29/83). No record of RM survey notes and initial benchmark.</td>
</tr>
<tr>
<td>Waiheu TH B</td>
<td>5431-01</td>
<td>492.15</td>
<td>492.51</td>
<td>--</td>
<td>USGS reports MP elevation of 492.51 ft for top of 1.5-inch PVC casing (9/24/75). However, later field notes show top of casing as 491.79, and top of surrounding wooden box as 492.51. No record of MP survey notes and initial benchmark. Probably surveyed from State of Hawaii benchmark U-6: 250.37 ft (1974). Driller's report provides elevation of 493.97 for top of drilling platform. Well has been measured from top of wooden box since USGS started measuring well in July, 1982. Well modified 3/31/04 by USGS, adding 0.74 ft to top of PVC casing. Revised MP (top of PVC casing) combines changes due to recent surveying and modification. Elevation of top of box was lowered by 0.42 ft from results of 2003/2004 surveying.</td>
</tr>
<tr>
<td>Waiheu Heights 2</td>
<td>5430-02</td>
<td>338.05</td>
<td>--</td>
<td>--</td>
<td>Notes in well folder show pump refurbishment in 1998. Measurement tube likely installed at that time. No prior leveling notes or references in USGS well folder.</td>
</tr>
<tr>
<td>Well Name</td>
<td>MP Code</td>
<td>MP Elevation</td>
<td>Top Casing Elevation</td>
<td>Top Plate Elevation</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------</td>
<td>---------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mokuhau 1 (Pump 2) 4</td>
<td>5330-09</td>
<td>353.37</td>
<td>353.79</td>
<td>-0.42</td>
<td>USGS reports MP elevation of 353.79 ft (12/1/99). No record of MP survey and initial benchmark. Dan Lum (DOWALD) provides MP elevation of 353.57 ft for access port at base of pump (1/17/72). H.A.R. Austin Engineering provides elevation of 353.17 ft for top of casing (6/4/53).</td>
</tr>
<tr>
<td>Wailuku Shaft 33</td>
<td>5330-05</td>
<td>32.33</td>
<td>32.17</td>
<td>0.16</td>
<td>USGS reports MP elevation of 32.17 ft for top of casing, based on leveling from Wailuku Courthouse NGS benchmark elevation of 331.066 ft (4/17/97).</td>
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<tr>
<td>Waikapu 1</td>
<td>5130-01</td>
<td>551.04</td>
<td>551.33</td>
<td>-0.29</td>
<td>USGS reports MP elevation of 551.33 ft for top of 6-inch coupling, based on leveling from RM - 0.5 inch pipe located on the east side of the concrete foundation (4/11/75). RM elevation of 550.61 ft provided by Norman Saito Engineering, based on leveling from Wailuku Courthouse NGS benchmark (12/74). Dan Lum (DOWALD) provides elevation of 552.03 ft for top of 8-inch casing, and 551.15 ft for top of conductor pipe (5/14/74).</td>
</tr>
<tr>
<td>Waikapu 2</td>
<td>5130-02</td>
<td>518.96</td>
<td>519.33</td>
<td>-0.37</td>
<td>USGS reports MP elevation of 519.33 ft for top of casing, based on leveling from Waikapu 1 well MP elevation of 551.33 ft (6/21/83). DOWALD as-built drawing provides elevation of 519.47 ft for top of 20-inch casing.</td>
</tr>
<tr>
<td>DWS Waikapu Mauka</td>
<td>5131-01</td>
<td>764.87</td>
<td>--</td>
<td>--</td>
<td>USGS surveying on 12/29/03 to top of 6-inch threaded coupling welded to plate that is welded to the top of the 18-inch casing (highest point after removing plug). CWRM well completion report and Water Resources International as-built drawing provides elevation of 764.7 ft for top plate welded to 18-inch casing.</td>
</tr>
</tbody>
</table>

1 Revised well measuring-point elevations were determined by the USGS using vertical leveling from National Geodetic Survey benchmarks and reference marks in December 2003. NGS benchmark and reference mark elevations provided by NGS on 1/20/04. Levelling notes and photographs of the measuring points are available in well folders maintained by the USGS Hawaii District Office.

2 Difference calculated by subtracting the previous from the revised well measuring-point elevation.

3 All information contained in USGS well folder.

4 Maui Department of Water Supply refers to this well as Mokuhau Pump 2 (Well 502) whereas Commission on Water Resource Management well index refers to this well as Mokuhau 1.
## WCR 2 Check for Well No. 5631-02
(survey to regulation memo)

### 1. Pump Tests Check (special condition of PIP? Yes/No)

**Glenn Bauer** (initial if yes)

<table>
<thead>
<tr>
<th>Step-Drawdown Test</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>acceptable</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>followed WCPI Stds</td>
<td>☐</td>
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<td></td>
</tr>
<tr>
<td>analysis attached</td>
<td>☐</td>
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<tr>
<td>proposed pump cap o.k.</td>
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**Analysis was done by Mike several years ago and it is in the Well File**

**Glenn Bauer** (initial if yes)

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<thead>
<tr>
<th>Aquifer Pump Test</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
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<tbody>
<tr>
<td>acceptable</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>followed WCPI Stds</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>T &amp; S analysis attached</td>
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</table>

<table>
<thead>
<tr>
<th>Well Interference</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
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<tr>
<td>estimated Steady-State</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>drawdown at 1-mile radius is _________ ft.</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>analysis attached</td>
<td>☐</td>
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</table>

<table>
<thead>
<tr>
<th>Stream Surface Water Impacted</th>
<th>Yes</th>
<th>No</th>
<th>If yes, identify most probable stream</th>
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</tbody>
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### 2. Pump Installation Check

**Mitch Ohye** (initial)

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<tr>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>data complete</td>
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<td>☐</td>
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<tr>
<td>followed WCPI Stds</td>
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<td>☐</td>
</tr>
<tr>
<td>wellphys.dbf updated</td>
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<td>☐</td>
</tr>
<tr>
<td>welaplic.dbf updated</td>
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<td>☐</td>
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</tbody>
</table>
### WCR 2 Check for Well No. 5631-03

**Survey to Regulation Memo**

1. **Pump Tests Check (special condition of PIP? Yes/No)**
   - Glenn Bauer *(initial if yes)*
   - Yes  No  If no, describe deficiency

   **Step-Drawdown Test:**
   - acceptable □ □
   - followed WCPI Stds □ □
   - analysis attached □ □
   - proposed pump cap OK □ □

   **Aquifer Pump Test:**
   - acceptable □ □
   - followed WCPI Stds □ □
   - T & S analysis attached □ □

   **Well Interference:**
   - estimated Steady-State drawdown at 1-mile radius is ________ ft.
   - analysis attached □ □

   **Stream Surface Water Impacted:** □ □ ← if yes, identify most probable stream

2. **Pump Installation Check**
   - Mitch Ohye *(initial)*
   - Yes  No  If no, describe deficiency

   - data complete □ □
   - followed WCPI Stds □ □
   - wellphys.dbf updated □ □
   - welaplic.dbf updated □ □
August 11, 1998

Honorable Timothy E. Johns
Deputy Director
State of Hawaii
Department of Land & Natural Resources
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: North Waihee Wells 1 and 2
State Well Nos. 5631-02 and 5631-03
North Waihee Water Source Project

Transmitting, for your use, are the completed pump installation reports and as-built drawings.

Should you have any questions, please contact Andy Pascua, Acting Plant Maintenance Superintendent, (808) [redacted]

Sincerely,

David Craddick, Director

"By Water All Things Find Life"
State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT
3/20/96 WCR Form

(Well Construction) 

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 70225.

1. State Well No.: 5631-02  
   Well Name: N. Waihee Water Source  
   Island: Maui

2. Location/Address: North Waihee Well No. 1  
   Tax Map Key: 3-2-0104

<table>
<thead>
<tr>
<th>PART I</th>
<th>WELL CONSTRUCTION REPORT</th>
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<tr>
<td>3. Drilling Company:</td>
<td></td>
</tr>
<tr>
<td>4. Name of driller who performed work:</td>
<td></td>
</tr>
<tr>
<td>5. Type of rig/construction:</td>
<td></td>
</tr>
<tr>
<td>6. Date(s) Well Construction and pump tests (if any) completed:</td>
<td></td>
</tr>
</tbody>
</table>
| 7. GROUND ELEVATION (referenced to mean sea level, msl): | ft.  
   Well Bench Mark (description/location):  
   Elevation(msl): | ft.  
| 8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)  
   Depths (ft.) Rock Description, Water Level, Dates, etc.  
   Depths (ft.) Rock Description, Water Level, Dates, etc.  
   | (if more space is needed, continue on back)  
| 9. Total depth of well below ground: | ft.  
| 10. Hole size:  
   inch dia. from | ft. to | ft. below ground  
   inch dia. from | ft. to | ft. below ground  
   inch dia. from | ft. to | ft. below ground  
| 11. Casing installed:  
   in. I.D. x in. wall solid section to | ft. below ground  
   in. I.D. x in. wall perforated section to | ft. below ground  
   Casing Material/Slot Size: |  
| 12. Annulus:  
   Grouted from | ft. below ground to | ft. below ground  
   Gravel packed from | ft. below ground to | ft. below ground  
| 13. Initial water level: | ft. below ground.  
   Date and time of measurement: |  
| 14. Initial chloride: | ppm  
   Date and time of sampling: |  
| 15. Initial temperature: | °F  
   Date and time of measurement: |  
| 16. PUMPING TESTS: Reference Point (R.P.) used: | which elevation is | ft.  
   (1) Step-Drawdown Test Date  
   Start water level | ft. below R.P.  
   End water level | ft. below R.P.  
   (2) Long-term Aquifer Test Date  
   Start water level | ft. below R.P.  
   End water level | ft. below R.P.  
| 17. Aquifer Pump Test Procedures data & graphs (1/96 LTAT Form) attached? _ Yes _ No  
| 18. As-built drawings attached attached? _ Yes _ No  
| 19. Other remarks/comments: | (On back of this form)  

Well Drilling Contractor (print) C-57 Lic. No.  
Signature  
Date  
Surveyor (print) Lic. No.  
Signature  
Date  
Applicant (print)  
Signature  
Date
SUBMERSIBLE OUTLINE
STANDARD WELL SEAL — JUNCTION BOX CONSTRUCTION

DATE ____________________

NAME OF CUSTOMER: COUNTY OF MAUI

DEPARTMENT OF WATER SUPPLY

PROPOSITION NO.: FOR NO. 95-10

ORDER NO. 58-910-1

PURCHASE ORDER NO. ____________________

NO. OF UNITS: ONE

SURFACE PLATE: 27 1/2" O.D. 1 3/4" TH'K

8-7/8" FOUNDATION HOLES, STR. & ON 25" B.C

8" — 8 T.P.I. — 3/4" TAPER T&C ST'D. COLUMN

10" - 150# F.F. (STEEL) DISCHARGE FLANGE

BOWL ASSEMBLY: 12 MQL / 7 STGS.

150 H.P. 1751 RPM B.J. SUBM. MOTOR TYPE M

10" SIZE 3 PH. 60 CYCLE 480 VOLT

1050 GPM 420 FT TDH

CABLE SIZE: 400 MCM VOLTAGE: 460 VOLTAGE: LENGTH: 300 FT

REMARKS: WELL PUMP NO. 1

CABLE: 400 MCM

COLUMN PIPE: 8" SCH. 40 GALVANIZED

TRANSVERSE PIPE: SCH 80 PVC, 1"

"NORTH WAIAKE WATER SOURCE"

PHASE II — DEVELOPMENT OF WELLS 1 & 2

WELL NO. 5631-02

DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED

JOB NO. PROP. NO. ____________

CERTIFIED ____________ DATE ____________

WELL I.D. 16"
Briefly describe the proposed work:

Subject wells were drilled and tested between March and August 1981.

PROPOSED SECTION OF WELL

- Elevation at top of casing: 284 ft., msl.
- Ground Elevation: 283 ft., msl.
- Cement Grout: 200 ft.
- Hole Diameter: 20 in.
- Total Depth: 363 ft.
- Rock Packing: 108 ft.
- Solid Casing: ASTM Designation A-242 USS Cor-ten, Kaiser
  - Material: Steel Kaisaloy
  - Length: 289 ft.
  - Diameter: 16 in.
  - Wall thickness: 0.3125 in.
- Casing: ☑ Perforated ☐ Screen
  - Material: Steel Kaisaloy
  - Length: 20 ft.
  - Diameter: 16 in.
  - Wall thickness: 0.25 in.
  - Openings: 100 sq. in./L.F.
- Open Hole:
  - Length: 79 ft.
  - Diameter: 15 in.

EXHIBIT 2
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WELL COMPLETION REPORT

Part I. WELL CONSTRUCTION REPORT

3. Drilling Company: ____________________________

4. Name of driller who performed work: ____________________________

5. Type of rig/construction: ____________________________

6. Date(s) Well Construction and pump tests (if any) completed: ____________________________

7. GROUND ELEVATION (referenced to mean sea level, msl): _________ ft.
   Well Bench Mark (description/location): ____________________________
   Elevation(msl): _________ ft.

8. DRILLER’S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.) Rock Description, Water Level, Dates, etc. Depths (ft.) Rock Description, Water Level, Dates, etc.
   _______ to _______ _______ to _______
   _______ to _______ _______ to _______
   _______ to _______ _______ to _______
   (If more space is needed, continue on back)

9. Total depth of well below ground: _________ ft.

10. Hole size: _________ inch dia. from _________ ft. to _________ ft. below ground
    _________ inch dia. from _________ ft. to _________ ft. below ground
    _________ inch dia. from _________ ft. to _________ ft. below ground

11. Casing installed: _________ in. I.D. x _________ in. wall solid section to _________ ft. below ground
    _________ in. I.D. x _________ in. wall perforated section to _________ ft. below ground
    Casing Material/Slot Size: ____________________________

12. Annulus: Grouted from _________ ft. below ground to _________ ft. below ground
    Gravel packed from _________ ft. below ground to _________ ft. below ground

13. Initial water level: _________ ft. below ground. Date and time of measurement: ____________________________

14. Initial chloride: _________ ppm Date and time of sampling: ____________________________

15. Initial temperature: _________ °F Date and time of measurement: ____________________________

16. PUMPING TESTS: Reference Point (R.P.) used: ____________________________, which elevation is _________ ft.
    (1) Step-Drawdown Test Date _________ (2) Long-term Aquifer Test Date _________
    Start water level _________ ft. below R.P. Start water level _________ ft. below R.P.
    End water level _________ ft. below R.P. End water level _________ ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? ______ Yes ______ No

18. As-built drawings attached? ______ Yes ______ No

19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) ____________________________ C-57 Lic. No. ____________________________
Signature ____________________________ Date ____________________________

Surveyor (print) ____________________________ Lic. No. ____________________________
Signature ____________________________ Date ____________________________

Applicant (print) ____________________________
Signature ____________________________ Date ____________________________
SUBMERSIBLE OUTLINE
STANDARD WELL SEAL — JUNCTION BOX CONSTRUCTION

DATE ______________________
NAME OF CUSTOMER
COUNTY OF MAUI
DEPARTMENT OF WATER SUPPLY

PROPOSITION NO. Job No. 95-10
ORDER NO. 58-960
PURCHASE ORDER NO. ______________________

NO. OF UNITS ONE

SURFACE PLATE
21 3/4 O.D. 13/4 TH'K

8—7/8" FOUNDATION HOLES. STR. @ ON 25" B.C
8" " 8 T.P.I. —3/4" TAPER T&C ST'D. COLUMN
10 " 250# F.F. (STEEL) DISCHARGE FLANGE

BOWL ASSEMBLY 12MQL / 7 STGS.

150 H.P. 1751 RPM B.J. SUBM. MOTOR TYPE M

12" SIZE 3 PH. 60 CYCLE 460 VOLT
1050 GPM 420 FT. TDH

CABLE SIZE 400 MCM VOLTAGE 460 LENGTH 310 FT.

REMARKS: WELL PUMP NO. 2

CABLE: 400 MCM
COLUMN PIPE: 8" SCH. 40 GALVANIZED
TRANS DUCER PIPE: SCH. 80 P.V.C. 1"
"NORTH WAIMEA WATER SOURCE"

PHASE II-DEVELOPMENT OF WELLS 1 & 2

WELL NO. 5631-03

DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED
JOB NO. ___________ PROP. NO. ___________
CERTIFIED ___________ CORRECT ___________ DATE ___________
PUMP INSTALLATION PERMIT

North Waihe'e Wells 1 & 2, Well Nos. 5631-02 & 03

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the pump installation for North Waihe'e Wells 1 & 2 Well (Well Nos. 5631-02 & 03) at Waihe'e Stream, Maui, TMK: 3-2-1-4, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96806, shall be notified, in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1400 gpm capacity, or less, pump in each well. The total pumpage from both wells shall average 2 mgd.

3. The permittee shall provide and maintain an approved meter or other appropriate means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly basis, on forms provided by the Chairperson (attached).

4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

5. The permittee shall complete and submit as-built drawings and Part II - (Permanent) Pump Installation Report of the Well Completion Report (attached) to the Chairperson within thirty (30) days after completion of work.

6. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

7. The permit may be revoked if work is not started within six (6) months after the date of issuance or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the pump installation permit application shall be completed within two (2) years from the date of permit issuance, unless otherwise specified.

8. The pump installation permit application and staff submittals, approved by the Commission at its March 3, 1993 and March 1, 1995 meetings, are incorporated into the permit by reference.

Date of Approval: March 14, 1995
Expiration Date: March 14, 1997

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the pump installer have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee's Signature: _______________________________ Date: ________________
Printed Name: _______________________________ Firm or Title: ________________

Installer's Signature: _______________________________ Date: ________________
Printed Name: _______________________________ Firm or Title: ________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments
C: USGS
Department of Health/ Safe Drinking Water & Wastewater Branches
Maui Department of Water Supply
Flash from the past: Dave Craddick requested a faxed copy of the actual permit. I see a letter transferring it from C.Brewer to the MEWS, referencing a permit extension incorporating the conditions. The extension was addressed to C.Brewer. (There's also a submittal with important wording a little different than was actually incorporated into the permit extension.) I thought we might have issued a new version naming MEWS as the permittee, but I see no record of that. Also, neither Brewer nor MEWS ever submitted signed copies!

Shall we simply fax the extension naming C.Brewer or cut a new permit? (And we'll note the absence of validation)
Mr. Byron Walters, Chairman  
County of Maui  
Board of Water Supply  
P.O. Box 1109  
Wailuku, Hawaii 96793  

Dear Mr. Walters:

Pump Installation Permit  
North Waihe'e Wells 1 & 2 (Well Nos. 5631-02 & 03))

It has come to our attention that your copies of the captioned permit may not have been transmitted in the name of the Board. Enclosed are two (2) originals of your approved Pump Installation Permit for the captioned well(s) which authorizes permanent pump installation work for your wells.

Please note that the requirement for validating the permit is for the permittee to sign and return one copy. Our records indicate that neither the original permittee, C. Brewer, nor the Board returned signed, validated copies. We appreciate your cooperation in updating the record.

If you have any questions, please call Charley Ice at [redacted] or toll-free at [redacted] (Maui), extension 70251.

Aloha,

[Signature]

MICHAEL D. WILSON  
Chairperson  

Enclosures
PUMP INSTALLATION PERMIT

North Waihe'e Wells 1 & 2, Well Nos. 5631-02 & 03

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1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1400 gpm capacity, or less, pump in each well. The total pumpage from both wells shall average 2 mgd.

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4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

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Expiration Date: March 14, 1997

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Permittee's Signature: ____________________________ Date: _____________
Printed Name: ____________________________ Firm or Title: ____________________________

Installer's Signature: ____________________________ Date: _____________
Printed Name: ____________________________ Firm or Title: ____________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments
C:
USGS
Department of Health/ Safe Drinking Water & Wastewater Branches
Maui Department of Water Supply
Transmitting PIP for N. Waihe'e Wells 1 & 2 (5631-02 & 03) and submitted outlining conditions (w/ additional information).

To follow: we will send a fresh permit in your (HBSWS) name. Please note that we have no signed/returned copy to validate the permit. When you receive the new one (by mail), please follow these instructions in the cover letter. Mahalo!

Note the condition you seek: the battery (2 wells) was limited to 2 mgd. If your pump tests show greater capacity and this checks w/ USGS monitoring elsewhere, we can entertain a permit modification.
## FACSIMILE TRANSMITTAL

**DATE:** 12/3/97  
**NO. OF PAGES (w/cover sheet):** 5

<table>
<thead>
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<th>TO:</th>
<th>Rae Low, Deputy Director</th>
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<tr>
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<td>DLNR/Commission on Water Resource Management</td>
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<th>FROM:</th>
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<td>OFFICE:</td>
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<td>PHONE:</td>
<td>(808) 586-4262</td>
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**MESSAGE:**

1. The request for 
   
   - The well approval for 
     
     North Waipahu well #2 was for temporary usage, not emergency. 

2. The North Waipahu well #1 approval request was for emergency usage.

   Sorry for the misinformation. I have attached the two requests for your information.

---

**NOTE:** If this transmittal was illegible or incomplete, please call the sender.
Mr. William Wong, Chief  
Safe Drinking Water Branch  
Environmental Management Division  
Department of Health  
919 Ala Moana Blvd., Room 308  
Honolulu, Hawaii 96814

Dear Mr. Wong:  

Re: PRELIMINARY ENGINEERING REPORT - NORTH WAIHEE WATER SOURCE PROJECT

Transmitted herewith for your review and approval are six copies of the Preliminary Engineering Report for the subject project.

Due to the necessity to alleviate the draw from the Iao Aquifer, we are requesting emergency domestic use of Well No. 1 of the North Waihee Water Source Project.

At present, the 12-month daily average daily water demand on the Iao Aquifer is approximately 20 plus MGD. The Commission on Water Resource Management Division has set a milestone on the Department of July 1, 1997 as the date to start draw of 1.5 MGD from the North Waihee Water Source. Hence, it is imperative that we obtain your approval to use the Well No. 1 as a source for domestic use before July 1, 1997.

The North Waihee Water Source Project will be constructed in five phases:

Phase 1

Construction of a transmission line from North Waihee Wells No. 1 & 2 to an existing 12-inch waterline along Kahekili Highway at Kohomua Street. This phase is under construction and will be completed before July 1, 1997.

"By Water All Things Find Life"
Phase 2

Installation of North Waihee Wells No. 1 & 2, emergency generator and sodium hypochlorite solution disinfection system. This phase is under construction and will be completed in August of 1997.

Phase 3

Construction of a transmission line from Kahekili Highway at Kuhinia Street to the existing 1.0 MG Waihee (Central Maui Joint Venture) Tank. Notice to proceed was given to start construction of this phase on June 1997.

Phases 4 & 5

Construction of a 1.0 MG tank and booster pump. The construction of this phase is pending the execution of a contract with Hawaiian Dredging & Construction Co.

Although Phase 2 will not be completed by July 1, 1997, the Department has hooked up a temporary generator to operate the Well No. 1 and chlorination unit with direct feed in the transmission pipeline at the well site. The first water service will be 1.0 miles away in Waihee Town. The chlorine residual is expected to be 0.3 MGL at the service.

Should you have any questions, please contact me at (808) [redacted] Your immediate attention and approval is very much appreciated.

Sincerely,

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

[Signature]
David E. Caddick
Director

EK:as
Enclosures
June 25, 1997

Mr. William Wong, Chief  
Safe Drinking Water Branch  
Environmental Management Division  
Department of Health  
919 Ala Moana Blvd., Room 308  
Honolulu, Hawaii 96814

Dear Mr. Wong:

Re: PRELIMINARY ENGINEERING REPORT  
NORTH WAIHEE WATER SOURCE PROJECT

Referencing our letter of June 24, 1997, please revise the second sentence of the third paragraph to read:

"The Commission on Water Resource Management Division has set a milestone on the Department of July 1, 1997 as the date to start draw of 1.5 MGD from Iao Ditch. However, the water source from Iao Ditch is presently in question by your office. The North Waihee Well No. 1 has been accelerated to meet the milestone of reducing pumpage from the Iao Aquifer by 1.5 MGD by July 1, 1997."

Should you have any questions, please contact me at [Redacted].

Sincerely,

[Signature]

David R. Craddock  
Director

"By Water All Things Find Life"
September 23, 1997

Mr. William Wong  
DEPARTMENT OF HEALTH - SDWA  
919 Ala Moana Blvd., 3rd Floor  
Honolulu, Hawaii 96813

Dear Mr. Wong:

Re: NORTH WAIHEE WELLS NOS. 1 & 2  
STATE WELL NOS. 6-56311-02 AND -03

North Waihee Well No. 2 is ready to supply water to our Central Maui system. The permanent sodium chloride unit is in operation, and the wells are now powered by Maui Electric Co. As a result, we are requesting your approval to allow us to use Well No. 2 on the same temporary basis the use of Well No. 1 is being allowed under. Enclosed is the test results for Well No. 1.

Should you have any questions, please contact Ed Kagehiro of my staff at [redacted].

Sincerely,

David R. Craddick  
Director

“By Water All Things Find Life”
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October 28, 1997

Ms. Rae Loui  
Commission on Water Resource Management  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Ms. Loui:

Subject: NORTH WAIHEE WATER SOURCE PHASE II  
WELL NO. 2

We request your approval to continuously pump water from North Waihee Well No. 2 for a period of 2 to 4 weeks. The purpose of pumping is to flush the well and take samples for water quality analysis. The water will be discharged into Waihee Stream.

If you have any questions, please call our Engineering Division at

Sincerely,

David R. Craddick  
Director

MF:sc

"By Water All Things Find Life"
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Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Craddick:

SUBJECT: PUBLIC WATER SYSTEM NO. 212, DWS WAILUKU
EMERGENCY SOURCE APPROVAL
NORTH WAIHEE WELL Nos. 1 and 2
STATE WELL Nos. 6-5631-02 AND -03

We have completed our current review of the engineering report for the North Waihee Well Nos. 1 and 2. Due to the bacterial problems encountered at the North Waihee Well No. 1, the Department of Health hereby grants temporary conditional approval for the use of the wells as drinking water sources. During this time period the Maui Department of Water Supply will be given the opportunity to demonstrate its ability to properly treat and deliver potable water from the subject sources. This temporary conditional approval shall expire at midnight, April 30, 1998.

In addition, the use of these wells as drinking water sources shall be subject to the following conditions:

1. The North Waihee Well Nos. 1 and 2 shall deliver potable water of the quality in compliance with Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems. The water quality shall be subject to verification by the Department of Health.

2. The Maui Department of Water Supply, in its operation of the North Waihee Well Nos. 1 and 2, shall comply with all other relevant provisions of Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems.

3. The Maui Department of Water Supply shall notify the Department of Health of any condition which may arise or be revealed that may contaminate the sources and pose a threat to human health.
4. Due to the high levels of heterotrophic bacteria found in North Waihee Well No. 1, the following initial conditions must be met prior to placing the North Waihee Well Nos. 1 and 2 in service:

a) **Sampling Taps:** Before using these wells, the Maui Department of Water Supply must install sampling taps at each well prior to disinfection.

b) **Well Disinfection:** Each well must be disinfected, flushed, and tested prior to use in accordance with the AWWA Standard for Disinfection of Wells (C654-87). The required bacteriological testing shall show the absence of coliform bacteria and a heterotrophic plate count of less than 500 per ml before the wells can be placed in service. This event shall be documented and subsequently noted in the monthly report described under condition no. 6.

5. Due to the high levels of heterotrophic bacteria at North Waihee Well No. 1, water from North Waihee Well Nos. 1 and 2 must be adequately disinfected. In addition, the following disinfection and monitoring conditions shall apply throughout the temporary conditional approval period:

a) **Well Disinfection:** Whenever a well has not been in use for more than 24 hours, the subject well must be disinfected, flushed, and tested prior to use in accordance with the AWWA Standard for Disinfection of Wells (C654-87). The required bacteriological testing shall show the absence of coliform bacteria and a heterotrophic plate count (HPC) of less than 500 per ml before the well can be placed in service. These events shall be documented and subsequently noted in the report described under condition no. 6.

The Department of Health may consider relaxing this additional treatment and testing requirement if subsequent data indicates that the heterotrophic plate counts are consistently below 500 per milliliter (ml). Any such request must be made in writing and accompanied by supporting data. Similarly, the Department of Health may impose more stringent disinfection requirements if the heterotrophic plate counts are consistently above 500 per ml.

b) **Routine Monitoring:** The Maui Department of Water Supply must sample and analyze the source, prior to treatment, the total and fecal coliform, heterotrophic
bacteria (measured as heterotrophic plate count) and nitrates, each day (Monday through Thursday) that either well is utilized during this period. In addition, total and fecal coliform, heterotrophic bacteria, and if chlorine is used as a disinfectant, free chlorine residual must be sampled and analyzed at one of the routine Waihee Valley Road sample sites, once each week. All of this data shall be documented and subsequently noted in the monthly report described under condition no. 6.

The Department of Health may consider reducing the monitoring frequency if the data indicates that the heterotrophic plate counts are consistently below 500 per ml. Any such request must be made in writing and accompanied by supporting data.

6. The Maui Department of Water Supply must submit a monthly report summarizing the North Waihee Well Nos. 1 and 2 water quality results during the emergency approval period by the 15th day of the following month (e.g., the October results must be submitted to DOH by November 15, etc.). The report must include all of the water quality data (including, but not limited to, total and fecal coliform, HPC, free chlorine residual, nitrates, etc.) at both wells and Waihee Valley Road sample sites, noting when the wells were in operation, when they were disinfected, flushed, and the subsequent bacteriological test results, as well as any other information that may help demonstrate that the source bacteria can be consistently controlled.

7. Anytime after December 31, 1997, the Maui Department of Water Supply may request a longer term approval if it has consistently demonstrated its ability to control the bacteria in these sources. Any such request must be made in writing and accompanied by supporting data.

This emergency conditional approval supersedes the July 1, 1997 emergency conditional approval issued by the Department of Health.

We must emphasize that this emergency conditional approval is strictly limited to the specified time period. The Department of Health will be prepared to issue a longer conditional approval when it is assured that the water quality will meet drinking water standards and public health is protected at all times.
The Department of Health reserves the right to suspend or revoke this conditional approval upon either a finding of violation on any of the above conditions or a determination of a threat to public health from factors which may arise in the future. Thank you for your attention and concern to these matters.

Sincerely,

[Signature]

THOMAS E. ARIZUMI, P.E., Chief
Environmental Management Division

c:  SDWB Monitoring Section
    SDWB Enforcement Section
    Gordon Muraoka, Maui SDWB Sanitarian
    Charles Ice, DLNR
    Cari Cerizo, Maui Dept. of Water Supply
Mr. Thomas E. Arizumi, P.E., Chief
Department of Health
Environmental Management Division
P.O. Box 3378
Honolulu, HI 96801

Dear Mr. Arizumi:

North Waihee Wells 1 & 2 Engineering Report (Well Nos. 5631-02 & 03)

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

[ ] We recommend coordination with the county government to incorporate this project into the county’s Water Use and Development Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer’s acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and a Pump Installation Permit from the CWRM would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the CWRM would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows. This may require an instream flow standard amendment.

[ ] We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[ ] If the proposed project diverts additional water from streams or if new or modified stream diversions are planned, the project may need to obtain a stream diversion works permit and petition to amend the interim instream flow standard for the affected stream(s).
Based on the information provided, it appears that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

Based on the information provided, it does not appear that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

An amendment to the instream flow standard from the CWRM would be required before any streamwater is diverted.

OTHER: Monitoring efforts by the US Geological Survey, Water Resource Division (USGS) indicate that, even without pumping at these wells, the water levels are declining. This is believed due to overpumpage of the adjacent Iao Aquifer System.

This overpumpage has led the Commission to consider designated Iao Aquifer System as a groundwater management area. The intended use of these wells is to reduce pumpage in the Iao Aquifer System. Similarly, the Maui Board of Water Supply (MBWS) is planning to drill wells at Waikapu to spread pumpage within the Iao Aquifer.

If there are any questions, please contact Charley Ice at 587-0251.

Sincerely,

[Signature]

RAE M. LOUI
Deputy Director
The Honorable Michael D. Wilson  
Chairman of the Board  
ATTN: Rae Loui  
Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Wilson:

SUBJECT: PROPOSED SOURCE OF POTABLE WATER

Enclosed for your review and comments is a copy of the engineering report for the following source:

North Waihee Wells #1 and #2  
State Well No. 6-5631-02 and 6-5631-03  
Waihee, Maui, Hawaii

This report has been prepared pursuant to Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems, section 11-20-29.

The Department of Health will use your comments in determining the potential impacts which may result by the proposed project. It is also important for you to verify that the coordinate locations provided in the engineering report match those shown in your Groundwater Index.

Please submit your comments to the Safe Drinking Water Branch within 30 days from the date of this letter. You may also return the engineering report to this office if you do not need it for future reference.

If you should have any questions, please call the Safe Drinking Water Branch, Engineering Section, at [contact information redacted].

Sincerely,

THOMAS E. ARIZUMI, P.E., Chief  
Environmental Management Division

MY:la

Enclosure
July 1, 1997

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Craddick:

SUBJECT: PUBLIC WATER SYSTEM NO. 212, DWS WAILUKU EMERGENCY SOURCE APPROVAL NORTH WAIHEE WELL 1 STATE WELL NO. 6-5631-02

We would like to acknowledge receipt of three (3) copies of the engineering report for the North Waihee Wells 1 and 2 and the June 24 and 25, 1997 transmittal letters requesting an emergency approval to meet the Commission on Water Resource Management Division's July 1, 1997 milestone. After a preliminary review of the water quality data, the Department of Health hereby grants temporary conditional approval for use of the North Waihee Well 1 as a source of drinking water for a six-month period. This temporary approval shall expire at midnight, January 30, 1998. In addition, the use of this well is subject to the following conditions:

1. All water from the North Waihee Well 1 shall be disinfected before entering the distribution system.

2. The North Waihee Well 1 shall deliver potable water of the quality in compliance with Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems. The water quality shall be subject to verification by the Department of Health.

3. The Department of Water Supply, in its operation of the North Waihee Well 1, shall comply with all other relevant provisions of Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems.
4. The Department of Water Supply shall notify the Department of Health of any condition which may arise or be revealed that may contaminate the source and pose a threat to human health.

5. This temporary approval does not imply acceptance of the engineering report for the North Waihee Wells 1 and 2. The Department of Water Supply must submit the required water quality analyses for the North Waihee Well 2 as well as any other relevant information that may be needed by the Department of Health. Final approval of this new source of potable water will be withheld until the report is completed and all of the reviewing agencies have had the opportunity to study the engineering report.

If you have any questions, please contact Stuart Yamada of the Safe Drinking Water Branch at [redacted] or call from Maui the direct toll free number [redacted] ext. 64258.

Sincerely,

THOMAS E. ARIZUMI, P.E., Chief
Environmental Management Division

SY:gm

c: Gordon Muraoka, Maui SDWB Sanitarian
Wendell Sano, Monitoring Section
Ann Zane, Enforcement Section

Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Maui, HI 96793

WELLS (5631-02A.MSY)
July 1, 1997

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Craddick:

SUBJECT: PUBLIC WATER SYSTEM NO. 212, DWS WAILUKU
EMERGENCY SOURCE APPROVAL
NORTH WAIHEE WELL 1
STATE WELL NO. 6-5631-02

We would like to acknowledge receipt of three (3) copies of the engineering report for the North Waihee Wells 1 and 2 and the June 24 and 25, 1997 transmittal letters requesting an emergency approval to meet the Commission on Water Resource Management Division's July 1, 1997 milestone. After a preliminary review of the water quality data, the Department of Health hereby grants temporary conditional approval for use of the North Waihee Well 1 as a source of drinking water for a six-month period. This temporary approval shall expire at midnight, January 30, 1998. In addition, the use of this well is subject to the following conditions:

1. All water from the North Waihee Well 1 shall be disinfected before entering the distribution system.

2. The North Waihee Well 1 shall deliver potable water of the quality in compliance with Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems. The water quality shall be subject to verification by the Department of Health.

3. The Department of Water Supply, in its operation of the North Waihee Well 1, shall comply with all other relevant provisions of Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems.
Mr. David Craddick  
July 1, 1997  
Page 2  

4. The Department of Water Supply shall notify the Department of Health of any condition which may arise or be revealed that may contaminate the source and pose a threat to human health.

5. This temporary approval does not imply acceptance of the engineering report for the North Waihee Wells 1 and 2. The Department of Water Supply must submit the required water quality analyses for the North Waihee Well 2 as well as any other relevant information that may be needed by the Department of Health. Final approval of this new source of potable water will be withheld until the report is completed and all of the reviewing agencies have had the opportunity to study the engineering report.

If you have any questions, please contact Stuart Yamada of the Safe Drinking Water Branch at [redacted] or call from Maui the direct toll free number [redacted] ext. 64258.

Sincerely,

THOMAS E. ARIZUMI, P.E., Chief  
Environmental Management Division  

SY:gm  

c: Gordon Murakoa, Maui SDWB Sanitarian  
Wendell Sano, Monitoring Section  
Ann Zane, Enforcement Section  
Warren S. Unemori Engineering, Inc.  
2145 Wells Street, Suite 403  
Wailuku, Maui, HI 96793  

WELLS(5631-02A.MSY)
May 19, 1997

Ms. Rae Loui
COMMISSION ON WATER RESOURCE MANAGEMENT
DEPARTMENT OF LAND & NATURAL RESOURCES
STATE OF HAWAII
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Loui:

Re: NORTH WAIHEE WELLS 1 AND 2
    STATE WELL NOS. 5631-02 AND 5631-03
    NORTH WAIHEE WATER SOURCE PROJECT

Attached, for your use, are the completed pump installation reports and as-built drawings.

Should you have any questions, please contact our Engineering Division at

Sincerely,

David R. Craddick
Director

EK:as
Enclosures
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: Roscoe Moss Hawaii, Inc.

21. Name of person performing work: John Mole

22. Date Pump Installation Completed: April 9, 1997

23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: Sub, Byron Jackson, 96WR007382
   Motor type, H.P., Voltage, rpm: Sub, 150 HP, 460, 1751
   Depth of Pump Intake Setting 317 ft. below Grade, which elevation is 284.08 ft.
   Depth to bottom of airline 304 ft. below Grade, which elevation is 284.08 ft.
   Pumping Head is 420 ft. Type of flow meter: which measures in

24. As-built drawings attached: X Yes _ No

25. Other remarks/comments: (See below)

Pump Installation Contractor (print) Roscoe Moss Hawaii, Inc. C-57 Lic. No. C-16437
Signature William C. Moore Date 4/30/97
Applicant (print)
Signature

8.(cont'd) DRILLER'S LOG (cont'd):
Water Level Depth (ft.) Rock Description, Remarks, Water Level Depth (ft.) Rock Description, Remarks,
Dates (ft.) Dates (ft.)
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19.& 25. Remarks:

RKL 6291-03 N. Walker 2
WELL COMPLETION REPORT

(2096 WCR Form)

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-0225, or 1-800-468-4644 Extension 70225.

1. State Well No.: 5631-03  Well Name: N. Waihee Water Source  Island: Maui
2. Location/Address: N. Waihee Well No. 2  Tax Map Key: 3-2-0106

PART I: WELL CONSTRUCTION REPORT

3. Drilling Company: ____________________________
4. Name of driller who performed work: ____________________________
5. Type of rig/construction: ____________________________
6. Date(s) Well Construction and pump tests (if any) completed: ____________________________
7. GROUND ELEVATION (referenced to mean sea level, msl): ____________________________ ft.
   Well Bench Mark (description/location): ____________________________ Elevation(msl): ____________________________ ft.
8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)

<table>
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<tr>
<th>Depths (ft.)</th>
<th>Rock Description, Water Level, Dates, etc.</th>
<th>Depths (ft.)</th>
<th>Rock Description, Water Level, Dates, etc.</th>
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| (If more space is needed, continue on back.)

9. Total depth of well below ground: ____________________________ ft.
10. Hole size: ____________________________ inch dia. from _________ ft. to _________ ft. below ground
           ____________________________ inch dia. from _________ ft. to _________ ft. below ground
           ____________________________ inch dia. from _________ ft. to _________ ft. below ground
11. Casing installed: ____________________________ in. I.D. x in. wall solid section to _________ ft. below ground
           ____________________________ in. I.D. x in. wall perforated section to _________ ft. below ground
   Casing Material/Slot Size: ____________________________
12. Annulus: ____________________________ ft. below ground to _________ ft. below ground
    Gravel packed from _________ ft. below ground to _________ ft. below ground
13. Initial water level: _________ ft. below ground.  Date and time of measurement: ____________________________
14. Initial chloride: ____________________________ ppm.  Date and time of sampling: ____________________________
15. Initial temperature: ____________________________ °F  Date and time of measurement: ____________________________
16. PUMPING TESTS: Reference Point (R.P.) used: ____________________________, which elevation is ____________________________ ft.
   (1) Step-Drawdown Test Date ____________
   Start water level _________ ft. below R.P.
   End water level _________ ft. below R.P.
   (2) Long-term Aquifer Test Date ____________
   Start water level _________ ft. below R.P.
   End water level _________ ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? __ Yes __ No
18. As-built drawings attached? __ Yes __ No
19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) ____________________________ C-57 Lic. No. ____________________________
Signature ____________________________ Date ____________________________
Surveyor (print) ____________________________ Lic. No. ____________________________
Signature ____________________________ Date ____________________________
Applicant (print) ____________________________
Signature ____________________________ Date ____________________________
SUBMERSIBLE OUTLINE
STANDARD WELL SEAL — JUNCTION BOX CONSTRUCTION

DATE ______________________

NAME OF CUSTOMER  County of Maui
DEPARTMENT OF WATER SUPPLY

PROPOSITION NO. Job No. 95-10

ORDER NO. 58-96D
PURCHASE ORDER NO. ______________________

NO. OF UNITS ONE

SURFACE PLATE 2 7/16" O.D. 1 3/4" TH'K

8 - 3/8" FOUNDATION HOLES. STR. & ON 25" B.C
8" - 8 T.P.I. - 5/8" TAPER T&C ST'D. COLUMN
10" - 150# F.F. (STEEL) DISCHARGE FLANGE

BOWL ASSEMBLY 12 MQ, 7 STGS.

150 H.P., 1751 RPM B.J. SUBM. MOTOR TYPE M

12" SIZE 3 PH 60 CYCLE 460 VOLT

1050 GPM 420 ft. TDH

CABLE SIZE 400 MCM VOLTAGE 460 LENGTH 310 FT.

REMARKS: WELL PUMP No. 2

CABLE: 400 MCM

COLUMN PIPE: 8" SCH 40 GALVANIZED
TRANSDUCER PIPE: SCH 80 PVC. 1"

"NORTH WAHEE WATER SOURCE"

PHASE II DEVELOPMENT OF WELLS 1 & 2

DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED

JOB NO. _________ PROP. NO. _________

CERTIFIED CORRECT _________ DATE _________

P-652 4/69
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: Roscoe Moss Hawaii, Inc.
21. Name of person performing work: John Mole
22. Date Pump Installation Completed: April 7, 1997
23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: Sub/Byron Jackson/96WR007381
   Capacity: 1050 gpm
   Motor type, H.P., Voltage, rpm: Sub/150/460/1751
   Depth of Pump Intake Setting: 307 ft. below Grade, which elevation is 284.08 ft.
   Depth to bottom of airline: 294 ft. below Grade, which elevation is 284.08 ft.
   Pumping Head is: 420 ft. Type of flow meter: __________ which measures in __________
24. As-built drawings attached: Yes No
25. Other remarks/comments: (See below)

Pump Installation Contractor (print) Roscoe Moss Hawaii, Inc., C-57 Lic. No. C-16437
Signature: William C. Moore, Vice President
Date: 4/30/97

Applicant (print)
Signature: ____________________________ Date: ____________________________

8.(cont'd) DRILLER'S LOG (cont'd):
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19. & 25. Remarks: 1
WELL COMPLETION REPORT

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL CONSTRUCTION REPORT

1. State Well No.: 5631-02  Well Name: N. Waihee Water Source  Island: Maui
2. Location/Address: North Waihe Water Well No. 1  Tax Map Key: 3-2-0104

PART I.

3. Drilling Company:

4. Name of driller who performed work:

5. Type of rig/construction:

6. Date(s) Well Construction and pump tests (if any) completed:

7. GROUND ELEVATION (referenced to mean sea level, msl): __________ ft.
   Well Bench Mark (description/location): __________ Elevation(msl): __________ ft.

8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.)  Rock Description, Water Level, Dates, etc.  Depths (ft.)  Rock Description, Water Level, Dates, etc.
   __________ to __________  __________ to __________
   __________ to __________  __________ to __________
   (If more space is needed, continue on back)

9. Total depth of well below ground: __________ ft.

10. Hole size:
    __________ inch dia. from __________ ft. to __________ ft. below ground
    __________ inch dia. from __________ ft. to __________ ft. below ground
    __________ inch dia. from __________ ft. to __________ ft. below ground

11. Casing installed:
    __________ in. I.D. x __________ in. wall solid section to __________ ft. below ground
    __________ in. I.D. x __________ in. wall perforated section to __________ ft. below ground
    Casing Material/Slot Size:

12. Annulus:
    Grouted from __________ ft. below ground to __________ ft. below ground
    Gravel packed from __________ ft. below ground to __________ ft. below ground

13. Initial water level: __________ ft. below ground.

14. Initial chloride: __________ ppm

15. Initial temperature: __________ °F

16. PUMPING TESTS: Reference Point (R.P.) used: __________ which elevation is __________ ft.

   (1) Step-Drawdown Test Date __________
       Start water level __________ ft. below R.P.
       End water level __________ ft. below R.P.

   (2) Long-term Aquifer Test Date __________
       Start water level __________ ft. below R.P.
       End water level __________ ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? Yes __ No __

18. As-built drawings attached? Yes __ No __

19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) ________ C-57 Lic. No. ________
Signature __________________________ Date __________

Surveyor (print) ________ Lic. No. ________
Signature __________________________ Date __________

Applicant (print) ________
Signature __________________________ Date __________
SUBMERSIBLE OUTLINE
STANDARD WELL SEAL—JUNCTION BOX CONSTRUCTION

DATE ______________________

NAME OF CUSTOMER County of Maui
DEPARTMENT OF WATER SUPPLY

PROPOSITION NO. JOB NO. 96-10

ORDER NO. 56-910D
PURCHASE ORDER NO. ______________________

NO. OF UNITS ONE

SURFACE PLATE 27 1/2" O.D. 13 1/4" THK
8 - 7/8" FOUNDATION HOLES, STR. Ø ON 25" B.C.
8" - 8 T.P.I. - 3/4" TAPER T&C ST'D. COLUMN
250 # F.F. (STEEL) DISCHARGE FLANGE

BOWL ASSEMBLY (2 MBL) 7 STGS. 160 H.P. 1751 RPM B.J. SUBM. MOTOR TYPE M
12" SIZE 3 PH. 60 CYCLE 460 VOLT
1050 GPM 420 FT. TDH

CABLE SIZE 400 MCM VOLTAGE 460 LENGTH 300 FT

REMARKS: WELL PUMP NO. 1
CABLE: 400 MCM
COLUMN PIPE: 8" SCH. 40 GALVANIZED
TRANSMIT PIP: SCH 80 PVC 1"
"NORTH WAIANEE WATER SOURCE"
PHASE II—DEVELOPMENT OF WELLS 1 & 2

DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED

JOB NO. _________ PROP. NO. _________
CERTIFIED CORRECT _________ DATE _________

P-652 4/69
Mr. David R. Craddick, Director
Maui Department of Water Supply
200 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

North Waihee Wells 1 & 2 Pump Installation

Thank you for our copy of your March 20, 1997 letter to the contractor for the captioned project. This letter anticipates pump delivery date and subcontractor commencement of work the first week of April. Commissioner Nobriga reports that work is indeed underway.

We draw your attention to the permit conditions requiring surveyed elevation for the top of the casing and provision of means to measure water levels. These should be included in the Well Completion Report (Part II). Please advise us how you plan to measure water levels.

If you have any questions, please call Charley Ice at extension 70251.

Sincerely,

RAE M. LOUI
Deputy Director
April 2, 1997

Rae M. Loui, Deputy Director
State of Hawaii, Dept. Of Land & Natural Resources
Commission on Water Resource Management
Post Office Box 621
Honolulu, Hawaii 96809

Re: North Waihe'e Pump Installation (Well No. 5631-02 & 03)
After-the-fact Kepaniwai Pump replacement permit
Well No. 5332-05

Dear Ms. Loui:

At our March 18, 1997 Board of Water Supply meeting, the Board conditionally approved the Water Use Development Plan contract amendment to redo the Water Use Development Plan. The conditions were that it be subject to the Commission’s concurrence that it meets the needs of the Kepaniwai pump permit and that $25,500 be applied to the Water Use Development Plan integrated resource planning process in lieu of the $51,000 permit fine.

I realize you can not commit to Commission action. However, we need immediate clarification that we are not subject to a $25,500 fine plus the $25,500 applied to the Water Use Development Plan integrated resource planning process.

Sincerely,

David Craddick, Director

“By Water All Things Find Life”
March 20, 1997

Mr. Eric Pilotin  
Goodfellow Brothers, Inc.  
P.O. Box 220  
Kihei, HI 96753-0220

Dear Mr. Pilotin:

SUBJECT: PUMP INSTALLATION, NORTH WAIHEE #1 AND #2

On March 19, 1997, the State Commission on Water Resource Management (CWRM) approved an extension of the pump installation permits for the North Waihee Wells #1 and #2. As you know, CWRM has focused on this project as a means to reduce pumping from the lao Aquifer. It is important to us that the pumps be installed and the well completion reports be submitted to CWRM by May 1, 1997.

We understand that the pumps will be on site the week of March 24 and that your subcontractor will commence work the first week of April. Should any problems affecting the installation develop, please contact us immediately.

A copy of CWRM’s agenda and the approved staff recommendation is enclosed for your information.

Very truly yours,

DAVID CRADDICK  
Director

Enclosure

xc: Commission on Water Resource Management  
   Engineering  
   Planning

"By Water All Things Find Life"
Nov. 14, 1995  Following three separate two-month extensions of the start date, all of which went to the Commission for action, the Commission denied further extension of the start date, allowing for revocation of the permit as of January 13, 1996, unless the site ownership was successfully transferred and a schedule of actual installation work was provided to the Commission.

January 24, 1996  The Commission rescinded the revocation of the permit, as its conditions for doing so were met. Transfer of the permit was duly recorded. In a separate action concerning designation of Iao Aquifer as a water management area, action milestones were set in place, including a start deadline for pump installation at North Waihee (Phase 1 - first well/1.5 mgd) of November 1, 1996. On March 18, 1996, staff received a written request for a two-month start date extension under the original permit extension, with a work schedule attached; the extension was accepted administratively, from May 14, 1996 to July 14, 1996. Another written request was submitted June 10, for a start date extension to September 14, 1996; no staff action was taken at this point in view of the November 1, 1996 deadline set under the Iao milestones.

December 9, 1996  Staff received a letter from the applicant 1) indicating that a notice to proceed had been issued October 14, 1996; and 2) requesting an extension of the permit beyond the original March 1, 1997 deadline to June 16, 1997 to be consistent with a new contract schedule of work. BWS staff indicated that the contractor was beginning to marshal materials and grub the site, while a shipping delay meant that the pump would be installed in February 1997.

At a meeting on Maui to discuss designation of the Iao Aquifer, the Commission approved new action milestones, including commencement of work on pump installation by February 1, 1997, with evidence to be provided by February 8, 1997.

February 18, 1997  The Commission extended the permit to April 1, 1997. If work is not completed by April 1, 1997, the permit will be allowed to expire and the Board would have to reapply.

March 12, 1997  Maui Board of Water Supply requested being placed on the agenda to extend the permit's completion date until May 1, 1997 because rains at the construction site have delayed work (Exhibit 3).

**WATER AVAILABILITY:**

Waihee Aquifer System (at Iao System boundary) of Wailuku Sector.
Estimated Sustainable Yield: 8 mgd. Existing Use: none.
Proposed Use: 2-3 mgd.
Anticipated pump capacity: 1050 gpm.
ISSUES/ANALYSIS:

The wells will develop fresh, basal water for municipal use. The wells’ static head currently stands about 7-8 feet above sea level. Pump tests have demonstrated that the drawdown from heavy pumping is relatively minor, with full recovery nearly instantaneous. Salinity is very low. Recent work by USGS indicates that these wells interact with the Iao Aquifer system and that current water levels and well depths may limit the capacity to produce water from these wells with chlorides below 250 mg/l. The applicant has chosen to reduce the pump size from 1400 to 1050 gpm, with the expectation that the total safe yield from these wells is probably closer to 3 mgd than the original prospective 4 mgd. Phase 1 will install the first pump in one of two wells, with capacity of 1.5 mgd; Phase 2, to install a pump in the other well for a total capacity of 3 mgd, is scheduled about four months behind Phase 1.

John Mink believes that there should be no stream effects because the stream channel in this vicinity is 200 feet above sea level.

While the BWS witnessed the lengthy period of failure to perform on this permit by the previous permittee and the Commission’s determination to have the project problems resolved, the BWS has continued to make optimistic estimates of time for completing this project. The Commission has accommodated new work schedules by the applicant, extending the start date for twice the normal period once the permit was transferred.

The pumps are scheduled to arrive on March 25, 1997, as evidenced by the attachment to Exhibit 3. Milestone 3 established in December, 1996 required delivery of materials by February 1, 1997 (Exhibit 4). This milestone was not met. The staff also requested submittal of the well completion report, which has not been submitted.

RECOMMENDATION:

That the Commission:

1. Approve the request to extend the pump installation permit for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) to May 1, 1997, and  
2. Require the submittal of the well completion reports Part I (Well Construction) for North Waihee Wells 1 and 2 by May 1, 1997.

Respectfully submitted,  

RAE M. LOUI  
Deputy Director

Exhibit(s)  
1 (Location Map)  
2 (Proposed Well Section)  
3 (Maui BWS letter)  
4 (Milestone letter)
March 12, 1997

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

Dear Ms. Loui:

Subject: North Waihee Pump Installation Permit  
Wells No. 5631-2 and 5631-3

Reference your letter of March 7 concerning CWRM's action on the subject permit. We respectfully request reconsideration of the Commission's action and extend the permit deadline from April 1, 1997 to May 1, 1997 and allow this request to be put on the March 18, 1997 meeting agenda.

The pumps are scheduled to arrive on Maui on March 25, see attachment. Installation of the pumps to start in mid-April. Barring any unforeseen delays, such as rain delays, the installation of the pumps are anticipated to be completed the latter part of April.

Your favorable consideration is appreciated.

Sincerely,

David Craddick, Director  
EK/aw  
Attachment

"By Water All Things Find Life"
**PRINT/SEND ORIGINATED BY HULC **

** BILL TRACER 03/12/97 17:00 PS

PRD NUMBER DATE DES ORG
006-525629 2/28/97 HUL TUL

6 PCS 97010 TOTAL FRT CHG $1827.45 PPD

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**SHIPPER**
BU/IP INTERNATIONAL INC
PO BOX 472250
TULSA OK 74147

**CONSIGNEE**
ROSCOE MOSS HAWAII INC
91-239A OLAI ST
KAPOLEI HI 96707

TRLR MATT460103

CUE 08 03/09/97 10:00A PS
HUL IB 03/10/97 22:00P PS

ISLAND HUL
CUBE 279
VEG LURLINE
ETD 3/8/97
ETA 3/12/97

SERVICE DATE N/A

MR. ERIC PILOTIN

THIS IS TO ADVISE YOU THAT THIS SHIPMENT-REFERENCING NORTH HAWAII- DUE TO ARRIVE INTO HONOLULU TODAY. WE HAVE MARKED THIS ORDER- RUSH- SO THAT WE CAN GET THIS OUT TO ROSCOE MOSS-ATTN: GLEN DAVIS- AS SOON AS POSSIBLE. WE ARE CURRENTLY SENDING TO GET THIS OUT TO THEM THIS FRIDAY. IF YOU HAVE FURTHER QUESTIONS, PLEASE CALL US AS (800)220-8201

THANK YOU,
ARLAIN WIND-TELLOW FRESHLY SYSTEM-HUL

** TOTAL PAGE 01 **
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, Hawaii 96793  

Dear Mr. Craddick:  

Iao Aquifer Milestones

We received your letter of February 10, 1997, reporting on the ten milestones set by the Commission for February 1, 1997 in the matter of designating the Iao Aquifer as a ground water management area. This response incorporates our understanding following a meeting with you in our office on Friday, February 21, 1997.

The Commission set ten milestones on December 9, 1996:

1) Water Shortage Plan: this is reported underway, and you are requesting guidance on "response triggers" for the various features mentioned in Milestone #1. In our February 24, 1997 meeting, you expressed concern that the Council would not approve a rule-change for invoking a cutback without these triggers. A water shortage plan is a preparedness measure outlining action to be taken in the event the Commission declares a water shortage or emergency. If the County wishes to exercise its own management in this regard, it is incumbent upon the Board to determine its own triggers and to undertake rule-making as necessary. This is separate from the Commission's shortage or emergency powers. We again request you provide details on the actions you are willing to take to reduce consumption by 1 mgd, 2 mgd, and 3 mgd.

2) A finalized site agreement for the Waikapu Tank Well (by February 1, 1997): a copy of the agreement, signed by both parties, was received from the attorney for Wailuku Agribusiness Co., Inc., (Mancini, Rowland & Welch) on February 21, 1997.

3) Delivery of materials and commencement of pump installation work at North Waie'e Wells 1 & 2: photos, with the penned date of February 3, 1997 and showing concrete work at the wellhead, appear to show finish work on the well construction via completion of the pump pad, prior to pump installation work. We request your completion of marked items on enclosed well completion report Part 1 (Well Construction), that are not on file from the previous owner, and documentation of delivery of the pump equipment.
4) 1.0 mgd brought on-line from North Waihee' Wells 1 & 2 by August 1997, and the Iao Aquifer pumpage reduced accordingly. Historic Preservation Division reports that work on the pipeline to North Waihe'e had proceeded without an approved survey and mitigation plan, and that in the course of work, human burials had been found. You report that this was not a critical path item and that there should be no delay to the schedule.

5) Submittal of EA for North Waihe'e Wells 3 & 4: the schedule submitted corrects earlier representation that this EA could be scheduled as an alternative to the Hāmākuapoko EA, and would be submitted not in February but mid-May. The milestone is therefore adjusted to May 15, 1997.

6) A finalized agreement for extended use of the Wailuku Shaft 33: the Right of Entry and Operating Agreement has been executed, and the attorney for Wailuku Agribusiness Co., Inc. and C. Brewer Homes has forwarded a copy to us.

7) Submit the EA for Hāmākuapoko Wells by April 1, 1997: this is reported on track.

8) Notice To Proceed on the Paia phase of construction for the East Maui Water Development project by May 1, 1997: this milestone was based on Board staff belief that this phase could proceed while the SEIS was being completed. This assumption is incorrect, as this phase is also subject to completion of the SEIS. This milestone will have to be modified or deleted.

9) Iao Ditch facility to provide 2 mgd beginning in July, with evidence of 50% completion by April 1, 1997: you correctly point out that, although the operating capacity of the filters is 2.0 mgd, the average flow is only 1.5 mgd. The milestone amount will be corrected accordingly, while the date remains unchanged.

10) Updated schedules and plans for Waikapū Tank Well and East Maui Water Development (to be submitted by December 23, 1996): these were submitted January 9, 1997.

If you have any questions, please call Charley Ice at extension 70251.

Sincerely,

RAE M. LOUI
Deputy Director

Enclosure

C: Mayor Linda Crockett Lingle
   Pat Kawano, Maui County Council
   Norma Piltz, Maui Board of Water Supply
March 12, 1997

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

Dear Ms. Loui:

Subject: North Waihee Pump Installation Permit  
Wells No. 5631-2 and 5631-3

Reference your letter of March 7 concerning CWRM’s action on the subject permit. We respectfully request reconsideration of the Commission’s action and extend the permit deadline from April 1, 1997 to May 1, 1997 and allow this request to be put on the March 18, 1997 meeting agenda.

The pumps are scheduled to arrive on Maui on March 25, see attachment. Installation of the pumps to start in mid-April. Barring any unforeseen delays, such as rain delays, the installation of the pumps are anticipated to be completed the latter part of April.

Your favorable consideration is appreciated.

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David Craddick, Director  
EK/jaw  
Attachment

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THANK YOU,

ARLEEN MIHO-YELLOW FREIGHT SYSTEM-HUL
Ms. Norma Piltz, Chairperson  
Maui Board of Water Supply  
P.O. Box 1109  
Wailuku, HI 96793

Dear Ms. Piltz:

North Waihe'e Pump Installation (Well No. 5631-02 & 03)  
After-the-fact Kepaniwai Pump Replacement Permit (Well No. 5332-05)

This letter replaces a letter dated March 7, 1997, and corrects the paragraph detailing the Commission's action of February 18, 1997 on the North Waihe'e Wells 1 & 2 Pump Installation Permit. The Commission's action was to extend the permit to April 1, 1997, at which time work must be completed.

The Commission on Water Resource Management (Commission) took action on the captioned matters on February 18, 1997 in Honolulu. The Commission noted that these two sources are critical to reducing the overpumping in the Iao Aquifer System, and that the problems encountered in these two instances are not a good sign of progress away from designation. Noting the vote of confidence given the Board of Water Supply (Board) by several interested parties at the hearing concerning designation of the Iao Aquifer, the Commission directed staff to communicate to them the Commission's concerns for proper management as represented in these two cases.

North Waihe'e Wells 1 & 2

The North Waihe'e Wells 1 & 2 Pump Installation Permit was extended from March 1 (when the permit is scheduled to expire) to April 1, 1997. If work is not completed by April 1, 1997, the permit will be allowed to expire and the Board would have to reapply.

The Commission asked that the Board Chairperson respond to the Commission on the status of pump installation. This permit has a long history of delinquencies that had caused the Commission to adopt the unusual practice of reviewing and conditioning each request for extension. The permit expiration has been extended twice, and there have been five start date extensions with one revocation hearing. Commission action on designating the Iao Aquifer on December 9, 1996 included a February 8, 1997 milestone to provide evidence of the delivery of materials and commencement of this pump installation work. On February 12, 1997, we received photos of concrete work in progress at the well heads, with the date February 3, 1997 penned below. This appears to be well construction finish work, including installation of the pump pad, and might normally be associated with the original construction work. The Commission wants to see evidence of pump delivery to the site.
Additionally, the Commission was concerned that no one from the Maui Board of Water Supply, County Council, or Mayor’s Office was present to testify or answer questions regarding this permit.

Kepaniwai Pump Replacement

The after-the-fact Pump Installation Permit to replace the Kepaniwai Well pump was approved, with a finding that the Board was in violation of the Water Code by knowingly proceeding without a permit. The Board staff member present was unable to explain how the work at Kepaniwai proceeded without a permit, but indicated that the Board now has procedures in place to prevent such an occurrence in the future. The Commission approved a fine of $51,000, or in the alternative to apply $25,500 to a revision of the Water Use and Development Plan using an integrated resource planning process, requiring the Board to enter an agreement with Commission within 100 days to retain a consultant for this purpose.

County Representation

The Commission Chairperson directed staff to request that representatives of the County Council and Mayor attend all Commission meetings involving the Iao Aquifer, and that a letter be sent to the Maui Chamber of Commerce and Maui Hotel Association informing them of the numerous delays at North Waihe’e and that no representative of the Board, Council, or Mayor was present to testify or answer questions on these serious issues.

If you have any questions, please call me at [redacted] or toll-free at [redacted] extension 70214.

Sincerely,

RAE M. LOUI
Deputy Director

Cc: Mayor Linda Crockett Lingle
David Craddick, Maui Department of Water Supply
Pat Kawano, Maui County Council
Alice Lee, Maui County Council, Public Works and Water Committee
Lynne Woods, Maui Chamber of Commerce
Terry Vencl, Maui Hotel Association
Terry Tomlin, Maui Board of Realtors
CWRM Commissioners
Ms. Norma Piltz, Chairperson
Maui Board of Water Supply
P.O. Box 1109
Wailuku, HI 96793

Dear Ms. Piltz:

North Waihe'e Pump Installation (Well No. 5631-02 & 03)
After-the-fact Kepaniwai Pump Replacement Permit (Well No. 5332-05)

5. Maui Board of Water Supply, Extension of Permit, North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03). Request to Install 1050 gpm Pumps for Domestic Use, TMK 3-2-1-4, Waihee, Wailuku, Maui

PRESENTATION OF SUBMITTAL: Mr. Roy Hardy

STAFF RECOMMENDATION:

The staff recommendation was amended as follows:

A. That the Commission authorize the Chairperson to extend the pump installation permit for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) until April 1, 1997 and if work on the pump installation has not started, the permit will expire.

TESTIMONY BY APPLICANT:

Mr. Eric Okazaki, of the Maui Board of Water Supply, was available to answer questions.

Commissioner Miike asked Mr. Okazaki to have the Board of Water Supply Chairperson respond to the CWRM regarding the pumps.

Commissioner Wilson asked Deputy Director Rae Loui to send letters to the Maui Chamber of Commerce and Maui Hotel Association informing them of the numerous delays and that no one from the Maui Board of Water Supply, Maui County Council, or Maui County Mayor's office was present at the Commission to testify or answer questions. He also instructed that a letter be sent to the Maui Board of Water Supply Chairperson, Maui County Council, and the Mayor requesting that they be represented at all Commission meetings involving the lao Aquifer.

MOTION: (MIKE/GIRALD)

To approve staff's recommendation as amended.

UNANIMOUSLY APPROVED AS AMENDED.
Additionally, the Commission was concerned that no one from the Maui Board of Water Supply, County Council, or Mayor’s Office was present to testify or answer questions regarding this permit.

Kepaniwai Pump Replacement

The after-the-fact Pump Installation Permit to replace the Kepaniwai Well pump was approved, with a finding that the Board was in violation of the Water Code by knowingly proceeding without a permit. The Board staff member present was unable to explain how the work at Kepaniwai proceeded without a permit, but indicated that the Board now has procedures in place to prevent such an occurrence in the future. The Commission approved a fine of $51,000, or in the alternative to apply $25,500 to a revision of the Water Use and Development Plan using an integrated resource planning process, requiring the Board to enter an agreement with Commission within 100 days to retain a consultant for this purpose.

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If you have any questions, please call me at [redacted] or toll-free at [redacted] extension 70214.

Sincerely,

[Signature]

RAE M. LOUI
Deputy Director

Cc:
Mayor Linda Crockett Lingle
David Craddick, Maui Department of Water Supply
Pat Kawano, Maui County Council
Alice Lee, Maui County Council, Public Works and Water Committee
Lynne Woods, Maui Chamber of Commerce
Terry Vencel, Maui Hotel Association
Terry Tomlin, Maui Board of Realtors
CWRM Commissioners

Attachment
Burial sites halt work on water main

Project could be altered once, no more—Craddick

WAIMEA — The discovery of two ancient burial sites under Kahekili Highway has caused the suspension of work on a 24-inch water main. Department of Water Supply Director David Craddick says he believes solving the problem will take three to four weeks. That should not endanger the department’s ability to meet “milestones” set by the state Commission on Water Resource Management to develop new water sources.

The new sources would relieve stress on the overused Iao aquifer that serves Central and South Maui. “We knew we were in a sensitive area,” says Craddick, and the contract with Goodfellow Brothers included an archaeologist.

While digging the trench, two burials were found. One was in the side of the trench and was bypassed. But the other was in the middle of the pipeline’s path. Possible solutions include realigning the pipeline, but Craddick says he can do that just once.

The reason is that the big pipeline will carry water under a pressure of 200 pounds per square inch. This flow is so powerful that when it is forced to bend, it exerts a tremendous pressure, which is contained by concrete “reaction” or “thrust” blocks.

A series of jinks that required many blocks would guarantee a blowout, says Craddick.

So, he might be able to realign one section, but no more. The actual solution will be decreed by the state Historic Preservation Office after consultation with the Maui-Lanai Islands Burial Council.

In the past in Waimea, the council has favored burial in place rather than removing ancient burials. The burials had been paved over without being noticed. A 1994 consultant’s report did not find them either.

However, because of the likelihood of finding old burials in the Waimea dunes, questions were raised, and a supplemental report was prepared in 1995.

The state says it has no record of ever receiving that report. “It was a mistake we made,” says Craddick.

If the state should force the county to send the pipeline “wigwagging” down the highway, Craddick says, the burials the realignment is meant to preserve would be destroyed anyway.

When the pipeline blows, the rush of water will “eat through the sand,” and “the crater will be so big, all archaeological evidence will be swept away.”

About 1,600 feet of road remains to be excavated for the big pipe. After that, the route turns up the mountain, and in that terrain it is hoped that burials will be rare or absent.
Craddick to abide by burial guidelines

By VALERIE MONSON

Staff Writer

WAILUKU -- Water Supply Director David Craddick said Thursday he will abide by state recommendations to keep the North Waihee waterline away from the sensitive sand dune areas on the makai side of Kahekili Highway, and described how he plans to gently bend the pipe around any mauka burials that may be encountered during future trenching.

Those statements were made during an occasionally heated 90-minute presentation before the Maui/Lanai Islands Burial Council in the Planning Department building.

Despite criticism about a Mainland firm he had brought in, by the end of the session Craddick was complimented for his proposal to preserve in place any human skeletons.

"I congratulate you," said Chairwoman Dana Naone Hall when told about the revisions.

Craddick must now put his words in writing and submit those plans to the State Historic Preservation Division of the Department of Land and Natural Resources for acceptance before work can resume. Because the preservation division had not received or approved an updated archaeological survey from the Board of Water Supply, it ordered that construction be halted two weeks ago after two ancient burials were disturbed during unauthorized digging. Division officials also said that any future trenching should be conducted mauka of the highway because the sand dunes on the makai side were known to contain unmarked burials and cultural artifacts.

One of the recent burials unearthed was discovered mauka and the other makai.

The first phases of the project will have a 24-inch pipeline running 4.3 miles through Waihee and Waiehu connect with two wells that were drilled in 1981. The additional water is needed to reduce stress on the lao aquifer, which is in danger of being overtapped. A 12-inch companion pipeline along the same route is also in the plans.

Water Supply Department officials continued to insist Thursday that an updated report had been sent to the Historic Preservation Division and must have been lost. Hall reminded them that the division had not asked for the report just once, but had made repeated documented requests for the paperwork over a two-year period to both Craddick and the Department of Public Works and Waste Management. Craddick again pleaded innocent.

"We were under the impression that all permits were approved," he said. "We now know they weren't. I don't want to say that's an excuse for not doing our job, but that's what happened."

The Burial Council echoed the preservation division's concerns by officially voting to recommend that future trenching be confined to the mauka side of the highway. The panel also
passed a motion to recommend that, in the future, an easement farther up on the mauka side should be obtained by Maui County, the Board of Water Supply, the Department of Hawaiian Home Lands or any other entity that has future plans to route utilities or pipelines through the area.

Both actions were unanimous among the five members who voted: Hall, Leslie Kuloloio, Charles Kauluwehi Maxwell Sr., Akoni Akana and Sam Kalalau. James Murray abstained, while Mercer "Chubby" Vincens had to leave and missed both votes. Loretta Hera of Lanai was not present.

When questioned what he would do next, Craddick said he "doesn't intend to" go makai into the sand dunes even if burials are found mauka during construction. He said he wants to test for any possible burials before starting work again "to incorporate their presence in aligning the pipeline." That would allow workers to plan the entire trench and gently shape the waterline around any burials rather than encounter a skeleton during digging and be forced to abruptly detour the pipe at sharp angles. Craddick fears the last scenario could lead to increased pressure on the joints, resulting in destructive blowouts.

Hall said later that Craddick should remember that any remains discovered during testing must still be reported to the Historic Preservation Division and discussed before the burial council.

Kuloloio and Maxwell were both visibly upset about a Mainland consultant brought in to perform "ground-penetrating radar" surveys to locate unknown burials. Rowland Cromwell, a geophysicist for Golder Associates of Redmond, Wash., admitted that while the technology can detect disturbances below the surface, it can't actually distinguish a group of rocks from human bones.

"It (the system) cannot prove or disprove the existence of a burial," conceded Cromwell.

"Then I don't know what you came here for," responded Kuloloio.

Craddick said the company and its sensing devices were brought in "because they can detect things underground. They can't tell the difference between rocks, nails or bones" but they can register signals that can be followed up by archaeological subsoil testing to see if burials are present. That would limit the number of random excavations.

Cromwell wanted members to know that "this machine is not to replace archaeologists or the burial council. It's a tool to aid the county in its decisions on where to send the archaeologists first."

After only one day on Maui, Cromwell said early radar suggests disturbances both mauka and makai of the highway in the pipeline's path. Hands-on testing by archaeologists will follow.

Maxwell was especially concerned that if the company compiles a high-tech listing of grave sites, it could lead to vandalism or the robbing of bones.

Craddick said the contract to Golder Associates was for $5,000.
Water department accused of violating burial site guidelines

By VALERIE MONSON
Staff Writer

WAIHEE -- At least one of the ancient burials recently unearthed during the digging of a water main in Waihee by the Department of Water Supply might have been left in peace had repeated orders by the state Department of Land and Natural Resources been followed, according to Dana Naone Hall, chairperson of the Maui-Lanai Islands Burial Council.

Because Water Director David Craddick did not submit an acceptable archaeological survey to DLNR before construction began, neither the state nor the burial council had an opportunity to give the project the green light. Construction of such a project is forbidden by law without the approval of the State Historic Preservation Division of DLNR.

But Craddick admitted that digging began in January, without that approval.

"The burials and another cultural layer that was also encountered were affected, perhaps needlessly, because the review process had not been completed," said Hall. "This was clearly a violation of the law."

The pipeline is to carry water to Central Maui from a new well in Waihee. The county has been under pressure to open up another well to alleviate the demand on the central Iao aquifer, which some believe is in danger of being overtapped. The state Commission on Water Resources Management is still considering plans to take over the county's management of the aquifer, a move that the business community and Mayor Linda Crockett Lingle strongly oppose.

To obtain a stream channel alteration permit for the project in March of 1995 from DLNR Chairman Michael D. Wilson, Craddick had to sign papers along with the co-applicant, a representative of C. Brewer Homes Inc. One of the conditions was that an updated survey needed to be submitted and approved by SHPD before digging could begin.

Craddick said last week that his department had sent in the survey, as required, but later in the interview, he admitted that "the archaeological work was not in final form." DLNR officials wrote to Craddick, as recently as Feb. 3, that an acceptable survey had not been received and continued to ask the water department to comply.
Hall claims that, had the report been completed and sent out for comment before approval, the human remains uncovered might have been avoided.

In December of 1994, SHPD had requested an updated archaeological inventory survey from the county for review. The county was planning to dig in an area mauka of the road as well as on the makai side, where it was already well known that numerous Native Hawaiian burials and artifacts were contained in the sensitive sand dune area.

When reports of trenching reached Honolulu, officials were caught off guard.

"Our office was surprised to learn that they had begun the construction work," said Sara Collins, state archaeologist for Maui.

Although SHPD continued to ask for the updated survey, Craddick said he thought it had been completed.

"Let's put it this way," said Craddick when asked to comment on the missing report, "DLNR said they didn't receive it."

Craddick also told The Maui News that, in the future, he believes if burials are encountered in the area in construction of the pipeline, they should be moved.

"It's not his call," said Hall.

Once the two burials had been disturbed, SHPD administrator Don Hibbard ordered the project stopped via fax on Feb. 3. Craddick claimed this week that he had already halted the project the day before, but Hall disputed that.

In his Feb. 3 letter, Hibbard called commencement of the construction work at the site "premature" and said it "already had an 'adverse effect' on significant historic sites in the project area."

Hall was also concerned that permits needed for construction might have been issued. On Dec. 24, 1996, Hibbard asked engineer Bert Ratte of the county Land Use and Codes Administration "that the permit be held until we have an opportunity to submit our recommendations . . . ." Ratte refused to comment and referred all questions to Charles Jencks, director of Public Works and Waste Management for Maui County.

When contacted Wednesday, Jencks said that grading permits were not required for the project, but that a plumbing permit was. When asked if his department had issued a plumbing permit, Jencks said he didn't know, but he would get the information to The Maui News. He has yet to do so.
AGENDA

FOR THE MEETING OF THE
COMMISSION ON WATER RESOURCE MANAGEMENT

DATE: February 18, 1997
TIME: 8:00 a.m.
PLACE: DLNR Board Room

1. Minutes of the January 23, 1997 meeting.

2. Old Business/Announcements

3. City and County of Honolulu, Department of Transportation Services, Request for Extension to Stream Channel Alteration Permit, Reconstruction of a Bikeway Bridge, Kaelepu Stream, Kailua, Oahu (TMK:4-3-10:84)

4. Department of Transportation, Application for a Stream Channel Alteration Permit, Construction of Bridge Abutments, Footing and Wing Walls For a Highway Widening Project, Pohakea Stream, North Kihei, Maui, (TMK 3-6-01:1,4 and 3-8-5)

5. Maui Board of Water Supply, Extension of Permit, North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03), Request to Install 1050 gpm Pumps for Domestic Use, TMK 3-2-1:4, Waihee, Wailuku, Maui

6. Maui Board of Water Supply, After-the-Fact Application for Well Permit, Kepaniwai Well (Well No. 5332-05), Pump Replacement: 700-gpm Pump for municipal use, Wailuku, Maui, TMK 3-3-3:5

7. Hawaii Country Club, Application for a Water Use Permit, Hawaii Country Club Well (Well No. 2603-01), TMK 9-4-2:8, Modification of Water Use Permit for Future Golf Course Irrigation Use for 1.0 mgd, Waipahu-Waiawa Ground Water Management Area, Oahu

8. Luana Hills Country Club (formerly Royal Hawaiian Country Club), Transferral of Water Use Permits, Royal Hawaiian Wells (Well Nos. 2145-01 and 2045-06), TMK 4-2-8:001 & 4-2-9:001, Waimanalo Ground Water Management Area, Kailua, Oahu
Agenda
Commission on Water Resource Management

9. Honolulu Board of Water Supply, Application for a Water Use Permit, Nuuanu Aerator Well, (Well No. 2149-03), TMK 1-09-07:2, Future Municipal Use for 0.5 mgd, Nuuanu Ground Water Management Area, Oahu

10. The Estate of James Campbell, Modification of a Water Use Permit, EP 7, 8 Well (Well No. 2202-15 to 20), TMK 9-1-17:04, Future Nonpotable Urban Use for 1.142 mgd, Waipahu-Waiawa Ground Water Management Area, Oahu

11. Land Process Service Corporation, Revocation of Water Use Permit, LandPro Well (Well No. 1849-07), TMK 2-8-09:76 for 0.001 mgd, Nuuanu Ground Water Management Area, Oahu

12. Other Business

Materials related to items on this agenda are available for review at our office at 1151 Punchbowl Street, Room 227, and also will be available at the meeting.

Any person may testify or present information on any meeting agenda item, unless the item involves a proceeding in an existing contested case. In addition, if you have a legal interest that may be adversely affected by the proposed action, you may have a right to an administrative contested case hearing. You must make the request for such a hearing either orally or in writing at the public hearing or meeting for which this notice is given. Hawaii Administrative Rules (H.A.R.) Section 13-167-52(a).

If you request a contested case hearing, you will have the opportunity to present to the Commission oral or written evidence or testimony or both to establish your standing. You may present your testimony or evidence on standing at the meeting or public hearing described above or, alternatively, at a hearing set by the Commission at a later date.

If you request a contested case hearing either orally or in writing, you must also complete and file (or mail and postmark) a written petition for a contested case with the Commission within ten days after the date of the public hearing or meeting noticed here. Petition forms are available from the Commission. H.A.R. Section 13-167-52(a).

If you do not make such a request or fail to file a timely written petition with the Commission, the consequence is that you will be precluded from later obtaining a contested case hearing and seeking judicial review of any adverse decision. H.A.R. Chapter 13-167.

Disabled individuals planning to attend the public hearing or meeting are asked to contact the Commission at the above address or phone (Kauai) ext. 70214, (Maui) ext. 70214, (Hawaii) 974-4000 ext. 70214, (Molokai or Lanai) 1-800-GOV-INHI ext. 70214 or 587-0214 to indicate if they have special needs which require accommodation.
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

February 18, 1997
Honolulu, Oahu

Maui Board of Water Supply
Extension of Permit
North Waihee Wells 1 & 2, (Well Nos. 5631-02 & 03)
Request to Install 1050 gpm Pumps for Domestic Use
TMK 3-2-1:4 Waihee, Wailuku, Maui

APPLICANT: Maui Board of Water Supply
P.O. Box 1109
Wailuku, HI 96793

LANDOWNER: Same

ACTION REQUESTED:

Extension of pump installation permit four months, from March 1, 1997 to July 1, 1997, for installing a 1050 gpm (gallons per minute) pump in each of two North Waihee Wells for private municipal use.

LOCATION: See Exhibit 1. DIMENSIONS: See Exhibit 2.

BACKGROUND:

March 25, 1993 Pump Installation Permits for North Waihee Wells 1 & 2 were issued. Due to delays in other aspects of the residential development project, action on the permits was also delayed. Several requests for extension of the start date were made and administratively approved.

March 1, 1995 Pump Installation Permits were extended, with a new expiration date of March 1, 1997. The start date was set to expire in two months, to require applicant to return to the Commission if delays continued. The permits were issued March 14, 1995.
Nov. 14, 1995  Following three separate two-month extensions of the start date, all of which went to the Commission for action, the Commission denied further extension of the start date, allowing for revocation of the permit as of January 13, 1996, unless the site ownership was successfully transferred and a schedule of actual installation work was provided to the Commission.

January 24, 1996  The Commission rescinded the revocation of the permit, as its conditions for doing so were met. Transfer of the permit was duly recorded. In a separate action concerning designation of Iao Aquifer as a water management area, action milestones were set in place, including a start deadline for pump installation at North Waihee (Phase 1 - first well/1.5 mgd) of November 1, 1996. On March 18, 1996, staff received a written request for a two-month start date extension under the original permit extension, with a work schedule attached; the extension was accepted administratively, from May 14, 1996 to July 14, 1996. Another written request was submitted June 10, for a start date extension to September 14, 1996; no staff action was taken at this point in view of the November 1, 1996 deadline set under the Iao milestones.

December 9, 1996  Staff received a letter from the applicant 1) indicating that a notice to proceed had been issued October 14, 1996; and 2) requesting an extension of the permit beyond the original March 1, 1997 deadline to June 16, 1997 to be consistent with a new contract schedule of work. BWS staff indicated that the contractor was beginning to marshal materials and grub the site, while a shipping delay meant that the pump would be installed in February 1997.

At a meeting on Maui to discuss designation of the Iao Aquifer, the Commission approved new action milestones, including commencement of work on pump installation by February 1, 1997, with evidence to be provided by February 8, 1997.

WATER AVAILABILITY:

Waihee Aquifer System (at Iao System boundary) of Wailuku Sector.
Estimated Sustainable Yield: 8 mgd. Existing Use: none.
Proposed Use: 2-3 mgd.
Anticipated pump capacity: 1050 gpm.
ISSUES/ANALYSIS:

The wells will develop fresh, basal water for municipal use. The wells' static head currently stands about 7-8 feet above sea level. Pump tests have demonstrated that the drawdown from heavy pumping is relatively minor, with full recovery nearly instantaneous. Salinity is very low. Recent work by USGS indicates that these wells interact with the lao Aquifer system and that current water levels and well depths may limit the capacity to produce water from these wells with chlorides below 250 mg/l. The applicant has chosen to reduce the pump size from 1400 to 1050 gpm, with the expectation that the total safe yield from these wells is probably closer to 3 mgd than the original prospective 4 mgd. Phase 1 will install the first pump in one of two wells, with capacity of 1.5 mgd; Phase 2, to install a pump in the other well for a total capacity of 3 mgd, is scheduled about four months behind Phase 1.

John Mink believes that there should be no stream effects because the stream channel in this vicinity is 200 feet above sea level.

While the BWS witnessed the lengthy period of failure to perform on this permit by the previous permittee and the Commission's determination to have the project problems resolved, the BWS has continued to make optimistic estimates of time for completing this project. The Commission has accommodated new work schedules by the applicant, extending the start date for twice the normal period once the permit was transferred.

RECOMMENDATION:

A. That the Commission authorize the Chairperson to extend the pump installation permit for North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) for four (4) months, to July 1, 1997, based upon evidence that work actually started.

Respectfully submitted,

RAE M. LOUI
Deputy Director

Exhibit(s) 1 (Location Map)
2 (Proposed Well Section)
Waihee 1&2
(Well No. 5631-02,03)

PROJECT LOCATION
Briefly describe the proposed work:

Subject wells were drilled and tested between March and August 1981.

PROPOSED SECTION OF WELL

Elevation at top of casing: 284 ft., msl.

Cement Grout: 200 ft.

Hole Diameter: 20 in.

Total Depth: 363 ft.

Rock Packing: 108 ft.

Ground Elevation: 283 ft., msl.

Solid Casing: ASTM Designation A-242
USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 289 ft.
Diameter 16 in.
Wall thickness 0.3125 in.

Casing: Perforated Screen
USS Cor-ten, Kaiser
Material Steel Kaisaloy
Length 20 ft.
Diameter 16 in.
Wall thickness 0.25 in.
Openings 100 sq. in./A.F.

Open Hole:
Length 79 ft.
Diameter 15 in.
DATE: 07/15/96

TO: Rae Lani, Dep. Dir

CWRM

Fax No. 801-02-19

Subject: N.Waiehu Evaluation on Dispute
         between Wailehu AquaBus/DWS

No. of Pages (including this transmittal): 5

REMARKS:

Transmitter: D. W. Donaldson

NOTE: If you have not received all of the pages, please call

       (808) 243-7816
January 8, 1996

Mr. David Craddick  
Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, Maui, Hawaii 96793

RE: C. BREWER HOMES & MAUI BOARD OF WATER SUPPLY

Dear Mr. Craddick:

In response to your letter of December 18, 1995, I submit the following information.

Pursuant to the Letter of Engagement, I agreed to serve as Evaluator on the dispute between Wailuku Agribusiness Co., Inc. and the Board of Water Supply concerning the Waihee Aquifer. The scope of my work was spelled out to be:

1. Assess the land and water resource, based on information provided by the parties or requested of the parties by the evaluator.

2. Assess the positions of the parties concerning the nature and scope of compensability for the value of the resources under consideration and the methods to quantify the value.

3. If requested by the parties, provide direction to the parties as to possible avenues and methods to narrow the gap in the positions of the parties, if any.

I met with the representatives of Wailuku Agribusiness and the Board of Water Supply on two occasions, July 17, 1995 in Wailuku, and again on August 10, 1995 in Honolulu at my office. The initial meeting was to enable me to gain a better understanding of my
role as an evaluator and to adopt a briefing schedule for the parties.

Pursuant to a schedule established, briefs were submitted to me by the parties. Subsequent to reviewing the briefs and forming an understanding of the issues from the parties, I met with the Board of Water Supply representatives; John S. Rapacz, Esq., Deputy Corporation Counsel; Marie Kimmey, AIA; J. Alan Kugle, Executive Vice President/General Counsel of C. Brewer; Pete Moynahan, President/Chief Executive Officer of C. Brewer; and Paul Mancini, Esq., representing Wailuku Agribusiness.

During these sessions, I gained an understanding of the goals of the parties and perception each party had on legal and factual issues. In my discussions with the parties, I formulated and expressed to them an opinion that condemnation of the property by the Board pursuant to Eminent Domain powers would undoubtedly meet with vigorous resistance by Wailuku Agribusiness and would clearly not meet the objectives that each of the parties had established. It would be an unsatisfactory solution based on the considerable costs involved, the time consumed, and the great uncertainties for both parties. I emphasized to the parties that because of the more than 20 years of litigation involved in the Hanapepe litigation, there exists considerable confusion regarding the law on water rights in the State of Hawaii. Particularly with the wide split between Federal and State courts, there is great confusion presently because of this conflict. The valuation matter would also involve a battle of experts over valuation.

For these and other reasons, I explained that I did not believe, and they both concurred that a judicial resolution would not satisfy the business and political objectives of each of the parties. I suggested that the parties compromise their positions to resolve the valuation matters at hand. I understand that this has been accomplished and the matter is now proceeding to closing.
I congratulate the parties on their ability to focus on the issues and to come to a resolution which I believe serves both purposes of the private and public sectors in a reasonable manner.

Very truly yours,

FONG & FONG
Attorneys-at-Law

By

ARTHUR S.K. FONG

ASKF:jfm
December 18, 1995

Mr. Arthur S.K. Fong  
FONG & FONG  
Attorneys At Law  
Grosvenor Center, PRI Tower  
733 Bishop Street, Suite 1550  
Honolulu, Hawaii 96813-4006

Dear Mr. Fong:

We would like to request a write-up on your analysis of the N. Waihee evaluation performed for the Board of Water Supply and C. Brewer.

We would pay for the write-up at the previously agreed rate. This write-up is needed for the record.

Your early response is greatly appreciated.

Sincerely,

[Signature]

David Craddick, Director  
DC/jaw
FROM: [Signature]
DATE: 6/17
SUSPENSE DATE

TO: BAUER, G.   LOUI, R.   FOR: Approval
TO: CHING, F.   NAKAMA, L.   Signature
TO: FUJII, N.   NAKANO, D.   Information
TO: HARDY, R.   OHYE, M.   PLEASE:
TO: HIGA, D.   SAKODA, E.   See Me
TO: HIRANO, E.   SUBIA, S.   Review & Comment
TO: ICE, C.   SWANSON, S.   Take Action
TO: JINNAI, R.   UWaine, J.   Type Draft
TO: KUNIMURA, I.   YODA, K.   Type Final

PUBLIC FOR BID: July 5
OPENING DATE: Aug 8
AWARD BID: Aug 26
NTP: Sep. 17 Ed Mtg. 19 or 20

2 July: [Signature]
June 10, 1996

Mr. Michael D. Wilson, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii  96809

Dear Mr. Wilson:

Subject: Pump Installation Permit
North Waihee Wells 1 and 2
(Wells No. 5631-02 & 03)

We have reviewed our schedule and progress of the completed bid documents and have determined that our plans will not be completed in timely manner to meet the revised start date for the pump installation work.

We respectfully request an extension of two (2) months for a start date by September 14, 1996.

If there are any questions, please call our Engineering Division at [Redacted]

Sincerely,

[Signature]

David R. Craddick
Director

hk
March 15, 1996

Honorable Rae M. Loui
Deputy to Chairperson
State of Hawaii
Department of Land & Natural Resources
Commission on Water Resource Management
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Loui:

In response to your letter of March 12, we offer the following:

1. Enclosed are copies of Exhibits A & B for the Unemori Contract showing preparation of the bid package for the North Waihee well development were included in the contract;

2. Colored copy of attachment to, and documentation of the extension of the December 21, 1995 Closing Agreement with Wailuku Agribusiness;

3. Item #4 requests information regarding the relationship the "Purchase Agreement dated December 21, 1995 and the Grant of Easement for North Waihee Wells.

The Purchase Agreement referred to is the Closing Agreement. The Closing Agreement was used to outline each parties position prior to final agreement. After a due diligence period, the "deal" documents were executed and consideration given. "Deal documents" include:

- Limited Warranty Deed
- Co-Tenancy Agreement and Agreement for Restrictive Covenants;
- Grant of Easement (Well Field 1);
- Release and Quitclaim of Right in Easement Area (Well Fields 2 and 3);
- Grant of Easement (Well Fields 2 and 3);
- Notice of Agreement;
- Declaration of Restrictive Covenant.

"By Water All Things Find Life"
The Grant of Easement gives the Board of Water Supply (BWS) the unfettered right to drill and develop water on a number of sites and the right to relocate sites, if required. The Limited Warranty deal with the purchase of a portion of North Waihee watershed property (A-1 on Item 2) and a Conservation Easement for a portion of the South Waihee watershed and portions of Waiehu watershed (A-2 on Item 2).

Water Source credits are not being given to anyone in these agreements. There is a provision for participation with Brewer after 5 MGD of water is developed.

Item #5 and #6 are enclosed for your review.

The contract for installation of pumps into the Hamakuapoko Wells has been executed and a contract for an EIS Supplement has been executed. The pumps will be used for testing only until DOH & OEQC requirements have been met.

The Haiku Well is not connected to the Central Maui System and cannot be used to reduce Iao demand.

We hope these answers satisfy your requirements.

Sincerely,

[Signature]

David Craddick, Director

DC/jaw

Copy: Marie Kimmey, BWS Chairperson
      George Y. Tengan, Deputy Director
WARREN S. UNEMORI ENGINEERING, INC. will proceed through a series of tasks comprising of the design of the development of the North Waihee Wells. The scope of the work is described in the attached letters.
Mr. David Craddick, Director
Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick,

Subject: North Waihee Wells Development

In response to your request of December 4, 1995 we are pleased to submit this proposal to complete the work necessary to finalize plans and specifications for the following:

PHASE I. INSTALLATION OF 24 INCH TRANSMISSION LINE ON KAHEKILI HIGHWAY BETWEEN KUHINIA STREET AND WELL SITE ACCESS ROAD. ALSO 16 INCH TANK FEEDER LINE BETWEEN WELL SITES 1 AND 2 AND KAHEKILI HIGHWAY

Scope of Services in Proposal to C. Brewer Homes, Inc.:

  - Work Completed to Date:
    1.1 Conducted topographic survey of Kahekili Highway between project limits. Located existing water meters, water lines, fire hydrants, valves, culvert crossings, sidewalks, driveways, poles, etc.
    1.2 Developed topographic map therefrom plotting adjoining property boundaries, driveways, etc.
    1.3 Developed approximate right-of-way line for Kahekili Highway based on adjoining property descriptions and right-of-way maps available.
    1.4 Conducted topographic survey of access road between Well Site 1 and 2 and Kahekili Highway.
Task 2. Engineering Design Services.

Work Completed to Date:

2.1 Met with client, SDOT, and DWS to discuss objectives and scheduling of project.

2.2 Developed plan and profile for waterline along Kahekili Highway and Waihee Stream crossing.

2.3 Determined size of waterline needed to deliver minimum of 8 MGD, allowing for reasonable head losses.

2.4 Developed details for stream crossing and typical trench and pavement sections.

2.5 Developed construction traffic control plan per State DOT standards.

2.6 Submitted construction plans to State DOT and Department of Water Supply for approval. (First Submittal)

Work Remaining:

2.7 Incorporate agency comments after first review and resubmit for final.

2.8 Prepare NPDES permit application and Best Management Practice BMP plan for trench bewatering and submit to DOH for approval.

2.9 Develop technical specs.

2.10 Develop cost estimate.

2.11 Develop contract bid documents.

2.12 Assist client with the bidding and bid review process.
Task 3. Installation of 16 Inch Tank Feeder Line Between Well Sites 1 and 2 and 24-inch Line on Kahekili Highway.

Additional Work:

3.1 Develop plan and profile for 16-inch tank feeder line along existing access road.

3.2 Develop plans for temporary connection between 16-inch tank feeder line and 24-inch transmission line on Kahekili Highway.

Task 4. Temporary Connection Between 24-inch Transmission line on Kuhinia Street and existing Distribution System on Kahekili Highway.

Additional Work:

4.1 Prepare plans to connect new 24-inch transmission line to the existing 8-inch line on Kanekili Highway south of Kuhinia Street intersection.

4.2 Prepare plans to install pressure regulator assembly between the 24-inch transmission line and Waihee Village distribution system north of Kuhinia Street.

COMPENSATION

We propose to provide the above mentioned remaining and additional work for the following fees:

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<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
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</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Engineering Design Services</td>
<td>$12,000</td>
</tr>
<tr>
<td>3.0</td>
<td>16-inch Feeder Line along Access Road</td>
<td>$12,000</td>
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<tr>
<td>4.0</td>
<td>Temporary Connection on Kanekili Highway in Vicinity of Kuhinia Street</td>
<td>$2,000</td>
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SUBTOTAL - PHASE I: $36,000
PHASE II. DEVELOPMENT OF NORTH WAIHEE WELLS 1 AND 2

Scope of Services in proposal to C. Brewer Homes Inc.

• Task 1. Civil Engineering.

  • Work Completed to Date:

  1.1 Prepared well site grading plan.

  1.2 Prepared site plan showing layout of equipment building, generator, electrical transformer pad and driveway.

  1.3 Prepared site drainage plan.

  1.4 Prepared plans to pave well site and access driveway.

  1.5 Prepared fencing plan to secure well site.

  1.6 Designed equipment building to house chlorinator, MCC, diesel generator and JCHSA system.

  1.7 Coordinated work with electrical and mechanical subconsultant and submitted plans and specs for agency review. "First Submittal

  • Work Remaining:

  1.8 Incorporate agency review comments and resubmit plans and specs for final approval of PW, IWS, JCH, and JLN.

  1.9 Prepare engineering report for approval by DOH Clean Water Branch.

  1.10 Prepare technical specs, proposal, and contract bid documents.

  1.11 Assist client solicit and review bids.
Mr. David Craddick  
North Waihee Wells Development  
December 7, 1995  
Page 5

• Task 2.  Mechanical and Electrical Engineering.

  • Work Completed to Date:

    2.1 Prepared plans for deepwell pumps to be installed in existing wells.

    2.2 Prepared plans for two sets of discharge piping, control valves, flow switches, solenoid valves, and well level recording devices.

    2.3 Designed chlorination system, exhaust air system, compressor, and flow meter assembly.

    2.4 Prepared plans for Motor Control Center (MCC), electrical conduits and wiring, incoming power ducts and transformer pad, and meter system.

    2.5 Prepared plans for emergency generator, automatic transfer switch and concrete mounting pad for same.

    2.6 Prepared plans for SCADA and telemetry system.

• Task 3. Geologist (John Mink)

  • Work Remaining:

    3.1 Provide general advice on setting for installation of pumps in North Waihee Wells 1 and 2.

    3.2 Write protocol for engineering report to be submitted to DOH.

    3.3 Oversee pumping tests on these wells.

• Task 4. Temporary Pump Control for Wells 1 and 2 and Connection to Existing Distribution System.

  • Additional Work:

    4.1 Run pipe analysis to determine capacity of existing system.
4.2 Evaluate pump curve to determine whether deep-well pump needs to be modified for temporary hook-up to existing low level water system.

4.3 Prepare plans and specifications for temporary pump control between Wells 1 and 2 and Waiehu Heights Tank.

COMPENSATION

We propose to provide the above mentioned remaining and additional work for the following fees:

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<td>Civil Engineering</td>
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<tr>
<td>2.</td>
<td>Mechanical and Electrical Engineering</td>
<td>$7,000</td>
</tr>
<tr>
<td>3.</td>
<td>Geologist</td>
<td>$12,000</td>
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<tr>
<td>4.</td>
<td>Temporary Pump Control Between Wells 1 and 2 and Waiehu Heights Tank</td>
<td>$4,200</td>
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SUBTOTAL - PHASE II: $25,700

TOTAL FEE PROPOSED - PHASES I AND II: $40,500

The State GET (4.167%) will be added to all fees.

DIRECT EXPENSES

Cost of printing approved plans, specifications, and addenda for bidding purpose shall be reimbursed at invoiced amount. Suggested budget amount for this purpose is: $5,400.
SCHEDULE OF PERFORMANCE

We propose to complete the above described remaining and additional work in Phases I and II within sixty (60) calendar days following receipt of the written Notice to Proceed, exclusive of review time by governmental agencies.

This proposal has been prepared with the understanding that the following services will be provided by the Department of Water Supply or other consultants retained by the Board for the project:

2. Environmental Assessment.
5. Soil Engineering, if required.

Thank you for giving us the opportunity to submit this proposal. If you have any questions, please call us. We look forward to receiving authorization to complete the design of Phases I and II of the project.

Sincerely,

[Signature]

Warren E. Wmemori
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
300 South High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick,

Subject: North Waihee Wells Development

This proposal is being submitted to complete the unfinished scope of services for Phases III, IV, and V of subject project as requested in your letter of November 22, 1995. The proposal for Phases I and II, which had a higher urgency, was submitted yesterday.

The scope of services for Phases III, IV, and V are as follows:

PHASE III. INSTALLATION OF 24 INCH TRANSMISSION LINE BETWEEN KUHINIA STREET AND THE CMIV 1.0 MG RESERVOIR IN UPPER WAIEHU

Scope of services in proposal to J. Brewer Homes, Inc.

Task 1. Surveying Services

• Work Completed to Date:

  1.1 Established horizontal and vertical survey controls along transmission line route between Kuhinia Street and "MV" well source.

  1.2 Conducted topographic survey of transmission line route including quick crossings, and developed topographic map therefrom.

• Work Remaining:

  1.3 Develop metes and bounds descriptions and maps for transmission line easement between Kuhinia Street and CMIV well source.
Task 2. Engineering Design Services

- **Work Completed to Date:**

  2.1 Set up preliminary plan and profile work sheets for transmission line.

  2.2 Prepared exhibits for stream alteration permit at four (4) drainage crossings.

- **Work Remaining:**

  2.3 Finalize plan and profile of water system.

  2.4 Design drainage structure at Waiehu Stream and Kope Gulch crossings.

  2.5 Develop typical details of pavement section and construction traffic control plan for Malaihi Road in Upper Waiehu.

  2.6 Prepare plan of water system details.

  2.7 Prepare plans for connection to existing 1.0 MG Upper Waiehu Reservoir.

  2.8 Develop technical specs, cost estimate and contract bid document.

  2.9 Submit plans and specs for agency review.

  2.10 Address review agency comments and resubmit plans for final approval.

  2.11 Prepare NPDES permit application and Best Management Practice (BMP) plan for stream crossing and disposal of water from hydrotesting and rewatering.

  2.12 Assist client with the bidding and bid review process.
Mr. David Craddick
North Waihee Wells Development
Phases III, IV, and V
December 8, 1995
Page 3

COMPENSATION

We propose to provide the above mentioned remaining services for the following fees:

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<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
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<tr>
<td>1.</td>
<td>Surveying Services</td>
<td>$3,000</td>
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<tr>
<td>2.</td>
<td>Design Engineering Services</td>
<td>$128,000</td>
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SUBTOTAL - PHASE III: $137,000

PHASE IV. CONSTRUCTION OF 0.5 MG CONTROL TANK AND SITE IMPROVEMENTS, INCLUDING GRADING AND PAVING OF TANK SITE AND ACCESS ROAD, INSTALLATION OF 24 INCH INFLOW AND OUTFLOW LINES AND DRAINAGE SYSTEM

Scope of services in proposal to C. Brewer Homes, Inc.

Task 1. Surveying Services

- Work Completed to Date:

  1.1 Established horizontal and vertical survey controls along tank access road and at tank site.

  1.2 Conducted topographic survey of 0.5 MG tank site.

  1.3 Conducted topographic survey of access road to tank site.

  1.4 Developed topographic map therefrom.

- Work Remaining:

  1.5 Develop subdivision map to cut out tank site from TMK 1-2-01:03 following establishment of the tank site limits.

  1.6 Prepare easement for tank access road.
1.7 Prepare metes and bounds description for tank site and tank access road easement.

1.8 Prepare subdivision application and transmit to DWS for submittal to LUCA for processing.

Task 2. Design Engineering Services

• Work Remaining:

2.1 Prepare mass grading plans for tank site and access road.

2.2 Prepare plans for tank access road.

2.3 Prepare drainage and soil erosion control report.

2.4 Prepare drainage plans for tank site and access road.

2.5 Prepare fencing plans to secure tank site.

2.6 Coordinate plans with MECO to extend overhead power to tank site for booster pumps.

2.7 Prepare Best Management Practice (BMP) Plan and NPDES permit application.

2.8 Prepare plans to construct 7.6 MG reinforced concrete control tank with required piping, valves, and appurtenances.

2.9 Prepare plans to install concrete diversion ditch, concrete gutter, drainage system, and pavement around reservoir site.

2.10 Prepare plans to construct equipment building to house MCC, ICADA, and telemetry systems.

2.11 Prepare plan and profile for separate 14-inch inflow and outflow lines between Kanekili Highway and 7.5 MG control tank.
2.12 Prepare specs, cost estimate, and contract bid documents.

2.13 Submit plans and specs for agency review.

2.14 Address review agency comments and resubmit for final approval.

2.15 Assist client with the bidding and bid review process.

COMPENSATION

We propose to provide the above mentioned remaining services for the following fees:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Surveying Services</td>
<td>$12,500</td>
</tr>
<tr>
<td>2.</td>
<td>Design Engineering Services</td>
<td>$119,500</td>
</tr>
</tbody>
</table>

SUBTOTAL - PHASE IV: $132,000

PHASE V. BOOSTER PUMP STATION AT CONTROL TANK SITE AND SCADA TIE-IN AT DWS BASEYARD IN KAHULUI.

- **Task 1:**

  1.1 Prepare plans for two (2) short-coupled vertical booster pumping units.

  1.2 Prepare plans for two sets discharge piping, including control valves, flow switches, and solenoid valves.

  1.3 Prepare plans for Motor Control Center, electrical conduits and wiring, incoming power ducts and transformer pad, and metering system.

  1.4 Prepare plans for emergency generator, automatic transfer switch and concrete pad.
1.5 Design new instrument house to be located at Upper Waiehu Reservoir to house all SCADA and telemetry equipment, electrical and mechanical work.

1.6 Prepare plans to integrate SCADA system with Department of Water Supply's existing SCADA system.

1.7 Prepare cost estimate, specs and contract bid documents.

1.8 Submit plans and specs for agency review.

1.9 Address review agency comments and resubmit for final approval.

1.10 Assist client in the bidding and bid review process.

COMPENSATION

We propose to provide the above mentioned remaining services for the following fee:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Design Engineering Services</td>
<td>$23,000</td>
</tr>
</tbody>
</table>

**SUBTOTAL - PHASE V:**  
$23,000

**TOTAL FEE PROPOSED - PHASES III, IV, AND V:** $238,700

The State GET (4.167%) will be added to all fees.
Mr. David Craddick  
North Waihee Wells Development  
Phases III, IV, and V  
December 8, 1995  
Page 7

DIRECT EXPENSES

Cost of printing approved plans, specifications, and addenda for bidding purpose shall be reimbursed at invoiced amount. Suggested budget amount for this purpose is: $5,000

SCHEDULE OF PERFORMANCE

We propose to complete the above described remaining and additional work in Phases III, IV, and V within one hundred fifty (150) calendar days following receipt of the written Notice to Proceed, exclusive of review time by governmental agencies.

This proposal has been prepared with the understanding that the following services will be provided by the Department of Water Supply or other consultants retained by the Board for the project.

1. Environmental Assessment.
2. Stream Alteration Permit.

We hope the foregoing reflects your understanding of the remaining work required to fully integrate Wells 1 and 2 with the TMJV transmission system. If not, please call us. We will be glad to meet with you to discuss any additional scope of services required.

Sincerely,

[Signature]

Warren G. Yamori
EXHIBIT B

TIME SCHEDULE

PHASE I AND PHASE II shall be completed within 60 days of the issuance on Notice to Proceed, exclusive of review time by governmental agencies.

PHASE III, PHASE IV, AND PHASE V shall be completed within 150 days of Notice to Proceed, exclusive of review time by governmental agencies.
GENERAL TERMS AND CONDITIONS OF CONTRACTS
OF THE DEPARTMENT OF WATER SUPPLY
FOR SERVICES OF CONSULTANTS

Section 1 - Definitions

1.01 Board
1.02 County
1.03 Consultant
1.04 Contract
1.05 Department
1.06 Director
1.07 HRS
1.08 Project

Section 2 - Award and execution of contract

2.01 Selection of consultant
2.02 Contract not binding unless properly executed
2.03 Agreements outside of the contract
2.04 Notice to proceed

Section 3 - Legal Relations and Responsibility

3.01 Independent contractor
3.02 Contracts by the consultant
3.03 Findings confidential
3.04 Ownership vested in department
3.05 Indemnity
3.06 Campaign contributions prohibited
3.07 Absence of interest
3.08 Laws, ordinances and codes, and rules
3.09 Arbitration
3.10 Professional liability insurance

Section 4 - Performance of contract

4.01 Time of performance
4.02 Delay
4.03 Liquidated damages
4.04 Prosecution of the work
4.05 Modification of contract
4.06 Authority of the director
4.07 Subcontracting or assignment of contract
4.08 Cooperation by the department
4.09 Use of department’s standards
4.10 Review by the department
Section 5 - Compensation

5.01 Compensation
5.02 Reduction or increase in compensation
5.03 Payments
5.04 Assignment of money due or payable

Section 6 - Remedies

6.01 Right of the board to suspend the performance of services
6.02 Right of the board to terminate the contract
6.03 Authority to withhold money due or payable
6.04 Remedies not exclusive

SECTION 1 - DEFINITIONS

1.01 "Board" means the Board of Water Supply, County of Maui.
1.02 "County" means the County of Maui, State of Hawaii.
1.03 "Consultant" means the individual, partnership, corporation, or joint venture engaged by the board to perform the services under the contract.
1.04 "Contract" means the written agreement covering the performance of certain professional services by the consultant. It shall include all referenced material, and all exhibits attached thereto and included therein. It shall also include all modifications of the contract by supplemental agreements thereto in writing and written orders of the director.
1.05 "Department" means the Department of Water Supply, County of Maui, including the Board of Water Supply.
1.06 "Director" means the director of the Department of Water Supply, County of Maui, or the director's representative.
1.07 "HRS" means Hawaii Revised Statutes.
1.08 "Project" means the undertaking under the contract.

SECTION 2 - SELECTION OF CONSULTANT AND EXECUTION OF CONTRACT

2.01 Selection of consultant. The consultant, upon being selected to render certain professional services for the project, will be notified of the consultant's selection by the director. The notice shall not be construed to be authorization to proceed with the performance of services.
2.02 Contract not binding unless properly executed. The contract shall not be binding or have any force until it has been fully and properly executed by all of the parties thereto, and the insurance policy required under subsection 3.10 is accepted by the director.

2.03 Agreements outside of the contract. The contract and this General Terms And Conditions Of Contracts Of The Department Of Water Supply For Services Of Consultants contain the complete understandings regarding the responsibilities of the department and the consultant, and as of the effective date of the contract, supersede all other understandings between the consultant and the department.

2.04 Notice to proceed. (a) The director shall issue a written notice to proceed, establishing the date on which the time of performance shall commence and authorizing the consultant to proceed with the performance of the consultant’s services.

(b) Services performed by the consultant prior to the date indicated in the notice to proceed shall be at the consultant’s own risk.

SECTION 3 - LEGAL RELATIONS AND RESPONSIBILITY

3.01 Independent contractor. The consultant shall perform the contract as an independent contractor. The consultant, the consultant’s subcontractors, agents, and employees shall not be entitled to the benefits and privileges of an employee of the county under the civil service system.

3.02 Contracts by the consultant. The consultant does not have the right to enter into any contract on behalf of or make any commitment on behalf of the department.

3.03 Findings confidential. Any report, information, or data prepared or assembled by the consultant under the contract shall not be made available to any individual or organization by the consultant without the prior written approval of the director.

3.04 Ownership vested in department. (a) Any and all data, information, field notes, designs, drawings, tracings, results, and any other thing derived or obtained directly or indirectly as a result of the contract shall be the sole and exclusive property of the department and the consultant shall not have any interest, right, or title in or to any of the foregoing.

(b) Prior to the release of retainage under subsection 5.03, or termination of the contract under subsection 6.02, the
consultant shall submit the items prepared pursuant to subsection (a) herein to the department.

3.05 Indemnity. The consultant shall defend, indemnify, and hold harmless the board, its officers, employees, and assigns, from and against any and all claims, suits, actions, injuries to persons, damages to property, and wrongful death, that may arise out of or in connection with any errors, omissions, or negligent acts by the consultant, the consultant’s subcontractors, agents, and employees, in their performance of the contract until such time as any action against the consultant is barred by Chapter 657 HRS, as amended, and shall reimburse the board, its officers, employees, and assigns, for any judgments, costs, and expenses, including attorney’s fees, incurred in connection with the defense of any such claim, or incurred by the board in enforcing this provision.

3.06 Campaign contributions prohibited. No portion of the consultant’s compensation under the contract shall be used for campaign contributions.

3.07 Absence of interest. The consultant covenants that it presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this contract. The consultant further covenants that in the performance of this contract, no person having any such interest shall be employed.

3.08 Laws, ordinances and codes, and rules and regulations.
(a) The consultant shall be fully informed of all applicable federal and state laws, county ordinances and codes, and federal, state, and county rules and regulations, which in any manner affect the contract and the performance thereof, including but not limited to:

(1) Article 1 of Title 10, Maui County Code, as amended, relating to the traffic code,

(2) Title 12, Maui County Code, as amended, relating to streets, sidewalks, and public places,

(3) Article 3 of Title 14, Maui County Code, as amended, relating to improvement districts,

(4) Chapter 16.04, Maui County Code, as amended, relating to the Model Fire Code,

(5) Chapter 16.08, Maui County Code, as amended, relating to the Housing Code,

(6) Title 19, Maui County Code, as amended, relating to zoning,
(7) Chapter 16.24, Maui County Code, as amended, relating to the Building Code,
(8) Chapter 16.16, Maui County Code, as amended, relating to the Electrical Code,
(9) Chapter 16.20, Maui County Code, as amended, relating to the Plumbing Code,
(10) Chapter 103, HRS, as amended, relating to expenditure of public money,
(11) Chapter 104, HRS, as amended, relating to wages and hours of employees on public works,
(12) Chapter 22 of Title 12, Hawaii Administrative Rules, relating to wage determinations
(13) Chapter 132, HRS, as amended, relating to the fire marshal,
(14) Chapter 321, HRS, as amended, relating to the Health Department,
(15) Chapter 343, HRS, as amended, relating to environmental impact statements.
(16) Chapter 178, HRS, as amended, relating to fair employment practices,
(17) Chapter 176, HRS, as amended, relating to industrial safety,
(18) Chapter 386, HRS, as amended, relating to workers' compensation,
(19) Chapter 396, HRS, as amended, relating to occupational safety and health.
(20) Section 507-17, HRS, as amended, relating to recovery on bond for materials and labor used on public works.
(21) Chapter 200 of Title 11 of the department of health, relating to environmental impact statements.
(22) Part 3 of Subtitle 8 of Title 12, Hawaii Administrative Rules, relating to construction standards.
(23) Article II, Special Management Area Rules and Regulations of the County of Maui.
(24) Title 19 of the Maui County Code, relating to zoning.
(b) If any discrepancy or inconsistency is discovered between the contract and any such law, ordinance, code, or rule, the consultant shall forthwith advise the director, in writing, of such discrepancy or inconsistency.

(c) The consultant shall comply with all such current laws, ordinances and codes, and rules.

(d) If, in part, the consultant's work includes the preparation of construction bid documents, the department's furnishing of the general conditions, and forms of the proposal, bid bond, contract, and performance and payment bond under subsection 4.09, does not waive the consultant's responsibility under this subsection and consultant shall be fully responsible for the design of the project.

3.09 Arbitration. (a) Any controversy arising out of the contract, the refusal to perform the contract or any portion thereof, or the breach thereof shall be settled by arbitration in accordance with the rules of the American Arbitration Association and judgment rendered by such arbitration shall be binding upon the board and the consultant. Each party shall bear its own costs and shall equally pay for any and all fees, costs, and expenses of the arbitrator.

(b) The consultant shall not delay the work because arbitration proceedings are pending or in progress, unless approved, in writing, by the board.

3.10 Professional liability insurance. The insurance to be procured and maintained under the contract shall not be less than one million dollars.

SECTION 4 - PERFORMANCE OF CONTRACT

4.01 Time of performance. Time is of the essence of the contract. Performance of the services shall be commenced on the commencement date designated in the notice to proceed, and shall be completed within the contract time specified in the contract.

4.02 Delay. (a) If any delay in the performance of the consultant's services occur as a result of unforeseeable causes beyond the control and without the fault or negligence of the consultant, including but not limited to acts of God, acts of the public enemy, acts of the department with respect to the contract, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe unforeseeable causes beyond the control and without the fault or negligence of the consultant and the consultant's subconsultants, the consultant shall be granted an
extension of the time of performance, corresponding to the length of the delay.

(b) If, as a result of the delay, completion of performance within the extended time causes undue hardship to the consultant, the director may, in the director's discretion, grant a further extension of the time of performance.

(c) No extension of time shall be granted unless a written application, stating in detail the cause or causes for such delays is filed by the consultant with the director within ten calendar days after the commencement of the delay. The period of time of each extension of time shall be determined by the director. No such extension shall be deemed a waiver of the right of the board to terminate the contract for any other or additional delay not covered by the specific terms of such an extension or extensions.

4.03 Liquidated damages. Due to the speculative character and difficulty of ascertaining damages to the department resulting from any delay beyond the contract time, the consultant, for the purpose of putting the question of damages beyond controversy and dispute, shall pay the board an amount equal to the daily rate set forth in the contract multiplied by the number of days beyond the contract time as liquidated damages and not as a penalty for work which remains incomplete beyond the contract time or as extended by the director; provided that the remedy of liquidated damages shall be in addition to any other rights and remedies otherwise available to the board and not expressly waived herein.

4.04 Prosecution of the work. (a) The consultant shall be available upon reasonable demand to discuss the progress of the services being performed. All questions arising during the performance of the contract which must be resolved by the director shall be brought to the director's immediate attention.

(b) The consultant shall perform the consultant's work in accordance with established practices for good exterior appearance, and the natural and man-made environment; provided that if the project is for an economic feasibility study or other study, the consultant shall direct the consultant's work to relate appropriately to and in accordance with established principles, practices, and standards for such study.

(c) The consultant shall furnish sufficient technical supervision and administrative personnel to insure the proper performance of the services under the contract.

(d) The consultant shall be responsible for the accuracy of all computations, completeness, and integrity of all designs and plans or studies.
(e) The director shall have access at all reasonable times to all notes, designs, drawings, tracings, or other technical data pertaining to the services being performed under the contract for the purpose of inspection or making copies thereof.

4.05 Modifications of contract. (a) The department may at any time revise the scope of the project or the consultant’s scope of work; provided that such revisions shall be made by an amendment to the contract.

(b) No waiver or modification of the contract, or any provision therein shall be valid unless such waiver or modification is in a form of an amendment to the contract and executed by the consultant and the board.

(c) No document, other than an amendment to the contract and executed by the consultant and the board, purported to be a waiver or modification of the contract, or any provision therein shall be offered or received in evidence of any proceeding, arbitration, or litigation arising out of or affecting the contract, or the rights or obligations of the consultant or the board.

4.06 Authority of the director. Any question or dispute concerning any provision of the contract which may arise during its performance shall be decided by the director. The decisions of the director shall be final and binding upon all parties unless such decisions is fraudulent, capricious, arbitrary, or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. Any appeal under this subsection shall be submitted to the board. Nothing herein shall be construed as making final and binding any decision of the director or the board, or both, on a question of law. Pending final decision of any dispute or question, the consultant shall proceed diligently with the consultant’s performance of services in accordance with the decision of the director or the board.

4.07 Subcontracting or assignment of contract. The consultant shall not subcontract or assign all or any part of the performance of the consultant’s services without the prior written consent of the director. Any consent by the director to subcontract any portion of the contract shall not be construed to relieve the consultant of any responsibility for the performance of the contract.

4.08 Cooperation by the department. The department, without cost to the consultant, shall cooperate fully with the consultant and will promptly place at the consultant’s disposal all available pertinent information which the department may have in its possession.

4.09 Use of department’s standards. (a) The consultant shall refer to the department’s standard details and shall not
duplicate such standard details in the consultant's work, unless the consultant makes modifications thereto.

(b) The department will provide the consultant with the general conditions, and formats of the proposal, bid bond, contract, performance and payment bond.

4.10 Review by the department. (a) The department will review the consultant's work, and may ask for certain modifications be made thereof. If, in the consultant's judgment, such modifications by the department affect the consultant's responsibilities under the contract, the consultant shall advise the director in writing.

(b) The inclusion of the department's comments does not waive the consultant's responsibilities under subsection 4.04.

SECTION 5 - COMPENSATION

5.01 Compensation. The consultant shall be paid the amount stated in the contract, reduced or increased pursuant to subsection 5.02, as full compensation for his services under the contract.

5.02 Reduction or increase in compensation. (a) The compensation of the consultant shall be reduced or increased in accordance with the modifications to the consultant's scope of work as the contract is amended under subsection 4.05.

(b) The compensation of the consultant shall be increased to reimburse the consultant for increased costs to perform the services if performance of the services is delayed by more than six months by an act or omission of the department; provided that the consultant submits within thirty days following the termination of the delay, in writing, a request for reimbursement containing:

(1) the reimbursement requested;

(2) the act or omission of the department causing the request for reimbursement;

(3) the services of the consultant affected by the department's act or omission;

(4) a breakdown of the requested reimbursement; and

(5) other information which the consultant and the director deem relevant to the request.
5.03 Payments. (a) As long as the services of the consultant are performed in accordance with the contract, the department may pay the consultant monthly progress payments based upon the value of the services performed by the consultant, as estimated by the consultant and the director.

(b) The department may retain up to five percent from each monthly progress payment, and after fifty percent of the compensation under the contract is paid, and the consultant’s performance is satisfactory, no additional amount will be retained; provided that if the consultant’s performance is not satisfactory, the director may retain up to five percent of all amounts due the consultant.

(c) Final payment, inclusive of amounts retained by the department, shall be made (1) upon determination by the director that the consultant has satisfactorily fulfilled his obligations under the contract, and (2) in accordance with chapters 103-53 and 237-45, HRS, upon receipt of a tax clearance from the department of taxation, certifying that the consultant has paid all delinquent taxes levied or accrued.

5.04 Assignment of money due or payable. Assignments of money due or to become payable to the consultant shall not be valid without the prior written consent of the director. The rights of the assignee to moneys due or to become due to the consultant shall be subject to subsection 6.03.

SECTION 6 - REMEDIES

6.01 Right of the board to suspend the performance of services. (a) The board has the right to order the suspension of the performance of the services or portions thereof at any time. The order shall:

(1) Be in writing;

(2) State the reason or reasons for the suspension;

(3) Specify the portions of the contract being suspended; and

(4) Specify the estimated period of suspension.

(b) If the board orders the suspension of the entire performance of services and the estimated period of suspension is more than six months, the consultant has the right to terminate the contract; provided that he submits a request for termination within six months following receipt of the order for suspension.
(c) If the contract is not terminated within six months, the consultant may request reimbursement for additional costs incurred due to the suspension of work.

6.02 Right of the board to terminate the contract. (a) The board has the right to order the termination of the contract at any time. The order shall be in writing and shall be forwarded to the address of the consultant stated in the contract.

(b) The board may terminate the contract if the consultant:

(1) fails to begin work under the contract at the time required;

(2) is unnecessarily delaying the performance of the contract or any part thereof;

(3) is failing to perform the contract with sufficient or adequate personnel, equipment, or materials, or is not making sufficient progress to ensure the completion of the contract within the time specified;

(4) fails to perform the contract in accordance with directions of the director;

(5) discontinues performance of the contract;

(6) fails to recommence performance of the contract within a reasonable time after service of a written order to do so is the performance had been suspended;

(7) becomes insolvent or is declared bankrupt;

(8) commits any act of bankruptcy or insolvency;

(9) allows any final judgment to stand against the consultant unsatisfied for a period of ten calendar days;

(10) makes an assignment for the benefit of creditors;

(11) fails to pay for all labor, tools, materials, and equipment;

(12) has abandoned the contract; or

(13) violates or fails to comply with any of the provisions of the contract or this General Terms and Conditions of Contracts of the Department of Water Supply for Services of Consultants.
(c) The board may also terminate the contract for reasons, which may include but are not be limited to, the abandonment, deferral, restudy, or revision of the project by the department.

(d) If the board terminates the contract due to the consultant’s default, the board may contract with another consultant to complete the remainder of the contract.

(e) In any termination, the consultant shall be compensated for all work performed until the termination order, upon the consultant’s compliance with subsections 3.04 and 5.03.

(f) Such compensation due the consultant shall take into account liquidated damages, and the value of materials, data, maps, plans, or other documents or information gathered, complied, produced, or obtained, which the consultant fails to deliver.

6.03 Authority to withhold money due or payable. The board may withhold such amounts from the money due or to become payable under the contract to the consultant, or any assignee under subsection 5.04, as may be necessary to protect the board against liability or to satisfy the obligations of the consultant to the board and to employees, subcontractors and material men who have performed labor or furnished material and equipment under the contract and may make such payments from such amounts as may be necessary to discharge such obligations and protect the board.

6.04 Remedies not exclusive. The express provision herein of certain measures which may be exercised by the board for its protection shall not be construed to preclude the board from exercising any other or further legal or equitable right to protect its interests.
FIRST AMENDMENT OF CLOSING AGREEMENT

This First Amendment is dated this 30th day of January, 1996 by and between the BOARD OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, with its principal office and post office address at 200 South High Street, Wailuku, Maui, Hawaii 96793 (the "Board") and WAILUKU AGribusiness CO., INC., a Hawaii corporation, whose principal place of business and post office address is 90 Waiko Road, P. O. Box 520, Wailuku, Maui, Hawaii 96793 ("Wailuku").

RECITALS: Reference is made to the closing agreement dated December 21, 1995 between the Board and Wailuku (the "Agreement"). The purpose of this first amendment is to set forth the mutual agreement of the parties concerning the extensions of certain dates to the agreement.

AMENDMENT: For valuable consideration, the Board and Wailuku mutually agree as follows:

1. The last full paragraph in Section 6 of the agreement is amended to read in its entirety as follows:

"If the BOARD is not satisfied as to any matter referred to above or any other matter, whether related to the Property or not related to the Property, the BOARD may cancel this agreement by written notice to WAILUKU no later than February 7, 1996, in which event this Agreement will terminate. If counsel for the BOARD and WAILUKU shall be unable to agree on the form and content of all closing documents, WAILUKU may cancel this Agreement by written notice to the BOARD no later than February 7, 1996. In each such instance, prior to February 8, 1996, the BOARD will return to WAILUKU all of WAILUKU’s studies, plans and other material in the Board’s possession; and the parties shall be relieved from any liability hereunder."

2. In all other respects the agreement shall remain in full force and effect.

3. This amendment may be executed in counterparts. Signatures by facsimile transmission will be accepted as originals by each party.

Executed the day and year first above written.
WAILUKU AGRIBUSINESS CO., INC.

By ____________________________

It: Chairman of the Board

By ____________________________

It: Secretary
STATE OF HAWAII )
 ) SS.
COUNTY OF MAUI )

On this 30th day of January, 1996, before me personally appeared MARIE KIMMEL, to me known, who being by me duly sworn, did say that she is the chairperson of the BOARD OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument was signed and sealed in behalf of said BOARD OF WATER SUPPLY, and the said MARIE KIMMEL acknowledged said instrument to be the free act and deed of said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public, in and for said County and State

My commission expires: 4/19/98
STATE OF HAWAII   
COUNTY OF MAUI   

On this 30th day of January, 1998, before me personally appeared J. Alom Endo and Takafumi F. Chino, to me known, who being by me duly sworn, did say that they are the President and Secretary of WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, and that said instrument was signed in behalf of said corporation by authority of its Board of Directors, and that said officers acknowledged said instrument to be the free act and deed of said corporation.

Alphonse A. Marques
Notary Public, in and for said County and State of Hawaii
My commission expires: 02/10/98

STATE OF HAWAII   
COUNTY OF MAUI   

On this ___ day of __________, 1998, before me personally appeared __________ and __________, to me known, who being by me duly sworn, did say that they are the __________ and __________ of WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, and that said instrument was signed in behalf of said corporation by authority of its Board of Directors, and that said officers acknowledged said instrument to be the free act and deed of said corporation.

Notary Public, in and for said County and State
My commission expires: ____________________
SECOND AMENDMENT OF CLOSING AGREEMENT

This Second Amendment is dated this 14th day of February, 1996 by and between the BOARD OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, with its principal office and post office address at 200 South High Street, Wailuku, Maui, Hawaii 96793 (the "Board") and WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, whose principal place of business and post office address is 90 Waiiko Road, P. O. Box 520, Wailuku, Maui, Hawaii 96793 ("Wailuku").

RECITALS: Reference is made to the closing agreement dated December 21, 1995 between the Board and Wailuku as amended by First Amendment of Closing Agreement dated January 30, 1996 (the "Agreement"). The purpose of this second amendment is to set forth the mutual agreement of the parties concerning the extensions of certain dates to the agreement.

AMENDMENT: For valuable consideration, the Board and Wailuku mutually agree as follows:

1. The last full paragraph in Section 8 of the agreement is amended to read in its entirety as follows:

"If the BOARD is not satisfied as to any matter referred to above or any other matter, whether related to the Property or not related to the Property, the BOARD may cancel this agreement by written notice to WAILUKU no later than February 16, 1996, in which event this Agreement will terminate. If counsel for the BOARD and WAILUKU shall be unable to agree on the form and content of all closing documents, WAILUKU may cancel this Agreement by written notice to the BOARD no later than February 16, 1996. In each such instance, prior to February 16, 1996, the BOARD will return to WAILUKU all of WAILUKU's studies, plans and other material in the Board's possession; and the parties shall be relieved from any liability hereunder."

2. In all other respects the agreement shall remain in full force and effect.

3. This amendment may be executed in counterparts. Signatures by facsimile transmission will be accepted as originals by each party.
Executed the day and year first above written.

THE BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI

By ______________________________
MARIE KIMMEY
Its Chairperson

WAILUKU AGRIBUSINESS CO., INC.

By ______________________________
J. Alan Kyle
Its: Chairman

By ______________________________
Kathleen J. Osorio
Its: Secretary
Executed the day and year first above written.

THE BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI

By __________________________
MARIE KIMMEY
Its Chairperson

WAILUKU AGribusiness Co., Inc.

By __________________________
Its:

By __________________________
Its:
On this _____ day of ___________ 1996, before me personally appeared MARIE KIMMEN, to me known, who being by me duly sworn, did say that she is the chairperson of the BOARD OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument was signed and sealed in behalf of said BOARD OF WATER SUPPLY, and the said MARIE KIMMEN acknowledged said instrument to be the free act and deed of said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public, in and for said County and State

My commission expires: __________________________

On this ______ day of February, 1996, before me personally appeared J. ALAN KUOE and KATHLEEN P. OSHIRO, to me known, who being by me duly sworn, did say that they are the Chairman and Secretary of WAILUKU AGROBUSINESS CO., INC., a Hawaii corporation, and that said instrument was signed in behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

Notary Public, in and for said County and State of Hawaii

My commission expires: 02/10/96
THIRD AMENDMENT OF CLOSING AGREEMENT

This Third Amendment is dated this 21st day of February, 1996 by and between the BOARD OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, with its principal office and post office address at 200 South High Street, Wailuku, Maui, Hawaii 96793 (the "Board") and WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, whose principal place of business and post office address is 90 Waiko Road, P. O. Box 520, Wailuku, Maui, Hawaii 96793 ("Wailuku").

RECITALS: Reference is made to the closing agreement dated December 21, 1995 between the Board and Wailuku as amended by First Amendment of Closing Agreement dated January 30, 1996 (the "Agreement") and Second Amendment of Closing Agreement dated February 6, 1996. The purpose of this third amendment is to set forth the mutual agreement of the parties concerning the extension of the closing date under the agreement to no later than February 22, 1996.

AMENDMENT: For valuable consideration, the Board and Wailuku mutually agree as follows:

1. Paragraph 4, page 2 of the agreement is amended to read in its entirety as follows:

   For the purpose of the agreement, closing shall be the date when all appropriate conveyance documents are recorded. WAILUKU and the BOARD agree to promptly execute appropriate and customary documents when requested by escrow to do so. The "scheduled closing date" shall be on or before February 22, 1996. There is no automatic right to extend. Time is of the essence and the "scheduled closing date" may not be extended unless both the BOARD and WAILUKU so agree in writing. This transaction shall be escrowed by Title Guaranty Escrow Services of Hawaii (Wailuku Branch).

2. In all other respects the agreement shall remain in full force and effect.

3. This amendment may be executed in counterparts. Signatures by facsimile transmission will be accepted as originals by each party.
Executed the day and year first above written.

THE BOARD OF WATER SUPPLY OF THE COUNTY OF MAUl

By [Signature]
Its Authorized Signatory

WAILUKU AGRIBUSINESS CO., INC.

By [Signature]
Its CHAIRMAN OF THE BOARD

By [Signature]
Its Secretary

APPROVED AS TO FORM AND LEGALITY:

[Signature]
Gary W. Zakia
Deputy Corporation Counsel
On this 21st day of February, 1996, before me personally appeared J. ALAN KUGLE and KATHLEEN F. OSHIRO, to me personally known, who, being by me duly sworn, did say that they are the Chairman of the Board and Secretary, respectively, of WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

[Signature]
Notary Public, State of Hawaii

My Commission Expires: 11/2/97
On this 20th day of February, 1996, before me appeared BYRON WALTERS, to me personally known, who, being by me duly sworn, did say that he is a Member of the Board of Water Supply of the County of Maui, and was authorized by the BOARD OF WATER SUPPLY on February 15, 1996 to execute any and all documents as set forth in the COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION RELATING TO THE PURCHASE OF THE WAIHEE VALLEY PROPERTY, and that the said instrument was signed on behalf of the said Board of Water Supply, and the said BYRON WALTERS acknowledged the said instrument to be the free act and deed of the said Board of Water Supply.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public, State of Hawaii

My commission expires: 11/25/96
March 13, 1996

TO: Mr. David Craddick  
Department of Water Supply  
County of Maui  
P.O. Box 1109  
200 S. High Street, 5th Floor  
Wailuku, Maui, Hawaii 96793-7109

FROM: Jill M. Teutsch

RE: Wailuku Agribusiness Co., Inc./BWS

Transmitted is/are:

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<td>6.</td>
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<td>Notice of Agreement dated 2/21/96, recorded in said Bureau as Document No. 96-023920</td>
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<td>7.</td>
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<td>Declaration of Restrictive Covenant dated 2/21/96, recorded in said Bureau as Document No. 96-023921</td>
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THIS SECOND EXTENSION OF RIGHT OF ENTRY AND OPERATING AGREEMENT ("Second Extension Agreement") is entered into this 15th day of March, 1996, by and between MAUI LANI PARTNERS, a Hawaii general partnership, whose principal place of business and mailing address is 810 Richards Street, Suite No. 900, Honolulu, Hawaii, 96813 ("Grantor"), and the MAUI COUNTY BOARD OF WATER SUPPLY ("Board"), a body politic and corporate of the State of Hawaii, whose place of business and mailing address is 200 South High Street, Wailuku, Maui, Hawaii, 96793, collectively referred to as the "Parties".

RECITALS

1. The Grantor and Board entered into a RIGHT OF ENTRY AND OPERATING AGREEMENT dated July 27, 1992 ("Agreement") which, among other things, granted the Board a temporary license over a portion of the property described in Exhibit "A" attached to the Agreement ("Property") for the purpose of testing and drawing water from certain of the wells on the Property and conducting activities related and accessory to the use of the water by the Board.

2. The Grantor subsequently sent to the Board by certified mailing, a letter dated August 5, 1992, which clarified among other things, that based upon the effective date of the Agreement and the provisions contained therein, the Agreement would terminate on November 24, 1993.

3. The Board, through its Director of the Department of Water Supply ("Director" and "Department", respectively) verbally notified Grantor's designated representative on October 20, 1993, that an extension of the Agreement would be desirable and indicated that such an extension to July 27, 1994, would be acceptable.

4. The Grantor and the Board entered into a RIGHT OF ENTRY AND OPERATING EXTENSION AGREEMENT ("Extension Agreement") dated December 9, 1993, by which the terms of the Agreement were extended to July 27, 1994.

5. The Board, through the Director, verbally notified Grantor's designated representative of its desire for an additional extension of the Agreement.

6. The Agreement contains several provisions which address the right to an extension:

   (a) Paragraph 13(b) provides that in the event the Board desires an extension of the Agreement, and if the Grantor shall choose to consent to the extension, the Grantor shall be compensated by the Board who shall pay a pro rata portion of the Grantor's interest cost on the portion of the Property which could have otherwise been developed but had to be delayed;
(b) Paragraph 16 provides that the Board designates its Director of the Board of Water supply as its authorized agent and authorizes him to, among other things, act for the Board in matters that include extension of the Agreement; and

(c) Paragraph 19 provides that the Agreement cannot be altered, amended, modified or otherwise changed except in writing executed by a duly authorized representative of the Grantor and the Board.

7. Bill Mills is the President of Bill Mills Development Company, Inc., and represents:
   (a) Horita-Maui Lani, Inc. is no longer the Managing General Partner of Maui Lani Partners;
   (b) Bill Mills Development Company, Inc., is now the Managing General Partner of Maui Lani Partners and that the address to which notice is to be sent to the Grantor should be changed.

BASED ON THE FOREGOING, GRANTOR AND BOARD HEREBY AGREE AS FOLLOWS:

1. The term of the Agreement shall be extended up to and including December 31, 1997.

2. Paragraph 1 is amended to read as follows:

"1. The "Licensed Area" is located on a parcel of land owned by Grantor, identified as Tax Map Key No. 2-3-8-7:121, as shown on the map attached hereto as Exhibit "B". The Licensed Area includes the "Maui Lani Wells" and State Well Number 5228-06, and any existing pumping stations, the existing unimproved roadways designated the "Primary Access Road", and the temporary pipelines located on the property.

3. Paragraph 9 is amended by deleting the last sentence which reads "The cost and expenses of all such relocation shall be paid for by the Board." and inserting in its place "Grantor may relocate the wells (at Grantor's cost) at anytime during the Agreement."

4. Paragraph 15 is amended to read as follows:

"15. Any notice by either party to the other shall be in writing and shall be personally delivered or sent by certified or registered mail to the Board or Grantor, as the case may be, addressed as follows:

If to the Board:
Maui County Board of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96893
Attention: Director
If to the Grantor:
Maui Lani Partners
810 Richards Street, Suite 900
Honolulu, Hawaii 96813
Attention: Mr. Bill Mills

5. Paragraph 16 is amended to read as follows:

"The Board hereby designates and authorizes the Director of the Department of Water Supply as its authorized agent for the purpose of acting for the Board and communicating for the Board to the Grantor in all matters including extension under this Agreement. Grantor may conclusively rely on all actions of and communications from the Director as duly authorized by the Board and binding on it."

6. Rather than renumbering the entire Agreement, two new paragraphs are added as paragraphs 21 and 22, and the original paragraph 21 (the last paragraph in the Agreement) is renumbered to be paragraph 23. It is the intent of the Grantor and Board that these new paragraphs are to be read in their appropriate context as if they appeared elsewhere in the Agreement. New paragraphs 21 and 22 read as follows:

"21. The Board will utilize State Well No. 5228-06, located in the Licensed Area up to 250,000 gallons of water per day."

"22. The Board will issue to Grantor, or its designates, 417 five-eighths inch (5/8") water meters, or its equivalents based on departmental standards, upon payment of the then current Water System Development Fees and in accord with all applicable governmental rules, regulations, findings and proceedings."

7. As this extension of the Agreement will not delay development of the Property, or any portion thereof, the Grantor makes no claim for any pro rata portion of interest costs under Paragraph 13(b). This does not impair the Grantor's right to compensation for damages due to delay past December 31, 1997, or for compensation as provided for in Paragraph 13(a), or in any other portion of the Agreement.

8. The Board shall indemnify and defend the Grantor, and its directors, officers, employees, agents, successors, licensees, affiliates and assigns, from and against any loss, damage, cost, expense or liability, including without limitation any personal injury, wrongful death or property damage (real or personal) proximately arising out of, or attributable to the testing, transmission or use of the wells by the Board for public potable water, including without limitation, all reasonable costs and
expenses incurred by the Grantor in connection therewith.

9. All other provisions of the Agreement, including the Extension Agreement, shall remain in full force and effect. Should there be any conflict between the provisions of the Agreement, the Extension Agreement, and this Second Extension Agreement such that the provisions of all three documents cannot be given full force and effect, the provisions of this Second Extension Agreement shall prevail only to the extent there is an unresolvable conflict. All other provisions that may be carried into effect shall remain in effect.

10. This Second Extension may be executed in counterpart signature pages.

11. For purposes of this Second Extension, a signature transmitted via facsimile transmission is deemed to be the original.

In witness whereof the parties have executed this Second Extension Agreement on the date first written above.

MAUI LANI PARTNERS

By BILL MILLS DEVELOPMENT COMPANY, INC.
   Its Managing General Partner

By
   Bill Mills, Its President
   "Grantor"

BOARD OF WATER SUPPLY
COUNTY OF MAUI

By
   David R. Craddick, Its Director
   "Board"

Approved as to Form and Legality

Gary W. Zakian
Deputy Corporation Counsel

4
On this 15th day of March, 1996, before me appeared DAVID R. CRADDICK, to me personally known, who, being by me duly sworn, did say that he is the Director of the DEPARTMENT OF WATER SUPPLY of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument is the lawful seal of the BOARD OF WATER SUPPLY of the County of Maui, and that the said instrument was signed and sealed in behalf of the said DEPARTMENT OF WATER SUPPLY of the County of Maui, and the said DAVID R. CRADDICK, acknowledged that said instrument to be the free act and deed of the said DEPARTMENT OF WATER SUPPLY of the County of Maui.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]

Notary Public, State of Hawaii

My commission expires: 4/19/98
RIGHT OF ENTRY AND OPERATING AGREEMENT - SECOND EXTENSION

THIS SECOND EXTENSION OF RIGHT OF ENTRY AND OPERATING AGREEMENT ("Second Extension Agreement") is entered into this day of __, 1996, by and between MAUI LANI PARTNERS, a Hawaii general partnership, whose principal place of business and mailing address is 810 Richards Street, Suite No. 900, Honolulu, Hawaii, 96813 ("Grantor"), and the MAUI COUNTY BOARD OF WATER SUPPLY ("Board"), a body politic and corporate of the State of Hawaii, whose place of business and mailing address is 200 South High Street, Wailuku, Maui, Hawaii, 96793, collectively referred to as the "Parties".

RECITALS

1. The Grantor and Board entered into a RIGHT OF ENTRY AND OPERATING AGREEMENT dated July 27, 1992 ("Agreement") which, among other things, granted the Board a temporary license over a portion of the property described in Exhibit "A" attached to the Agreement ("Property") for the purpose of testing and drawing water from certain of the wells on the Property and conducting activities related and accessory to the use of the water by the Board.

2. The Grantor subsequently sent to the Board by certified mailing, a letter dated August 5, 1993, which clarified among other things, that based upon the effective date of the Agreement and the provisions contained therein, the Agreement would terminate on November 24, 1993.

3. The Board, through its Director of the Department of Water Supply ("Director" and "Department", respectively) verbally notified Grantor's designated representative on October 20, 1993, that an extension of the Agreement would be desirable and indicated that such an extension to July 27, 1994, would be acceptable.

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6. The Agreement contains several provisions which address the right to an extension:
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(b) Paragraph 16 provides that the Board designates its Director of Water Supply as its authorized agent and authorizes him to, among other things, act for the Board in matters that include extension of the Agreement; and

(c) Paragraph 19 provides that the Agreement cannot be altered, amended or otherwise changed except in writing executed by a duly authorized representative of the Grantor and the Board.

7. Bill Mills is the President of Bill Mills Development Company, Inc., and represents:
   (a) Horita-Maui Lani, Inc. is no longer the Managing General Partner of Maui Lani Partners;
   (b) Bill Mills Development Company, Inc., is now the Managing General Partner of Maui Lani Partners and that the address to which notice is to be sent to the Grantor should be changed.

BASIS ON THE FOREGOING, GRANTOR AND BOARD HEREBY AGREE AS FOLLOWS:

1. The term of the Agreement shall be extended up to and including December 31, 1997.

2. Paragraph 1 is amended to read as follows:

"1. The "Licensed Area" is located on a parcel of land owned by Grantor, identified as Tax Map Key No. 2-3-8-7:121, as shown on the map attached hereto as Exhibit "B". The Licensed Area includes the "Maui Lani Wells" and State Well Number 5228-06, and any existing pumping stations, the existing unimproved roadways designated the "Primary Access Road", and the temporary pipelines located on the property.

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If to the Board:
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200 South High Street
Wailuku, Maui, Hawaii 96893
Attention: Director
5. Paragraph 16 is amended to read as follows:

"The Board hereby designates and authorizes the Director of the Department of Water Supply as its authorized agent for the purpose of acting for the Board and communicating for the Board to the Grantor in all matters including extension under this Agreement. Grantor may conclusively rely on all actions of and communications from the Director as duly authorized by the Board and binding on it."

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"21. The Board will utilize State Well No. 5228-06, located in the Licensed Area up to 250,000 gallons of water per day."

"22. The Board will issue to Grantor, or its designates, 447 five-eighths inch (5/8") water meters, or its equivalents based on departmental standards, upon payment of the then current Water System Development Fees and in accord with all applicable governmental rules, regulations, findings and proceedings."

7. As this extension of the Agreement will not delay development of the Property, or any portion thereof, the Grantor makes no claim for any pro rata portion of interest costs under Paragraph 13(b). This does not impair the Grantor's right to compensation for damages due to delay past December 31, 1997, or for compensation as provided for in Paragraph 13(a), or in any other portion of the Agreement.

8. The Board shall indemnify and defend the Grantor, and its directors, officers, employees, agents, successors, licensees, affiliates and assigns, from and against any loss, damage, cost, expense or liability, including without limitation any personal injury, wrongful death or property damage (real or personal) proximately arising out of, or attributable to the testing, transmission or use of the wells by the Board for public potable water, including without limitation, all reasonable costs and
expenses incurred by the Grantor in connection therewith.

9. All other provisions of the Agreement, including the Extension Agreement, shall remain in full force and effect. Should there be any conflict between the provisions of the Agreement, the Extension Agreement, and this Second Extension Agreement such that the provisions of all three documents cannot be given full force and effect, the provisions of this Second Extension Agreement shall prevail only to the extent there is an unresolvable conflict. All other provisions that may be carried into effect shall remain in effect.

10. This Second Extension may be executed in counterpart signature pages.

11. For purposes of this Second Extension, a signature transmitted via facsimile transmission is deemed to be the original.

In witness whereof the parties have executed this Second Extension Agreement on the date first written above.

MAUI LANI PARTNERS

By BILL MILLS DEVELOPMENT COMPANY, INC.

The Managing General Partner

By Bill Mills, Its President

"Grantor"

BOARD OF WATER SUPPLY

COUNTY OF MAUI

By

David R. Craddick, Its Director

"Board"

Approved as to Form and Legality

Gary W. Zakian

Deputy Corporation Counsel
1996

**REYNOLDS' FOODS WELL =1**

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Item 6
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* PENDING
Mr. David R. Craddick, Director
Maui Department of Water Supply
P.O. Box 1109
Wailuku, Hawaii 96793-7109

Dear Mr. Craddick:

Extension of Start Date
North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03)

We received your March 18, 1996 request to extend the start date for installing pumps in the captioned wells two months beyond the May 14, 1996 date permitted by the Commission. We understand that the Department has entered a contract to complete construction documents, and that the initiation of construction may occur after May 14, 1996. You state that a two-month extension will assure compliance with the start time.

By this letter, the start date for your pump installation permit is extended to July 14, 1996. All the other conditions of your permit remain the same. If you are unable to start work by July 14, 1996, please inform us thirty (30) days prior to that date, to allow time to prepare a submittal for the Commission.

If you have any questions, please call Charley Ice at [redacted].

Sincerely,

[Signature]
RAE M. LOUI
Deputy Director
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<td>FUJII, N.</td>
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<td>OHYE, M.</td>
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<td>Review &amp; Comment</td>
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COMMISSION ON WATER RESOURCE MANAGEMENT

FROM: [Redacted]  
DATE: 3/26  
SUSPENSE DATE: 

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**Note:**

- "did this need to go back to the Commission?"
- "Because we have a timetable, let's handle administratively; if it breaks down, let's go back to CWRM"
March 18, 1996

Mr. Michael D. Wilson, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Pump Installation Permit
North Waihee Wells 1 and 2
(Wells No 5631-02 & 03)

Thank you for the reminder dated March 5, 1996 regarding the subject wells. We are requesting an extension of the two months.

In the process of the agreement with C. Brewer Properties and transfer of permit, the Department has entered into a contract with the design consultants to complete the construction contract documents within sixty days. Based on this time table, the construction contracting process may not be completed by May 14, 1996. A two month extension will assure compliance with the start time.

Your favorable consideration will be greatly appreciated. If there are any questions, please call our Engineering Division at

Sincerely,

David R. Craddick
Director

hk

"By Water All Things Find Life"
TO: C. Brewer Properties, Inc.  
P.O. Box 1437  
Wailuku, HI 96793

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your request to extend the permit to install pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03), is approved subject to the following conditions:

STANDARD PUMP INSTALLATION PERMIT CONDITIONS

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, before any work covered by this permit commences.

2. The pump installation permits shall be for installation of a 1400 gpm capacity, or less, pump in each well. A means to accurately measure water levels, acceptable to the Commission, shall be provided.

3. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

4. The applicant shall comply with all applicable laws, rules, and ordinances.

5. An approved flowmeter(s) must be installed to measure withdrawals and a monthly record of withdrawals, water-levels, salinity, and temperature must be kept and reported to the Commission on a monthly basis, which conforms with the Commission's September 16, 1992 direction on reporting requirements.
EXTENSION OF PUMP INSTALLATION PERMIT
Well Nos. 5631-02 & 03

6. The permit may be revoked if work is not started within two (2) months after the date of issuance or if work is suspended or abandoned for two (2) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

7. An as-built sectional drawing of the pump installation shall be submitted to the Commission within thirty (30) days after completion of work.

8. The pump installation permit application and staff submittals, approved by the Commission at its March 3, 1993 and March 1, 1995 meetings, are incorporated into the permit by reference.

[Signature]
MICHAEL D. WILSON, Chairperson
Commission on Water Resource Management

MAR 1-4 1995
Date of Issuance

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant's Signature: ___________________________ Date: ________________
Printed Name: ___________________________________________
Firm or Title: _____________________________________________

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

cc: USGS
Department of Health
Safe Drinking Water Branch
Ground Water Protection Program
Wastewater Branch
Maui Department of Water Supply
March 1, 1996

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

Dear Ms. Loui:

Subject: Iao Aquifer

Transmitting evidence of the following milestones achieved, as requested by the Commission:

1. Grant of Easement for the North Waihee Wells, Phase 1, is being sent under separate cover from our Attorney, Douglas W. MacDougal of Ashford & Wriston;

2. The membranes for treatment of Waihee/Iao Ditch water have been obtained, as evidenced by shipping notice (Attachment #1); and

3. A copy of the executed contract for professional services for the development of North Waihee Wells and a copy of the NTP (Attachment #2).

The final use of filter membranes being shipped are intended for Lahainaluna Treatment Facility. Upon arrival, we intend to utilize this equipment to perform testing required for DOH approvals, while we order the filters noted on the February 13, 1996 quotation from Memtec (Attachment #3).

Sincerely,

[Signature]

David Craddick, Director
DC/jaw

Attachments
copy w/o attachments: Marie Kimmey, BWS Chai
Douglas W. MacDougal

"By Water All Things Find Life"
Further to our telephone conversation, I confirm that 3 x 20' FCL containers have been booked to sail on board 'COLUMBUS CANADA' V16 which is due to sail Sydney 10.3.96 and arrive Honolulu 29.3.96 with a further 4 to 5 days to be added on for transhipment to Maui.

If I can be of any further assistance please do not hesitate to contact me.

Regards, Lyn Cunliffe
Import/Export Clerk
CONTRACT NO. WC0053

CONTRACT FOR INDEPENDENT PROFESSIONAL SERVICES
RELATING TO THE PLAN AND DESIGN OF THE
THE DEVELOPMENT OF NORTH WAIHEE WELLS

Source of Funds: CENTRAL MAUI SOURCE

Certification requested: $384,150.00

This Agreement, made and entered into this 29th day of
February, 1996, by and between WARREN S.
UNEMORI ENGINEERING, INC., a Hawaii corporation authorized to do
dbusiness in Hawaii, whose address is 2145 Wells Street, Suite 403,
Wailuku, Maui, Hawaii 96793, referred to as the "Consultant", and
the BOARD OF WATER SUPPLY of the County of Maui, whose address is
200 South High Street, Wailuku, Hawaii 96793, referred to as the
"Board",

W I T N E S S E T H:

WHEREAS, the Board desires to engage the Consultant as an
independent contractor to provide professional and technical
engineering services to prepare a study and plans, specifications,
and contract documents for design of the Development of the North
Waihee Wells, referred to as the "PROJECT"; and

WHEREAS, the Consultant desires to render such services as an
independent contractor for and on behalf of the Board; and
WHEREAS, the Consultant has been engaged to provide engineering professional services to C. Brewer Homes, Inc., referred to as "CBHI" for the development of said wells; and

WHEREAS, CBHI has paid for all services performed up to December 7, 1995; and

WHEREAS, the Board is obtaining the well site and the previously performed services in connection with development of the wells from CBHI; and

WHEREAS, Consultant agrees that all work performed for CBHI is included as part of this Contract; and

WHEREAS, the Board desires to enter into an agreement to facilitate the completion of the Project, based on the Consultant’s previous work on the Project; and

WHEREAS, time is of an essence to get the delivery of water to the water system; now therefore,

IN CONSIDERATION of the mutual promises and agreements hereinafter set forth, the parties hereto agree as follows:

1. **Scope of work.** The Consultant shall use the degree of care and skill normally exercised by members of the profession to carry out the following services as outlined in Exhibit "A" attached hereto and by reference made a part hereof.

2. **Time of performance.** Consultant shall complete Consultant’s services as set forth in Exhibit "A" in accordance with the time schedules set forth in Exhibit "B", attached hereto and by reference made a part hereof.

3. **General Terms and Conditions of Contracts of the**
Department of Water Supply of the County of Maui for Services of Consultants. The General Terms and Conditions of Contracts of the Department of Water Supply of the County of Maui for Services of Consultants attached hereto are made a part hereof as fully and completely as if the same were set forth in its entirety herein.

4. **Compensation.** The Board shall pay the Consultant the amount of THREE HUNDRED EIGHTY-FOUR THOUSAND ONE HUNDRED FIFTY AND NO/100 DOLLARS, ($384,150.00), which amount shall constitute full and complete compensation, inclusive of all applicable taxes, for the Consultant’s services as set forth in Section 1 Scope of Work. Compensation for the services shall be in accordance with the following Schedule of Fees:

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<th>Phase</th>
<th>Description</th>
<th>Fee</th>
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<td>I</td>
<td>24-INCH TRANSMISSION BETWEEN KUHINIA STREET AND WELL SITE ACCESS ROAD.</td>
<td>$33,000</td>
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<tr>
<td>II</td>
<td>DEVELOPMENT OF WELLS NO. 1 AND 2</td>
<td>$27,500</td>
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<td>(G.E.T. for PH I &amp; II)</td>
<td>$2,500</td>
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<td>(Direct Expense for PH I &amp; II)</td>
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<tr>
<td>III</td>
<td>24-INCH TRANSMISSION BETWEEN KUHINIA STREET AND CMJV RESERVOIR</td>
<td>$137,000</td>
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<td>IV</td>
<td>0.5 MG TANK AND 24-INCH INFLOW-OUTFLOW LINES</td>
<td>$123,100</td>
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<td>V</td>
<td>BOOSTER PUMP STATION AND SCADA TO KAHULUI BASEYARD</td>
<td>$38,600</td>
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<td>(G.E.T. for PH III, VI, &amp; V)</td>
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<tr>
<td></td>
<td>(Direct Expense for PH III, VI, &amp; V)</td>
<td>$6,000</td>
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<tr>
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<td><strong>TOTAL</strong></td>
<td><strong>$384,150</strong></td>
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As long as the services of the Consultant are being performed as required herein, the Board may pay the Consultant monthly progress payments based upon the value of services performed by the Consultant as estimated by the Consultant and approved by the Department. Of any progress payments deemed to be due and owing, the Board may retain up to five percent (5%) of the payments due the Consultant, and after fifty percent (50%) of the contract is completed, and performance is satisfactory, no additional sum shall be withheld; provided, however, that if progress is not satisfactory, the Director may continue to hold as retainage sums not exceeding five percent (5%) of the amounts due the Consultant.

Final payment, inclusive of amounts retained by the Board, shall be made upon written acceptance from the Department to the Consultant advising it of the satisfactory fulfillment of the agreement requirements, and, pursuant to Sections 103-53 and 237-45 of the Hawaii Revised Statutes, the receipt of a tax clearance from the State Department of Taxation verifying that the Consultant has paid all delinquent taxes levied or accrued. Upon acceptable completion of the agreement or upon termination of this agreement, the Consultant shall turn over to the Board all tracings, drawings, masters, computations, computer data, etc., prepared or obtained by the Consultant or furnished by the Board in connection with the work performed under this agreement or in connection with work performed by Consultant for CBHI relating to the development of North Waiheee Wells, at no extra cost to the Board.

5. Liquidated damages. The Consultant recognizes and agrees
that time is of the essence under this contract and due to the speculative character and difficulty of ascertaining damages to the Board resulting from any delay beyond the date set herein for contract completion, the parties hereto, for the purpose of putting the question of damages beyond controversy and dispute, hereby agree that the Consultant shall pay to the Board the sum of TWO THOUSAND AND NO/100 DOLLARS ($2,000.00) as liquidated damages and not as a penalty, for each and every day that work contemplated in this contract remains uncompleted beyond the time set herein for completion unless such delay is attributable to the Board. The Consultant further understands and agrees that the remedy of liquidated damages shall be in addition to any other rights and remedies otherwise available to the Board and not expressly waived herein. The Consultant agrees that the aforesaid sum is a reasonable estimate, of and reasonably proportionate to, the damages which will probably be sustained by the Board as a result of any delay.

6. **Employment Status.** It is agreed and understood that the Consultant shall be engaged as an independent contractor and shall not be entitled to the benefits and privileges of an employee of the County of Maui under the County’s Civil Service System, and it is further agreed and understood that the Consultant shall be excluded from participating in any fringe benefits not specifically enumerated herein.

7. **Best Efforts.** Consultant agrees that it will, at all times, faithfully, industriously, and to the best of its ability,
experience and talents, perform all of the duties that may be required of it pursuant to the expressed and implicit terms hereof to the reasonable satisfaction of the Board.

8. **Consultant's Inability to Contract for Board.** Notwithstanding anything herein contained to the contrary, Consultant shall not have the right to make any contracts or commitments for or on behalf of the Board without first obtaining written consent of the Board.

9. **Agreements Outside of Contract.** This contract contains the complete agreement concerning the arrangement between the parties and shall, as of the effective date hereof, supersede all other agreements between the parties. The parties stipulate that neither of them have made any representation with respect to the subject matter of this agreement or any representations including the execution and delivery hereof except such representations as are specifically set forth herein and each of the parties hereto acknowledge that any payments or representations that may have hereinbefore been made by either of them to the other are of no effect and that neither of them have relied thereon in connection with its dealings with the other.

10. **Modification of Contract.** No waiver or modification of this agreement or of any covenant, condition, or limitation herein contained shall be valid unless in writing and duly executed by the party to be charged therewith and no evidence of any waiver or modification shall be offered or received in evidence of any proceeding, arbitration, or litigation between the parties hereto
arising out of or affecting this agreement, or the rights or obligations of the parties hereunder, unless such waiver or modification is in writing, duly executed as aforesaid, and the parties further agree that the provisions of this section may not be waived except as herein set forth.

11. **Changes.** The Board may from time to time require changes in the scope of services of Consultant to be performed hereunder. Such changes, including any increase or decrease in the amount of Consultant's compensation shall be incorporated by written amendment to this agreement.

12. **Termination.** The Board may terminate this contract without cause upon written notice to that effect delivered to the Consultant at the address set forth herein. It is agreed that the Consultant shall receive compensation from the Board for the time actually spent in the performance of the services hereunder to the date of termination. The Consultant shall also be entitled to recover any reasonable costs incurred in connection with the contract prior to the receipt of any notice of termination.

In the event the Consultant violates the terms of this agreement, the Board may elect any remedy available to it in law or in equity, without limitation, including, but not limited to:

A. **Termination of this contract without prior notice in which event** the Board shall be liable under this contract only for those services satisfactorily performed to the date of termination, if any. All materials, data, maps, plans or other documents or information gathered, compiled, produced or obtained pursuant to
this contract shall be the property of the Board and the Consultant shall immediately upon termination of this contract deliver said items to the Board.

B. Unilateral substitution of a suitable replacement for Consultant to complete the remainder of the contract in which event Consultant shall be liable to pay for the difference, if any, between the cost of the substituted Consultant and the cost of such similar services remaining to be completed under this contract by the Consultant at the time of termination.

13. Professional Liability Insurance. The insurance to be procured and maintained by Consultant pursuant to the General Terms and Conditions shall be in an amount not less than ONE MILLION AND NO/100 DOLLARS ($1,000,000.00).

14. Findings Confidential. Any reports, information, data, given to or prepared or assembled by the Consultant under this agreement, which the County deems confidential, shall not be made available to any individual or organization by the Consultant without the prior written approval of the Director.

15. Ownership Vested in Board. It is expressly understood that any and all equipment, materials, data, information, results and any other thing derived or obtained directly or indirectly as a result of the Project herein, including but not limited to equipment, materials, data, information, and results shall be the sole and exclusive property of the Board and that the Consultant shall have no interest, right, or title in or to any of the foregoing.
16. **Indemnity.** The Consultant shall indemnify, defend and hold harmless the Board from claims, suits, actions, damages, including attorney’s fees, arising out of the Consultant’s errors, omissions, or negligent acts in connection with the Consultant’s performance under this agreement.

17. **Campaign Contributions Prohibited.** It is understood and agreed by the parties hereto that no portion of the Consultant’s compensation to be paid under the terms of this agreement shall be used as a campaign contribution.

18. **Absence of Interest.** The Consultant covenants that it has no interest and shall not acquire any interest, direct, or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this agreement. The Consultant further covenants that in the performance of this agreement, no person having any such interest shall be employed.

19. **Severability.** If any provision of this contract is held invalid, the other provisions of this contract shall not be affected thereby. If the application of the contract or any of its provision of the contract and its provisions to other persons or circumstances shall not be affected thereby.

20. **Conflict.** In the event of any conflict between this contract and the incorporated documents, the terms of this contract shall prevail.

IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed on the date first above written.
DATE: 2/29/96

Consultant:
WARREN S. UNEMORI ENGINEERING, INC.

By Warren S. Unemori
Its President

BOARD OF WATER SUPPLY
COUNTY OF MAUI

Marie Kimmey
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:

Brian T. Moto
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII ) SS.

CITY AND COUNTY OF HONOLULU )

On this 29th day of February, 1996, before me appeared WARREN S. UNEMORI, to me personally known, who, being by me duly sworn, did say he is the President, of WARREN S. UNEMORI ENGINEERING, INC., a Hawaii corporation authorized to do business in Hawaii; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Garme L. Keshimura
Notary Public, State of Hawaii

My commission expires: 6-14-96
STATE OF HAWAII

COUNTY OF MAUI

On this 29th day of February, 1996, before me appeared MARIE KIMMEY, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui and that the seal affixed to the foregoing instrument is the lawful seal of the BOARD OF WATER SUPPLY, and that said instrument was signed and sealed on behalf of the BOARD OF WATER SUPPLY, and the said MARIE KIMMEY acknowledged said instrument to be the free act and deed of said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]
Notary Public, State of Hawaii

My commission expires: 4/19/98

11
WARREN S. UNEMORI ENGINEERING, INC. will proceed through a series of tasks comprising of the design of the development of the North Waihee Wells. The scope of the work is described in the attached letters.
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick,

Subject: North Waihe Wells Development

In response to your request of December 4, 1995 we are pleased to submit this proposal to complete the work necessary to finalize plans and specifications for the following:

PHASE I. INSTALLATION OF 24 INCH TRANSMISSION LINE ON KAHEKILI HIGHWAY BETWEEN KUHINIA STREET AND WELL SITE ACCESS ROAD. ALSO 16 INCH TANK FEEDER LINE BETWEEN WELL SITES 1 AND 2 AND KAHEKILI HIGHWAY

Scope of Services in Proposal to C. Brewer Homes, Inc.:

  - Work Completed to Date:

  1.1 Conducted topographic survey of Kahekili Highway between project limits. Located existing water meters, water lines, fire hydrants, valves, culvert crossings, sidewalks, sidewalks, power poles, etc.

  1.2 Developed topographic map therefrom plotting adjoining property boundaries, driveways, etc.

  1.3 Developed approximate right-of-way line for Kahekili Highway based on adjoining property descriptions and right-of-way maps available.

  1.4 Conducted topographic survey of access road between Well Site 1 and 2 and Kahekili Highway.
• Task 2. Engineering Design Services.

• Work Completed to Date:

2.1 Met with client, SDOT, and DWS to discuss objectives and scheduling of project.

2.2 Developed plan and profile for waterline along Kahekili Highway and Waihee Stream crossing.

2.3 Determined size of waterline needed to deliver minimum of 8 MGD, allowing for reasonable head losses.

2.4 Developed details for stream crossing and typical trench and pavement sections.

2.5 Developed construction traffic control plan per State DOT standards.

2.6 Submitted construction plans to State DOT and Department of Water Supply for approval. (First Submittal)

• Work Remaining:

2.7 Incorporate agency comments after first review and resubmit for final.

2.8 Prepare NPDES permit application and Best Management Practice (BMP) plan for trench dewatering and submit to DOH for approval.

2.9 Develop technical specs.

2.10 Develop cost estimate.

2.11 Develop contract bid documents.

2.12 Assist client with the bidding and bid review process.
• **Task 3.** Installation of 16 Inch Tank Feeder Line Between Well Sites 1 and 2 and 24-inch Line on Kahekili Highway.

**Additional Work:**

3.1 Develop plan and profile for 16-inch tank feeder line along existing access road.

3.2 Develop plans for temporary connection between 16-inch tank feeder line and 24-inch transmission line on Kahekili Highway.

• **Task 4.** Temporary Connection Between 24-inch Transmission line on Kuhinia Street and existing Distribution System on Kahekili Highway.

**Additional Work:**

4.1 Prepare plans to connect new 24-inch transmission line to the existing 8-inch line on Kahekili Highway south of Kuhinia Street intersection.

4.2 Prepare plans to install pressure regulator assembly between the 24-inch transmission line and Waihee Village distribution system north of Kuhinia Street.

**COMPENSATION**

We propose to provide the above mentioned remaining and additional work for the following fees:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>Engineering Design Services</td>
<td>$21,000</td>
</tr>
<tr>
<td>3.0</td>
<td>16-inch Feeder Line along Access Road</td>
<td>$10,000</td>
</tr>
<tr>
<td>4.0</td>
<td>Temporary Connection on Kahekili Highway in Vicinity of Kuhinia Street</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

SUBTOTAL - PHASE I: $33,000
PHASE II. DEVELOPMENT OF NORTH WAIHEE WELLS 1 AND 2

Scope of Services in proposal to C. Brewer Homes Inc.

- Task 1. Civil Engineering.

- Work Completed to Date:
  1.1 Prepared well site grading plan.
  1.2 Prepared site plan showing layout of equipment building, generator, electrical transformer pad and driveway.
  1.3 Prepared site drainage plan.
  1.4 Prepared plans to pave well site and access driveway.
  1.5 Prepared fencing plan to secure well site.
  1.6 Designed equipment building to house chlorinator, MCC, diesel generator and SCADA system.
  1.7 Coordinated work with electrical and mechanical subconsultant and submitted plans and specs for agency review. (First Submittal)

- Work Remaining:
  1.8 Incorporate agency review comments and resubmit plans and specs for final approval of DPW, TWC, DOH, and DLNR.
  1.9 Prepare engineering report for approval by DOH Clean Water Branch.
  1.10 Prepare technical specs, proposal, and contract bid documents.
  1.11 Assist client solicit and review bids.
• Task 2. Mechanical and Electrical Engineering.

  • Work Completed to Date:

    2.1 Prepared plans for deepwell pumps to be installed in existing wells.

    2.2 Prepared plans for two sets of discharge piping, control valves, flow switches, solenoid valves, and well level recording devices.

    2.3 Designed chlorination system, exhaust air system, compressor, and flow meter assembly.

    2.4 Prepared plans for Motor Control Center (MCC), electrical conduits and wiring, incoming power ducts and transformer pad, and meter system.

    2.5 Prepared plans for emergency generator, automatic transfer switch and concrete mounting pad for same.

    2.6 Prepared plans for SCADA and telemetry system.

• Task 3. Geologist (John Mink)

  • Work Remaining:

    3.1 Provide general advice on setting for installation of pumps in North Waihee Wells 1 and 2.

    3.2 Write protocol for engineering report to be submitted to DOH.

    3.3 Oversee pumping tests on these wells.

• Task 4. Temporary Pump Control for Wells 1 and 2 and Connection to Existing Distribution System.

  • Additional Work:

    4.1 Run pipe analysis to determine capacity of existing system.
4.2 Evaluate pump curve to determine whether deep-well pump needs to be modified for temporary hookup to existing low level water system.

4.3 Prepare plans and specifications for temporary pump control between Wells 1 and 2 and Waiehu Heights Tank.

**SENSATION**

We propose to provide the above mentioned remaining and additional work for the following fees:

<table>
<thead>
<tr>
<th>Task</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Civil Engineering</td>
<td>$6,500</td>
</tr>
<tr>
<td>2.</td>
<td>Mechanical and Electrical Engineering</td>
<td>$7,000</td>
</tr>
<tr>
<td>3.</td>
<td>Geologist</td>
<td>$10,000</td>
</tr>
<tr>
<td>4.</td>
<td>Temporary Pump Control Between Wells 1 and 2 &amp; Waiehu Heights Tank</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

**SUBTOTAL - PHASE II:** $27,500

**TOTAL FEE PROPOSED - PHASES I AND II:** $60,500

The State GET (4.167%) will be added to all fees.

**DIRECT EXPENSES**

Cost of printing approved plans, specifications, and addenda for bidding purpose shall be reimbursed at invoiced amount. Suggested budget amount for this purpose is: $4,000
SCHEDULE OF PERFORMANCE

We propose to complete the above described remaining and additional work in Phases I and II within sixty (60) calendar days following receipt of the written Notice to Proceed, exclusive of review time by governmental agencies.

This proposal has been prepared with the understanding that the following services will be provided by the Department of Water Supply or other consultants retained by the Board for the project.

2. Environmental Assessment.
5. Soil Engineering, if required.

Thank you for giving us the opportunity to submit this proposal. If you have any questions, please call us. We look forward to receiving authorization to complete the design of Phases I and II of the project.

Sincerely,

[Signature]

Warren S. Unemori
December 8, 1995

Mr. David Craddick, Director
Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick,

Subject: North Waihe Wells Development

This proposal is being submitted to complete the unfinished scope of services for Phases III, IV, and V of subject project as requested in your letter of November 29, 1995. The proposal for Phases I and II, which had a higher urgency, was submitted yesterday.

The scope of services for Phases III, IV, and V are as follows:

PHASE III. INSTALLATION OF 24 INCH TRANSMISSION LINE BETWEEN KUHINIA STREET AND THE CMJV 1.0 MG RESERVOIR IN UPPER WAIHEU

Scope of services in proposal to C. Brewer Homes, Inc.

Task 1. Surveying Services

- Work Completed to Date:
  
  1.1 Established horizontal and vertical survey controls along transmission line route between Kuhinia Street and CMJV well source.

  1.2 Conducted topographic survey of transmission line route including gulch crossings, and developed topographic map therefrom.

- Work Remaining:

  1.3 Develop metes and bounds descriptions and maps for transmission line easement between Kuhinia Street and CMJV well source.
Task 2. Engineering Design Services

• Work Completed to Date:

2.1 Set up preliminary plan and profile work sheets for transmission line.

2.2 Prepared exhibits for stream alteration permit at four (4) drainage crossings.

• Work Remaining:

2.3 Finalize plan and profile of water system.

2.4 Design drainage structure at Waiehu Stream and Hope Gulch crossings.

2.5 Develop typical details of pavement section and construction traffic control plan for Malaihi Road in Upper Waiehu.

2.6 Prepare plan of water system details.

2.7 Prepare plans for connection to existing 1.0 MG Upper Waiehu Reservoir.

2.8 Develop technical specs, cost estimate and contract bid document.

2.9 Submit plans and specs for agency review.

2.10 Address review agency comments and resubmit plans for final approval.

2.11 Prepare NPDES permit application and Best Management Practice (BMP) plan for stream crossing and disposal of water from hydrotesting and dewatering.

2.12 Assist client with the bidding and bid review process.
Mr. David Craddick  
North Waihee Wells Development  
Phases III, IV, and V  
December 8, 1995  
Page 3

COMPENSATION

We propose to provide the above mentioned remaining services for the following fees:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Surveying Services</td>
<td>$9,000</td>
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<tr>
<td>2.</td>
<td>Design Engineering Services</td>
<td>$128,000</td>
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</tbody>
</table>

**SUBTOTAL - PHASE III:** $137,000

**PHASE IV. CONSTRUCTION OF 0.5 MG CONTROL TANK AND SITE IMPROVEMENTS, INCLUDING GRADING AND PAVING OF TANK SITE AND ACCESS ROAD, INSTALLATION OF 24 INCH INFLOW AND OUTFLOW LINES AND DRAINAGE SYSTEM**

Scope of services in proposal to C. Brewer Homes, Inc.

**Task 1. Surveying Services**

- **Work Completed to Date:**
  
  1.1 Established horizontal and vertical survey controls along tank access road and at tank site.
  
  1.2 Conducted topographic survey of 0.5 MG tank site.
  
  1.3 Conducted topographic survey of access road to tank site.
  
  1.4 Developed topographic map therefrom.

- **Work Remaining:**
  
  1.5 Develop subdivision map to cut out tank site from TMK 3-2-01:03 following establishment of the tank site limits.
  
  1.6 Prepare easement for tank access road.
Mr. David Craddick  
North Waihee Wells Development  
Phases III, IV, and V  
December 8, 1995  
Page 4

1.7 Prepare metes and bounds description for tank site and tank access road easement.

1.8 Prepare subdivision application and transmit to DW3 for submittal to LUCA for processing.

Task 2. Design Engineering Services

• Work Remaining:

2.1 Prepare mass grading plans for tank site and access road.

2.2 Prepare plans for tank access road.

2.3 Prepare drainage and soil erosion control report.

2.4 Prepare drainage plans for tank site and access road.

2.5 Prepare fencing plans to secure tank site.

2.6 Coordinate plans with MECO to extend overhead power to tank site for booster pumps.

2.7 Prepare Best Management Practice (BMP) Plan and NPDES permit application.

2.8 Prepare plans to construct 0.5 MG reinforced concrete control tank with required piping, valves, and appurtenances.

2.9 Prepare plans to install concrete diversion ditch, concrete gutter, drainage system and pavement around reservoir site.

2.10 Prepare plans to construct equipment building to house MCC, SCADA, and telemetry systems.

2.11 Prepare plan and profile for separate 24-inch inflow and outflow lines between Kahekili Highway and 0.5 MG control tank.
2.12 Prepare specs, cost estimate, and contract bid documents.

2.13 Submit plans and specs for agency review.

2.14 Address review agency comments and resubmit for final approval.

2.15 Assist client with the bidding and bid review process.

COMPENSATION

We propose to provide the above mentioned remaining services for the following fees:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Surveying Services</td>
<td>$13,500</td>
</tr>
<tr>
<td>2.</td>
<td>Design Engineering Services</td>
<td>$109,600</td>
</tr>
</tbody>
</table>

SUBTOTAL - PHASE IV: $123,100

PHASE V. BOOSTER PUMP STATION AT CONTROL TANK SITE AND SCADA TIE-IN AT DWS BASEYARD IN KAHLULI.

- Task 1:

1.1 Prepare plans for two (2) short-coupled vertical booster pumping units.

1.2 Prepare plans for two sets discharge piping, including control valves, flow switches, and solenoid valves.

1.3 Prepare plans for Motor Control Center, electrical conduits and wiring, incoming power ducts and transformer pad, and metering system.

1.4 Prepare plans for emergency generator, automatic transfer switch and concrete pad.
1.5 Design new instrument house to be located at Upper Waiehu Reservoir to house all SCADA and telemetry equipment, electrical and mechanical work.

1.6 Prepare plans to integrate SCADA system with Department of Water Supply's existing SCADA system.

1.7 Prepare cost estimate, specs and contract bid documents.

1.8 Submit plans and specs for agency review.

1.9 Address review agency comments and resubmit for final approval.

1.10 Assist client in the bidding and bid review process.

COMPENSATION

We propose to provide the above mentioned remaining services for the following fee:

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Description of Services</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Design Engineering Services</td>
<td>$38,600</td>
</tr>
</tbody>
</table>

SUBTOTAL - PHASE V: $38,600

TOTAL FEE PROPOSED - PHASES III, IV, AND V: $298,700

The State GET (4.167%) will be added to all fees.
DIRECT EXPENSES

Cost of printing approved plans, specifications, and addenda for bidding purpose shall be reimbursed at invoiced amount. Suggested budget amount for this purpose is: $6,000

SCHEDULE OF PERFORMANCE

We propose to complete the above described remaining and additional work in Phases III, IV, and V within one hundred fifty (150) calendar days following receipt of the written Notice to Proceed, exclusive of review time by governmental agencies.

This proposal has been prepared with the understanding that the following services will be provided by the Department of Water Supply or other consultants retained by the Board for the project:

1. Environmental Assessment.
2. Stream Alteration Permit.

We hope the foregoing reflects your understanding of the remaining work required to fully integrate Wells 1 and 2 with the CMJV transmission system. If not, please call us. We will be glad to meet with you to discuss any additional scope of services required.

Sincerely,

[Signature]
Warren S. Unemori
EXHIBIT B

TIME SCHEDULE

PHASE I AND PHASE II shall be completed within 60 days of the issuance on Notice to Proceed, exclusive of review time by governmental agencies.

PHASE III, PHASE IV, AND PHASE V shall be completed within 150 days of Notice to Proceed, exclusive of review time by governmental agencies.
Section 1 - Definitions

1.01 Board
1.02 County
1.03 Consultant
1.04 Contract
1.05 Department
1.06 Director
1.07 HRS
1.08 Project

Section 2 - Award and execution of contract

2.01 Selection of consultant
2.02 Contract not binding unless properly executed
2.03 Agreements outside of the contract
2.04 Notice to proceed

Section 3 - Legal Relations and Responsibility

3.01 Independent contractor
3.02 Contracts by the consultant
3.03 Findings confidential
3.04 Ownership vested in department
3.05 Indemnity
3.06 Campaign contributions prohibited
3.07 Absence of interest
3.08 Laws, ordinances and codes, and rules
3.09 Arbitration
3.10 Professional liability insurance

Section 4 - Performance of contract

4.01 Time of performance
4.02 Delay
4.03 Liquidated damages
4.04 Prosecution of the work
4.05 Modification of contract
4.06 Authority of the director
4.07 Subcontracting or assignment of contract
4.08 Cooperation by the department
4.09 Use of department’s standards
4.10 Review by the department
Section 5 - Compensation

5.01 Compensation
5.02 Reduction or increase in compensation
5.03 Payments
5.04 Assignment of money due or payable

Section 6 - Remedies

6.01 Right of the board to suspend the performance of services
6.02 Right of the board to terminate the contract
6.03 Authority to withhold money due or payable
6.04 Remedies not exclusive

SECTION 1 - DEFINITIONS

1.01 "Board" means the Board of Water Supply, County of Maui.
1.02 "County" means the County of Maui, State of Hawaii.
1.03 "Consultant" means the individual, partnership, corporation, or joint venture engaged by the Board to perform the services under the contract.
1.04 "Contract" means the written agreement covering the performance of certain professional services by the consultant. It shall include all referenced material, and all exhibits attached thereto and included therein. It shall also include all modifications of the contract by supplemental agreements thereto in writing and written orders of the director.
1.05 "Department" means the Department of Water Supply, County of Maui, including the Board of Water Supply.
1.06 "Director" means the director of the Department of Water Supply, County of Maui, or the director's representative.
1.07 "HRS" means Hawaii Revised Statutes.
1.08 "Project" means the undertaking under the contract.

SECTION 2 - SELECTION OF CONSULTANT AND EXECUTION OF CONTRACT

2.01 Selection of consultant. The consultant, upon being selected to render certain professional services for the project, will be notified of the consultant's selection by the director. The notice shall not be construed to be authorization to proceed with the performance of services.
2.02 Contract not binding unless properly executed. The contract shall not be binding or have any force until it has been fully and properly executed by all of the parties thereto, and the insurance policy required under subsection 3.10 is accepted by the director.

2.03 Agreements outside of the contract. The contract and this General Terms And Conditions Of Contracts Of The Department Of Water Supply For Services Of Consultants contain the complete understandings regarding the responsibilities of the department and the consultant, and as of the effective date of the contract, supersede all other understandings between the consultant and the department.

2.04 Notice to proceed. (a) The director shall issue a written notice to proceed, establishing the date on which the time of performance shall commence and authorizing the consultant to proceed with the performance of the consultant’s services.

(b) Services performed by the consultant prior to the date indicated in the notice to proceed shall be at the consultant’s own risk.

SECTION 3 - LEGAL RELATIONS AND RESPONSIBILITY

3.01 Independent contractor. The consultant shall perform the contract as an independent contractor. The consultant, the consultant’s subcontractors, agents, and employees shall not be entitled to the benefits and privileges of an employee of the county under the civil service system.

3.02 Contracts by the consultant. The consultant does not have the right to enter into any contract on behalf of or make any commitment on behalf of the department.

3.03 Findings confidential. Any report, information, or data prepared or assembled by the consultant under the contract shall not be made available to any individual or organization by the consultant without the prior written approval of the director.

3.04 Ownership vested in department. (a) Any and all data, information, field notes, designs, drawings, tracings, results, and any other thing derived or obtained directly or indirectly as a result of the contract shall be the sole and exclusive property of the department and the consultant shall not have any interest, right, or title in or to any of the foregoing.

(b) Prior to the release of retainage under subsection 5.03, or termination of the contract under subsection 6.02, the
consultant shall submit the items prepared pursuant to subsection (a) herein to the department.

3.05 Indemnity. The consultant shall defend, indemnify, and hold harmless the board, its officers, employees, and assigns, from and against any and all claims, suits, actions, injuries to persons, damages to property, and wrongful death, that may arise out of or in connection with any errors, omissions, or negligent acts by the consultant, the consultant’s subcontractors, agents, and employees, in their performance of the contract until such time as any action against the consultant is barred by Chapter 657 HRS, as amended, and shall reimburse the board, its officers, employees, and assigns, for any judgments, costs, and expenses, including attorney’s fees, incurred in connection with the defense of any such claim, or incurred by the board in enforcing this provision.

3.06 Campaign contributions prohibited. No portion of the consultant’s compensation under the contract shall be used for campaign contributions.

3.07 Absence of interest. The consultant covenants that it presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this contract. The consultant further covenants that in the performance of this contract, no person having any such interest shall be employed.

3.08 Laws, ordinances and codes, and rules and regulations. (a) The consultant shall be fully informed of all applicable federal and state laws, county ordinances and codes, and federal, state, and county rules and regulations, which in any manner affect the contract and the performance thereof, including but not limited to:

(1) Article 1 of Title 10, Maui County Code, as amended, relating to the traffic code,

(2) Title 12, Maui County Code, as amended, relating to streets, sidewalks, and public places,

(3) Article 3 of Title 14, Maui County Code, as amended, relating to improvement districts,

(4) Chapter 16.04, Maui County Code, as amended, relating to the Model Fire Code,

(5) Chapter 16.08, Maui County Code, as amended, relating to the Housing Code,

(6) Title 19, Maui County Code, as amended, relating to zoning,
(7) Chapter 16.24, Maui County Code, as amended, relating to the Building Code,
(8) Chapter 16.16, Maui County Code, as amended, relating to the Electrical Code,
(9) Chapter 16.20, Maui County Code, as amended, relating to the Plumbing Code,
(10) Chapter 103, HRS, as amended, relating to expenditure of public money,
(11) Chapter 104, HRS, as amended, relating to wages and hours of employees on public works,
(12) Chapter 22 of Title 12, Hawaii Administrative Rules, relating to wage determinations
(13) Chapter 132, HRS, as amended, relating to the fire marshal,
(14) Chapter 321, HRS, as amended, relating to the Health Department,
(15) Chapter 343, HRS, as amended, relating to environmental impact statements.
(16) Chapter 378, HRS, as amended, relating to fair employment practices,
(17) Chapter 376, HRS, as amended, relating to industrial safety,
(18) Chapter 386, HRS, as amended, relating to workers' compensation,
(19) Chapter 396, HRS, as amended, relating to occupational safety and health.
(20) Section 507-17, HRS, as amended, relating to recovery on bond for materials and labor used on public works.
(21) Chapter 200 of Title 11 of the department of health, relating to environmental impact statements.
(22) Part 3 of Subtitle 8 of Title 12, Hawaii Administrative Rules, relating to construction standards.
(23) Article II, Special Management Area Rules and Regulations of the County of Maui.
(24) Title 19 of the Maui County Code, relating to zoning.
(b) If any discrepancy or inconsistency is discovered between the contract and any such law, ordinance, code, or rule, the consultant shall forthwith advise the director, in writing, of such discrepancy or inconsistency.

(c) The consultant shall comply with all such current laws, ordinances and codes, and rules.

(d) If, in part, the consultant's work includes the preparation of construction bid documents, the department's furnishing of the general conditions, and forms of the proposal, bid bond, contract, and performance and payment bond under subsection 4.09, does not waive the consultant's responsibility under this subsection and consultant shall be fully responsible for the design of the project.

3.09 Arbitration. (a) Any controversy arising out of the contract, the refusal to perform the contract or any portion thereof, or the breach thereof shall be settled by arbitration in accordance with the rules of the American Arbitration Association and judgment rendered by such arbitration shall be binding upon the board and the consultant. Each party shall bear its own costs and shall equally pay for any and all fees, costs, and expenses of the arbitrator.

(b) The consultant shall not delay the work because arbitration proceedings are pending or in progress, unless approved, in writing, by the board.

3.10 Professional liability insurance. The insurance to be procured and maintained under the contract shall not be less than one million dollars.

SECTION 4 - PERFORMANCE OF CONTRACT

4.01 Time of performance. Time is of the essence of the contract. Performance of the services shall be commenced on the commencement date designated in the notice to proceed, and shall be completed within the contract time specified in the contract.

4.02 Delay. (a) If any delay in the performance of the consultant's services occur as a result of unforeseeable causes beyond the control and without the fault or negligence of the consultant, including but not limited to acts of God, acts of the public enemy, acts of the department with respect to the contract, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe unforeseeable causes beyond the control and without the fault or negligence of the consultant and the consultant's subconsultants, the consultant shall be granted an
extension of the time of performance, corresponding to the length of the delay.

(b) If, as a result of the delay, completion of performance within the extended time causes undue hardship to the consultant, the director may, in the director's discretion, grant a further extension of the time of performance.

(c) No extension of time shall be granted unless a written application, stating in detail the cause or causes for such delays is filed by the consultant with the director within ten calendar days after the commencement of the delay. The period of time of each extension of time shall be determined by the director. No such extension shall be deemed a waiver of the right of the board to terminate the contract for any other or additional delay not covered by the specific terms of such an extension or extensions.

4.03 Liquidated damages. Due to the speculative character and difficulty of ascertaining damages to the department resulting from any delay beyond the contract time, the consultant, for the purpose of putting the question of damages beyond controversy and dispute, shall pay the board an amount equal to the daily rate set forth in the contract multiplied by the number of days beyond the contract time as liquidated damages and not as a penalty for work which remains incomplete beyond the contract time or as extended by the director; provided that the remedy of liquidated damages shall be in addition to any other rights and remedies otherwise available to the board and not expressly waived herein.

4.04 Prosecution of the work. (a) The consultant shall be available upon reasonable demand to discuss the progress of the services being performed. All questions arising during the performance of the contract which must be resolved by the director shall be brought to the director's immediate attention.

(b) The consultant shall perform the consultant's work in accordance with established practices for good exterior appearance, and the natural and man-made environment; provided that if the project is for an economic feasibility study or other study, the consultant shall direct the consultant's work to relate appropriately to and in accordance with established principles, practices, and standards for such study.

(c) The consultant shall furnish sufficient technical supervision and administrative personnel to insure the proper performance of the services under the contract.

(d) The consultant shall be responsible for the accuracy of all computations, completeness, and integrity of all designs and plans or studies.
(e) The director shall have access at all reasonable times to all notes, designs, drawings, tracings, or other technical data pertaining to the services being performed under the contract for the purpose of inspection or making copies thereof.

4.05 Modifications of contract. (a) The department may at any time revise the scope of the project or the consultant's scope of work; provided that such revisions shall be made by an amendment to the contract.

(b) No waiver or modification of the contract, or any provision therein shall be valid unless such waiver or modification is in a form of an amendment to the contract and executed by the consultant and the board.

(c) No document, other than an amendment to the contract and executed by the consultant and the board, purported to be a waiver or modification of the contract, or any provision therein shall be offered or received in evidence of any proceeding, arbitration, or litigation arising out of or affecting the contract, or the rights or obligations of the consultant or the board.

4.06 Authority of the director. Any question or dispute concerning any provision of the contract which may arise during its performance shall be decided by the director. The decisions of the director shall be final and binding upon all parties unless such decisions is fraudulent, capricious, arbitrary, or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. Any appeal under this subsection shall be submitted to the board. Nothing herein shall be construed as making final and binding any decision of the director or the board, or both, on a question of law. Pending final decision of any dispute or question, the consultant shall proceed diligently with the consultant's performance of services in accordance with the decision of the director or the board.

4.07 Subcontracting or assignment of contract. The consultant shall not subcontract or assign all or any part of the performance of the consultant's services without the prior written consent of the director. Any consent by the director to subcontract any portion of the contract shall not be construed to relieve the consultant of any responsibility for the performance of the contract.

4.08 Cooperation by the department. The department, without cost to the consultant, shall cooperate fully with the consultant and will promptly place at the consultant's disposal all available pertinent information which the department may have in its possession.

4.09 Use of department's standards. (a) The consultant shall refer to the department's standard details and shall not
duplicate such standard details in the consultant's work, unless the consultant makes modifications thereto.

(b) The department will provide the consultant with the general conditions, and formats of the proposal, bid bond, contract, performance and payment bond.

4.10 Review by the department. (a) The department will review the consultant's work, and may ask that certain modifications be made thereof. If, in the consultant's judgment, such modifications by the department affect the consultant's responsibilities under the contract, the consultant shall advise the director in writing.

(b) The inclusion of the department's comments does not waive the consultant's responsibilities under subsection 4.04.

SECTION 5 - COMPENSATION

5.01 Compensation. The consultant shall be paid the amount stated in the contract, reduced or increased pursuant to subsection 5.02, as full compensation for his services under the contract.

5.02 Reduction or increase in compensation. (a) The compensation of the consultant shall be reduced or increased in accordance with the modifications to the consultant's scope of work as the contract is amended under subsection 4.05.

(b) The compensation of the consultant shall be increased to reimburse the consultant for increased costs to perform the services if performance of the services is delayed by more than six months by an act or omission of the department; provided that the consultant submits within thirty days following the termination of the delay, in writing, a request for reimbursement containing:

(1) the reimbursement requested;

(2) the act or omission of the department causing the request for reimbursement;

(3) the services of the consultant affected by the department's act or omission;

(4) a breakdown of the requested reimbursement; and

(5) other information which the consultant and the director deem relevant to the request.
5.03 Payments. (a) As long as the services of the consultant are performed in accordance with the contract, the department may pay the consultant monthly progress payments based upon the value of the services performed by the consultant, as estimated by the consultant and the director.

(b) The department may retain up to five percent from each monthly progress payment, and after fifty percent of the compensation under the contract is paid, and the consultant's performance is satisfactory, no additional amount will be retained; provided that if the consultant's performance is not satisfactory, the director may retain up to five percent of all amounts due the consultant.

(c) Final payment, inclusive of amounts retained by the department, shall be made (1) upon determination by the director that the consultant has satisfactorily fulfilled his obligations under the contract, and (2) in accordance with chapters 103-53 and 237-45, HRS, upon receipt of a tax clearance from the department of taxation, certifying that the consultant has paid all delinquent taxes levied or accrued.

5.04 Assignment of money due or payable. Assignments of money due or to become payable to the consultant shall not be valid without the prior written consent of the director. The rights of the assignee to moneys due or to become due to the consultant shall be subject to subsection 6.03.

SECTION 6 - REMEDIES

6.01 Right of the board to suspend the performance of services. (a) The board has the right to order the suspension of the performance of the services or portions thereof at any time. The order shall:

(1) Be in writing;

(2) State the reason or reasons for the suspension;

(3) Specify the portions of the contract being suspended; and

(4) Specify the estimated period of suspension.

(b) If the board orders the suspension of the entire performance of services and the estimated period of suspension is more than six months, the consultant has the right to terminate the contract; provided that he submits a request for termination within six months following receipt of the order for suspension.
(c) If the contract is not terminated within six months, the consultant may request reimbursement for additional costs incurred due to the suspension of work.

6.02 Right of the board to terminate the contract. (a) The board has the right to order the termination of the contract at any time. The order shall be in writing and shall be forwarded to the address of the consultant stated in the contract.

(b) The board may terminate the contract if the consultant:

(1) fails to begin work under the contract at the time required;

(2) is unnecessarily delaying the performance of the contract or any part thereof;

(3) is failing to perform the contract with sufficient or adequate personnel, equipment, or materials, or is not making sufficient progress to ensure the completion of the contract within the time specified;

(4) fails to perform the contract in accordance with directions of the director;

(5) discontinues performance of the contract;

(6) fails to recommence performance of the contract within a reasonable time after service of a written order to do so is the performance had been suspended;

(7) becomes insolvent or is declared bankrupt;

(8) commits any act of bankruptcy or insolvency;

(9) allows any final judgment to stand against the consultant unsatisfied for a period of ten calendar days;

(10) makes an assignment for the benefit of creditors;

(11) fails to pay for all labor, tools, materials, and equipment;

(12) has abandoned the contract; or

(13) violates or fails to comply with any of the provisions of the contract or this General Terms and Conditions of Contracts of the Department of Water Supply for Services of Consultants.
(c) The board may also terminate the contract for reasons, which may include but are not be limited to, the abandonment, deferral, restudy, or revision of the project by the department.

(d) If the board terminates the contract due to the consultant's default, the board may contract with another consultant to complete the remainder of the contract.

(e) In any termination, the consultant shall be compensated for all work performed until the termination order, upon the consultant's compliance with subsections 3.04 and 5.03.

(f) Such compensation due the consultant shall take into account liquidated damages, and the value of materials, data, maps, plans, or other documents or information gathered, complied, produced, or obtained, which the consultant fails to deliver.

6.03 Authority to withhold money due or payable. The board may withhold such amounts from the money due or to become payable under the contract to the consultant, or any assignee under subsection 5.04, as may be necessary to protect the board against liability or to satisfy the obligations of the consultant to the board and to employees, subcontractors and material men who have performed labor or furnished material and equipment under the contract and may make such payments from such amounts as may be necessary to discharge such obligations and protect the board.

6.04 Remedies not exclusive. The express provision herein of certain measures which may be exercised by the board for its protection shall not be construed to preclude the board from exercising any other or further legal or equitable right to protect its interests.
I, Kim Nuyen, Fiscal Officer of the Department of Water Supply, County of Maui, State of Hawaii, do certify that there is available appropriation or balance of an appropriation over and above all outstanding contracts, sufficient to cover the amount required by the foregoing contract, i.e.

<table>
<thead>
<tr>
<th>Appropriation Symbol</th>
<th>Source of Funds</th>
<th>Amount Required</th>
</tr>
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<tbody>
<tr>
<td>CENTRAL MAUI</td>
<td>SOURCE</td>
<td>$384,150</td>
</tr>
</tbody>
</table>

Contract No. WU0853 - WENMORI ENGINEERING, INC.

Dated this 29th day of FEBRUARY, 1996.

JN 92-5

Holly Perdido
Fiscal Officer
February 29, 1996

Mr. Warren Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Maui, Hawaii 96793

Dear Mr. Unemori:

Subject: Independent Professional Services for the Development of North Waihe Wells

This letter constitutes NOTICE TO PROCEED for all work under the subject project.

You are hereby notified that the official commencement date of this project shall be February 29, 1996. The time allowed to complete the required services is specified in the contract, exclusive of time required for governmental review.

Please acknowledge receipt of this notice in the space provided below on the original and two copies and return them to the Department of Water Supply. Please keep the third copy of this letter for your files.

A copy of the fully executed contract will be forwarded for your files.

Sincerely,

David R. Craddick
Director

hk

cc: DWS Fiscal
    DWS Contractor
    DWS Engineer
    Director

NOTICE TO PROCEED RECEIVED
THIS 29TH DAY OF FEBRUARY 1996.

Warren S. Unemori

"By Water All Things Find Life"
Tuesday, February 13, 1996

Paul Seitz
BWS County of Maui
614 PalaPala Drive
Kahului, Maui, Hawaii 96732

Dear Mr. Seitz,

Memtec America Corporation (Memcor Division), has pleasure in submitting this budgetary quotation for the supply of Microfiltration technology for the Olinda WTF. The Memcor® Continuous Microfiltration (CMF) technology will provide the Island of Maui with a very high quality water for its potable water applications.

In this quotation, Memcor has detailed a CMF system to handle the requirements of 2 mgd by utilizing modular microfiltration units 3 x 90M10C for a total price of $1,659,340. Also, the price to supply a 2 x 90M10C system would be $1,295,650.

As we previously discussed, this project is quoted as a bare minimum. This does not include freight, except the microfiltration skids themselves, which are FOB Port of Honolulu, all other equipment is FOB supplier. Additionally, there are no submittal drawings, spare parts, any additional training, control programming, any state, federal or local taxes, and the Terms and Conditions and payment terms are as previously negotiated for Lahaina and Kamole WTF’s. Memcor have attempted to cut everything that is not absolutely necessary in order to give the County of Maui the absolute lowest price.

What it does include is, three microfiltration skids, one control system using a Pentium based processor (Wonderware or equal), two air compressors w/ air dryers, one air receiver, one CIP tank w/ no immersion heater, one CIP recirculation pump, essential actuated valves on CIP line, concentrate solution feed system, 55 gallons of Memclean® concentrate, 15 man days of startup, and six standard O&M manuals. Our standard scope of supply as we have quoted in the past.

Memcor will supply our generic drawings for process layout, but will not provide any site specific detailed drawings, telemetry is also excluded.
Memcor has allowed for microfiltration equipment inspection at our factory, if this is necessary.

Delivery is 10 to 14 weeks after acceptance of purchase order. This delivery is based on present inventory and may change at any time.

This offer is valid for 45 days.

We look forward to working with you on this project to satisfy your filtration requirements.

Sincerely,

Paul Johnson
Regional Manager

cc: Claude Jordan - Memtec America
    John Crapper - Memtec Limited
GRANT OF EASEMENT
(Well Field 1)

This Indenture is made this 21\textsuperscript{st} day of \textit{February}, 1996, by and between WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, whose business and post office address is 90 Waiko Road, P. O. Box 520, Wailuku Maui, Hawaii 96793 ("Grantor") and THE BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI, a political subdivision of the State of Hawaii whose principal office and post office address is 200 South High Street, Wailuku, Maui, Hawaii 96793 ("Grantee").

BACKGROUND STATEMENT:

1. Grantor owns that certain parcel of land situated at Waihe'e, Maui, Hawaii, described on Exhibit "A" attached hereto and made a part hereof (the "Grantor's Land").
2. The purpose of this indenture is to establish an easement in accordance with that certain Right-of-Entry Agreement to Grant Easements between Grantor and Grantee, dated \( \text{Feb} \, 21, \, 1996 \).

**EASEMENT:** For valuable consideration, Grantor hereby grants and conveys to the Grantee an "Easement" (defined below) over the "Easement Area" (defined below and located on the Grantor's Land described in Exhibit A), upon and in accordance with all of the following terms and conditions:

1. **Easement Defined.** This easement shall include the following rights:

   a) To construct, maintain, operate, repair and replace the following facilities:

      two existing water wells together with appurtenant pipelines, valves, fences, security devices, electrical power lines, communication lines and other facilities associated with the use and operation of said wells;

   b) The right of pedestrian and vehicular ingress and egress and the right to construct, operate, repair, maintain and replace a road or driveway, as needed for the purpose of constructing, maintaining and operating the facilities described in subparagraph (a) above; and

   c) The right to drain overflows and discharges of water from said wells and appurtenant pumps, provided that all such overflows and discharges shall be managed within the Easement Area, so that the volume or flow of drainage from the Easement Area to adjoining lands shall not be increased or altered from its presently existing natural flow.

2. **Easement Area Defined.** The Easement Area is the area described and located as set forth in Exhibit B attached hereto and made a part hereof.

3. **Grantor's Limited Warranty.** Grantor for itself and its successors and assigns does hereby covenant with Grantee that Grantor is seised in fee simple of the Easement Area; the Grantor's Land is free and clear of all liens and encumbrances made by Grantor or by persons claiming by, through or under the Grantor except for those encumbrances and other matters set forth on Exhibit A; and Grantor will, and its successors and assigns shall, warrant and defend the interest unto Grantee, its successors and assigns against the lawful claims and demands of all persons claiming by, through or under Grantor, except as aforesaid.
4. **Responsibility.** Grantee will at all times in connection with all uses or actions within the Easement Area by Grantee or its agents and licensees, (a) observe and perform all laws, ordinances, rules and regulations now or hereafter imposed by any governmental authority which are applicable to the Easement Area; (b) not at any time make or suffer any strip or waste or unlawful, improper or offensive use of the Easement Area; (c) keep the Easement Area reasonably clear of litter and refuse; (d) keep and maintain the Easement Area in reasonably safe condition and in good repair; (e) not permit the Easement Area to be used for any purpose other than the purposes expressly permitted under paragraph 1 above; and (f) complete the construction of all improvements, once begun, promptly and with due care and diligence and free and clear of all liens.

5. **Use of Easement Area by Grantor.** This Easement shall be exclusive as to those areas containing the facilities described in Section 1(a) above, but shall be nonexclusive as to those areas designated for roadway or access purposes. Grantee understands that the existing driveway is used for access to abutting properties other than Grantor’s land, and that third parties may have rights to use said access.

6. **Relocation of Easement Area by Grantor.** At any time and from time to time the Grantor may relocate the Easement Area in order to facilitate the Grantor’s use and development of the Grantor’s land, provided that:

   (a) Said relocation right shall apply only to roadways, pipelines, buildings and moveable equipment, and shall not apply to permanent fixtures which cannot physically be moved such as developed wells.

   (b) All expenses in connection with governmental approvals for the relocation of the easement area and the establishment of record of the relocated easement shall be borne by the Grantor at no cost to the Grantee;

   (c) Said relocated Easement shall provide for Grantee’s rights and obligations on all of the same terms and conditions as set forth in this Easement; and

   (d) As a condition of said relocation becoming effective, Grantor will pay all costs to relocate all of the Grantee’s improvements and facilities to the relocated easement area in at least as good condition and remaining useful life as existed prior to the relocation.

Simultaneously with Grantor’s conveyance and grant to the Grantee of a new Easement over the relocated easement area, meeting all the terms and conditions...
hereof, (i) Grantee will release and transfer to Grantor all of its rights and interest in the Easement Area as it existed prior to the relocation becoming effective, free and clear of all liens, claims, and encumbrances made or suffered by Grantee, and (ii) Grantor and Grantee will execute and record an appropriate amendment to this easement under which all of the terms and conditions of this easement will remain applicable to the relocated easement.

Grantee intends to install overhead utility lines as part of Grantee's improvements, within the Easement Area. Grantee agrees to convert such overhead utility lines to underground utility lines when requested, in writing, by Grantor, provided however that Grantee's obligation to so convert to underground utilities is on the condition that Grantor has first created an underground conduit in order for Grantee to install the power lines underground. It is agreed and understood that the cost to construct the underground conduit will be borne totally by Grantor and the cost to convert the overhead utility line to underground, that is, the cost to remove the overhead power lines, poles and facilities and to install the power lines in Grantor's conduit shall be borne totally by Grantee.

7. **Maintenance of Easement Area by Grantor.** Grantor shall have the right to improve or maintain the Easement Area in its sole discretion. However, Grantor will not be obligated in any way to maintain or improve the Easement Area or to maintain, safeguard or repair Grantee's facilities within the Easement Area.

8. **Construction, Bonding and Insurance.** All of Grantee's construction work shall be performed in accordance with all applicable governmental law, rules and regulations of the State of Hawaii and Grantee. This includes the performance of all construction work by appropriately qualified contractors, the provision of performance and payment bond(s), and the maintenance of all insurance coverage for the duration of the construction period. Grantor shall be named as an additional insured under all insurance policies, including comprehensive general liability insurance and such coverage shall be required in the bid specifications for the construction work.

9. **Taxes.** Grantee shall pay as and when due all real estate taxes and assessments which shall become due with respect to and are properly allocable to Grantee's facilities and those areas of Grantor's land encumbered by the Grantee's facilities.

10. **Grantor's Agricultural Activities and Right to Farm.** Grantor and the Grantee agree that lands located adjacent to or in the vicinity to the Easement Area which are now owned, used or hereafter acquired by Grantor are or will be in agricultural operation and Grantor will have the unrestricted right to engage in any type of farming operation, including, but not limited to, open burning, percolating, evaporating, fertilizing, milling, generating power, water diversion, plowing grading, storing, hauling, spraying pesticides, irrigating, crop dusting, and all other activities
incidental to the planning, farming, harvesting and processing of agricultural products and that smoke, dust, light, heat, vapor, odor, chemicals, vibration, and other nuisances may be discharged or emitted over and upon the Easement Area. Grantor, its successors and assigns, shall not be responsible or liable to the Grantee, its successors and assigns, for the consequences from the creation and discharge of such noxious emissions.

11. **Property “As Is”**. This Easement is granted subject to the encumbrances affecting Grantors’ land as set forth in Exhibit A hereto. Grantee accepts the physical condition of the land and all Easement Areas in “as is” condition. Grantor makes no representations or warranties whatsoever, as to the physical condition of the Easement Area, the suitability of the land for the Grantee’s intended purposes, the availability, quantity or quality of any developed or undeveloped water resources, or the applicability of any laws, rules or regulations.

12. **Mediation**. If any claim or dispute shall arise in connection with the interpretation of this agreement or the performance or breach by any party, both parties agree in good faith to attempt to settle such dispute by non-binding mediation in Wailuku, Hawaii conducted under the Commercial Mediation Rules of the American Arbitration Association.

13. **Attorney’s Fees**. If any legal action or arbitration shall be brought by a party to enforce or interpret any provision of this agreement or to redress any breach by the other party, the prevailing party shall be entitled to recover its reasonable attorney’s fees and costs.

14. **Appurtenance and Successors**. This Agreement shall inure to the benefit of and shall be binding upon the parties hereto and their respective successors and assigns. The terms "Grantor" and "Grantee" herein shall include their respective successors.

15. **Governing Law**. This Agreement shall be governed by the laws of the State of Hawaii.

16. **No Waiver**. No failure by any party to insist upon strict performance by the other party of any of the terms and provisions of this agreement shall be deemed to be a waiver of any such terms or provisions or of the other party’s obligation to comply with such terms or provisions; and notwithstanding such failure, each party shall have the right thereafter to insist upon the other party’s strict performance of such terms and provisions. Any waiver of the terms of this agreement shall not be effective unless given in writing.

17. **Amendments**. This agreement may not be amended unless mutually agreed to in writing and signed by the parties hereto.
18. **Notices.** All notices or other communications given by either party hereto shall be deemed to be duly given and received by the other party upon the earlier to occur of (a) actual receipt by a duly elected or appointed officer, director or authorized employee of said other party, either by mail, courier, hand delivery or facsimile transmission, or (b) three business days after having been deposited in the United States Mail, postage prepaid, sent by registered or certified mail (whether or not actually received by the other party), addressed to the other party at the address set forth at the top of this agreement, or to such other address as such other party may have given notice of to the sending party in accordance with the foregoing provision.

19. **Counterparts.** This Easement may be executed in counterparts, and said execution shall have the same effect as if all parties executed the same original copy hereof. Either party shall be authorized to combine all signed original pages and notary acknowledgments within a single copy of this document for purposes of recording in the State of Hawaii Bureau of Conveyances and submission to any tribunal in any proceeding.

Executed as of the day and year first above written.

**Grantor:**

**WAILUKU AGRIBUSINESS CO., INC.**

By ____________________________

Its: CHAIRMAN OF THE BOARD

By ____________________________

Its: Secretary

**Grantee:**

**THE BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI**

By ____________________________

Its: Authorized Signatory
Approved as to Form and Legality

Gary W. Zakian
Deputy Corporation Counsel
County of Maui
On this 21st day of February, 1996, before me personally appeared J. ALAN KUGLE and KATHLEEN F. OSHIRO, to me personally known, who, being by me duly sworn, did say that they are the Chairman of the Board and Secretary, respectively, of WAILUKU AGribusiness Co., Inc., a Hawaii corporation, that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

[Signature]

Notary Public, State of Hawaii

My Commission Expires: 11/2/97
STATE OF HAWAI'I  )
COUNTY OF MAUI  ) SS.

On this 20th day of February, 1996, before me appeared BYRON WALTERS, to me personally known, who, being by me duly sworn, did say that he is a Member of the Board of Water Supply of the County of Maui, and was authorized by the BOARD OF WATER SUPPLY on February 15, 1996 to execute any and all documents as set forth in the COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION RELATING TO THE PURCHASE OF THE WAIHEE VALLEY PROPERTY, and that the said instrument was signed on behalf of the said Board of Water Supply, and the said BYRON WALTERS acknowledged the said instrument to be the free act and deed of the said Board of Water Supply.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

[Signature]
Notary Public, State of Hawaii

My commission expires: 11/25/96
EXHIBIT A

All of that certain parcel of land (being portion of the land(s) described in and covered by Royal Patent Number 4475, Land Commission Award Number 7713, Apana 24 to V. Kamamalu and Royal Patent Number 6207, Land Commission Award Number 4405-EE, Apana 1 to Kaokaa) situate, lying and being at Waihee, District of Wailuku, Island and County of Maui, State of Hawaii, bearing Tax Key designation 3-2-001-004 (2) and containing an area of 12.122 acres, more or less.

Subject, to the following:

1. Reservation in favor of the State of Hawaii of all mineral and metallic mines.

2. Water rights, easements and other rights as set forth in Deed of Exchange dated June 23, 1924, by and between HAWAIIAN COMMERCIAL SUGAR COMPANY, now known as Alexander and Baldwin, Inc., and WAILUKU SUGAR COMPANY, recorded in Liber 740 at Page 134, as amended by Agreement dated March 24, 1937, recorded in Liber 1371 at Page 227.

3. Water rights in favor of HAWAIIAN COMMERCIAL AND SUGAR COMPANY, LIMITED, now known as ALEXANDER AND BALDWIN, INC., and WAILUKU SUGAR COMPANY, as set forth in instrument dated July 15, 1927, recorded in Liber 893 at Page 316.


5. That certain unrecorded Agreement dated January 6, 1949, by and between the COUNTY OF MAUI and WAILUKU SUGAR COMPANY; re: water distribution system.

6. Non-exclusive easements over, under and across a portion of Easement "A" for road and utility purposes in favor of George Ezaki, et al., as set forth and described in Deed dated June 25, 1979, recorded in Liber 13830 at Page 232.
7. RIGHT OF ENTRY AGREEMENT dated May 17, 1983, recorded in Liber 17090 at Page 20, in favor of County of Maui for the purposes of performing surveys and design engineering for a new water tank, inlet and outlet waterlines, and appurtenances.

8. Grant dated January 5, 1987, recorded in Liber 20331 at Page 23, in favor of MAUI ELECTRIC COMPANY, LIMITED and HAWAIIAN TELEPHONE COMPANY, now known as GTE HAWAIIAN TELEPHONE COMPANY INCORPORATED, granting nonexclusive right and easement to build, construct, reconstruct, repair, maintain, operate and remove pole and wire lines and underground lines, etc. for the transmission of electricity.

9. SUBDIVISION AGREEMENT (THREE LOTS OR LESS) dated July 27, 1987, recorded in Liber 20986 at Page 529, by and between WAILUKU AGRIBUSINESS CO., INC., "Owner" and THE COUNTY OF MAUI, "County".

10. SUBDIVISION AGREEMENT (LARGE LOTS) dated July 27, 1987, recorded in Liber 20986 at Page 535, by and between WAILUKU AGRIBUSINESS CO., INC., "Owner" and THE COUNTY OF MAUI, "County".

11. FARM DWELLING AGREEMENT dated July 27, 1987, recorded in Liber 20986 at Page 544, by and between WAILUKU AGRIBUSINESS CO., INC., "Owner" and THE COUNTY OF MAUI, "County".

12. GRANT OF EASEMENT dated April 25, 1991, recorded as Document No. 91-063482, by and between WAILUKU AGRIBUSINESS CO., INC., a Hawaii corporation, "Grantor" and WILLIAM B. FREITAS, JR., a married person, "Grantee", granting a perpetual non-exclusive road easement for pedestrian and vehicular ingress and egress to and from a public road over and across:
EASEMENT "A"

over and across portion of R. P. 4475, L. C. Aw. 7713, Ap. 24 to V. Kamamalu situated on the westerly side of Kahekili Highway at Waihee, Maui, Hawaii, being more particularly described as follows:

Beginning at a point at the most northerly corner of this easement, the coordinates of said point of beginning referred to Government Survey Triangulation Station "HAY" being 9,347.68 feet North and 7,323.39 feet West and running by azimuths measured clockwise from True South:

1. 319' 00' 197.53 feet along the westerly side of Kahekili Highway;

2. Thence over and across a portion of R. P. 4475, L. C. Aw. 7713, Ap. 24 to V. Kamamalu on a curve to the right having a radius of 197.07 feet, the chord azimuth and distance being:

   332' 00' 88.66 feet;

3. 345' 00' 90.00 feet over and across same;

4. Thence over and across same on a curve to the right having a radius of 122.00 feet, the chord azimuth and distance being:

   7' 30' 93.37 feet;

5. 30' 00' 21.00 feet over and across same;

6. Thence over and across same on a curve to the right having a radius of 222.00 feet, the chord azimuth and distance being:

   50' 00' 151.86 feet;

7. 70' 00' 71.00 feet over and across same;

8. Thence over and across same on a curve to the left having a radius of 178.00 feet, the chord azimuth and distance being:

   62' 30' 46.47 feet;
<table>
<thead>
<tr>
<th>Step</th>
<th>Azimuth</th>
<th>Distance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>55° 00'</td>
<td>504.75 feet</td>
<td>over and across same;</td>
</tr>
<tr>
<td>10.</td>
<td>Thence over and across same on a curve to the right</td>
<td>having a radius of 272.00 feet, the chord azimuth and distance being:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66° 15'</td>
<td>106.13 feet</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>77° 30'</td>
<td>115.84 feet</td>
<td>over and across same along R. P. 5331, L. C. Aw. 4405-Q:1 to Kaalepo;</td>
</tr>
<tr>
<td>12.</td>
<td>68° 00'</td>
<td>65.99 feet</td>
<td>along R. P. 5331, L. C. Aw. 4405-Q:1 to Kaalepo;</td>
</tr>
<tr>
<td>13.</td>
<td>54° 30'</td>
<td>134.00 feet</td>
<td>along same and along R. P. 4120, L. C. Aw. 4405-P:2 &amp; 4 to Moo;</td>
</tr>
<tr>
<td>15.</td>
<td>110° 00'</td>
<td>78.70 feet</td>
<td>along R. P. 4475, L. C. Aw. 7713, Ap. 24 to V. Kamamalu;</td>
</tr>
<tr>
<td>16.</td>
<td>Thence over and across same on a curve to the left</td>
<td>having a radius of 50.00 feet, the chord azimuth and distance being:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>92° 30'</td>
<td>30.07 feet</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>75° 00'</td>
<td>162.00 feet</td>
<td>over and across same;</td>
</tr>
<tr>
<td>18.</td>
<td>Thence over and across same on a curve to the left</td>
<td>having a radius of 680.00 feet, the chord azimuth and distance being:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70° 45'</td>
<td>100.79 feet</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>66° 30'</td>
<td>40.00 feet</td>
<td>over and across same;</td>
</tr>
</tbody>
</table>
20. Thence over and across same on a curve to the right having a radius of 370.00 feet, the chord azimuth and distance being:

<table>
<thead>
<tr>
<th>Azimuth</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>72° 45'</td>
<td>80.56 ft</td>
</tr>
</tbody>
</table>

21. 79° 00' 138.00 feet over and across same;

22. 86° 38' 20" 75.50 feet over and across same;

23. 103° 45' 38.08 feet over and across same;

24. 66° 35' 40.00 feet over and across same;

25. 77° 50' 32.00 feet over and across same;

26. 9° 55' 48.00 feet over and across same;

27. 52° 40' 94.00 feet over and across same;

28. 63° 00' 37.96 feet over and across same;

29. 94° 00' 34.89 feet over and across same;

30. Thence over and across same on a curve to the right having a radius of 97.36 feet, the chord azimuth and distance being:

<table>
<thead>
<tr>
<th>Azimuth</th>
<th>Distance</th>
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</thead>
<tbody>
<tr>
<td>104° 45'</td>
<td>36.32 ft</td>
</tr>
</tbody>
</table>

31. 115° 30' 53.00 feet over and across same;

32. Thence over and across same on a curve to the left having a radius of 150.00 feet, the chord azimuth and distance being:

<table>
<thead>
<tr>
<th>Azimuth</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>101° 45'</td>
<td>71.31 ft</td>
</tr>
</tbody>
</table>

33. 88° 00' 126.80 feet over and across same;

34. Thence over and across same on a curve to the left having a radius of 500.00 feet, the chord azimuth and distance being:
83° 30'  78.46 feet;
35.  79° 00'  81.00 feet over and across same;
36. Thence over and across same on a curve to the left
   having a radius of 200.00 feet, the chord azimuth
   and distance being:
   65° 15'  95.07 feet;
37.  51° 30'  251.00 feet over and across same;
38. Thence over and across same on a curve to the right
   having a radius of 160.00 feet, the chord azimuth
   and distance being:
   65° 37' 30"  78.09 feet;
39.  79° 45'  307.38 feet over and across same;
40. Thence over and across same on a curve to the left
   having a radius of 53.95 feet, the chord azimuth
   and distance being:
   54° 52' 30"  45.39 feet;
41.  97° 40'  21.62 feet over and across same;
42.  210° 00'  8.22 feet over and across same;
43. Thence over and across same on a curve to the right
   having a radius of 73.95 feet, the chord azimuth
   and distance being:
   234° 52' 30"  62.21 feet;
44.  259° 45'  307.38 feet over and across same;
45. Thence over and across same on a curve to the left
   having a radius of 140.00 feet, the chord azimuth
   and distance being:
245° 37' 30" 68.33 feet;
46. 231° 30' 251.00 feet over and across same;
47. Thence over and across same on a curve to the right having a radius of 220.00 feet, the chord azimuth and distance being:
245° 15' 104.58 feet;
48. 259° 00' 81.00 feet over and across same;
49. Thence over and across same on a curve to the right having a radius of 520.00 feet, the chord azimuth and distance being:
263° 30' 81.60 feet;
50. 268° 00' 175.01 feet over and across same;
51. Thence over and across same on a curve to the right having a radius of 150.00 feet, the chord azimuth and distance being:
281° 45' 71.31 feet;
52. 295° 30' 19.47 feet over and across same;
53. Thence over and across same on a curve to the left having a radius of 57.36 feet, the chord azimuth and distance being:
276° 15' 37.82 feet;
54. Thence over and across same on a curve to the left having a radius of 120.00 feet, the chord azimuth and distance being:
244° 50' 50.58 feet;
55. 232° 40' 158.00 feet over and across same;
56. Thence over and across same on a curve to the right having a radius of 93.25 feet, the chord azimuth and distance being:
256' 35'  75.62 feet;
57. Thence over and across same on a curve to the left having a radius of 160.00 feet, the chord azimuth and distance being:
269' 45'  59.69 feet;
58. 259' 00'  138.00 feet over and across same;
59. Thence over and across same on a curve to the left having a radius of 330.00 feet, the chord azimuth and distance being:
252' 45'  71.35 feet;
60. 246' 30'  40.00 feet over and across same;
61. Thence over and across same on a curve to the right having a radius of 720.00 feet, the chord azimuth and distance being:
250' 45'  106.72 feet;
62. 255' 00'  162.00 feet over and across same;
63. Thence over and across same on a curve to the right having a radius of 90.00 feet, the chord azimuth and distance being:
272' 30'  54.13 feet;
64. 290' 00'  23.79 feet over and across same;
65. Thence over and across same on a curve to the left having a radius of 100.00 feet, the chord azimuth and distance being:
268' 35'  73.03 feet;
66. 247' 10'  30.36 feet over and across same;
67. Thence over and across same on a curve to the left having a radius of 180.00 feet, the chord azimuth and distance being:
68. 234' 30'  79.05 feet;  

69. Thence over and across same on a curve to the right 
   having a radius of 218.00 
   feet, the chord azimuth 
   and distance being: 

246' 00'  86.92 feet;  

70. 257' 30'  119.05 feet;  

71. Thence over and across same on a curve to the left 
   having a radius of 232.00 
   feet, the chord azimuth 
   and distance being: 

246' 15'  90.52 feet;  

72. 235' 00'  504.75 feet;  

73. Thence over and across same on a curve to the right 
   having a radius of 218.00 
   feet, the chord azimuth 
   and distance being: 

242' 30'  56.91 feet;  

74. 250' 00'  71.00 feet;  

75. Thence over and across same on a curve to the left 
   having a radius of 182.00 
   feet, the chord azimuth 
   and distance being: 

230' 00'  124.50 feet;  

76. 210' 00'  21.00 feet;  

77. Thence over and across same on a curve to the left 
   having a radius of 82.00 
   feet, the chord azimuth 
   and distance being: 

187' 30'  62.76 feet;  

78. 165' 00'  90.00 feet.
79. Thence over and across same on a curve to the left having a radius of 82.00 feet, the chord azimuth and distance being:

142' 30'  62.76 feet;
120' 00'  99.00 feet over and across same;

80. Thence over and across same on a curve to the right having a radius of 68.00 feet, the chord azimuth and distance being:

174' 30'  110.72 feet;

81. Thence over and across same on a curve to the left having a radius of 20.00 feet, the chord azimuth and distance being:

184' 00'  28.28 feet to the point of beginning, containing an area of 3.269 acres, more or less.

13. UTILITY EASEMENT dated November 19, 1991, recorded as Document No. 91-179022 in favor of MAUI ELECTRIC COMPANY LIMITED and GTE HAWAIIAN TELEPHONE COMPANY INCORPORATED, re: perpetual right and easement to build, construct, reconstruct, rebuild, repair, maintain and operate pole and wire lines and underground power lines for the transmission of electricity.

14. ACCESS EASEMENT dated May 26, 1995, recorded as Document No. 95-083357, in favor of MILES H. KAWASAKI, husband of Cheryl N. Kawasaki, DOMINICK A. MARINO and PATRICIA A. MARINO, husband and wife, re: perpetual access easements over and across the following described easements:

EASEMENT "A-1"
Situated at Waihee, Wailuku, Maui, Hawaii
Being a portion of Royal Patent 4475, Land Commission Award Number 7713, Apana 24 to V. Kamamalu

An easement (20.00 feet wide) for access and utility purposes affecting Lot 3, Waihee Valley Large-Lot Subdivision, in favor of Parcels 19, 20 and 21 of Tax Map
Key (2) 3-2-03 and described as follows:

Beginning at the Southwest corner of this Easement, on the South boundary of Lot 3, Waihee Valley Large-Lot Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "HAY" being 8,420.41 feet North and 7,912.27 feet West and running by azimuths measured clockwise from True South:

1. 181' 00' 1.93 feet along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision;

2. Thence, along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision on a curve to the left with a radius of 15.00 feet, the chord azimuth and distance being:
   
   129' 15 23.56 feet;

3. 257' 30' 45.11 feet along existing Roadway and Utility Easement "A";

4. Thence, along existing Roadway and Utility Easement "A" on a curve to the left with a radius of 272.00 feet, the chord azimuth and distance being:
   
   256' 52' 05" 6.00 feet;

5. Thence, along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision on a curve to the left with a radius of 15.00 feet, the chord azimuth and distance being:
   
   38' 37" 05" 18.31 feet;

6. 1' 00' 14.00 feet along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision;

7. 91' 00' 20.00 feet along Parcel 20 of Tax Map Key (2) 3-2-03 to the point of beginning and containing an area of 576 square feet.
EASEMENT "A-2"
Situated at Waihee, Wailuku, Maui, Hawaii
Being a portion of Royal Patent 4475,
Land Commission Award 7713, Apana 24 to V. Kamamalu

An Easement (40.00 feet wide) for access and utility purposes affecting Lot 3, Waihee Valley Large-Lot Subdivision, in favor of Parcels 19, 20 and 21 of Tax Map Key (2) 3-2-03 and described as follows:

Beginning at the South corner of this Easement, on the South boundary of Lot 3, Waihee Valley Large-Lot Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "HAY" being 8,454.13 feet North and 7,802.76 feet West and running by azimuths measured clockwise from True South:

1. 149° 50' 8.88 feet along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision;

2. Thence along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision on a curve to the left with a radius of 15.00 feet, the chord azimuth and distance being:

106° 59' 35.4" 20.40 feet;

3. Thence along existing Roadway and Utility Easement "A" on a curve to the left with a radius of 272.00 feet, the chord azimuth and distance being:

239° 34' 35.4" 43.41 feet;

4. 235° 00' 24.29 feet along existing Roadway and Utility Easement "A";

5. Thence along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision on a curve to the left with a radius of 15.00 feet, the chord azimuth and distance being:

12° 25' 20.30 feet;
6. 329' 50' 11.13 feet along the remainder of Lot 3, Waihee Valley Large-Lot Subdivision;

7. 59' 50' 40.00 feet along Parcel 20 of Tax Map Key (2) 3-2-03 to the point of beginning and containing an area of 1,026 square feet.

15. Any unrecorded leases and tenancy agreements and matters arising from or affecting the same.

16. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, or any other facts which a correct boundary and improvement survey or archaeological study would disclose, including, without limitation, trails, rights of way, historic property and burial sites.

   -Note:- A current survey, with metes and bounds description, should be made of said premises so that the boundaries can be determined.

17. Claims arising out of right customarily and traditionally exercised for subsistence, cultural, religious, access or gathering purposes as provided for in Hawaii Revised Statutes or the Hawaii Constitution.
Exhibit B

Well Field 1 and Area for Access, Pipeline and Utility Lines

Easement "A-1" over and across portion of R.P. 4475, L.C. Av. 7713 Ap. 24 to V. Kamamalu, also being portion of Lot 3 of Waihee Valley Large-Lot Subdivision (TMK: 3-2-01:4) situated on the westerly side of Kahekili Highway at Waihee, Maui, Hawaii, being more particularly described as follows:

Beginning at a point at the most northerly corner of this easement, the coordinates of said point of beginning referred to Government Survey Triangulation Station "HAY" being 9,347.68 feet North and 7,323.39 feet West and running by azimuths measured clockwise from True South:

1. 319° 00' 197.53 feet along the westerly side of Kahekili Highway;

2. Thence over and across a portion of R.P. 4475, L.C. Av. 7713 Ap. 24 to V. Kamamalu on a curve to the right having a radius of 197.07 feet, the chord azimuth and distance being: 332° 00' 88.66 feet;

3. 345° 00' 90.00 feet over and across same;

4. Thence over and across same on a curve to the right having a radius of 122.00 feet, the chord azimuth and distance being: 7° 30' 93.37 feet;

5. 30° 00' 21.00 feet over and across same;

6. Thence over and across same on a curve to the right having a radius of 222.00 feet, the chord azimuth and distance being: 50° 00' 151.86 feet;

7. 70° 00' 71.00 feet over and across same;
8. Thence over and across same on a curve to the left having a radius of 178.00 feet, the chord azimuth and distance being:
   62° 30'  46.47 feet;

9.  55° 00'  504.75 feet over and across same;

10. Thence over and across same on a curve to the right having a radius of 272.00 feet, the chord azimuth and distance being:
   66° 15'  106.13 feet;

11.  77° 30'  115.84 feet over and across same;

12.  68° 00'  65.99 feet along R.P. 5331, L.C. Aw. 4405 Q:1 to Kaalepo;

13.  54° 30'  134.00 feet along R.P. 5331, L.C. Aw. 4405 Q:1 to Kaalepo and along R.P. 4120, L.C. Aw. 4405 P:2 and 4 to Moo;

14.  67° 10'  131.89 feet over and across a portion of R.P. 4475, L.C. Aw. 7713 Ap. 24 to Kamamalu;

15.  110° 00'  78.70 feet over and across same;

16. Thence over and across same on a curve to the left having a radius of 50.00 feet, the chord azimuth and distance being:
   92° 30'  30.07 feet;

17.  75° 00'  162.00 feet over and across same;

18. Thence over and across same on a curve to the left having a radius of 680.00 feet, the chord azimuth and distance being:
   70° 45'  100.79 feet;

19.  66° 30'  40.00 feet over and across same;

20. Thence over and across same on a curve to the right having a radius of 370.00 feet, the chord azimuth and distance being:
   72° 45'  80.56 feet;
21. $79^\circ 00'$ 17.22 feet over and across same;
22. $113^\circ 40'$ 66.30 feet over and across same;
23. $82^\circ 30'$ 6.73 feet over and across same;
24. $90^\circ 00'$ 228.40 feet over and across same;
25. $180^\circ 00'$ 33.00 feet over and across same;
26. $249^\circ 30'$ 15.00 feet over and across same;
27. $262^\circ 30'$ 49.50 feet over and across same;
28. $257^\circ 30'$ 120.00 feet over and across same;
29. $264^\circ 15'$ 17.00 feet over and across same;
30. $274^\circ 00'$ 13.50 feet over and across same;
31. $308^\circ 00'$ 16.50 feet over and across same;
32. $349^\circ 20'$ 44.48 feet over and across same;
33. $293^\circ 40'$ 25.87 feet over and across same;
34. $259^\circ 00'$ 50.40 feet over and across same;
35. Thence over and across same on a curve to the left having a radius of 330.00 feet, the chord azimuth and distance being: $252^\circ 45'$ 71.85 feet;
36. $246^\circ 30'$ 40.00 feet over and across same;
37. Thence over and across same on a curve to the right having a radius of 720.00 feet, the chord azimuth and distance being: $250^\circ 45'$ 106.72 feet;
38. $255^\circ 00'$ 162.00 feet over and across same;
39. Thence over and across same on a curve to the right having a radius of 90.00 feet, the chord azimuth and distance being: $272^\circ 30'$ 54.13 feet;
40. 290° 00' 23.79 feet over and across same;

41. Thence over and across same on a curve to the left having a radius of 100.00 feet, the chord azimuth and distance being: 268° 35' 73.03 feet;

42. 247° 10' 30.36 feet over and across same;

43. Thence over and across same on a curve to the left having a radius of 380.00 feet, the chord azimuth and distance being: 240° 50' 83.84 feet;

44. 234° 30' 79.05 feet over and across same;

45. Thence over and across same on a curve to the right having a radius of 218.00 feet, the chord azimuth and distance being: 246° 00' 86.92 feet;

46. 257° 30' 119.05 feet over and across same;

47. Thence over and across same on a curve to the left having a radius of 232.00 feet, the chord azimuth and distance being: 246° 15' 90.52 feet;

48. 235° 00' 504.75 feet over and across same;

49. Thence over and across same on a curve to the right having a radius of 218.00 feet, the chord azimuth and distance being: 242° 30' 56.91 feet;

50. 250° 00' 71.00 feet over and across same;

51. Thence over and across same on a curve to the left having a radius of 182.00 feet, the chord azimuth and distance being: 230° 00' 124.50 feet;
52. 210° 00' 21.00 feet over and across same;

53. Thence over and across same on a curve to the left having a radius of 82.00 feet, the chord azimuth and distance being:
   187° 30' 62.76 feet;

54. 165° 00' 90.00 feet over and across same;

55. Thence over and across same on a curve to the left having a radius of 82.00 feet, the chord azimuth and distance being:
   142° 30' 62.76 feet;

56. 120° 00' 99.00 feet over and across same;

57. Thence over and across same on a curve to the right with the point of curvature azimuth from the radial point being:
   30° 00', and the point of tangency azimuth from the radial point being:
   139° 00', having a radius of 68.00 feet, the chord azimuth and distance being:
   174° 30' 110.72 feet;

58. Thence over and across same on a curve to the left with the point of curvature azimuth from the radial point being:
   319° 00', and the point of tangency azimuth from the radial point being:
   229° 00', having a radius of 20.00 feet, the chord azimuth and distance being:
   184° 00' 28.28 feet to the point of beginning and containing an Area of 2.562 acres.
SUBJECT, HOWEVER, to the following:

1. An existing Roadway and Utility Easement "A".
Ms. Marie Kimmey, Chairperson
Maui Board of Water Supply
P.O. Box 1109
Wailuku, Hawaii 96793-7109

Dear Ms. Kimmey:

Pump Installation Permit Transfer
North Waihee Wells 1 & 2
(Well Nos. 5631-02 & 03)

By your February 20, 1996 letter, the Commission on Water Resource Management acknowledges the transfer of the captioned permit from C. Brewer Properties, Inc. to the Maui Board of Water Supply.

Enclosed are copies of the permit and its extensions. Please be advised that the permit requires that work be started by May 14, 1996, and be completed by March 1, 1997. Should you be unable to meet those deadlines, please submit a request to extend them, showing cause why the permit should not be revoked.

Aloha,

Michael D. Wilson
Chairperson

Enclosures

c: C. Brewer Homes, Inc.
<table>
<thead>
<tr>
<th>TO</th>
<th>INIT</th>
<th>TO</th>
<th>INIT</th>
<th>FOR</th>
<th>PLEASE</th>
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<tr>
<td>BAUER, G.</td>
<td></td>
<td>LOUI, R.</td>
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<td>Approval</td>
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<td>CHING, F.</td>
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<td>MIZUNO, L.</td>
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<td>UWAINIE, J.</td>
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<td>KUNIMURA, I.</td>
<td></td>
<td>YODA, K.</td>
<td></td>
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1 copy for Rae
March 5, 1996

HAND DELIVERY

Ms. Rae M. Loui
Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
1151 Punchbowl Street
Honolulu, Hawaii 96813

Re: North Waihee Wells

Dear Ms. Loui:

As indicated by separate correspondence to you from Mr. David Craddick of the Maui Department of Water Supply, we have been asked to transmit to you a fully executed copy of the Grant of Easement (Well Field 1) dated February 21, 1996 executed by Wailuku Agribusiness Co., Inc., as Grantor, and The Board of Water Supply of the County of Maui, as Grantee. The Grant was recorded in the Bureau of Conveyances as Document No. 96-023917.

Yours truly,

ASHFORD & WRISTON

By

Douglas W. MacDougal

DWM:met
Enclosure

cc: Mr. David Craddick
DATA SET:
WAIHEE2.DAT
11/07/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test date: May 15-19, 1989
test well: North Waihee Well #2
obs. well: North Waihee Well #1

TEST DATA:
Q = 4.717E+05 ft³/day
r = 176 ft
r_c = 0.67 ft
r_w = 0.62 ft
b = 448 ft
Pumping Well Screen Depth:
top = 19 ft
bot. = 106 ft
Obs. Well Screen Depth:
top = 6 ft
bot. = 106 ft

PARAMETER ESTIMATES:
T = 289 ft²/min
S = 0.4826
DATA SET: WAIHEE2.DAT
11/07/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Theis

PROJECT DATA:
test date: May 15-19, 1989
test well: North Waihee Well #2
obs. well: North Waihee Well #1

TEST DATA:
Q = 4.717E+05 ft³/day
r = 176. ft
rc = 0.67 ft
rw = 0.62 ft
b = 448. ft

PARAMETER ESTIMATES:
T = 221.6 ft²/min
S = 0.3432
DATA SET:
WAIHEE2.DAT
11/07/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Theis

PROJECT DATA:

test date: May 15-19, 1989

test well: North Waihee Well #2

obs. well: North Waihee Well #1

TEST DATA:

Q = 4.717E+05 ft³/day

r = 176. ft

r_c = 0.67 ft

r_w = 0.62 ft

b = 448. ft

PARAMETER ESTIMATES:

T = 224.4 ft²/min

S = 0.3188
DATA SET:
WAIHEE2.DAT
11/07/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test date: May 15-19, 1989
test well: North Waihee Well #2
obs. well: North Waihee Well #1

TEST DATA:
Q = 4.717E+05 ft³/day
r = 176. ft
r_c = 0.67 ft
r_w = 0.62 ft
b = 448. ft
Pumping Well Screen Depth:
top = 19. ft
bot. = 106. ft
Obs. Well Screen Depth:
top = 6. ft
bot. = 106. ft

PARAMETER ESTIMATES:
T = 301.6 ft²/min
S = 0.5205
THEIS DRAWDOWN CALCULATION

by Glenn Bauer & Roy Hardy with numerical approximations by Huntoon (1983)

INPUT PARAMETERS BOLD GREEN VALUES

For Well No.: 02 obs well, N. Waihee

Transmissivity \( T = 320,000.00 \) sq.ft./day
Storage Coeff. \( S = 0.200 \) dimensionless
Time \( t = 10250 \) days
Pumping Rate \( Q = 269,518.72 \) cubic ft./day

Aquifer thickness \( b = 410 \) ft.
Hydraulic Conductivity \( K = 780.5 \) ft./day
Pumping rate \( Q = 1400 \) gpm
2016 mgd
3.119 cfs

OBSERVATION WELL
Radial distance \( r \) from pumping well: 1 ft.

Radial distance \( r \) ft. \[ u \quad W(u) \quad \text{Drawdown } s \]

\[
\begin{array}{ccc}
1 & 0.000000 & 24.907 \\
10 & 0.000000 & 20.301 \\
50 & 0.000000 & 17.082 \\
100 & 0.000000 & 15.696 \\
250 & 0.00001 & 13.864 \\
500 & 0.000002 & 12.477 \\
1,000 & 0.000009 & 11.091 \\
1,500 & 0.000019 & 10.280 \\
2,000 & 0.000034 & 9.705 \\
2,500 & 0.000054 & 9.258 \\
3,000 & 0.000077 & 8.894 \\
5,000 & 0.000214 & 7.872 \\
10,000 & 0.000856 & 6.487 \\
\end{array}
\]

Drawdown \( s \) ft.

Drawdown \( s \) vs. \( r \) @ time \( t \)

Time, \( t \) (days, year) \[ u \quad W(u) \quad \text{Drawdown } s \]

\[
\begin{array}{ccc}
0.1 & 0.00 & 0.000002 & 12.792 \\
1 & 0.00 & 0.000000 & 15.095 \\
2 & 0.01 & 0.000000 & 15.788 \\
3 & 0.01 & 0.000000 & 16.193 \\
4 & 0.01 & 0.000000 & 16.481 \\
5 & 0.01 & 0.000000 & 16.704 \\
6 & 0.02 & 0.000000 & 16.886 \\
7 & 0.02 & 0.000000 & 17.041 \\
8 & 0.02 & 0.000000 & 17.174 \\
10 & 0.05 & 0.000000 & 18.090 \\
100 & 0.27 & 0.000000 & 19.700 \\
200 & 0.55 & 0.000000 & 20.393 \\
500 & 1.37 & 0.000000 & 21.309 \\
1,000 & 2.74 & 0.000000 & 22.002 \\
2,000 & 5.48 & 0.000000 & 22.695 \\
5,000 & 13.70 & 0.000000 & 23.612 \\
10,000 & 27.40 & 0.000000 & 24.305 \\
20,000 & 54.79 & 0.000000 & 24.998 \\
50,000 & 136.99 & 0.000000 & 25.914 \\
100,000 & 273.97 & 0.000000 & 26.608 \\
\end{array}
\]

For both wells (2) pumping 2 = 2 mgd each
drawdown will double in each, in Table.
Example: if both pump 2 mgd drawdown @ 50 yrs=

\[ 1.7 + 1.7 = 3.4 \text{ ft.} \]
THEIS DRAWDOWN CALCULATION

by Glenn Bauer & Roy Hardy with numerical approximations by Huntoon (1983)

INPUT PARAMETERS GREEN VALUES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity T</td>
<td>318,512.00 ft./day</td>
</tr>
<tr>
<td>Storage Coeff. S</td>
<td>0.270 dimensionless</td>
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<tr>
<td>Time t</td>
<td>20000 days</td>
</tr>
<tr>
<td>Pumping Rate Q</td>
<td>269,518.72 cubic ft./day</td>
</tr>
<tr>
<td>Aquifer thickness b</td>
<td>448 ft.</td>
</tr>
<tr>
<td>Hydraulic Conductiv K</td>
<td>706.5 ft./day</td>
</tr>
<tr>
<td>Pumping rate Q</td>
<td>1,400 gpm</td>
</tr>
<tr>
<td></td>
<td>2.016 mgd</td>
</tr>
<tr>
<td></td>
<td>3.119 cfs</td>
</tr>
</tbody>
</table>

Radial distance from well r ft. Drawdown s

<table>
<thead>
<tr>
<th>r</th>
<th>W(u)</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.000000</td>
<td>24.688</td>
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<tr>
<td>10</td>
<td>0.000000</td>
<td>20.083</td>
</tr>
<tr>
<td>50</td>
<td>0.000000</td>
<td>16.864</td>
</tr>
<tr>
<td>100</td>
<td>0.000000</td>
<td>15.478</td>
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<tr>
<td>250</td>
<td>0.000001</td>
<td>13.645</td>
</tr>
<tr>
<td>500</td>
<td>0.000266</td>
<td>12.250</td>
</tr>
<tr>
<td>10000</td>
<td>0.001005</td>
<td>10.873</td>
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<td></td>
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<td>10.062</td>
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<tr>
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<td>9.486</td>
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<tr>
<td></td>
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<td>9.049</td>
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<tr>
<td></td>
<td></td>
<td>8.675</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.654</td>
</tr>
</tbody>
</table>

OBSERVATION WELL
Radial distance r from pumping well

<table>
<thead>
<tr>
<th>Time, t (days, year)</th>
<th>u</th>
<th>Drawdown s W(u) ft.</th>
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</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.00</td>
<td>2.130251</td>
</tr>
<tr>
<td>1</td>
<td>0.00</td>
<td>0.213025</td>
</tr>
<tr>
<td>2</td>
<td>0.01</td>
<td>0.106513</td>
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<tr>
<td>3</td>
<td>0.01</td>
<td>0.071008</td>
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<tr>
<td>4</td>
<td>0.01</td>
<td>0.053256</td>
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<td>5</td>
<td>0.01</td>
<td>0.042605</td>
</tr>
<tr>
<td>6</td>
<td>0.02</td>
<td>0.035504</td>
</tr>
<tr>
<td>7</td>
<td>0.02</td>
<td>0.030432</td>
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<td>8</td>
<td>0.02</td>
<td>0.026628</td>
</tr>
<tr>
<td>10</td>
<td>0.03</td>
<td>0.021303</td>
</tr>
<tr>
<td>100</td>
<td>0.27</td>
<td>0.002130</td>
</tr>
<tr>
<td>200</td>
<td>0.55</td>
<td>0.001065</td>
</tr>
<tr>
<td>500</td>
<td>1.37</td>
<td>0.000426</td>
</tr>
<tr>
<td>1,000</td>
<td>2.74</td>
<td>0.000213</td>
</tr>
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<td>2,000</td>
<td>5.48</td>
<td>0.000107</td>
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<td>5,000</td>
<td>13.70</td>
<td>0.000043</td>
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<td>10,000</td>
<td>27.40</td>
<td>0.000021</td>
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<td>54.79</td>
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<td>50,000</td>
<td>136.99</td>
<td>0.000004</td>
</tr>
<tr>
<td>100,000</td>
<td>273.97</td>
<td>0.000002</td>
</tr>
</tbody>
</table>
DATA SET: WAIHEE2.DAT 12/04/95

AQUIFER MODEL: Confined

SOLUTION METHOD: Cooper-Jacob

PROJECT DATA:
  test date: May 15-19, 1989
  test well: North Waihee Well #2
  obs. well: North Waihee Well #1

TEST DATA:
  \( Q = 4.717 \times 10^5 \) ft\(^3\)/day
  \( r = 176. \) ft
  \( r_c = 0.67 \) ft
  \( r_w = 0.62 \) ft
  \( b = 448. \) ft

PARAMETER ESTIMATES:
  \( T = 219.8 \) ft\(^2\)/min = \( 316.5 \) ft\(^1/2\)
  \( S = 0.2697 \)
Chairperson and Members
Commission on Water Resource Management
State of Hawaii
Honolulu, Hawaii

Gentlemen:

C. Brewer Properties, Inc.
Application for Pump Installation Permits
North Waihee Wells 1 & 2, Waihee, Maui

Applicant: C. Brewer Properties, Inc.
Landowner: Wailuku Agribusiness Company, Inc.
P.O. Box 1437
Wailuku, HI 96793
P.O. Box 520
Wailuku, HI 96793

Action Requested: Permission to install 1400 gallons per minute (gpm) pumps in North Waihee Wells 1 & 2 (Well Nos. 5631-02 & 03) for private/municipal use. The proposed total amount of use from both wells is 2,000,000 gallons per day (2 mgd).

Well Location/Tax Map Key: The wells are located at Tax Map Key: 3-2-01:4 (see attached map).

Well Description (typical):
- Ground elevation: 283 ft.
- Casing diameter: 16 inches
- Solid casing depth: 289 ft.
- Screen casing depth: 309 ft.
- Open hole: 79 ft.
- Total depth: 388 ft.
- Proposed pump capacity: 1400 gpm per well

Agency Review: The application has been sent to the Maui Department of Water Supply, the State Historic Preservation Division, the Office of Hawaiian Affairs, and to the State Departments of Health and Hawaiian Home Lands for review. There have been no objections to the project.

Analysis: The well will develop fresh, basal water, for private/municipal use. The wells tap a basal aquifer with a static head standing about 10 ft. above mean sea level. John Mink, in a letter to C. Brewer Properties, Inc. states, "The water table in the North Waihee wells lies 10 to 11 feet above sea level while the channel of the stream opposite the wells is 200 feet above sea level. A small depression in the water table caused by pumping will not influence Waihee upstream of the wells. Nor is it likely that the stream will suffer in the downstream direction because of the high invert of the channel compared to the position of the water table". The wells were drilled and tested in 1981 and tested again in 1989. A pumping test conducted between May 15 and May 19, 1989, using Well 2 as the pumping well and Well 1 along with a specially drilled boring at Kanoa as observation wells, showed that the aquifer is extensive and potentially very productive. Well 2 was pumped at 2480 gpm (3.57 mgd) and experienced drawdown of just 5 feet. Recovery was virtually instantaneous following 96 hours of continuous pumping. The salinity of the water was constant at less than 20 mg/l chloride. No adverse impacts are expected.
Water Availability: The wells are located in the Wailuku Sector, Waihee System of Maui. Sustainable yield of the Waihee System is estimated at 8 mgd. There is no pumpage from the aquifer. Ground water use from the aquifer system is expected to be about 4.2 mgd by the year 2010. The wells are listed for potential development in the Maui County Water Use and Development Plan.

RECOMMENDATION:

That the Commission approve the issuance of pump installation permits for North Waihee Wells 1 & 2, subject to the following conditions:

1. The Commission on Water Resource Management (Commission) shall be notified before work commences.

2. The permits shall be for installation of 1400 gpm capacity pumps in the wells. The total pumpage from both wells shall average 2 mgd.

3. The proposed uses shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. These permits or the authorization to pump water from the wells shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from each well could be reduced by the Commission in the future. These permits are not a commitment that the pump capacities permitted here or even some lesser amount are guaranteed in the future.

4. The applicant shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage. Water usage shall be measured on a monthly basis and reported to the Commission.

5. The following shall be submitted to the Commission within 30 days after completion of the work:
   a. Well Completion Reports.
   b. As-built sectional drawings of the pump installations.

6. The applicant shall comply with all applicable laws, rules, and ordinances.

7. These permits may be revoked if work is not started within six months of the dates of issuance or if work is suspended or abandoned for six months. The work proposed in these permit applications shall be completed within two years from the dates of permit issuance.

Respectfully submitted,

RAE M. LOUI
Deputy Director

APPROVED FOR SUBMITTAL:

JOHN P. KEPELER II, Acting Chairperson
TEST WELL DATA
NORTH WAIHEE WELL #2

Test well elevation at top of casing 281.98
Measure point at base of gearing 282.73
Pump location (-300 feet from M.P.) -17.27
Air line location (top of bowl assembly) -6.27
Pressure gauge reading at beginning of test (to 1/10) 17.5

Distance from North Waihee Well #1 to North Waihee Well #2 176 feet

Chloride readings were taken twice daily. All were between 37.5 mg/l and 50 mg/l. NaCl measured with the HACH chloride test kit, Model 7-P, using low range measure 0-250 mg/l.
The pump test at North Waihee Well #2 began on Monday, May 15, 1989, at noon.

Pumping was to be at a constant rate of 2,400-2,500 gpm for 5 days.

Between 6:00 p.m. on Wednesday, May 17 and 9:00 a.m. on Thursday, May 18 the in-line flow meter malfunctioned. Not knowing this, we increased the pump's rpm to keep up the 2,450 gpm rate.

The pumping was at this increased rate (1,900 rpm) from 9:00 a.m. on Thursday, May 17 to 6:00 p.m. on Thursday, May 17. At that time the pumping was reduced to approximately 2,450 gpm by reducing the pump rotation to the original 1,700 rpm. The remainder of the test was run at this rate.

Pumping at the test well was stopped at 12:00 p.m. (noon) on Friday, May 18, 1989.

Recovery was almost immediate and by 2:00 p.m. the pressure gauge at the test well read 17.2 feet. By 5:00 p.m., Friday it was back to the original 17.5 feet on the gauge.

On Saturday at 8:00 a.m. the water level at the test well was measured by tape to be 11.25 feet above sea level. At this time the gauge was at 17.5 feet.

With the air line at -6.27 feet and water level at 11.25 feet, the gauge reading should be at 17.52 feet. The gauge reading correlates well with these results.
## WAILENA WELL

**ELEVATION = 608.23**  
*(AT TOP OF PIPE)*

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOP WATER ELEVATION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/17/89</td>
<td>X</td>
<td>Poor reading - chloride content 87.5 mg/l</td>
</tr>
<tr>
<td>03/01/89</td>
<td>6.63</td>
<td>Good results; 3:00 p.m. - NaCl 87.5 mg/l</td>
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<tr>
<td>03/08/89</td>
<td>6.67</td>
<td>4:30 p.m.; river nearby flowing</td>
</tr>
<tr>
<td>03/15/89</td>
<td>6.44</td>
<td>4:00 p.m.; river not flowing</td>
</tr>
<tr>
<td>03/22/89</td>
<td>6.16</td>
<td>4:00 p.m.; river not flowing</td>
</tr>
<tr>
<td>04/03/89</td>
<td>6.61</td>
<td>10:15 a.m.; no water in river</td>
</tr>
<tr>
<td>04/11/89</td>
<td>6.54</td>
<td>1:30 a.m.; 150 mg/l - river running strong</td>
</tr>
<tr>
<td>04/17/89</td>
<td>6.20</td>
<td>9:00 a.m.; from chart</td>
</tr>
<tr>
<td>DATE</td>
<td>ELEVATION</td>
<td>TIME</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>12/09/89</td>
<td>11.74</td>
<td>2:00 p.m.</td>
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<td>10.54</td>
<td>11:00 a.m.</td>
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<td>3:00 p.m.</td>
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<td>11.54</td>
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<td>12.31</td>
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<td>12.14</td>
<td>9:00 a.m.</td>
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<td>05/17/89</td>
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<td>9:00 a.m.</td>
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<tr>
<td>05/19/89</td>
<td>11.98</td>
<td>11:15 a.m.</td>
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<td>05/19/89</td>
<td>12.14</td>
<td>2:00 p.m.</td>
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<td>12.20</td>
<td>5:30 p.m.</td>
</tr>
<tr>
<td>05/20/89</td>
<td>12.</td>
<td>8:20 a.m.</td>
</tr>
<tr>
<td>05/22/89</td>
<td>12.</td>
<td>8:30 a.m.</td>
</tr>
</tbody>
</table>

- NaCl content 50 mg/l
- NaCl content 38 mg/l
- NaCl content 38 mg/l
- Pump Test Today - Noon
- (chart reading)
  (tape)
  (tape)
**KANOA WELL**

Elevation: 305.94 feet  
(Bubbler System)

<table>
<thead>
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<th>Date</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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<th>Saturday</th>
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<td>9:00 am</td>
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<td>9:00 am</td>
<td>8:20 am</td>
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<tr>
<td></td>
<td>12.42</td>
<td>12.14</td>
<td>12.05</td>
<td>12.05</td>
<td>12.05</td>
<td>12.24*</td>
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<tr>
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*Measured by steel tape.*

On Monday, May 22, 1989, at 8:30 a.m. a final measure was taken by tape to read 12.35 feet.
### PUMP TEST AT
NORTH WAIHEE WELL NO. 2

MP Elevation = 282.73 (Bottom of Housing)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>PUMPING TIME</th>
<th>RATES X 100</th>
<th>RATE (GPM)</th>
<th>WATER LEVEL (FT.)</th>
<th>WATER LEVEL (FT.)</th>
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<tbody>
<tr>
<td>Mon. 5/15</td>
<td>Noon</td>
<td>Begin Pump Test</td>
<td>Begin. Level</td>
<td>17.10</td>
<td>11.2</td>
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<tr>
<td>Mon. 5/15</td>
<td>2:15 p.m.</td>
<td>409651</td>
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<td>5:20 p.m.</td>
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<td>6:30 a.m.</td>
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<td>&gt; 2506</td>
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<td>477283</td>
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# NORTH WAIHEE WELL NO.2
## PUMP TEST FIELD DATA
### 5/15/69 TO 5/19/69

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<th>PUMP</th>
<th>RECORDER</th>
<th>WATER LEVEL</th>
<th>NaCl (mg/l)</th>
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### NORTH WAINEE WELL NO. 2
#### PUMP TEST FIELD DATA
#### 5/15/89 TO 5/19/89

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<th>DATE</th>
<th>TIME</th>
<th>TOTALIZER (x's 100)</th>
<th>PUMP RATE</th>
<th>RECORDER LEVEL</th>
<th>WATER LEVEL</th>
<th>ELEVATION</th>
<th>NOCl (mg/l)</th>
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<td>12.00</td>
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<td>&quot;Pumping rates are assumed&quot;</td>
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</table>
### PUMP TEST AT
NORTH WAIHEE WELL NO. 2

MP Elevation = 282.73 (Bottom of Housing)

<table>
<thead>
<tr>
<th>DATE</th>
<th>PUMPING TIME</th>
<th>RATES X 100</th>
<th>RATE (GPM)</th>
<th>WATER LEVEL (FT.)</th>
</tr>
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<tbody>
<tr>
<td>Mon. 5/15</td>
<td>2:15 p.m.</td>
<td>409651</td>
<td>&gt; 2527</td>
<td>14.00</td>
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<tr>
<td>Tues. 5/16</td>
<td>8:25 a.m.</td>
<td>436445</td>
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<td>2:05 p.m.</td>
<td>444888</td>
<td>&gt; 2475</td>
<td>12.60</td>
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<td>Tues. 5/16</td>
<td>5:20 p.m.</td>
<td>449715</td>
<td>&gt; 2451</td>
<td>12.50</td>
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<td>Wed. 5/17</td>
<td>8:30 a.m.</td>
<td>472020</td>
<td>&gt; 2506</td>
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<td>12:00 noon</td>
<td>477283</td>
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<td>3:00 p.m.</td>
<td>481693</td>
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<td>485400</td>
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<td>Thur. 5/18</td>
<td>9:00 a.m.</td>
<td>502255</td>
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<td>Thur. 5/18</td>
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<td>10.60</td>
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</table>

*(Increased Pump Rotation 1700 rpm - 1900 rpm)*

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Flow meter malfunction

At 6 p.m. 5/16 reduced rpm's to 1700. Water level went up to 12.6

**JRU Field Work**

5/15/84 Died to 1500' = 0.4 mil.

\[
\begin{align*}
A (\text{1500' to 1000'}) &= 1760 \\
\end{align*}
\]

MP (top cut away after 160') = 281.98 + 7.5 ft water = 282.73 ft.

Start water: 406419

Pump setting 1300 (-17.27) down 1272 (1500-1000)

Start test @ 1200 7/1/89 @ u/t 2400 rpm

Water level @ 17.14 ft (below wt).  \( A (1200) = 2.8 \)

Pump efficiency @ 519/89 1200 A = 5.2  \( t = 32.5 \text{ sec.} \)

\[
\begin{align*}
\Delta (12:40) &= 3.6 \\
\Delta (12:40) &= 3.1
\end{align*}
\]
## KANOA WELL

Elevation = 305.94  
(Bubbler System)

<table>
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<tr>
<th>TIME</th>
<th>5/15/89 Monday</th>
<th>5/16/89 Tuesday</th>
<th>5/17/89 Wednesday</th>
<th>5/18/89 Thursday</th>
<th>5/19/89 Friday</th>
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<td>8:00 a.m.</td>
<td>Before Test</td>
<td>12.14</td>
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<td>9:00 a.m.</td>
<td>12.42 (tape)</td>
<td>12.05</td>
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<td>8:00 p.m.</td>
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\[ h = 12.42 + \text{tape} \text{(8:30)} \]

\[ h \text{ (8:30)} = 12.42 + 0.30 = 12.72 \text{ at} 9:00 \text{ a.m.} \]

\[ h \text{ (8:30)} = 12.72 - 11.98 = 0.74 \text{ (chart)} \]

\[ h \text{ (chart)} = 12.10 \]

\[ h = 12.14 \text{ (local)} \]

\[ h' = 0.32 \]

\[ h' = 0.28 \text{ (local)} \]
North Waihee Wells
Pump Test Protocol

John F. Mink
April 4, 1989

The pump rate will be held constant at 2000 gpm over a continuous period of 96 hours. The continuous rate may be prolonged another 24 hours at the discretion of the test supervisor.

In the Waihee-Kahakuloa sector water level measurements will be taken in the pumping well, the other North Waihee well, the Kanoa boring and the Wailena well. In the Waihee-Waiehu sector, measurements will be taken in Test Hole A-1. The unpumped North Waihee well is outfitted with a continuous water level recorder and in the Kanoa boring a bubbler will be installed. The Wailena well and A-1 are open. Manual measurements will be made with an insulated copper wire equipped with an electrode, or a steel tape.

Static water level measurements by steel tape or wire will be taken as follows.

1. Both North Waihee wells and the Kanoa boring.
   a. Three days before the start of the test in the A.M.
   b. One day before the start, also A.M.
   c. 30 minutes before the start.

2. Wailena well.
   a. Within five days of the start of the test.
   b. The day of the start of the test.

3. Test Hole A-1.
   a. Within five days of the start of the test.
   b. The day of the start of the test.

   After the test is started, water level measurements will be taken as follows.

1. Pumping North Waihee well (manual measurements preferred; airline if manual not possible).
   a. 1 reading per minute for 5 minutes.
   b. 1 reading per 5 minutes for 25 minutes.
   c. 1 reading per 10 minutes for 60 minutes.
   d. 1 reading every hour thereafter.
2. Unpumped North Waihee well. Drawdowns will be traced on the continuous recorder, but manual measurements should be made as follows to check the reliability of the recorder.
   a. At 10 minutes
   b. At 30 minutes.
   c. Every hour thereafter.

3. Kanoa boring. Drawdowns will be determined by the bubbler arrangement but need to be checked manually. Recognizable drawdown of about 0.1 feet will not occur until 48 hours after the start of the test if the aquifer is unconfined and not narrowly bounded. If the aquifer is confined, drawdown will be measureable sooner. The sequence of readings should be:
   a. At 10 minutes.
   b. At 30 minutes.
   c. Every hour thereafter.

4. Wailena well. The Wailena well is so distant from North Waihee that drawdown of 0.1 feet and more isn't likely to occur unless the aquifer is confined. Nevertheless, manual measurements should be made as follows.
   a. At 6 hours.
   b. At 24 hours.
   c. at 30 hours.
   d. At 48 hours.
   e. At 54 hours.
   f. At 72 hours.
   g. At 78 hours.
   h. At 96 hours.

   If a response is noted, the frequency of measurements will be increased as practicable.

5. Test Hole A-1. Same schedule as the Wailena well.

   Recoveries will be measured after the pump is turned off. Recovery measurements at the pumped well, the unpumped North Waihee well and the Kanoa boring will follow the same schedule as the drawdown measurements over a period of 12 hours. Thereafter single measurements will be made in the A.M. for the following 5 days. Recovery measurements will be made at Wailena and A-1 only if these wells experienced measureable drawdown. The schedule for such measurements will be drawn up before the end of the test.
# PUMP TEST AT WELL A-1

**ELEVATION = 248.11**  
(Water Level In Feet)

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<th>5/16/89</th>
<th>5/17/89</th>
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WELL A-1

Elevation: 248.11 feet
(Water Level in Feet)

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10:40 am
18.04

(noon-begin test)

2:30 pm 5:10 pm 5:00 pm 5:00 pm 5:10 pm
18.06 18.05 17.99 18.09 18.05

All measurements taken by steel tape.

The A-1 well is located far enough away from the test well, North Waihee #2, that any effect on A-1 would be doubtful.

A final reading of Well A-1 was taken on Monday, May 22, 1989 at 8:00 a.m. with a water level elevation of 18.08 feet above sea level.
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**NORTH WAIHEE WELL NO. 1**

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</tr>
<tr>
<td>12:00 a.m.</td>
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<td></td>
<td>10.90</td>
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</table>

* Rate of Pump increased from 1070 to 1900 rpm

All units by chart.

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<th>Time</th>
<th>( t )</th>
<th>( A )</th>
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<td>.325</td>
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<td>.19</td>
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<td></td>
<td>14:00</td>
<td>2.0</td>
<td>.24</td>
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<td>5/19</td>
<td>11:30</td>
<td>.16</td>
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<td>Pump</td>
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<td>1.70</td>
<td>Standard reading ( 1.375 ) ( \text{w.c.} ) ( \text{in.} )</td>
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### C-49 Kanka Well

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<td>11 am</td>
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<td>10 am</td>
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<tr>
<td>2/17/89</td>
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<td>3 pm</td>
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<td>4 pm</td>
<td></td>
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<td>3/8/89</td>
<td>11.66</td>
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<td>3/22/89</td>
<td>11.60</td>
<td>4 pm</td>
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<td>11.48</td>
<td>2 pm</td>
<td></td>
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<td>4/10/89</td>
<td>11.54</td>
<td>1:30 pm</td>
<td>C1 content 35 mg/l</td>
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<tr>
<td>5/13/89</td>
<td>12.34</td>
<td>11:30 am</td>
<td></td>
</tr>
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<td>5/14/89</td>
<td>12.92</td>
<td>9:30 am</td>
<td>Hop 17 day before</td>
</tr>
<tr>
<td>5/25/89</td>
<td>12.31</td>
<td>8:30 pm</td>
<td></td>
</tr>
<tr>
<td>5/26/89</td>
<td>12.11</td>
<td>9:00 am</td>
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<td>12.05</td>
<td>9 am</td>
<td>Chart reading</td>
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</table>
NORTH WAIHEE WELLS

Site Description
Pump Test Results

JOHN F. MINK

Submitted to:
Hawaiiana Investment Co., Inc.
October 20, 1981
NORTH WAIHEE WELLS

Summary

The basal aquifer extending southward from Waihee Stream to Waikapu Stream, which is now referred to as the Waiehu aquifer, is being exploited nearly to the limit of its sustainable yield, and an additional significant contribution from it to Central Maui's water supply is not reasonable to expect. To develop more water different sources must be explored, and to this purpose an exploration-production well field was proposed in the region north of Waihee Stream where the aquifer was thought to be either separate or only poorly connected to the aquifer south of the valley. A separate aquifer would provide a new exploitable source of water supply, while proof of connection with the Waiehu aquifer would extend the limits of that aquifer and increase the overall allowable sustainable yield.

Two wells have now been drilled on the north side of Waihee Valley by Roscoe Moss Co. for Hawaiiana Investment Co., Inc. (See Figure 1 for location). Both have been successfully tested and have proved that a substantial, highly transmissive aquifer extends toward Kohakuloa from Waihee. A sustained rate of about 1,700 gpm over 48 hours was pumped from each well with very small drawdown and with no change in
the low initial salinity (15 mg/l chloride). Interpretation of the initial conditions and the pump test results indicate that the aquifer, to be referred to as the North Waihee aquifer, is essentially independent of the Waiehu basal aquifer. If a hydraulic connection exists, it is very weak.

The two wells can be safely fitted with 1,750 gpm pumps. The North Waihee aquifer is large enough to support more production than can be provided by the completed well field. The site of the next well is proposed in the small valley about 1,600 feet northward at a ground elevation of 400 to 500 feet.

**North Waihee Aquifer**

The region north of Waihee Stream toward Kohakuloa over a width of about two miles is probably underlain by a basal aquifer, perhaps modified by stray dikes, in the Wailuku volcanic series, a highly permeable basaltic formation. Dense trachytic flows of the Honolua series overlie the Wailuku series except in the deeper valleys where erosion has exposed the basaltic rocks. The trachytes do not constitute a principal aquifer and should be avoided if possible because they are difficult to drill through.

The North Waihee wells were located to avoid the trachyte but as a result had to penetrate about 100 feet of
talus and alluvium before striking the basalt. Drilling logs indicate that bedrocks of the Wailuku series was encountered 70 to 100 feet below ground surface. The deep alluvial fill of Waihee Valley was successfully avoided. Dikes were not observed in the vicinity of the well field but are known to occur about 3,500 feet upstream, approximately coincident with the forest reserve line. The rift zone is close enough to the wells that local geohydrologic conditions may be dike-basal rather than strictly basal.

The Wells

The North Waihee wells lie 2,150 feet inland of Kahekili Highway about 250 feet from the stream channel. Ground elevation is 280 to 283 feet. The wells are fitted with 16 inch casing and were drilled to a depth of 105 feet below sea level. The casing is perforated from five to 25 feet below sea level, and the remainder of the bore is open (uncased). The wells are on a line parallel to the stream, 178 feet apart. The most inland well is called North Waihee 1, the other is called North Waihee 2. They are identical in design and nearly so in performance. The first well was completed in March of 1981 and tested in April and June. The second well was completed in July and tested in August.
Pump Tests

Step Drawdown

Step drawdown tests were conducted on North Waihee 1 on April 15 and June 3 and on North Waihee 2 on August 3. Initial head was nine to ten feet at each well and initial chloride about 15 mg/l. Behavior of the wells was similar during pumping; in each drawdown was small even at high rates of draft and recovery was instantaneous. The specific capacity of Well 1 was 450 gpm/ft. drawdown at 1,765 gpm, and of Well 2 550 gpm/ft. drawdown at 1,715 gpm. Tables 1 and 2 list the step drawdown results and Figure 2 shows a plot of s = f(Q) for each.
TABLE 1

NORTH WAIHEE WELL 1
Step Drawdown Pump Test

April 15, 1981

Ground elev. 283 ft.; Bowls set 309.5 ft.; Airline at 310 ft.; uncased.

<table>
<thead>
<tr>
<th>Time</th>
<th>Min.</th>
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<th>D.D. Ft.</th>
<th>Rate GPM</th>
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</thead>
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<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>2</td>
<td>17.1</td>
<td>.92</td>
<td>577</td>
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<td>1.16</td>
<td>769</td>
</tr>
<tr>
<td>08:50</td>
<td>36</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>08:52</td>
<td>38</td>
<td>16.75</td>
<td>1.73</td>
<td>1071</td>
</tr>
<tr>
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<td>46</td>
<td>16.75</td>
<td>1.73</td>
<td>1071</td>
</tr>
<tr>
<td>09:43</td>
<td>89</td>
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<td>1.73</td>
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</tr>
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<td></td>
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<td>09:45</td>
<td>91</td>
<td>16.5</td>
<td>2.31</td>
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<tr>
<td>09:48</td>
<td>94</td>
<td>16.5</td>
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<td>1333</td>
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<td>119</td>
<td>16.4</td>
<td>2.54</td>
<td>1333</td>
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<td>10:51</td>
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<td>3.93</td>
<td>1765</td>
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<td>17.5</td>
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TABLE 2
NORTH WAIHEE WELL 2
Step Drawdown Test
August 3, 1981

Ground elevation 282.21 feet; airline set 304 feet; cased.

<table>
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<tr>
<th>Time</th>
<th>Min.</th>
<th>P.S.I.</th>
<th>D.D. Ft.</th>
<th>Rate GPM</th>
<th>Remarks</th>
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<td>0</td>
<td>0</td>
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<td>1.16</td>
<td>375</td>
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<td>13.25</td>
<td>1.16</td>
<td>360</td>
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<td>20</td>
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<td>0.58</td>
<td>346</td>
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<tr>
<td>08:38</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td>Increase rate</td>
</tr>
<tr>
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<td>24</td>
<td>13.0</td>
<td>1.73</td>
<td>1,111</td>
<td></td>
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<tr>
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<td>26</td>
<td></td>
<td></td>
<td>1,071</td>
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</tr>
<tr>
<td>08:47</td>
<td>32</td>
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<td>1.73</td>
<td>1,111</td>
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<tr>
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<td>1.73</td>
<td>1,071</td>
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<td>09:48</td>
<td>93</td>
<td></td>
<td></td>
<td>1,500</td>
<td></td>
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<tr>
<td>09:57</td>
<td>102</td>
<td>12.6</td>
<td>2.66</td>
<td>1,539</td>
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<td>1,500</td>
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<td>10:15</td>
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<td>2.89</td>
<td>1,715</td>
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<td>1,715</td>
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<td>10:43</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
<td>Stop. Instant recovery.</td>
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</table>
Both wells were subjected to 48 hours of continuous pumping at a constant rate. The first well was tested before the second was drilled so that drawdown measurements were restricted to the pumping well. While Well 2 was being pumped, Well 1 was available for use as an observation well. Sustained pumping at Well 1 at 1,715 gpm for 48 hours was successful on the first try and the results indicated the aquifer to be highly transmissive. At Well 2, two attempts to sustain a constant rate for 48 hours failed, the first after 30 hours and the other after 26 hours, but the third attempt succeeded at a rate of 1,680 gpm. During all three attempts, drawdown measurements were taken at Well 1, a distance of 178 feet away. With these drawdown observation it was possible to compute the transmissivity and specific yield of the aquifer. Drawdown at Well 1 caused by draft at Well 2 and a summary of aquifer characteristics is given in Figure 3. The aquifer was proved to be extensive and highly transmissive, conditions needed for successful exploitation.

Drawdown at pumping wells during sustained tests give well efficiency but generally are not adaptable for calculating aquifer characteristics. The North Waihee wells are very efficient, having specific capacities in excess of
500 gpm/ft. drawdown. During the sustained test at Well 1 drawdown stabilized at 2.54 feet at 1,715 gpm and at Well 2 it stabilized at 3.0 feet at 1,680 gpm.

The drawdowns induced at Well 1 by constant pumping at Well 2 were carefully analyzed to determine, in addition to the aquifer constants, the following:

1. whether the aquifer is effectively closed by impermeable boundaries at short to moderate distances from the well field
2. whether the aquifer has unimpeded hydraulic connection with the Waiehu aquifer
3. whether the aquifer is extensive and effectively unconnected, or poorly connected, with the Waiehu aquifer.

The values for transmissivity and specific yield (effective porosity) were computed by employing the short form (Jacob's method) of the non-equilibrium well hydraulic formula. The short form is permissible because the drawdown data at Well 1 for sustained Test 1 at Well 2 includes early and late measurements that fall on a continuous curve expressed by:

\[ s = \frac{Q W(u)}{4\pi T} \]

in which \( s \) is drawdown, \( Q \) is constant pumping rate, \( T \) is transmissivity, and \( W(u) \) is the solution for the series
that expands the variable, \( u = \frac{r^2 S}{4Tt} \), in which

\( r \) is distance between the pumping and observation wells, \( S \) is specific yield, and \( t \) is time. Units are in feet and days. Proof that the \( s = f(u) \) curve is continuous was demonstrated by assuming that the straight line portion of the plot (after about three hours) fit the Jacob criteria, then employing the computed \( S \) and \( T \) values in calculating the ratio, \( s/W(u) \), for the early part of the curve to check its values against the fixed value of \( Q/4\pi T \). The accord is good and thus it is permissible to conclude that all of the drawdowns fall along a continuous curve. Table 3 below summarizes the computations.

### Table 3

Aquifer Characteristics by Jacob Method

Continuity of \( s = f(u) \)

\((T = 320,000 \text{ ft}^2/\text{d}; S = .284; r = 178 \text{ ft.}; Q/4\pi T = .0737)\)

<table>
<thead>
<tr>
<th>Time Days</th>
<th>( u )</th>
<th>( W(u) )</th>
<th>( s (\text{ft.}) )</th>
<th>( s/W(u) )</th>
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<td>1.3648</td>
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<td>.0625</td>
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<td>.0698</td>
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<tr>
<td>.1042</td>
<td>.0675</td>
<td>2.1853</td>
<td>.16</td>
<td>.0709</td>
</tr>
<tr>
<td>.1250</td>
<td>.0562</td>
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<td>.17</td>
<td>.0717</td>
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<tr>
<td>.50</td>
<td>.0141</td>
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<td>.26</td>
<td>.0702</td>
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<tr>
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<td>5.0770</td>
<td>.38</td>
<td>.0739</td>
</tr>
</tbody>
</table>
The aquifer parameters are comparable to those of the best aquifers in Hawaii. The transmissivity is about 320,000 ft²/day, which implies a hydraulic conductivity of 2,000 to 3,000 ft./day, based on partial penetration of 100 feet in the saturated aquifer, and an average specific yield of at least .20.

Continuity of the early and later drawdown data implies that the aquifer is extensive. On the other hand, hydraulic connection between it and the Waiehu aquifer is, at best, very weak. The nearest test hole in the Waiehu aquifer is A-1, which lies 5,100 feet south of the North Waihee wells. Head in this test hole quickly responds to pumping by the Mokuhau and Waiehu wells in the Waiehu aquifer, and the speed of the response indicates that head changes are transmitted under confined aquifer conditions. No such response showed up on the recorder chart at A-1 as a result of the pumping at North Waihee. If continuous confined conditions existed between North Waihee and A-1, a drawdown of 0.1 feet would have been recorded at A-1 within 70 minutes of the start of each pump test.

For unconfined conditions between the two sites almost ten days would be required for transmittal of 0.1 feet of drawdown. The record at A-1 is too responsive to pumping starts and stops at the Mokuhau and Waiehu wells to unambiguously display any long term effects from North Waihee
if they occurred. Following is a summary of behavior at A-1 during the North Waihee tests.

TEST 4

Head Changes at A-1
Pump Tests at North Waihee

<table>
<thead>
<tr>
<th>Date</th>
<th>Time of Test</th>
<th>Type of Test</th>
<th>Rate (GPM)</th>
<th>Head-changes at A-1</th>
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<td>No change.</td>
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<td>07:30 - 07:30</td>
<td>Sustained</td>
<td>1715</td>
<td>No significant change during test; slight gain in head 6/3-6/10; abrupt drawdown of 0.1 ft. on 6/12, probably caused by Mokuhau-Waiehu pump start up. Gradual increase of 0.15 ft. by 6/18. Head at A-1 20.5 to 21.0 ft.</td>
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<td>Head at A-1 about 15.5 ft. Variable small head changes, up and down. Same head at end of period as at start.</td>
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A more telling argument against free hydraulic connection between North Waihee and Waiehu is the large difference in head between A-1 and the new wells. At A-1 the head is about 20 feet when Mokuhau and Waiehu are not pumping,
or 15 to 16 feet when they are, while at North Waihee the head is nine to ten feet. The hydraulic gradient in the Waiehu aquifer is 1 ft./mile, but between A-1 and North Waihee it is five to ten feet per mile, an impossible gradient if free connection prevailed. Whatever connection exists is highly damped by the alluvial fill and weathered rock in Waihee Valley. For planning purposes it is reasonable to consider the North Waihee aquifer to be effectively separate from the Waiehu aquifer.

**Water Quality**

Analyses by Brewer Analytical Laboratories of water collected in April during the pump test at Well 1 and in August at Well 2 showed no change in chloride from 15 mg/l. A more complete analysis for Well 1 is given below.

**TABLE 5**

North Waihee Water Quality

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<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Conductance</td>
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<tr>
<td>Alkalinity</td>
<td>as CaCO₃ 108 mg/l</td>
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<tr>
<td>Sodium</td>
<td>9.43 mg/l</td>
</tr>
<tr>
<td>Chloride</td>
<td>14.0 mg/l</td>
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<tr>
<td>Nitrate-Nitrogen</td>
<td>2.03 mg/l</td>
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<tr>
<td>Calcium</td>
<td>10.7 mg/l</td>
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<tr>
<td>Magnesium</td>
<td>8.94 mg/l</td>
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</table>
The quality of the water is excellent for any purpose. Chloride content did not increase during the tests.

Conclusions and Recommendations

The North Waihee aquifer is extensive and potentially very productive. The aquifer consists of Wailuku basalt with hydraulic conductivity of 2,000 to 3,000 ft./day and specific yield of .20. The aquifer is basal, possibly affected by widespread dikes, with a static head of about ten feet. The two wells drilled to date are very efficient, displaying specific capacities in excess of 500 gpm/ft. drawdown at high pumping rates. Water quality is excellent.

The two wells at North Waihee could safely be outfitted with 1,750 gpm pumps to provide a potential field output of five mgd. Northward toward Kohakuloa more water could be developed from the aquifer. When an additional water supply is planned, a well field could be located in the next valley about 0.3 miles north of Waihee Stream at an elevation of 400 to 500 feet (See Figure 1).

JOHN F. MINK
NW = NORTH WAAWEE WELLS
A-1 = TEST HOLE
D = TEST HOLE
○ = PROPOSED WELL

FIGURE 1
Figure 2

North Waihee Wells 1 and 2
Step Drawdown Pump Test

April 15, 1981 (Well No. 1)
August 3, 1981 (Well No. 2)
SUSTAINED PUMP TEST
NORTH WAKEE WELL FIELD, MAUI
WELL 2 PUMPING : WELL 1 OBSERVATION
NORTH WAIHEE WELLS 1 AND 2
STEP DRAWDOWN PUMP TEST
APRIL 15, 1981 (WELL NO. 1)
AUGUST 3, 1981 (WELL NO. 2)
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<th>Active Length (m)</th>
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Well Information (m) and Hydraulic Conductivity (m/d)
PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
KANOA WELL NO. 1
(State Well No. 5731-02)
Waihee, Maui, Hawaii

PREPARED FOR:
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, HAWAII 96793

PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 1999
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AUGUST 1999
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FIGURES

Well Location
Site Topographic Map & Preliminary Site Plan - Kanoa 1 Well Site
Site Topographic Map & Preliminary Site Plan - Treatment Site
Water System Service Area
Example Pump Curve

EXHIBITS

Exhibit A: The North Waihee Aquifer, An Additional Water Supply Source
Exhibit A-1: North Waihee Aquifer, Kupaa 1 and Kanoa 1 Wells Test Results and interpretation
Exhibit B: Water Quality Testing Results
Exhibit C: OEQC Bulletin dated June 23, 1997
The undersigned, being a licensed professional engineer, certifies that:

1. He has prepared the attached report and the information contained therein is true to the best of his information and belief; and

2. The water produced by Kanoa Well No. 1 (State Well No. 5731-02), the potable water system identified in the attached report, will comply with the State primary potable water regulations contained in Hawaii Administrative Rule, Title 11, Chapter 20, Rules Relating to Potable Water Systems, and will comply with the Rules and Regulations of the Department of Water Supply, County of Maui, when said drinking water system is operated and maintained in accordance with the instructions and information contained in this report.

This work was prepared by me or under my supervision.

Carl K. Takumi, P. E.
C. Takumi Engineering, Inc.
1. Introduction

This Preliminary Engineering Report was prepared to conform to the provisions of Hawaii Administrative Rules, Title 11, Chapter 20, relating to new potable water source development. The rules require all new potable water sources serving a public water system be approved by the Director of Health prior to its use.

2. General Information

a. Description of project and location, including phasing schedule, persons served by new water source and/or service connection, name and public water system number.

The Kanoa Well No. 1 (State Well No. 5731-02) project is part of the North Waihee Water Source Development Project and consists of developing a basal well located on the northern slopes of West Maui Mountains on the Island of Maui. The project consists of clearing, grubbing, grading, installation of a pump and related electrical controls, electrical building, piping, fencing and related work.

Water from Kanoa Well No. 1 be used to service the Department of Water Supply's Wailuku District or commonly known as the Central Maui Water System (CMWS), Public Water System #212, which provides water for the communities of Paia-Kuau on the east, Kihei-Makena on the south, Maalaea on the west and Waihee on the north. The project is needed to meet the rising demands for water in the Central Maui Region and relieve some of the stress being made on the lao Aquifer.

The North Waihee Wells 1 and 2 (State Well No. 5631-02 & 5631-03 respectively), is also located in the Waihee Aquifer (60103) and have been placed into operation. Kupaa Well No. 1 (State Well No. 5731-03), also in the Waihee Aquifer, is in the process of being developed by the Department of Water Supply.
b. **Owner and authorized representative**

The owner of the Kanoa Well No. 1 (State Well No. 5731-02) facility will be the Board of Water Supply, County of Maui. Upon completion, the Maui County Department of Water Supply (DWS) will operate and maintain the facility. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the well and its appurtenances.

c. **Site Plan with contours and drawn to scale.**

A preliminary site grading plan with existing and proposed contours is attached. Besides the well and pump, the site will have an electrical building, piping, parking, fencing and related site work. Disinfection facility will be located at a separate site (proposed Kanoa Well 2 site designated as well field 2) closer to the North Waihee Reservoir. A preliminary site plan of the disinfection site is attached.

3. **Physical and Hydrological Characteristics of Area**

a. **Location.**

The project is on the northern slopes of the West Maui Mountains north of the village of Waihee and Waihee Stream on the Island of Maui. The tax map key for the parcel is TMK (2) 3-2-1: 3. A location map is attached. Kanoa Well No. 1 is located within pasture land. The well is located on a one acre perpetual easement at approximate elevation 311 mean sea level (MSL) and approximately 2,000 feet from the ocean. The nearest residence is over a 1,000 feet east of the well.

b. **Climate.**

The site is influenced by the northeasterly trade winds as is typical of windward areas of the Hawaiian Islands. The annual rainfall at the site averages 30 to 40 inches with average temperatures in mid 60's to mid 80's range.
c. **Topography including detailed study of project site.**

A preliminary site plan of the well site with existing contours is attached. No significant grading is anticipated at this site for the proposed improvements. The site is located at about elevation 311 feet mean sea level (M.S.L.). The area slopes in the north-south direction with slopes around 20%. A natural swale lies north of the site and will be used to dispose of storm runoff generated by the site.

d. **Geology and foundation conditions.**

The geological profile of the area consists of alluvium at the surface above Honolua series andesitic basalt lavas and the highly permeable Wailuku series basalts. The alluvium and andesitic lavas are fairly low permeability which suggests that wells to basal ground water would not interfere with stream flows above the low permeability layers.

e. **Earthquake considerations and design parameters.**

According to Seismic Zone Maps in the Uniform Building Code, the island of Maui is in Zone 2B. This translates to only moderate seismic hazard. All structures will be designed accordingly. On Maui, there is no record of deep well casings being damaged by earthquakes.

f. **Groundwater conditions.**

"The North Waihee Aquifer, An Additional Water Supply Source for Central Maui," Dr. John Mink, Mink and Yuen, Inc. dated April 10, 1997 provides initial studies for the project. Since information on the aquifer and other groundwater conditions is limited in the area, this project will help with the accumulation of data on the North Waihee Aquifer. In summary, the report states that the North Waihee Aquifer is adjacent and hydraulically connected to the Iao Aquifer; however, the lack of response in the test holes within the Iao Aquifer during test pumping of the North Waihee Wells suggests that the Waihee Aquifer is quasi-independent aquifer. The estimated sustainable yield of the Waihee Aquifer is 8 MGD. The North Waihee Wells has a pumping capacity of 1.5 MGD each well but it is anticipated that the pumps will not run simultaneously nor run continuously except under emergency conditions. The Kanoa Well will help quantify the aquifer sustainable yield and generally provide better information of the Waihee Aquifer for future development potential.
Additional information is provided in the attached “Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation,” Mink & Yuen, June 21, 1999 presents the pump test results of the Kupaa 1 and Kanoa 1 wells.

g. Flood problems including tsunami inundation zones and preventive measures that may be used.

The elevation of the site makes it obvious that the site is not located within any tsunami inundation zone. According to the Federal Emergency Management Agency (FEMA) Flood Zone maps, the site is in an area of minimal flooding (zone c). A Drainage and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction.

h. Information confirming the conformance with local land use planning and zoning regulations.

The site is located within an area designated as “Agricultural” by the State Land Use Commission. The Maui County Wailuku-Kahului Community Plan designates the project site as within “Agricultural” lands. The proposed project is considered as a minor utility facility and a permitted use within the “Agricultural” designation.

i. Discussion of water rights and future uses by others.

The wells within the Waihee Aquifer on record with the CWRM are as follows:

<table>
<thead>
<tr>
<th>State Well No.</th>
<th>Well Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>5631-02</td>
<td>North Waihe’e Well 1 (DWS)</td>
</tr>
<tr>
<td>5631-03</td>
<td>North Waihe’e Well 2 (DWS)</td>
</tr>
<tr>
<td>5631-04</td>
<td>Marino Well A (Private)</td>
</tr>
<tr>
<td>5631-05</td>
<td>Marino Well B (Private)</td>
</tr>
<tr>
<td>5731-01</td>
<td>Mendes Well (Private)</td>
</tr>
<tr>
<td>5731-03</td>
<td>Kupa’a Well (DWS)</td>
</tr>
<tr>
<td>5731-02</td>
<td>Kanoa Well (Project Well)</td>
</tr>
<tr>
<td>5832-01</td>
<td>Unknown</td>
</tr>
<tr>
<td>5832-02</td>
<td>Kahakuloa Acres (Private)</td>
</tr>
<tr>
<td>5832-03</td>
<td>Kahakuloa Acres (Wailena) (Private)</td>
</tr>
</tbody>
</table>

The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields.
within Wailuku Agribusiness Company properties between Waihe'e Stream and Kupa'a Gulch. North Waihe'e Well 1 & 2 (5631-02 & 5631-03) is in well field one (TMK: 3--2-01:04); well field three is the Kanoa Well No. 1 (5731-02); the Kupa’a Well No. 1 (5731-03) is located in well field five. The DWS can potentially develop two additional wells (well fields 2 & 4); however, future well development will require well drilling and pump installation permits from the CWRM and analysis of pump test results. The proposed Kanoa Well No. 2 site is designated as well field 2. The CWRM has received no new well applications for wells in this aquifer.

4. Extent of Water Works System.

a. Description of the nature and extent of the existing area and future area to be served.

The North Waihee Water Source Development project will be used to service the Maui County Department of Water Supply’s Wailuku District Water System which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala. The water system service area is bounded by Paia/Kuau to the east, Kihei/Makena to the south, Maalaea on the west and Waihee on the north and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei, Maalaea and Puunene. The water system service area is shown in the attached figure.

Upon completion of the proposed improvements, the well will be connected to an existing nearby water transmission line from the North Waihee Wells source to the existing 1.0 MG North Waihee Reservoir which is already serving the CMWS.

b. Description of population served, land use and consumption data including forecasting the water demands.

The Central Maui area varies in land use, population and services. The Kahului-Wailuku communities serves as the business-industrial hub and the population center of the island with Kahului Airport and Kahului Harbor as the main transportation centers for traveling off the island and importing and exporting goods and produce. Wailuku is also the governmental center of Maui. Destination resorts of Wailea and Makena are also served by the Central Maui Water System. Paia-Kuau present a more residential setting with small stores serving the community and
limited tourist activity. The Maui County Water Use and Development Plan, 1992, estimates that residential consumption for Wailuku to be about 52%, compared to Kihei at 72% and Kahului at 48%.

Anticipated water demand from the "Maui County Water Use and Development Plan" (Water Use and Development Plan), 1992, estimates that the year 2010 demand within the Central Maui Water System to range between 25 million gallons per day (mgd) to 30 mgd depending upon the method of forecast used. The "Historical Trend" adopted by the DWS used in the Water Use and Development Plan uses a linear extrapolation of 0.5 mgd/year which equates to a forecasted a water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd or a 8.6% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 is 18.1 mgd. Comparatively, the water consumption reported by the Annual Report for Fiscal Year 1997, Board of Water Supply, County of Maui, averaged 19.3 mgd or a 6.6% deviation.

c. Appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional and other water supply needs.

The future requirements of service as forecasted above is based upon a mix of residential, commercial, institutional and other needs of the community as development occurs. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes. As stated previously, the DWS uses a linear demand model based upon historical experience for predicting future water demand. The model includes potential residential, industrial, commercial, institutional and other water supply needs.
d. **Provisions for extending water works system to include consideration of additional area required, easements, and right-of-way acquisition for facilities and utilities.**

A 12-inch transmission waterline is planned to be constructed as part of this project to connect to an existing 24-inch transmission waterline approximately 800 feet from the well site. The 24-inch waterline carries water from the existing North Waihee Wells (5631-02 & 5631-03) to the existing 1.0 MG North Waihee Reservoir. The transmission waterline will be placed within an existing easement; the same easement will also be used for access and to bring power to the site.

e. **Required capacity to meet fire protection and pressure requirements.**

The DWS generally plans reservoirs within the local service area to provide fire protection and assure adequate pressure for its users.

f. **Alternative solutions considered and supporting data for recommended plan.**

The Central Maui Water System has been primarily dependent on water from the Iao Aquifer and withdrawal from the Iao Aquifer is nearing the aquifer's 20 MGD sustainable yield as set by the State Commission on Water Resource Management (CWRM). Hence, the DWS started seeking new sources of water to meet the increasing demand.

Attention was initially given to developing of groundwater in East Maui. Two wells in the Hamakuapoko area have been drilled; however, the East Maui initiative has been delayed due to the discovery of pesticides in the wells and legal challenges, leaving the North Waihee groundwater source as the choice for timely water source development. It may be several years before any East Maui Sources can be utilized for Central Maui.

The "**Water Resource Protection Plan, Volume I & II,**" CWRM, June 1990, estimates that the sustainable yield for the Waihee Aquifer (60103) is 8 MGD. The two North Waihee Wells (5631-02 & 5631-03) have been placed on line within the water system to relieve the stress being placed on the Iao Aquifer. The Kanoa Well No. 1 (5731-02) will be the third well in the Waihee Aquifer to be placed into production.
A fourth well, Kupaa Well No. 1, (5731-03) is also being developed and a separate Preliminary Engineering Report for New Potable Water Source will be submitted to the State Department of Health for approval. If successful, the well will be the fourth well to be placed into production. The Kupaa Well and the Kanoa Well will reduce DWS dependence on the Iao Aquifer and the possibility of over pumping the Iao Aquifer while allowing the Maui County Department of Water Supply to meet the needs of their consumers.

**g. Environmental and economic impact.**

The land is presently undeveloped and presently used as range land. Environmental impacts once the facility is in place should not be significant. An environmental assessment was prepared for the project prior to drilling the exploratory well. A finding of no significant impact (FONSI) was published in the OEQC bulletin on June 23, 1997. A copy of the OEQC Bulletin is attached as an Exhibit C. Another Environmental Assessment is being prepared for the development of the Kanoa Well No. 1 and Kupaa Well No. 1. The development of the Kanoa Well No. 1 will relieve the stress being placed upon the Iao Aquifer and provide an adequate water supply to meet the demand anticipated in the County Community Plans. The project is not being completed to encourage any special development nor any single developer.

The short term economic impacts of the project by itself creates construction jobs. The monies will come from the Board of Water Supply. The long term economic impacts of the project will mean continuous maintenance, electricity and the purchase of disinfectants. The well will reduce stress upon the Iao Aquifer and allow growth as anticipated by the Maui County Community Plans.

**5. Potential Sources of Contamination.**

**a. Description of well site:**

1) coordinates (latitude, longitude), State Well No., and Tax Map Key Number.

- **Latitude:** 20° 57' 08"
- **Longitude:** 156° 31' 23"
- **State Well No.:** 5731-02
- **Tax Map Key:** (2) 3-2-1: 03

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Kanoa Well No. 1

State Well No. 5731-02
2) **land surface elevation, topographic map of well site.**

A preliminary site plan and topographic map of the well site is attached. The ground elevation at the well is approximately 310 feet M.S.L.

3) **Size and topography of catchment area, slope of ground surface.**

The "Water Resources Protection Plan," CWRM, Department of Land and Natural Resources, State of Hawaii, June 1990, reports that the aquifer catchment area is approximately 12.87 square miles. Elevation ranges from sea level to elevation 4,480 at Eke Crater over a distance of approximately 24,000 feet from the ocean to the top of the crater. This equates to an average overall slope of 18%.

4) **General summary of soil and substrata.**

"The North Waihee Aquifer, An Additional Water Supply for Central Maui," Mink & Yuen, April 10, 1997 was initially prepared for this project; the report is attached as Exhibit A. The report also provides insight as to the soil and substrata and the initial design criteria for the well. Substrata information at the well site is provided in the "North Waihee Aquifer System, Kupaa Well 1 and Kanoa 1 Wells Test Results and Interpretation," Mink & Yuen, June 21, 1999 attached as Exhibit A-1.

1) **anticipated well depth and depth of groundwater.**

The well has been drilled 359 feet below ground surface or about 50 feet below mean sea level. The water surface elevation of the basal aquifer encountered is at elevation 7.81.

b. **Design well draft.**

The design well draft is 1,200 gpm.

c. **Water quality data on any existing wells in the area.**

Water quality data was taken at North Waihee Well 2 (State Well No. 5631-03) and the results of the analysis is attached as Exhibit B-1. The
North Waihee Well #2 is also in the same basal aquifer as the Kupaa Well. A water quality sample was taken during the well testing of the Kupaa Well No. 1 (State Well No. 5731-03) and water quality analysis is attached as Exhibit B-2. A water sample was also taken for the Kanoa Well No. 1 (State Well No. 5731-02) during well testing, the water quality sample analysis results is provided as Exhibit B-3.

d. Land use classification of surrounding area.
e. Existing or potential sources of contamination in recharge area:
   1) extent of recharge area likely to contribute water to source including population.
   2) type of contaminants.
   3) distance to proposed well.
   4) method of disposal, i.e. surface, subsurface - above groundwater table, subsurface - in groundwater table.
   5) depth from base on contaminant source to groundwater table including but not limited to urban development, agricultural areas, pasture lands, feedlots, sanitary landfills, dumps, subsurface disposal units.

The recharge area estimated for the Waihee Aquifer 60103) is about 12 square miles. Located between the Waihee and Kahakuloa Valleys. The well is located within an agricultural zoned area. The area is relatively undeveloped and is used as rangeland; no known pesticides have been used on the property for decades. There is no public (County) wastewater system serving the area and existing residences are serviced by individual wastewater disposal systems. The nearest existing residence is located more than 1,000 feet southeast (makai) of the well. Forest reserve lands are approximately 4,700 feet west (mauka) of the site.

The Kanoa Well No. 1 is located in a recharge area composed of conservation and agricultural lands and away from dense populated areas, potential for contamination from external sources appears unlikely. The agricultural zoned areas will allow for limited residences to be built. However, no development can occur in the conservation zoned forest reserve area with out proper permits and authorizations. The geology of the area, consisting of a thick andesite layer makes potential for contamination unlikely from sources makai of the well.

Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. The area is being used as rangeland and has been for a very long time. The
agricultural/conservation zoning within the recharge area limits land use and population. There are no feedlots, sanitary landfills or public dumps within the aquifer recharge area. Wastewater disposal for the few residences are limited to individual wastewater disposal units.

f. Approximate groundwater contour.

"North Waihee Aquifer System, Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation," prepared by John F. Mink, Mink & Yuen, Inc., June 21, 1999 provides well data, pump test results, estimated ground water contours and transmissivity of the aquifer. The report is attached as Exhibit A-1.

6. Sources of Water Supply.

a. Nature of soil and stratum within and overlaying the water source, with special emphasis on identification of fissures and faults as it relates to the natural purification or treatment of percolating fluids from existing or future activities.

Discussed previously.

b. The probability and effect of surface drainage or contaminated underground water entering the subject water source.

Discussed previously.

c. Depth to water table, location and description of wells in vicinity in use and/or abandoned.

Discussed previously.

d. Slope of water table, preferably as determined from observation wells, or studies of wells in the area.

Discussed previously.

e. Site data relating to potential flooding and/or earthquake data.

Discussed previously.

f. Data relating to quality and quantity of the source waters under
normal conditions and during stress periods of drought or heavy precipitation, as determined by field and laboratory analysis and investigations of available records; if records are not available or are inadequate to determine source quality under stress conditions, an estimate of expected quality and quantity during stress conditions should be established and related to the hydrologic budget to the aquifer or isopiestic area. At a minimum, analysis for all of the contaminants listed in the table “Contaminants to be Tested in All New Sources of Potable Water” shall be performed by the Department of Health, State Laboratories Division, for all sources being addressed in the report. For example, when approval of a well field is being sought, all of the wells must be tested for all of the required contaminants.

Laboratories performing the analysis must be currently certified by the Hawaii Department of Health, State Laboratories Division. While the lab data has often been conveniently summarized in a table, some reports have failed to note when analyses have been subcontracted to another lab. The lab reports from all of the laboratories involved must be included in the engineering report to allow the Department to verify that the analyses were performed by an approved lab. Failure to do so may delay the review process.

A water sample was taken during well testing. The sample was analyzed by Montgomery Watson Laboratories. The results are included in this report as Exhibit B-3. Water sample analysis results were obtained from the North Waihee Well #2 and Kupaa Well #1 and are included as Exhibit B-1 and Exhibit B-2 respectively. The water samples were taken during the well pump tests of these wells.

g. Identification of all significant factors having potential for contaminating or reducing the quality of the water source or which would cause the quality of water delivered to users of the system to be in violation of any state primary drinking water regulation.

h. For each present and projected potential source of contamination, identification and evaluation of alternative control measures which could be implemented to reduce or eliminate the potential for contamination of the water source, including treatment of the water source if subject to contamination, and evaluation of the physical, economic and social effects of implementing such control measures.

The lands surrounding the site is zoned either agricultural or conservation.
The zoning in itself limits the potential for contamination. The conservation lands are mauka of the site. Conservation land uses are restrictive and requires a permit to develop the land. Similarly, agricultural development has limited uses. Presently, the lands are used mainly for cattle grazing. Waste water treatment facilities for the existing homes in the area do not penetrate down to the aquifer and water quality samples show that individual waste water treatment facilities have not affected the quality of water from the aquifer. Therefore, the only anticipated source of contamination is biological; water treatment to mitigate potential contamination will consist of disinfection.

i. A summary section indicating how the proposed development and improvements will provide reasonable assurance that the new water source is not subject to actual or potential contamination such as may result in the water not complying with any state primary drinking water regulation or as may otherwise adversely affect the health of persons.

The annular space around the well casing has been grouted from just above aquifer water level to ground surface to prevent surface waters from entering the well.

The Maui County Community plan for the area shows that the lands have been designated as either agricultural lands or conservation lands. The conservation lands are above the project site.

7. Proposed Treatment Works.

a. Summary description of proposed processes and unit parameters for treating the specific water under consideration. Include pertinent information on built up and packaged plant systems.

Water samples taken during well testing show that only disinfection will be needed. Water from the well will be treated by an 12.5% premixed sodium hypochlorite solution disinfection system. It is estimated that approximately 8.4 pounds (equivalent Cl₂) per day would be normally used and 11.4 lbs (equivalent Cl₂) if the pumps ran for 24 hours. The hypochlorite solution will be injected before the water enters 1,000,000 gallon North Waihee control reservoir. The reservoir should provide sufficient contract period to allow thorough disinfection of the basal waters. The system located in a separate room within the control building (electrical and chlorine residual analyzer to be located in adjacent
electrical room) at the proposed Kanoa Well 2 site includes the following:

Storage for 12.5% sodium hypochlorite solution with spill containment.
Potable water supply.
Metering pumps.
Plastic tubing accessories and PVC Schedule 80 piping within the control building, below ground to a common injection point.

Operation and maintenance consist of field visits to the site primarily to measure chlorine residual and to resupply sodium hypochlorite solution when required. Adjustments to chlorine injection will be made to assure adequate chlorine residual.

b. **Site:** Discuss various sites available indicating proximity to developed areas, availability of utilities, and accessibility of plant site. Show on a topographic map the treatment plant and arrangement of present and proposed treatment facilities.

The project is a water development project within the Waihee Aquifer (60103) and therefore, the well site north of the Waihee Stream was selected. The Kanoa Well No. 1 site is one of five well fields that is available to the Department of Water Supply. The remainder of the well fields are located between the North Waihee Wells (State Well No. 5631-02 & 5631-03) and Kupaa Well No. 1 (5731-03). A preliminary site plan of the proposed well development site is attached. Access to the well site will be via existing easement. A paved driveway will be constructed as part of this project. Electrical power will be brought to the site by Maui Electric Company, the local electric utility through the existing easement.

The water treatment facility (hypochlorination) will be located at a separate site and a site plan is attached.

c. **Basis of Design:**
1) Design Period
2) Design population and flow demand data
3) Nature and characteristics of flow
4) Design flow rate for plant
5) Reserve capacity
6) Treatment processes and unit parameters including calculations for design of units. Include description of equipment, capacities, size, operational factors and plant
hydraulics.

7) If components are to be modified in stages, discuss staging, sequence, and future changes as required.

The sustainable yield of the Ioa Aquifer is 20 MGD. In the past, the DWS has come close to pumping near the sustainable yield levels. It is important to provide additional sources of water to reduce the stress being placed on the Ioa Aquifer and to provide an adequate supply of water to meet the demands of the water system. The well, pumping, storage and appurtenances will be designed and constructed in compliance with the County of Maui Department of Water Supply and State Department of Health Drinking Water Standards. The facility will be owned and operated by the DWS. Their staff is thoroughly familiar with and have the experience and qualified personnel that are committed to provide water that will be in compliance with the requirements of the State Safe Drinking Water Regulations. Water samples taken from the North Waihee Well during the well testing phase shows that disinfection is the only treatment needed for the water.

d. Waste Disposal: Discuss various wastes from the water treatment plant, their volume, proposed treatment and disposal, and points of discharge.

No wastes are anticipated for the treatment process.

e. Operation and maintenance: provide general information operation and maintenance requirements, automatic equipment and justification for system proposed.

The operation and maintenance of the disinfection system will be by the Maui County Department of Water Supply. The Department has several similar disinfection systems and the qualified personnel to operate and maintain the equipment. Regularly scheduled field visits will be made to the site to measure chlorine residual and to resupply hypochlorite solution for injection.

8. Pumping Facilities. In addition to information required under sections 2 through 4, the following information should be provided in the engineering report:
   a. Purpose of service
   b. Pumping layout and sizing of force main
   c. Design flow requirements including maximum, average, minimum,
variations in demand, and effect of storage  

d. Liquid characteristics  
e. Pump selection including system and characteristic curves  
f. Pumping arrangement.  

Submersible deep well pumps are planned for the project. The layout of the project site is shown in attached figure. Potable water will service the CMWS. The pumping facility will have the following attributes:

Pump Type: Deepwell Submersible  
Pump Rating: 1,200 gpm @ 450' TDH  
Motor: Submersible, 200 HP, 1750 RPM  
Power Supply: 480 volt, 3 phase, 60 Hz.  
Piping: Ductile Iron  
Appurtenances: Check Valve, Air and Vacuum Valve.  
Flow Tubes: Cast Iron with a bronze liner with transmitters and receivers.

Pump Control: Pump controls will be through a pressure sensing line (water level) which has been already placed in the existing 1.0 MG North Waihee Reservoir. A signal proportional to tank level will be sent to a receiver in the control building on site. As water level in the reservoir reaches a certain level (to be set by operator), the pump will turn on. After reservoir fills, the pump will turn off by signal from the reservoir level sensor. High level and low level alarms will be installed to warn operator of malfunction.

Well level control: An electronic well drawdown sensing device will be placed in a well level monitoring tube to record water levels within the well. The information will be used as part of the data gathering information that will provide better understanding of aquifer conditions of the Waihee Aquifer and will set off an alarm if well level get below a certain draw down.

A 12-inch transmission waterline is planned to carry water from the Kanoa well to an existing 24-inch transmission waterline from the North Waihee Well Project where the water will stored in a 1.0 MG reservoir. As water is needed in the Central Maui Water System, a signal by SCADA will activate the booster pumps. Additional booster pumps will be activated as demand grows; simultaneously, well pumps of the same pump rate will be activated. The North Waihee 1.0 MG reservoir will control the three wells.
The Kanoa Well No. 1 is part of a system of wells planned for the area by the Department of Water Supply. The design and operation of the well will be in conformance with the “Water System Standards,” Department of Water Supply, County of Maui, 1985. Since the Maui County Department of Water Supply is a public agency, the pumping unit must go through a bidding process. A specific pumping unit with pump curves cannot be presented at this time; however, an example pump curve is attached. The pump parameters were previously provided.

g. Electric power available:

Electrical power will be brought to the site. Electrical power will be supplied by Maui Electric Company. At present, no emergency power at the well is planned. Existing wells in the water system has emergency power available and would be sufficient to provide for water requirements during power failures. Emergency power will be available at the proposed Kanoa Well 2 site to drive hypochlorinator units.

h. Proposed building and other structural improvements

A control building will be constructed as part of the project. The building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other electrical appliances. A separate, enclosed building at Well Field 2 (Kanoa 2 well site) will house the disinfection facility. The building will be a slab on grade, CMU building with asphalt shingle roofing.

i. Water hammer consideration.

Water hammer effects will be mitigated by the use of slow opening/slow closing control valves and check valves. In addition, the 1.0 MG North Waihee Reservoir would act as a surge relief outlet.

j. Descriptions of essential features of construction and operation, including staging sequence if applicable

The staging sequence will be left up to the contractor; however, the following is the most likely staging sequence for the project construction:

a. Mobilize.
b. Clear and grub site.
c. Grading and earthwork to the well site, construct access road and install transmission waterline.
d. Grass exposed slopes.
e. In the meantime, the building can be constructed, the pump and related piping installed and the paved area prepared for paving.
f. Complete the paving within the well site. The booster pump at the 1.0 North Waihee Reservoir will be installed.
g. Electrical and telemetry equipment installation simultaneously with the disinfection equipment. Meanwhile, MECO will provide power to the site.
h. Finally, the fence can be completed.

k. Electrical system including provisions in the event of power failure, and telemetering and supervisory control systems

Electrical Power will be obtained from Maui Electric Company, the local power company providing service to the island. The Department of Water Supply has other wells in the system with stand-by power which can be activated during power emergencies. A generator will be located at the treatment facility and will be automatically activated during power outages.

9. **Finished Water Storage.** Describe location, type and sizing of storage facilities. Include discussion on drains, overflows, telemetering and supervisory controls, painting and protective coating and other important and pertinent considerations.

Finish water storage will be the existing 1.0 MG North Waihee Reservoir. The reservoir is equipped with water level sensors to control the well pump. The controller shall have a pump off setting, pump on setting and a low level alarm. The system will be connected to the Department of Water Supply SCADA system for monitoring at their Central Maui Baseyard.

10. **Water Distribution Systems.**

   a. Provide general layout of the system.
   b. Indicate materials, valves, hydrants, meters, etc.
   c. Proximity of other utilities
   d. Include effects of incremental or phased construction, possibilities of future developments as applicable
   e. Provide information, profiles or sections showing pipe cover, location, groundwater conditions and other important data affecting installation of the distribution system.
The Central Maui System service area has been described previously. A layout of the Central Maui Water System is attached. A description of the total service area was previously described. The water distribution system is one of the existing public water systems maintained by the Maui County Department of Water Supply. The water system materials, construction and maintenance are in accordance to the standards set forth by the Maui County Department of Water Supply. This project is not planned for any specific development but to meet the rising demand for water throughout the water system and to reduce stressing the lão Aquifer.

11. **Financing. Provide information on estimated costs of installation, phasing, operation and maintenance and other related information.**

The project will be funded by the Maui County Board of Water Supply. A preliminary cost estimate is attached. Operation and maintenance will be performed by the Department of Water Supply as part of their daily operations on all of the wells in the area.

An estimate of the project construction cost are as follows:

- Site improvements including pump, electrical/equipment building, electrical, disinfection, fencing, paving, drainage and miscellaneous piping: $570,000.00
- Booster Pump at existing 1.0 MG North Waihee Reservoir: $100,000.00
- 12" Transmission Waterline from site to connect to existing transmission line including connection to existing waterline: $200,000.00
- Total construction estimate for project: $870,000.00
- Contingencies: $174,000.00
- Total project cost not including MECO charges: $1,044,000.00
REFERENCES


3. NORTH WAIHEE AQUIFER SYSTEM, Kupaa 1 and Kanoa 1 Well Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.


9. East Maui Development Plan, Department of Water Supply

KANOA WELL NO. 1

FIGURES

WELL LOCATION (USGS MAP)

KANOA 1 WELL SITE TOPOGRAPHIC MAP & PRELIMINARY SITE PLAN

KANOA 2 WELL PRELIMINARY SITE PLAN - TREATMENT SITE

WATER SYSTEM SERVICE AREA

EXAMPLE PUMP CURVE
KANOA WELL 1 (STATE WELL NO. 5731-02)
APPROXIMATE SCALE 1"=2000'
KANOA WELL SITE No. 1
EASEMENT "D"
AREA = 1.00 Acres

PROPOSED ELEC. HHG W/ TRANSFORMER
EXISTING KANOA MONITOR WELL
PROPOSED ACCESS ROAD
PROPOSED 12" W.L.

KANOA 1 WELL SITE-SITE PLAN
KANOA WELL SITE No. 2

EASEMENT "C"
AREA = 1.00 Acres

PROPOSED ELECT. HHG W/ TRANSFORMER
PROPOSED ELECTRICAL/CHLORINATION BUILDING
PROPOSED EMERGENCY GENERATOR

KANOA 2 WELL SITE-SITE PLAN
KANOA 2 WELL SITE – GRADING PLAN
**NOTES**

- Performance indicated based on cold water with a specific gravity of 1.0.
- *Standard construction.
- **Minimum submergence over lip of bell to prevent vortexing.
- Efficiency improvements are available in certain instances. Please contact the factory.

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### PUMP DATA

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<tr>
<td>2</td>
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**HORSEPOWER WILL BE EFFECTED BY CHANGE IN EFFICIENCY**

**PERFORMANCE FOR:**

Bowl Pattern No.: 547612-A-R0
Imp. Pattern No.: 547611-A-R0

**PUMP DATA**

<table>
<thead>
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<td>Maximum Head (FT.)</td>
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<td>Min. Submergence (IN.)**</td>
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<tr>
<td>Impeller Wt. (LBS.)</td>
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<tr>
<td>Thrust Constant (K)</td>
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</tr>
<tr>
<td>Bowl O.D. (IN.)</td>
<td>9 9/16</td>
</tr>
</tbody>
</table>

**NOTES**

- Performance indicated based on cold water with a specific gravity of 1.0.
- *Standard construction.
- **Minimum submergence over lip of bell to prevent vortexing.
- Efficiency improvements are available in certain instances. Please contact the factory.
EXHIBIT A

THE NORTH WAIHEE AQUIFER, AN ADDITIONAL WATER SOURCE

MINK & YUEN, INC.
THE NORTH WAIHEE AQUIFER
AN ADDITIONAL WATER SUPPLY SOURCE FOR CENTRAL MAUI

John F. Mink
Mink and Yuen, Inc.
April 10, 1997

Introduction

The Iao Aquifer System, which for managerial purposes is defined as the region between Waikapu Valley and Waihee Valley, has satisfactorily supplied Central Maui with drinking water since the Mokuahau wells were drilled more than 30 years ago. The aquifer system is large with an assigned sustainable yield of 20 mgd, but demand has already reached this level and threatens to substantially exceed it in the next few years. New sources of drinking water are needed to meet increasing demand.

As the exploitation of the Iao Aquifer was undergoing considerable expansion with the drilling of the Waiehu Heights and Waiehu wells in the late 1970s and the early 1980s, it became evident that additional sources needed to be located and put on line a decade or so in the future. The region north of Waihee Valley was considered a prime
candidate for groundwater production, but at first most attention was given to developing groundwater in East Maui. The East Maui initiative has been delayed, however, by the discovery of pesticides in newly drilled wells and by legal challenges, leaving the North Waihee groundwater resource as the obvious choice for timely additional development.

Construction of a pipeline connecting North Waihee with the Central Maui distribution network is underway, and two potential production wells are in place. The North Waihee Aquifer will be developed in phases, the first of which incorporates the existing wells and the drilling of two new wells. Details of future phases will depend on the behavior of the aquifer in response to pumping following completion of the first phase.

Relationship Between Iao and North Waihee Aquifer Systems

After it was recognized that production from the Iao Aquifer System would not be able to match the increasing demand in Central Maui, attention turned to the region north of Waihee Valley as a prospective source of additional groundwater. In 1980 Dan Lum, then hydrologist with the State Department of Water and Land Development (DOWALD), suggested that exploratory drilling be attempted on the slope of the ridge
just north of the Waihee River to test whether the area was an extension of the Iao Aquifer System or could be treated as an independent groundwater province. About at the same time Stephen Bowles, consulting hydrologist, recommended essentially the same course of action. Subsequently John F. Mink was retained by C. Brewer Co., owner of the land, to locate drilling sites and design a drilling and testing program.

Two wells were drilled in 1981 and the groundwater data compared with the original premise that if North Waihee was an uninterrupted extension of the Iao Aquifer System, the head should be at least 15 feet, based on the head at Test Hole A-1 located 4000 feet across the valley to the south, and the corollary that if the head were 5 feet or less, the aquifer would be independent of the Iao System. In fact, the head at the exploratory wells was about 10 feet while the head at Test Hole A-1 was nearly 20 feet. This relationship suggested that the Iao Aquifer System was hydraulically connected to North Waihee but that Waihee Valley behaved as a low permeability impediment to hydraulic continuity. The lack of response of groundwater levels at Test Hole A-1 to pumping at the North Waihee wells further suggested that North Waihee could be treated as a quasi-independent aquifer
The connection between the Iao and North Waihee Aquifer Systems, as well as the dampening effect on hydraulic continuity exercised by the low permeability associated with the alluvium and weathered zone in Waihee Valley, is indicated by comparing the continuous head records at Test Hole A-1 and North Waihee Well 1. The head trace for the test hole is synchronous with that at North Waihee but higher by about 7 feet. If the normal groundwater gradient in basal aquifers of the shield basalts characteristic of every island in Hawaii governed flow, the difference in head would be less than 1 foot. The exaggerated difference is a result of head loss as the groundwater moves through the valley. Global hydraulic conductivity in the valley is at least two magnitudes less than in the unweathered basalt aquifer. A derivation based on Darcy's law indicates that the global hydraulic conductivity of the impediment is about 25 ft./day compared with normal basalt conductivity of 1500 ft./day.

Knowledge of the hydrogeology of both the Iao and North Waihee Aquifer Systems is insufficient to unequivocally establish the pattern of groundwater flow in and from the
aquifers. However, assuming that the general direction of groundwater flow in the Iao Aquifer is toward and across Waihee Valley, the North Waihee System would then be recharged by excess groundwater from Iao as well as by recharge from the high rainfall region north of Waihee Valley. As a result, the sustainable yield of the North Waihee System is substantial. Its magnitude, now estimated to be 8 mgd, will be more accurately determined after an operational record of pumping is established. The sustainable yield refers to the entire North Waihee Aquifer System, which extends from Waihee Valley north to Kahakuloa Valley.

Hydrogeology of the North Waihee Aquifer System

In the Iao Aquifer System the basal aquifer in the Wailuku basalt formation is covered by a caprock of sediments extending to approximately 8000 feet inland of the coast. The inland boundary of the basal aquifer is the rift zone lying about 12,000 feet from the coast and approximately parallel to it. Heads are high in the aquifer because the low permeability of the caprock sediments prevent easy discharge of the groundwater.

This sedimentary blanket, which north of Iao Valley is more
than 1200 feet deep at the coast, is truncated at Waihee Valley. North of Waihee the volcanic rock formations reach to the coast; if a sedimentary blanket exists, it lies below sea level and does not play a role in the North Waihee hydrogeology. The absence of sediments north of Waihee Valley suggests that the sector to the south was displaced downward as a result faulting, and that the fault itself is along what is now Waihee Valley. South of Iao Valley the deep sediments continue beyond Waikapu, but are absent where the Isthmus terminates. The faulted block, therefore, is a wedge truncated on the north at Waihee Valley and ending in the south where the isthmus sediments abut the basalt bedrock.

Although a sedimentary caprock does not exist in the North Waihee Aquifer System, nevertheless north of Waihee Valley a caprock composed of a volcanic formation resists drainage from the basal lens into the sea. The formation constituting the aquifer is the Wailuku basalt, a highly permeable medium equivalent to other premium aquifers such as the Koolau basalt of Oahu in its water bearing properties. In the region between Waihee Valley and Waiolai Gulch, and perhaps beyond to Wailena Gulch, the Wailuku basalt is covered by the Honolua formation, a low permeability combination of
andesite and trachyte in which even lower permeability soil and ash layers are stratified. The Honolua averages about 100 feet in thickness and completely caps the Wailuku basalt to the coast and out to sea. This formation behaves as a caprock in the region where the proposed additional groundwater development is to take place. Figure 1 illustrates the geology of the region.

The Honolua formation is a pale tan to gray to white rock, massive and dense with platy cleavage. Individual andesite layers average about 40 feet thick, and trachyte layers are as much as 150 feet thick. In contrast, the primitive basalt of the Wailuku formation is piled in layers normally 10 feet or less thick throughout which many highly permeable clinker layers occur. A weak unconformity separates the Wailuku from the overlying Honolua, but the volcanism that produced these rocks was continuous, though eruptions were less frequent during the extrusion of the Honolua formation. Nowhere in West Maui is the Honolua exploited as an aquifer.

For convenience in classification and management, the North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. The basal portion may be disrupted near Makamakaole Valley by massive
Honolua dikes that connect the trachyte eruptive centers at Puu Kukui and Eke at the crest of the West Maui Mountains with trachyte bulbous domes near the coast, such as Puu Olai (Figure 1). Inland the basal sector ends at the rift zone which is about at and parallel to the Forest Reserve boundary 7000 feet from the coast. In the entire North Waihee Aquifer System the sustainable yield is estimated as 8 mgd; between Waihee and Makamakaole it is less.

North Waihee Wells 1 and 2: Drilling and Testing
In 1981 C. Brewer Co. had two wells drilled in its property on the north bank of Waihee Valley. The wells are located about 500 feet from the axis of the valley and 5200 feet inland from the valley mouth at Waihee Point. The purpose of drilling was exploratory, to determine aquifer characteristics, ground water levels and quality, but the wells were constructed and completed for use as production wells. The locations of wells in the North Waihee Aquifer System is given in Figure 2.

The wells were located to avoid a deep section of valley fill sediments. They were driven from elevation 280 feet through 100 feet of talus into the the Wailuku basalt. The Honolua formation is missing at this level on the slope of
the ridge. The initial head was 9 to 10 feet, which was higher than expected if the aquifer were independent of the Iao Aquifer System to the south yet lower if it were connected. At the time the head at Test Hole A-1, 4000 feet to the south in the Iao Aquifer, was 20 feet during periods of low to no pumping at the Mokuhau and Waiehu wells.

Each well was drilled to 105 feet below sea level (BSL) and fitted with 16 inch diameter blank casing to 5 feet BSL, and screen between 5 and 25 feet BSL. The remaining 80 feet was left open.

The pump test in 1982 employed North Waihee 2 as the pumping well and North Waihee 1 as an observation well. The wells are on a line parallel to the valley, 176 feet apart. A continuous 48 hour test at a rate of 1700 gpm (2.45 mgd) was performed. Analysis of the test results determined the transmissivity of the aquifer as 325,000 sq.ft./day and the storage coefficient as .25. Salinity of the pumped water was very low and constant at 15 mg/l chloride. No effect on the head at Test Hole A-1 could be detected, nor were any boundary effects indicated by the drawdown curve.

The test proved the occurrence of a substantial groundwater
resource north of Waihee Valley, and the results implied that the connection with the Iao Aquifer System was weak. The wells were capped. Interest in them flagged because draft in the Iao Aquifer System was still significantly less than the assigned sustainable yield.

Interest was rekindled in 1989 when Iao pumpage began to approach sustainable yield. A longer test with expanded data collection opportunities was designed. An observation well was drilled in Kanoa Valley about 2000 feet north of the North Waihee wells and equipped with a continuous water level recorder. An existing small diameter well in Wailena, 13,500 feet north of the North Waihee wells, was also equipped with a continuous water level recorder. The Wailena well had been drilled in 1987. Test Hole A-1 and North Waihee Well 1 also had continuous water level recorders. North Waihee 2 was selected as the pumping well. Another well in the region, the Mendes well (Figure 2), was not available for measurements. This well has a 4 inch diameter casing and is fitted with a 5 HP pump capable of yielding 20 to 30 gpm. It is infrequently pumped.

Ground elevation at the Kanoa observation well is 305 feet. The drilling log places the Honolua/Wailuku contact at depth
248 feet (57 feet ASL). The initial head was 12.4 feet. The Wailena well ground surface is at 608 feet, and the well lies at the inland turn of the road nearly on the axis of the valley. The Honolua formation is absent in Wailena, and the well penetrated only the Wailuku basalt. The initial head at completion of drilling in 1987 was 6.4 feet while just before commencement of the test it was 6.6 feet. At the start of the test head in North Waihee 1 was 11.5 feet and in North Waihee 2 it was 10.7 feet. At Test Hole A-1 in the Iao Aquifer System the head was 18.1 feet. Heads at Kanoa and North Waihee were inconsistent with a flow net that would have groundwater passing northward from Waihee Valley toward Makamakaole as might be interpreted if flow crossed Waihee Valley from Iao to North Waihee.

The pump test lasted four days, from May 15 to May 19, 1989. The average rate of pumping over the 96 hours was 2400 gpm (3.46 mgd). Drawdown in North Waihee 2, the pumping well, stabilized at 5.5 feet, and in North Waihee 1, 176 feet away, it reached 0.7 feet. At the Kanoa observation well drawdown peaked at 0.4 feet. Tidal efficiency at Kanoa is high because the well lies just 2000 feet from the coast, and the range and distribution of drawdowns on the chart reflected this efficiency. At Wailena and Test Hole A-1 no
change in head attributable to the pumping could be detected. The drawdown curves for North Waihee 1 and Kanoa did not indicate the presence of flow boundaries.

The test results were evaluated both graphically and by computer program to yield values for the fundamental aquifer properties of transmissivity and storage coefficient (effective porosity). At North Waihee 1 transmissivity computed from drawdown data was 320,000 sq.ft./day and storage coefficient 0.30, about the same as that determined for the 1982 test. The Kanoa data was not as easily interpreted because of the imposition of the tidal signal on the drawdown values. Transmissivity fell between 260,000 and 334,000 sq.ft./day and storage coefficient between 0.013 and 0.034. The transmissivity values are consistent with those obtained at North Waihee 1, but the storage coefficient values are a magnitude lower. At the North Waihee wells the computed storage coefficients may represent local phenomena, whereas the values determined at Kanoa may reflect a regional characteristic. For planning the arrangement of a well field the smaller storage coefficient is likely to be more realistic than the larger one. In the Pearl Harbor region of Southern Oahu, for example, where the Koolau formation resembles the Wailuku basalt the regional storage
coefficient is about .05.

For predictive purposes a transmissivity of 325,000 sq.ft./day and coefficient of storage of .05 will be employed. The transmissivity is representative of a highly permeable aquifer having a substantial depth of fresh water flow. Assuming a hydraulic conductivity of 1500 ft./day, which is a value typical of primitive basalts like the Wailuku formation, and accepting the Ghyben-Herzberg relationship that depth below sea level to the 50 percent sea water isochlor is 40 times the head, the thickness of the fresh water core is calculated as 217 feet and that of the upper limb of the transition zone as 40*h - 217 (e.g. for a 10 feet head the upper limb would be 183 feet thick).

The calculated thickness of the fresh water core is further constrained by the assumption that the groundwater flow contributing to transmissivity is restricted to this zone. These assumptions lead to approximate, not accurate, estimates of zonation in the basal lens. Nevertheless it is clear that the fresh water core is thick because even under the intense stress of pumping 3.46 mgd from a single well the salinity of the pumped water did not increase.
Proposed Development of the North Waihee Aquifer

The first phase of the North Waihee groundwater development program calls for activation of the two existing North Waihee wells and drilling two new wells. The existing wells were completed to construction standards meeting both the Department of Health and Commission on Water Resources Management recommendations. One of the new wells, Kupaa 1, will be located at an elevation of approximately 575 feet near the C. Brewer Co. property boundary line on a slope inland of Kahekili Highway. The other, Kanoa 1, will be drilled about 75 to 100 feet inland of the existing Kanoa monitor well.

The North Waihee wells are 16 inch diameter (casing) and bottom at 105 feet BSL. The new wells also will be completed as 16 inch diameter wells after testing proves acceptable production capability. However, the first stage in the drilling protocol for the new wells will consist of a pilot hole driven to 50 feet BSL into which a pump can be lowered for a preliminary test. An option will be included to drill deeper in 25 feet increments if results of the preliminary test fail to predict adequate production.

General specifications and the drilling protocol for the two
new wells are as follows.

1. Drill pilot hole to depth 50 feet BSL.

2. Conduct preliminary pump test in open hole; duration two hours or less.

3. Option to deepen drilling in 25 feet increments if preliminary tests fail to show sufficient production capability.

4. At selected depth, ream boring so it can hold 16 inch diameter casing while allowing for a 3 inch annular space for grouting.

5. Conduct another preliminary test of a few hours duration.

6. Select length of blank casing on basis of preliminary tests.

7. Screen is optional; at most, 10 to 20 feet of screen, the remainder of boring open hole.

8. Grout to water table, which is expected to lie about 10 feet above sea level.

Although the North Waihee 2 well was tested for a continuous run of 96 hours at 3.46 mgd, this rate is about twice that allowable for a production well. Upon reviewing the results of the pumping tests of 1982 and 1989, the preliminary recommendation was to fit the wells with 2 mgd (1390 gpm) pumps. This recommendation envisioned a single well field
comprising two wells in the North Waihee Aquifer. Expansion to more than two wells justifies a more prudent recommendation of 1.5 mgd (1040 gpm) per well. The new wells will be tested to determine whether a 1.5 mgd pump would be appropriate, but final pump size will depend on the results of the long term continuous test.

Total well capacity will be 6.0 mgd if each of the four wells is fitted with a 1.5 mgd pump. A scenario in which one of the existing North Waihee wells serves as an inactive stand-by but the other three wells are producers, and assuming that a peaking factor of 1.5 times average output is exercised for the three active wells, average production will total 3.0 mgd. If the capacity of the inactive well is included, the average output will be 4.0 mgd. Whether or not the North Waihee Aquifer between the C. Brewer Co. property line and Waihee Valley can sustain an average yield of 4.0 mgd is not predictable until a record of the effects of pumping operations on water levels and the quality of the pumped water accumulates.

The proposed location of Kupaa 1 is 1000 feet from the Mendes well and 2 miles south of the new Wailena well. At the time of testing the Wailena well had a 4 inch diameter
casing. In 1994 a new well with 6 inch diameter casing was drilled and successfully tested at 200 gpm. Pumping at Kupaa and Kanoa should not affect the Wailena well because of its distance from the proposed wells. The capacity of the Mendes well is too small for either the quality or quantity of its pumpage to be affected.
Figure 1
NORTH WAIHEE
(Waihee Valley to Kaha Kuloa Valley)
Scale: 1" = 1 mile.

- Existing Wells
- Proposed Wells

Geology:
- Ra: Recent alluvium and dunes
- Pa: Old alluvium
- Th: Honolulu formation
- Tw: Wailuku formation

Intermittent stream:

Location:
- Wailena
- Mendes
- Kupaa 1
- Kanoa 1
- North Waihee 1, 2
EXHIBIT A - 1

NORTH WAIHEE AQUIFER SYSTEM
KUPAA 1 AND KANOA 1 WELL
TEST RESULTS AND INTERPRETATION

JOHN F. MINK
MINK & YUEN
Kupaa 1

The location of the well, which was completed in March of 1999, is plotted on Figure 1. The completed configuration of the well is as follows.

- Depth 687 ft. (49 ft. BSL)
- Boring diameter, 21 in.
- Blank casing diameter, 16 in.; depth 633 ft. (4 ft. ASL)
- Perforated casing, diameter 16 in.; length 53 ft.
- Grout, 0 to 630 ft. (7 ft. ASL)
- Gravel, 633 to 686 ft.

Further details are given in the Driller’s Well Completion Form, which is attached. Note that the measuring point (MP) on the form differs from the surveyed elevation. The driller’s MP elevation on the top of the casing is listed as 638.1 feet; the actual elevation is 639.37 feet, which is based on a vertical survey from a benchmark elevation of 631.87 feet located about 200 feet from the well. This correction affects computation of head but not of drawdown measured during the pumping tests.

Examination of the drill cuttings indicates that the unconformity between the overlying Honolua trachyte formation and the Wailuku basalt formation is 70 to 80 feet below ground surface, and that the weathering zone of the Wailuku extends another 55 feet before fresh Wailuku basalt is struck. The driller’s lithology log is attached. Also attached is a drawing illustrating the relationship between the Honolua and Wailuku at both the Kupaa and Kanoa wells.
Step Drawdown Test

Head before pumping started was 7.41 feet (MP 639.37 ft. - DTW 631.96 ft = 7.41 ft.), as measured with the Driller's tape. Putative stable drawdown at each pumping rate was:

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<tr>
<th>Rate (gpm)</th>
<th>Drawdown (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td>1.34</td>
</tr>
<tr>
<td></td>
<td>2.14</td>
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</table>

In the Appendix these data are used to calculate a transmissivity (T) value of 178,928 sq.ft./day employing the standard laminar-turbulent flow relationship between drawdown and pumping rate. Assuming depth of flow to the well equal to penetration of the well below the water table (about 50 feet), hydraulic conductivity (k) is 3566 ft./day This value is of the magnitude consistent with the usual values derived for other primary basalt aquifers in Hawaii.

Constant Rate Pump Test

The constant rate test at 1200 gpm began at 0900 on March 15, 1999, and went on for four days (96 hours). Initial drawdown was rapid, but after about 40 minutes it no longer decreased monotonically but began to oscillate within a range of approximately 0.5 feet. Tidal and barometric perturbations, randomized by apparent hysterisis in the transducer readings, contributed too much noise to the record to allow an accurate extraction of drawdowns due to pumping alone.

For the first 44 minutes of the test, however, the monotonic drawdowns can be employed in the Theis equation to derive an approximate value of T. The computer program, THEISFIT, yields a T value of 91,363 sq.ft./day, which for a 50 feet depth of flow translates to hydraulic conductivity of 1827 ft./day. This value is of the same magnitude as the one obtained from the step drawdown test data but is probably more accurate and is more consistent with typical values for other Hawaiian basalt aquifers (e.g. The Koolau aquifer of southern Oahu, which has an average hydraulic conductivity of 1500 ft./day). The printout of the THEISFIT computation is included in the Appendix. A realistic value for storage coefficient (S) is impossible to derive because a meaningful radius value for the pumping well is unknowable. The total bore diameter may be one or two feet, but the apparent diameter is likely to be greater.
The effort to disassociate tidal changes in groundwater level from drawdown did not produce clearly identifiable results. However, the tidal efficiency at the well site and Kanoa is 5 to 10 percent. For the maximum tidal change, about 2 feet, the effect on the water level in the well would be 0.10 to 0.20 feet. Change of this magnitude could not be discriminated from barometric and random perturbations after drawdown reached approximately 1.35 feet in less than an hour following the start of the test.

An effort was made to measure water levels in nearby wells during the test. The North Waihee wells were shut down to avoid interference. None of the wells (Kanoa monitor, Mendes, North Waihee) provided unambiguous, interpretable drawdown data.

During the four days of the test chloride content remained steady at 20 to 25 mg/l and temperature was 68 F. The temperature indicates that the source of recharge is from higher elevations where rainfall is copious, and the steady chloride content confirms that at 1200 gpm sea water intrusion does not affect the pumped water. A full spectrum analysis shows that the water is not contaminated with either volatile organics or heavy metals.

**Recommended Pump Size**

The sustained constant rate, 1200 gpm (1.73 mgd), is the recommended pump size. Initial head at Kupaa was 7.41 feet, which is adequate to avoid upconing of sea water during pumping in a well penetrating 50 to 100 feet below the water table. Should adherence to the full breadth of the DWS protocol on pumping be required, average daily yield will be 0.77 mgd (.444 x 1.73 mgd); if only the 16 hr/day pumping portion of the protocol were followed, average yield would be 1.15 mgd (.667 x 1.73 mgd).

**Kanoa 1**

Kanoa 1 was completed in April and tested in May, 1999. Its location is plotted on Figure 1. Final configuration of the well is as follows.

- **Depth**: 359 ft. (50 ft. BSL)
- **Boring diameter**: 22 in.
- **Blank casing diameter**: 16 in.; depth
- **Perforated casing diameter**: 16 in.;
- **Grout**: 0 to 300 ft.
- **Gravel**: 300 to 389 ft.
Further details are given in the attached Drillers Well Completion Form. The measuring point is 309.15 feet above sea level, and the depth to water (DTW) before testing was 301.34 feet, giving a head of 7.81 feet, 0.4 feet higher than at Kupaa 1 a month earlier.

The lithology log places the Honolua/Wailuku unconformity at an elevation of about 64 feet, which is virtually identical to the placement identified by well cuttings from the Kanoa monitor well. The thickness of the Honolua and unconformity is approximately 245 feet. The greater thickness at Kanoa than at Kupaa (75 feet) is due to the topography on to which the Honolua lavas flowed; the Kanoa site is in a pre-existing valley, while the Kupaa site is on a pre-existing ridge.

**Step Drawdown Test**

The step drawdown test was conducted on May 14, 1999, at rates to 1400 gpm. The results are summarized as follows.

<table>
<thead>
<tr>
<th>Rate (gpm)</th>
<th>Drawdown (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>.46</td>
</tr>
<tr>
<td>375</td>
<td>.51</td>
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<tr>
<td>500</td>
<td>.66</td>
</tr>
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<td>700</td>
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<td>1100</td>
<td>2.16</td>
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<tr>
<td>1400</td>
<td>3.36</td>
</tr>
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</table>

The computed transmissivity is 124,770 sq.ft./day (see Appendix), which, if the depth of flow is 50 feet, yields hydraulic conductivity of 2495 ft./day. The computed T is comparable to that determined by step drawdown data for Kupaa 1. However, values derived from step drawdown results are indicative rather than absolute; in both wells they are of the same high magnitude that indicates the Wailuku basalt is very permeable.

**Constant Rate Pump Test**

The 1200 gpm constant rate pump test was started at 0900, May 17, and completed at 0900, May 21, 1999, a period of 4 days. Maximum drawdown at the pumping well, uncorrected for tidal and barometric influences, was 2.77 feet. Instantaneous drawdown over the first few moments after the pump was turned on was 2.58 feet, which suggests a maximum aquifer drawdown of 0.19 feet. Transducers were placed in North Waihee Wells 1 and 2, but unambiguous drawdown data could not be deciphered from the computer print-out. Tidal efficiency and barometric
fluctuations compounded by inconsistencies in transducer readings relegate the use of the data to speculation. Similarly the transducer data from the Kanoa monitor well evidently did not reliably reflect pumping drawdown. During testing transducer readings have to be supplemented by tape measurements to check their accuracy and reliability.

Chloride content during the test remained constant at 20 to 24 mg/l (see Appendix), the same as at Kupaa, and temperature fell between 69 and 71 F.

Clearly the North Waihee aquifer is highly permeable and capable of supplying low salinity water at satisfactory pumping rates. When the North Waihee 1 and North Waihee 2 wells were tested in 1981 and 1989, the transmissivity values were 325,000 sq.ft./day for the original test, and 320,000 sq.ft./day for the 1989 test. The associated storage coefficient values were .25 and .30.

**Recommended Pump Size**

As for Kupaa, the recommended pump size is 1200 gpm (1.73 mgd). For the DWS standard factor of .444, average production will be 0.77 mgd, for the more liberal factor of .667, the average will be 1.15 mgd.
APPENDIX

Kupaa 1 Step Drawdown

A value of transmissivity (T) can be calculated from a step drawdown test by assuming that drawdown at each rate is stable and that it is expressed by the equation,

\[ s = aQ + bQ \]

in which s is drawdown, Q is pump rate, a is the laminar flow (aquifer) constant, and b is the turbulent flow (well loss) constant. The equation is linearized by dividing by Q,

\[ s/Q = a + bQ \]

which plots as a straight line with s/Q as the ordinate and Q the abscissa. The value, a, is the intercept, and b is the slope of the line. An attached graph shows the linear form of the step drawdown curve for Kupaa 1.

To determine T, the intercept, a, is substituted in the Thiem steady state formula for drawdown as a function of pumping. The Thiem equation is,

\[ s = \frac{Q}{2\pi T} \ln \left( \frac{R}{r} \right) \]

in which R is the nearest distance from the well where s = 0, and r is the effective radius of the well. The value of R is unknown and has to be approximated.

Because \( s = aQ \) in the step drawdown equation refers to laminar flow in the aquifer, substitution in the Thiem equation gives,

\[ aQ = \frac{Q}{2\pi T} \ln \left( \frac{R}{r} \right) \]

and,

\[ T = \frac{1}{2\pi a} \ln \left( \frac{R}{r} \right) \]

The intercept, a, has a value of 0.00067 (see graph), thus,

\[ T = (237.6) \ln \left( \frac{R}{r} \right) \]
The value of $R$ is estimated as equal to the length of penetration of the well below the water table (Zanger; Polybarunova-Kochina), and assuming the radius of the well as 1 foot,

$$ T = (237.6) \ln (50) = 929.5 \text{ gpm/ft} $$

which when converted to consistent units (feet and days) is,

$$ T = 178,928 \text{ sq.ft./day}. $$

For a depth of flow of 50 feet, $k = 3566 \text{ ft/day}$.

**Kupaa 1 Constant Rate**

Drawdown during the period of monotonic decline before oscillation of the water level set in is plotted on an attached graph. If the Jacob simplification is employed, the $T$ value from the graph is calculated as,

$$ T = (264) (1200)/\Delta s $$

In which $\Delta s$ is drawdown over one log cycle of time. Thus, $T = 70,588 \text{ sq.ft./day}$, which is comparable to the THEISFIT value of 91,363 sq.ft./day.

Unfortunately, none of the test result data allows for calculation of storage coefficient ($S$). In the most thoroughly studied Hawaii basaltic aquifer similar to the Wailuku basalt, the Koolau aquifer, storage coefficient as effective porosity is approximately .05, but rigorously conducted tests at North Waihee 1 and North Waihee 2 in 1981 and 1989 gave $S$ values of .25 and .30, respectively.

**Kanoa 1 Step Drawdown**

Employing the same applicable parameters as for the Kupaa 1 step drawdown analysis and a value of .0009606 ft./gpm for the aquifer constant, $a$, the computed value of $T$ is 124,770 sq.ft./day. If depth of flow is equal to depth of penetration of the well below the water table (50 ft.), hydraulic conductivity is 2495 ft./day.

**Kanoa 1 Constant Rate**

The water level data derived from transducer readings was too imprecise to allow for realistic determination of aquifer parameters.
Figure 1 - Vicinity Map
Proposed Exploratory Well Sites
Kupaa Well NO.1 & Kanoa Well No.2
Wahee, Maui, Hawaii

Source: U.S.G.S. Map Wailuku and Kahanuohu Quadangles
Scale: 1" = 2000'
**WELL COMPLETION REPORT**

4/25/97 WCR Form

**PART I. WELL CONSTRUCTION REPORT**

<table>
<thead>
<tr>
<th>1. State Well No.: 5731-03</th>
<th>2. Well Name: Kuapa Well</th>
<th>Island: Maui</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Drilling Company: Waian BiDrilling Inc.</td>
<td>4. Name of driller who performed work: Mike Robertson</td>
<td></td>
</tr>
<tr>
<td>5. Type of rig/construction: Air Rotary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Date(s) Well Construction and pump tests (if any) completed: 5/18/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. GROUND ELEVATION (referenced to mean sea level, msl): 634 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well Bench Mark (description/location): Top of casing Elevation (msl): 633.10 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. DRILLER'S LOG: Please attach geologic log (If available or if required by permit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depths (ft.) Rock Description, Water Level, Dates, etc.</td>
<td>Depths (ft.) Rock Description, Water Level, Dates, etc.</td>
<td></td>
</tr>
<tr>
<td>0 to 6</td>
<td>Red Clay &amp; Assorted Rock</td>
<td></td>
</tr>
<tr>
<td>6 to 10</td>
<td>Tan Clay &amp; Assorted Rock</td>
<td></td>
</tr>
<tr>
<td>10 to 12</td>
<td>Grey Clay &amp; Assorted Rock</td>
<td></td>
</tr>
<tr>
<td>9. Total depth of well below ground: 687 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Hole size: 2.3 inch dia. from 0 ft. to 687 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Casing installed: 16 in. I.D. x 3/8 in. wall solid section to 633 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Annulus: Grouted from 0 ft. below ground to 630 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Initial water level: 631.35 ft. below ground. Date and time of measurement: 3/4/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Initial chloride: 2.5 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Initial temperature: 71 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. PUMPING TESTS: Reference Point (R.P.) used: well casing, which elevation is 633.10 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Step-Drawdown Test Date 3/12/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start water level: 631.9 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End water level: 532.05 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Long-term Aquifer Test Date 3/15/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start water level: 631.90 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End water level: 632.20 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Aquifer Pump Test Procedures data &amp; graphs (1/06 LTAT Form) attached? Yes No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. As-built drawings attached? Yes No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Other remarks/comments: (On back of this form)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**State of Hawaii**
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

**WELL DRILLING CONTRACTOR** (print) Waian BiDrilling Inc. C-57 Lic. No. C-20115

**Signatures**

**Date** 5/20/99

**Surveyor (print)**

**Lic. No.** L.P.L.S. # 5076

**Date** May 22, 1999

**Applicant (print)**

**Date** 6/27/99

**Diploma of Water Supply**
**PART II. (PERMANENT) PUMP INSTALLATION REPORT**

20. Pump installation Company: ____________________________________________

21. Name of person performing work: ______________________________________

22. Date Pump Installation Completed: _________________________

23. PUMP INSTALLATION:

   Pump Type, Make, Serial No.: ________________________________
   Motor type, H.P., Voltage, rpm: ________________________________
   Depth of Pump Intake Setting ______ ft. below ______ ft., which elevation is ______ ft.
   Depth to bottom of intake ______ ft. below ______ ft., which elevation is ______ ft.
   Pumping Head is ______ ft. Type of flow meter: ________ which measures in ______

24. As-built drawings attached? __ Yes __No

25. Other remarks/comments: (See below)

---

**Pump Installation Contractor (print)______________ C-57 Lic. No.______________**

Signature ______________________________________ Date ______________________

Applicant (print) ________________________________ Date ______________________

Signature ______________________________________ Date ______________________

---

8. (cont'd) DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Dates (ft.)</th>
<th>Water Level</th>
<th>Rock Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 to 41</td>
<td>41 to 59</td>
<td>Weathered Basalt</td>
<td>Blue Rock</td>
</tr>
<tr>
<td>41 to 59</td>
<td>59 to 67</td>
<td>Weathered Basalt</td>
<td>Blue Rock</td>
</tr>
<tr>
<td>59 to 67</td>
<td>67 to 75</td>
<td>Weathered Basalt</td>
<td>Blue Rock</td>
</tr>
<tr>
<td>75 to 83</td>
<td>83 to 91</td>
<td>Assorted Rock &amp; Coral</td>
<td></td>
</tr>
<tr>
<td>91 to 135</td>
<td>135 to 160</td>
<td>Dense Basalt &amp; Blue Rock</td>
<td></td>
</tr>
<tr>
<td>160 to 190</td>
<td>Assorted Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>190 to 315</td>
<td>Dense Basalt &amp; Blue Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>315 to 355</td>
<td>Softest Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>355 to 395</td>
<td>Tan Clay &amp; Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>395 to 435</td>
<td>Softest Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>435 to 475</td>
<td>Tan Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>475 to 515</td>
<td>Softest Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>515 to 555</td>
<td>Basalt &amp; Brown Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>555 to 595</td>
<td>Brown Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>595 to 635</td>
<td>Basalt &amp; Black &amp; Red Cinders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>635 to 675</td>
<td>Black &amp; Red Cinders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15 & 25. Remarks: __________________________________________________________
<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Depth</th>
<th>Drift pipe</th>
<th>Drift Degree</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27 3:30</td>
<td>0-6</td>
<td>N.A.</td>
<td></td>
<td>12 in. HAMMER + STAB = 7 ft.</td>
<td></td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RED CLAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/27 6-10</td>
<td></td>
<td></td>
<td></td>
<td>add 18 ft x 12 in. stabilizer/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TAN CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/27 10-18</td>
<td></td>
<td></td>
<td></td>
<td>GREY CLAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 5:00</td>
<td>18-25</td>
<td>“</td>
<td>0.25</td>
<td>GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 8-28</td>
<td>25-31</td>
<td>“</td>
<td></td>
<td>add 58x12 inch stabilizer /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 11:45</td>
<td></td>
<td></td>
<td></td>
<td>add 69x12 inch stabilizer /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 12:30</td>
<td>31-36</td>
<td>“</td>
<td></td>
<td>WEATHERED BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 2:12</td>
<td>36-41</td>
<td>“</td>
<td></td>
<td>add 69x12 inch stabilizer /</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>WEATHERED BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 2:33</td>
<td>41-46</td>
<td>“</td>
<td></td>
<td>add 69x12 inch stabilizer /</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 3:20</td>
<td>46-49</td>
<td>“</td>
<td></td>
<td>add 67x12 inch stabilizer /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 3:31</td>
<td>49-54</td>
<td>“</td>
<td>0.2</td>
<td>add 67x12 inch stabilizer /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28 3:45-</td>
<td>54-</td>
<td></td>
<td></td>
<td>add 67x12 inch stabilizer /</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td>60.41</td>
<td>“</td>
<td></td>
<td>BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LAST FOOT(59-60.41)WEATHERED BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 8:00</td>
<td></td>
<td></td>
<td></td>
<td>all pilot tools installed-install diverter-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 11:23</td>
<td>60-60</td>
<td># 1</td>
<td></td>
<td>start drill pipe #1/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 12:20</td>
<td>80-85</td>
<td>0.1</td>
<td></td>
<td>ASSORTED ROCK- CORAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 1:04</td>
<td>85-110</td>
<td># 2</td>
<td></td>
<td>SAME FORMATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 2:25</td>
<td>110-135</td>
<td># 3</td>
<td>0.6 *</td>
<td>BROWN CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 3:05</td>
<td>135-160</td>
<td># 4</td>
<td>0.4 *</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>160-170</td>
<td>0.25</td>
<td></td>
<td>ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 4:00</td>
<td>170-185</td>
<td># 5</td>
<td>0.3</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 9/1</td>
<td>185-210</td>
<td># 6</td>
<td>0.2</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 10:10</td>
<td></td>
<td></td>
<td></td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 11:10</td>
<td>210-235</td>
<td># 7</td>
<td>0.3</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 12:05</td>
<td>235-260</td>
<td># 8</td>
<td>0.1</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31 12:50</td>
<td>260-285</td>
<td># 9</td>
<td>0.6 *</td>
<td>DENSE BASALT (Blueroock)</td>
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<td></td>
</tr>
<tr>
<td>8/31 1:50-</td>
<td>285-310</td>
<td># 10</td>
<td>0.2</td>
<td>DENSE BASALT (Blueroock)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date / Time</td>
<td>Drill pipe no.</td>
<td>Depth</td>
<td>Drift Degree</td>
<td>Tooling / Geologic Formation</td>
<td>Air Press.</td>
<td>Bit Press.</td>
</tr>
<tr>
<td>--------------</td>
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<td>---------------------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>9/3 11:00</td>
<td>#11</td>
<td>310-315</td>
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<td>HARD BASALT</td>
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<td></td>
</tr>
<tr>
<td>12:00</td>
<td></td>
<td>315-325</td>
<td></td>
<td>SOFTER BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:15</td>
<td>#12</td>
<td>335-340</td>
<td>0.25</td>
<td>TAN CLAY AND BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:15</td>
<td></td>
<td>355-360</td>
<td>0.1</td>
<td>TAN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30-2:20</td>
<td>#13</td>
<td>360-375</td>
<td>0.25</td>
<td>TAN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>375-385</td>
<td></td>
<td>SOFTER BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30-3:20</td>
<td>#14</td>
<td>385-410</td>
<td>0.25</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td>#15</td>
<td>410-435</td>
<td>0.2</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30-5:15</td>
<td>#16</td>
<td>435-460</td>
<td>0.24</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9/4 9:30-10:15</td>
<td>#17</td>
<td>460-485</td>
<td>0.3</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:45</td>
<td>#18</td>
<td>485-493</td>
<td></td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:55</td>
<td></td>
<td>493-510</td>
<td>0.1</td>
<td>TAN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:10</td>
<td>#19</td>
<td>510-535</td>
<td>0.1</td>
<td>BASALT-BROWN ROCK-RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00-3:05</td>
<td>#20</td>
<td>535-560</td>
<td>0.3</td>
<td>BASALT - BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30-4:20</td>
<td>#21</td>
<td>560-585</td>
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<td>BASALT - BLACK + RED CINDERS</td>
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<tr>
<td>4:45-5:18</td>
<td>#22</td>
<td>585-610</td>
<td>0.4</td>
<td>BASALT - BLACK + RED CINDERS</td>
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<tr>
<td>9/8 2:00-2:46</td>
<td>#23</td>
<td>610-635</td>
<td>0.01</td>
<td>BASALT - BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:05-4:10</td>
<td>#24</td>
<td>635-660</td>
<td>0.02</td>
<td>BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:10-4:40</td>
<td>#25</td>
<td>660-675</td>
<td></td>
<td>BLACK + RED CINDERS (Bit Stuck)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/30 9:30-11:50</td>
<td>#25</td>
<td>675-685</td>
<td></td>
<td>BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Kupaa 1 Step Drawdown Test

Rank 1 Eqn 8160 [Line Robust None, Gaussian Errors] \( y = a + bx \)

\( r^2 = 0.9667889 \) DF Adj \( r^2 = 0.9003669 \) Fit StdErr = 6.1934602e-05 Fstat = 58.220322

\( a = 0.00066990868 \)

\( b = 8.386758e-07 \)
CALCULATION OF 'BEST FIT' TRANSMISSIVITY AND STORAGE COEFFICIENT BY AUTOMATICALLY FITTING EXPERIMENTAL PUMPTEST DATA TO THE THEIS EQUATION IN A LEAST SQUARES SENSE.

constant rate test

INPUT DATA

ENGLISH UNITS

PUMPAGE RATE: 1200 [GAL/MIN]
OBSERVATION DISTANCE FROM PUMPING WELL: 1 [FT]
NUMBER OF ENTERED TIME-DRAWDOWN DATA PAIRS: 8

EXPERIMENTAL TIME-DRAWDOWN DATA

<table>
<thead>
<tr>
<th>TIME [MIN]</th>
<th>DRAWDOWN [FT]</th>
</tr>
</thead>
<tbody>
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<td>8</td>
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<td>1.25</td>
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<tr>
<td>36</td>
<td>1.35</td>
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<tr>
<td>44</td>
<td>1.36</td>
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</tbody>
</table>
**RESULTS**

CALCULATED GUESS FOR TRANSMISSIVITY SC: 475.845 [GAL/MIN/FT]
CALCULATED GUESS FOR STORAGE COEFFICIENT SC: 7.113292

<table>
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<tr>
<th>ITERATION</th>
<th>BEST FIT: KB [GAL/MIN/FT]</th>
<th>SC</th>
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<td>470.2363</td>
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<td>473.3729</td>
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<td>6</td>
<td>474.31</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>474.5846</td>
<td>1</td>
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Kupaa 1 Pump Test 1200 gpm 3/15/99
<table>
<thead>
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<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUPAA WELL 1</td>
<td>3/15/99@0935 by WS</td>
<td>20</td>
<td>3/18/99@0806 by KK</td>
</tr>
<tr>
<td>KUPAA WELL 1</td>
<td>3/15/99@2100 by ?</td>
<td>22</td>
<td>3/18/99@0900 by WS</td>
</tr>
<tr>
<td>KUPAA WELL 1</td>
<td>3/16/99@0900 by ?</td>
<td>22</td>
<td>3/18/99@2100 by NR</td>
</tr>
<tr>
<td>KUPAA WELL 1</td>
<td>3/16/99@2100 by MR</td>
<td>20</td>
<td>3/19/99@0900 by NR</td>
</tr>
<tr>
<td>KUPAA WELL 1</td>
<td>3/17/99@0900 by MR</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>KUPAA WELL 1</td>
<td>3/17/99@2100 by MR</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
### PART I. WELL CONSTRUCTION REPORT

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Name of driller who performed work:</td>
<td>Mike Robertson</td>
</tr>
<tr>
<td>5. Type of rig/construction:</td>
<td>Air Rotary</td>
</tr>
<tr>
<td>6. Date(s) Well Construction and pump tests (if any) completed:</td>
<td>5/15/99</td>
</tr>
<tr>
<td>7. GROUND ELEVATION (referenced to mean sea level, msl):</td>
<td>307.16 ft.</td>
</tr>
<tr>
<td>Well Bench Mark (description/location):</td>
<td>Top of pump base plate Elevation(msl) 309.15 ft.</td>
</tr>
<tr>
<td>8. DRILLER'S LOG:</td>
<td>Please attach geologic log (if available or if required by permit)</td>
</tr>
<tr>
<td>Depths (ft)</td>
<td>Rock Description, Water Level, Dates, etc.</td>
</tr>
<tr>
<td>Depths (ft)</td>
<td>Rock Description, Water Level, Dates, etc.</td>
</tr>
<tr>
<td>9. Total depth of well below ground:</td>
<td>359 ft.</td>
</tr>
<tr>
<td>10. Hole size:</td>
<td>20 in. dia. from 0 ft. to 359 ft. below ground</td>
</tr>
<tr>
<td>11. Casing installed:</td>
<td>10 in. I.D. x 3/8 in. wall solid section to 305 ft. below ground</td>
</tr>
<tr>
<td>Casing Material/Slot Size:</td>
<td>1/4&quot; full flow Laundered</td>
</tr>
<tr>
<td>12. Annulus:</td>
<td>Grouted from 0 ft. below ground to 300 ft. below ground</td>
</tr>
<tr>
<td>13. Initial water level:</td>
<td>399.89 ft. below ground</td>
</tr>
<tr>
<td>15. Initial temperature:</td>
<td>62.9 °F</td>
</tr>
<tr>
<td>16. PUMPING TESTS: Reference Point (R.P.) used:</td>
<td>Pump base plate, which elevation is 309.15 ft.</td>
</tr>
<tr>
<td>(1) Step-Drawdown Test Date</td>
<td>5/14/99</td>
</tr>
<tr>
<td>Start water level</td>
<td>301.34 ft. below R.P.</td>
</tr>
<tr>
<td>End water level</td>
<td>300.13 ft. below R.P.</td>
</tr>
<tr>
<td>(2) Long-term Aquifer Test Date</td>
<td>5/17/99</td>
</tr>
<tr>
<td>Start water level</td>
<td>301.2 ft. below R.P.</td>
</tr>
<tr>
<td>End water level</td>
<td>301.1 ft. below R.P.</td>
</tr>
<tr>
<td>17. Aquifer Pump Test Procedures data &amp; graphs (1/2/96 LTAT Form) attached?</td>
<td>Yes</td>
</tr>
<tr>
<td>18. As-built drawings attached?</td>
<td>Yes</td>
</tr>
<tr>
<td>19. Other remarks/comments:</td>
<td>On back of this form</td>
</tr>
</tbody>
</table>

---

**Well Drilling Contractor (print):** Mike Robertson  
**C-57 Lic. No.:** 20115  
**Date:** 5/15/99  
**Signature:**  

---

**Surveyor (print):** Carlos Calistro  
**Lic. No.:** 4665  
**Date:** 1/16/99  
**Signature:**  

---

**Applicant (print):**  
**Signature:**  
**Date:** 6/28/99  
**State of Hawaii**  
**Commission on Water**  
**Department of Land and Natural Resources**  
**Well Completion Report**  
**4/25/97 WCR Form**  
**Instructions:** Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 521, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-6225, or 1-800-468-4644 Extension 70225.
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company:
______________________________________________________________

21. Name of person performing work:
______________________________________________________________

22. Date Pump Installation Completed:
______________________________________________________________

23. PUMP INSTALLATION:

<table>
<thead>
<tr>
<th>Pump Type, Make, Serial No.:</th>
<th>Capacity gpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type, H.P., Voltage, rpm:</td>
<td></td>
</tr>
<tr>
<td>Depth of Pump Intake Setting ft. below _________, which elevation is _________ ft.</td>
<td></td>
</tr>
<tr>
<td>Depth to bottom of airline ft. below _________, which elevation is _________ ft.</td>
<td></td>
</tr>
<tr>
<td>Pumping Head is _________ ft. Type of flow meter: _________ which measures in _________</td>
<td></td>
</tr>
</tbody>
</table>

24. As-built drawings attached? _Yes _No

25. Other remarks/comments: (See below)

Pump Installation Contractor (print) C-57 Lic. No. ____________________________

Signature ____________________________ Date ____________________________

Applicant (print) ____________________________

Signature ____________________________ Date ____________________________

8. (cont’d) DRILLER’S LOG (cont’d):

<table>
<thead>
<tr>
<th>Dates (ft.)</th>
<th>Water Level Depth (ft.)</th>
<th>Rock Description, Remarks</th>
<th>Dates (ft.)</th>
<th>Water Level Depth (ft.)</th>
<th>Rock Description, Remarks</th>
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<tbody>
<tr>
<td>95 to 135</td>
<td>Hard Basalt + Bluerock</td>
<td></td>
<td>135 to 225</td>
<td>Weathered Basalt</td>
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<tr>
<td>135 to 225</td>
<td>Hard Basalt</td>
<td></td>
<td>225 to 290</td>
<td>Hard Tufa Rock</td>
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<tr>
<td>225 to 290</td>
<td>Weathered Basalt</td>
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<td>290 to 360</td>
<td>Weathered Basalt</td>
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<tr>
<td>290 to 360</td>
<td>Saucer Black Lava (gj)</td>
<td></td>
<td>360 to 385</td>
<td>Dense Bluerock</td>
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<tr>
<td>360 to 385</td>
<td>Black + Red Cinders + Water</td>
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<td>385 to 395</td>
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<td>Hit Water at 325’</td>
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19. & 25. Remarks:

_________________________________________________________________
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<tr>
<th>Date / Time</th>
<th>Drill Pipe #</th>
<th>Drift Degrees</th>
<th>Depth in feet</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
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<tr>
<td>3/15/99</td>
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<td></td>
<td>0-22</td>
<td>12 in. x 7 ft. hammer + 17 ft. stabilizer</td>
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<tr>
<td>Air Press.</td>
<td></td>
<td></td>
<td>8:30</td>
<td>white gray weathered rock and clay</td>
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</tr>
<tr>
<td>9:15</td>
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<td></td>
<td>22-38</td>
<td>add 5 ft. 8 in. x 12 in stab / gray rock and clay</td>
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</tr>
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<td>9:40</td>
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<td></td>
<td>38-60</td>
<td>add 30 ft. of stabilizers total = 60 ft stabilization</td>
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</tr>
<tr>
<td>12:05</td>
<td>1</td>
<td>0.3</td>
<td>70-85</td>
<td>same formation - gray rock and less clay</td>
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<tr>
<td>Air Press.</td>
<td></td>
<td></td>
<td>1:30</td>
<td>gray rock - weathered basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td>2</td>
<td>0.4</td>
<td>85-110</td>
<td>hard basalt</td>
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<td></td>
</tr>
<tr>
<td>3/16/99</td>
<td>3</td>
<td>0.5</td>
<td>115-135</td>
<td>same</td>
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<tr>
<td>Air Press.</td>
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<td></td>
<td>8:00</td>
<td>softer basalt</td>
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</tr>
<tr>
<td>9:45</td>
<td>4</td>
<td>0.5</td>
<td>135-160</td>
<td>same</td>
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<td>5</td>
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<td>160-185</td>
<td>same</td>
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<td>11:15</td>
<td>6</td>
<td>0.7</td>
<td>185-210</td>
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<td>12:10</td>
<td>7</td>
<td>0.6</td>
<td>210-225</td>
<td>same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:15</td>
<td>8</td>
<td>0.5</td>
<td>225-235</td>
<td>hard dense basalt</td>
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<td></td>
</tr>
<tr>
<td>Air Press.</td>
<td></td>
<td></td>
<td>3:15</td>
<td>hard tan rock</td>
<td></td>
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</tr>
<tr>
<td>4:10</td>
<td>9</td>
<td>0.3</td>
<td>235-240</td>
<td>weathered basalt</td>
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</tr>
<tr>
<td>Air Press.</td>
<td></td>
<td></td>
<td>4:10</td>
<td>soft black lava (aa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:40</td>
<td>10</td>
<td>0.6</td>
<td>240-250</td>
<td>same</td>
<td></td>
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<tr>
<td>3:25-335</td>
<td>305-310</td>
<td>bluerock basalt</td>
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<td></td>
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</tr>
<tr>
<td>125</td>
<td>0</td>
<td></td>
<td></td>
<td>Static Water Level = 299.68 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>18</td>
<td></td>
<td>3/17/99</td>
<td>black and red cinders - hit water table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00</td>
<td>11</td>
<td>0.4</td>
<td>310-325</td>
<td>Reference elevation point = 307.76 ft.</td>
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<td></td>
</tr>
<tr>
<td>163</td>
<td>32</td>
<td></td>
<td>335-359</td>
<td>Static Head = 8.08 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference elevation point = 307.76 ft.</td>
<td></td>
<td>150</td>
<td>black and red cinders - water bearing</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Kanoa 1 Step Drawdown 5/14/99

Pump Rate, gpm

Drawdown/Rate, ft/gpm
REPORT DATE:       JUNE 2, 1999
CLIENT:            TAKUMI ENGINEERING
                   18 CENTRAL AVENUE
                   WAILUKU, MAUI, HAWAII 96793
                   PHONE #:  [Redacted]
MATRIX:            WATER
SAMPLER:           

EPA METHOD:        CHLORIDE:  4500-CI

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>CHLORIDE</th>
<th>SAMPLE ID</th>
<th>CHLORIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KANOA WELL 1</td>
<td>mg/L</td>
<td>KANOA WELL 1</td>
<td>mg/L</td>
</tr>
<tr>
<td>5/14/99</td>
<td>20</td>
<td>5/19/99</td>
<td>24</td>
</tr>
<tr>
<td>by WS</td>
<td></td>
<td>@ 0900 by MR</td>
<td></td>
</tr>
<tr>
<td>5/17/99</td>
<td>20</td>
<td>5/20/99</td>
<td>24</td>
</tr>
<tr>
<td>@ 0930 by WS</td>
<td></td>
<td>@ 1430 by WS</td>
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<tr>
<td>5/18/99</td>
<td>21</td>
<td>5/21/99</td>
<td>24</td>
</tr>
<tr>
<td>@ 0820 by LP</td>
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<td>@ 0900 by WS</td>
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</tr>
</tbody>
</table>

ANALYST: L. AMANO

APPROVED BY: C. CERIZO
             W.M. IV
EXHIBIT B

WATER QUALITY TESTING RESULTS
EXHIBIT B-1

WATER QUALITY ANALYSIS

NORTH WAIHEE WELL NO. 2
<table>
<thead>
<tr>
<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/17/97</td>
<td>trans-1,2-Dichloroethene</td>
<td>ND</td>
<td>ug/l</td>
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<tr>
<td>06/17/97</td>
<td>tert-Butylbenzene</td>
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<tr>
<td>06/17/97</td>
<td>Trichloroethylene (TCE)</td>
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COUNTY OF MAUI
BOARD OF WATER SUPPLY
WATER QUALITY LABORATORY
614 PALAPALA DRIVE
KAHULUI, MAUI, HAWAII 96732

REPORT DATE: JUNE 23, 1997
SITE: NORTH WAIHEE WELL # 2
USGS 56-31-03
MATRIX: WATER

DATE/TIME SAMPLED: 6/09/97 @ 1000
CL2: 0.0 [MG/L]
SAMPLER: K.KUBA

DATE/TIME RECEIVED: 6/09/97 @ 1228
TEMP.CONTROL: 7.0 ° C

EPA METHOD: TOTAL COLIFORM: 9222B
FECAL COLIFORM: 9221C
HPC: 9215B

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<tr>
<th>SAMPLE ID</th>
<th>TOTAL COLIFORM BACTERIA [# / 100 ML]</th>
<th>Fecal Coliform Verification</th>
<th>HPC [CFU/100 ML]</th>
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<tr>
<td>NORTH WAIHEE WELL</td>
<td>NOT FOUND</td>
<td></td>
<td>610</td>
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<tr>
<td>#2</td>
<td>[S-574]</td>
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ANALYST: L.POOLE
APPROVED BY: C.CERIZO
CHEMIST
County of Maui  
Department of Water Supply  
Water Quality Laboratory  
614 Palapala Drive  
Kahului, Maui, Hawaii 96732

June 23, 1997

Location: NORTH WAIHEE WELL #2  
USGS 56-31-03

Date Sampled Collected: June 9, 1997

Sampler: K.Kuba

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<tr>
<th>TEST</th>
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<th>MCL</th>
<th>RESULTS</th>
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<td>292</td>
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<tr>
<td>pH</td>
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<td>N. WAIHEE WELL 2 USGS 563103 (970610016)</td>
<td>Sampled on 06/09/97</td>
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<tr>
<td>06/16/97 ( ML/52520B )</td>
<td>Alkalinity</td>
<td>110</td>
<td>mg/l</td>
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<tr>
<td>06/10/97 ( ML/EPA 100.1 )</td>
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<td>&lt;0.13</td>
<td>MPL</td>
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<td>06/16/97 ( EPA/ML 200.7 )</td>
<td>Calcium, Total, ICAP</td>
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<td>06/16/97 ( ML/S4500CMF )</td>
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<td>06/20/97 ( ML/EPA 540.1 )</td>
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<td>06/16/97 ( SM 6500F )</td>
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<td>mg/l</td>
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<td>Nitrate, Nitrogen by IC</td>
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<td>06/15/97 ( EPA 1613 )</td>
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<td>525 Semivolatiles by GC/MS</td>
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<td>2,4-Dinitrotoluene</td>
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<tr>
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<td>Analyte</td>
<td>Result</td>
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<th>MDL</th>
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<td>06/17/97</td>
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Maui, County of, Department of Water Supply
(continued)

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<th>MDL</th>
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<td></td>
<td>BDMC</td>
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Diquat and Paraquat

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<th>Units</th>
<th>MDL</th>
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<td>(EPA 549.1)</td>
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EDB and DBCP by GC-ECD

<table>
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<td>(Surrogate) 1,2-dibromopropane</td>
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Herbicides by 515.1

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<td>Date</td>
<td>Method</td>
<td>Analyte</td>
<td>Result</td>
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EXHIBIT B-2

WATER QUALITY ANALYSIS

KUPAA WELL NO. 1
STATE WELL NO. 5731-03
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo
<table>
<thead>
<tr>
<th>Parameter</th>
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<th>Result</th>
<th>Conc.</th>
<th>Rec.</th>
<th>Dilution</th>
<th>Det.Limit</th>
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<th>Analyzed By</th>
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## Laboratory Report

**Sample ID:** KUPAA WELL  
**Sample Type:** Water  
**Sampled:** 18-Mar-1999  
**Received:** 19-Mar-1999  
**Reported:** 22-Mar-1999  
**Author:** Cari Cerino  
**Project:** PHASEV  
**Location:** Kalalau, HI 96732

### Diquat and Paraquat (ML/EPA 549.1)

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**Laboratory Report**

**Sample ID:** KUPAA WELL

**Sample Type:** Water

**Sampled:** 18-mar-1999

**Received:** 18-mar-1999

**Reported:** 19-apr-1999

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**Parameter** | **Units** | **Result** | **Conc.** | **$\text{EqC}$** | **Dilution** | **Det Limit** | **Prepared By** | **Analyzed By** |
--- | --- | --- | --- | --- | --- | --- | --- | --- |
Dibromochloropropane (DBCP) | ug/l | ND | | | | | | |
Ethylene Dibromide (EDB) | ug/l | ND | | | | | | |

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Report #: 52899

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### Laboratory Report

**Sample** # 29019269  Sample ID KUPAA WELL  Project PHASEV

Sample Type Water  Sampled 18-mar-1999  Received 25-mar-1999  Reported 25-apr-1999

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Report # 57800
**Laboratory Report**

Sample ID: FIPPA WELL  
Sample Type: Water  
Sampled: 19-Mar-1999  
Received: 19-Mar-1999  
Reported: 19-Apr-1999  

**Volatile Organic Compounds (ML/EPA 502.2)**

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Report # : 52603
Sample #: 920219269  Sample ID: KUPAA WELL  Project: PHASEV

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<th>Det. Limit</th>
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Report #: 52869
### Laboratory Report

**Sample Type:** Water  
**Sampled:** 18-Mar-1999  
**Received:** 19-Mar-1999  
**Reported:** 19-Apr-1999  

**Sample ID:** KUPAA WELL  
**Project:** PHASEV  

#### 525 Semivolatiles by GC/MS

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*Prepared By: YKS*
### Laboratory Report

**Sample ID:** KUPAA WELL  
**Sample Type:** Water  
**Sampled:** 18-Mar-1999  
**Received:** 19-Mar-1999  
**Reported:** 19-Apr-1999

#### 525 Semivolatiles by GC/MS (ML/EPA 525.2)

| Parameter                                | Units | Result | Conc. | MEC | Dilution | Det Limit | Prepared | Analyzed | By  |
|------------------------------------------|-------|--------|-------|-----|----------|-----------|----------|----------|-----|-------|
| Hexachlorocyclopentadiene                | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Heptachlor                               | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Heptachlor Epoxide                       | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Indeno[1,2,3-c,d]Pyrene                   | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Isophorone                               | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Lindane                                  | ug/l  | ND     |       |     |          | 0.02      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Methylcholr                              | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Metribuzin                                | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Molinate                                 | ug/l  | ND     |       |     |          | 0.2       | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Metolachlor                              | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| trans-Nonachlor                          | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Pentachlorphenol                         | ug/l  | ND     |       |     |          | 0.2       | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Phenanthrene                             | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Prometryn                                | ug/l  | ND     |       |     |          | 0.06      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Propachlor                               | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Pyrene                                   | ug/l  | ND     |       |     |          | 0.06      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Simazine                                 | ug/l  | ND     |       |     |          | 0.05      | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Thiobencarb                              | ug/l  | ND     |       |     |          | 0.2       | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |
| Triflurzine                              | ug/l  | ND     |       |     |          | 0.1       | 24-Mar-1999 CSK | 29-Mar-1999 | yks |      |

**Report #: 52800**
### Aldicarbs (ML/EPA 531.1)

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<th>Result</th>
<th>Conc.</th>
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<th>Dilution</th>
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<th>Analyzed By</th>
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### Laboratory Report

**Sample ID:** KUPAA WELL  
**Sample Type:** Water  
**Sampled:** 18-mar-1999  
**Received:** 19-mar-1999  
**Reported:** 19-apr-1999

#### Herbicides by 515.1 (ML/EPA 515.1)

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Report #: 52800
**METHOD BLANK REPORT**

**Dioxins**

Client Lot #: G9C240155  
MB Lot-Sample #: G9C000000-266  
Analysis Date: 04/06/99  
Dilution Factor: 1

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**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.
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Date Sampled: 03/18/99  Date Received: 03/24/99
Prep Date: 03/19/99  Analysis Date: 04/07/99
Prep Batch #: 9089266
Dilution Factor: 1

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COUNTY OF MAUI  
DEPARTMENT OF WATER SUPPLY  
WATER QUALITY LAB  
614 PALAPALA DRIVE  
KAHULUI, MAUI, HAWAII 96732

REPORT DATE: MAR 22, 1999

CLIENT: TAKUMI ENGINEERING  
18 CENTRAL AVENUE  
WAILUKU, MAUI, HAWAII 96793  
PHONE #: (XXX) XXX-XXXX

MATRIX: WATER

SAMPLE: WATER QUALITY LAB

EPA METHOD: CHLORIDE: 4500-Cl⁻

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APPROVED BY: C. CERIZO  
W.M. IV

[Signature]
EXHIBIT B-3

WATER QUALITY ANALYSIS

KANOA WELL NO. 1
STATE WELL 5731-02
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo
The following samples were received from you on 05/20/99. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

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Test Acronym Description

- @DIQUAT: Diquat and Paraquat
- @EDB-DBC: EDB and DBCP by GC-ECD
- @MET-HI: ICPMS Metals
- @ML502.2: Volatile Organic Compounds
- @ML525: 525 Semivolatile by GC/MS
- @ML531: Aldicarbs
- @NPS3: Herbicides by 515.1
- @PESTSDW: SDWA Pesticides
- ALK: Alkalinity
- CA: Calcium, Total, ICAP
- CNDW: Cyanide
- ENDOTHAL: Endothall
- F: Fluoride
- GLYPHOS: Glyphosate
- HG: Mercury
- NO2-N: Nitrite, Nitrogen by IC
- NO3: Nitrate-N by IC
- TCDD-DW: 2,3,7,8 - TCDD
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Laboratory Report

Maui, County of, Department of Water Supply
614 Palapala Dr

ANALYZED BY: Carl Cerizzo

Sample #: 990620027  Sample ID: KANOA WELL  Project: PHASEV

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Report #: 54445

4
Laboratory Report

Maui, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96732
ATTN: Cari Cerizo

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Report #: 54445
Lab: Sample 

Sample 

Sample Type Water 

Sampled 18-may-1999 

Received 20-may-1999 

Reported 11-jun-1999 

ICPMS Metals (ML 200.8 ) 

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# Volatile Organic Compounds

**Parameter** | **Units** | **Result** | **Conc. (ug/l)** | **Dilution** | **Det. Limit** | **Prepared** | **By** | **Analyzed** | **By** |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
1,1,2-Tetrachloroethane | ug/l | ND | 0.5 | 0.5 | 0.5 | 24-may-1999 | rcw |
1,1,2-Trichloroethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,1,2,2-Tetrachloroethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,1,2-Trichloroethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,1-Dichloroethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,1-Dichloroethene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,1-Dichloropropene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2,3-Trichloropropene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2,3-Trichlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2,4-Trichlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2,4-Trimethylbenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2-Dichloroethene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2-Dichlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2-Dichloropropene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,3,5-Trimethylbenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,3-Dichlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,2-Dichloropropane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
1,4-Dichlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
2,2-Dichloropropane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
2-Chlorotoluene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
4-Chlorotoluene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Bromodichloromethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Benzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Bromobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Bromochloromethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Bromoethane | ug/l | ND | 0.5 | 24-may-1999 | rcw |
cis-1,2-Dichloroethene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Chlorobenzene | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Carbon tetrachloride | ug/l | ND | 0.5 | 24-may-1999 | rcw |
Sample ID: KANOA WELL  Project: PHASE V

**Volatile Organic Compounds (ML/EPA 502.2)**

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Report #: 54445
# Laboratory Report

**Sample ID:** KANOA WELL  
**Sample Type:** Water  
**Sampled:** 19-May-1999  
**Received:** 20-May-1999  
**Reported:** 11-Jun-1999

## 525 Semivolatiles by GC/MS  
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Sample # 990520027  Sample ID KANDA WELL  Project PHASEV
Sample Type Water  Sampled 18-may-1999  Received 20-may-1999  Reported 11-jun-1999

525 Semivolatiles by GC/MS  (ML/EPA 525.2 )

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Sample # 990520027  Sample ID: KANDA WELL  Project: Phase 5

### Aldicarbs (ML/EPA 531.1)

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Report #: 54445
Sample ID: KANOA WELL
Sample Type: Water
Sampled: 18-may-1999
Received: 20-may-1999
Reported: 11-jun-1999

Herbicides by 515.1 (ML/EPA 515.1)

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Report #: 54445
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo
Montgomery Watson Laboratories
555 East Walnut Street
Pasadena, CA 91101
Ph Fax

Ship To
Nanny Estrada
Quanterra Environmental Services
880 Riverside Parkway
West Sacramento, CA 95605

Bill Recipient: FEDEX ACCT: 2060-8019

MWL Project # Report Due:
55058 6/28/99

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Do Not Combine Report with any other samples submitted under different MWL project numbers!

Report & Invoice must have the MWL Project Number and Sub PO#: 99-0669

Report all quality control data according to Method. Include dates analyzed, date extracted (if extracted) and Method reference on the report. Fax results to

Faxed results must have complete data & QC. Hardcopy report is due in hand on due date.
Please advise us immediately if Due Date will be missed.

HARDCOPY REPORT, FORMS, & INVOICE MUST BE SENT TO ATTENTION
Martha Frost, Sub-contracting Administrator
Montgomery Watson Laboratories 555 East Walnut Street Pasadena, CA 91101
Phone Fax

RECEIVED IN GOOD CONDITION UNDER COC
JUN 12 1999

Received by: [Signature]
Date 06/11/99 Time 10:00
An Acknowledgement of Receipt is requested to attn: Martha Frost
June 28, 1999

QUANTERRA INCORPORATED
PROJECT NUMBER: G9F120155

Montgomery Laboratories
555 East Walnut Street
Pasadena, CA 91101

Dear Ms. Frost,

This report contains the analytical results for the aqueous sample received under chain of custody by Quanterra Incorporated on June 12, 1999. This sample is associated with your project number 55058.

All applicable quality control procedures met method-specified acceptance criteria.

If you have any questions, please feel free to call me.

Sincerely,

Nanny Estrada
Project Manager
Sample # 992611009  Sample ID KANDA WELL (990520027)  Project PHASEV
Sample Type Water  Sampled 18-May-1999  Received 11-Jun-1999  Reported 30-Jun-1999

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Date Sampled....: 05/18/99  Date Received...: 06/12/99
Prep Date.......: 06/18/99  Analysis Date...: 06/26/99
Prep Batch #....: 9167334
Dilution Factor: 1

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**NOTE(S):**
Calculations are performed before rounding to avoid round-off errors in calculated results.
PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
KANOA WELL NO. 2
(State Well No. 5731-04)
Waihee, Maui, Hawaii

PREPARED FOR:
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, HAWAII 96793

PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 2000
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PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 2000
The undersigned, being a licensed professional engineer, certifies that:

1. He has prepared the attached report and the information contained therein is true to the best of his information and belief; and

2. The water produced by Kanoa Well No. 2 (State Well No. 5731-04), the potable water system identified in the attached report, will comply with the State primary potable water regulations contained in Hawaii Administrative Rule, Title 11, Chapter 20, Rules Relating to Potable Water Systems, and will comply with the Rules and Regulations of the Department of Water Supply, County of Maui, when said drinking water system is operated and maintained in accordance with the instructions and information contained in this report.

This work was prepared by me or under my supervision.

Carl K. Takumi, P. E.
C. Takumi Engineering, Inc.
TO: Mr. Charley Ice
State Water Resource Commission

FROM: Carl K. Takumi

DATE: February 14, 2001

SUBJECT: North Waihee Water Development Project
Kanoa Well 1 & 2, Kupaa Well 1

Job No.: CWS-002

PHONE: (808) [redacted]
FAX: (808) [redacted]
No. of Pages: 2

I am faxing location of the three wells relative to the USGS map. Hopefully this will help clear the air on well numbering and location.

If you have any questions please call Carl Takumi at (808) [redacted]
# PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
KANOA WELL NO. 2 (5731-04)

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## FIGURES

- Well Location
- Site Topographic Map & Preliminary Site Plan - Kanoa 1 Well Site
- Water System Service Area
- Example Pump Curve

## EXHIBITS

- Exhibit A: North Waihee Aquifer, Kanoa 2 Well, Well Completion and Testing
- Exhibit B: Water Quality Testing Results
1. Introduction

This Preliminary Engineering Report was prepared to conform to the provisions of Hawaii Administrative Rules, Title 11, Chapter 20, relating to new potable water source development. The rules require all new potable water sources serving a public water system be approved by the Director of Health prior to its use.

2. General Information

a. Description of project and location, including phasing schedule, persons served by new water source and/or service connection, name and public water system number.

The Kanoa Well No. 2 (State Well No. 5731-04) project is part of the North Waihee Water Source Development Project and consists of developing a basal well located on the northern slopes of West Maui Mountains on the Island of Maui. The project consists of clearing, grubbing, grading, installation of a pump and related electrical controls, electrical building, piping, fencing and related work.

Water from Kanoa Well No. 2 be used to service the Department of Water Supply's Wailuku District or commonly known as the Central Maui Water System (CMWS), Public Water System #212, which provides water for the area bounded by the communities of Paia-Kuau on the east, Kihei-Makena on the south, Maalaea on the west and Waihee on the north. The project is needed to meet the rising demands for water in the Central Maui Region and relieve some of the stress being made on the Iao Aquifer.

The North Waihee Wells 1 and 2 (State Well No. 5631-02 & 5631-03 respectively), is also located in the Waihee Aquifer (60103) and have been placed into operation. Kanoa Well No. 1 (State Well No. 5731-02) and Kupaa Well No. 1 (State Well No. 5731-03), also in the Waihee Aquifer, is in the process of being developed by the Department of Water Supply.
b. **Owner and authorized representative**

The owner of the Kanoa Well No. 2 (State Well No. 5731-04) facility will be the Board of Water Supply, County of Maui. Upon completion, the Maui County Department of Water Supply (DWS) will operate and maintain the facility. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the well and its appurtenances.

c. **Site Plan with contours and drawn to scale.**

A preliminary site grading plan with existing and proposed contours is attached. Besides the well and pump, the site will have an electrical building, piping, parking, fencing and related site work. Disinfection facility will be located at the site. The disinfection facility will be also used for disinfection of waters coming from Kanoa Well 1 and the two North Waihee Wells. A preliminary site plan of the Kanoa Well 2 site is attached.

3. **Physical and Hydrological Characteristics of Area**
   
   **a. Location.**
   
   The project is on the northern slopes of the West Maui Mountains north of the village of Waihee and Waihee Stream on the Island of Maui. The tax map key for the parcel is TMK (2) 3-2-1: 3. A location map is attached. Kanoa Well No. 2 is located within pasture land. The well is located on a one acre perpetual easement at approximate elevation 280 mean sea level (MSL) and approximately 2,000 feet from the ocean. The nearest residence is over a 1,000 feet east of the well.

   **b. Climate.**

   The site is influenced by the northeasterly trade winds as is typical of windward areas of the Hawaiian Islands. The annual rainfall at the site averages 30 to 40 inches with average temperatures in mid 60's to mid 80's range.

   **c. Topography including detailed study of project site.**

   A preliminary site plan of the well site with existing contours is attached. No significant grading is anticipated at this site for the proposed improvements. The site is located at about elevation 280 feet MSL. The area slopes in the west-east direction with slopes around 24%. A natural swale lies north of the site and will be used to dispose of storm runoff generated by the site.
d. Geology and foundation conditions.

The geological profile of the area consists of alluvium at the surface above Honolua series andesitic basalt lavas and the highly permeable Wailuku series basalts. The alluvium and andesitic lavas are fairly low permeability which suggests that wells to basal ground water would not interfere with stream flows above the low permeability layers.

e. Earthquake considerations and design parameters.

According to Seismic Zone Maps in the Uniform Building Code, the island of Maui is in Zone 2B. This translates to only moderate seismic hazard. All structures will be designed accordingly. On Maui, there is no record of deep well casings being damaged by earthquakes.

f. Groundwater conditions.

"The North Waihee Aquifer, An Additional Water Supply Source for Central Maui," Dr. John Mink, Mink and Yuen, Inc. dated April 10, 1997 provides initial studies for the project. Since information on the aquifer and other groundwater conditions is limited in the area, this project will help with the accumulation of data on the North Waihee Aquifer. In summary, the report states that the North Waihee Aquifer is adjacent and hydraulically connected to the lao Aquifer; however, the lack of response in the test holes within the lao Aquifer during test pumping of the North Waihee Wells suggests that the Waihee Aquifer is quasi-independent aquifer. The estimated sustainable yield of the Waihee Aquifer is 8 MGD. The North Waihee Wells has a pumping capacity of 1.5 MGD each well but it is anticipated that the pumps will not run simultaneously nor run continuously except under emergency conditions. The Kanoa Well will help quantify the aquifer sustainable yield and generally provide better information of the Waihee Aquifer for future development potential.

Information on aquifer conditions was provided in "Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation," Mink & Yuen, June 21, 1999 after pump testing the Kupaa 1 and Kanoa 1 wells.

"North Waihee Aquifer System, Kanoa 2 Well," John F. Mink, Mink & Yuen, July 12, 2000 presents aquifer conditions at Kanoa Well 2 and is presented as Exhibit A.
g. Flood problems including tsunami inundation zones and preventive measures that may be used.

The elevation of the site makes it obvious that the site is not located within any tsunami inundation zone. According to the Federal Emergency Management Agency (FEMA) Flood Zone maps, the site is in an area of minimal flooding (zone c). The site project work area is small (approximately 9,500 sq. ft.). Exposed areas not covered by paving or roof will be grassed as part of the project.

h. Information confirming the conformance with local land use planning and zoning regulations.

The site is located within an area designated as “Agricultural” by the State Land Use Commission. The Maui County Wailuku-Kahului Community Plan designates the project site as within “Agricultural” lands. The proposed project is considered as a minor utility facility and a permitted use within the “Agricultural” designation.

i. Discussion of water rights and future uses by others.

The wells within the Waihe'e Aquifer on record with the CWRM are as follows:

<table>
<thead>
<tr>
<th>State Well No.</th>
<th>Well Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>5631-02</td>
<td>North Waihe’e Well 1 (DWS)</td>
</tr>
<tr>
<td>5631-03</td>
<td>North Waihe’e Well 2 (DWS)</td>
</tr>
<tr>
<td>5631-04</td>
<td>Marino Well A (Private)</td>
</tr>
<tr>
<td>5631-05</td>
<td>Marino Well B (Private)</td>
</tr>
<tr>
<td>5731-01</td>
<td>Mendes Well (Private)</td>
</tr>
<tr>
<td>5731-02</td>
<td>Kupa’a Well 1 (DWS)</td>
</tr>
<tr>
<td>5731-04</td>
<td>Kanoa Well 1 (DWS) - Project Well</td>
</tr>
<tr>
<td>5832-01</td>
<td>Unknown</td>
</tr>
<tr>
<td>5832-02</td>
<td>Kahakuloa Acres (Private)</td>
</tr>
<tr>
<td>5832-03</td>
<td>Kahakuloa Acres (Wailena) (Private)</td>
</tr>
</tbody>
</table>

The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields within Wailuku Agribusiness Company properties between Waihe’e Stream and Kupa’a Gulch. North Waihe’e Well 1 & 2 (5631-02 & 5631-03) is in well field one (TMK: 3--2-01:04); well field two is the Kanoa Well 2 (5731-04); well field three is the Kanoa Well No. 1 (5731-02) and the Kupa’a Well No. 1 (5731-03) is located in well field five. The DWS can potentially develop one additional well (well field 4); however, future well development will require well drilling and pump installation permits from

Kanoa Well No. 2
State Well No. 5731-04
July 28, 2000
the CWRM and analysis of pump test results. The proposed Kanoa Well No. 2 site is designated as well field 2. The CWRM has received no new well applications for wells in this aquifer.

4. Extent of Water Works System.

a. Description of the nature and extent of the existing area and future area to be served.

The North Waihee Water Source Development project will be used to service the Maui County Department of Water Supply’s Wailuku District Water System which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala. The water system service area is bounded by Paia/Kuau to the east, Kihei/Makena to the south, Maalaea on the west and Waihee on the north and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei, Maalaea and Puunene. The water system service area is shown in the attached figure.

Upon completion of the proposed improvements, the well will be connected to an existing nearby water transmission line from the North Waihee Wells source to the existing 1.0 MG North Waihee Reservoir which is already serving the CMWS.

b. Description of population served, land use and consumption data including forecasting the water demands.

The Central Maui area varies in land use, population and services. The Kahului-Wailuku communities serves as the business-industrial hub and the population center of the island with Kahului Airport and Kahului Harbor as the main transportation centers for traveling off the island and importing and exporting goods and produce. Wailuku is also the governmental center of Maui. Destination resorts of Wailea and Makena are also served by the Central Maui Water System. Paia-Kuau present a more residential setting with small stores serving the community and limited tourist activity.

The Maui County Water Use and Development Plan, 1992, estimates that residential consumption for Wailuku to be about 52%, compared to Kihei at 72% and Kahului at 48%.

Anticipated water demand from the “Maui County Water Use and Development Plan” (Water Use and Development Plan), 1992, estimates that the year 2010 demand within the Central Maui Water System to range between 25 million gallons per day (mgd) to 30 mgd depending upon the method of forecast used. The “Historical Trend” adopted by the DWS
used in the Water Use and Development Plan uses a linear extrapolation of 0.5 mgd/year which equates to a forecasted a water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd or a 8.5% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 and 1998 is 18.1 mgd and 18.6 mgd respectively. Comparatively, the water consumption reported in the Board of Water Supply, County of Maui, annual report averaged 19.3 mgd for 1997 and 19.8 mgd for 1998.

c. **Appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional and other water supply needs.**

The future requirements of service as forecasted above is based upon a mix of residential, commercial, institutional and other needs of the community as development occurs. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes. As stated previously, the DWS uses a linear demand model based upon historical experience for predicting future water demand. The model includes potential residential, industrial, commercial, institutional and other water supply needs.

d. **Provisions for extending water works system to include consideration of additional area required, easements, and right-of-way acquisition for facilities and utilities.**

A 12-inch transmission waterline is planned to be constructed as part of this project to connect to an existing 24-inch transmission waterline passing through the well site. The 24-inch waterline carries water from the existing North Waihee Wells (5631-02 & 5631-03) and Kanoa Well 1 (5731-03) to the existing 1.0 MG North Waihee Reservoir. The transmission waterline will be placed within an existing easement; the same easement is also being used for access and to bring power to the site.
e. Required capacity to meet fire protection and pressure requirements.

The DWS generally plans reservoirs within the local service area to provide fire protection and assure adequate pressure for its users.

f. Alternative solutions considered and supporting data for recommended plan.

The Central Maui Water System has been primarily dependent on water from the lao Aquifer and withdrawal from the lao Aquifer is nearing the aquifer's 20 MGD sustainable yield as set by the State Commission on Water Resource Management (CWRM). Hence, the DWS started seeking new sources of water to meet the increasing demand.

Attention was initially given to developing of groundwater in East Maui. Two wells in the Hamakuapoko area have been drilled; however, the East Maui initiative has been delayed due to the discovery of pesticides in the wells and legal challenges, leaving the North Waihee groundwater source as the choice for timely water source development. It may be several years before any East Maui Sources can be utilized for Central Maui.

The “Water Resource Protection Plan, Volume I & II,” CWRM, June 1990, estimates that the sustainable yield for the Waihee Aquifer (60103) is 8 MGD. The two North Waihee Wells (5631-02 & 5631-03) have been placed on line within the water system to relieve the stress being placed on the lao Aquifer. The Kanoa Well 1 (5731-03) and Kanoa Well No. 2 (5731-04) will be the third and forth well in the Waihee Aquifer to be placed into production.

A fifth well, Kupaa Well No. 1, (5731-03) is also being developed and a separate Preliminary Engineering Report for New Potable Water Source has been submitted to the State Department of Health for approval. The Kupaa Well and the Kanoa Well will reduce DWS dependence on the lao Aquifer and the possibility of over pumping the lao Aquifer while allowing the Maui County Department of Water Supply to meet the needs of their consumers.

g. Environmental and economic impact.

The land is presently undeveloped and presently used as range land. Environmental impacts once the facility is in place should not be significant. A final environmental assessment with a finding of no significant impact (FONSI) was published in the OEQC bulletin on November 23, 1999. The development of the Kanoa Well No. 1 will relieve the stress being placed upon the lao Aquifer and provide an
adequate water supply to meet the demand anticipated in the County Community Plans. The project is not being completed to encourage any special development nor any single developer.

The short term economic impacts of the project by itself creates construction jobs. The monies will come from the Board of Water Supply. The long term economic impacts of the project will mean continuous maintenance, electricity and the purchase of disinfectants. The well will reduce stress upon the Iao Aquifer and allow growth as anticipated by the Maui County Community Plans.

5. Potential Sources of Contamination.

a. Description of well site:

1) coordinates (latitude, longitude), State Well No., and Tax Map Key Number.

Latitude: 20° 56' 49"
Longitude: 156° 31' 07"
State Well No. 5731-04
Tax Map Key: (2) 3-2-1: por. of 03

2) land surface elevation, topographic map of well site.

A preliminary site plan and topographic map of the well site is attached. The ground elevation at the well is approximately 280 feet MSL.

3) Size and topography of catchment area, slope of ground surface.

The "Water Resources Protection Plan," CWRM, Department of Land and Natural Resources, State of Hawaii, June 1990, reports that the aquifer catchment area is approximately 12.87 square miles. Elevation ranges from sea level to elevation 4,480 at Eke Crater over a distance of approximately 24,000 feet from the ocean to the top of the crater. This equates to an average overall slope of 18%.

4) General summary of soil and substrata.

"The North Waihee Aquifer, An Additional Water Supply for Central Maui," Mink & Yuen, April 10, 1997 was initially prepared for this project. The report also provides insight as to the soil and
substrata and the initial design criteria for the well. Substrata information at the well site is provided in the “North Waihee Aquifer System, Kanoa 2 Well Completion and Testing,” John F. Mink, Mink & Yuen, July 12, 2000 attached as Exhibit A.

5) Anticipated well depth and depth of groundwater.

The well has been drilled 330 feet below ground surface or approximately 50 feet below mean sea level. The water surface elevation of the basal aquifer encountered is at elevation 7.16.

b. Design well draft.

The design well draft is 1,200 gpm.

c. Water quality data on any existing wells in the area.

Water sample was taken at Kanoa Well 2 (State Well No. 5731-04) during the continuous well test. The water quality results are attached as Exhibit B. Water quality data was provided for North Waihee Well #2 (5631-03), Kanoa Well #1 (5731-02) and Kupaa Well No. #1 (5731-03). Water quality data was previously reported for these wells in the Preliminary Engineering Report for New Potable Water Source, Kanoa Well No. 1 (State Well No. 5731-02), July 1999. The recently constructed Kanoa Well No. 1 is within the same aquifer and part of the same project.

d. Land use classification of surrounding area.

e. Existing or potential sources of contamination in recharge area:

1) extent of recharge area likely to contribute water to source including population.
2) type of contaminants.
3) distance to proposed well.
4) method of disposal, i.e. surface, subsurface - above groundwater table, subsurface - in groundwater table.
5) depth from base on contaminant source to groundwater table including but not limited to urban development, agricultural areas, pasture lands, feedlots, sanitary landfills, dumps, subsurface disposal units.

The recharge area estimated for the Waihee Aquifer 60103) is about 12 square miles. Located between the Waihee and Kahakuloa Valleys. The well is located within an agricultural zoned area. The area is relatively undeveloped and is used as rangeland; no known pesticides have been used on the property for decades. There is no public (County) wastewater system serving the area and existing residences are serviced by individual
waster water disposal systems. The nearest existing residence is located more than 1,000 feet east (makai) of the well. Forest reserve lands are approximately 4,700 feet west (mauka) of the site.

The Kanoa Well No. 2 is located in a recharge area composed of conservation and agricultural lands and away from dense populated areas, potential for contamination from external sources appears unlikely. The agricultural zoned areas will allow for limited residences to be built. However, no development can occur in the conservation zoned forest reserve area without proper permits and authorizations. The geology of the area, consisting of a thick andesite layer makes potential for contamination unlikely from sources makai of the well.

Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. The area is being used as rangeland and has been for a very long time. The agricultural/conservation zoning within the recharge area limits land use and population. There are no feedlots, sanitary landfills or public dumps within the aquifer recharge area. Wastewater disposal for the few residences are limited to individual wastewater disposal units.

f. **Approximate groundwater contour.**

"North Waihee Aquifer System, Kanoa 2 Well, Well Completion and Testing," prepared by John F. Mink, Mink & Yuen, Inc., July 12, 2000 provides well data, pump test results, estimated ground water contours and transmissivity of the aquifer. The report is attached as Exhibit A.

6. **Sources of Water Supply.**

a. **Nature of soil and stratum within and overlaying the water source, with special emphasis on identification of fissures and faults as it relates to the natural purification or treatment of percolating fluids from existing or future activities.**

   Discussed previously.

b. **The probability and effect of surface drainage or contaminated underground water entering the subject water source.**

   Discussed previously.
c. Depth to water table, location and description of wells in vicinity in use and/or abandoned.

Discussd previously.

d. Slope of water table, preferably as determined from observation wells, or studies of wells in the area.

Discussd previously.

e. Site data relating to potential flooding and/or earthquake data.

Discussd previously.

f. Data relating to quality and quantity of the source waters under normal conditions and during stress periods of drought or heavy precipitation, as determined by field and laboratory analysis and investigations of available records; if records are not available or are inadequate to determine source quality under stress conditions, an estimate of expected quality and quantity during stress conditions should be established and related to the hydrologic budget to the aquifer or isopiestic area. At a minimum, analysis for all of the contaminants listed in the table “Contaminants to be Tested in All New Sources of Potable Water” shall be performed by the Department of Health, State Laboratories Division, for all sources being addressed in the report. For example, when approval of a well field is being sought, all of the wells must be tested for all of the required contaminants.

Laboratories performing the analysis must be currently certified by the Hawaii Department of Health, State Laboratories Division. While the lab data has often been conveniently summarized in a table, some reports have failed to note when analyses have been subcontracted to another lab. The lab reports from all of the laboratories involved must be included in the engineering report to allow the Department to verify that the analyses were performed by an approved lab. Failure to do so may delay the review process.

A water sample was taken during well testing. The sample was analyzed by Montgomery Watson Laboratories. The results are included in this report as Exhibit B.
g. Identification of all significant factors having potential for contaminating or reducing the quality of the water source or which would cause the quality of water delivered to users of the system to be in violation of any state primary drinking water regulation.

h. For each present and projected potential source of contamination, identification and evaluation of alternative control measures which could be implemented to reduce or eliminate the potential for contamination of the water source, including treatment of the water source if subject to contamination, and evaluation of the physical, economic and social effects of implementing such control measures.

The lands surrounding the site is zoned either agricultural or conservation. The zoning in itself limits the potential for contamination. The conservation lands are mauka of the site. Conservation land uses are restrictive and requires a permit to develop the land. Similarly, agricultural development has limited uses. Presently, the lands are used mainly for cattle grazing. Waste water treatment facilities for the existing homes in the area do not penetrate down to the aquifer and water quality samples show that individual waste water treatment facilities have not affected the quality of water from the aquifer. Therefore, the only anticipated source of contamination is biological; water treatment to mitigate potential contamination will consist of disinfection.

i. A summary section indicating how the proposed development and improvements will provide reasonable assurance that the new water source is not subject to actual or potential contamination such as may result in the water not complying with any state primary drinking water regulation or as may otherwise adversely affect the health of persons.

The annular space around the well casing has been grouted from just above aquifer water level to ground surface to prevent surface waters from entering the well.

The Maui County Community Plan for the area shows that the lands have been designated as either agricultural lands or conservation lands. The conservation lands are above the project site. Land zoning restrictions further limit the potential of source contamination.

7. Proposed Treatment Works.
a. **Summary description of proposed processes and unit parameters for treating the specific water under consideration.** Include pertinent information on built up and packaged plant systems.

Water samples taken during well testing show that only disinfection will be needed. Water from the well will be treated by an 12.5% premixed sodium hypochlorite solution disinfection system. It is estimated that approximately 8.4 pounds (equivalent Cl₂) per day would be normally used and 11.4 lbs (equivalent Cl₂) if the pumps ran for 24 hours. The hypochlorite solution will be injected before the water enters 1,000,000 gallon North Waihee control reservoir. The reservoir should provide sufficient contact period to allow thorough disinfection of the basal waters. The system located in a separate room within the control building (electrical and chlorine residual analyzer to be located in adjacent electrical room) at the Kanoa Well 2 site includes the following:

- Storage for 12.5% sodium hypochlorite solution with spill containment.
- Potable water supply.
- Metering pumps.
- Chlorine Residual Analyzer.
- Plastic tubing accessories and PVC Schedule 80 piping within the control building, below ground to a common injection point.

A chlorine residual analyzer will be used to monitor chlorine residual and connected to the DWS SCADA system at their baseyard. Low chlorine alarm at the site and at the baseyard will warn maintenance personnel. Normal operation and maintenance consist of field visits to the site primarily to measure chlorine residual and to resupply sodium hypochlorite solution when required. Adjustments to chlorine injection will be made to assure adequate chlorine residual.

b. **Site: Discuss various sites available indicating proximity to developed areas, availability of utilities, and accessibility of plant site.** Show on a topographic map the treatment plant and arrangement of present and proposed treatment facilities.

The project is a water development project within the Waihee Aquifer (60103) and therefore, the well site north of the Waihee Stream was selected. The Kanoa Well No. 2 site is one of five well fields that is available to the Department of Water Supply. The remainder of the well fields are located between the North Waihee Wells (State Well No. 5631-02 & 5631-03) and Kupaa Well No. 1 (5731-03). A preliminary site plan of the proposed well development site is attached. Access to the well site will be via existing easement. A paved driveway passes next to the site as
part of a previous project. Electrical power is also available next to the site by Maui Electric Company, the local electric utility, through the existing easement.

The water treatment facility (hypochlorination) will be located at the site and a site plan is attached.

c. Basis of Design:
   1) Design Period
   2) Design population and flow demand data
   3) Nature and characteristics of flow
   4) Design flow rate for plant
   5) Reserve capacity
   6) Treatment processes and unit parameters including calculations for design of units. Include description of equipment, capacities, size, operational factors and plant hydraulics.
   7) If components are to be modified in stages, discuss staging, sequence, and future changes as required.

The sustainable yield of the Iao Aquifer is 20 MGD. In the past, the DWS has come close to pumping near the sustainable yield levels. It is important to provide additional sources of water to reduce the stress being placed on the Iao Aquifer and to provide an adequate supply of water to meet the demands of the water system. The well, pumping, storage and appurtenances will be designed and constructed in compliance with the County of Maui Department of Water Supply and State Department of Health Drinking Water Standards. The facility will be owned and operated by the DWS. Their staff is thoroughly familiar with and have the experience and qualified personnel that are committed to provide water that will be in compliance with the requirements of the State Safe Drinking Water Regulations. Water samples taken from the North Waihee Well during the well testing phase shows that disinfection is the only treatment needed for the water.

d. Waste Disposal: Discuss various wastes from the water treatment plant, their volume, proposed treatment and disposal, and points of discharge.

No wastes are anticipated for the treatment process.
e. **Operation and maintenance:** provide general information operation and maintenance requirements, automatic equipment and justification for system proposed.

The operation and maintenance of the disinfection system will be by the Maui County Department of Water Supply. The Department has several similar disinfection systems and the qualified personnel to operate and maintain the equipment. Regularly scheduled field visits will be made to the site to measure chlorine residual and to resupply hypochlorite solution for injection.

8. **Pumping Facilities.** In addition to information required under sections 2 through 4, the following information should be provided in the engineering report:
   a. **Purpose of service**
   b. **Pumping layout and sizing of force main**
   c. **Design flow requirements including maximum, average, minimum, variations in demand, and effect of storage**
   d. **Liquid characteristics**
   e. **Pump selection including system and characteristic curves**
   f. **Pumping arrangement.**

Submersible deep well pumps are planned for the project. The layout of the project site is shown in attached figure. Potable water will service the CMWS. The pumping facility will have the following attributes:

- **Pump Type:** Deepwell Submersible
- **Pump Rating:** 1,200 gpm @ 450' TDH
- **Motor:** Submersible, 200 HP, 1750 RPM
- **Power Supply:** 480 volt, 3 phase, 60 Hz.
- **Piping:** Ductile Iron
- **Appurtenances:** Check Valve, Pump control valve, air and vacuum valve.
- **Flow Tubes:** Cast Iron with a bronze liner with transmitters and receivers.

**Pump Control:** Pump controls will be through a pressure sensing line (water level) which has been already placed in the existing 1.0 MG North Waihee Reservoir. A signal proportional to tank level will be sent to a receiver in the control building on site. As water level in the reservoir reaches a certain level (to be set by operator), the pump will turn on. After reservoir fills, the pump will turn off by signal from the reservoir level sensor. High level and low level alarms will be installed to warn operator of malfunction.

**Well level control:** An electronic well drawdown sensing device will be
placed in a well level monitoring tube to record water levels within the well. The information will be used as part of the data gathering information that will provide better understanding of aquifer conditions of the Waihee Aquifer and will set off an alarm if well level get below a certain draw down.

A 12-inch transmission waterline is planned to carry water from the Kanoa well to an existing 24-inch transmission waterline from the North Waihee Well Project where the water will stored in a 1.0 MG reservoir. As water is needed in the Central Maui Water System, a signal by SCADA will activate the booster pumps. Additional booster pumps will be activated as demand increases. The water level in the North Waihee 1.0 MG reservoir will control the four wells.

The Kanoa Well No. 2 is part of a system of wells planned for the area by the Department of Water Supply. The design and operation of the well will be in conformance with the “Water System Standards,” Department of Water Supply, County of Maui, 1985. Since the Maui County Department of Water Supply is a public agency, the pumping unit must go through a bidding process. A specific pumping unit with pump curves cannot be presented at this time; however, the pump parameters were previously provided.

g. **Electric power available:**

Electrical power will be brought to the site. Electrical power will be supplied by Maui Electric Company. A 350 KW diesel generator at the site will provide emergency power. A automatic transfer switch will immediately activate the emergency power should emergency power be required. Emergency power will be capable of powering the deep well pump and hypochlorinator units at the site. A SCADA signal will notify the DWS that the site is on emergency power when power outages occur.

h. **Proposed building and other structural improvements**

A control building will be constructed as part of the project. The building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other electrical appliances and a separate, enclosed room will house the disinfection facility. A roofed slab connected to the building will house the emergency generator. The building will be a slab on grade, CMU building with asphalt shingle roofing.
i. Water hammer consideration.

Water hammer effects will be mitigated by the use of slow opening/slow closing control valves and check valves. In addition, the 1.0 MG North Waihee Reservoir would act as a surge relief outlet.

j. Descriptions of essential features of construction and operation, including staging sequence if applicable

The staging sequence will be left up to the contractor; however, the following is the most likely staging sequence for the project construction:

a. Mobilize.
b. Clear and grub site.
c. Grading and earthwork to the well site, construct access road and install transmission waterline.
d. Grass exposed slopes.
e. In the meantime, the building can be constructed, the pump and related piping installed and the paved area prepared for paving.
f. Complete the paving within the well site. The booster pump at the 1.0 North Waihee Reservoir will be installed.
g. Electrical and telemetry equipment installation simultaneously with the disinfection equipment. Meanwhile, MECO will provide power to the site.
h. Finally, the fence can be completed.

k. Electrical system including provisions in the event of power failure, and telemetering and supervisory control systems

Electrical Power will be obtained from Maui Electric Company, the local power company providing service to the island. A 350 KW stand-by generator will be activated by an automatic transfer switch during power emergencies. The generator will be capable of running the deep well pump and treatment facility and will be automatically activated during power outages.

9. Finished Water Storage. Describe location, type and sizing of storage facilities. Include discussion on drains, overflows, telemetering and supervisory controls, painting and protective coating and other important and pertinent considerations.

Finish water storage will be the existing 1.0 MG North Waihee Reservoir. The reservoir is equipped with water level sensors to control the well pump. The controller shall have a pump off setting, pump on setting and a low level alarm. The system will be connected to the Department of Water Supply SCADA system.
10. **Water Distribution Systems.**
   a. Provide general layout of the system.
   b. Indicate materials, valves, hydrants, meters, etc.
   c. Proximity of other utilities
   d. Include effects of incremental or phased construction, possibilities of future developments as applicable
   e. Provide information, profiles or sections showing pipe cover, location, groundwater conditions and other important data affecting installation of the distribution system.

The Central Maui System service area has been described previously. A layout of the Central Maui Water System is attached. A description of the total service area was previously described. The water distribution system is one of the existing public water systems maintained by the Maui County Department of Water Supply. The water system materials, construction and maintenance are in accordance to the standards set forth by the Maui County Department of Water Supply. This project is not planned for any specific development but to meet the rising demand for water throughout the water system and to reduce stressing the Iao Aquifer.

11. **Financing.** Provide information on estimated costs of installation, phasing, operation and maintenance and other related information.

The project will be funded by the Maui County Board of Water Supply. A preliminary cost estimate is attached. Operation and maintenance will be performed by the Department of Water Supply as part of their daily operations on all of the wells in the area.

An estimate of the project construction cost are as follows:

Site improvements including pump, electrical equipment building, electrical, disinfection, fencing, paving, drainage and miscellaneous piping: $530,000.00
Emergency Generator $100,000.00
Booster Pump at existing 1.0 MG North Waihee Reservoir: $150,000.00
12" Transmission Waterline from site to connect to existing transmission line including connection to existing waterline: $15,000.00
Total construction estimate for project: $780,000.00
Contingencies: $80,000.00
Total project cost not including MECO charges: $860,000.00

Kanoa Well No. 2
State Well No. 5731-04
July 28, 2000
REFERENCES


3. NORTH WAIHEE AQUIFER SYSTEM, Kupaa 1 and Kanoa 1 Well Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.


9. East Maui Development Plan, Department of Water Supply

KANOA WELL NO. 2

FIGURES

WELL LOCATION (USGS MAP)

KANOA 2 WELL SITE TOPOGRAPHIC MAP & SITE PLAN

WATER SYSTEM SERVICE AREA

EXAMPLE PUMP CURVE
KANOA WELL 2 - SITE PLAN
Maui Department of Water Supply
Central Maui System
Vl-44

NO OF STAGES  EFF CHANGE  (NO. OF POINTS)
1             0
2             -1
3             -0

HORSEPOWER WILL BE EFFECTED BY CHANGE IN EFFICIENCY

PERFORMANCE FOR:
Bowl Pattern No.: 547812-A-RO
Imp. Pattern No.: 547811-A-RO

PUMP DATA
Shaft Dia. (IN.)  1 1/2
Maximum Sonee (IN.)  1
Maximum Head (FT.)*  950
Min. Submergence (IN.)**  20
Impeller Wt. (LBS.)  10.75
Thrust Constant (K)  10.0
Bowl O.D. (IN.)  9.0

NOTES
Performance indicated based on cold water with a specific gravity of 1.0.
* Standard construction.
** Minimum submergence overlap of bell to prevent vortexing.
Efficiency improvements are available in certain instances. Please contact the factory.

---

10FKH

NO OF STAGES  EFF CHANGE  (NO. OF POINTS)
1             2 1/4
2             -1
3             -0

HORSEPOWER WILL BE EFFECTED BY CHANGE IN EFFICIENCY

PERFORMANCE FOR:
Bowl Pattern No.: 548320-A-RO
Imp. Pattern No.: 548324-A-R1

PUMP DATA
Shaft Dia. (IN.)  1 1/4
Maximum Sonee (IN.)  1
Maximum Head (FT.)*  769
Min. Submergence (IN.)**  20
Impeller Wt. (LBS.)  9.0
Thrust Constant (K)  13.3
Bowl O.D. (IN.)  9 1/2

NOTES
Performance indicated based on cold water with a specific gravity of 1.0.
* Standard construction.
** Minimum submergence overlap of bell to prevent vortexing.
Efficiency improvements are available in certain instances. Please contact the factory.
EXHIBIT A

NORTH WAIHEE AQUIFER SYSTEM
KANOA 2 WELL
WELL COMPLETION AND TESTING

JOHN F. MINK
MINK & YUEN, INC.
Kanoa 2 (5731-04) was completed and tested in April, 2000, and the well completion report was submitted to CWRM by Mike Robertson (Wailani Drilling Co.) on June 7, 2000. The driller's log and pump test results were also submitted.

Kanoa 2, like Kupaa and Kanoa 1, is an excellent well, and its water levels reacted to pumping during the tests very similarly to the previously drilled wells. Quality of the pumped water among the three wells is identical, having a salinity of only 20 to 25 mg/l chloride.

The completed configuration of Kanoa 2 is as follows.

Ground elevation ... 281 feet
Depth ... 331 feet (50 feet BSL)
Measuring point (sounding tube) elevation ... 281.38 feet
Depth to water at start of test ... 274.67 feet
Head ... 7.16 feet
Boring diameter 22.5 inches, 0 to 330 feet
Blank casing diameter 16 inches, 0 to 277 feet
Perforated casing diameter 16 inches, 277 to 330 feet
Grout, 0 to 263 feet
Gravel, 263 to 330 feet

The head measured at Kanoa 2 before the start of the initial step drawdown test was 7.16 feet, which is comparable to 7.8 feet at Kanoa 1 and 7.41 feet at Kupaa, also measured before testing a year earlier in March - May, 1999. It is not possible to unambiguously identify the thickness of the Honolua formation and the thickness of the weathered zone of the underlying Wailuku basalt from the
driller's log, but the unconformity probably lies at a depth similar to that at Kanoa 1, about 70 to 130 feet below ground level. The driller’s log has been submitted to CWRM by Wailani Drilling Co. and C. Takumi Engineering, Inc.

Pump Test Results and Interpretation

A step drawdown test was conducted on April 28, 2000, over a period of 2.5 hours. The drawdown results as measured with a tape and as estimated from the transducer record are as follows.

<table>
<thead>
<tr>
<th>Rate(gpm)</th>
<th>Tape Drawdown(ft)</th>
<th>Transducer Drawdown(ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>0.76</td>
<td>0.58</td>
</tr>
<tr>
<td>600</td>
<td>1.18</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>1.85</td>
<td>3.40</td>
</tr>
<tr>
<td></td>
<td>3.35</td>
<td></td>
</tr>
</tbody>
</table>

The stable drawdown toward the end of the continuous test at 1200 gpm was 2.80 feet.

Assuming total drawdown is stable for each step of the step drawdown test and that it can be decomposed into aquifer (laminar) and well loss (turbulent) drawdowns, the computed transmissivity (T) is approximately 150,000 sq.ft./day. This is comparable to the T values computed for the step drawdown tests at Kanoa 1 (124,770 sq.ft./day) and Kupaa (178,930 sq.ft./day). The data for Kanoa 2 does not plot as neatly as for Kanoa 1 and Kupaa.

The drawdown and recovery data for the Kanoa 2 continuous test (4 days, 1200 gpm) also is less coherent than that for Kanoa 1 and Kupaa. However, the somewhat erratic drawdown data inserted into the computer program, THEISFIT, yields a T value of 345,370 sq.ft./day with an S (storage coefficient) approaching zero (which is not realistic). The straight Jacob plot gives a T of approximately 265,000 sq.ft./day and S = .014. The drawdowns used in the calculations occurred during the first 90 minutes of the test during which time a steady, though small, increase in drawdown took place.

All of the calculated values for T are similar in magnitude to the T computed for the North Waihee wells (1 and 2), Kanoa 1 and Kupaa. Exact values are not possible to determine because water levels were measured in the pumping wells and are therefore inherently ambiguous. The meaningful conclusion is that the transmissivity of the aquifer is very high and hydraulic conductivity (k) exceeds 1,000 ft./day. The T and k values pose no constraint on pump capacity in any of
the wells; the primary constraint is the threat of up-coning if pump capacity is excessive.

No attempt was made to employ the North Waihee wells and Kanoa 1 as observation wells. A transducer was placed in Kupaa, but the well is too distant from Kanoa 2 to have yielded usable data. Kanoa 1 and the North Waihee wells were being pumped during the tests to help relieve demand on the Iao Aquifer.

**Recommended Pump Size**

The recommended pump size is 1200 gpm (1.73 mgd), the same as recommended for Kanoa 1 and Kupaa. For the DWS factor of .444, average production will be 0.77 mgd; for the liberal factor of .67, the average will be 1.15 mgd.

**Concluding Remarks About the North Waihee Aquifer System**

A serious misrepresentation about the sustainable yield of the North Waihee, Kupaa and Kanoa wells as totalling 8 mgd has appeared in newspaper reports and repeated at public hearings. The sustainable yield of 8 mgd is that proposed for the entire North Waihee Aquifer System, which extends from the axis of Waihee Valley to Kahakuloa Valley. The portion of the System to be exploited by the existing wells extends from Waihee Valley to the Brewer property line at the south boundary of the Makamakaole drainage. For this segment of the North Waihee Aquifer System the sustainable yield has been estimated at just 4 mgd.

If the three new wells (Kanoa 1 and 2, and Kupaa) are controlled by the .444 factor, the average production will be 2.3 mgd, while with the .67 factor it will be 3.5 mgd. In addition to these new wells, North Waihee 1 and 2 are in this portion of the Aquifer System. With all five wells pumping at capacity as amended by the factors, a sustainable yield of 4 mgd can be readily obtained.
EXHIBIT B

WATER QUALITY TESTING RESULTS
KANOA WELL 2
Sample # 2005110022  Sample ID PHASEV  Project PHASEV
Sample Type Water  Sampled 10-May-2000  Received 11-May-2000  Reported 02-Jun-2000

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
<th>Prepared By</th>
<th>Analyzed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanide</td>
<td>mg/L</td>
<td>ND</td>
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<td>0.025</td>
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<tr>
<td>Endotoxin</td>
<td>ug/L</td>
<td>ND</td>
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<td>Glyphosate</td>
<td>ug/L</td>
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<td>YPM</td>
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<td>2,3,7,8-TCDD</td>
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<td>4.20</td>
<td>4.20</td>
<td>4.20</td>
<td>24-May-2000</td>
<td>24-May-2000 sub</td>
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</tbody>
</table>
Group Validation Comments

(TCDD) Analyzed by STL, Sacramento, CA.
ACKNOWLEDGMENT OF SAMPLES RECEIVED

Maui, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96732
Attn: Carl Cerizo

Customer Code: MAUI
Group#: 65850
Project#: PHASEV
Proj Mgr: Hillary Strayer
Phone: [redacted]

The following samples were received from you on 05/11/00. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

<table>
<thead>
<tr>
<th>Sample#</th>
<th>Sample Id</th>
<th>Tests Scheduled</th>
<th>Matrix</th>
<th>Sample Date</th>
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<td>KANOA 2</td>
<td>CNDW ENDOHAL GLYPHOS TCDD-DW</td>
<td>Water</td>
<td>05/10/00</td>
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Test Acronym Description

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<th>Description</th>
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<td>CNDW</td>
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<td>ENDOHAL</td>
<td>Endothall</td>
</tr>
<tr>
<td>GLYPHOS</td>
<td>Glyphosate</td>
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<tr>
<td>TCDD-DW</td>
<td>2,3,7,8 - TCDD</td>
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**ICPMS Metals**

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<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
<th>Prepared By</th>
<th>Analyzed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic, Total, ICAP/MS</td>
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<td>ND</td>
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<td>jps</td>
<td>10-may-2000</td>
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<tr>
<td>Barium, Total, ICAP/MS</td>
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<td>2.00</td>
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<tr>
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<td>ND</td>
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<tr>
<td>Cadmium, Total, ICAP/MS</td>
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<td>ND</td>
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<td>Chromium, Total, ICAP/MS</td>
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<td>ND</td>
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<td>Copper, Total, ICAP/MS</td>
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<td>Nickel, Total, ICAP/MS</td>
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<td>Lead, Total, ICAP/MS</td>
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<td>Thallium, Total, ICAP/MS</td>
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Sample # 2003110073  Sample ID KAHUA 2  Project PHASE 2
Sample Type Water  Sampled 10-may-2000  Received 11-may-2000  Reported 25-may-2000

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<th>Parameter</th>
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<th>Det. Limit</th>
<th>Prepared By</th>
<th>Analyzed By</th>
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<tbody>
<tr>
<td>Alkalinity</td>
<td>(SH2320R/E310.1) mg/l</td>
<td>80</td>
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<td>Calcium, Total, ICAP</td>
<td>(ML/EPA 200.7) mg/l</td>
<td>9.6</td>
<td></td>
<td>1.00</td>
<td>12-may-2000</td>
<td>12-may-2000</td>
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</tr>
<tr>
<td>Specific Conductance</td>
<td>(ML/251040) mS/cm</td>
<td>245</td>
<td></td>
<td>4.00</td>
<td>18-may-2000</td>
<td>18-may-2000</td>
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<tr>
<td>Fluoride</td>
<td>(EPA/ML 140.2) mg/l</td>
<td>0.17</td>
<td></td>
<td>0.0500</td>
<td>15-may-2000</td>
<td>15-may-2000</td>
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<tr>
<td>Mercury</td>
<td>(EPA/ML 705.1) mg/l</td>
<td>ND</td>
<td></td>
<td>0.2000</td>
<td>15-may-2000</td>
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<td>Nitrite, Nitrogen by IC</td>
<td>(ML/EPA 100.0) mg/l</td>
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<tr>
<td>Nitrate-N by IC</td>
<td>(ML/EPA 300.0) mg/l</td>
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<td>0.1900</td>
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**Report Summary of positive results, PR65851**

<table>
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<td>2005110023</td>
<td>KANOA 2</td>
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<tr>
<td>5/18/00 Barium, Total, ICAP/MS</td>
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<td>UGL</td>
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<td>5/18/00 Copper, Total, ICAP/MS</td>
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<td>2.000</td>
<td>UGL</td>
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<td>5/18/00 Lead, Total, ICAP/MS</td>
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<td>.500</td>
<td>UGL</td>
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<td>5/15/00 Alkalinity</td>
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<td>5/18/00 Specific Conductance</td>
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<td>UMHO</td>
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The following samples were received from you on 05/11/00. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

<table>
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<tr>
<th>Sample#</th>
<th>Sample Id</th>
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<td>05_10023</td>
<td>KANOA 2</td>
<td>Water</td>
<td>@MET-HI ALK CA EC</td>
<td>05/10/00</td>
</tr>
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<td></td>
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<td></td>
<td>NO2-N NO3</td>
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Test Acronym Description

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<tr>
<th>Test Acronym</th>
<th>Description</th>
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<td>ICPMS Metals</td>
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</tr>
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<td>CA</td>
<td>Calcium, Total, ICAP</td>
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<tr>
<td>EC</td>
<td>Specific Conductance</td>
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<td>F</td>
<td>Fluoride</td>
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<td>HG</td>
<td>Mercury</td>
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<td>NO2-N</td>
<td>Nitrite, Nitrogen by IC</td>
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<td>NO3</td>
<td>Nitrate-N by IC</td>
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## METHOD BLANK REPORT

Trace Level Organic Compounds

Client Lot #: G0E130155
MB Lot-Sample #: G0E230000-508
Analysis Date: 05/26/00

Work Order #: DDL0D101
Prep Date: 05/24/00
Prep Batch #: 0144508
Dilution Factor: 1

Matrix: WATER

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<thead>
<tr>
<th>PARAMETER</th>
<th>RESULT</th>
<th>LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
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</thead>
<tbody>
<tr>
<td>2,3,7,8-TCDD</td>
<td>ND</td>
<td>1.7</td>
<td>pg/L</td>
<td>EPA-5 1613B-Terra</td>
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**NOTE(S):**

Calculations are performed before rounding to avoid round-off error in calculated results.
QC DATA ASSOCIATION SUMMARY

Sample Preparation and Analysis Control Numbers

<table>
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<tr>
<th>SAMPLE#</th>
<th>MATRIX</th>
<th>ANALYTICAL METHOD</th>
<th>LEACH BATCH #</th>
<th>PREP BATCH #</th>
<th>MS RUN#</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>WATER</td>
<td>EPA-S 1613B-Tetra</td>
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<td>0144508</td>
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**MON'TGOMERY LABORATORIES**

Client Sample ID: 2005110022

Trace Level Organic Compounds

<table>
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<th>Units</th>
<th>Method</th>
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</thead>
<tbody>
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<td>ND</td>
<td>4.2</td>
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Matrix: WATER

Lot-Sample #: G0E130155-001
Work Order #: DDFSXV101
Date Sampled: 05/10/00
Date Received: 05/12/00
Prep Date: 05/24/00
Analysis Date: 05/26/00
Prep Batch #: 0144508
Dilution Factor: 1

Date Sampled: 05/10/00
Prep Date: 05/24/00
Prep Batch #: 0144508
Dilution Factor: 1
SAMPLE SUMMARY

G0E130155

NOTE(S):
- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.
ANALYTICAL REPORT

PROJECT NO. 65850
MWL-65850/Sub PO# 99-2407
Lot #: GOE130155

Martha Frost
Montgomery Laboratories

SEVERN TRENT LABORATORIES, INC.

Nanny Estrada
Project Manager

May 30, 2000
May 31, 2000

QUANTERRA INCORPORATED PROJECT NUMBER: G0E130155
PO/CONTRACT: 99-2407

Martha Frost
Montgomery Laboratories
555 East Walnut Street
Pasadena, CA 91101

Dear Ms. Frost,

This report contains the analytical results for the drinking water sample received under chain of custody by Quanterra Incorporated on May 12, 2000. This sample is associated with your project number 65850.

All applicable quality control procedures met method-specified acceptance criteria.

If you have any questions, please feel free to call me at (916) 374-4348.

Sincerely,

Nanny Estrada
Project Manager
Ship To  
Nannie Estrada  
Severn Trent Laboratories  
880 Riverside Parkway  
West Sacramento, CA 95605-1501  

Bill Recipient: FEDEX ACCT: 2060-8019

<table>
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<th>MWL Project #</th>
<th>Report Due:</th>
<th>Use MWL</th>
<th>Client Sample ID for reference only</th>
<th>Analysis Requested</th>
<th>Sample Date &amp; Time</th>
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<th>Container</th>
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<tbody>
<tr>
<td>65850</td>
<td>05/25/00</td>
<td></td>
<td></td>
<td>KANOA 2 Dioxin in drinking water 1613b</td>
<td>05/10/00</td>
<td>dw</td>
<td>2L amber glass / no preservative</td>
</tr>
</tbody>
</table>

RECEIVED IN GOOD CONDITION UNDER COC  
MAY 13 2000

An Acknowledgement of Receipt is requested to all: Martha Frost

For Specific Questions about samples: Hillary Strayer  
(626) 568-6412
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
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<th>Analyzed By</th>
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### Herbicides by 515.1

**Parameter**                      | **Units** | **Result** | **Conc.** | **Dilution** | **Det. Limit** | **Prepared By** | **Reported By** | **Analized By** |
---                                |          |           |           |             |               |                |                |                |
2,4,5-T                             | µg/l     | ND        |           | 0.200       | 15-May-2000   | KKD             | 20-May-2000     | WPT             |
2,4,5-TF (Silvex)                   | µg/l     | ND        |           | 0.200       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
2,4-D                               | µg/l     | ND        |           | 0.100       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
2,4-DH                              | µg/l     | ND        |           | 2.00        | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Dichlorprop                         | µg/l     | ND        |           | 0.500       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Acifluorfen (qualitative)           | µg/l     | ND        |           | 0.200       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Bentazon                            | µg/l     | ND        |           | 0.500       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Dalapon (qualitative)               | µg/l     | ND        |           | 1.00        | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
1,5-Dichlorobenzene acid            | µg/l     | ND        |           | 0.500       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Total DCPA Monophosphoric Acid Degradate | µg/l | ND |           | 0.100       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Dicamba                             | µg/l     | ND        |           | 0.0009      | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Binoxyd                            | µg/l     | ND        |           | 0.200       | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Pentachlorophenol                   | µg/l     | ND        |           | 0.000004    | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
4-Nitrophenol (qualitative)         | µg/l     | ND        |           | 5.00        | 15-May-2000   | KKC             | 20-May-2000     | WPT             |
Data Entry                          |          | --        |           | 05/31/00    |                |                |                |                 |

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Report #: 45849

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Laboratory Report

Maui, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96712
ATTN: Carl Cerigo
Sample #: 2005110021 | Sample ID: KAMHA 2 | Project: PHASEV
Sample Type: Water | Sampled: 10-May-2000 | Received: 11-May-2000 | Reported: 01-Jun-2000

**Parameter** | **Units** | **Result** | **Conc.** | **Dilution** | **Det. Limit** | **Prepared By** | **Reported By** | **Report Date** | **Result** |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
1-Hydroxy Carbomethoxy Furandine | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Aldicarb (Temik) | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Aldicarb Wetform | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Aldicarb Sulfoxide | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Baygon | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Carbaryl (Purdan) | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Carfentrazone | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Methiocarb | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Methomyl | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
Oxamyl (Vydax) | mg/L | ND | 2.00 | 0.500 | 17-May-2000 | yam | | 17-May-2000 | yam |
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<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det Limit</th>
<th>Prepared</th>
<th>By</th>
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### Laboratory Report

**Sample #:** 2005110081  **Sample ID:** KANIA 2  **Project:** PHASV

**Sample Type:** Water  **Sampled:** 10-May-2000  **Received:** 11-May-2000  **Reported:** 01-Jun-2000  **ATTN:** Carl Cerizo

---

**525 Semivoltiles by GC/MS (ML/EPA 525.2)**

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<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
<th>Prepared</th>
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Sample Type: Water  Sampled: 10-May-2000  Received: 11-May-2000  Reported: 01-Jun-2000

Volatile Organic Compounds (ML/EPA 502.2)

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Report #: 65845
# Volatile Organic Compounds (ML/EPA 502.2)

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</table>
## Laboratory Report

**Sample #:** 7905119021  **Sample ID:** ENNO 2  **Project:** PHASEV

**Sample Type:** Water  **Sampled:** 10-May-2000  **Received:** 11-May-2000  **Reported:** 01-Jun-2000

### EDB and DBCP by GC-ECD (ML/EPA 504.1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det.Limit</th>
<th>Prepared By</th>
<th>Analyzed By</th>
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Report #: 65869
### Laboratory Report

**Sample #** 2005118021  **Sample ID** FAMA 7  **Sample Type** Water  **Sampled** 10-may-2000  **Received** 11-may-2000  **Reported** 01-jun-2000

**Project** PHASEV

---

**Parameter** | **Units** | **Result** | **Conc.** | **Det. Limit** | **Prepared By** | **Received By** | **Analysis By** | **Reported By** |
--- | --- | --- | --- | --- | --- | --- | --- | --- |
Diquat | ug/l | HD | | 0.400 | AQI | 16-may-2000 | 18-may-2000 | CW |
Paraquat | ug/l | HD | | 2.00 | AQI | 16-may-2000 | 18-may-2000 | CW |

---

**Report #** 65849
Summary of positive results, PR65849

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<th>Activity</th>
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<td>Data Entry</td>
<td>05/22/00</td>
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<td>5/19/00</td>
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<td>05/21/00</td>
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<td>5/19/00</td>
<td>Perylene-d12</td>
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<td>5/24/00</td>
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<td>05/24/00</td>
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</tbody>
</table>
(525.2) Except for hexachlorocyclopentadiene from the LFM, recoveries from the LFM and LFB are within method QC limits. This sample was not selected for fortification.
(531) Recoveries from the LFM and LFB are within method QC limits.
(508) LCS recoveries failed low for heptachlor and aldrin. Refer to 525 data for sample results. QIR-GC-00-153.
<table>
<thead>
<tr>
<th>Lab Number</th>
<th>Sample ID Number</th>
<th>Site Description</th>
<th>Time Collected</th>
<th>Date Collected</th>
<th>Sample Type</th>
<th>Membrane Filter Sheen</th>
<th>Non-Coll.</th>
<th>Total Coliform Verification (LTB/BGB)</th>
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</tbody>
</table>

**Collection by:** Monday, June 20, 2005

**Recollected by:** Monday, June 20, 2005

**Received by:** Monday, June 20, 2005

**Temp. Control Initial:** 60°C

**Temp. Control Final:** 120°C

**Sample Type Codes:**
- R: Routine
- RPL: Replacement
- RPT: Repeat
- S: Special
<table>
<thead>
<tr>
<th>Lab Number</th>
<th>State/ID Number</th>
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<td>SAT &gt; 200</td>
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</table>

**Verification:**

- Inoculated by Linao on 5/21/00 at 15:15
- Read at 24 hrs by Linao on 5/22/00 at 15:35
- Controls: LTB (E. coli) 0.05, LTB (S. aureus) 0.05, BGB (E. coli) 0.05, BGB (S. aureus) 0.05
- EC (E. coli) 0.05, EC (E. aerogenes) 0.05

- Reported by (Name) on (Date)
DRAFT
ENVIRONMENTAL ASSESSMENT

North Waihee Water Source Development
Kanoa Well Nos. 1 and 2
(Project No. 97-023)

Waihee, Maui, Hawaii
TMK 3-2-01:por.3

SEPTEMBER 1999
Keros Test Well Sluchi
BM installed by NSW/USC on 9/03

Elevation determined by RTK CS"
March 27, 2003

Mr. George Y. Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, HI 96793

Dear Mr. Tengan:

Well Completion Report for Well No. 5731-02

We received your Well Completion Report Part II for the Kanoa #1 (Well No. 5731-02) on March 21, 2003 and acknowledge that it is complete as of March 21, 2003, with our telephone conversation. Other than the continuing reporting requirements, this completes the permitting requirements for this well.

If you have any questions, please contact Charley Ice of the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Sincerely,

[Signature]

ERNEST Y.W. LAU
Deputy Director

cc: Beylik Drilling, Inc.
MEMO and ROUTE SLIP

WCR 2 Check for Well No. 5731-02 (survey to regulation memo)

1. Pump Tests Check (special condition of PIP? Yes/No) Glenn Bauer (initial if yes)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

   Step-Drawdown Test:
   followed WCPI Stds
   analysis attached
   proposed pump cap o.k.

   Aquifer Pump Test:
   followed WCPI Stds
   T & S analysis attached

   Well Interference:
   estimated Steady-State
   drawdown at 1-mile radius is ft.
   analysis attached

Stream Surface Water Impacted: No If yes, identify most probable stream

Geology Code for Well Index: Wa

2. Pump Installation Check Mitch Ohye (initial)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

   data complete
   followed Special Cond & Elev.
   well database updated

3. Charley/Lenore/Ryan (initial) take action based on above analysis

4. Roy (initial) check

5. Subia (initial) finalize

6. Dean (initial) signature

7. Charley/Lenore/Ryan File
March 11, 2003

Mr. Peter Leong, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Leong:

Subject: Kanoa Well #1 (Well no. 5731-02)

Attn: Mr. Charley Ice

We are enclosing the Well Completion Report - Part II for Pump Installation for Kanoa Well #1 (Well No. 5731-02) along with pump curve for a 1200 gpm pump and the well test pump results and raw data. We are also enclosing a copy of the FEA and publication notice for development of Kupaa Well #1. We will be submitting the application for pump installation for Waikapu Mauka Well in the very near future.

Thank you for the reminder. If there are any questions, please call our Engineering Division at...

Sincerely,

George V. Tengan
Director

hk
enc.

"By Water All Things Find Life"
TO: Herb Kogasaka  
FROM: Charles Ice  

Date: 06 March 03

Transmitting WCR 2 form for Kāne‘ohe.

After looking at files, three wells have requirements to proceed.

Kāne‘ohe: WCR 2 (current form), pump test results (date), pump curve

Kūpa‘a: documentation of completed Ch. 343 process

Waikapū Mauka: need application for pump installation

Return Fax: [redacted]
Return Post: P.O.Box 621, Honolulu 96809
Mr. George Tengan, Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, HI 96793  

Dear Mr. Tengan:

Permanent Pump Installation  
Kānoa Well #1 (Well No. 5731-02)

This is to inform you that the permanent pump installation permit for a 1200-gpm pump, issued in September of 1999, has expired. You submitted a well completion report, part 2 (WCR2, pump installation) in May of 2000 for a temporary 870-gpm pump. Since then, we have received no further correspondence on this matter, and have not accepted the WCR2 as complete, due to the following:

1. We are anticipating your directions concerning the 1200-gpm permanent pump.  
2. We have no pump curve for the 870 gpm pump.  
3. We have not received any raw data to review for this well’s pump test.

We would like to know your plans concerning the temporary status of this pump as it has been over two years since your last update on this well, especially as the Waihee Aquifer System is the subject of designation proceedings.

If you have any questions, please call Charley Ice of the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Sincerely,

Peter T. Young  
Chairperson
Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson,

RE: Final Environmental Assessment (FEA), for the Kupaa Well No. 1 and Water Transmission Line at Waihee, Maui, Hawaii (TMK: 3-2-001:003 portion)

The Department of Water Supply has reviewed the final environmental assessment for the subject project, and has determined that a Findings of No Significant Impact (FONSI) is warranted. Please publish notice of availability for this project in the May 23, 2002, OEQC Environmental Notice.

We have enclosed four (4) copies of the Final EA, and will be transmitting a completed OEQC Publication form and project summary via e-mail (e-mail will be transmitted by Chris Hart & Partners). Should you have any questions, please call our Engineering Division at [number] or Mr. Rory Frampton of Chris Hart & Partners at [number].

Very truly yours,

David Craddick, Director
County of Maui, Department of Water Supply

Encls.

Cc: Mr. Herbert Kogasaka
    Mr. Carl Takumi
    Mr. Rory Frampton

"By Water All Things Find Life"
Development of the project will consist of clearing, grubbing, grading; installation of a pump and related electrical controls; 500,000 gallon reservoir; equipment building with disinfection and electrical equipment; piping, fencing, and related work. A 16-inch transmission waterline is planned to carry water from the Kupa'a 500,000 gallon reservoir to Kanoa Well No. 1 where the water will then be transported via an existing 24-inch transmission line to the Central Maui Water System. The short-term impacts associated with these activities are not anticipated to have a significant impact upon existing land uses at the site or in the region.

The project is not anticipated to have any adverse impacts upon existing environmental features such as flora and fauna, topography, soils, or air quality. The project is not anticipated to have an impact upon archaeological or historical features.

The proposed project will not have an adverse impact upon existing socio-economic conditions nor will it have an adverse effect upon existing public services or infrastructure.

In light of the forgoing, the proposed project will not result in significant environmental impacts to the environment and a Finding of No Significant Impact (FONSI) is warranted.

Previously Published Projects Pending Public Comments

Environmental Impact Statement Preparation Notices

**Lahaina Watershed Flood Control Project**

** Applicant:** County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawai‘i 96793
Contact: Joe Krueger

**Approving Agency/Accepting Authority:** Mayor, County of Maui
200 South High Street
Wailuku, Hawai‘i 96793

**Public Comment Deadline:** June 7, 2002 (see also, page 16).
Kanoa Step Draw Down

6-5731-02

Time

Draw Down per Ft.
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<th>Time</th>
<th>Reading</th>
<th>Draw Down per Ft.</th>
<th>GPM</th>
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INSTALLATION REPORT

DATE 10 DEC 01
JOB 1197 D KANOA #1 6-5731-02
SWL 301' 7"
DEPTH 364' 4"

AS BUILT

NO. CONDUCTOR
440 VOLT POWER CABLE

10" COLUMN PIPE IN RANDOM 20' LENGTHS

CABLE CLAMPS EVERY 10 FT.

CHECK VALVE(S) LOCATED 7' ABOVE PUMP

PUMP MODEL # 0104AF000957-1
2 STAGE MAKE BJ 12 MB SUB.

SER # 34395034-01
MFGR MODEL # 34395034-0 SIZE 12"

HP 200 RPM VOLTS 460
PH 3 CY 60 FRAME
FLA 263
Kanoa Long Term Test

Time

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-0.7500
-1.0000
-1.2500
-1.5000
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### Kanoa Long Term Test

#### 5/17 02

Pumping Rate 96 Hrs. @ 1200 GPM

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## Kanoa Long Term Test

**Pumping Rate 96 Hrs. @ 1200 GPM**

<table>
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<th>Transducer Reading</th>
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FINAL ENVIRONMENTAL ASSESSMENT

North Waihee Water Source Development
Kanoa Well Nos. 1 and 2
(Project No. 97-023)

Waihee, Maui, Hawaii
TMK 3-2-01:por.3

NOVEMBER 1999
FINAL
ENVIRONMENTAL ASSESSMENT

North Waihee Water Source Development
Kanoa Well Nos. 1 & 2
(Project No. 97-023)

Waihee, Maui, Hawaii
TMK 3-2-01:por.3

Prepared for:
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793

Engineering Consultant:
C. Takumi Engineering, Inc.
18 Central Avenue
Wailuku, Maui, Hawaii 96793

Planning Consultant:
Chris Hart and Partners
Landscape Architecture and Planning
1955 Main Street, Suite 200
Wailuku, Maui, Hawaii 96793
Phone: (808) [redacted]

NOVEMBER 1999
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I. INTRODUCTION

A. IDENTIFICATION OF THE PROPOSING/ACCEPTING AUTHORITY AND CONSULTANTS

Proposing Agency/Accepting Authority:
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793

Engineering Consultant:
C. Takumi Engineering, Inc.
18 Central Avenue
Wailuku, Hawaii 96793

Planning Consultant:
Chris Hart & Partners
Landscape Architecture and Planning
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

B. OVERVIEW OF THE REQUEST

The County of Maui Department of Water Supply (DWS) is proposing the development of two wells in Waihee, Maui, Hawaii (TMK 3-2-01: por. 03) (See Figure 1 and 2). The project will involve the well development and pump installation for Kanoa Well Nos. 1 and 2 (previously known as Waihee Well Nos. 4 and 3, respectively).

DWS prepared and processed a Final Environmental Assessment (EA) for the Waihee Wells and Transmission line in March 1994 (Michael T. Munekiyo Consulting, 1994). The 1994 Final EA document examined the activation of Waihee Well Nos. 1 and 2, installation of a new 500,000-gallon water tank, construction of approximately 4.26 miles of underground transmission line, and the drilling of Kupaa Well No. 1 and Kanoa Well No. 1. (This project is now collectively referred to as the North Waihee Water Source Project.) The particular focus of the 1994 Final EA document was the activation of Well Sites 1 and 2 and the construction of the 4.26 miles of transmission line, including the Waihee Stream crossing, and connection to the Central Maui Water System. Development of Kupaa Well No. 1 and Kanoa Well No. 1 were discussed, however, at the time the actual sites had not been chosen and thus the specific impacts could not be assessed. Thereafter, the DWS prepared and processed a Final Environmental Assessment (EA) to assess the potential impacts associated with the exploratory drilling of Kupaa Well No. 1 and Kanoa Well No. 1 (Chris Hart & Partners, 1997).
Well pumping and water quality test results from Kanoa Well No. 1 have been completed and results support well development and pump installation at the proposed capacities. Kanoa Well No. 2 is proposed within the same general vicinity as Kanoa Well No. 1.

The purpose of this Draft EA is to assess the potential impacts associated with the well development of Kanoa Well Nos. 1 and 2.

C. BACKGROUND INFORMATION

The Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, demand from Central Maui has already reached this sustainable yield and threatens to exceed it in the next few years. As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring indicates that the North Waihee Aquifer can adequately supplement the Iao System.

The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. Testing has indicated that the Waihee Aquifer is quasi-independent from the Iao Aquifer System and that the direction and flow of the Iao Aquifer is toward and across Waihee Valley (Mink and Yuen, Inc., 1997). It has been estimated that the entire North Waihee Aquifer could supply the Central Maui Water System with an additional average annual yield of 8 mgd (Mink and Yuen Inc., 1997).

The North Waihee Water Source Development Project presently comprises 5 wells, associated transmission lines, pumps, electrical buildings, and related improvements. North Waihee Wells Nos. 1 and 2 (State Well No. 5631-02 & 5631-03, respectively) and transmission lines to the Central Maui Water System were placed into operation in 1999 and have a pumping capacity of 1.5 mgd each. The DWS is in the process of developing Kupaa Well No. 1 (State Well No. 5731-03). Kanoa Well No. 1 (State Well No. 5731-02) had exploratory drilling and water quality testing conducted in 1999 and is currently proposed for development along with Kanoa Well No. 2 (State Well No. 5731-04), which is in the same general vicinity as Kanoa Well No. 1. The following 5 wells comprise the DWS's North Waihee Water Source Project:

<table>
<thead>
<tr>
<th>WELL</th>
<th>STATUS</th>
<th>PUMPING CAPACITY</th>
<th>AVE. DAILY USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Waihee Wells 1 and 2 (State Well Nos. 5631-02, 03)</td>
<td>Developed</td>
<td>3.0 mgd</td>
<td>1.980 mgd</td>
</tr>
<tr>
<td>Kanoa Well Nos. 1 and 2</td>
<td>Currently Proposed</td>
<td>3.4 mgd (proposed)</td>
<td>2.244 mgd</td>
</tr>
<tr>
<td>(State Well Nos. 5731-02, 04)</td>
<td>Future Development</td>
<td>1.7 mgd (proposed)</td>
<td>1.122 mgd</td>
</tr>
<tr>
<td>Kupaa Well</td>
<td>Future Development</td>
<td>1.7 mgd (proposed)</td>
<td>1.122 mgd</td>
</tr>
<tr>
<td>(State Well Nos. 5731-03)</td>
<td></td>
<td>8.2 MGD</td>
<td>5.4 MGD</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>8.2 MGD</td>
<td>5.4 MGD</td>
</tr>
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</table>
According to the State Commission on Water Resource Management (Commission), the pump tests for the Kanoa Well No. 1 and Kupaa Well No. 1 wells indicate that the average pump capacity will not exceed 1.15 mgd. Commission staff will base their pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

Several private wells also exist within the North Waihee Aquifer System. These wells include:

<table>
<thead>
<tr>
<th>WELL</th>
<th>STATUS</th>
<th>PUMPING CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marino Well A and B</td>
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<tr>
<td>(State Well Nos. 5631-04, 05)</td>
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<td></td>
</tr>
<tr>
<td>Mendes Well</td>
<td>Developed</td>
<td>144,000 gpd</td>
</tr>
<tr>
<td>(State Well No. 5731-01)</td>
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<tr>
<td>Unknown</td>
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<td>Unknown</td>
</tr>
<tr>
<td>(State Well No. 5832-01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahakuloa Acres</td>
<td>Developed</td>
<td>Unknown</td>
</tr>
<tr>
<td>(State Well No. 5832-02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahakuloa Acres / Wailena State Well No. 5832-03</td>
<td>Developed</td>
<td>288,000 gpd</td>
</tr>
</tbody>
</table>

The Marino and Mendez Wells are small residential wells. The Kahakuloa and Wailena wells are used for residential and irrigation purposes. Current water use in the area has been limited due to limited development in the region. The North Waihee Aquifer has not been designated as a water management area; as such, the Commission on Water Resource Management has not established controls on the use of this water.

The North Waihee Water Source Development Project is being implemented to develop new sources of water to meet the needs of future development in the Central Maui Service Area.

D. DESCRIPTION OF PROPOSED ACTION

The DWS is proposing the development of Kanoa Well Nos. 1 and 2. Kanoa Well No. 1 is located mauka (west) of Kahekili Highway, approximately 100 feet inland from the existing Kanoa monitoring well and at an approximate elevation of 310 feet above mean sea level. Kanoa Well No. 2 is situated approximately 600 feet to the southwest of Kanoa Well No. 1, adjacent to the existing access road for the North Waihee Reservoir, at an approximate elevation of 275 feet above mean sea level. (See Figures 1 and 2).

Development of Kanoa Well No. 1 will consist of clearing, grubbing, grading, installation of a pump and related electrical controls, construction of a small electrical building, piping, fencing, and related work. The proposed electrical building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other appliances (See Figure 4a). The well has been drilled 359 feet below ground surface or about 50 feet below mean sea level. The water surface elevation of the basal aquifer is at elevation 7.93 feet.
Kanoa Well No. 2 will be developed in the same manner as Kanoa Well No. 1, but will also support a chlorination facility that will be attached to the proposed electrical building. The chlorination facility will be used to disinfect water from both wells and will be built slab on grade with asphalt shingle roofing (See Figure 4b). Kanoa Well No. 2 will be drilled approximately 330 feet below ground surface or about 50 feet below mean sea level.

The pumping facility for each site will have the following specifications:

<table>
<thead>
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<th>Pump Type</th>
<th>Deepwell Submersible</th>
</tr>
</thead>
<tbody>
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<td>Pump Rating</td>
<td>1,200 gpm @ 450' TDH</td>
</tr>
<tr>
<td>Motor</td>
<td>Submersible, 200 HP, 1750 RPM</td>
</tr>
<tr>
<td>Power Supply</td>
<td>480 volt, 3 phase, 60 Hz</td>
</tr>
<tr>
<td>Piping</td>
<td>Ductile Iron</td>
</tr>
<tr>
<td>Appurtenances</td>
<td>Check Valve, Air and Vacuum Valve</td>
</tr>
<tr>
<td>Flow Tubes</td>
<td>Cast Iron with a bronze liner with transmitters and receivers</td>
</tr>
</tbody>
</table>

A 12-inch transmission water line is planned to transport water approximately 800 feet from Kanoa Well No. 1 along the existing access route to an existing 24-inch transmission waterline where the water will be transported to the existing 1.0 MG North Waihee Reservoir. Water developed from Kanoa Well No. 2 will also be transported to the North Waihee Reservoir via the existing 24-inch waterline (See Figure 2). Water from the proposed wells will be used to service the Department of Water Supply's Central Maui Water System.

Each respective site will be cleared, grubbed, and graded. The adjacent slopes will be grassed, and access roads and well sites will be paved. Installation of transmission water lines, construction of accessory buildings, and pump installation and related piping will be required at each site. Electrical and telemetry equipment will also be installed at each site while disinfection equipment is proposed for just the Kanoa Well No. 2 site. Each site will be fenced.

Electrical power will be obtained from the Maui Electric Company. A generator will be located at the chlorination facility (Kanoa Well No. 2) and will be automatically activated during power outages.

The Maui County Board of Water Supply will provide funding for the project. Operation and maintenance will be the responsibility of the Department of Water Supply. It is estimated that the cost of the proposed improvements will be approximately $1.74 million (C. Takumi Engineering, Inc.). The design and operation of both wells will be in conformance with the "Water System Standards," Department of Water Supply, County of Maui, 1985 (C. Takumi Engineering, Inc., 1999).

Access to Kanoa Well No. 1 will be via a paved driveway that traverses an existing access easement over undeveloped pasture owned by Wailuku Agribusiness Co. The access easement is on slightly sloping lands that are relatively easy to access.
Access to Kanoa Well No. 2 will be via the existing paved roadway that services the North Waihee Reservoir.
II. EXISTING ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Orientation/Land Use Data

   Tax Map Key: (2) 3-2-001:003 (portion)
   State Land Use Classification: Agricultural
   County Zoning: Agricultural
   Wailuku/Kahului Community Plan: Agricultural
   Flood Zone: C

   The proposed wells are located on the northern slopes of the West Maui Mountains north of the village of Waihee on the Island of Maui (See Figure 1). Each respective well is located on a one-acre perpetual easement mauka of Kahekili Highway at approximate 310 feet (Kanoa 1) and 275 feet (Kanoa 2) above mean sea level. The proposed wells are approximately 2,000 feet from the ocean and the nearest adjacent structure is over 1,000 feet east of each well.

2. Existing Land Uses for the Subject Property

   Kanoa Well No. 1 is located within an area that was previously cleared during the well drilling phase. The surrounding area is pastureland and is presently covered with various grass, weeds, and shrubs. An existing monitoring well, Kanoa, is located approximately 100 feet east (makai) of the existing well site. The subject property has been used in recent times for agricultural pursuits, principally the grazing of cattle and horses.

   The proposed Kanoa Well No. 2 site is located adjacent to the existing North Waihee Reservoir access road in an area that was previously cleared for installation of electrical transmission lines. Grazing of cattle and horses has been the predominant land use for the last several decades.

   Kanoa Well Nos. 1 and 2 each maintain an easement area of approximately 1-acre, but only a small portion of each respective site will be impacted by the proposed developments (See Figure 4).

   Analysis. The proposed wells, and appurtenant facilities, are located within a sparsely populated and largely undeveloped area that is buffered by pasturelands, gullies, and
hills. Only a small portion of each site will be affected by the short-term activities associated with the proposed project, i.e. grading, grubbing, drilling, and other construction related activities. A majority of each site will be retained in open space while the electrical and electrical/chlorification buildings will be small one-story structures, approximately 500 sq. ft. and 1,600 sq. ft., respectively. Access to each site will be provided via a paved driveway with parking provided on-site. Thus, it is not anticipated that the proposed action will have a significant impact upon existing land uses at the sites or in the project area.

3. Surrounding Land Uses

The well sites, which are located approximately five (5) miles north of the urbanized region of Wailuku Town, are surrounded by an area that is characterized by an open pastoral setting, comprised of various agricultural settlements interspersed with low density residential uses (See Figure 5).

Specific uses surrounding the sites include the following:

Kanoa Well No. 1

- **North**: Vacant undeveloped lands in pastoral use. Further north are the Kahakuloa Homesteads.

- **South**: Vacant undeveloped lands in pastoral use. Further south is the town of Waiheee.

- **East (Makai)**: Across Kahekili Highway, additional lands in pastoral use and further east is the rugged shoreline.

- **West (Mauka)**: Vacant undeveloped lands in pastoral use. Further west is the West Maui Forest Reserve.

Kanoa Well No. 2

- **North**: Vacant undeveloped lands in pastoral use. Further north is Kanoa Well No. 1 and further beyond are the Kahakuloa Homesteads.

- **South**: Vacant undeveloped lands in pastoral use. Further south is the DWS reservoir and booster pump site and beyond is the town of Waiheee.

- **East (Makai)**: Across Kahekili Highway, additional lands in pastoral use and further east is the rugged shoreline.

- **West (Mauka)**: Vacant undeveloped lands in pastoral use. Further west is the West Maui Forest Reserve.
Analysis. As noted above, each site maintains an area of approximately 1-acre, but only a small portion of each site will be affected by the wells. A significant majority of each site will be retained in open space while the electrical and electrical/chlorification buildings will be small one-story structures. Access to each site will be provided via a paved driveway with parking provided on-site. The short-term activities associated with drilling and construction, are not anticipated to have a significant impact upon land uses in the vicinity of the project.

4. Climate

Located on the coastal uplands of the West Maui Mountains, Waihee’s climatic pattern is heavily influenced by the northeasterly tradewinds as is typical of windward areas in the Hawaiian Islands. In the absence of the tradewinds, diurnal heating and cooling of the Island produces onshore sea breezes during the day and offshore land breezes at night. The average annual rainfall at the well sites is approximately 30 to 40 inches, with showers usually more frequent during the night and early morning. Average temperatures range from lows in the mid 60’s to highs in the mid 80’s.

The proposed wells will have no effect upon existing climatic conditions.

5. Topography

The topography of the surrounding area is characterized as having slopes cut by numerous erosional gullies and established drainage patterns. The elevation at Kanoa Well No. 1 is approximately 311 feet above mean sea level while the elevation at Kanoa Well No. 2 is approximately 350 feet above mean sea level. The topography slopes in a mauka-makai direction with the slopes around 20%. There does not appear to be any significant topographical constraints within the areas proposed for the wells.

Analysis. Development of each respective site will be implemented using best management practices and steps will be taken to avoid permanent changes to topographical features in the vicinity of the well sites. At the Kanoa No. 1 site a natural swale lies north of the site and will be used to dispose of storm runoff generated by the site. Access provided to each site will be via a paved driveway and the disturbed area around the project sites will be to minimize runoff and erosion during periods of heavy rain. As such, once completed, the proposed project is not anticipated to have a significant impact upon topographical features of the surrounding area.

6. Soils

The soil type specific to Kanoa Well Nos. 1 and 2 is Rough Broken land (rRR). rRR soils consist of very steep land broken by numerous intermittent drainage channels. Runoff is rapid and geologic erosion is active. The proposed wells will not have a significant effect upon existing soils at the site or those that surround the site.
7. Flood and Tsunami Hazard

Kanoa Well No. 1 and 2 lie within Flood Zone C, an area of minimal flood and tsunami hazard, as determined by the Flood Insurance Rate Map for this region. A Drainage and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction.

The proposed project will have no effect upon the existing flood or tsunami areas.

8. Aquifer Unit Status

Sustainable Yield: The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley (See Figure 3). However, the basal aquifer may be disrupted near Makamakaole Valley by massive Honolua dikes. The sustainable yield for the entire North Waihee Aquifer is estimated at 8 mgd and the estimated sustainable yield for the area between Waihee and Makamakaole will be less. The proposed wells will aid in determining the aquifer conditions and sustainable yield for the North Waihee Aquifer System.

Current pump capacity: The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields within Wailuku Agribusiness Company properties between Waihee Stream and Kupaa Gulch. North Waihee Wells 1 & 2 are in well field one; Kanoa Well Nos. 1 and 2 are proposed for development and are within well fields 2 and 3, respectively; Kupaa Well is part of well field 5 is in the early design/development planning stages.

Current pump capacity in the North Waihee Aquifer consists of the North Waihee Wells 1 and 2 with a combined pumping capacity of 3 mgd. Private well use is limited and consists of the Mendes Well (State Well No. 5731-01), a small residential well; the Wailena well (State Well No. 5832-03), a residential subdivision well at Wailena; and, the Marino Well (State Well No. 5631-04), a small residential subdivision well. The lack of development in the area has kept pumpage of these wells to a minimum. The Commission on Water Resource Management has no record of the current water use totals.

Current and pending installed capacity: The two existing North Waihee Wells have a pumping capacity of 3 mgd. The Mendes well is too small for either the quality or quantity of its pumpage to be affected. The well at Wailena was drilled and successfully tested at 200 gpm. Pumping from the proposed sites should not affect the Wailena Well because of its distance from the proposed wells. The Marino Well has a 100 gpm pump.

Kupaa Well is currently being developed and will have a pumping capacity of 1.7 mgd. Once on line, Kanoa Well Nos. 1 and 2 will have a combined pumping capacity of 3.4 mgd. Thus, total pumping capacity from the North Waihee Aquifer will be just over 8.2 mgd. It is not anticipated that the pumps will run simultaneously, nor continuously,
except under emergency conditions. Average daily pumping is expected to be about 16 hours per day, which would produce an average daily yield of approximately 5.4 mgd, depending upon demand.

**Authorized water use by the Commission on Water Resource Management:** The Commission on Water Resource Management has not designated The North Waihee Aquifer as a water management area; therefore, authorized water use controls have not been implemented by the Commission.

### 9. Contamination Analysis and Vulnerability Assessment

The recharge area estimated for the Waihee Aquifer is about 12 square miles between the Waihee and Kahakuloa Valleys. The proposed wells are located within an agriculturally zoned area that has predominantly been used for rangeland. No known pesticides have been used on the property for decades. There are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. Agricultural and conservation zoning within the recharge area limits future land use options and restricts population growth in the area. Conservation zoning requires that permits be obtained prior to urban or agricultural uses being conducted. There are no feedlots, sanitary landfills, or public dumps within the aquifer recharge area. The limited residential development that exists is serviced by individual wastewater disposal systems.

Water quality samples taken from the North Waihee Wells 1 and 2, Kupaa Well, and Kanoa Well 1 during well pumping testing confirms that the subject water is free of pesticides and other contaminants. The only anticipated source of contamination is biological; thus, water treatment to mitigate potential contamination will consist of disinfection (C. Takumi Engineering, Inc., 1999). The space around the well casing will be grouted from just above the aquifer level to ground surface to prevent surface waters from entering the well.

### 10. Hydrologic Impact Analysis

The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. Testing has indicated that the Waihee Aquifer is quasi-independent from the Ioa Aquifer System and that the direction and flow of the Iao Aquifer is toward and across Waihee Valley (Mink and Yuen, Inc., 1997). It has been estimated that the entire North Waihee Aquifer could supply the Central Maui Water System with an additional average annual yield of 8 mgd (Mink and Yuen Inc., 1997). As discussed, water quality samples taken from the North Waihee Aquifer System confirms that the subject water is free of pesticides and other contaminants. The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards” to insure that the proposed action does not result in pollutants penetrating the aquifer. In addition, average daily pumping is
anticipated to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield. Thus, the proposed action should not significantly impact ground water resources.

Streams: There are no perennial streams in close proximity to the well sites. The nearest perennial streams are Waihee and Makamakaole.

Makamakaole stream flows on the Honolua formation and nowhere does it intersect the Wailuku formation, which is the aquifer proposed for development. Pumping in the Wailuku formation will have no effect on the Makamakaole stream flow. The stream is located approximately 3,500 feet away from the proposed wells.

Except for the mouth of Waihee Stream, the water table in the aquifer lies below the invert of the Waihee stream channel. Any effect on stream flow will be very small and not likely to be measurable. The stream is about 4,000 feet distant from the proposed wells.

Wetlands: A large wetland occurs in the headwater region of Makamakaole Stream, and a smaller wetland occurs at the mouth of Waihee Stream.

The Makamakaole wetlands extend irregularly over a distance of about 2.5 miles from Eke crater toward the sea and range in elevation from 4,500 feet above MSL to 2,800 feet above MSL. They lie on the Honolua formation and are sustained by perched water in the formation. There is no hydraulic continuity between these wetlands and the Wailuku formation. They will not be affected by pumping in the Wailuku aquifer. The lowest reach of the wetlands is two miles from the proposed wells.

The wetlands at the mouth of Waihee Stream are a mile away from the proposed wells. A reduction in head in the Wailuku aquifer may diminish seepage into the wetlands but probably not enough to be detectable. The wetlands are in valley fill alluvium and are sustained mostly by seepage from Waihee Stream.

11. Watershed and Land Use Analysis

As noted, the Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, demand from Central Maui has already reached the system’s sustainable yield and threatens to exceed it within the next few years. As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring indicates that the North Waihee Aquifer can adequately supplement the Iao System with an average daily sustainable yield of 8 mgd.

The Central Maui Water System services the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waihee, Spreckelsville, Paia/Kuau, Kihei and Puunene (See Figure 6). This region comprises the majority of the County’s
economic activity, and maintained a resident population of approximately 49,750 persons in 1990, about 54% of the Island of Maui’s resident population.

The Department of Water Supply estimates that year 2010 demand within the Central Maui Water System will range from 27 mgd to 29 mgd depending upon the method of forecast (Per conversation with DWS). The "Historical Trend" method, utilized by the DWS in the Water Use and Development Plan, uses a linear extrapolation of 0.5 mgd/year, which equates to a forecasted water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd, or a 8.5% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 was 18.1 mgd. Comparatively, the water consumption reported by the Annual Report for Fiscal Year 1997, Board of Water Supply, County of Maui, averaged 19.3 mgd, or a 6.6% deviation (C. Takumi Engineering, Inc., 1999).

The future requirements of service as forecasted above are based upon a mix of residential, commercial, institutional and other needs of the community. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku regions are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes.

The following table summarizes projected water demand relative to existing and proposed supply for the year 2010.

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Demand/Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iao Aquifer</td>
<td>20 mgd</td>
</tr>
<tr>
<td>North Waihee Aquifer</td>
<td>8 mgd</td>
</tr>
<tr>
<td>Iao Tunnel</td>
<td>1.5 mgd</td>
</tr>
<tr>
<td>Wastewater Reuse</td>
<td>1.2 mgd</td>
</tr>
<tr>
<td>Retrofit and Conservation</td>
<td>.50 mgd</td>
</tr>
<tr>
<td>Total Supply</td>
<td>31.2 mgd</td>
</tr>
<tr>
<td>Projected Demand*</td>
<td>29 mgd</td>
</tr>
<tr>
<td>Net Surplus/Deficit</td>
<td>2.2 mgd</td>
</tr>
</tbody>
</table>

* Conservative estimate of projected water demand.

12. Flora and Fauna

The exploratory well sites are situated within the pastoral setting of Waihee. Natural environmental features, such as plant and animal life, therefore, are reflective of this pastoral setting. Existing vegetation at the actual well sites is non-existent due to previous clearing for well drilling and access way construction. There are no rare, endangered or threatened species of plants at the well sites.
Animal life in the vicinity similarly reflects the pastoral setting of the region. Avifauna typically found within Waihee's pastoral area include the common myna, several species of dove, cardinal, house finch, and house sparrow. Mammals common to this area include cats, dogs, rodents, and mongoose.

There are no known significant habitats of rare, endangered or threatened species of flora and fauna located at the exploratory well sites. Therefore, the proposed wells will not have an adverse impact upon the flora or fauna found in the area.

13. Air Quality

Waihee's constant exposure to tradewinds creates a clean air environment. There are no point sources of airborne emissions in the immediate vicinity of the exploratory well sites, and the air quality at the sites is considered good.

Air quality impacts attributed to the development of each well and appurtenant facilities could include dust generated by short-term drilling and construction-related activities. Mitigation measures for dust control, such as regular watering and sprinkling, will be implemented as needed to minimize wind-blown emissions. The pumps utilized during drilling will be diesel driven and may produce diesel fumes which could impact local air conditions. Permanent pumps will be electrical and will produce no air emissions. During drilling, the DWS will adhere to the State Department of Health's rules and requirements for air emission controls regarding this issue. As such, the proposed wells are not anticipated to be detrimental to local air quality.

14. Noise Characteristics

Background noise at the well sites is natural, except for intermittent noise generated by vehicles on Kahekili Highway.

It is anticipated that drilling related activities may impact noise levels, however, the nearest potentially sensitive receptor site is a dwelling located more than 1000 feet to the east. This distance will mitigate potential noise impacts. In addition, in order to minimize noise related impacts, the applicant proposes to limit drilling activities to normal daylight working hours and adhere to the State Department of Health's noise regulations for drilling equipment. Once completed, it is anticipated that the wells will not have an adverse impact upon existing noise characteristics.

15. Visual Resources

The well sites are located on the mauka side of Kahekili Highway. Scenic resources within proximity to the well sites include views of the nearby shoreline, open space natural drainage ways (gulch areas), and views of Haleakala's northshore.

Once completed, the wells will be at or near grade. The proposed single-story accessory structures are minimal in mass and bulk and are permitted within the State and County
Agricultural Districts. As such, the proposed project is not anticipated to have an adverse affect upon scenic resources.

16. Archaeological/Historical Resources

An Archaeological Reconnaissance Surface Survey was conducted for Kanoa No. 2 on July 6, 1993, (Michael T. Munekiyo Consulting, 1994) and for Kanoa Well No. 1 on March 27, 1997. SEE APPENDIX A - ARCHAEOLOGICAL RECONNAISSANCE SURFACE SURVEY.

The Archaeological Reconnaissance Surface Survey conducted in 1993 examined a 300/1000 ft-long alignment (Transect “B”) extending upslope within the immediate area of Kanoa Well No. 2. The study states that “nothing of archaeological or historical value was observed in this transect” (Michael T. Munekiyo, 1994).

At Kanoa Well No. 1 a rock feature was noted within 300 feet of the existing monitoring well.

The March 1997 Reconnaissance Surface Survey recommended the following:

**Kanoa Well No. 1**

1) Limited subsurface testing at the inventory level should be undertaken if the permanent well will be placed beyond the area previously cleared for the existing Kanoa monitoring well.
2) Monitoring of the initial placement of the permanent well should be undertaken. Care must be utilized in order to avoid the adjacent areas covered with trees. The possibility exists that 1 or more indigenous sites are contained in the densely wooded areas.

Kanoa Well No. 1 was not to be located beyond the area previously cleared for the existing Kanoa monitoring well. The adjacent areas, which are covered with trees, were not to be affected or altered. Agricultural activities continuing since the late historic period have extensively affected the areas proposed for both of the wells. Recent clearing for the Kanoa Well No. 1 site and the Reservoir access road has already disturbed the existing project sites. As such, the proposed project is not anticipated to have an impact upon archaeological or historical features.
B. SOCIO-ECONOMIC ENVIRONMENT

1. Population and Economy

The population of the County of Maui has exhibited relatively strong growth over the past decade with the year 2000 population estimated to be 124,562, an approximate 24% increase over the 1990 population of 100,504 (County of Maui Data Book, 1996-97). Growth in the County is expected to continue, with resident population to the year 2005 and 2010, estimated to be 134,064 and 140,060, respectively.

The Wailuku-Kahului region is the island's center of commerce, including a wide range of commercial, service, professional, and governmental activities. The large agricultural tracts of lands that encompass the region, mainly owned by Hawaiian Commercial & Sugar and Wailuku Agribusiness Company, are also a vital part of the region's economy.

The Central Maui Water System services both the residential and commercial areas of Central Maui, including Paia and South Maui, which are expected to continue to grow. The growth rate of these regions continues to place additional stress on the Iao Aquifer System, which is currently at or near its sustainable yield. The North Waihee Water Source Development Project is intended to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. The wells are intended to provide additional alternatives to service the region’s population and economic centers.

C. PUBLIC SERVICES

1. Recreational Facilities

The well sites are in close proximity to numerous recreational opportunities, including Maui War Memorial Complex, Maui Zoological and Botanical Gardens, Waihee Beach Park, and Waiehu Golf Course. In addition, there are numerous ocean related activities near by.

The subject wells will not impact existing recreational facilities.

2. Police and Fire Protection

Police protection for the region is provided by the County Police Department headquartered at the Wailuku station approximately six (6) miles away. The Central Maui Patrol includes approximately 100 full time personnel.

The County Department of Fire Control’s Wailuku Station and Kahului Station provide fire prevention, suppression, and protection services.

The proposed project is not anticipated to affect police or fire protection.
3. Solid Waste

The County of Maui provides weekly solid waste collection services to residential properties in the area. Drilling will produce residual crushed rock and soil materials. These materials will be spread out evenly at the drilling sites. After completion of the wells, there will be no long-term generation of solid waste products. Therefore, the project will have no impact upon solid waste services.

4. Health Care

Medical facilities are located approximately six (6) miles from the well sites at Maui Memorial Hospital and at various private practices and clinics in Kahului and Wailuku.

The exploratory wells are not anticipated to have an impact upon medical services in terms of service area.

5. Schools

Public schools that serve residents in the Waihee area include Waihee Elementary School, Grades K-5; Maui Waena Intermediate, Grades 6-8; and Maui High School, Grades 10-12.

The exploratory wells are not anticipated to have an impact upon the region's public school system.

D. INFRASTRUCTURE

1. Roadways

Access to the proposed wells is off of Kahekili Highway, a two-lane State highway that provides access from Central Maui to Kahakuloa and further on to Kapalua.

No roadway improvements are proposed as part of the project. In the short-term, during the construction phase, the project may involve a relatively insignificant increase in traffic levels for the region. However, once completed, the wells will have no impact upon local traffic conditions.

2. Wastewater

Wastewater disposal in the Waihee community is accommodated via cesspools or individual wastewater treatment systems such as septic tanks. There are no existing County or private wastewater collection and treatment facilities in this area.

The proposed wells will not have any impact upon the County's wastewater system.
3. **Water**

As noted in the background section, the Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, the demand from Central Maui has already reached this sustainable yield and threatens to exceed it in the next few years (Mink and Yuen Inc., 1997). As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring of the North Waihee Aquifer has indicated that it can adequately supplement the Iao System. It has been estimated that the North Waihee Aquifer project could supply the Central Maui Water System with an additional average yield of 8 mgd.

DWS has completed construction of the transmission lines to connect North Waihee Well Nos. 1 and 2 to the Central Maui Water System. Kupaa Well No. 1 is now in the design/development-planning phase. As part of the County's North Waihee Water Source Project, Kanoa Well Nos. 1 and 2 will provide alternate sources of water for the Central Maui Water System, and as such, should have a beneficial impact upon the Iao Aquifer System by minimizing the potential for over pumping. In addition, the proposed wells will provide valuable data regarding the long-term sustainable yield potential from the North Waihee Aquifer.

4. **Drainage**

Storm-water runoff generated at the well sites percolates into the ground or sheet flows across the sites from the high points to the low points and eventually into adjacent gulches.

The proposed action involves minimal land alteration activities and will not significantly alter drainage patterns in the area.

Normal erosion control measures during construction should be adequate to control soil loss from the well sites. These measures include the following:

- Leave natural vegetation undisturbed in areas not needed for immediate construction;
- Use sprinklers to control dust; and
- Water down any disturbed areas after drilling activity has ceased for the day and during weekends and holidays.

In addition, access roads to each site will be paved and surrounding vegetation planted to mitigate runoff and erosion during periods of heavy rain. As such, the subject wells are not anticipated to have an adverse affect upon the existing hydrologic conditions, adjoining or downstream properties, or coastal waters.
III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICT

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural" and "Conservation". The subject parcel is within the "Agricultural" District. The proposed project is permitted within the "Agricultural" District.

B. MAUI COUNTY GENERAL PLAN

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter, "The purpose of the General Plan is to recognize and state the major problems and opportunities concerning the needs and the development of the County and the social, economic and environmental effects of such development and set forth the desired sequence, patterns and characteristics of future development."

The proposed action is in keeping with the following General Plan Objective and Policies:

Objective:

To supply an adequate supply of potable and irrigation water to meet the needs of Maui County's Residents.

Policy:

Support the improvement of water transmission systems to those areas that historically experience critical water supply problems provided the improvements are consistent with the water priorities and the County's Water Use Development Plan provisions for the applicable community plan area.

Policy:

Seek new sources of water by exploration in conjunction with other government agencies.

C. WAILUKU-KAHULUI COMMUNITY PLAN

The well sites are located in the Wailuku-Kahului Community Plan region, one of nine Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui
County General Plan. Each Community Plan contains recommendations and standards that guide the sequencing, patterns, and characteristics of future development in the region.

The well sites are designated "Agricultural" by the Wailuku-Kahului Community Plan Land Use Map. The proposed project is consistent with the "Agricultural" designation.

Approval of the proposed request would be consistent with the Wailuku-Kahului Community Plan by addressing the following objectives:

- Coordinate water system improvement plans with growth rates to ensure adequate supply and a program to replace deteriorating portions of the distribution system. Future growth should be phased to be in concert with the service capacity of the water system.

IV. LIST OF ALTERNATIVES

The Department of Water Supply (Department) has studied alternative means of water supply, i.e. surface water treatment and desalinization. Groundwater development remains the most viable alternative for potable water due to the high cost associated with meeting new surface water treatment rules promulgated by the Safe Drinking Water Act, and as experienced during the course of operating several surface water treatment plants currently in use. The Department has also promoted water conservation, wastewater reuse, and non-potable water use.

Wastewater Reuse: The County of Maui has long initiated wastewater reuse measures in the Central Maui Water Service Area. Presently, wastewater reuse is used for irrigation at The Silversword Golf Course, Kalama Park, Kihei Fire Station and Kihei Library, Haleakala Ranch, Dekalb Seed Corn Project, Kihei Waste Water Treatment Plant, Kahului Wastewater Treatment Plant, and for dust control.

Catchment: Rainfall catchment is not a viable alternative in the dry central Maui area where long dry periods occur during the summer.

Conservation: The Department of Water Supply and the County of Maui have already initiated programs to promote conservation measures. The use of low flow fixtures is required by County ordinance for all new construction and renovations. In addition, the Department of Water Supply is engaged in promoting a xeriscape program, leak detection and repair program, and a low flow fixture retrofit program.

Non-potable Sources: Many central Maui parks and golf courses have their own irrigation wells that use predominantly non potable (brackish) water. Sugar growing, the primary agricultural crop in Central Maui, is supported by long developed surface water and non potable water sources.

Despite the active pursuit of the alternatives listed above, the Department needs to initiate additional source development in order to relieve the stress on the Iao Aquifer and to accommodate increased demand for water.
V. OTHER REQUIRED PERMITS AND APPROVALS

In order to proceed with the proposed action, DWS will need approval of a Pump Installation Permit from the Commission on Water Resource Management.

VI. ENVIRONMENTAL ASSESSMENT SIGNIFICANCE CRITERIA

In accordance with Title 11, Department of Health, Chapter 200 and Subchapter 6, Section 11-200-12, Environmental Impact Statement Rules, and based on the detailed analyses contained within this document, the following conclusions are supported:

1. The proposed action will not result in an irrevocable commitment to loss or destruction of natural or cultural resources.

   Analysis. Development of the proposed wells will involve a relatively small area within each respective one-acre site. The proposed sites have been used for cattle grazing for several decades and the proposed action will not affect this use. In addition, the proposed action will relieve stress on the Iao Aquifer System by providing additional source and transmission systems. It is not anticipated that the pumps will run simultaneously, nor continuously, except under emergency conditions. Average daily pumping from current, proposed, and future wells is expected to be about 16 hours, which would produce an average daily yield of approximately 5.4 mgd, depending upon demand. The estimated sustainable yield from the North Waihe'e Aquifer system is 8.0 mgd.

2. The proposed action will not curtail the range of beneficial uses of the environment.

   Analysis. The minimal scope of the proposed action should not have a significant impact upon existing or future land uses in the area. The proposed wells are a permitted use within the State and County Agricultural Districts. As discussed, water drawn from the wells will be used to service the Central Maui Water System, which serves the eastern slopes of the West Maui Mountains, the Central isthmus of Maui, and the lower western slopes of Haleakala. The water will be available to existing and future residential, commercial, and agricultural users.

3. The proposed action will not conflict with State or County long-term environmental policies and goals as expressed in Chapter 344, HRS.

   Analysis. As noted, the purpose of the proposed action is to relieve stress currently being placed upon the Iao Aquifer System and to meet projected demand for residential, commercial, industrial, and agricultural water uses. The proposed wells will obtain all
required permits prior to construction and will comply with all required State and County water quality standards.

4. The proposed action will not substantially affect the economic or social welfare and activities of the community, county or state.

**Analysis.** The Iao Aquifer System is the primary source of water for Central Maui residents. Unfortunately, the system is now being pumped at or near its sustainable yield. The proposed action will benefit the County of Maui by providing an alternative source of water to supplement the Central Maui Water System; thereby, relieving stress currently being placed upon the Iao Aquifer System, while accommodating future water demand.

5. The proposed action will not substantially affect public health.

**Analysis.** The proposed wells will be owned and operated by the Department of Water Supply. As noted previously, water samples taken from North Waihee Wells during well testing indicated that disinfection is the only necessary treatment for the water. All applicable State Safe Drinking Water Regulations will be strictly adhered to.

6. The proposed action will not result in substantial secondary impacts.

**Analysis.** The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards.” As noted, the purpose of the wells is to provide an alternative source of water for the County’s Central Maui Water System; thereby, relieving stress currently being placed upon the Iao Aquifer System. The water will be available to existing and future residential, commercial, and agricultural users. In addition, development of the wells will also provide valuable information regarding the condition of the aquifer system.

7. The proposed action will not involve substantial degradation of environmental quality.

**Analysis.** The recharge area for the Waihee Aquifer System is about 12 square miles between the Waihee and Kahakuloa Valleys. Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. Water quality samples have indicated the North Waihee Aquifer System is free of contaminants. The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards” to insure that the proposed action does not result in pollutants penetrating the aquifer. In addition, average daily pumping is anticipated
to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield.

8. The proposed project will not produce cumulative impacts and does *not* have considerable effect upon the environment or involve a commitment for larger actions.

**Analysis.** As noted, the proposed wells will be utilized to supplement the Central Maui Water System, which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei, Maalaea, and Puunene. The proposed wells are necessary to relieve stress being placed upon the lao Aquifer System, which is being pumped near its sustainable yield, and to accommodate increasing demand arising from projected population growth.

9. The proposed project will *not* affect a rare, threatened, or endangered species, or its habitat.

**Analysis.** The proposed well sites are located on pasturelands. Natural environmental features, such as plant and animal life, therefore, are reflective of this pastoral setting. Existing vegetation within the well sites include various weeds, grasses, and shrubs. There are no rare, endangered, or threatened species of plants or animal life at the well sites.

10. The proposed action will *not* substantially or adversely affect air and water quality or ambient noise levels.

**Analysis.** As discussed, the proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, "Hawaii Well Construction & Pump Installation Standards" to insure that the proposed wells do not result in pollutants penetrating the aquifer. In addition, average daily pumping is anticipated to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield. Surface water resources will not be impacted since there are no perennial streams in close proximity to the well sites. The discharge water from the well tests will be transported and discharged into nearby drainage gulches and will avoid any perennial streams. Inasmuch as there are no surface streams that traverse or border the well sites, the proposed exploratory wells are not anticipated to produce any long-term affect upon the region's surface waters. As noted previously, there are not anticipated to be any adverse air or ambient noise level impacts.

11. The proposed action will *not* substantially affect or be subject to damage by being located in an environmentally sensitive area, such as flood plain, shoreline, tsunami zone, erosion-prone areas, estuary, fresh waters, geologically hazardous land or coastal waters.

**Analysis.** The proposed wells lie within Flood Zone C, an area of minimal flood and tsunami hazard, as determined by the Flood Insurance Rate Map for this region. A Drainage
and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction. The proposed project will have no effect upon the existing flood or tsunami areas.

12. The proposed action will not substantially affect scenic vistas or view planes identified in county or state plans or studies.

**Analysis.** The proposed wells will be situated approximately 650 feet mauka (west) of Kahekili Highway and will not create a significant impact to adjacent property owners or to vehicles traveling along Kahekili Highway. Thus, visual resources will not be significantly affected.

13. The proposed action will not require substantial energy consumption.

**Analysis.** Electric pumps will be utilized in the proposed wells. It is not anticipated that these pumps will require substantial energy consumption.

VI. FINDINGS AND CONCLUSIONS

The North Waihee Water Source Development Project is intended to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. The development of Kanoa Well Nos. 1 and 2 will provide additional alternatives to service the region’s population and economic centers.

Development of Kanoa Well Nos. 1 and 2 will require clearing, grubbing, grading, installation of pumps, and construction of electrical buildings, fencing and related work. The short-term impacts associated with these activities are not anticipated to have a significant impact upon existing land uses at the sites or in the region.

The project is not anticipated to have any adverse impacts upon any existing environmental features such as flora and fauna, topography, soils, or air quality. The project is not anticipated to have an impact upon archaeological or historical features.

The proposed project will not have an adverse impact upon existing socio-economic conditions nor will it have an adverse effect upon existing public services or infrastructure.

Therefore, as a result of the findings of this report, the proposed project is not anticipated to have any significant environmental impacts and it is anticipated that a "Finding of No Significant Impact" (FONSI) will be made by DWS.
VII. AGENCIES CONTACTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

**County of Maui**

- Department of Water Supply
- Department of Planning

**Private/Public Individual**

- Wailuku Agribusiness Co., Inc.
REFERENCES


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U.S. Department of Agriculture, Soil Conservation Service in cooperation with the University of Hawaii Agricultural Experiment Station. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, 1972.

FIGURES
HYDROLOGIC UNITS - ISLAND OF MAUI

Source: Department of Water Supply

Kanoa Wells Draft Environmental Assessment
HYDROLOGIC UNIT MAP

FIGURE 3
PROPOSED ELEC. HHG W/ TRANSFORMER

KANOA WELL SITE No. 1
EASEMENT "D"
AREA = 1.00 Acres

EXISTING KANOA MONITOR WELL

PROPOSED ACCESS ROAD

PROPOSED 12" W.L.

EXISTING 20' WIDE EASEMENT

Source: C. Takumi Engineering, Inc.
KANOA WELLS SITE No. 2

EASEMENT "C"

AREA = 1.00 Acres

PROPOSED ELECTRICAL/CHLORINATION BUILDING

PROPOSED EMERGENCY GENERATOR

PROPOSED ELEC. HHG W/ TRANSFORMER
Kanoa 1 Site

Kanoa 1 Access Road

Kanoa 2 Site (mauka view)

Kanoa 2 Site (makai view)

Example of a completed well

Kanoa Wells Draft Environmental Assessment
SITE PHOTOS
APPENDIX – A
Archaeological Reconnaissance Surface Survey
SUBJECT: Letter report on a reconnaissance surface survey for a proposed exploratory well (Kupa’a Well No. 1) and an existing monitoring well (Kanoa Well No. 1) site in the North Waihe’e Water Source Development, Phases 6 & 7, Waihe’e, Island of Maui. (TMK: 03-02-01: 03) [Note: Proposed water transmission line easement not finalized.]

An archaeological reconnaissance surface survey was conducted for C. Takumi Engineering, Inc. by Xamanek Researches on 27 March 1997. An earlier field visit was made on 25 March 1997 with Mr. Wade Shimabukuro of C. Takumi Engineering, Inc. to view the study area. The survey was undertaken in order to assess the presence of cultural resources at 2 proposed wells (Kanoa Well No. 1 and Kupa’a Well No. 1) that will eventually feed into the North Waihe’e Water Transmission system.

The first proposed well project (Kanoa Well No. 1) will be located c. 30 to 50 m. from an existing monitoring well. The present monitoring well rests at c. 300 ft. AMSL and the proposed well will likely be situated at a higher elevation. Vegetation in the general vicinity consists of pasture grasses and annual weeds in the low lying areas with moderately dense tree growth covering the surrounding slopes. At least two native plant species observed growing on the slopes include *kukui* (*Aleurites moluccana*) and *‘ulei* (*Osteomeles anthyllidifolia*). Kanoa Well No. 1 will not be placed on the slopes where a probable rock feature was noted within c. 100 m. of the existing monitoring well.

The second proposed well project (Kupa’a Well No. 1) will be located in a pasture likely between 630 to 640 ft. AMSL. Two possible areas were inspected (A and B) in this pasture. At location A (c. 635 ft. AMSL), the surface was vegetated with pasture grasses and alien weed species. There was no surface evidence of significant material culture remains in the immediate vicinity. However, a likely site remnant was observed c. 100 m. to the north. It consisted of stacked basalt cobbles and small boulders. A portion of it appears to have been bulldozed in the past. At location B (c. 550 ft. AMSL) the surface was also vegetated with pasture grasses and alien weed species. This second possible location (less favored than A) is near the north boundary of the parcel. A possible site remnant lies at this location. It was covered with lantana and consists of
roughly stacked rocks. Portions of this feature may have been pushed by a bulldozer. No other surface evidence of material culture remains was observed in area B.

Both of the proposed well sites are in relatively open locations. The Kanoa Well No. 1 site will be located in pasture land within 30 to 50 m. of the present monitoring well and away from thick vegetation and the probable rock feature in the vicinity of the existing monitoring well. The exploratory Kupa’a Well No. 1 will likely be drilled at area A in open pasture land. Location B is less favorable and may contain a site remnant. Both Kanoa Well No. 1 and Kupa’a Well No. 1 will eventually feed into the North Waihe’e Water Transmission Line project. Kupa’a Well No. 1 will need to be tested before water transmission line design can be finalized. The following recommendations are based on the results of the reconnaissance surface survey.

Kanoa Well No. 1

1. Limited subsurface testing at the inventory level should be undertaken if the permanent well will be placed beyond the area previously cleared for the existing monitoring well.
2. Monitoring of the initial placement of the permanent Kanoa Well No. 1 should be undertaken. Care must be utilized in order to avoid the adjacent areas covered with trees. The possibility exists that 1 or more indigenous sites are contained in the densely wooded areas.

Kupa’a Well No. 1

1. Area A is the recommended location for this exploratory well. This portion of the pasture appears to have been bulldozed in the past and has a low probability of containing subsurface cultural materials. Area B may contain a site remnant.
2. Work at the inventory level is recommended for Area B if it is chosen for the exploratory well.

Future pipeline trench pathways

1. An archaeological inventory survey is recommended for future transmission lines associated with both Kanoa Well No. 1 and Kupa’a Well No. 1.

Please contact us if you have any questions about this letter report.

Sincerely,

Erik Fredericksen

Sara Collins, SHPD
APPENDIX – B
The North Waihee Aquifer: An Additional Water Source for Central Maui
THE NORTH WAIHEE AQUIFER

AN ADDITIONAL WATER SUPPLY SOURCE FOR CENTRAL MAUI

John F. Mink
Mink and Yuen, Inc.
April 10, 1997

Introduction
The Iao Aquifer System, which for managerial purposes is defined as the region between Waikapu Valley and Waihee Valley, has satisfactorily supplied Central Maui with drinking water since the Mokuhau wells were drilled more than 30 years ago. The aquifer system is large with an assigned sustainable yield of 20 mgd, but demand has already reached this level and threatens to substantially exceed it in the next few years. New sources of drinking water are needed to meet increasing demand.

As the exploitation of the Iao Aquifer was undergoing considerable expansion with the drilling of the Waiehu Heights and Waiehu wells in the late 1970s and the early 1980s, it became evident that additional sources needed to be located and put on line a decade or so in the future. The region north of Waihee Valley was considered a prime
candidate for groundwater production, but at first most attention was given to developing groundwater in East Maui. The East Maui initiative has been delayed, however, by the discovery of pesticides in newly drilled wells and by legal challenges, leaving the North Waihee groundwater resource as the obvious choice for timely additional development.

Construction of a pipeline connecting North Waihee with the Central Maui distribution network is underway, and two potential production wells are in place. The North Waihee Aquifer will be developed in phases, the first of which incorporates the existing wells and the drilling of two new wells. Details of future phases will depend on the behavior of the aquifer in response to pumping following completion of the first phase.

Relationship Between Iao and North Waihee Aquifer Systems
After it was recognized that production from the Iao Aquifer System would not be able to match the increasing demand in Central Maui, attention turned to the region north of Waihee Valley as a prospective source of additional groundwater. In 1980 Dan Lum, then hydrologist with the State Department of Water and Land Development (DOWALD), suggested that exploratory drilling be attempted on the slope of the ridge
just north of the Waihee River to test whether the area was an extension of the Iao Aquifer System or could be treated as an independent groundwater province. About at the same time Stephen Bowles, consulting hydrologist, recommended essentially the same course of action. Subsequently John F. Mink was retained by C. Brewer Co., owner of the land, to locate drilling sites and design a drilling and testing program.

Two wells were drilled in 1981 and the groundwater data compared with the original premise that if North Waihee was an uninterrupted extension of the Iao Aquifer System, the head should be at least 15 feet, based on the head at Test Hole A-1 located 4000 feet across the valley to the south, and the corollary that if the head were 5 feet or less, the aquifer would be independent of the Iao System. In fact, the head at the exploratory wells was about 10 feet while the head at Test Hole A-1 was nearly 20 feet. This relationship suggested that the Iao Aquifer System was hydraulically connected to North Waihee but that Waihee Valley behaved as a low permeability impediment to hydraulic continuity. The lack of response of groundwater levels at Test Hole A-1 to pumping at the North Waihee wells further suggested that North Waihee could be treated as a quasi-independent aquifer.
The connection between the Iao and North Waihee Aquifer Systems, as well as the dampening effect on hydraulic continuity exercised by the low permeability associated with the alluvium and weathered zone in Waihee Valley, is indicated by comparing the continuous head records at Test Hole A-1 and North Waihee Well 1. The head trace for the test hole is synchronous with that at North Waihee but higher by about 7 feet. If the normal groundwater gradient in basal aquifers of the shield basalts characteristic of every island in Hawaii governed flow, the difference in head would be less than 1 foot. The exaggerated difference is a result of head loss as the groundwater moves through the valley. Global hydraulic conductivity in the valley is at least two magnitudes less than in the unweathered basalt aquifer. A derivation based on Darcy's law indicates that the global hydraulic conductivity of the impediment is about 25 ft./day compared with normal basalt conductivity of 1500 ft./day.

Knowledge of the hydrogeology of both the Iao and North Waihee Aquifer Systems is insufficient to unequivocally establish the pattern of groundwater flow in and from the
aquifers. However, assuming that the general direction of groundwater flow in the Iao Aquifer is toward and across Waihee Valley, the North Waihee System would then be recharged by excess groundwater from Iao as well as by recharge from the high rainfall region north of Waihee Valley. As a result, the sustainable yield of the North Waihee System is substantial. Its magnitude, now estimated to be 8 mgd, will be more accurately determined after an operational record of pumping is established. The sustainable yield refers to the entire North Waihee Aquifer System, which extends from Waihee Valley north to Kahakuloa Valley.

Hydrogeology of the North Waihee Aquifer System

In the Iao Aquifer System the basal aquifer in the Wailuku basalt formation is covered by a caprock of sediments extending to approximately 8000 feet inland of the coast. The inland boundary of the basal aquifer is the rift zone lying about 12,000 feet from the coast and approximately parallel to it. Heads are high in the aquifer because the low permeability of the caprock sediments prevent easy discharge of the groundwater.

This sedimentary blanket, which north of Iao Valley is more
than 1200 feet deep at the coast, is truncated at Waihee Valley. North of Waihee the volcanic rock formations reach to the coast; if a sedimentary blanket exists, it lies below sea level and does not play a role in the North Waihee hydrogeology. The absence of sediments north of Waihee Valley suggests that the sector to the south was displaced downward as a result faulting, and that the fault itself is along what is now Waihee Valley. South of Iao Valley the deep sediments continue beyond Waikapu, but are absent where the Isthmus terminates. The faulted block, therefore, is a wedge truncated on the north at Waihee Valley and ending in the south where the isthmus sediments abut the basalt bedrock.

Although a sedimentary caprock does not exist in the North Waihee Aquifer System, nevertheless north of Waihee Valley a caprock composed of a volcanic formation resists drainage from the basal lens into the sea. The formation constituting the aquifer is the Wailuku basalt, a highly permeable medium equivalent to other premium aquifers such as the Koolau basalt of Oahu in its water bearing properties. In the region between Waihee Valley and Waiolai Gulch, and perhaps beyond to Wailena Gulch, the Wailuku basalt is covered by the Honolua formation, a low permeability combination of
andesite and trachyte in which even lower permeability soil and ash layers are stratified. The Honolua averages about 100 feet in thickness and completely caps the Wailuku basalt to the coast and out to sea. This formation behaves as a caprock in the region where the proposed additional groundwater development is to take place. Figure 1 illustrates the geology of the region.

The Honolua formation is a pale tan to gray to white rock, massive and dense with platy cleavage. Individual andesite layers average about 40 feet thick, and trachyte layers are as much as 150 feet thick. In contrast, the primitive basalt of the Wailuku formation is piled in layers normally 10 feet or less thick throughout which many highly permeable clinker layers occur. A weak unconformity separates the Wailuku from the overlying Honolua, but the volcanism that produced these rocks was continuous, though eruptions were less frequent during the extrusion of the Honolua formation. Nowhere in West Maui is the Honolua exploited as an aquifer.

For convenience in classification and management, the North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. The basal portion may be disrupted near Makamakaole Valley by massive
Honolua dikes that connect the trachyte eruptive centers at Puu Kukui and Eke at the crest of the West Maui Mountains with trachyte bulbous domes near the coast, such as Puu Olai (Figure 1). Inland the basal sector ends at the rift zone which is about at and parallel to the Forest Reserve boundary 7000 feet from the coast. In the entire North Waihee Aquifer System the sustainable yield is estimated as 8 mgd; between Waihee and Makamakaole it is less.

North Waihee Wells 1 and 2: Drilling and Testing

In 1981 C. Brewer Co. had two wells drilled in its property on the north bank of Waihee Valley. The wells are located about 500 feet from the axis of the valley and 5200 feet inland from the valley mouth at Waihee Point. The purpose of drilling was exploratory, to determine aquifer characteristics, ground water levels and quality, but the wells were constructed and completed for use as production wells. The locations of wells in the North Waihee Aquifer System is given in Figure 2.

The wells were located to avoid a deep section of valley fill sediments. They were driven from elevation 280 feet through 100 feet of talus into the the Wailuku basalt. The Honolua formation is missing at this level on the slope of
the ridge. The initial head was 9 to 10 feet, which was higher than expected if the aquifer were independent of the Iao Aquifer System to the south yet lower if it were connected. At the time the head at Test Hole A-1, 4000 feet to the south in the Iao Aquifer, was 20 feet during periods of low to no pumping at the Mokuhau and Waiehu wells.

Each well was drilled to 105 feet below sea level (BSL) and fitted with 16 inch diameter blank casing to 5 feet BSL, and screen between 5 and 25 feet BSL. The remaining 80 feet was left open.

The pump test in 1982 employed North Waihee 2 as the pumping well and North Waihee 1 as an observation well. The wells are on a line parallel to the valley, 176 feet apart. A continuous 48 hour test at a rate of 1700 gpm (2.45 mgd) was performed. Analysis of the test results determined the transmissivity of the aquifer as 325,000 sq.ft./day and the storage coefficient as .25. Salinity of the pumped water was very low and constant at 15 mg/l chloride. No effect on the head at Test Hole A-1 could be detected, nor were any boundary effects indicated by the drawdown curve.

The test proved the occurrence of a substantial groundwater
resource north of Waihee Valley, and the results implied that the connection with the Iao Aquifer System was weak. The wells were capped. Interest in them flagged because draft in the Iao Aquifer System was still significantly less than the assigned sustainable yield.

Interest was rekindled in 1989 when Iao pumpage began to approach sustainable yield. A longer test with expanded data collection opportunities was designed. An observation well was drilled in Kanoa Valley about 2000 feet north of the North Waihee wells and equipped with a continuous water level recorder. An existing small diameter well in Wailena, 13,500 feet north of the North Waihee wells, was also equipped with a continuous water level recorder. The Wailena well had been drilled in 1987. Test Hole A-1 and North Waihee Well 1 also had continuous water level recorders. North Waihee 2 was selected as the pumping well. Another well in the region, the Mendes well (Figure 2), was not available for measurements. This well has a 4 inch diameter casing and is fitted with a 5 HP pump capable of yielding 20 to 30 gpm. It is infrequently pumped.

Ground elevation at the Kanoa observation well is 305 feet. The drilling log places the Honolua/Wailuku contact at depth
248 feet (57 feet ASL). The initial head was 12.4 feet. The Wailena well ground surface is at 608 feet, and the well lies at the inland turn of the road nearly on the axis of the valley. The Honolua formation is absent in Wailena, and the well penetrated only the Wailuku basalt. The initial head at completion of drilling in 1987 was 6.4 feet while just before commencement of the test it was 6.6 feet. At the start of the test head in North Waihee 1 was 11.5 feet and in North Waihee 2 it was 10.7 feet. At Test Hole A-1 in the Iao Aquifer System the head was 18.1 feet. Heads at Kanoa and North Waihee were inconsistent with a flow net that would have groundwater passing northward from Waihee Valley toward Makamakaole as might be interpreted if flow crossed Waihee Valley from Iao to North Waihee.

The pump test lasted four days, from May 15 to May 19, 1989. The average rate of pumping over the 96 hours was 2400 gpm (3.46 mgd). Drawdown in North Waihee 2, the pumping well, stabilized at 5.5 feet, and in North Waihee 1, 176 feet away, it reached 0.7 feet. At the Kanoa observation well drawdown peaked at 0.4 feet. Tidal efficiency at Kanoa is high because the well lies just 2000 feet from the coast, and the range and distribution of drawdowns on the chart reflected this efficiency. At Wailena and Test Hole A-1 no
change in head attributable to the pumping could be detected. The drawdown curves for North Waihee 1 and Kanoa did not indicate the presence of flow boundaries.

The test results were evaluated both graphically and by computer program to yield values for the fundamental aquifer properties of transmissivity and storage coefficient (effective porosity). At North Waihee 1 transmissivity computed from drawdown data was 320,000 sq.ft./day and storage coefficient .30, about the same as that determined for the 1982 test. The Kanoa data was not as easily interpreted because of the imposition of the tidal signal on the drawdown values. Transmissivity fell between 260,000 and 334,000 sq.ft./day and storage coefficient between .013 and .034. The transmissivity values are consistent with those obtained at North Waihee 1, but the storage coefficient values are a magnitude lower. At the North Waihee wells the computed storage coefficients may represent local phenomena, whereas the values determined at Kanoa may reflect a regional characteristic. For planning the arrangement of a well field the smaller storage coefficient is likely to be more realistic than the larger one. In the Pearl Harbor region of Southern Oahu, for example, where the Koolau formation resembles the Wailuku basalt the regional storage
coefficient is about .05.

For predictive purposes a transmissivity of 325,000 sq.ft./day and coefficient of storage of .05 will be employed. The transmissivity is representative of a highly permeable aquifer having a substantial depth of fresh water flow. Assuming a hydraulic conductivity of 1500 ft./day, which is a value typical of primitive basalts like the Wailuku formation, and accepting the Ghyben-Herzberg relationship that depth below sea level to the 50 percent sea water isochlor is 40 times the head, the thickness of the fresh water core is calculated as 217 feet and that of the upper limb of the transition zone as \(40h - 217\) (e.g. for a 10 feet head the upper limb would be 183 feet thick). The calculated thickness of the fresh water core is further constrained by the assumption that the groundwater flow contributing to transmissivity is restricted to this zone. These assumptions lead to approximate, not accurate, estimates of zonation in the basal lens. Nevertheless it is clear that the fresh water core is thick because even under the intense stress of pumping 3.46 mgd from a single well the salinity of the pumped water did not increase.
Proposed Development of the North Waihee Aquifer

The first phase of the North Waihee groundwater development program calls for activation of the two existing North Waihee wells and drilling two new wells. The existing wells were completed to construction standards meeting both the Department of Health and Commission on Water Resources Management recommendations. One of the new wells, Kupaa 1, will be located at an elevation of approximately 575 feet near the C. Brewer Co. property boundary line on a slope inland of Kahekili Highway. The other, Kanoa 1, will be drilled about 75 to 100 feet inland of the existing Kanoa monitor well.

The North Waihee wells are 16 inch diameter (casing) and bottom at 105 feet BSL. The new wells also will be completed as 16 inch diameter wells after testing proves acceptable production capability. However, the first stage in the drilling protocol for the new wells will consist of a pilot hole driven to 50 feet BSL into which a pump can be lowered for a preliminary test. An option will be included to drill deeper in 25 feet increments if results of the preliminary test fail to predict adequate production.

General specifications and the drilling protocol for the two
new wells are as follows.
1. Drill pilot hole to depth 50 feet BSL.
2. Conduct preliminary pump test in open hole; duration two hours or less.
3. Option to deepen drilling in 25 feet increments if preliminary tests fail to show sufficient production capability.
4. At selected depth, ream boring so it can hold 16 inch diameter casing while allowing for a 3 inch annular space for grouting.
5. Conduct another preliminary test of a few hours duration.
6. Select length of blank casing on basis of preliminary tests.
7. Screen is optional; at most, 10 to 20 feet of screen, the remainder of boring open hole.
8. Grout to water table, which is expected to lie about 10 feet above sea level.

Although the North Waihee 2 well was tested for a continuous run of 96 hours at 3.46 mgd, this rate is about twice that allowable for a production well. Upon reviewing the results of the pumping tests of 1982 and 1989, the preliminary recommendation was to fit the wells with 2 mgd (1390 gpm) pumps. This recommendation envisioned a single well field...
comprising two wells in the North Waihee Aquifer. Expansion to more than two wells justifies a more prudent recommendation of 1.5 mgd (1040 gpm) per well. The new wells will be tested to determine whether a 1.5 mgd pump would be appropriate, but final pump size will depend on the results of the long term continuous test.

Total well capacity will be 6.0 mgd if each of the four wells is fitted with a 1.5 mgd pump. A scenario in which one of the existing North Waihee wells serves as an inactive stand-by but the other three wells are producers, and assuming that a peaking factor of 1.5 times average output is exercised for the three active wells, average production will total 3.0 mgd. If the capacity of the inactive well is included, the average output will be 4.0 mgd. Whether or not the North Waihee Aquifer between the C. Brewer Co. property line and Waihee Valley can sustain an average yield of 4.0 mgd is not predictable until a record of the effects of pumping operations on water levels and the quality of the pumped water accumulates.

The proposed location of Kupaa 1 is 1000 feet from the Mendes well and 2 miles south of the new Wailena well. At the time of testing the Wailena well had a 4 inch diameter
casing. In 1994 a new well with 6 inch diameter casing was drilled and successfully tested at 200 gpm. Pumping at Kupaa and Kanoa should not affect the Wailena well because of its distance from the proposed wells. The capacity of the Mendes well is too small for either the quality or quantity of its pumpage to be affected.
Figure 1
NORTH WAIHEE
(Waihee Valley to Kaha Kula Valley)
Scale: 1" = 1 mile.

Geology
- Ra: Recent alluvium and dunes
- Pa: Old alluvium
- Th: Honolua formation
- Tw: Wailuku formation

Legend:
- Existing Wells
- Proposed Wells
- Good motor building
- Bridge
- Bench mark
- Intermittent stream

Locations:
- Wailena
- Mendes
- Kupaa 1
- Kanoa 1
- North Waihee 1, 2
Figure 2. NORTH WAIHEE REGION WELL SITES

Scale: 1 inch = 2000 feet.
APPENDIX - C
DRAFT EA COMMENT LETTERS
AND RESPONSES
Mr. Michael J. Summers  
Chris Hart and Partners  
1955 Main Street, Suite 200  
Wailuku, Hawaii 96793

Dear Mr. Summers:

SUBJECT: Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04), Draft Environmental Assessment  
FILE NO.: 97-023

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[X] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.

We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

1) Please be advised of our naming convention for these wells to avoid confusion. The original North Waihe'e Water Source Development Plan called for four wells, which originally were anticipated to be in the same general vicinity. The first two wells were alternatively known simply as "Waihe'e Wells" 1 & 2, very similar to nearby private wells (Waihe'e Tunnels 1 & 2, Well Nos. 5434-01 & 02; and "Waihe'e" (Marino) Wells, of which there may be two or three, Well Nos. 5631-04, for which we have drilling information, and Well Nos. 5531-05 and/or 06, for which permits have expired without any well completion information). It became apparent that the North Waihe'e site could only support two wells, and not at the original hoped-for capacity. Two new sites were identified, which are now called Kanoa #1 and Kupaa #1 (Well Nos. 5731-02 & 03), rather than their original designations as North Waihe'e 3 & 4. Subsequently, Maui Board of Water Supply has applied for and received a permit approval for the construction of a second Kanoa Well (Kanoa #2, Well No. 5731-04).

2) The pump tests for the Kanoa #1 and Kupaa #1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd. Our staff will base our pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

If there are any questions, please contact Charley Ice at [redacted]

Sincerely,

LINKEL T. NISHIOKA
Deputy Director

State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management

September 24, 1999
Ms. Linnel T. Nishioka  
Deputy Director  
State of Hawaii  
Department of Land and Natural Resources  
Commission on Water Resource Management  
P.O. Box 621  
Honolulu, Hawaii 96809  

RE: Kanoa Wells 1 & 2, Draft Environmental Assessment (Well Nos. 5731-02 & 04)  

Dear Ms. Nishioka,  

Thank you very much for your comments dated September 24, 1999, regarding the above-referenced Draft Environmental Assessment.  

We have incorporated your comments regarding State Well Nos. and pumping capacity at Kanoa Well No. 1 and Kupaa Well No. 1 into the Final Environmental Assessment for the reader’s clarification.  

Should you have any questions, Please call our Engineering Division at 808- or Mr. Rory Frampton of Chris Hart & Partners at  

Sincerely,  

David R. Craddick  
Director  

Cc: Mr. Herbert Kogasaka, DWS Engineering Div.  
    Mr. Carl Takumi, Takumi Engineering, Inc.  
    Mr. Rory Frampton, Chris Hart & Partners  

"By Water All Things Find Life"
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Subject: Draft Environmental Assessment for the North Waihee Water Source Development, Kanoa Well Nos. 1 and 2, Maui

Thank you for the opportunity to review the subject document. We have the following comments and questions.

1. Please provide data on the anticipated depth of the wells and the water surface elevation of the basal aquifer.

2. In some instances, a well is developed by private financing, the transfer of public lands to government or private developers, or in return for a water allocation credit to supply an urban development. The EA should include a full discussion of any institutional, financial or land use arrangements or commitments related to developing the well and delivering water to end users.

These arrangements may include the formation of public utility companies and subsequent rate-setting, the establishment of county water commitments, the co-funding of state or county water system development, an executive order or other set-aside of state lands, and purchase of land or easements by public entities.

Any or all of these arrangements and all permits or governmental approvals required to fulfill these commitments should be listed.
If you have any questions please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson  
Director

c:  Chris Hart and Partners
November 9, 1999

Ms. Genevieve Salmonson
Director
State of Hawaii
Office of Environmental Quality Control
235 South Beratania Street, Suite 702
Honolulu, Hawaii 96813

RE: Draft Environmental Assessment for the North Waihee Water Source Development Project, Kanoa Well Nos. 1 and 2

Dear Ms. Salmonson:

Thank you very much for your comments dated October 26, 1999, regarding the above-referenced Draft Environmental Assessment.

1. Anticipated well depth and depth of groundwater.

   Kanoa Well No. 1 -- The well is situated at approximately 310 feet above mean sea level (msl) and has been drilled 359 feet below ground surface, or about 50 feet below msl. The water surface elevation of the basal aquifer is at elevation 7.93 feet above msl.

   Kanoa Well No. 2 -- The well is situated at approximately 275 feet above msl and will be drilled approximately 325 feet below ground surface, or about 50 feet below msl.

2. Institutional, financial, or land use arrangements.

   The Board of Water Supply, County of Maui, will finance both wells. Upon completion, the Maui County Department of Water Supply will operate and

"By Water All Things Find Life"
maintain the facilities. There will be no water allocation credits, institutional, financial, or land use arrangements or commitments related to developing the wells and delivering water to end-users. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the wells and their appurtenances.

Should you have any questions, Please call our Engineering Division at 808- or Mr. Rory Frampton of Chris Hart & Partners at

Sincerely,

David R. Craddick
Director

Cc: Mr. Herbert Kogasaka, DWS Engineering Div.
   Mr. Carl Takumi, Takumi Engineering, Inc.
   Mr. Rory Frampton, Chris Hart & Partners
Mr. Michael Summers  
Chris Hart & Partners  
1955 Main Street, Suite 200  
Wailuku, Hawaii 96793  

Dear Mr. Summers:  

RE: Draft Environmental Assessment (DEA) for the North Waihee Water Source Development Kanowa Well Nos. 1 and 2  

Thank you for the opportunity to comment on this DEA. We have reviewed the document and have no comments to offer at this time.  

If you have any questions, please contact Mr. William Spence, Staff Planner, of this office at [redacted]  

Very truly yours,  

JOHN E. MIN  
Planning Director  

JEM:WRS:cmb  
c: Clayton Yoshida, AICP, Deputy Director of Planning  
William Spence, Staff Planner  
General File  
S:\ALL\WILLIAACORESP\WAIHEEWE.WPD
PART II.

(PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: Roscoe Moss HI, A Division of Beylik Drilling, Inc.
21. Name of person performing work: Mole, John
22. Date Pump Installation Completed: 03/07/00
23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: Byron Jackson, 12MQ, 5 STG
   Capacity: 870 gpm
   Motor type, H.P., Voltage, rpm: G.E. 150 H.P.
   Depth of Pump Intake Setting 328 ft. below Ground, which elevation is 19 ft.
   Depth to bottom of airline 315 ft. below Ground, which elevation is 6 ft.
   Pumping Head is 420 ft. Type of flow meter: Signet which measures in gpm
24. As-built drawings attached? Yes
25. Other remarks/comments: (See below)

Pump Installation Contractor (print) Beylik Drilling Inc. C-57 Lic. No. C-21896
Signature
Applicant (print) County of Butte
Signature

8.(cont'd) DRILLER'S LOG (cont'd):

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<tr>
<th>Water Level Dates</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks,</th>
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19. & 25. Remarks: 6-9131-02 Kanoa 1
WELL COMPLETION REPORT

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at [Phone Number] or Extension 70225.

1. State Well No.: 5731-02  Well Name: Kānāo Well  Island: Maui

2. Location/Address: North Waihe'e, Wailuku  Tax Map Key: 3-2-1:3

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: ____________________________

4. Name of driller who performed work: ____________________________

5. Type of rig/construction: ____________________________

6. Date(s) Well Construction and pump tests (if any) completed: ____________________________

7. GROUND ELEVATION (referenced to mean sea level, msl): _______ ft.

   Well Bench Mark (description/location): ____________________________

   Elevation (msl): _______ ft.

8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)

   Depths (ft.)  Rock Description, Water Level, Dates, etc.  Depths (ft.)  Rock Description, Water Level, Dates, etc.

   _______ to _______  ____________________________  _______ to _______

   _______ to _______  ____________________________  _______ to _______

   (If more space is needed, continue on back.)

9. Total depth of well below ground: _______ ft.

10. Hole size: _______ inch dia. from _______ ft. to _______ ft. below ground

   _______ inch dia. from _______ ft. to _______ ft. below ground

   _______ inch dia. from _______ ft. to _______ ft. below ground

11. Casing installed: _______ in. I.D. x _______ in. wall solid section to _______ ft. below ground

   _______ in. I.D. x _______ in. wall perforated section to _______ ft. below ground

   Casing Material/Slot Size: ____________________________

12. Annulus:

   Grouted from _______ ft. below ground to _______ ft. below ground

   Gravel packed from _______ ft. below ground to _______ ft. below ground

13. Initial water level: _______ ft. below ground.  Date and time of measurement: ____________________________

14. Initial chloride: _______ ppm  Date and time of sampling: ____________________________

15. Initial temperature: _______ °F  Date and time of measurement: ____________________________

16. PUMPING TESTS: Reference Point (R.P.) used: ____________________________, which elevation is _______ ft.

   (1) Step-Drawdown Test Date ____________________________

   Start water level _______ ft. below R.P.

   End water level _______ ft. below R.P.

   (2) Long-term Aquifer Test Date ____________________________

   Start water level _______ ft. below R.P.

   End water level _______ ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/8/96 LTAT Form) attached? __ Yes ___ No

18. As-built drawings attached? __ Yes ___ No

19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) ____________________________ C-57 Lic. No. ____________________________

Signature ____________________________ Date ____________________________

Surveyor (print) ____________________________ Lic. No. ____________________________

Signature ____________________________ Date ____________________________

Applicant (print) ____________________________

Signature ____________________________ Date ____________________________
PUMP INSTALLATION PERMIT
Kanoa #1 Well (Well No. 5731-02)

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the pump installation for Kanoa #1 Well (Well No. 5731-02) at, Kanoa, North Waihee, Maui, TMK 3-2-1:3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1200 gpm capacity, or less, pump in the well.

3. The permittee shall provide and maintain an approved meter or other appropriate means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly/annual [choose reporting period] basis, on forms provided by the Chairperson (attached).

4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

5. The permittee shall complete and submit as-built drawings and Part II - (Permanent) Pump Installation Report of the Well Completion Report (attached) to the Chairperson within sixty (60) days after completion of work.

6. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

7. The pump installation permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97). If the HWCPIS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.

8. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the pump installation permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

9. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

10. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.

11. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 27, 1999
Expiration Date: September 27, 2001

TIMOTHY E. JOHNS, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the pump installer have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day starting from the permit date of approval.

Permittee's Signature: ___________________________ Date: 4/17/00

Printed Name: DAVID CRADDICK Firm or Title: Director of Water Supply

Installer's Signature: ___________________________ Date: 4/19/00

Printed Name: WILLIAM C. MOORE C-57, C-57a, or A License #: C-21896 Firm or Title: Beylneck Drilling, Inc.

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments
c: USGS
Department of Health/ Safe Drinking Water & Wastewater Branch
May 5, 2000

Mr. Timothy Johns, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: Pump Installation Permit
Kanoa #1 Well (Well No. 5731-02)

We are submitting the pump installation permit completion report for a temporary pump to be used until the permanent installation can be completed.

If there are any questions please call me at [Redacted]

Sincerely,

[Signature]

David R. Craddick
Director

enc

"By Water All Things Find Life"
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, Hawaii 96793  

Dear Mr. Craddick:  

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)  

Enclosed are two (2) originals of your approved Pump Installation Permit for the captioned well(s) that authorize permanent pump installation work for your well(s). As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 11:  

**Special Conditions**  

1. None  

The permittee is responsible for all conditions of the permit. This includes ensuring that the pump installation contractor, or other party who installs the pump, submits a completed Part II of the Well Completion Report form (enclosed) within sixty (60) days after the pump installation work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions starting from the permit approval date.  

To validate your pump installation permit, please sign and have the contractor sign both permit originals and return one for our files. A copy of the Well Completion Report (Part II) and a copy of your water use report form are enclosed for your use.  

**IMPORTANT** - Unless specifically exempted, pump installation may not proceed without a validated permit returned to the Commission. Except for the monthly water use report form, please provide copies of all the information in this packet to your pump installation contractor.  

Finally, this letter is notice that we have accepted your Well Completion Report - Part I as complete.  

If you have any questions, please call the Commission staff at [redacted] or toll-free at [redacted] extension 70251.  

Aloha,  

TIMOTHY E. JOHNS  
Chairperson  

Enclosure
FROM: LINNEL
DATE: NOV 30 1999
SUSPENSE DATE

TO: BAUER, G.
INIT: __
TO: LUM, A.
INIT: __
FOR: Approval
PLEASE: __

TO: CHING, F.
INIT: __
TO: NAKAMA, L.
INIT: __
FOR: Signature
PLEASE: __

TO: DANBARA, S.
INIT: __
TO: NAKANO, D.
INIT: __
FOR: Information
PLEASE: __

TO: FUJII, N.
INIT: __
TO: NISHIOKA, L.
INIT: __
FOR: __
PLEASE: __

TO: HARDY, R.
INIT: __
TO: OHYE, M.
INIT: __
FOR: __
PLEASE: __

TO: HIRA, N.
INIT: __
TO: SAKODA, E.
INIT: __
FOR: __
PLEASE: __

TO: HIRANO, E.
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TO: SUBIA, S.
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FOR: __
PLEASE: __

TO: ICE, C.
INIT: __
TO: SWANSON, S.
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FOR: __
PLEASE: __

TO: IMATA, R.
INIT: __
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TO: JINNAI, R.
INIT: __
TO: YODA, K.
INIT: __
FOR: __
PLEASE: __

TO: KUNIMURA, I.
INIT: __
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FOR: __
PLEASE: __

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We received AP for Kenza 1. We already circulated the document (what about Kenza 2?) anticipating imminent receipt of TPL approval.

Should we have also included Kenza 2 (159104)?

In making the decision, I also included the previous version with the draft (159102).
TO: Commission on Water Resource Management  
1151 Punchbowl Street, Room 227  
Honolulu, Hawai‘i 96813  
Phone [redacted] FAX [redacted]  

DATE: November 29, 1999  
PROJECT: Final EA for Kanoa Wells Nos. 1 and 2  

SUBJECT: Final EA  

THE FOLLOWING ARE ENCLOSED:  
( X ) FOR YOUR USE  
( ) FOR YOUR REVIEW AND COMMENT  
( ) FOR YOUR INFORMATION  
( ) OTHER  

COPIES DATE DESCRIPTION  
1 November 29, 1999 Final Environmental Assessment  

REMARKS:  
Enclosed is one (1) copy of the Draft Environmental Assessment for your use.  
Should you have any questions, please call me at [redacted]  

COPY TO: Project File  
BY: Michael J. Summers  

LANDSCAPE ARCHITECTURE AND PLANNING  
1955 MAIN STREET, SUITE 200 • WAILUKU, MAUI, HAWAII 96793 • [redacted] • [redacted]
November 16, 1999

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P. O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Craddick:

SUBJECT: PUBLIC WATER SYSTEM NO. 212, Wailuku
KANOA WELL NO. 1
STATE WELL NO. 6-5731-02

We have completed our review of the engineering report submitted for the Kanoa Well No. 1, State Well No. 6-5731-02, prepared by Carl Takumi Engineering, Inc. dated August 1999, water quality data submitted on September 30, 1999 and supplemental information submitted on October 19, 1999. The Department of Health hereby grants conditional approval for the use of the Kanoa Well No. 1 as a drinking water source for a public water system. In addition, the use of this well as a drinking water source shall be subject to the following conditions:

1. The Kanoa Well No. 1, State Well No. 6-5731-02, shall deliver potable water of the quality in compliance with Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Related to Potable Water Systems." The water quality shall be subject to verification by the Department of Health.

2. The Maui Department of Water Supply, in its operation of the Kanoa Well No. 1, State Well No. 6-5731-02, shall comply with all other relevant provisions of Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Related to Potable Water Systems."

3. The Maui Department of Water Supply shall notify the Department of Health of any condition that may arise or be revealed which may contaminate the source and pose a threat to human health.
4. The Maui Department of Water Supply shall notify the Safe Drinking Water Branch of the planned well activation date(s), at least ten (10) days in advance. This will help the Department incorporate the well into its monitoring schedules.

5. The Kanoa Well No. 1, State Well No. 6-5731-02, shall be installed with sampling tap located prior to the point of disinfection.

6. The Maui Department of Water Supply shall provide adequate disinfection to Kanoa Well No. 1, State Well No. 6-5731-02, on a continuous basis based on information that indicates a potential microbiological problem.

7. Immediately prior to or upon startup, the Maui Department of Water Supply shall resample the Kanoa Well No. 1, State Well No. 6-5731-02, to retest for barium, chromium, fluoride, and nitrate to confirm the presence of these contaminants. A laboratory approved by the Hawaii Department of Health, State Laboratories Division, using EPA approved drinking water methods must perform the analyses. At a minimum, the chains of custody and laboratory reports need to be submitted. In the event that the presence of these contaminants is confirmed, the Maui Department of Water Supply will issue a press release.

8. The Maui Department of Water Supply must sample and analyze the Kanoa Well No. 1, State Well No. 6-5731-02, for all required contaminants that are not analyzed by the Department of Health, State Laboratories Division. Presently, the Department of Health cannot analyze the following EPA regulated contaminants:

- 2,4-D
- Cyanide
- Benzo(A)Pyrene
- Dalapon
- Di(ethylhexyl)-Adipate
- Di(ethylhexyl)-Phthalate
- Dinoseb
- 2,3,7,8-TCDD (Dioxin)
- Diquat
- Endothall
- Pentachlorophenol
- Picloram
- 2,4,5-TP (Silvex)

Please note that the drinking water regulations are frequently revised and the preceding list may be subject to change.
9. It is also important to note that the drinking water well may affect future development plans. Hawaii Administrative Rules, Title 11, Chapter 23, "Underground Injection Control", prohibits the siting of an injection well within 1/4 - mile of any drinking water well. In addition, Hawaii Administrative Rules, Title 11, Chapter 62, "Wastewater Systems" requires septic tank effluent disposal systems (page 9, section 4.e.4) to be located at least 1,000 feet from the drinking water well.

10. Hawaii Revised Statutes, Chapter 340E-24, requires suppliers of water to notify the Department of Health, in writing, of any previously undetected chemical contaminant found in a source of drinking water, within seven days of the positive detection.

The Department of Health reserves the right to suspend or revoke this conditional approval upon either a finding of violation on any of the above conditions or a determination of a threat to public health from factors which may arise in the future.

Thank you for your attention and concern to these matters. If you should have any questions, please contact Ms. Queenie Komori of the Safe Drinking Water Branch, Engineering Section, at [REDACTED]

Sincerely,

THOMAS E. ARIZUMI, P.E., CHIEF
Environmental Management Division

QK: la

c: SDWB Monitoring Section
    SDWB Enforcement Section
    Charlie Ice, DLNR, CWRM
    Stuart Yamada, SDWB Engineering Section
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I thought we had pulled the permit earlier! Let's sit down and discuss anything that was pulled from permit... 1992.

---

Gill Swanson, D. 

Need to discuss this with...
November 24, 1999

Mr. Michael J. Summers  
Chris Hart and Partners  
1955 Main Street, #200  
Wailuku, HI 96793

Dear Mr. Summers:

Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04)  
Draft Environmental Assessment, File No. 97-023

It is our understanding from phone calls with John Mink and Carl Takumi that there is some concern over our comment on the Environmental Assessment for the captioned wells. We had stated that "pump tests for the Kanoa 1 and Kupaa 1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd". This comment was made to recognize results of pump testing rather than to infer any limits to average pumping from these wells. Our staff based its pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

We recognize that installed pump capacity is determined by several factors, and that daily pumpage might fluctuate higher and lower than the average. Rated pump capacity is typically greater than the anticipate average pumpage, and the approved permit, in fact, allows installation of a 1200 gpm capacity pump, with a daily pumpage capacity far greater than 1.15 mgd.

If you have any questions, please call Charley Ice at extension 70251 or toll-free at extension 70251.

Sincerely,

LINNEL T. NISHIOKA  
Deputy Director

CI:ss

c: John Mink  
Carl Takumi
FROM: LINNEL
DATE: NOV - 3 1999
SUSPENSE DATE

TO: BAUER, G. INIT. TO: LUM, A. INIT. FOR: Approval PLEASE:

CHING, F. NAKAMA, L. Signature

DANBARA, S. NAKANO, D. Information

FUJI, N. NISHIOKA, L.

HARDY, R. OHYE, M.

HIGA, D. SAKODA, E.

HIRANO, E. SUBIA, S.

ICE, C. SWANSON, S.

IMATA, R. UYENO, D.

JINNAI, R. YODA, K.

KUNIMURA, I.

PLEASE:
See Me
Review & Comment
Take Action
Type Draft
Type Final
File
Xerox copies

A well w/incomplete reports held up PIP: Waiiku (Hana) "A" damaged, covered; no pump, may become monitor well (still no WCR); Waipuka #2 (hereby OK); Waikapu Mauka (still no WCR: "imminent"); Maui H.S. sealing difficulties, still no WCR.
October 25, 1999

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

Dear Ms. Nishioka:

Subject: Kanoa Well No. 1 (Well No. 5731-02)

Attn: Charles Ice

To complete the inquiry on the Kanoa Well No. 1 (well No. 5731-02), we are enclosing the well completion report for Waipuka Well No. 2 (Well No. 5339-02).

Your consideration in accepting the Pump Installation Permit application for Kanoa Well No. 1 (Well No. 5731-02). If there are any questions, please call our Engineering Division at

Sincerely,

David R. Craddick
Director

hk
October 19, 1999

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

Dear Ms. Nishioka:

Subject: Kanoa Well No. 1(Well No. 5731-02)

In reference to your request for status of the various wells, our comments as follows:

1. The Wakiu Well “A” was removed, but because of some structural damage or failure, we have not installed the pump. The well is covered and plans are being made in anticipation of replacing it in the proximity. We may want to use this as a possible monitoring well, at least temporarily, until the replacement well is developed. At this time we do not anticipate installing a pump at this well. We will update you as soon as some decision on its disposition is made.

2. The Waipuka Well No. 2 well completion report will be filed.

3. We request a two month extension from now to seal the Maui High School Well (Well No. 5420-01). The pump is stuck in the well and has to be taken out or otherwise sealed.

4. The Waikapu Mauka Well was previously addressed in a separate letter.

Your consideration on the above request is greatly appreciated. If there are any questions, please call our Engineering Division at [Contact Information]

Sincerely,

David R. Craddick
Director

“By Water All Things Find Life”
Mr. David Craddick, Director
Department of Water Supply
County of Maui
200 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Pump Installation Permit
Kanoa #1 Well (Well No. 5731-02)

Enclosed are two (2) originals of your approved Pump Installation Permit for the captioned well(s) that authorize permanent pump installation work for your well(s). As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 11:

Special Conditions

1. None

The permittee is responsible for all conditions of the permit. This includes ensuring that the pump installation contractor, or other party who installs the pump, submits a completed Part II of the Well Completion Report form (enclosed) within sixty (60) days after the pump installation work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions starting from the permit approval date.

To validate your pump installation permit, please sign and have the contractor sign both permit originals and return one for our files. A copy of the Well Completion Report (Part II) and a copy of your water use report form are enclosed for your use.

IMPORTANT - Unless specifically exempted, pump installation may not proceed without a validated permit returned to the Commission. Except for the monthly water use report form, please provide copies of all the information in this packet to your pump installation contractor.

Finally, this letter is notice that we have accepted your Well Completion Report - Part I as complete.

If you have any questions, please call the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Aloha,

TIMOTHY E. JOHNS
Chairperson

Enclosure
PUMP INSTALLATION PERMIT
Kanoa #1 Well (Well No. 5731-02)

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the pump installation for Kanoa #1 Well (Well No. 5731-02) at Kanoa, North Waihee, Maui, TMK 3-2-1-3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1200 gpm capacity, or less, pump in the well.

3. The permittee shall provide and maintain an approved meter or other means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly/6m annual (choose reporting period) basis, on forms provided by the Chairperson (attached).

4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of cumulative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

5. The permittee shall complete and submit as-built drawings and Part II - (Permanent) Pump Installation Report of the Well Completion Report (attached) to the Chairperson within sixty (60) days after completion of work.

6. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

7. The pump installation permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97). If the HWCPIS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.

8. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the pump installation permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

9. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

10. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.

11. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 27, 1999
Expiration Date: September 27, 2001

TIMOTHY E. JOHNS, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the pump installer have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day starting from the permit date of approval.

Permittee's Signature: ___________________________ Date: __________

Printed Name: ______________________ Firm or Title: ______________________

Installer's Signature: ___________________________ C-57, C-57a, or A License #: __________ Date: __________

Printed Name: ______________________ Firm or Title: ______________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments
C: USGS
Department of Health/ Safe Drinking Water & Wastewater Branch
COMMISSION ON WATER RESOURCE MANAGEMENT

FROM: Linnell

DATE: 29 Sep 79

SUSPENSE DATE

TO: BAUER, G.
CHING, F.
FUJII, N.
HARDY, R.
HIGA, D.
HIRANO, E.
ICE, C.
IMATA, R.
JINNAI, R.
KUNIMURA, I.

INIT

TO: LUM, A.
NAKAMA, L.
NAKANO, D.
NISHIOKA, I.
OHYE, M.
SAKODA, E.
SUBIA, S.
SWANSON, S.
UYENO, D.
YODA, K.

INIT

FOR: Approval
Signature
Information

Need retraction/void letter for both:

1. 5731-33 need
2. 5731-03 need

Gill 5731-2x3.pq

agreed not to list spec - announc

Need to discuss w/green - I dont
understand how we arrived at .15 gpd
figure. Upcoming well interference, depths of
well etc.?
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, HI 96793  

Dear Mr. Craddick:  

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)  

We have received your pump installation permit application for the Kanoa #1 Well (Well No. 5731-02). However, matters which must be addressed before we accept your application as complete are as follows:  

1. The Pump Installation Permits for two wells expired without a well completion report being filed:  
   a. Wakiu (Hana) Well "A" (Well No. 4600-02)  
   b. Waipuka Well #2 (Well No. 5339-02)  

2. The Well Construction Permits for two wells that have expired without a well completion report being filed:  
   a. Waikapu Mauka Well (Well No. 5131-01)  
   b. Maui High School Well (Well No. 5420-01) (to be sealed).  

Please provide information on the status of these projects, and well completion reports, if applicable. Upon receipt of this information, we will accept your application as complete and you can then expect your application to be processed within ninety (90) days.

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at [redacted] or toll free at [redacted] extension 70251.

Sincerely,  

LINNEL T. NISHIOKA  
Deputy Director  

Cl:ss
**APPLICANT INFORMATION:** (Fill out all three, if applicable, and place a check next to the primary contact)

1. □ WELL OWNER: Maui Dept. of Water Supply  
   Contact Person: David Craddick  
   Phone: 270-7816  
   Mailing Address: 200 South High Street, Wailuku, HI 96793  
   Fax: 270-7833  
   E-mail: 

2. □ LAND OWNER: Maui Dept. of Water Supply  
   Contact Person: David Craddick  
   Phone: 270-7816  
   Mailing Address: 200 South High Street, Wailuku, HI 96793  
   Fax: 270-7833  
   E-mail: 

3. □ CONTRACTOR:  
   Contact Person:  
   Phone:  
   Mailing Address:  
   Fax:  
   E-mail:  
   Lic #:  

**WELL & PUMP INFORMATION:** (Please fill in the diagram on the back of this form)

2. **WELL LOCATION/NAME:** KANOA WELL No. 1  
   Island: Maui  
   Address: Wailuku, Maui, Hawaii  
   Mailing Address: 200 South High Street, Wailuku, HI 96793  
   Fax: 270-7833  
   E-mail:  
   Tax Map Key: (2) 3-02-01: 03  

   **(Attach the relevant portion of (a) a 7.5-Minute Series USGS topographic map (scale 1"=24,000"), and (b) a property tax map, showing well location referenced to established property boundaries.)**

3. **PROPOSED WORK:** (Check all that apply)  
   □ Drill New Well  
   □ Deepen  
   □ Install New Pump  
   □ Modify Existing Well  
   □ Redrill  
   □ Modify Pump  
   □ Abandon/Seal  
   □ Replace Pump  
   * Well No.:  
   Be sure to complete and submit well abandonment report upon completion of work.

4. **CONSTRUCTION:**  
   □ Dug  
   □ Bored  
   □ Driven  
   □ Drilled  
   □ Radial  
   Is this well a part of a battery of wells? □ Yes □ No  
   (Please describe)

5. **PROPOSED PUMP INFORMATION:**  
   **Rated Pump Capacity:** 1,200 gallons per minute  
   **(Check one):**  
   □ Deep Well Turbine  
   □ Rotary  
   □ Submersible  
   □ Rotary-Displacement  
   □ Submersible  
   □ Rotary-Gear  
   **Powered by:**  
   □ Electric, rated horsepower: 200  
   □ Diesel  

6. **PROPOSED USE:** (Check all that apply)  
   □ Municipal (including hotels, stores, etc.)  
   □ Domestic (individual, noncommercial water system)  
   □ Irrigation (crop)  
   □ Military  
   □ Other (explain):  
   □ No. of Dwelling Units:  
   □ No. of Acres:  

7. **(a) PROPOSED AMOUNT OF WITHDRAWAL:** 1,152,000 gallons per day  
   **(b) METHOD OF FLOW MEASUREMENT:**  
   □ Flowmeter  
   □ Open pipe  
   □ Weir  
   □ Orifice  
   □ Other (explain):  
   □ Other:

**OTHER IMPORTANT INFORMATION:**

8. **PENDING ACTIONS:**  
   □ CDUA □ SRA □ EIS □ EA □ NONE □ Other (explain):  
   □ Other (explain):  
   □ Permit  

9. **THE LANDOWNER CERTIFIES THAT THE SUBJECT PROPERTY, OR A PORTION THEREOF, WAS □ OR WAS NOT □ A STATE OF HAWAII LAND PATENT GRANT ISSUED AFTER 1960.**  
   (CHECK WITH YOUR TITLE SEARCH COMPANY OR THE LAND DIVISION, DEPT. OF LAND AND NATURAL RESOURCES AT __________ FOR HELP)

10. **REMARKS, EXPLANATIONS:**  
    (If more space is needed, please attach additional sheet)

I understand that approval of this application attaches the following standard conditions: 1) the proposed work is to be completed within two (2) years of the approval date; 2) the contractor shall submit to the Commission a well completion/abandonment report within 30 days after the completion date of the permitted work; 3) monthly water use data shall be submitted to the Commission; 4) such approval shall not constitute a determination of correlative water rights and shall not guarantee the pump capacity of future use up to the permitted pump capacity.

**Well Owner:** Maui Dept. of Water Supply  
**Landowner:** Maui Dept. of Water Supply  
**Contractor:**  

**Signature:** ___________________________  
**Date:** 01/14/99  

**Field Checked By:** ___________________________  
**Longitude:** ___________  
**Aquifer System Name:** ___________  
**Date:** ___________  
**Latitude:** ___________  
**State Well No.:** ___________  

WCPIFORM (2/23/99)
For non-salt water Basal Wells - bottom elevation of well should not be deeper than 1/4 of aquifer thickness or, Bottom Elevation of Well Limit = (Water Elevation - 1/4 X Aquifer Thickness or Water Level Elevation)

Example: Estimated 2 ft. Water Level Elev. → Bottom Elevation of Well Limit = (2 - 1/4 X 2)) = -1.5 ft.

* The approximate elevation must be referenced to mean sea level (msl) at the time of application. Final elevations of well components shall be submitted in the Well Completion/Well Abandonment reports and referenced to a benchmark which has been established by a surveyor licensed by the State.

**Solid Casing Material:**
- **Steel:** compliant with (check one or more):
  - [ ] ANSI/AWWA C200
  - [ ] API Spec. 5L
  - [ ] ASTM A53
  - [ ] ASTM A139
- And compliant with (check one or more):
  - [ ] ASTM A242
  - [ ] Type E
  - [ ] Type S
  - [ ] Grade B
  - [ ] Other ____________________
- **Stainless Steel:** (check one):
  - [ ] ASTM A409
  - [ ] ASTM A312
- **ABS Plastic** conforming to ASTM F490 and ASTM D1527: (check one) Schedule 40
- Schedule 80
- **PVC Plastic** conforming to ASTM F490 and ASTM D1795 or ASTM D2241: (check one):
  - [ ] Schedule 40
  - [ ] Schedule 80

**Thermoset Plastic:** (check one):
- [ ] Filament Wound Resin Pipe conforming to ASTM D2906
- Centrifugally Cast Resin Pipe conforming to ASTM D2907
- Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
- Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
- PTFE Fluorocarbon Tubing conforming to ASTM D3296
- FEP Fluorocarbon Tubing conforming to ASTM D3296

**Open Casing Material:**
- **Steel:** compliant with (check one or more):
  - [ ] ANSI/WWA C200
  - [ ] API Spec. 5L
  - [ ] ASTM A53
  - [ ] ASTM A139
- And compliant with (check one or more):
  - [ ] ASTM A242
  - [ ] Type E
  - [ ] Type S
  - [ ] Grade B
  - [ ] Other ____________________
- **Stainless Steel:** (check one):
  - [ ] ASTM A409
  - [ ] ASTM A312
- **ABS Plastic** conforming to ASTM F490 and ASTM D1527: (check one)
  - [ ] Schedule 40
  - [ ] Schedule 80
- **PVC Plastic** conforming to ASTM F490 and ASTM D1795 or ASTM D2241: (check one):
  - [ ] Schedule 40
  - [ ] Schedule 80

**Thermoset Plastic:** (check one):
- [ ] Filament Wound Resin Pipe conforming to ASTM D2906
- Centrifugally Cast Resin Pipe conforming to ASTM D2907
- Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
- Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
- PTFE Fluorocarbon Tubing conforming to ASTM D3296
- FEP Fluorocarbon Tubing conforming to ASTM D3296
THEIS DRAWDOWN CALCULATION

by Glenn Bauer & Roy Hardy with numerical approximations by Hontoon (1980)

FILE NAME = Kanoa Well 1
TEST NAME = Long-Term Test
DATE = May 14-21, 1999

INPUT PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>T = 124,770 ft²/day</td>
</tr>
<tr>
<td>Storage Coeff.</td>
<td>S = 0.300 dimensionless</td>
</tr>
<tr>
<td>Time</td>
<td>t = 200,000 days</td>
</tr>
<tr>
<td>Pumping Rate</td>
<td>Q = 154,010.7 ft²/day</td>
</tr>
</tbody>
</table>

GREEN VALUES

<table>
<thead>
<tr>
<th>Radial Distance (r)</th>
<th>u</th>
<th>W(u)</th>
<th>Drawdown s (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.0055E-12</td>
<td>26.0</td>
<td>2.55</td>
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<td>10</td>
<td>3.0055E-10</td>
<td>21.3</td>
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<tr>
<td>50</td>
<td>7.5138E-09</td>
<td>18.1</td>
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<tr>
<td>100</td>
<td>3.0055E-08</td>
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<tr>
<td>1500</td>
<td>1.8785E-07</td>
<td>14.9</td>
<td>1.46</td>
</tr>
<tr>
<td>2000</td>
<td>7.5138E-07</td>
<td>13.5</td>
<td>1.33</td>
</tr>
<tr>
<td>3000</td>
<td>3.0055E-06</td>
<td>12.1</td>
<td>1.19</td>
</tr>
<tr>
<td>5000</td>
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<td>3.0055E-06</td>
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<td>0.74</td>
</tr>
</tbody>
</table>

OBSERVATION WELL

Radial distance from pumping well: 5280 ft

Theoretical drawdown a mile (5,280 ft) from the pumping well when u < 0.01

T = 124,770 ft²/d
Sp. yield = 0.2
r = 20000 ft
s = 0.286 ft
Predicted rise of the saltwater interface

\[ Z_t = \frac{pfQ}{2\pi(ps-pf)K_xL} \left( 1 - \frac{2pfnL}{(ps-pf)K_z} \right) \]

Where:

- \( Z_t \) = rise of cone center at time \( t \)
- \( Q \) (\( \text{ft}^3/\text{d} \)) = well discharge
- \( L \) = Depth of mid-pt. below bottom of well before pumping
- \( K_x \) = Horizontal K
- \( K_z \) = Vertical K
- \( n \) = porosity of aquifer
- \( ps \) = density of salt water
- \( pf \) = density of freshwater

Well Name: Kanoa Well 5731-02
Kx analysis by: Glenn Bauer

Assume \( K_x/K_z = 200 \)

Predicted Rise in Transition Zone

<table>
<thead>
<tr>
<th>( t ) (days)</th>
<th>( t ) (years)</th>
<th>( Z_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.27</td>
<td>0.548842</td>
<td></td>
</tr>
<tr>
<td>1.37</td>
<td>1.41286</td>
<td></td>
</tr>
<tr>
<td>2.74</td>
<td>1.758999</td>
<td></td>
</tr>
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<td>6.85</td>
<td>2.06212</td>
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<td>273.97</td>
<td>2.322239</td>
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<tr>
<td>1369.86</td>
<td>2.328263</td>
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</tr>
</tbody>
</table>
# CONSTANT-RATE PUMP TEST DATA

Table 2 (CRPTD Form 12/17/97)

<table>
<thead>
<tr>
<th>Pumped Well No.</th>
<th>5731-02</th>
<th>Observation well no.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumped Well Name</td>
<td>Kamea Well 1</td>
<td>Distance between Obs. &amp; Pumped Well</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target Q</td>
<td>1200 gpm</td>
<td>Reference pt. for depth to water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Static Water Level @ start of test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water level measurements by:</td>
<td>☑ steel tape</td>
<td>☐ pressure transducer</td>
<td>☐ airline</td>
<td></td>
</tr>
</tbody>
</table>

| START TEST Date: | 5/17/99 | Time of day: | 9:00 Am | |
| Flow Meter Reading Start: | 10 3.238 gals | | | |

<table>
<thead>
<tr>
<th>Suggested elapsed time (min)</th>
<th>Actual elapsed time (min)</th>
<th>Depth to water (nearest 0.1 ft)</th>
<th>Drawdown (unadjusted to nearest 0.1 ft)</th>
<th>Pumping rate Q (gpm)</th>
<th>EC (µhos)</th>
<th>Cl⁻ (mg/l)</th>
<th>Temp. °F or °C</th>
<th>Data in this table is for:</th>
<th>Remarks</th>
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<td>☑ Pumped Well</td>
<td>Start Test</td>
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<td>-30</td>
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<td>☐ Observation Well</td>
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<tr>
<td>1</td>
<td>9:00 Am</td>
<td></td>
<td>303.80</td>
<td>2.58</td>
<td>1200</td>
<td>152</td>
<td>25</td>
<td>69</td>
<td>Start pump/Cl⁻ taken</td>
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<tr>
<td>1.5</td>
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1 Chloride sampling required
2 Use same ending drawdown figure as start for recovery

**Flow meter reading at end of pumped period:** 178,745 x 100 gals
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Data in this table is for: [ ] Pumped Well  [ ] Observation Well
Remarks

END TEST Date: 5/21/99 Time of day: 10:10 Am
ADDITIONAL REMARKS: 6.5731 0.2

Person in charge of pump test (print): Mike Robertson
Signature: [Signature]

The signature above indicates that the data reported on this form is accurate and true to the best of his knowledge.
### STEP-DRAWDOWN PUMP TEST DATA

**Table 1 (SDPTD Form 12/17/97)**

*not required for wells producing < 100,000 gpd or 70 gpm*

**Pumped Well No.** 57131-02  
**Pumped Well Name** Kanoa Well  
**Target Q**  
**Observation well no.**  
**Distance between Obs. & Pumped Well** ft.  
**Reference pt. for depth to water** ft. msl  
**Static Water Level @ start of test** ft. msl

**Water level measurements by:**  
☑ steel tape  
☐ pressure transducer  
☐ airline

**START TEST**  
Date: 5/14/99  
Time of day: 7:45 Am

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<th>Pumping rate Q (at least 3 steps) (gpm)</th>
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- Observation Well

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Max possible duration, water level or quality did not stabilize for any 24 period

Begin recovery data next page

Flow meter reading at end of pumped period: 10 8 2 3 8 gals

1 starting pumping rate Q
2 minimum length of step period of constant pumping rate
3 minimum mandatory Chloride (Cl⁻) measurement/sampling at end of every step
4 Use same ending drawdown figure as start for recovery
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END TEST  Date: 5/14/99  Time of day: 2:52

ADDITIONAL REMARKS:

Person in charge of pump test (print): Mike Robertson

Signature: [Signature]

The signature above indicates that the data reported on this form is accurate and true to the best of the person's knowledge who operated this pump test.
Please review and comment on whether test results support simultaneous pumping of both wells at 0.15 mgd.

9/27/99

Based upon the previous's fig. (worst case) and all of the assumptions, the wells should be able to handle 0.15 mgd each.
TO: COMMISSION ON WATER RESOURCE MANAGEMENT  
State of Hawaii  
P.O. Box 621  
Honolulu, HI 96809  

DATE: June 30, 1999  
JOB NO. CWS-002  

SUBJECT: NORTH WAIHEE WATER SOURCE PROJECT  
DEVELOPMENT OF KANOA WELL 1 AND KUPAA WELL  
TMK: (2) 3-2-01: 03

We are sending you X Attached Under separate cover the following:

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<th>DESCRIPTION</th>
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<td>As-Builts of Well</td>
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THESE ARE TRANSMITTED (AS CHECKED BELOW):

For Signature/Approval  
For Review and Comment  

X For Information/Use  
As Requested

REMARKS:

C. TAKUMI ENGINEERING, INC.  

Wade Shimabukuro

cc: ____________________
NORTH WAIHEE AQUIFER SYSTEM

Kupaa 1 and Kanoa 1 Wells
Test Results and Interpretation

John F. Mink
Mink and Yuen, Inc.

June 21, 1999

Kupaa 1

The location of the well, which was completed in March of 1999, is plotted on Figure 1. The completed configuration of the well is as follows.

- Depth 687 ft. (49 ft. BSL)
- Boring diameter, 21 in.
- Blank casing diameter, 16 in.; depth 633 ft. (4 ft. ASL)
- Perforated casing, diameter 16 in.; length 53 ft.
- Grout, 0 to 630 ft. (7 ft. ASL)
- Gravel, 633 to 686 ft.

Further details are given in the Driller's Well Completion Form, which is attached. Note that the measuring point (MP) on the form differs from the surveyed elevation. The driller's MP elevation on the top of the casing is listed as 638.1 feet; the actual elevation is 639.37 feet, which is based on a vertical survey from a benchmark elevation of 631.87 feet located about 200 feet from the well. This correction affects computation of head but not of drawdown measured during the pumping tests.

Examination of the drill cuttings indicates that the unconformity between the overlying Honolua trachyte formation and the Wailuku basalt formation is 70 to 80 feet below ground surface, and that the weathering zone of the Wailuku extends another 55 feet before fresh Wailuku basalt is struck. The driller's lithology log is attached. Also attached is a drawing illustrating the relationship between the Honolua and Wailuku at both the Kupaa and Kanoa wells.
**Step Drawdown Test**

Head before pumping started was 7.41 feet (MP 639.37 ft. – DTW 631.96 ft. = 7.41 ft.), as measured with the Driller’s tape. Putative stable drawdown at each pumping rate was:

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<th>Rate (gpm)</th>
<th>Drawdown (ft)</th>
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<td>700</td>
<td>.82</td>
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<tr>
<td>1000</td>
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In the Appendix these data are used to calculate a transmissivity (T) value of 178,928 sq.ft./day employing the standard laminar-turbulent flow relationship between drawdown and pumping rate. Assuming depth of flow to the well equal to penetration of the well below the water table (about 50 feet), hydraulic conductivity (k) is 3566 ft./day. This value is of the magnitude consistent with the usual values derived for other primary basalt aquifers in Hawaii.

**Constant Rate Pump Test**

The constant rate test at 1200 gpm began at 0900 on March 15, 1999, and went on for four days (96 hours). Initial drawdown was rapid, but after about 40 minutes it no longer decreased monotonically but began to oscillate within a range of approximately 0.5 feet. Tidal and barometric perturbations, randomized by apparent hysterisis in the transducer readings, contributed too much noise to the record to allow an accurate extraction of drawdowns due to pumping alone.

For the first 44 minutes of the test, however, the monotonic drawdowns can be employed in the Theis equation to derive an approximate value of T. The computer program, THEISFIT, yields a T value of 91,363 sq.ft./day, which for a 50 feet depth of flow translates to hydraulic conductivity of 1827 ft./day. This value is of the same magnitude as the one obtained from the step drawdown test data but is probably more accurate and is more consistent with typical values for other Hawaiian basalt aquifers (e.g. The Koolau aquifer of southern Oahu, which has an average hydraulic conductivity of 1500 ft./day). The printout of the THEISFIT computation is included in the Appendix. A realistic value for storage coefficient (S) is impossible to derive because a meaningful radius value for the pumping well is unknowable. The total bore diameter may be one or two feet, but the apparent diameter is likely to be greater.
The effort to disassociate tidal changes in groundwater level from drawdown did not produce clearly identifiable results. However, the tidal efficiency at the well site and Kanoa is 5 to 10 percent. For the maximum tidal change, about 2 feet, the effect on the water level in the well would be 0.10 to 0.20 feet. Change of this magnitude could not be discriminated from barometric and random perturbations after drawdown reached approximately 1.35 feet in less than an hour following the start of the test.

An effort was made to measure water levels in nearby wells during the test. The North Waihee wells were shut down to avoid interference. None of the wells (Kanoa monitor, Mendes, North Waihee) provided unambiguous, interpretable drawdown data.

During the four days of the test chloride content remained steady at 20 to 25 mg/l and temperature was 68 F. The temperature indicates that the source of recharge is from higher elevations where rainfall is copious, and the steady chloride content confirms that at 1200 gpm sea water intrusion does not affect the pumped water. A full spectrum analysis shows that the water is not contaminated with either volatile organics or heavy metals.

Recommended Pump Size

The sustained constant rate, 1200 gpm (1.73 mgd), is the recommended pump size. Initial head at Kupaa was 7.41 feet, which is adequate to avoid upconing of sea water during pumping in a well penetrating 50 to 100 feet below the water table. Should adherence to the full breadth of the DWS protocol on pumping be required, average daily yield will be 0.77 mgd (.444 x 1.73 mgd); if only the 16 hr/day pumping portion of the protocol were followed, average yield would be 1.15 mgd (.667 x 1.73 mgd).

Kanoa 1

Kanoa 1 was completed in April and tested in May, 1999. Its location is plotted on Figure 1. Final configuration of the well is as follows.

Depth: 359 ft. (50 ft. BSL)
Boring diameter: 22 in.
Blank casing diameter: 16 in.; depth
Perforated casing diameter: 16 in.;
Grout: 0 to 300 ft.
Gravel: 300 to 389 ft.
fluctuations compounded by inconsistencies in transducer readings relegate the use of the data to speculation. Similarly the transducer data from the Kanoa monitor well evidently did not reliably reflect pumping drawdown. During testing transducer readings have to be supplemented by tape measurements to check their accuracy and reliability.

Chloride content during the test remained constant at 20 to 24 mg/l (see Appendix), the same as at Kupaa, and temperature fell between 69 and 71 F.

Clearly the North Waihee aquifer is highly permeable and capable of supplying low salinity water at satisfactory pumping rates. When the North Waihee 1 and North Waihee 2 wells were tested in 1981 and 1989, the transmissivity values were 325,000 sq.ft./day for the original test, and 320,000 sq.ft./day for the 1989 test. The associated storage coefficient values were .25 and .30.

**Recommended Pump Size**

As for Kupaa, the recommended pump size is 1200 gpm (1.73 mgd). For the DWS standard factor of .444, average production will be 0.77 mgd, for the more liberal factor of .667, the average will be 1.15 mgd.
APPENDIX

Kupaa 1 Step Drawdown

A value of transmissivity (T) can be calculated from a step drawdown test by assuming that drawdown at each rate is stable and that it is expressed by the equation,

\[ s = aQ + bQ^2 \]

in which \( s \) is drawdown, \( Q \) is pump rate, \( a \) is the laminar flow (aquifer) constant, and \( b \) is the turbulent flow (well loss) constant. The equation is linearized by dividing by \( Q \),

\[ s/Q = a + bQ \]

which plots as a straight line with \( s/Q \) as the ordinate and \( Q \) the abcissa. The value, \( a \), is the intercept, and \( b \) is the slope of the line. An attached graph shows the linear form of the step drawdown curve for Kupaa 1.

To determine \( T \), the intercept, \( a \), is substituted in the Thiem steady state formula for drawdown as a function of pumping. The Thiem equation is,

\[ s = \frac{Q}{2\pi T T} \ln \left( R/r \right) \]

in which \( R \) is the nearest distance from the well where \( s = 0 \), and \( r \) is the effective radius of the well. The value of \( R \) is unknown and has to be approximated.

Because \( s = aQ \) in the step drawdown equation refers to laminar flow in the aquifer, substitution in the Thiem equation gives,

\[ aQ = \frac{Q}{2\pi T} \ln \left( R/r \right), \]

and,

\[ T = \frac{1}{2\pi a} \ln \left( R/r \right). \]

The intercept, \( a \), has a value of .00067 (see graph), thus,

\[ T = (237.6) \ln \left( R/r \right). \]
The value of R is estimated as equal to the length of penetration of the well below the water table (Zanger; Polybarunova-Kochina), and assuming the radius of the well as 1 foot,

\[ T = (237.6) \ln (50) = 929.5 \text{ gpm/ft} \]

which when converted to consistent units (feet and days) is,

\[ T = 178,928 \text{ sq.ft./day}. \]

For a depth of flow of 50 feet, \( k = 3566 \text{ ft/day} \).

**Kupaa 1 Constant Rate**

Drawdown during the period of monotonic decline before oscillation of the water level set in is plotted on an attached graph. If the Jacob simplification is employed, the \( T \) value from the graph is calculated as,

\[ T = (264) (1200)/\Delta s \]

In which \( \Delta s \) is drawdown over one log cycle of time. Thus, \( T = 70,588 \text{ sq.ft./day} \), which is comparable to the THEISFIT value of 91,363 sq.ft./day.

Unfortunately, none of the test result data allows for calculation of storage coefficient (S). In the most thoroughly studied Hawaii basaltic aquifer similar to the Wailuku basalt, the Koolau aquifer, storage coefficient as effective porosity is approximately .05, but rigorously conducted tests at North Waihee 1 and North Waihee 2 in 1981 and 1989 gave S values of .25 and .30, respectively.

**Kanoa 1 Step Drawdown**

Employing the same applicable parameters as for the Kupaa 1 step drawdown analysis and a value of .0009606 ft./gpm for the aquifer constant, \( a \), the computed value of \( T \) is 124,770 sq.ft./day. If depth of flow is equal to depth of penetration of the well below the water table (50 ft.), hydraulic conductivity is 2495 ft./day.

**Kanoa 1 Constant Rate**

The water level data derived from transducer readings was too imprecise to allow for realistic determination of aquifer parameters.
Figure 1 - Vicinity Map
Proposed Exploratory Well Sites
Kupaa Well NO.1 & Kanoa Well No.2
Waihee, Maui, Hawaii

Source: U.S.G.S. Map Waikuku and Kahakuloa Quadrangles
## WELL CONSTRUCTION REPORT

### Part I

<table>
<thead>
<tr>
<th>Description</th>
<th>Depth (ft.)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Clay</td>
<td>0 to 10</td>
<td></td>
</tr>
<tr>
<td>Assorted Rock</td>
<td>10 to 18</td>
<td></td>
</tr>
<tr>
<td>Gray Clay</td>
<td>18 to 36</td>
<td></td>
</tr>
<tr>
<td>(if more space is needed, continue on back)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total depth of well below ground:</strong></td>
<td>687</td>
<td></td>
</tr>
<tr>
<td><strong>Hole size:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 in. dia. from 0 ft. to 687 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 in. dia. from 0 ft. to 687 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Casing installed:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2 in. I.D. x 3/4 in. wall solid section to 633 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2 in. I.D. x 5/16 in. wall perforated section to 636 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gravel:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grouted from 0 ft. below ground to 630 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel back from 633 ft. below ground to 636 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Initial water level:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>631.3 ft. below ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Initial chlorine:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Initial temperature:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PUMPING TESTS:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Point (R.P.) used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well casing, which elevation is 633.10 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Step-Drawdown Test Date 3/12/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start water level 631.3 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End water level 632.05 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Long-term Aquifer Test Date 3/13/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start water level 631.30 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End water level 631.20 ft. below R.P.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other remarks/comments:
- As-built drawings attached: Yes
- No

### Applicant (print)
- Wailani Drilling Inc.
- Lic. No. C-57
- Date 5/20/99

### Surveyor (print)
- Eduardo Valera
- Lic. No. L.P.L.S. # 5278
- Date May 24, 1999

### Well Drilling Contractor (print)
- Wailani Drilling Inc.
- Lic. No. C-57
- Date 5/20/99
**PART II. (PERMANENT) PUMP INSTALLATION REPORT**

20. Pump Installation Company:

21. Name of person performing work:

22. Date Pump Installation Completed:

23. PUMP INSTALLATION:

<table>
<thead>
<tr>
<th>Pump Type, Make, Serial No.</th>
<th>Capacity:  ____ gpm</th>
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</thead>
<tbody>
<tr>
<td>Motor type, H.P., Voltage, rpm:</td>
<td></td>
</tr>
<tr>
<td>Depth of Pump Intake Setting:  ____ ft. below  ____ ft. which elevation is  ____ ft.</td>
<td></td>
</tr>
<tr>
<td>Depth to bottom of airline:  ____ ft. below  ____ ft. which elevation is  ____ ft.</td>
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</tr>
<tr>
<td>Pumping Head is:  ____ ft. Type of flow meter:  ____ which measures in  ____</td>
<td></td>
</tr>
</tbody>
</table>

24. As-built drawings attached:  ____ Yes  ____ No

25. Other remarks/comments. (See below)

Pump Installation Contractor (print):  ____ C-57 Lic. No.  ____

Signature  ___________________________  Date  ____________

Applicant (print)  ___________________________  Date  ____________

Signature  ___________________________  Date  ____________

*DRILLER'S LOG (cont'd):*

<table>
<thead>
<tr>
<th>Water Level (ft.)</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks, Water Level (ft.)</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks,</th>
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</thead>
<tbody>
<tr>
<td>35</td>
<td>10</td>
<td>Weathered Basalt</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>10</td>
<td>Blue Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>10</td>
<td>Weathered Basalt</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>10</td>
<td>Blue Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>10</td>
<td>Assorted Rock &amp; Coral</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>10</td>
<td>Brown Clay &amp; Assorted Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>Peper Clay &amp; Blue Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>10</td>
<td>Assorted Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>10</td>
<td>Assorted Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>395</td>
<td>10</td>
<td>Dense Basalt</td>
<td>10</td>
<td></td>
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<tr>
<td>35</td>
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<td>Soffer Basalt</td>
<td>10</td>
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<td>10</td>
<td>Tan Clay &amp; Basalt</td>
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<tr>
<td>35</td>
<td>10</td>
<td>Soffer Basalt</td>
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<td></td>
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<tr>
<td>35</td>
<td>10</td>
<td>Tan Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>10</td>
<td>Soft Basalt</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>10</td>
<td>Basalt &amp; Brown Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>10</td>
<td>Tan Rock</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>10</td>
<td>Basalt-Brown Rock &amp; Red Cinder</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>10</td>
<td>Basalt-Black &amp; Red Cinders</td>
<td>10</td>
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</tr>
<tr>
<td>65</td>
<td>10</td>
<td>Black &amp; Red Cinders</td>
<td>10</td>
<td></td>
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</tbody>
</table>

19 & 25. Remarks:

______________________________
______________________________
## Well Log

### Kupaa well #1

**Date:** 8/27/98

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Depth</th>
<th>Drift pipe</th>
<th>Drift Degree</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27</td>
<td>3:30</td>
<td>0-6</td>
<td>N.A.</td>
<td></td>
<td>12 in. HAMMER + STAB = 7 ft. - TOP SUB = 2 ft. RED CLAY</td>
<td>150</td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-10</td>
<td>&quot;</td>
<td></td>
<td>add 18 ft x 12 in. stabilizer/ TAN CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-18</td>
<td>&quot;</td>
<td></td>
<td>GREY CLAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28</td>
<td>5:00</td>
<td>18-25</td>
<td>&quot;</td>
<td>0.25</td>
<td>GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25-31</td>
<td>&quot;</td>
<td></td>
<td>add 58x12 inch stabilizer / GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:45</td>
<td></td>
<td>31-36</td>
<td>&quot;</td>
<td></td>
<td>add 69x12 inch stabilizer/ GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30</td>
<td></td>
<td>36-41</td>
<td>&quot;</td>
<td></td>
<td>add 69x12 inch stabilizer/ WEATHERED BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:12</td>
<td></td>
<td>41-46</td>
<td>&quot;</td>
<td></td>
<td>add 69x12 inch stabilizer/ BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:33</td>
<td></td>
<td>46-49</td>
<td>&quot;</td>
<td></td>
<td>add 67x12 inch stabilizer/ BLUEROCK</td>
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<td></td>
</tr>
<tr>
<td>3:20</td>
<td></td>
<td>49-54</td>
<td>&quot;</td>
<td>0.2</td>
<td>add 67x12 inch stabilizer/ BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:31</td>
<td></td>
<td>54-60</td>
<td>&quot;</td>
<td></td>
<td>add 67x12 inch stabilizer/ BLUEROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:45-4:30</td>
<td>60.41</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
<td>add 67x12 inch stabilizer/ BLUEROCK-LAST FOOT(59-60.41)WEATHERED BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/31</td>
<td>8:00</td>
<td></td>
<td></td>
<td></td>
<td>all pilot tools installed-install diverter-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:23</td>
<td></td>
<td>60-80</td>
<td># 1</td>
<td></td>
<td>start drill pipe #1/ DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:20</td>
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<td>80-85</td>
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<td>ASSORTED ROCK-CORAL</td>
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</tr>
<tr>
<td>1:04</td>
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<td>85-110</td>
<td># 2</td>
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<td>SAME FORMATION</td>
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<tr>
<td>1:27</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:25</td>
<td></td>
<td>110-135</td>
<td># 3</td>
<td>0.6 *</td>
<td>BROWN CLAY AND ASSORTED ROCK</td>
<td></td>
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</tr>
<tr>
<td>3:05</td>
<td></td>
<td>135-160</td>
<td># 4</td>
<td>0.4 *</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td></td>
<td>160-170</td>
<td># 5</td>
<td>0.25</td>
<td>ASSORTED ROCK</td>
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</tr>
<tr>
<td>4:00</td>
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<td>170-185</td>
<td># 6</td>
<td>0.3</td>
<td>DENSE BASALT</td>
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<td></td>
</tr>
<tr>
<td>4:40</td>
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<td>185-210</td>
<td># 7</td>
<td>0.2 *</td>
<td>DENSE BASALT</td>
<td></td>
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<td>9/1</td>
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<td>210-235</td>
<td># 8</td>
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<td>DENSE BASALT</td>
<td></td>
<td></td>
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<tr>
<td>10:10</td>
<td></td>
<td>235-260</td>
<td># 9</td>
<td>0.6 *</td>
<td>DENSE BASALT (Blueroock)</td>
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<tr>
<td>12:30</td>
<td></td>
<td>260-285</td>
<td># 10</td>
<td>0.2</td>
<td>DENSE BASALT (Blueroock)</td>
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</tr>
<tr>
<td>Date / Time</td>
<td>Drill pipe no.</td>
<td>Depth</td>
<td>Drift Degree</td>
<td>Tooling / Geologic Formation</td>
<td>Air Press.</td>
<td>Bit Press.</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
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<td>--------------</td>
<td>-----------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>9/2/98 Rain- No Drilling Today</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9/3 11:00</td>
<td># 11</td>
<td>310-315</td>
<td></td>
<td>HARD BASALT</td>
<td></td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>&quot;</td>
<td>315-325</td>
<td></td>
<td>SOFTER BASALT</td>
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<td></td>
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<tr>
<td>12:15</td>
<td># 12</td>
<td>325-335</td>
<td>0.25</td>
<td>TAN CLAY AND BASALT</td>
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</tr>
<tr>
<td>1:15</td>
<td></td>
<td>335-340</td>
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<td>TAN CLAY AND BASALT</td>
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</tr>
<tr>
<td>1:20</td>
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<td>340-355</td>
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<td>SOFTER BASALT</td>
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<tr>
<td>1:30-2:20</td>
<td># 13</td>
<td>355-360</td>
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<td>TAN ROCK</td>
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<tr>
<td>2:30-3:20</td>
<td># 14</td>
<td>360-375</td>
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<td>TAN ROCK</td>
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</tr>
<tr>
<td>3:30</td>
<td></td>
<td>375-385</td>
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<td>SOFTER BASALT</td>
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<tr>
<td>4:30-5:15</td>
<td># 16</td>
<td>385-410</td>
<td>0.25</td>
<td>BASALT AND BROWN ROCK</td>
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<tr>
<td>9/4 9:30-10:15</td>
<td># 17</td>
<td>410-435</td>
<td>0.2</td>
<td>BASALT AND BROWN ROCK</td>
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<tr>
<td>10:45</td>
<td></td>
<td>435-460</td>
<td>0.24</td>
<td>BASALT AND BROWN ROCK</td>
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<td></td>
</tr>
<tr>
<td>11:55</td>
<td># 18</td>
<td>460-485</td>
<td>0.3</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:10</td>
<td># 19</td>
<td>485-500</td>
<td>0.1</td>
<td>TAN ROCK</td>
<td></td>
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<td></td>
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<tr>
<td>2:00-3:05</td>
<td># 20</td>
<td>500-525</td>
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<td>BASALT-BROWN ROCK-RED CINDERS</td>
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<tr>
<td>3:30-4:20</td>
<td># 21</td>
<td>520-540</td>
<td>0.2</td>
<td>BASALT - BLACK + RED CINDERS</td>
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<tr>
<td>4:45-5:15</td>
<td># 22</td>
<td>540-560</td>
<td>0.3</td>
<td>BASALT - BLACK + RED CINDERS</td>
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<tr>
<td>9/8 2:00-2:46</td>
<td>#23</td>
<td>560-580</td>
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<td>BASALT - BLACK + RED CINDERS</td>
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<tr>
<td>3:05-4:10</td>
<td>#24</td>
<td>585-600</td>
<td>0.4</td>
<td>BASALT - BLACK + RED CINDERS</td>
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<td></td>
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<tr>
<td>4:10-4:40</td>
<td>#25</td>
<td>600-625</td>
<td>0.5</td>
<td>BASALT - BLACK + RED CINDERS</td>
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<td></td>
</tr>
<tr>
<td>11/30 9:30-11:50</td>
<td>#25</td>
<td>625-650</td>
<td>0.5</td>
<td>BASALT - BLACK + RED CINDERS</td>
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</tr>
</tbody>
</table>
Kupaa 1 Step Drawdown Test
Rank 1 Eqn 8160 [Line Robust None, Gaussian Errors] y=a+bx
\[ r^2=0.9667389 \quad DF \quad Adj \quad r^2=0.90036669 \quad FitStdErr=6.1934602e-05 \quad Fstat=58.220822 \]
\[ a=0.00066990868 \]
\[ b=6.386758e-07 \]
CALCULATION OF 'BEST FIT' TRANSMISSIVITY AND STORAGE COEFFICIENT BY AUTOMATICALLY FITTING EXPERIMENTAL PUMPTEST DATA TO THE THEIS EQUATION IN A LEAST SQUARES SENSE.

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constant rate test

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INPUT DATA

ENGLISH UNITS

PUMPAGE RATE: 1200 [GAL/MIN]

OBSERVATION DISTANCE FROM PUMPING WELL: 1 [FT]

NUMBER OF ENTERED TIME-DRAWDOWN DATA PAIRS: 8

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EXPERIMENTAL TIME-DRAWDOWN DATA

<table>
<thead>
<tr>
<th>TIME [MIN]</th>
<th>DRAWDOWN [FT]</th>
</tr>
</thead>
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<tr>
<td>4</td>
<td>.75</td>
</tr>
<tr>
<td>8</td>
<td>1.02</td>
</tr>
<tr>
<td>12</td>
<td>1.08</td>
</tr>
<tr>
<td>16</td>
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<td>24</td>
<td>1.25</td>
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<tr>
<td>32</td>
<td>1.26</td>
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**RESULTS**

CALCULATED GUESS FOR TRANSMISSIVITY SC: 475.845 [GAL/MIN/FT]
CALCULATED GUESS FOR STORAGE COEFFICIENT SC: 7.113292

<table>
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<td>1</td>
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<td>3</td>
<td>460.354</td>
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</tr>
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<td>474.31</td>
<td>GAL/MIN/FT</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
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<td>GAL/MIN/FT</td>
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<td>474.31</td>
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</tr>
<tr>
<td>7</td>
<td>460.354</td>
<td>GAL/MIN/FT</td>
<td>1</td>
</tr>
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</table>
REPORT DATE: MAR 22, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUl, HAWAII 96793
PHONE #: [redacted]

MATRIX: WATER

SAMPLER: 

EPA METHOD: CHLORIDE: 4500-CI

<table>
<thead>
<tr>
<th>SAMPLE ID KUPAA WELL 1</th>
<th>CHLORIDE mg/L</th>
<th>SAMPLE ID KUPAA WELL 1</th>
<th>CHLORIDE mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/15/99 @ 0935 by WS</td>
<td>20</td>
<td>3/18/99 @ 0806 by KK</td>
<td>25</td>
</tr>
<tr>
<td>3/15/99 @ 2100 by ?</td>
<td>22</td>
<td>3/18/99 @ 0900 by WS</td>
<td>25</td>
</tr>
<tr>
<td>3/16/99 @ 0900 by ?</td>
<td>22</td>
<td>3/18/99 @ 2100 by MR</td>
<td>20</td>
</tr>
<tr>
<td>3/16/99 @ 2100 by MR</td>
<td>20</td>
<td>3/19/99 @ 0900 by NR</td>
<td>21</td>
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<tr>
<td>3/17/99 @ 0900 by MR</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/17/99 @ 2100 by MR</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPROVED BY: C. CERIZO
W.M. IV
WELL COMPLETION REPORT

(WELL CONSTRUCTION REPORT)

1. State Well No.: 5731-02
   WELL NAME: Kona Well
   Island: Maui
2. Location/Address: North Wailua, Wailuku
   Tax Map Key: 32-1-13

PART I.

4. Name of driller who performed work: Mike Robertson
5. Type of rig/construction: Air Rotary
6. Date(s) Well Construction and pump tests (if any) completed: 5/15/99
7. GROUND ELEVATION (referenced to mean sea level, fsl): 309.15 ft.
   Well Bench Mark (description/location): Tag of pump base plate
   Elevations (fsl) 309.15 ft.
2. DRILLER'S LOG: Please attach geologic log (if available or if required by permit).
   Depths (ft.) Rock Description, Water Level, Dates, etc.
   Depths (ft.) Rock Description, Water Level, Dates, etc.
   0 to 28 Gray Weathered Rock - Clay (60 to 70) Gray Rock
   28 to 10 Same with less clay
   10 to 30 Gray Weathered Rock - Clay
   (If more space is needed, continue on back)
9. Total depth of well below ground: 359 ft.
10. Hole size: 2.3 inch dia. from ______ to ______ ft. below ground
    ______ inch dia. from ______ to ______ ft. below ground
    ______ inch dia. from ______ to ______ ft. below ground
11. Casing installed: 1 1/4 in. diameter, section to 305 ft. below ground
    1 1/2 in. diameter, section to 359 ft. below ground
    Casing Material/Slot Size: 1 1/4 in. full flow covered
12. Annulus: Gravel packed from 0 ft. below ground to 100 ft. below ground
    Gravel packed from 100 ft. below ground to 359 ft. below ground
13. Initial water level: 299.83 ft. below ground
    Date and time of measurement: 5/17/99
    Date and time of sampling: 5/17/99
15. Initial temperature: 68 °F
    Date and time of measurement: 5/17/99
16. PUMPING TESTS: Reference Point (RP) used: Pump base plate, which elevation is 309.15 ft.
    (1) Step-Drawdown Test Date: 5/14/99
    Start water level: 300.34 ft. below R.P.
    End water level:
    (2) Long-term Aquifer Test Date: 5/17/99
    Start water level: 300.34 ft. below R.P.
    End water level: 300.34 ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs (1996 LAT Form) attached? Yes No
18. As-built drawings attached? Yes No
19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) Mike Robertson
C-57 Lic. No. 21115
Signature
Date: 5/17/99

Surveyor (print) W. VALENT
Lic. No. 64507, 7576
Signature
Date: June 13, 1989

Applicant (print) Department of Water Supply
Signature
Date: 5/26/99

TAKUMI ENGINEERING

Jun-29-99 02:43P C TAKUMI ENGINEERING P.02
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: \\
21. Name of person performing work: \\
22. Date Pump Installation Completed: \\
23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: ____________________________ Capacity: _______ gpm
   Motor type, H.P., Voltage, rpm: ____________________________
   Depth of Pump Intake Setting __________ ft. below __________ ft., which elevation is __________ ft.
   Depth to bottom of intake __________ ft. below __________ ft., which elevation is __________ ft.
   Pumping Head is __________ ft. Type of flow meter __________ which measures in ________.

24. As-built drawings attached: _______ Yes _______ No

25. Other remarks/comments: (See below)

Pump Installation Contractor (print) ______________________ C-57 Lic. No. ________________
Signature ________________________________ Date ____________________
Applicant (print) ________________________________
Signature ________________________________ Date ____________________

8.(cont'd) DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Dates (ft.)</th>
<th>Water Level</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 to 1.5</td>
<td>Hard Basalt</td>
<td>Blurred</td>
<td></td>
</tr>
<tr>
<td>1.5 to 2.5</td>
<td>Weathered Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 to 3.5</td>
<td>Hard Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 to 4.5</td>
<td>Hard Clay Rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 to 5.5</td>
<td>Weathered Basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 to 5.5</td>
<td>Salted Basalt (aa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 to 7.5</td>
<td>Dense Blurred</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 to 9.5</td>
<td>Black + Red Clinders + Water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19 & 25. Remarks:

________________________________________________________

________________________________________________________
<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Drill Pipe #</th>
<th>Drift Degrees</th>
<th>Depth in feet</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/15/99</td>
<td></td>
<td></td>
<td>0-22</td>
<td>12 in. x 7 ft. hammer + 17 ft. stabilizer white gray weathered rock and clay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:15</td>
<td></td>
<td>22-38</td>
<td>add 5ft. 8in.x 12 in stab / gray rock and clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:40</td>
<td></td>
<td>38-60</td>
<td>add 30 ft. of stabilizers total= 60 ft stabilization same formation- gray rock and less clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30</td>
<td>1</td>
<td>0.3</td>
<td>70-85</td>
<td>gray rock - weathered basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td>2</td>
<td>0.4</td>
<td>85-110</td>
<td>hard basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/16/99</td>
<td>3</td>
<td>0.5</td>
<td>115-135</td>
<td>same</td>
<td></td>
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</tr>
<tr>
<td>8:00</td>
<td>4</td>
<td>0.5</td>
<td>135-160</td>
<td>softer basalt</td>
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</tr>
<tr>
<td>9:45</td>
<td>5</td>
<td>0.3</td>
<td>160-185</td>
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<td></td>
</tr>
<tr>
<td>10:20</td>
<td>6</td>
<td>0.7</td>
<td>185-210</td>
<td>same</td>
<td></td>
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</tr>
<tr>
<td>12:10</td>
<td>7</td>
<td>0.6</td>
<td>225</td>
<td>same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:15</td>
<td>8</td>
<td>0.5</td>
<td>235-240</td>
<td>hard tan rock</td>
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<td>240-250</td>
<td>weathered basalt</td>
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<td>4:10</td>
<td>9</td>
<td>0.3</td>
<td>250-260</td>
<td>soft black lava (aa)</td>
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<tr>
<td></td>
<td>10</td>
<td>0.6</td>
<td>285-305</td>
<td>same</td>
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<td></td>
<td>305-310</td>
<td>bluerock basalt</td>
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<tr>
<td>3/17/99</td>
<td>11</td>
<td>0.4</td>
<td>310-325</td>
<td>same</td>
<td>125</td>
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<td>8:00</td>
<td></td>
<td></td>
<td>325-335</td>
<td>black and red cinders - hit water table</td>
<td>150</td>
<td>18</td>
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<tr>
<td>10:10</td>
<td>12</td>
<td>0.3</td>
<td>335-359</td>
<td>black and red cinders - water bearing</td>
<td>163</td>
<td>32</td>
</tr>
</tbody>
</table>

Static Water Level = 299.68 ft.
Reference elevation point = 307.76 ft.
Static Head = 8.08 ft.
REPORT DATE: JUNE 2, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: 249-0411

MATRIX: WATER

SAMPLER:

EPA METHOD: CHLORIDE: 4500-CI

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<tr>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
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<td>KANOA WELL 1</td>
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<td>5/19/99 @ 0900 by MR</td>
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<td>5/17/99 @ 0930 by WS</td>
<td>20</td>
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<tr>
<td>KANOA WELL 1</td>
<td>5/18/99 @ 0820 by LP</td>
<td>21</td>
<td>5/21/99 @ 0900 by WS</td>
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</table>

ANALYST: L. AMANO

APPROVED BY: C. CERIZO
W. M. IV
Mr. David Craddick, Director  
Department of Water Supply.  
County of Maui  
200 S. High Street  
Wailuku, HI 96793

Dear Mr. Craddick:

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)

We have received your pump installation permit application for the Kanoa #1 Well (Well No. 5731-02). However, matters which must be addressed before we accept your application as complete are as follows:

1. The Pump Installation Permits for two wells expired without a well completion report being filed:  
   a. Wakiu (Hana) Well "A" (Well No. 4600-02)  
   b. Waipuka Well #2 (Well No. 5339-02)

2. The Well Construction Permits for two wells that have expired without a well completion report being filed:  
   a. Waikapu Mauka Well (Well No. 5131-01)  
   b. Maui High School Well (Well No. 5420-01) (to be sealed).

Please provide information on the status of these projects, and well completion reports, if applicable. Upon receipt of this information, we will accept your application as complete and you can then expect your application to be processed within ninety (90) days.

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at [redacted] or toll free at [redacted] extension 70251.

Sincerely,

LINNEL T. NISHIOKA  
Deputy Director
STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 821
HONOLULU, HAWAII 96809

September 24, 1999

Mr. Michael J. Summers
Chris Hart and Partners
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

Dear Mr. Summers:

SUBJECT: Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04), Draft Environmental Assessment

FILE NO.: 97-023

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

[X ]  We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[X ]  We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[X ]  We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[X ]  A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[X ]  The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[X ]  Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.

[X ]  We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[X ]  If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[X ]  If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X ]  OTHER:

1) Please be advised of our naming convention for these wells to avoid confusion. The original North Waihe'e Water Source Development Plan called for four wells, which originally were anticipated to be in the same general vicinity. The first two wells were alternatively known simply as "Waihe'e Wells" 1 & 2, very similar to nearby private wells (Waihe'e Tunnels 1 & 2, Well Nos. 5434-01 & 02; and "Waihe'e" (Marino) Wells, of which there may be two or three, Well Nos. 5631-04, for which we have drilling information, and Well Nos. 5631-05 and/or 06, for which permits have expired without any well completion information). It became apparent that the North Waihe'e site could only support two wells, and not at the original hoped-for capacity. Two new sites were identified, which are now called Kanoa #1 and Kupaa #1 (Well Nos. 5731-02 & 03), rather than their original designations as North Waihe'e 3 & 4.

Subsequently, Maui Board of Water Supply has applied for and received a permit approval for the construction of a second Kanoa Well (Kanoa #2, Well No. 5731-04).

2) The pump tests for the Kanoa #1 and Kupaa #1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd. Our staff will base our pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

If there are any questions, please contact Charley Ice at [blank]

Sincerely,

LINNEL T. NISHIOKA
Deputy Director

Cl: ss
September 16, 1999

Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809

SUBJECT: KANOA WELL #1
Waihee, Maui, Hawaii
State Well # 5731-02

Dear Sir:

On behalf of the Maui County Department of Water Supply, we are submitting the pump installation permit application for the Kanoa Well #1 (State Well #5731-02) at Waihee, Maui, Hawaii. In addition to the permit application, we are attaching the following:


B. North Waihee Aquifer System, Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.

C. Reduced TMK: 3-2-01 showing well location on TMK.

D. The Draft Environmental Assessment is being published in the September 23, 1999 OEQC Bulletin. A copy of the Draft Environmental Assessment will be sent under a separate cover as part of the Environmental Assessment Review process.

E. The pump installation permit is for the County of Maui, Department of Water Supply. No filing fee is being submitted.

If you have any questions, please do not hesitate to call Carl Takumi, C. Takumi Engineering, Inc. at [redacted] or Herb Kogasaka, Maui Department of Water Supply at [redacted]

Very truly yours,

C. Takumi Engineering, Inc.

Carl K. Takumi, P.E.

cc: Department of Water Supply
**WCR 1 Check for Well No. 5731-02** (survey to regulation memo)

### 1. Pump Tests Check

<table>
<thead>
<tr>
<th>Step-Drawdown Test:</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>acceptable</td>
<td>☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>followed WCPI Stds</td>
<td>☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>analysis attached</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>proposed pump cap o.k.</td>
<td>☑</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

Aquifer Pump Test:

| acceptable          | ☑   |    |                           |
| followed WCPI Stds  | ☑   |    |                           |
| T & S analysis attached | ☑ | ☐ |                           |

Well Interference:

- estimated Steady-State drawdown at 1-mile radius is _________ ft.
- analysis attached ☐ ☑

Stream Surface Water Impacted: ☐ ☑ If yes, identify most probable stream

---

### 2. Construction Check

<table>
<thead>
<tr>
<th>data complete</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>followed WCPI Stds</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>wellphys.dbf updated</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>welaplic.dbf updated</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
</tbody>
</table>

07/06/99

John thinks will provide.
**State of Hawaii**

**COMMISSION ON WATER RESOURCE MANAGEMENT**

**Department of Land and Natural Resources**

**WELL COMPLETION REPORT - PART II**

Pump Installation

---

**Instructions:** Please print in ink or type and send completed report (with attachments, if applicable) to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. The Commission may not accept incomplete reports. This form shall be submitted within 60 days of the completion of work. For assistance, please consult the Hawaii Well Construction and Pump Installation Standards or call the Regulation Branch at [phone number]. For updates to this form or additional information, please visit our website at [http://www.state.hi.us/dlnr/cwrm/](http://www.state.hi.us/dlnr/cwrm/).

---

### 1. State Well No.: 5731-02

**Well Name:** KANOA WELL 1  
**Island:** MAUI

### 2. Address:

**Address:** NO. WAIHEE  
**Tax Map Key:** 3-2-1:003

### 3. Pump Installation Company:

**Company:** BEYLIK DRILLING, INC.

### 4. Date Pump Installed:

**Date:** 12-10-01

### 5. PERMANENT PUMP INFORMATION

**Pump Type, Make, Serial No.:** SUB/BJ/0104AF000957-1  
**Rated Capacity:** 1200 gpm

**Motor Type, H.P., Voltage, rpm:** SUB/BJ/200/460/1742

**Type of flow meter:** _______________  
which measures in _______________ GPM

### 6. Method of flow measurement:

- [ ] Flowmeter  
- [ ] Weir*  
- [ ] Open Pipe*  
- [ ] Orifice*  
- [ ] Other*, explain below  
*attach schematic

### 7. Fill in the as-built section on the other side of this sheet.

### 8. Other remarks/comments:

**VENTURI FLOW TUBE - MEASURES PRESSURE DIFFERENTIALS**

---

**Pump Installation Contractor (print):** BEYLIK DRILLING, INC.  
**Lic. No.:** AC-21896

**Signature:**  
**Date:** 1-16-02

**Permittee (print):** GEORGE Y. TENGAN, DIRECTOR  
**County of Maui/Department of Water Supply**

**Signature:**  
**Date:** 3/2/03
9. **AS-BUILT PUMP SECTION** *(Please attach as-built if different from diagram provided below)*

Bench mark elevation surveyed to nearest 0.01 ft. = 301.7 ft. mean sea level

Identify reference point elevation for water level measurements through chase tube

_____ ft. mean sea level

describe reference point:

Pump intake depth = -31 ft. (referenced to bench mark)

Chase tube depth = -5 ft. (referenced to bench mark)

If airline installed, bottom of airline elevation = _____ ft. mean sea level
LETTER OF TRANSMITTAL

TO: COMMISSION ON WATER RESOURCE MANAGEMENT  
   State of Hawaii  
P.O. Box 621  
Honolulu, HI 96809

DATE: June 30, 1999

JOB NO. CWS-002

SUBJECT: NORTH WAIHEE WATER SOURCE PROJECT  
DEVELOPMENT OF KANOA WELL 1 AND KUPAA WELL
TMK: (2) 3-2-01: 03

We are sending you X Attached Under separate cover the following:

<table>
<thead>
<tr>
<th>NO. OF COPIES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Well Completion Report-Kanoa Well 1 (State well 5731-02)</td>
</tr>
<tr>
<td>1</td>
<td>As-Builts of Well</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED (AS CHECKED BELOW):

For Signature/Approval X For Information/Use

For Review and Comment As Requested

REMARKS:

C. TAKUMI ENGINEERING, INC.

Wade Shimabukuro

cc: _____________________
Constant Rate Pump Test (1200 gpm.)
Kanua Well #1
5/17/60 9:00 A.M.
Step Draw Down Pump Test
Kanoo Well #1
5/14/99 7:45 A.M.
State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

FAX: Transmitting 11 pages, including this one; call [Redacted] with any reception problems.

TO: Ed Sentinella

FROM: Charley Ice

Date: 16 March 99

Transmitting pages from 2 files:

1) Wells 5731-02 & 03 "North Wai'ake Wells 3 & 4", or
   Kawaan Well 5731-02
   Kupapa Well 5731-03
   * permits of transmittal ltr
   * map

(4 pp)

2) Kahakuloa Acre Well 5832-03
   * 1990 ltr from Commission Deputy to Council Chair
   * Pump Installation Permit (final step)
   * map

(6 pp)

Return Fax: [Redacted]
Return Post: P.O.Box 621, Honolulu 96809
PART I.

WELL CONSTRUCTION REPORT

4. Name of driller who performed work: Mike Robertson
5. Type of rig/construction: Air Rotary
6. Date(s) Well Construction and pump tests (if any) completed: 5/25/99
7. GROUND ELEVATION (referenced to mean sea level, msl): 307.76 ft.
   Well Bench Mark (description/location): Top of pump base plate
   Elevation (msl): 309.15 ft.
8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.) Rock Description, Water Level, Dates, etc.
   0 to 38 Gray Weathered Rock+Clay
   38 to 60 Same with less Clay
   (If more space is needed, continue on back)
9. Total depth of well below ground: 360 ft.
10. Hole size: 22 inch dia. from +2 ft. to 360 ft. below ground
     22 inch dia. from 360 ft. to 359 ft. below ground
     22 inch dia. from 359 ft. to 360 ft. below ground
11. Casing installed: 16 in. I.D. x 3/8 in. wall solid section to 305 ft. below ground
     16 in. I.D. x 1/8 in. well perforated section to 359 ft. below ground
     Casing Material/Slot Size: 1/4" full flow lowered
12. Annulus: Grouted from 0 ft. below ground to 300 ft. below ground
     Gravel packed from 300 ft. below ground to 359 ft. below ground
13. Initial water level: 299.83 ft. below ground.
15. Initial temperature: 69.0°F
16. PUMPING TESTS: Reference Point (R.P.) used: Pump baseplate, which elevation is 309.15 ft.
   (1) Step-Drawdown Test Date 5/14/99
      Start water level 301.34 ft. below R.P.
      End water level 301.3 ft. below R.P.
   (2) Long-term Aquifer Test Date 5/17/99
      Start water level 301.32 ft. below R.P.
      End water level 301.3 ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs (1/96 LTAT Form) attached? Yes No
18. As-built drawings attached? Yes No
19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) Mike Robertson C-57 Lic. No. 20115
Signature Mike Robertson Date 5/25/99

Surveyor (print) Elbert C. Pedersen 116 Lic. No. 116
Signature Date 6/28/99
Applicant (print) County of Maui
Signature Date 6/28/99
PART II.  
(PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: ________________________________

21. Name of person performing work: __________________________

22. Date Pump Installation Completed: _________________________

23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: _____________________________  Capacity: _______ gpm
   Motor type, H.P., Voltage, rpm: __________________________
   Depth of Pump Intake Setting ___________ ft. below ____________, which elevation is ___________ ft.
   Depth to bottom of airline ___________ ft. below ____________, which elevation is ___________ ft.
   Pumping Head is ___________ ft. Type of flow meter: ___________ which measures in _______

24. As-built drawings attached?  _Yes _No

25. Other remarks/comments: (See below)

   Pump Installation Contractor (print) __________________________ C-57 Lic. No. __________
   Signature __________________________________ Date __________

   Applicant (print) ________________________________________
   Signature __________________________________ Date __________

8.(cont'd)  DRILLER'S LOG (cont'd):

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<th>Depth (ft.)</th>
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<td>95 to 125</td>
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<td></td>
<td>Hard Basalt + Bluestone</td>
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<tr>
<td>125 to 225</td>
<td></td>
<td></td>
<td>Weathered Basalt</td>
</tr>
<tr>
<td>225 to 240</td>
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<td></td>
<td>Hard Basalt</td>
</tr>
<tr>
<td>240 to 280</td>
<td></td>
<td></td>
<td>Hard Tuff Rock</td>
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<td>280 to 320</td>
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<td></td>
<td>Weathered Basalt</td>
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<tr>
<td>320 to 365</td>
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<td></td>
<td>Softer Black Lava (aq)</td>
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<tr>
<td>365 to 385</td>
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<td></td>
<td>Dense Bluweather</td>
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<td>385 to 699</td>
<td></td>
<td></td>
<td>Black + Red Cinders + Water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hit Water at 325'</td>
</tr>
</tbody>
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   ____________________________________________
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   ____________________________________________
   ____________________________________________
   ____________________________________________
July 17, 1998

Mr. Michael D. Wilson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Well Construction Permit
Kanoa Well 1 and Kupaa Well 1 (Well No. 5731-02 & 03)

We are enclosing the signed copies of the permits. The Department has awarded the contract for both wells to Wailani Drilling Company. The Contractor will be drilling one well at a time starting with Kupaa Well No. 1.

If there are any questions, please call our Engineering Division at [number redacted].

Sincerely,

David R. Craddick
Director

hk
enc.

"By Water All Things Find Life"
Mr. David Craddick, Director  
Maui Department of Water Supply  
200 S. High Street  
Wailuku, Hawaii 96793  

Dear Mr. Craddick:

Extension of Start Work Deadline  
Waikapu Mauka Well (Well No. 5131-01)  
Kānoa #1 & Kūpaa #1 Wells (5731-02 & 03)

We received your May 19, 1998 request for an additional three-month extension of your start work deadline (permit condition #10) on the Waikapu Mauka Well, and a second two-month extension of the start date for Kānoa and Kūpaa Wells. We understand that the contracts for construction are being finalized.

By this letter, your request is approved. All other conditions of your permit remain the same. Your new deadlines to start work are:

Waikapu Mauka Well (Well No. 5131-01) - August 12, 1998  
Kānoa #1 and Kūpaa #1 Wells (Well No. 5731-02 & 03) - July 22, 1998

If you have any questions, please call Charley Ice at 587-0251 or toll-free at (Maui), extension 70251.

Sincerely,

TIMOTHY E. JOHNS  
Deputy Director

Claire
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<th>INIT.</th>
<th>TO:</th>
<th>INIT.</th>
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<td>CHING, F.</td>
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<td>UWAIN, J.</td>
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<td>UYENO, D.</td>
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<tr>
<td>JOHNS, T.</td>
<td></td>
<td>YODA, K.</td>
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<tr>
<td>KUNIMURA, I.</td>
<td></td>
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May 19, 1998

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

Dear Mr. Sakoda:

Subject: Kanoa and Kupa’a Well (Well No 5731-02 and 03)

The Department has selected Wailani Drilling to perform the well construction work and is in the process of executing a contract with them. We anticipate the contractor to start within a month from now. As such we respectfully request a two month extension for the start work deadline.

If there are any questions, please call me at [Redacted]

Sincerely,

David R. Craddick
Director

hk
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone [redacted] • Fax (808) 243-7833

Ed Sakoda, Acting Deputy Director
Commission on Water Resource Management
Department of Land & Natural Resources
PO Box 621
Honolulu, Hawaii 96809

RE: Transmitting Signed Well Construction Permits for Wells 5131-01 Waikapu Mauka Well; 5731-02 Kanoa Well; 5731-03 Kupaa Well

April 30, 1998

Dear Mr. Sakoda,

Transmitted herewith are signed well construction permits for the subject wells.

Please feel free to contact me at [redacted] Ellen Kraftsow of my Water Resources & Planning Division staff at [redacted] or Ed Kagehiro of my Engineering Division staff at [redacted] should you require further information.

Sincerely,

[Signature]

David Craddick
Director
elk

By Water All Things Find Life
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management’s Administrative Rules, Section 13-168, entitled “Water Use, Wells, and Stream Diversion Works,” the document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Wailπ’e, Wailuku, Maui, TMK 3-2-1-3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified in writing, at least two (2) weeks before any work authorized by this permit commences.

2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.

3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.

4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.

5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department’s Historic Preservation Division (587-0045) immediately.

6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.

7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.

8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).

10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement data is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(6) prior to any well sealing or plugging work.

12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee’s Signature: ___________________________ Date: 4/27/98
Printed Name: ___________________________ Firm or Title: Director/Water Supply
Driller's Signature: ___________________________ License #: ___________________________ Date: __________
Printed Name: ___________________________ Firm or Title: ___________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.
Mr. David Craddick, Director  
Maui Department of Water Supply  
200 S. High Street  
Wailuku HI 96793

Dear Mr. Craddick:

Extension of Start Work Deadline  
Waikapū Mauka Well (Well No. 5131-01)  
Kānoa #1 and Kūpa’a #1 Wells (5731-02 and 03)

We received your request for a two-month extension of your six-month start work deadline (permit condition #10). We understand that the bidding process has been initiated but that more time is needed to secure a contractor for the well drilling.

By this letter, your request is approved. All other conditions of your permit remain the same. Your new deadlines to start work are:

Waikapū Mauka (Well No. 5131-01) - May 12, 1998  
Kānoa & Kūpa’a (Well No. 5731-02 and 03) - May 22, 1998

If you have any questions, please call Charley Ice at [number] or toll-free at [number] (Maui), extension 70251.

Sincerely,

[Signature]
EDWIN T. SAKODA  
Acting Deputy Director
March 5, 1998

Mr. Michael D. Wilson, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Well Construction Permit
Kanoa Well 1 and Kupaa Well 1 (Well Nos. 5731-02 & 03)

The Department of Water Supply, County of Maui respectfully requests an extension of time to start work on the subject well. The bidding process is initiated but selection of the contractor has not been completed. A two-month extension for the start of work will provide us with sufficient time to assure securing a contractor for the well drilling.

Thank you for your support. If there are any questions, please call our Engineering Division at [Redacted]

Sincerely,

David R. Craddick
Director

hk

cc: Carl Takumi
Mr. David Craddick, Director
Maui Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Well Construction Permit
Kānoa Well 1 and Kūpaa Well 1 (Well Nos. 5731-02 & 03)

Enclosed are two (2) copies of your approved Well Construction Permit for the captioned well(s) which authorizes well construction activities but excludes installation work for your permanent pump. As part of the Chairperson’s approval, the following special conditions were added and are part of your permit under Permit Condition 12:

Special Conditions

1. The hole diameter shall allow for a minimum three-inch grouted annulus for the casing.
2. The depth of the well shall not exceed one-quarter of the thickness of the aquifer.
3. Casing materials shall conform to the strength and thickness specifications of the Hawaii Well Construction and Pump Installation Standards.

This permit does not authorize work for your permanent pump installation. Approval and issuance of your pump installation permit is contingent upon information provided to and accepted by Commission staff as required in the Well Construction & Pump Installation Standards (1/23/97) and any special conditions performed under this permit. Please note that special conditions may simply highlight application deviations from the Standards.

The well owner is responsible for all conditions of the permit. This includes ensuring that the well construction contractor, or other party who constructs the well(s), submits a completed Part I of the Well Completion Report form (enclosed) within sixty (60) days after the well construction work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions.

To validate your permit, please sign and have the contractor sign both permit originals and return one for our files. Also, copies of the aquifer pump test worksheet and the well completion report form are enclosed for your use. Please provide all the information in this packet to your well drilling contractor.

Also attached for your information is a copy of the Department of Health’s review comments.

If you have any questions, please call the Commission staff at 587-0251 or toll-free at (Maui), extension 70251.

Aloha,

MICHAEL D. WILSON
Chairperson
Mr. David Craddick, Director  
Maui Department of Water Supply  
200 South High Street  
Wailuku, Hawaii 96793  

Dear Mr. Craddick:  

Well Construction Permit  
Kānoa Well 1 and Kūpaa Well 1 (Well Nos. 5731-02 & 03)  

Enclosed are two (2) copies of your approved Well Construction Permit for the captioned well(s) which authorizes well construction activities but excludes installation work for your permanent pump. As part of the Chairperson’s approval, the following special conditions were added and are part of your permit under Permit Condition 12:  

**Special Conditions**  

1. The hole diameter shall allow for a minimum three-inch grouted annulus for the casing.  
2. The depth of the well shall not exceed one-quarter of the thickness of the aquifer.  
3. Casing materials shall conform to the strength and thickness specifications of the Hawaii Well Construction and Pump Installation Standards.  

This permit does not authorize work for your permanent pump installation. Approval and issuance of your pump installation permit is contingent upon information provided to and accepted by Commission staff as required in the Well Construction & Pump Installation Standards (1/23/97) and any special conditions performed under this permit. Please note that special conditions may simply highlight application deviations from the Standards.  

The well owner is responsible for all conditions of the permit. This includes ensuring that the well construction contractor, or other party who constructs the well(s), submits a completed Part I of the Well Completion Report form (enclosed) within sixty (60) days after the well construction work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions.  

To validate your permit, please sign and have the contractor sign both permit originals and return one for our files. Also, copies of the aquifer pump test worksheet and the well completion report form are enclosed for your use. Please provide all the information in this packet to your well drilling contractor.  

Also attached for your information is a copy of the Department of Health’s review comments.  

If you have any questions, please call the Commission staff at [phone number] or toll-free at [phone number] (Maui), extension 70251.  

Aloha,  

[Signature]  
Michael D. Wilson  
Chairperson  

Enclosures
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Waihe'e, Wailuku, Maui, TMK 3-2-1:3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences.

2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.

3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.

4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.

5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division (587-0045) immediately.

6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.

7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.

8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).

10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee's Signature: ____________________________ Date: __________

Printed Name: ____________________________ Firm or Title: ____________________________

Driller's Signature: ____________________________ License #: __________ Date: __________

Printed Name: ____________________________ Firm or Title: ____________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

C: USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Waihe'e, Waialuku, Maui, TMK 2-21-3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences.

2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.

3. In basalt ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basalt ground water unless otherwise authorized by the Chairperson.

4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.

5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division immediately.

6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.

7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.

8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).

10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee's Signature: [Signature]
Date: 7/14/98
Printed Name: David Craddick
Firm or Title: Director of Water Supply

Driller's Signature: [Signature]
License #: 20755
Date: 7/8/98
Printed Name: Michael Liaw
Firm or Title: [Signature]

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment
C: USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
TO: Honorable Lawrence Miike, Director
    Department of Health
    Attention: Dennis Tulang, Wastewater Branch
    William Wong, Safe Drinking Water Branch

FROM: Michael D. Wilson, Chairperson
    Commission on Water Resource Management

SUBJECT: Well Construction Permit Application
    Kānoa Well #1 and Kūpā'a Well #1 (Well No. 5731-02 & 03)

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. Please respond by returning this cover memo form by August 1, 1997. Please find a map, attached, to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Charley Ice of the Commission staff at __________

RESPONSE:

This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 20 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §§11-20-29.

This well does not qualify as a source serving a public water system (serves less than 25 people or more people at least 20 days per year or 15 service connections) and if the well water is used for drinking, the private owner should test for bacteriological and chemical presence before initiating such use and routinely monitor the water quality thereafter. However, if future planned use from the source increases to meet the public water system definition then Director of Health approval is required prior to implementation.

If the well is used to supply both potable and non-potable purposes in a single system, the user shall eliminate cross-connections and backflow connections by physically separating potable and non-potable systems by an air gap or an approved backflow prevention device, and by clearly labeling all non-potable spigots with warning signs to prevent inadvertent consumption of non-potable water. Backflow prevention devices should be routinely inspected and tested.

It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.

For the applicant's information, a source of possible wastewater contamination is not located near the proposed well site (information attached).

Other relevant DOH rules/regulations, information, or recommendations are attached.

No comments/objections

Contact Person: William Wong
    Phone: 586-9258

Signed: William Wong
    Date: 7/27/97
TO: Honorable Lawrence Miike, Director  
   Department of Health  
   Attention: Dennis Tulang, Wastewater Branch  
   William Wong, Safe Drinking Water Branch  

FROM: Michael D. Wilson, Chairperson  
   Commission on Water Resource Management  

SUBJECT: Well Construction Permit Application  
   Kōnoa Well #1 and Kūpā’a Well #1 (Well No. 5731-02 & 03)  

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Please find a map, attached, to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Charley Ice of the Commission staff at [Redacted]

CI: ss  
Attachment(s)  

RESPONSE:  

[] This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 60 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.

[] This well does not qualify as a source serving a public water system (serves less than 25 people or more people at least 60 days per year or 15 service connections) and if the well water is used for drinking, the private owner should test for bacteriological and chemical presence before initiating such use and routinely monitor the water quality thereafter. However, if future planned use from this source increases to meet the public water system definition then Director of Health approval is required prior to implementation.

[] It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.

[] For the applicant’s information, a source of possible wastewater contamination [] is [] located near the proposed well site (information attached).

[] Other relevant DOH rules/regulations, information, or recommendations are attached.

[] No comments/objections  

Contact Person: Lori N. Kajiwara  
Signed: [Redacted]  
Phone: 506-4294  
Date: 7/22/97
Mr. David Craddick  
Maui Department of Water Supply  
200 South High Street  
Wailuku, HI 96793

Dear Mr. Craddick:

Well Construction Permit Application for Well No. 5731-02 & 03

We acknowledge receipt, on July 14, 1997, of your completed well construction permit application for the Kānoa Well #1 and Kūpā'a Well #1 (Well Nos. 5731-02 & 03). You can expect your application to be processed within ninety (90) days from this date.

For your information, the process of constructing a well is normally regulated and permitted in two (2) steps. First, a well construction permit is issued for drilling and testing purposes only. Based upon information provided by you through a Well Completion Report Part I (Well Construction), a pump installation permit may then be issued to authorize pump work. If a pump is installed then a Well Completion Report Part 2 (Pump Installation) is required.

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at  or toll-free at extension 70251.

Sincerely,

RAE M. LOUI  
Deputy Director

Cl:ss
TO: Honorable Lawrence Miike, Director
    Department of Health
    Attention: Dennis Tulang, Wastewater Branch
    William Wong, Safe Drinking Water Branch

FROM: Michael D. Wilson, Chairperson
    Commission on Water Resource Management

SUBJECT: Well Construction Permit Application
    Kānoa Well #1 and Kūpa‘a Well #1 (Well No. 5731-02 & 03)

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. Please respond by returning this cover memo form by August 1, 1997.

Please find a map, attached, to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Charley Ice of the Commission staff at [redacted].

Cl:ss
Attachment(s)

RESPONSE:

[ ] This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 60 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.

[ ] This well does not qualify as a source serving a public water system (serves less than 25 people or more people at least 60 days per year or 15 service connections) and if the well water is used for drinking, the private owner should test for bacteriological and chemical presence before initiating such use and routinely monitor the water quality thereafter. However, if future planned use from this source increases to meet the public water system definition then Director of Health approval is required prior to implementation.

[ ] If the well is used to supply both potable and non-potable purposes in a single system, the user shall eliminate cross-connections and backflow connections by physically separating potable and non-potable systems by an air gap or an approved backflow preventer, and by clearly labeling all non-potable spigots with warning signs to prevent inadvertent consumption of non-potable water. Backflow prevention devices should be routinely inspected and tested.

[ ] It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.

[ ] For the applicant's information, a source of possible wastewater contamination [ ] is [ ] is not located near the proposed well site (information attached).

[ ] Other relevant DOH rules/regulations, information, or recommendations are attached.

[ ] No comments/objections

Contact Person: _____________________________ Phone: _____________________________

Signed: _____________________________ Date: _____________________________
SECTION 1: WELL LOCATION INFORMATION

<table>
<thead>
<tr>
<th>Island</th>
<th>Maui MAUl</th>
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<td>WAIHEE</td>
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<tr>
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<tr>
<td>Proposed Withdrawal</td>
<td>not provided</td>
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SECTION 2: WELL SECTION DATA  (enter data in grey cells only)

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<th>Field</th>
<th>Data</th>
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<td>Elevation at top of casing</td>
<td>402 ft.</td>
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<tr>
<td>Ground Elevation</td>
<td>400 ft.</td>
</tr>
<tr>
<td>Cement Grout</td>
<td>400 ft.</td>
</tr>
<tr>
<td>Rock Packing</td>
<td>6 in.</td>
</tr>
<tr>
<td>Hole Diameter</td>
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<td>Estimated Head</td>
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<tr>
<td>Calculated Aquifer Thickness</td>
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<td>County Water Supply (Y/N ?)</td>
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<tr>
<td>Solid Casing Material</td>
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<tr>
<td>Designation</td>
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<td>Length</td>
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<td>Diameter</td>
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<td>Wall Thickness</td>
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<td>Openings</td>
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<td>Open Hole Length</td>
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<tr>
<td>Diameter</td>
<td>10 in.</td>
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</tbody>
</table>

SECTION 3: CHECKLIST  (values to check are shaded)

Well Depth
- Theoretical Thickness of Aquifer
- 1/4 Aquifer Thickness
- Depth of Well below Sea Level

Well Casing
- Minimum Wall Thickness
  - Material: Steel
county
  - Minimum Thickness per standards: 0.375 in.
  - Wall Thickness Provided: 0.375 in. okay
- Minimum Length of Solid Casing
  - 90% of ground to top of aquifer
  - Length of solid casing Provided: 360 ft. okay
- Casing Material
  - ASTMA-242
- Annular Space
  - Depth of Grouting
    - Calculated Depth of Grouting: 280 ft.
    - Depth of Grouting provided: 400 ft. okay
  - Thickness of Annular Space: 8 in. too small

Reviewer: RRI  Date of Review: 7/16/97
Applicant: Maui DWS
Well Name: Kanaa Well No.1
Well No.: 5731-02
July 3, 1997

Ms. Rae Loui  
Commission on Water Resource Management  
Department of Land and Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Subject: North Waihee Exploratory Wells  
Kupaa Well No. 1 and Kanoa Well No. 1  
TMK: (2) 3-2-01:003

We are enclosing completed applications and two copies of well construction permit for Kupaa Well No. 1 and for Kanoa Well No. 1 for approval. We understand that the filing fees is not required of the Department.

The final environmental assessment and finding of no substantial impact is published in the June 23, 1997 OEQC Bulletin.

If there are any questions, please call our Engineering Division at [redacted]

Sincerely,

David R. Craddick  
Director

hk  
encc.  
cc. Carl Takumi Engineering

"By Water All Things Find Life"
APPLICATION FOR PERMIT

1. APPLICANT: (circle primary contact a, b, or c) Primary Fax:
   (a) WELL OWNER
      COUNTY OF MAUI
      Fl姓名: Department of Water Supply
      Contact Person: David R. Craddock
      Ph: 243-7730
      Address: 200 South High Street
      Wailuku, HI 96793
      (b) LANDOWNER
      Fl姓名: Wailuku Agribusiness Co., Inc.
      Contact Person: Ph: 244-9570
      Address: 90 Wailo Road P.O. Box 520
      Wailuku, HI 96793
      (c) CONTRACTOR
      Fl姓名: ____________ Ph: ____________
      Contractor's C-67 License No: ____________
      Address: ____________

2. WELL LOCATION/NAME:
   Kanao Well No. 1 (N. Waihee Well Site) Island: Maui
   Address: ____________
   Wailuku, HI
   Tax Map Key: 3-2-01: 03

   (Attach a USGS map, scale 1"=2000', and a property tax map showing well location referenced to established property boundaries.)

3. (a) PROPOSED WORK:
   [ ] Drill New Well
   [ ] Alter Location
   [ ] Modify Existing Well
   [ ] Redes
   [ ] Abandon/Seal
   [ ] Install New Pump
   [ ] Replace Pump
   [ ] Modify Pump
   * Be sure to complete and submit well abandonment report upon completion of work.

   (b) WELL TYPE:
   [ ] Deep [ ] Refined [ ] Driven [ ] Bore [ ] Radial
   In this well is part of a battery of wells? [ ] Yes [ ] No
   (Briefly describe and fit in the diagram on the back of this form)

4. PROPOSED PUMP INFORMATION:
   Rated Pump Capacity: 1400 gallons per minute
   Pump Type:
   [ ] Deep Well Turbine [ ] Rotary [ ] Propeller [ ] Diesel
   [ ] Submersible [ ] Rotary Displacement [ ] Hydraulic [ ] Gas
   [ ] Centrifugal [ ] Rotary Gear [ ] Impulse [ ] Electric, rated horsepower of
   ____________

5. PROPOSED USE:
   [ ] Municipal (including hotels, stores, etc.) [ ] Military
   [ ] Domestic (individual, non-commercial water use) [ ] Industrial
   [ ] Irrigation (crop) [ ] Other (explain)
   State Land Use District: [ ] Urban [ ] Agriculture [ ] Rural [ ] Conservation
   County Zoning (describe): ____________ County Interim
   (If more space is needed, continue below under remarks, explanations.)

6. (a) PROPOSED AMOUNT OF WITHDRAWAL:
   ____________ gallons per day
   (b) METHOD OF FLOW MEASUREMENT:
   [ ] Flow-meter [ ] Open Pipe [ ] Office Plate [ ] Web

7. PENDING ACTIONS:
   [ ] CDUA [ ] SMA [ ] EIS [ ] EA [ ] NONE [ ] Other (explain)
   Completion Date: ____________

8. REMARKS, EXPLANATIONS:
   Preliminary test in pilot hole at depth of 650’ (elev-50’)
   Option to increase pilot hole in 25 foot increments. Final depth of blank
   ____________
   16” diam. casing to be determined later.
   (If more space is needed, continue on back)

Date: ____________

Signature: ____________
Well Owner

Signature: ____________
Landowner

Signature: ____________
Contractor

Print Name: 

COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

State of Hawaii
Remarks, Explanations (cont’d):  Grout to extend to bottom of blank casing.  
10 to 20 feet of screen may be added to bottom of solid casing—
depending on test results.

9. PROPOSED WELL SECTION

Elevation at top of casing
402 ft, n.m.

Cement Grout: 400 ft.

Rock Packing: 0 ft.

Hole Diameter: In.

Total Depth 450 ft.

Ground Elevation: 400 ft, n.m.

Solid Casing:
- Material: steel
- Length: 400 ft
- Diameter: 6 in
- Wall thickness: 0.375 in

Casing: [ ] Perforated [ ] Screen
- Material
- Length: 10 to 20 ft
- Diameter: 6 in
- Wall thickness
- Openings [ ] sq. in./LF.

Open Hole:
- Length: 50 ft
- Diameter: 10 in

Approximate elevation at time of filing application. Ground elevation above mean sea level (n.m.) by a surveyor licensed by the State must be submitted at
time of construction. Final elevations of well components shall be submitted in the well completion/well abandonment report.
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<th>WELL NO</th>
<th>Head</th>
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PRELIMINARY ENGINEERING REPORT
FOR NEW POTABLE WATER SOURCE
KANOA WELL NO. 1
(State Well No. 5731-02)
Waihee, Maui, Hawaii

PREPARED FOR:
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, HAWAII 96793

PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 1999
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FIGURES

Well Location
Site Topographic Map & Preliminary Site Plan - Kanoa 1 Well Site
Site Topographic Map & Preliminary Site Plan - Treatment Site
Water System Service Area
Example Pump Curve

EXHIBITS

Exhibit A: The North Waihee Aquifer, An Additional Water Supply Source
Exhibit A-1: North Waihee Aquifer, Kupaa 1 and Kanoa 1 Wells Test Results and interpretation
Exhibit B: Water Quality Testing Results
Exhibit C: OEQC Bulletin dated June 23, 1997
The undersigned, being a licensed professional engineer, certifies that:

1. He has prepared the attached report and the information contained therein is true to the best of his information and belief; and

2. The water produced by Kanoa Well No. 1 (State Well No. 5731-02), the potable water system indentified in the attached report, will comply with the State primary potable water regulations contained in Hawaii Administrative Rule, Title 11, Chapter 20, Rules Relating to Potable Water Systems, and will comply with the Rules and Regulations of the Department of Water Supply, County of Maui, when said drinking water system is operated and maintained in accordance with the instructions and information contained in this report.

This work was prepared by me or under my supervision.

Carl K. Takumi, P. E.
C. Takumi Engineering, Inc.
1. Introduction

This Preliminary Engineering Report was prepared to conform to the provisions of Hawaii Administrative Rules, Title 11, Chapter 20, relating to new potable water source development. The rules require all new potable water sources serving a public water system be approved by the Director of Health prior to its use.

2. General Information

a. Description of project and location, including phasing schedule, persons served by new water source and/or service connection, name and public water system number.

The Kanoa Well No. 1 (State Well No. 5731-02) project is part of the North Waihee Water Source Development Project and consists of developing a basal well located on the northern slopes of West Maui Mountains on the Island of Maui. The project consists of clearing, grubbing, grading, installation of a pump and related electrical controls, electrical building, piping, fencing and related work.

Water from Kanoa Well No. 1 be used to service the Department of Water Supply’s Wailuku District or commonly known as the Central Maui Water System (CMWS), Public Water System #212, which provides water for the communities of Paia-Kuau on the east, Kihei-Makena on the south, Maalaea on the west and Waihee on the north. The project is needed to meet the rising demands for water in the Central Maui Region and relieve some of the stress being made on the lao Aquifer.

The North Waihee Wells 1 and 2 (State Well No. 5631-02 & 5631-03 respectively), is also located in the Waihee Aquifer (60103) and have been placed into operation. Kupaa Well No. 1 (State Well No. 5731-03), also in the Waihee Aquifer, is in the process of being developed by the Department of Water Supply.
b. Owner and authorized representative

The owner of the Kanoa Well No. 1 (State Well No. 5731-02) facility will be the Board of Water Supply, County of Maui. Upon completion, the Maui County Department of Water Supply (DWS) will operate and maintain the facility. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the well and its appurtenances.

c. Site Plan with contours and drawn to scale.

A preliminary site grading plan with existing and proposed contours is attached. Besides the well and pump, the site will have an electrical building, piping, parking, fencing and related site work. Disinfection facility will be located at a separate site (proposed Kanoa Well 2 site designated as well field 2) closer to the North Waihee Reservoir. A preliminary site plan of the disinfection site is attached.

3. Physical and Hydrological Characteristics of Area

a. Location.

The project is on the northern slopes of the West Maui Mountains north of the village of Waihee and Waihee Stream on the Island of Maui. The tax map key for the parcel is TMK (2) 3-2-1: 3. A location map is attached. Kanoa Well No. 1 is located within pasture land. The well is located on a one acre perpetual easement at approximate elevation 311 mean sea level (MSL) and approximately 2,000 feet from the ocean. The nearest residence is over a 1,000 feet east of the well.

b. Climate.

The site is influenced by the northeasterly trade winds as is typical of windward areas of the Hawaiian Islands. The annual rainfall at the site averages 30 to 40 inches with average temperatures in mid 60's to mid 80's range.
c. Topography including detailed study of project site.

A preliminary site plan of the well site with existing contours is attached. No significant grading is anticipated at this site for the proposed improvements. The site is located at about elevation 311 feet mean sea level (M.S.L.). The area slopes in the north-south direction with slopes around 20%. A natural swale lies north of the site and will be used to dispose of storm runoff generated by the site.

d. Geology and foundation conditions.

The geological profile of the area consists of alluvium at the surface above Honolua series andesitic basalt lavas and the highly permeable Wailuku series basalts. The alluvium and andesitic lavas are fairly low permeability which suggests that wells to basal ground water would not interfere with stream flows above the low permeability layers.

e. Earthquake considerations and design parameters.

According to Seismic Zone Maps in the Uniform Building Code, the island of Maui is in Zone 2B. This translates to only moderate seismic hazard. All structures will be designed accordingly. On Maui, there is no record of deep well casings being damaged by earthquakes.

f. Groundwater conditions.

"The North Waihee Aquifer, An Additional Water Supply Source for Central Maui," Dr. John Mink, Mink and Yuen, Inc. dated April 10, 1997 provides initial studies for the project. Since information on the aquifer and other groundwater conditions is limited in the area, this project will help with the accumulation of data on the North Waihee Aquifer. In summary, the report states that the North Waihee Aquifer is adjacent and hydraulically connected to the Iao Aquifer; however, the lack of response in the test holes within the Iao Aquifer during test pumping of the North Waihee Wells suggests that the Waihee Aquifer is quasi-independent aquifer. The estimated sustainable yield of the Waihee Aquifer is 8 MGD. The North Waihee Wells has a pumping capacity of 1.5 MGD each well but it is anticipated that the pumps will not run simultaneously nor run continuously except under emergency conditions. The Kanoa Well will help quantify the aquifer sustainable yield and generally provide better information of the Waihee Aquifer for future development potential.
Additional information is provided in the attached “Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation,” Mink & Yuen, June 21, 1999 presents the pump test results of the Kupaa 1 and Kanoa 1 wells.

g. Flood problems including tsunami inundation zones and preventive measures that may be used.

The elevation of the site makes it obvious that the site is not located within any tsunami inundation zone. According to the Federal Emergency Management Agency (FEMA) Flood Zone maps, the site is in an area of minimal flooding (zone c). A Drainage and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction.

h. Information confirming the conformance with local land use planning and zoning regulations.

The site is located within an area designated as “Agricultural” by the State Land Use Commission. The Maui County Wailuku-Kahului Community Plan designates the project site as within “Agricultural” lands. The proposed project is considered as a minor utility facility and a permitted use within the “Agricultural” designation.

i. Discussion of water rights and future uses by others.

The wells within the Waihee Aquifer on record with the CWRM are as follows:

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<thead>
<tr>
<th>State Well No.</th>
<th>Well Name</th>
</tr>
</thead>
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<td>5631-02</td>
<td>North Waihe'e Well 1 (DWS)</td>
</tr>
<tr>
<td>5631-03</td>
<td>North Waihe'e Well 2 (DWS)</td>
</tr>
<tr>
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<td>Kahakuloa Acres (Wailena) (Private)</td>
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The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields.
within Wailuku Agribusiness Company properties between Waihe'e Stream and Kupa'a Gulch. North Waihe'e Well 1 & 2 (5631-02 & 5631-03) is in well field one (TMK: 3--2-01:04); well field three is the Kanoa Well No. 1 (5731-02); the Kupa'a Well No. 1 (5731-03) is located in well field five. The DWS can potentially develop two additional wells (well fields 2 & 4); however, future well development will require well drilling and pump installation permits from the CWRM and analysis of pump test results. The proposed Kanoa Well No. 2 site is designated as well field 2. The CWRM has received no new well applications for wells in this aquifer.

4. Extent of Water Works System.

a. Description of the nature and extent of the existing area and future area to be served.

The North Waihee Water Source Development project will be used to service the Maui County Department of Water Supply’s Wailuku District Water System which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala. The water system service area is bounded by Paia/Kuau to the east, Kihei/Makena to the south, Maalaea on the west and Waihee on the north and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei, Maalaea and Puunene. The water system service area is shown in the attached figure.

Upon completion of the proposed improvements, the well will be connected to an existing nearby water transmission line from the North Waihee Wells source to the existing 1.0 MG North Waihee Reservoir which is already serving the CMWS.

b. Description of population served, land use and consumption data including forecasting the water demands.

The Central Maui area varies in land use, population and services. The Kahului-Wailuku communities serves as the business-industrial hub and the population center of the island with Kahului Airport and Kahului Harbor as the main transportation centers for traveling off the island and importing and exporting goods and produce. Wailuku is also the governmental center of Maui. Destination resorts of Wailea and Makena are also served by the Central Maui Water System. Paia-Kuau present a more residential setting with small stores serving the community and
limited tourist activity. The Maui County Water Use and Development Plan, 1992, estimates that residential consumption for Wailuku to be about 52%, compared to Kihei at 72% and Kahului at 48%.

Anticipated water demand from the “Maui County Water Use and Development Plan” (Water Use and Development Plan), 1992, estimates that the year 2010 demand within the Central Maui Water System to range between 25 million gallons per day (mgd) to 30 mgd depending upon the method of forecast used. The “Historical Trend” adopted by the DWS used in the Water Use and Development Plan uses a linear extrapolation of 0.5 mgd/year which equates to a forecasted a water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd or a 8.5% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 is 18.1 mgd. Comparatively, the water consumption reported by the Annual Report for Fiscal Year 1997, Board of Water Supply, County of Maui, averaged 19.3 mgd or a 6.6% deviation.

c. Appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional and other water supply needs.

The future requirements of service as forecasted above is based upon a mix of residential, commercial, institutional and other needs of the community as development occurs. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes. As stated previously, the DWS uses a linear demand model based upon historical experience for predicting future water demand. The model includes potential residential, industrial, commercial, institutional and other water supply needs.
d. Provisions for extending water works system to include consideration of additional area required, easements, and right-of-way acquisition for facilities and utilities.

A 12-inch transmission waterline is planned to be constructed as part of this project to connect to an existing 24-inch transmission waterline approximately 800 feet from the well site. The 24-inch waterline carries water from the existing North Waihee Wells (5631-02 & 5631-03) to the existing 1.0 MG North Waihee Reservoir. The transmission waterline will be placed within an existing easement; the same easement will also be used for access and to bring power to the site.

e. Required capacity to meet fire protection and pressure requirements.

The DWS generally plans reservoirs within the local service area to provide fire protection and assure adequate pressure for its users.

f. Alternative solutions considered and supporting data for recommended plan.

The Central Maui Water System has been primarily dependent on water from the Iao Aquifer and withdrawal from the Iao Aquifer is nearing the aquifer’s 20 MGD sustainable yield as set by the State Commission on Water Resource Management (CWRM). Hence, the DWS started seeking new sources of water to meet the increasing demand.

Attention was initially given to developing of groundwater in East Maui. Two wells in the Hamakuapoko area have been drilled; however, the East Maui initiative has been delayed due to the discovery of pesticides in the wells and legal challenges, leaving the North Waihee groundwater source as the choice for timely water source development. It may be several years before any East Maui Sources can be utilized for Central Maui.

The “Water Resource Protection Plan, Volume I & II,” CWRM, June 1990, estimates that the sustainable yield for the Waihee Aquifer (60103) is 8 MGD. The two North Waihee Wells (5631-02 & 5631-03) have been placed on line within the water system to relieve the stress being placed on the Iao Aquifer. The Kanoa Well No. 1 (5731-02) will be the third well in the Waihee Aquifer to be placed into production.
A fourth well, Kupaa Well No. 1, (5731-03) is also being developed and a separate Preliminary Engineering Report for New Potable Water Source will be submitted to the State Department of Health for approval. If successful, the well will be the fourth well to be placed into production. The Kupaa Well and the Kanoa Well will reduce DWS dependence on the Iao Aquifer and the possibility of over pumping the Iao Aquifer while allowing the Maui County Department of Water Supply to meet the needs of their consumers.

g. Environmental and economic impact.

The land is presently undeveloped and presently used as range land. Environmental impacts once the facility is in place should not be significant. An environmental assessment was prepared for the project prior to drilling the exploratory well. A finding of no significant impact (FONSI) was published in the OEQC bulletin on June 23, 1997. A copy of the OEQC Bulletin is attached as an Exhibit C. Another Environmental Assessment is being prepared for the development of the Kanoa Well No. 1 and Kupaa Well No. 1. The development of the Kanoa Well No. 1 will relieve the stress being placed upon the Iao Aquifer and provide an adequate water supply to meet the demand anticipated in the County Community Plans. The project is not being completed to encourage any special development nor any single developer.

The short term economic impacts of the project by itself creates construction jobs. The monies will come from the Board of Water Supply. The long term economic impacts of the project will mean continuous maintenance, electricity and the purchase of disinfectants. The well will reduce stress upon the Iao Aquifer and allow growth as anticipated by the Maui County Community Plans.

5. Potential Sources of Contamination.

a. Description of well site:

1) coordinates (latitude, longitude), State Well No., and Tax Map Key Number.

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<td>(2) 3-2-1: 03</td>
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Kanoa Well No. 1
State Well No. 5731-02
2) Land surface elevation, topographic map of well site.

A preliminary site plan and topographic map of the well site is attached. The ground elevation at the well is approximately 310 feet M.S.L.

3) Size and topography of catchment area, slope of ground surface.

The "Water Resources Protection Plan," CWRM, Department of Land and Natural Resources, State of Hawaii, June 1990, reports that the aquifer catchment area is approximately 12.87 square miles. Elevation ranges from sea level to elevation 4,480 at Eke Crater over a distance of approximately 24,000 feet from the ocean to the top of the crater. This equates to an average overall slope of 18%.

4) General summary of soil and substrata.

"The North Waihee Aquifer, An Additional Water Supply for Central Maui," Mink & Yuen, April 10, 1997 was initially prepared for this project; the report is attached as Exhibit A. The report also provides insight as to the soil and substrata and the initial design criteria for the well. Substrata information at the well site is provided in the "North Waihee Aquifer System, Kupaa Well 1 and Kanoa 1 Wells Test Results and Interpretation," Mink & Yuen, June 21, 1999 attached as Exhibit A-1.

1) Anticipated well depth and depth of groundwater.

The well has been drilled 359 feet below ground surface or about 50 feet below mean sea level. The water surface elevation of the basal aquifer encountered is at elevation 7.81.

b. Design well draft.

The design well draft is 1,200 gpm.

c. Water quality data on any existing wells in the area.

Water quality data was taken at North Waihee Well 2 (State Well No. 5631-03) and the results of the analysis is attached as Exhibit B-1. The
North Waihee Well #2 is also in the same basal aquifer as the Kupaa Well. A water quality sample was taken during the well testing of the Kupaa Well No. 1 (State Well No. 5731-03) and water quality analysis is attached as Exhibit B-2. A water sample was also taken for the Kanoa Well No. 1 (State Well No. 5731-02) during well testing, the water quality sample analysis results is provided as Exhibit B-3.

d. Land use classification of surrounding area.

e. Existing or potential sources of contamination in recharge area:
   1) extent of recharge area likely to contribute water to source including population.
   2) type of contaminants.
   3) distance to proposed well.
   4) method of disposal, i.e. surface, subsurface - above groundwater table, subsurface - in groundwater table.
   5) depth from base on contaminant source to groundwater table including but not limited to urban development, agricultural areas, pasture lands, feedlots, sanitary landfills, dumps, subsurface disposal units.

The recharge area estimated for the Waihee Aquifer 60103) is about 12 square miles. Located between the Waihee and Kahakuloa Valleys. The well is located within an agricultural zoned area. The area is relatively undeveloped and is used as rangeland; no known pesticides have been used on the property for decades. There is no public (County) wastewater system serving the area and existing residences are serviced by individual wastewater disposal systems. The nearest existing residence is located more than 1,000 feet southeast (makai) of the well. Forest reserve lands are approximately 4,700 feet west (mauka) of the site.

The Kanoa Well No. 1 is located in a recharge area composed of conservation and agricultural lands and away from dense populated areas, potential for contamination from external sources appears unlikely. The agricultural zoned areas will allow for limited residences to be built. However, no development can occur in the conservation zoned forest reserve area with out proper permits and authorizations. The geology of the area, consisting of a thick andesite layer makes potential for contamination unlikely from sources makai of the well.

Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. The area is being used as rangeland and has been for a very long time. The
agricultural/conservation zoning within the recharge area limits land use and population. There are no feedlots, sanitary landfills or public dumps within the aquifer recharge area. Wastewater disposal for the few residences are limited to individual wastewater disposal units.

f. Approximate groundwater contour.

"North Waihee Aquifer System, Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation," prepared by John F. Mink, Mink & Yuen, Inc., June 21, 1999 provides well data, pump test results, estimated ground water contours and transmissivity of the aquifer. The report is attached as Exhibit A-1.

6. Sources of Water Supply.
   
a. Nature of soil and stratum within and overlaying the water source, with special emphasis on identification of fissures and faults as it relates to the natural purification or treatment of percolating fluids from existing or future activities.

   Discussed previously.

b. The probability and effect of surface drainage or contaminated underground water entering the subject water source.

   Discussed previously.

c. Depth to water table, location and description of wells in vicinity in use and/or abandoned.

   Discussed previously.

d. Slope of water table, preferably as determined from observation wells, or studies of wells in the area.

   Discussed previously.

e. Site data relating to potential flooding and/or earthquake data.

   Discussed previously.

f. Data relating to quality and quantity of the source waters under
normal conditions and during stress periods of drought or heavy precipitation, as determined by field and laboratory analysis and investigations of available records; if records are not available or are inadequate to determine source quality under stress conditions, an estimate of expected quality and quantity during stress conditions should be established and related to the hydrologic budget to the aquifer or isopiestic area. At a minimum, analysis for all of the contaminants listed in the table “Contaminants to be Tested in All New Sources of Potable Water” shall be performed by the Department of Health, State Laboratories Division, for all sources being addressed in the report. For example, when approval of a well field is being sought, all of the wells must be tested for all of the required contaminants.

Laboratories performing the analysis must be currently certified by the Hawaii Department of Health, State Laboratories Division. While the lab data has often been conveniently summarized in a table, some reports have failed to note when analyses have been subcontracted to another lab. The lab reports from all of the laboratories involved must be included in the engineering report to allow the Department to verify that the analyses were performed by an approved lab. Failure to do so may delay the review process.

A water sample was taken during well testing. The sample was analyzed by Montgomery Watson Laboratories. The results are included in this report as Exhibit B-3. Water sample analysis results were obtained from the North Waihee Well #2 and Kupaa Well #1 and are included as Exhibit B-1 and Exhibit B-2 respectively. The water samples were taken during the well pump tests of these wells.

g. Identification of all significant factors having potential for contaminating or reducing the quality of the water source or which would cause the quality of water delivered to users of the system to be in violation of any state primary drinking water regulation.

h. For each present and projected potential source of contamination, identification and evaluation of alternative control measures which could be implemented to reduce or eliminate the potential for contamination of the water source, including treatment of the water source if subject to contamination, and evaluation of the physical, economic and social effects of implementing such control measures.

The lands surrounding the site is zoned either agricultural or conservation.

Kanoa Well No. 1
State Well No. 5731-02
The zoning in itself limits the potential for contamination. The conservation lands are mauka of the site. Conservation land uses are restrictive and requires a permit to develop the land. Similarly, agricultural development has limited uses. Presently, the lands are used mainly for cattle grazing. Waste water treatment facilities for the existing homes in the area do not penetrate down to the aquifer and water quality samples show that individual waste water treatment facilities have not affected the quality of water from the aquifer. Therefore, the only anticipated source of contamination is biological; water treatment to mitigate potential contamination will consist of disinfection.

A summary section indicating how the proposed development and improvements will provide reasonable assurance that the new water source is not subject to actual or potential contamination such as may result in the water not complying with any state primary drinking water regulation or as may otherwise adversely affect the health of persons.

The annular space around the well casing has been grouted from just above aquifer water level to ground surface to prevent surface waters from entering the well.

The Maui County Community plan for the area shows that the lands have been designated as either agricultural lands or conservation lands. The conservation lands are above the project site.

7. Proposed Treatment Works.

a. Summary description of proposed processes and unit parameters for treating the specific water under consideration. Include pertinent information on built up and packaged plant systems.

Water samples taken during well testing show that only disinfection will be needed. Water from the well will be treated by an 12.5% premixed sodium hypochlorite solution disinfection system. It is estimated that approximately 8.4 pounds (equivalent Cl₂) per day would be normally used and 11.4 lbs (equivalent Cl₂) if the pumps ran for 24 hours. The hypochlorite solution will be injected before the water enters 1,000,000 gallon North Waihee control reservoir. The reservoir should provide sufficient contract period to allow thorough disinfection of the basal waters. The system located in a separate room within the control building (electrical and chlorine residual analyzer to be located in adjacent
electrical room) at the proposed Kanoa Well 2 site includes the following:

- Storage for 12.5% sodium hypochlorite solution with spill containment.
- Potable water supply.
- Metering pumps.
- Plastic tubing accessories and PVC Schedule 80 piping within the control building, below ground to a common injection point.

Operation and maintenance consist of field visits to the site primarily to measure chlorine residual and to resupply sodium hypochlorite solution when required. Adjustments to chlorine injection will be made to assure adequate chlorine residual.

b. **Site:** Discuss various sites available indicating proximity to developed areas, availability of utilities, and accessibility of plant site. Show on a topographic map the treatment plant and arrangement of present and proposed treatment facilities.

The project is a water development project within the Waihee Aquifer (60103) and therefore, the well site north of the Waihee Stream was selected. The Kanoa Well No. 1 site is one of five well fields that is available to the Department of Water Supply. The remainder of the well fields are located between the North Waihee Wells (State Well No. 5631-02 & 5631-03) and Kupaa Well No. 1 (5731-03). A preliminary site plan of the proposed well development site is attached. Access to the well site will be via existing easement. A paved driveway will be constructed as part of this project. Electrical power will be brought to the site by Maui Electric Company, the local electric utility through the existing easement.

The water treatment facility (hypochlorination) will be located at a separate site and a site plan is attached.

c. **Basis of Design:**

1. Design Period
2. Design population and flow demand data
3. Nature and characteristics of flow
4. Design flow rate for plant
5. Reserve capacity
6. Treatment processes and unit parameters including calculations for design of units. Include description of equipment, capacities, size, operational factors and plant
If components are to be modified in stages, discuss staging, sequence, and future changes as required.

The sustainable yield of the lao Aquifer is 20 MGD. In the past, the DWS has come close to pumping near the sustainable yield levels. It is important to provide additional sources of water to reduce the stress being placed on the lao Aquifer and to provide an adequate supply of water to meet the demands of the water system. The well, pumping, storage and appurtenances will be designed and constructed in compliance with the County of Maui Department of Water Supply and State Department of Health Drinking Water Standards. The facility will be owned and operated by the DWS. Their staff is thoroughly familiar with and have the experience and qualified personnel that are committed to provide water that will be in compliance with the requirements of the State Safe Drinking Water Regulations. Water samples taken from the North Waihee Well during the well testing phase shows that disinfection is the only treatment needed for the water.

d. Waste Disposal: Discuss various wastes from the water treatment plant, their volume, proposed treatment and disposal, and points of discharge.

No wastes are anticipated for the treatment process.

e. Operation and maintenance: provide general information operation and maintenance requirements, automatic equipment and justification for system proposed.

The operation and maintenance of the disinfection system will be by the Maui County Department of Water Supply. The Department has several similar disinfection systems and the qualified personnel to operate and maintain the equipment. Regularly scheduled field visits will be made to the site to measure chlorine residual and to resupply hypochlorite solution for injection.

8. Pumping Facilities. In addition to information required under sections 2 through 4, the following information should be provided in the engineering report:

a. Purpose of service
b. Pumping layout and sizing of force main
c. Design flow requirements including maximum, average, minimum,
variations in demand, and effect of storage
d. Liquid characteristics
e. Pump selection including system and characteristic curves
f. Pumping arrangement.

Submersible deep well pumps are planned for the project. The layout of the project site is shown in attached figure. Potable water will service the CMWS. The pumping facility will have the following attributes:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Type</td>
<td>Deepwell Submersible</td>
</tr>
<tr>
<td>Pump Rating</td>
<td>1,200 gpm @ 450' TDH</td>
</tr>
<tr>
<td>Motor</td>
<td>Submersible, 200 HP, 1750 RPM</td>
</tr>
<tr>
<td>Power Supply</td>
<td>480 volt, 3 phase, 60 Hz.</td>
</tr>
<tr>
<td>Piping</td>
<td>Ductile Iron</td>
</tr>
<tr>
<td>Appurtenances</td>
<td>Check Valve, Air and Vacuum Valve.</td>
</tr>
<tr>
<td>Flow Tubes</td>
<td>Cast Iron with a bronze liner with transmitters and receivers.</td>
</tr>
<tr>
<td>Pump Control</td>
<td>Through a pressure sensing line (water level) which has been already placed in the existing 1.0 MG North Waihee Reservoir. A signal proportional to tank level will be sent to a receiver in the control building on site. As water level in the reservoir reaches a certain level (to be set by operator), the pump will turn on. After reservoir fills, the pump will turn off by signal from the reservoir level sensor. High level and low level alarms will be installed to warn operator of malfunction.</td>
</tr>
<tr>
<td>Well level control: An electronic well drawdown sensing device will be placed in a well level monitoring tube to record water levels within the well. The information will be used as part of the data gathering information that will provide better understanding of aquifer conditions of the Waihee Aquifer and will set off an alarm if well level get below a certain draw down.</td>
<td></td>
</tr>
<tr>
<td>A 12-inch transmission waterline is planned to carry water from the Kanoa well to an existing 24-inch transmission waterline from the North Waihee Well Project where the water will stored in a 1.0 MG reservoir. As water is needed in the Central Maui Water System, a signal by SCADA will activate the booster pumps. Additional booster pumps will be activated as demand grows; simultaneously, well pumps of the same pump rate will be activated. The North Waihee 1.0 MG reservoir will control the three wells.</td>
<td></td>
</tr>
</tbody>
</table>
The Kanoa Well No. 1 is part of a system of wells planned for the area by the Department of Water Supply. The design and operation of the well will be in conformance with the "Water System Standards," Department of Water Supply, County of Maui, 1985. Since the Maui County Department of Water Supply is a public agency, the pumping unit must go through a bidding process. A specific pumping unit with pump curves cannot be presented at this time; however, an example pump curve is attached. The pump parameters were previously provided.

g. Electric power available:

Electrical power will be brought to the site. Electrical power will be supplied by Maui Electric Company. At present, no emergency power at the well is planned. Existing wells in the water system has emergency power available and would be sufficient to provide for water requirements during power failures. Emergency power will be available at the proposed Kanoa Well 2 site to drive hypochlorinator units.

h. Proposed building and other structural improvements

A control building will be constructed as part of the project. The building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other electrical appliances. A separate, enclosed building at Well Field 2 (Kanoa 2 well site) will house the disinfection facility. The building will be a slab on grade, CMU building with asphalt shingle roofing.

i. Water hammer consideration.

Water hammer effects will be mitigated by the use of slow opening/slow closing control valves and check valves. In addition, the 1.0 MG North Waihee Reservoir would act as a surge relief outlet.

j. Descriptions of essential features of construction and operation, including staging sequence if applicable

The staging sequence will be left up to the contractor; however, the following is the most likely staging sequence for the project construction:

a. Mobilize.
b. Clear and grub site.
c. Grading and earthwork to the well site, construct access road and install transmission waterline.

d. Grass exposed slopes.

e. In the meantime, the building can be constructed, the pump and related piping installed and the paved area prepared for paving.

f. Complete the paving within the well site. The booster pump at the 1.0 North Waihee Reservoir will be installed.

g. Electrical and telemetry equipment installation simultaneously with the disinfection equipment. Meanwhile, MECO will provide power to the site.

h. Finally, the fence can be completed.

k. Electrical system including provisions in the event of power failure, and telemetering and supervisory control systems

Electrical Power will be obtained from Maui Electric Company, the local power company providing service to the island. The Department of Water Supply has other wells in the system with stand-by power which can be activated during power emergencies. A generator will be located at the treatment facility and will be automatically activated during power outages.

9. Finished Water Storage. Describe location, type and sizing of storage facilities. Include discussion on drains, overflows, telemetering and supervisory controls, painting and protective coating and other important and pertinent considerations.

Finish water storage will be the existing 1.0 MG North Waihee Reservoir. The reservoir is equipped with water level sensors to control the well pump. The controller shall have a pump off setting, pump on setting and a low level alarm. The system will be connected to the Department of Water Supply SCADA system for monitoring at their Central Maui Baseyard.


a. Provide general layout of the system.

b. Indicate materials, valves, hydrants, meters, etc.

c. Proximity of other utilities

d. Include effects of incremental or phased construction, possibilities of future developments as applicable

e. Provide information, profiles or sections showing pipe cover, location, groundwater conditions and other important data affecting installation of the distribution system.
The Central Maui System service area has been described previously. A layout of the Central Maui Water System is attached. A description of the total service area was previously described. The water distribution system is one of the existing public water systems maintained by the Maui County Department of Water Supply. The water system materials, construction and maintenance are in accordance to the standards set forth by the Maui County Department of Water Supply. This project is not planned for any specific development but to meet the rising demand for water throughout the water system and to reduce stressing the lao Aquifer.

11. **Financing.** Provide information on estimated costs of installation, phasing, operation and maintenance and other related information.

The project will be funded by the Maui County Board of Water Supply. A preliminary cost estimate is attached. Operation and maintenance will be performed by the Department of Water Supply as part of their daily operations on all of the wells in the area.

An estimate of the project construction cost are as follows:

Site improvements including pump, electrical/equipment building, electrical, disinfection, fencing, paving, drainage and miscellaneous piping: $ 570,000.00
Booster Pump at existing 1.0 MG North Waihee Reservoir: $ 100,000.00
12" Transmission Waterline from site to connect to existing transmission line including connection to existing waterline: $ 200,000.00
Total construction estimate for project: $ 870,000.00
Contingencies: $ 174,000.00
Total project cost not including MECO charges: $1,044,000.00
REFERENCES


3. NORTH WAIHEE AQUIFER SYSTEM, Kupaa 1 and Kanoa 1 Well Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.


9. East Maui Development Plan, Department of Water Supply

KANOA WELL NO. 1

FIGURES

WELL LOCATION (USGS MAP)

KANOA 1 WELL SITE TOPOGRAPHIC MAP & PRELIMINARY SITE PLAN

KANOA 2 WELL PRELIMINARY SITE PLAN - TREATMENT SITE

WATER SYSTEM SERVICE AREA

EXAMPLE PUMP CURVE
KANOA WELL 1 (STATE WELL NO. 5731-02)
APPROXIMATE SCALE 1"=2000'
KANOA WELL SITE No. 1
EASEMENT "D"
AREA = 1.00 Acres

KANOA WELL 1
EXISTING KANOA MONITOR WELL
PROPOSED ACCESS ROAD
PROPOSED 12" W.L.
EXISTING 20' WIDE EASEMENT

KANOA 1 WELL SITE-SITE PLAN
KANOA WELL SITE No. 2

EASEMENT "C"

AREA = 1.00 Acres

PROPOSED ELEC. HHG W/ TRANSFORMER

PROPOSED ELECTRICAL/CHLORINATION BUILDING

PROPOSED EMERGENCY GENERATOR

KANOA 2 WELL SITE-SITE PLAN
### PERFORMANCE FOR:
- **Bowl Pattern No.**: 547612-A-RO
- **Imp. Pattern No.**: 547611-A-RO

#### PUMP DATA
- **Shaft Dia. (IN.)**: 1 1/5
- **Maximum Sphere (IN.)**: 1
- **Maximum Head (FT.)**: 950
- **Min. Submergence (IN.)**: 20
- **Impeller Wt. (LBS.)**: 10.75
- **Thrust Constant (K)***: 10.0
- **Bowl O.D. (IN.)**: 9%

#### NOTES
- Performance indicated based on cold water with a specific gravity of 1.0.
- Standard construction.
- Minimum submergence over lip of bell to prevent vortexing.
- Efficiency improvements are available in certain instances. Please contact the factory.

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### PERFORMANCE FOR:
- **Bowl Pattern No.**: 545320-A-RO
- **Imp. Pattern No.**: 545324-A-R1

#### PUMP DATA
- **Shaft Dia. (IN.)**: 1 1/5
- **Maximum Sphere (IN.)**: 1
- **Maximum Head (FT.)**: 769
- **Min. Submergence (IN.)**: 20
- **Impeller Wt. (LBS.)**: 9.0
- **Thrust Constant (K)***: 13.3
- **Bowl O.D. (IN.)**: 9%

#### NOTES
- Performance indicated based on cold water with a specific gravity of 1.0.
- Standard construction.
- Minimum submergence over lip of bell to prevent vortexing.
- Efficiency improvements are available in certain instances. Please contact the factory.

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EXHIBIT A

THE NORTH WAIHEE AQUIFER, AN ADDITIONAL WATER SOURCE

MINK & YUEN, INC.
The North Waihee Aquifer
An Additional Water Supply Source for Central Maui

John F. Mink
Mink and Yuen, Inc.
April 10, 1997

Introduction
The Iao Aquifer System, which for managerial purposes is defined as the region between Waikapu Valley and Waihee Valley, has satisfactorily supplied Central Maui with drinking water since the Mokuhau wells were drilled more than 30 years ago. The aquifer system is large with an assigned sustainable yield of 20 mgd, but demand has already reached this level and threatens to substantially exceed it in the next few years. New sources of drinking water are needed to meet increasing demand.

As the exploitation of the Iao Aquifer was undergoing considerable expansion with the drilling of the Waiehu Heights and Waiehu wells in the late 1970s and the early 1980s, it became evident that additional sources needed to be located and put on line a decade or so in the future. The region north of Waihee Valley was considered a prime
candidate for groundwater production, but at first most attention was given to developing groundwater in East Maui. The East Maui initiative has been delayed, however, by the discovery of pesticides in newly drilled wells and by legal challenges, leaving the North Waihee groundwater resource as the obvious choice for timely additional development.

Construction of a pipeline connecting North Waihee with the Central Maui distribution network is underway, and two potential production wells are in place. The North Waihee Aquifer will be developed in phases, the first of which incorporates the existing wells and the drilling of two new wells. Details of future phases will depend on the behavior of the aquifer in response to pumping following completion of the first phase.

Relationship Between Iao and North Waihee Aquifer Systems
After it was recognized that production from the Iao Aquifer System would not be able to match the increasing demand in Central Maui, attention turned to the region north of Waihee Valley as a prospective source of additional groundwater. In 1980 Dan Lum, then hydrologist with the State Department of Water and Land Development (DOWALD), suggested that exploratory drilling be attempted on the slope of the ridge
just north of the Waihee River to test whether the area was an extension of the Iao Aquifer System or could be treated as an independent groundwater province. About at the same time Stephen Bowles, consulting hydrologist, recommended essentially the same course of action. Subsequently John F. Mink was retained by C. Brewer Co., owner of the land, to locate drilling sites and design a drilling and testing program.

Two wells were drilled in 1981 and the groundwater data compared with the original premise that if North Waihee was an uninterrupted extension of the Iao Aquifer System, the head should be at least 15 feet, based on the head at Test Hole A-1 located 4000 feet across the valley to the south, and the corollary that if the head were 5 feet or less, the aquifer would be independent of the Iao System. In fact, the head at the exploratory wells was about 10 feet while the head at Test Hole A-1 was nearly 20 feet. This relationship suggested that the Iao Aquifer System was hydraulically connected to North Waihee but that Waihee Valley behaved as a low permeability impediment to hydraulic continuity. The lack of response of groundwater levels at Test Hole A-1 to pumping at the North Waihee wells further suggested that North Waihee could be treated as a quasi-independent aquifer
The connection between the Iao and North Waihee Aquifer Systems, as well as the dampening effect on hydraulic continuity exercised by the low permeability associated with the alluvium and weathered zone in Waihee Valley, is indicated by comparing the continuous head records at Test Hole A-1 and North Waihee Well 1. The head trace for the test hole is synchronous with that at North Waihee but higher by about 7 feet. If the normal groundwater gradient in basal aquifers of the shield basalts characteristic of every island in Hawaii governed flow, the difference in head would be less than 1 foot. The exaggerated difference is a result of head loss as the groundwater moves through the valley. Global hydraulic conductivity in the valley is at least two magnitudes less than in the unweathered basalt aquifer. A derivation based on Darcy's law indicates that the global hydraulic conductivity of the impediment is about 25 ft./day compared with normal basalt conductivity of 1500 ft./day.

Knowledge of the hydrogeology of both the Iao and North Waihee Aquifer Systems is insufficient to unequivocally establish the pattern of groundwater flow in and from the
aquifers. However, assuming that the general direction of groundwater flow in the Iao Aquifer is toward and across Waihee Valley, the North Waihee System would then be recharged by excess groundwater from Iao as well as by recharge from the high rainfall region north of Waihee Valley. As a result, the sustainable yield of the North Waihee System is substantial. Its magnitude, now estimated to be 8 mgd, will be more accurately determined after an operational record of pumping is established. The sustainable yield refers to the entire North Waihee Aquifer System, which extends from Waihee Valley north to Kahakuloa Valley.

Hydrogeology of the North Waihee Aquifer System

In the Iao Aquifer System the basal aquifer in the Wailuku basalt formation is covered by a caprock of sediments extending to approximately 8000 feet inland of the coast. The inland boundary of the basal aquifer is the rift zone lying about 12,000 feet from the coast and approximately parallel to it. Heads are high in the aquifer because the low permeability of the caprock sediments prevent easy discharge of the groundwater.

This sedimentary blanket, which north of Iao Valley is more
than 1200 feet deep at the coast, is truncated at Waihee Valley. North of Waihee the volcanic rock formations reach to the coast; if a sedimentary blanket exists, it lies below sea level and does not play a role in the North Waihee hydrogeology. The absence of sediments north of Waihee Valley suggests that the sector to the south was displaced downward as a result faulting, and that the fault itself is along what is now Waihee Valley. South of Iao Valley the deep sediments continue beyond Waikapu, but are absent where the Isthmus terminates. The faulted block, therefore, is a wedge truncated on the north at Waihee Valley and ending in the south where the isthmus sediments abut the basalt bedrock.

Although a sedimentary caprock does not exist in the North Waihee Aquifer System, nevertheless north of Waihee Valley a caprock composed of a volcanic formation resists drainage from the basal lens into the sea. The formation constituting the aquifer is the Wailuku basalt, a highly permeable medium equivalent to other premium aquifers such as the Koolau basalt of Oahu in its water bearing properties. In the region between Waihee Valley and Waiolai Gulch, and perhaps beyond to Wailena Gulch, the Wailuku basalt is covered by the Honolua formation, a low permeability combination of
andesite and trachyte in which even lower permeability soil and ash layers are stratified. The Honolua averages about 100 feet in thickness and completely caps the Wailuku basalt to the coast and out to sea. This formation behaves as a caprock in the region where the proposed additional groundwater development is to take place. Figure 1 illustrates the geology of the region.

The Honolua formation is a pale tan to gray to white rock, massive and dense with platy cleavage. Individual andesite layers average about 40 feet thick, and trachyte layers are as much as 150 feet thick. In contrast, the primitive basalt of the Wailuku formation is piled in layers normally 10 feet or less thick throughout which many highly permeable clinker layers occur. A weak unconformity separates the Wailuku from the overlying Honolua, but the volcanism that produced these rocks was continuous, though eruptions were less frequent during the extrusion of the Honolua formation. Nowhere in West Maui is the Honolua exploited as an aquifer.

For convenience in classification and management, the North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. The basal portion may be disrupted near Makamakaole Valley by massive
Honolua dikes that connect the trachyte eruptive centers at Puu Kukui and Eke at the crest of the West Maui Mountains with trachyte bulbous domes near the coast, such as Puu Olai (Figure 1). Inland the basal sector ends at the rift zone which is about at and parallel to the Forest Reserve boundary 7000 feet from the coast. In the entire North Waihee Aquifer System the sustainable yield is estimated as 8 mgd; between Waihee and Makamakaole it is less.

North Waihee Wells 1 and 2: Drilling and Testing

In 1981 C. Brewer Co. had two wells drilled in its property on the north bank of Waihee Valley. The wells are located about 500 feet from the axis of the valley and 5200 feet inland from the valley mouth at Waihee Point. The purpose of drilling was exploratory, to determine aquifer characteristics, ground water levels and quality, but the wells were constructed and completed for use as production wells. The locations of wells in the North Waihee Aquifer System is given in Figure 2.

The wells were located to avoid a deep section of valley fill sediments. They were driven from elevation 280 feet through 100 feet of talus into the the Wailuku basalt. The Honolua formation is missing at this level on the slope of
the ridge. The initial head was 9 to 10 feet, which was higher than expected if the aquifer were independent of the Iao Aquifer System to the south yet lower if it were connected. At the time the head at Test Hole A-1, 4000 feet to the south in the Iao Aquifer, was 20 feet during periods of low to no pumping at the Mokuhau and Waiehu wells.

Each well was drilled to 105 feet below sea level (BSL) and fitted with 16 inch diameter blank casing to 5 feet BSL, and screen between 5 and 25 feet BSL. The remaining 80 feet was left open.

The pump test in 1982 employed North Waihee 2 as the pumping well and North Waihee 1 as an observation well. The wells are on a line parallel to the valley, 176 feet apart. A continuous 48 hour test at a rate of 1700 gpm (2.45 mgd) was performed. Analysis of the test results determined the transmissivity of the aquifer as 325,000 sq.ft./day and the storage coefficient as .25. Salinity of the pumped water was very low and constant at 15 mg/l chloride. No effect on the head at Test Hole A-1 could be detected, nor were any boundary effects indicated by the drawdown curve.

The test proved the occurrence of a substantial groundwater
resource north of Waihee Valley, and the results implied that the connection with the Iao Aquifer System was weak. The wells were capped. Interest in them flagged because draft in the Iao Aquifer System was still significantly less than the assigned sustainable yield.

Interest was rekindled in 1989 when Iao pumpage began to approach sustainable yield. A longer test with expanded data collection opportunities was designed. An observation well was drilled in Kanoa Valley about 2000 feet north of the North Waihee wells and equipped with a continuous water level recorder. An existing small diameter well in Wailena, 13,500 feet north of the North Waihee wells, was also equipped with a continuous water level recorder. The Wailena well had been drilled in 1987. Test Hole A-1 and North Waihee Well 1 also had continuous water level recorders. North Waihee 2 was selected as the pumping well. Another well in the region, the Mendes well (Figure 2), was not available for measurements. This well has a 4 inch diameter casing and is fitted with a 5 HP pump capable of yielding 20 to 30 gpm. It is infrequently pumped.

Ground elevation at the Kanoa observation well is 305 feet. The drilling log places the Honolua/Wailuku contact at depth
248 feet (57 feet ASL). The initial head was 12.4 feet. The Wailena well ground surface is at 608 feet, and the well lies at the inland turn of the road nearly on the axis of the valley. The Honolua formation is absent in Wailena, and the well penetrated only the Wailuku basalt. The initial head at completion of drilling in 1987 was 6.4 feet while just before commencement of the test it was 6.6 feet. At the start of the test head in North Waihee 1 was 11.5 feet and in North Waihee 2 it was 10.7 feet. At Test Hole A-1 in the Iao Aquifer System the head was 18.1 feet. Heads at Kanoa and North Waihee were inconsistent with a flow net that would have groundwater passing northward from Waihee Valley toward Makamakaole as might be interpreted if flow crossed Waihee Valley from Iao to North Waihee.

The pump test lasted four days, from May 15 to May 19, 1989. The average rate of pumping over the 96 hours was 2400 gpm (3.46 mgd). Drawdown in North Waihee 2, the pumping well, stabilized at 5.5 feet, and in North Waihee 1, 176 feet away, it reached 0.7 feet. At the Kanoa observation well drawdown peaked at 0.4 feet. Tidal efficiency at Kanoa is high because the well lies just 2000 feet from the coast, and the range and distribution of drawdowns on the chart reflected this efficiency. At Wailena and Test Hole A-1 no
change in head attributable to the pumping could be detected. The drawdown curves for North Waihee 1 and Kanoa did not indicate the presence of flow boundaries.

The test results were evaluated both graphically and by computer program to yield values for the fundamental aquifer properties of transmissivity and storage coefficient (effective porosity). At North Waihee 1 transmissivity computed from drawdown data was 320,000 sq.ft./day and storage coefficient .30, about the same as that determined for the 1982 test. The Kanoa data was not as easily interpreted because of the imposition of the tidal signal on the drawdown values. Transmissivity fell between 260,000 and 334,000 sq.ft./day and storage coefficient between .013 and .034. The transmissivity values are consistent with those obtained at North Waihee 1, but the storage coefficient values are a magnitude lower. At the North Waihee wells the computed storage coefficients may represent local phenomena, whereas the values determined at Kanoa may reflect a regional characteristic. For planning the arrangement of a well field the smaller storage coefficient is likely to be more realistic than the larger one. In the Pearl Harbor region of Southern Oahu, for example, where the Koolau formation resembles the Wailuku basalt the regional storage
coefficient is about .05.

For predictive purposes a transmissivity of 325,000 sq.ft./day and coefficient of storage of .05 will be employed. The transmissivity is representative of a highly permeable aquifer having a substantial depth of fresh water flow. Assuming a hydraulic conductivity of 1500 ft./day, which is a value typical of primitive basalts like the Wailuku formation, and accepting the Ghyben-Herzberg relationship that depth below sea level to the 50 percent sea water isochlor is 40 times the head, the thickness of the fresh water core is calculated as 217 feet and that of the upper limb of the transition zone as \(40 \times h - 217\) (e.g. for a 10 feet head the upper limb would be 183 feet thick). The calculated thickness of the fresh water core is further constrained by the assumption that the groundwater flow contributing to transmissivity is restricted to this zone. These assumptions lead to approximate, not accurate, estimates of zonation in the basal lens. Nevertheless it is clear that the fresh water core is thick because even under the intense stress of pumping 3.46 mgd from a single well the salinity of the pumped water did not increase.
Proposed Development of the North Waihee Aquifer

The first phase of the North Waihee groundwater development program calls for activation of the two existing North Waihee wells and drilling two new wells. The existing wells were completed to construction standards meeting both the Department of Health and Commission on Water Resources Management recommendations. One of the new wells, Kupaa 1, will be located at an elevation of approximately 575 feet near the C. Brewer Co. property boundary line on a slope inland of Kahekili Highway. The other, Kanoa 1, will be drilled about 75 to 100 feet inland of the existing Kanoa monitor well.

The North Waihee wells are 16 inch diameter (casing) and bottom at 105 feet BSL. The new wells also will be completed as 16 inch diameter wells after testing proves acceptable production capability. However, the first stage in the drilling protocol for the new wells will consist of a pilot hole driven to 50 feet BSL into which a pump can be lowered for a preliminary test. An option will be included to drill deeper in 25 feet increments if results of the preliminary test fail to predict adequate production.

General specifications and the drilling protocol for the two
new wells are as follows.

1. Drill pilot hole to depth 50 feet BSL.
2. Conduct preliminary pump test in open hole; duration two hours or less.
3. Option to deepen drilling in 25 feet increments if preliminary tests fail to show sufficient production capability.
4. At selected depth, ream boring so it can hold 16 inch diameter casing while allowing for a 3 inch annular space for grouting.
5. Conduct another preliminary test of a few hours duration.
6. Select length of blank casing on basis of preliminary tests.
7. Screen is optional; at most, 10 to 20 feet of screen, the remainder of boring open hole.
8. Grout to water table, which is expected to lie about 10 feet above sea level.

Although the North Waihee 2 well was tested for a continuous run of 96 hours at 3.46 mgd, this rate is about twice that allowable for a production well. Upon reviewing the results of the pumping tests of 1982 and 1989, the preliminary recommendation was to fit the wells with 2 mgd (1390 gpm) pumps. This recommendation envisioned a single well field
comprising two wells in the North Waihee Aquifer. Expansion to more than two wells justifies a more prudent recommendation of 1.5 mgd (1040 gpm) per well. The new wells will be tested to determine whether a 1.5 mgd pump would be appropriate, but final pump size will depend on the results of the long term continuous test.

Total well capacity will be 6.0 mgd if each of the four wells is fitted with a 1.5 mgd pump. A scenario in which one of the existing North Waihee wells serves as an inactive stand-by but the other three wells are producers, and assuming that a peaking factor of 1.5 times average output is excercised for the three active wells, average production will total 3.0 mgd. If the capacity of the inactive well is included, the average output will be 4.0 mgd. Whether or not the North Waihee Aquifer between the C. Brewer Co. property line and Waihee Valley can sustain an average yield of 4.0 mgd is not predictable until a record of the effects of pumping operations on water levels and the quality of the pumped water accumulates.

The proposed location of Kupaa 1 is 1000 feet from the Mendes well and 2 miles south of the new Wailena well. At the time of testing the Wailena well had a 4 inch diameter
casing. In 1994 a new well with 6 inch diameter casing was drilled and successfully tested at 200 gpm. Pumping at Kupaa and Kanoa should not affect the Wailena well because of its distance from the proposed wells. The capacity of the Mendes well is too small for either the quality or quantity of its pumpage to be affected.
Figure 1
NORTH WAIHEE
(Waihee Valley to Kaha Kula Valley)
Scale: 1" = 1 mile.

Geology
- RA: Recent alluvium and dunes
- PA: Old alluvium
- Th: Honolulu formation
- Tw: Wailuku formation

Existing Wells
- Existing Wells
- Proposed Wells

Locations:
- Wailena
- Mendes
- Kupaa 1
- Kanoa 1
- North Waihee 1,2
EXHIBIT A - 1

NORTH WAIHEE AQUIFER SYSTEM
KUPAA 1 AND KANOA 1 WELL
TEST RESULTS AND INTERPRETATION

JOHN F. MINK
MINK & YUEN
NORTH WAIHEE AQUIFER SYSTEM

Kupaa 1 and Kanoa 1 Wells
Test Results and Interpretation

John F. Mink
Mink and Yuen, Inc.

June 21, 1999

Kupaa 1

The location of the well, which was completed in March of 1999, is plotted on Figure 1. The completed configuration of the well is as follows.

Depth 687 ft. (49 ft. BSL)
Boring diameter, 21 in.
Blank casing diameter, 16 in.; depth 633 ft. (4 ft. ASL)
Perforated casing, diameter 16 in.; length 53 ft.
Grout, 0 to 630 ft. (7 ft. ASL)
Gravel, 633 to 686 ft.

Further details are given in the Driller’s Well Completion Form, which is attached. Note that the measuring point (MP) on the form differs from the surveyed elevation. The driller’s MP elevation on the top of the casing is listed as 638.1 feet; the actual elevation is 639.37 feet, which is based on a vertical survey from a benchmark elevation of 631.87 feet located about 200 feet from the well. This correction affects computation of head but not of drawdown measured during the pumping tests.

Examination of the drill cuttings indicates that the unconformity between the overlying Honolua trachyte formation and the Wailuku basalt formation is 70 to 80 feet below ground surface, and that the weathering zone of the Wailuku extends another 55 feet before fresh Wailuku basalt is struck. The driller’s lithology log is attached. Also attached is a drawing illustrating the relationship between the Honolua and Wailuku at both the Kupaa and Kanoa wells.
Step Drawdown Test

Head before pumping started was 7.41 feet (MP 639.37 ft. - DTW 631.96 ft. = 7.41 ft.), as measured with the Driller's tape. Putative stable drawdown at each pumping rate was:

<table>
<thead>
<tr>
<th>Rate (gpm)</th>
<th>Drawdown (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>.35</td>
</tr>
<tr>
<td>700</td>
<td>.82</td>
</tr>
<tr>
<td>1000</td>
<td>1.34</td>
</tr>
<tr>
<td>1400</td>
<td>2.14</td>
</tr>
</tbody>
</table>

In the Appendix these data are used to calculate a transmissivity (T) value of 178,928 sq.ft./day employing the standard laminar-turbulent flow relationship between drawdown and pumping rate. Assuming depth of flow to the well equal to penetration of the well below the water table (about 50 feet), hydraulic conductivity (k) is 3566 ft./day This value is of the magnitude consistent with the usual values derived for other primary basalt aquifers in Hawaii.

Constant Rate Pump Test

The constant rate test at 1200 gpm began at 0900 on March 15, 1999, and went on for four days (96 hours). Initial drawdown was rapid, but after about 40 minutes it no longer decreased monotonically but began to oscillate within a range of approximately 0.5 feet. Tidal and barometric perturbations, randomized by apparent hysteresis in the transducer readings, contributed too much noise to the record to allow an accurate extraction of drawdowns due to pumping alone.

For the first 44 minutes of the test, however, the monotonic drawdowns can be employed in the Theis equation to derive an approximate value of T. The computer program, THEISFIT, yields a T value of 91,363 sq.ft./day, which for a 50 feet depth of flow translates to hydraulic conductivity of 1827 ft./day. This value is of the same magnitude as the one obtained from the step drawdown test data but is probably more accurate and is more consistent with typical values for other Hawaiian basalt aquifers (e.g. The Koolau aquifer of southern Oahu, which has an average hydraulic conductivity of 1500 ft./day). The printout of the THEISFIT computation is included in the Appendix. A realistic value for storage coefficient (S) is impossible to derive because a meaningful radius value for the pumping well is unknowable. The total bore diameter may be one or two feet, but the apparent diameter is likely to be greater.
The effort to disassociate tidal changes in groundwater level from drawdown did not produce clearly identifiable results. However, the tidal efficiency at the well site and Kanoa is 5 to 10 percent. For the maximum tidal change, about 2 feet, the effect on the water level in the well would be 0.10 to 0.20 feet. Change of this magnitude could not be discriminated from barometric and random perturbations after drawdown reached approximately 1.35 feet in less than an hour following the start of the test.

An effort was made to measure water levels in nearby wells during the test. The North Waihee wells were shut down to avoid interference. None of the wells (Kanoa monitor, Mendes, North Waihee) provided unambiguous, interpretable drawdown data.

During the four days of the test chloride content remained steady at 20 to 25 mg/l and temperature was 68 F. The temperature indicates that the source of recharge is from higher elevations where rainfall is copious, and the steady chloride content confirms that at 1200 gpm sea water intrusion does not affect the pumped water. A full spectrum analysis shows that the water is not contaminated with either volatile organics or heavy metals.

**Recommended Pump Size**

The sustained constant rate, 1200 gpm (1.73 mgd), is the recommended pump size. Initial head at Kupaa was 7.41 feet, which is adequate to avoid upconing of sea water during pumping in a well penetrating 50 to 100 feet below the water table. Should adherence to the full breadth of the DWS protocol on pumping be required, average daily yield will be 0.77 mgd (.444 x 1.73 mgd); if only the 16 hr/day pumping portion of the protocol were followed, average yield would be 1.15 mgd (.667 x 1.73 mgd).

**Kanoa 1**

Kanoa 1 was completed in April and tested in May, 1999. Its location is plotted on Figure 1. Final configuration of the well is as follows.

- Depth: 359 ft. (50 ft. BSL)
- Boring diameter: 22 in.
- Blank casing diameter: 16 in.; depth
- Perforated casing diameter: 16 in.;
- Grout: 0 to 300 ft.
- Gravel: 300 to 389 ft.
Further details are given in the attached Drillers Well Completion Form. The measuring point is 309.15 feet above sea level, and the depth to water (DTW) before testing was 301.34 feet, giving a head of 7.81 feet, 0.4 feet higher than at Kupaa 1 a month earlier.

The lithology log places the Honolua/Wailuku unconformity at an elevation of about 64 feet, which is virtually identical to the placement identified by well cuttings from the Kanoa monitor well. The thickness of the Honolua and unconformity is approximately 245 feet. The greater thickness at Kanoa than at Kupaa (75 feet) is due to the topography on to which the Honolua lavas flowed; the Kanoa site is in a pre-existing valley, while the Kupaa site is on a pre-existing ridge.

**Step Drawdown Test**

The step drawdown test was conducted on May 14, 1999, at rates to 1400 gpm. The results are summarized as follows.

<table>
<thead>
<tr>
<th>Rate (gpm)</th>
<th>Drawdown (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>.46</td>
</tr>
<tr>
<td>375</td>
<td>.51</td>
</tr>
<tr>
<td>500</td>
<td>.66</td>
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<td>700</td>
<td>1.26</td>
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<tr>
<td>1100</td>
<td>2.16</td>
</tr>
<tr>
<td>1400</td>
<td>3.36</td>
</tr>
</tbody>
</table>

The computed transmissivity is 124,770 sq.ft./day (see Appendix), which, if the depth of flow is 50 feet, yields hydraulic conductivity of 2495 ft./day. The computed \( T \) is comparable to that determined by step drawdown data for Kupaa 1. However, values derived from step drawdown results are indicative rather than absolute; in both wells they are of the same high magnitude that indicates the Wailuku basalt is very permeable.

**Constant Rate Pump Test**

The 1200 gpm constant rate pump test was started at 0900, May 17, and completed at 0900, May 21, 1999, a period of 4 days. Maximum drawdown at the pumping well, uncorrected for tidal and barometric influences, was 2.77 feet. Instantaneous drawdown over the first few moments after the pump was turned on was 2.58 feet, which suggests a maximum aquifer drawdown of 0.19 feet. Transducers were placed in North Waihee Wells 1 and 2, but unambiguous drawdown data could not be deciphered from the computer print-out. Tidal efficiency and barometric
fluctuations compounded by inconsistencies in transducer readings relegate the use of the data to speculation. Similarly the transducer data from the Kanoa monitor well evidently did not reliably reflect pumping drawdown. During testing transducer readings have to be supplemented by tape measurements to check their accuracy and reliability.

Chloride content during the test remained constant at 20 to 24 mg/l (see Appendix), the same as at Kupaa, and temperature fell between 69 and 71 F.

Clearly the North Waihee aquifer is highly permeable and capable of supplying low salinity water at satisfactory pumping rates. When the North Waihee 1 and North Waihee 2 wells were tested in 1981 and 1989, the transmissivity values were 325,000 sq.ft./day for the original test, and 320,000 sq.ft./day for the 1989 test. The associated storage coefficient values were .25 and .30.

Recommended Pump Size

As for Kupaa, the recommended pump size is 1200 gpm (1.73 mgd). For the DWS standard factor of .444, average production will be 0.77 mgd, for the more liberal factor of .667, the average will be 1.15 mgd.
APPENDIX

Kupaa 1 Step Drawdown

A value of transmissivity (T) can be calculated from a step drawdown test by assuming that drawdown at each rate is stable and that it is expressed by the equation,

\[ s = aQ + bQ \]

in which \( s \) is drawdown, \( Q \) is pump rate, \( a \) is the laminar flow (aquifer) constant, and \( b \) is the turbulent flow (well loss) constant. The equation is linearized by dividing by \( Q \),

\[ s/Q = a + bQ \]

which plots as a straight line with \( s/Q \) as the ordinate and \( Q \) the abcissa. The value, \( a \), is the intercept, and \( b \) is the slope of the line. An attached graph shows the linear form of the step drawdown curve for Kupaa 1.

To determine \( T \), the intercept, \( a \), is substituted in the Thiem steady state formula for drawdown as a function of pumping. The Thiem equation is,

\[ s = \left(\frac{Q}{2\pi T}\right) \ln \left(\frac{R}{r}\right) \]

in which \( R \) is the nearest distance from the well where \( s = 0 \), and \( r \) is the effective radius of the well. The value of \( R \) is unknown and has to be approximated.

Because \( s = aQ \) in the step drawdown equation refers to laminar flow in the aquifer, substitution in the Thiem equation gives,

\[ aQ = \left(\frac{Q}{2\pi T}\right) \ln \left(\frac{R}{r}\right), \]

and,

\[ T = \left(\frac{1}{2\pi a}\right) \ln \left(\frac{R}{r}\right). \]

The intercept, \( a \), has a value of .00067 (see graph), thus,

\[ T = (237.6) \ln \left(\frac{R}{r}\right). \]
The value of $R$ is estimated as equal to the length of penetration of the well below the water table (Zanger; Polybarunova-Kochina), and assuming the radius of the well as 1 foot,

$$T = (237.6) \ln (50) = 929.5 \text{ gpm/ft}$$

which when converted to consistent units (feet and days) is,

$$T = 178,928 \text{ sq.ft./day}.$$ 

For a depth of flow of 50 feet, $k = 3566 \text{ ft/day}.$

**Kupaa 1 Constant Rate**

Drawdown during the period of monotonic decline before oscillation of the water level set in is plotted on an attached graph. If the Jacob simplification is employed, the $T$ value from the graph is calculated as,

$$T = (264) (1200)/\Delta s$$

In which $\Delta s$ is drawdown over one log cycle of time. Thus, $T = 70,588 \text{ sq.ft./day},$ which is comparable to the THEISFIT value of 91,363 sq.ft./day.

Unfortunately, none of the test result data allows for calculation of storage coefficient ($S$). In the most thoroughly studied Hawaii basaltic aquifer similar to the Wailuku basalt, the Koolau aquifer, storage coefficient as effective porosity is approximately .05, but rigorously conducted tests at North Waihee 1 and North Waihee 2 in 1981 and 1989 gave $S$ values of .25 and .30, respectively.

**Kanoa 1 Step Drawdown**

Employing the same applicable parameters as for the Kupaa 1 step drawdown analysis and a value of .0009606 ft./gpm for the aquifer constant, $a$, the computed value of $T$ is 124,770 sq.ft./day. If depth of flow is equal to depth of penetration of the well below the water table (50 ft.), hydraulic conductivity is 2495 ft./day.

**Kanoa 1 Constant Rate**

The water level data derived from transducer readings was too imprecise to allow for realistic determination of aquifer parameters.
Figure 1 - Vicinity Map
Proposed Exploratory Well Sites
Kupaa Well NO.1 & Kanoa Well No.2
Wahee, Maui, Hawaii

Source: U.S.G.S. Map Waikuku and Kahakuloa Quadrangles
State of Hawaii  
COMMISSION ON WATER RESOURCE MANAGEMENT  
Department of Land and Natural Resources

WELL COMPLETION REPORT  
4/25/97 WCR Form

State Well No.: 5731-03  
Well Name: Kūpā' a Well  
Island: Maui

PART I.  
WELL CONSTRUCTION REPORT

Drilling Company: Wailani Drilling Inc.  
Name of driller who performed work: Mike Robertson  
Type of rig/construction: Air Rotary  
Date(s) Well Construction and pump tests (if any) completed: 5/18/99

GROUND ELEVATION (referenced to mean sea level, msl): 631.9 ft.  
Well Bench Mark (description/location): Top of Casing Elevation (msl): 633.10 ft.

DRILLER'S LOG:  
Please attach geologic log (if available or if required by permit)  
Depth (ft.)  Rock Description, Water Level, Dates, etc.  
Depth (ft.)  Rock Description, Water Level, Dates, etc.

0 to 6  Red Clay  
6 to 10  Tan Clay & Assorted Rock  
10 to 18  Grey Clay  
(If more space is needed, continue on back)

Total depth of well below ground: 681 ft.  
Hole size: 2.3 inch dia. from 0 ft. to 681 ft. below ground

Casing installed:  

16 in. I.D. x 3/8 in. wall solid section to 633 ft. below ground  
16 in. I.D. x 5/16 in. wall perforated section to 633 ft. below ground

Casing Material/Slot Size:

Annulus:  
Grouted from 0 ft. below ground to 630 ft. below ground  
Gravel packed from 630 ft. below ground to 681 ft. below ground  

Initial water level: 631.9 ft. below ground  
Initial temperature: 71 °F

PUMPING TESTS:  
Reference Point (R.P.) used: Well casing, which elevation is 633.10 ft.  
(1) Step-Drawdown Test Date 3/12/99  
Start water level: 631.9 ft. below R.P.  
End water level: 632.05 ft. below R.P.

(2) Long-term Aquifer Test Date 3/15/99  
Start water level: 631.90 ft. below R.P.  
End water level: 632.20 ft. below R.P.

Aquifer Pump Test Procedures data & graphs (1996 LTAT Form) attached? Yes No

As-built drawings attached? Yes No  
Other remarks/comments: (On back of this form)

Well Drilling Contractor (print)  
Wailani Drilling Inc. C-57 Lic. No. C 20115

Signature: Mike Robertson  
Date: 5/20/99

Surveyor (print)  
EDGARDO V. VALERA  
Lic. No. L.P.L.S. # 507G

Signature:  
Date: May 25, 1999

Applicant (print)  
Dept. of Water Supply

Signature:  
Date: 6/22/99
### PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump installation Company: 
21. Name of person performing work: 
22. Date Pump Installation Completed: 
23. PUMP INSTALLATION: 
   - Pump Type, Make, Serial No.: 
   - Motor type, H.P., Voltage, rpm: 
   - Depth of Pump Intake Setting ft. below which elevation is ft. 
   - Depth to bottom of intake ft. below which elevation is ft. 
   - Pumping Head is ft. Type of flow meter: which measures in . 
24. As-built drawings attached attached? Yes No 
25. Other remarks/comments: (See below)

#### Pump Installation Contractor (print) C-57 Lic. No. 
Signature Date

#### Applicant (print) 
Signature Date

---

### DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Water Level Dates (ft.)</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks</th>
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<td>Weathere d Basalt</td>
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<tr>
<td>41 to 59</td>
<td></td>
<td>Blue Rock</td>
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<td>59 to 67</td>
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<td>Weathere d Basalt</td>
</tr>
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<td>67 to 75</td>
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<td>Blue Rock</td>
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<td>75 to 110</td>
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<td>Dense Basalt Blue Rock</td>
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<td>Assorted Rock</td>
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<td>Dense Basalt Blue Rock</td>
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<td>Softer Basalt</td>
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<td>Black &amp; Red Cinders</td>
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<td>635 to 685</td>
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15 & 25. Remarks: ________________________________
<table>
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<tr>
<th>Date/Time</th>
<th>Depth</th>
<th>Drill pipe</th>
<th>Drift pipe</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27</td>
<td>0-6</td>
<td>N.A.</td>
<td>12 in. HAMMER + STAB = 7 ft. - TOP SUB = 2 ft.</td>
<td>RED CLAY</td>
<td>150</td>
<td>N.A.</td>
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<tr>
<td>3:30</td>
<td>6-10</td>
<td>“</td>
<td>add 18 ft x 12 in. stabilizer/</td>
<td>TAN CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-18</td>
<td>“</td>
<td>GREY CLAY</td>
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</tr>
<tr>
<td>5:00</td>
<td>18-25</td>
<td>“</td>
<td>GREY CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28</td>
<td>25-31</td>
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<td>add 58x12 inch stabilizer/</td>
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<tr>
<td>11:45</td>
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<tr>
<td>12:30</td>
<td>31-36</td>
<td>“</td>
<td>add 69x12 inch stabilizer/</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2:12</td>
<td>36-41</td>
<td>“</td>
<td>add 69x12 inch stabilizer/</td>
<td>WEATHERED BASALT</td>
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<td></td>
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<tr>
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<td>41-46</td>
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<td></td>
</tr>
<tr>
<td>3:20</td>
<td>46-49</td>
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<td>add 67x12 inch stabilizer/</td>
<td>BLUEROCK</td>
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<td></td>
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<td>add 67x12 inch stabilizer/</td>
<td>BLUEROCK</td>
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<td>54-60.41</td>
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<td>BLUEROCK - LAST FOOT (59-60.41) WEATHERED BASALT</td>
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<tr>
<td>8:00</td>
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<td>all pilot tools installed-install diverter-</td>
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<tr>
<td>11:23</td>
<td>60-80</td>
<td># 1</td>
<td>start drill pipe #1/</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
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<tr>
<td>12:20</td>
<td>80-85</td>
<td>0.1</td>
<td>ASSORTED ROCK - CORAL</td>
<td>SAME FORMATION</td>
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<tr>
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<td>85-110</td>
<td># 2</td>
<td></td>
<td>BROWN CLAY AND ASSORTED ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:27</td>
<td></td>
<td></td>
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<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:25</td>
<td>110-135</td>
<td># 3</td>
<td>0.6 *</td>
<td>DENSE BASALT</td>
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<td></td>
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<td>0.4 *</td>
<td>ASSORTED ROCK</td>
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<tr>
<td>4:00</td>
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<tr>
<td>9/1</td>
<td>185-210</td>
<td># 6</td>
<td>0.2</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:10</td>
<td>210-235</td>
<td># 7</td>
<td>0.3</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:05</td>
<td>235-260</td>
<td># 8</td>
<td>0.1</td>
<td>DENSE BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:50</td>
<td>260-285</td>
<td># 9</td>
<td>0.6 *</td>
<td>DENSE BASALT (Bluerock)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:50-3:50</td>
<td>285-310</td>
<td># 10</td>
<td>0.2</td>
<td>DENSE BASALT (Bluerock)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date / Time</td>
<td>Drill pipe no.</td>
<td>Depth</td>
<td>Drift Degree</td>
<td>Tooling / Geologic Formation</td>
<td>Air Press.</td>
<td>Bit Press.</td>
</tr>
<tr>
<td>------------</td>
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<td>--------------</td>
<td>-----------------------------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>9/3</td>
<td>#11</td>
<td>310-315</td>
<td></td>
<td>HARD BASALT</td>
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<tr>
<td>11:00</td>
<td></td>
<td>315-325</td>
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<td>SOFTER BASALT</td>
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<td></td>
</tr>
<tr>
<td>12:00</td>
<td></td>
<td>325-335</td>
<td>0.25</td>
<td>TAN CLAY AND BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:15</td>
<td>#12</td>
<td>335-340</td>
<td></td>
<td>TAN CLAY AND BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:15</td>
<td></td>
<td>340-355</td>
<td></td>
<td>SOFTER BASALT</td>
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<td></td>
</tr>
<tr>
<td>1:30-2:20</td>
<td>#13</td>
<td>360-375</td>
<td>0.25</td>
<td>TAN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>375-385</td>
<td></td>
<td>SOFTER BASALT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30-3:20</td>
<td>#14</td>
<td>385-410</td>
<td>0.25</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td>#15</td>
<td>410-435</td>
<td>0.2</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30-5:15</td>
<td>#16</td>
<td>435-460</td>
<td>0.24</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/4</td>
<td>#17</td>
<td>460-485</td>
<td>0.3</td>
<td>BASALT AND BROWN ROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30-10:15</td>
<td></td>
<td>485-493</td>
<td></td>
<td>BASALT AND BROWN ROCK</td>
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<td>10:45</td>
<td>#18</td>
<td>493-510</td>
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<td>TAN ROCK</td>
<td></td>
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<tr>
<td>11:55</td>
<td></td>
<td>510-535</td>
<td>0.1</td>
<td>BASALT-BROWN ROCK-RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:10</td>
<td>#19</td>
<td>535-560</td>
<td>0.3</td>
<td>BASALT-BROWN ROCK-RED CINDERS</td>
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<td>2:00-3:05</td>
<td>#20</td>
<td>560-585</td>
<td>0.2</td>
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<td></td>
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<td>#21</td>
<td>585-610</td>
<td>0.4</td>
<td>BASALT-BROWN ROCK-RED CINDERS</td>
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<td></td>
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<tr>
<td>4:45-5:18</td>
<td>#22</td>
<td>610-635</td>
<td>0.01</td>
<td>BASALT-BROWN ROCK-RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9/8</td>
<td>#23</td>
<td>635-660</td>
<td>0.02</td>
<td>BLACK + RED CINDERS</td>
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<td></td>
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<tr>
<td>2:00-2:46</td>
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<td>660-675</td>
<td></td>
<td>BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:05-4:10</td>
<td>#24</td>
<td>675-685</td>
<td></td>
<td>BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/30</td>
<td>#25</td>
<td>685-710</td>
<td></td>
<td>BLACK + RED CINDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30-11:50</td>
<td></td>
<td>710-735</td>
<td></td>
<td>BLACK + RED CINDERS</td>
<td></td>
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</tr>
</tbody>
</table>
Kupaa 1 Step Drawdown Test

Eqn 8160 [Line Robust None, Gaussian Errors] y=a+bx

\[ r^2=0.90036699 \text{OF} \quad \text{Adj} \quad r^2=0.90036699 \text{FilSldErr}=6.1934602e-05 \quad F\text{stat}=58.220822 \]

\[ a=0.00066990868 \]

\[ b=6.386758e-07 \]
CALCULATION OF 'BEST FIT' TRANSMISSIVITY AND STORAGE COEFFICIENT BY AUTOMATICALLY FITTING EXPERIMENTAL PUMP TEST DATA TO THE THEIS EQUATION IN A LEAST SQUARES SENSE.

constant rate test

INPUT DATA

ENGLISH UNITS

PUMPAGE RATE: 1200 [GAL/MIN]

OBSERVATION DISTANCE FROM PUMPING WELL: 1 [FT]

NUMBER OF ENTERED TIME-DRAWDOWN DATA PAIRS: 8

EXPERIMENTAL TIME-DRAWDOWN DATA

<table>
<thead>
<tr>
<th>TIME [MIN]</th>
<th>DRAWDOWN [FT]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>.75</td>
</tr>
<tr>
<td>8</td>
<td>1.02</td>
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<tr>
<td>12</td>
<td>1.08</td>
</tr>
<tr>
<td>16</td>
<td>1.24</td>
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<td>24</td>
<td>1.25</td>
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<tr>
<td>32</td>
<td>1.26</td>
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<tr>
<td>36</td>
<td>1.35</td>
</tr>
<tr>
<td>44</td>
<td>1.36</td>
</tr>
</tbody>
</table>
CALCULATED GUESS FOR TRANSMISSIVITY SC: 475.845 [GAL/MIN/FT]
CALCULATED GUESS FOR STORAGE COEFFICIENT SC: 7.113292

<table>
<thead>
<tr>
<th>ITERATION</th>
<th>BEST FIT: KB</th>
<th>SC</th>
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<tbody>
<tr>
<td>1</td>
<td>378.8661 [GAL/MIN/FT]</td>
<td>1</td>
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<tr>
<td>2</td>
<td>460.354 [GAL/MIN/FT]</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>474.31 [GAL/MIN/FT]</td>
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</tr>
<tr>
<td>4</td>
<td>474.31 [GAL/MIN/FT]</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>474.31 [GAL/MIN/FT]</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>474.31 [GAL/MIN/FT]</td>
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</tr>
<tr>
<td>7</td>
<td>474.31 [GAL/MIN/FT]</td>
<td>1</td>
</tr>
</tbody>
</table>
REPORT DATE: MAR 22, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: [REDACTED]

MATRIX: WATER

SAMPLER:

EPA METHOD: CHLORIDE: 4500-CI

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUPAA WELL 1</td>
<td>KUPAA WELL 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/15/99 @ 0935 by WS</td>
<td>20</td>
<td>3/18/99 @ 0806 by KK</td>
<td>25</td>
</tr>
<tr>
<td>3/15/99 @ 2100 by ?</td>
<td>22</td>
<td>3/18/99 @ 0900 by WS</td>
<td>25</td>
</tr>
<tr>
<td>3/16/99 @ 0900 by ?</td>
<td>22</td>
<td>3/18/99 @ 2100 by NR</td>
<td>20</td>
</tr>
<tr>
<td>3/16/99 @ 2100 by MR</td>
<td>20</td>
<td>3/19/99 @ 0900 by NR</td>
<td>21</td>
</tr>
<tr>
<td>3/17/99 @ 0900 by MR</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/17/99 @ 2100 by MR</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPROVED BY: C. CERIZO
W.M. IV
**WELL COMPLETION REPORT**

4/25/97 WCR Form

**PART I. WELL CONSTRUCTION REPORT**

3. Drilling Company: **Wailani Drilling Inc.**

4. Name of driller who performed work: **Mike Robertson**

5. Type of rig/construction: **Air Rotary**

6. Date(s) Well Construction and pump tests (if any) completed: **5/15/99**

7. GROUND ELEVATION (referenced to mean sea level, msl): **307.76 ft.**

8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Rock Description</th>
<th>Water Level</th>
<th>Dates, etc.</th>
<th>Well Construction and Pumping Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 38</td>
<td>Gray Weathered Rock-Clay</td>
<td>10 to 70</td>
<td>Gray Rock</td>
<td>(If more space is needed, continue on back)</td>
</tr>
<tr>
<td>38 to 140</td>
<td>Same with less clay</td>
<td>10 to 85</td>
<td>Gray Rock</td>
<td>Weathered Basalt</td>
</tr>
<tr>
<td>140 to 359</td>
<td>Gravel packed from</td>
<td>0 ft. below ground</td>
<td>300 ft. below ground</td>
<td>359 ft. below ground</td>
</tr>
<tr>
<td>359 ft. below ground</td>
<td>300 ft. below ground</td>
<td>359 ft. below ground</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Total depth of well below ground: **359 ft.**

10. Hole size: **22 in.** diam. from **4 ft.** to **359 ft.** below ground

11. Casing installed: **14 in. I.D. x 3/8 in. wall solid section to 305 ft.** below ground

   **14 in. I.D. x 5/16 in. wall perforated section to 359 ft.** below ground

   Casing Material/Slot Size: **1/4” full flow Launder**

12. Annulus: Grouted from **0 ft.** below ground to **300 ft.** below ground

    Gravel packed from **300 ft.** below ground to **359 ft.** below ground

13. Initial water level: **299.33 ft.** below ground


15. Initial temperature: **29 °F**

16. PUMPING TESTS: Reference Point (R.P.) used: **pump base plate** which elevation is **309.15 ft.**

   (1) Step-Drawdown Test Date: **5/14/99**

   Start water level: **301.34 ft.** below R.P.

   End water level: **301.33 ft.** below R.P.

   (2) Long-term Aquifer Test Date: **5/17/99**

   Start water level: **301.22 ft.** below R.P.

   End water level: **301.33 ft.** below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/96 LTAT Form) attached? **Yes**

18. As-built drawings attached? **Yes**

19. Other remarks/comments: **(On back of this form)**

**Well Drilling Contractor (print)** **Mike Robertson** C-37 Lic. No. **20155**

**Surveyor (print)** **Edward C. Alewa** Lic. No. **C-104835**

**Applicant (print)** **City of Wailuku**

**Signature**

**Date** **5/25/99**

**Date** **June 16, 1999**

**Date** **5/25/99**
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company:

21. Name of person performing work:

22. Date Pump Installation Completed:

23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: _____________________________ Capacity _______ gpm
   Motor type, H.P., Voltage, rpm: ____________________________
   Depth of Pump Intake Setting __________ ft. below __________, which elevation is __________ ft.
   Depth to bottom of airline __________ ft. below __________, which elevation is __________ ft.
   Pumping Head is __________ ft. Type of flow meter: __________ which measures in __________

24. As-built drawings attached? Yes No

25. Other remarks/comments: (See below)

Pump Installation Contractor (print) ____________________________ C-57 Lic. No. ______
Signature __________________________________________ Date ______

Applicant (print) __________________________________________
Signature __________________________________________ Date ______

8.(cont'd) DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Water Level</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates (ft.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 to 135</td>
<td>135</td>
<td>Hard Basalt</td>
</tr>
<tr>
<td>135 to 225</td>
<td>225</td>
<td>Weathered Basalt</td>
</tr>
<tr>
<td>225 to 240</td>
<td>240</td>
<td>Hard Basalt</td>
</tr>
<tr>
<td>240 to 260</td>
<td>260</td>
<td>Weathered Basalt</td>
</tr>
<tr>
<td>260 to 305</td>
<td>305</td>
<td>Softer Black Lava (qa)</td>
</tr>
<tr>
<td>305 to 325</td>
<td>325</td>
<td>Dense Bluerock</td>
</tr>
<tr>
<td>325 to 359</td>
<td>359</td>
<td>Black + Red Cinders + Water</td>
</tr>
<tr>
<td>359 to 390</td>
<td>390</td>
<td>Hit Water at 325'</td>
</tr>
</tbody>
</table>

19. & 25. Remarks:

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________


<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Drill Pipe #</th>
<th>Drift Degrees</th>
<th>Depth in feet</th>
<th>Tooling / Geologic Formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/15/99 8:30</td>
<td>1</td>
<td>0.3</td>
<td>0-22</td>
<td>12 in. x 7 ft. hammer + 17 ft. stabilizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>white gray weathered rock and clay</td>
</tr>
<tr>
<td>9:15</td>
<td>2</td>
<td>0.4</td>
<td>22-38</td>
<td>add 5 ft. 8 in. x 12 in stab / gray rock and clay</td>
</tr>
<tr>
<td>9:40</td>
<td>1</td>
<td>0.3</td>
<td>38-60</td>
<td>add 30 ft. of stabilizers total= 60 ft stabilization</td>
</tr>
<tr>
<td>12:05</td>
<td></td>
<td></td>
<td></td>
<td>same formation- gray rock and less clay</td>
</tr>
<tr>
<td>1:30</td>
<td>1</td>
<td>0.3</td>
<td>70-85</td>
<td>gray rock -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>weathered basalt</td>
</tr>
<tr>
<td>4:30</td>
<td>2</td>
<td>0.4</td>
<td>85-110</td>
<td>hard basalt</td>
</tr>
<tr>
<td>3/16/99 8:00</td>
<td>3</td>
<td>0.5</td>
<td>115-135</td>
<td>same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>softer basalt</td>
</tr>
<tr>
<td>9:45</td>
<td>4</td>
<td>0.5</td>
<td>135-160</td>
<td>same</td>
</tr>
<tr>
<td>10:20</td>
<td>5</td>
<td>0.3</td>
<td>160-185</td>
<td>same</td>
</tr>
<tr>
<td>11:15</td>
<td>6</td>
<td>0.7</td>
<td>185-210</td>
<td>same</td>
</tr>
<tr>
<td>12:10</td>
<td>7</td>
<td>0.6</td>
<td>210-225</td>
<td>same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>225-235</td>
<td>hard dense basalt</td>
</tr>
<tr>
<td>3:15</td>
<td>8</td>
<td>0.5</td>
<td>235-240</td>
<td>same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>240-250</td>
<td>hard tan rock</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250-260</td>
<td>weathered basalt</td>
</tr>
<tr>
<td>4:10</td>
<td>9</td>
<td>0.3</td>
<td>260-285</td>
<td>soft black lava (aa)</td>
</tr>
<tr>
<td>4:40</td>
<td>10</td>
<td>0.6</td>
<td>285-305</td>
<td>same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>305-310</td>
<td>bluerock basalt</td>
</tr>
<tr>
<td>3/17/99 8:00</td>
<td>11</td>
<td>0.4</td>
<td>310-325</td>
<td>same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>325-335</td>
<td>black and red cinders - hit water table</td>
</tr>
<tr>
<td>10:10</td>
<td>12</td>
<td>0.4</td>
<td>335-359</td>
<td>black and red cinders - water bearing</td>
</tr>
</tbody>
</table>

Static Water Level = 299.68 ft.
Reference elevation point = 307.76 ft.
Static Head = 8.08 ft.
Kanoa 1 Step Drawdown 5/14/99

Diagram showing the relationship between Drawdown/Rate (ft/gpm) and Pump Rate (gpm). The graph plots data points and a trend line indicating a linear relationship between the two variables.
COUNTY OF MAUI
DEPARTMENT OF WATER SUPPLY
WATER QUALITY LAB
614 PALAPALA DRIVE
KAHULUI, MAUI. HAWAII 96732

REPORT DATE: JUNE 2, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: [REDACTED]

MATRIX: WATER

SAMPLER:

EPA METHOD: CHLORIDE: 4500-CI

<table>
<thead>
<tr>
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<th>CHLORIDE</th>
<th>SAMPLE ID</th>
<th>CHLORIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KANOA WELL 1</td>
<td>mg/L</td>
<td>KANOA WELL 1</td>
<td>mg/L</td>
</tr>
<tr>
<td>5/14/99</td>
<td>20</td>
<td>5/19/99</td>
<td>24</td>
</tr>
<tr>
<td>by WS</td>
<td></td>
<td>@ 0900 by MR</td>
<td></td>
</tr>
<tr>
<td>5/17/99</td>
<td>20</td>
<td>5/20/99</td>
<td>24</td>
</tr>
<tr>
<td>@ 0930 by WS</td>
<td></td>
<td>@ 1430 by WS</td>
<td></td>
</tr>
<tr>
<td>5/18/99</td>
<td>21</td>
<td>5/21/99</td>
<td>24</td>
</tr>
<tr>
<td>@ 0820 by LP</td>
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<td>@ 0900 by WS</td>
<td></td>
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</table>

ANALYST: L. AMANO

APPROVED BY: C. CERIZO
W.M. IV
EXHIBIT B

WATER QUALITY TESTING RESULTS
EXHIBIT B-1

WATER QUALITY ANALYSIS

NORTH WAIHEE WELL NO. 2
Maui, County of, Department of Water Supply
(continued)

<table>
<thead>
<tr>
<th>Anal Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>trans-1,2-Dichloroethene</td>
<td>ND</td>
<td>ug/l</td>
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<tr>
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REPORT DATE: JUNE 23, 1997

SITE: NORTH WAIHEE WELL # 2
USGS 56-31-03

MATRIX: WATER

DATE/TIME SAMPLED: 6/09/97 @ 1000
SAMPLER: K.KUBA

DATE/TIME RECEIVED: 6/09/97 @ 1228
TEMP.CONTROL: 7.0 ° C

EPA METHOD: TOTAL COLIFORM: 9222B
FECAL COLIFORM: 9221C
HPC: 9215B

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<tr>
<th>SAMPLE ID</th>
<th>TOTAL COLIFORM BACTERIA [# / 100 ML]</th>
<th>FECAL COLIFORM VERIFICATION</th>
<th>HPC [CFU/100 ML]</th>
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<tr>
<td>NORTH WAIHEE WELL #2 [S-574]</td>
<td>NOT FOUND</td>
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ANALYST: L.POOLE

APPROVED BY: C.CERIZO CHEMIST
Location: NORTH WAIHEE WELL #2
USGS 56-31-03

Date Sampled Collected: June 9, 1997
Sampler: K. Kuba

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<tr>
<th>TEST</th>
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<th>MCL</th>
<th>RESULTS</th>
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<td>Conductivity</td>
<td>uS/cm</td>
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<td>-</td>
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<tr>
<td>pH</td>
<td>-</td>
<td>4500H</td>
<td>6.5-8.5</td>
<td>7.2</td>
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<tr>
<td>Temperature</td>
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<td>Result</td>
<td>Units</td>
<td>MDL</td>
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<td>N. WAIHEE WELL 2 USGS 563103 (970610016)</td>
<td>Sampled on 06/09/97</td>
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<td>06/16/97 ( ML/S2320B ) Alkalinity</td>
<td>110 mg/l</td>
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<tr>
<td>06/10/97 ( ML/EPA 100.1 ) Asbestos by TEM</td>
<td>&lt;0.13 MPL</td>
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<td>06/16/97 ( ML/EPA 200.7 ) Calcium, Total, ICAP</td>
<td>13 mg/l</td>
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<td>06/16/97 ( ML/54505CM-F ) Cyanide</td>
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<td>06/20/97 ( ML/EPA 540.1 ) Endothall</td>
<td>ND ug/l</td>
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<td>06/16/97 ( SM 4500F ) Fluoride</td>
<td>0.20 ug/l</td>
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<td>06/12/97 ( ML/EPA 547 ) Glyphosate</td>
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<td>06/16/97 ( EPA/ML 245.1 ) Mercury</td>
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<td>ND mg/l</td>
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<td>06/15/97 ( EPA 1613 ) 2,3,7,8 - TCDD</td>
<td>ND PGL</td>
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<td>525 Semivolatiles by GC/MS</td>
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<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) alpha-Chlordane</td>
<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Acenaphthylene</td>
<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Alachlor</td>
<td>ND ug/l</td>
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<td>0.050</td>
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</tr>
<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Aldrin</td>
<td>ND ug/l</td>
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<td>0.050</td>
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</tr>
<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Anthracene</td>
<td>ND ug/l</td>
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<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Benz(a)Anthracene</td>
<td>ND ug/l</td>
<td></td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Benzo(a)pyrene</td>
<td>ND ug/l</td>
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<td>0.020</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Benzo(b)Fluoranthene</td>
<td>ND ug/l</td>
<td></td>
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<td>06/19/97 ( ML/EPA 525.2 ) Benzo(g,h,i)Perylene</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Benzo(k)Fluoranthene</td>
<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Di(2-Ethylhexyl)phthalate</td>
<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Butylbenzylphthalate</td>
<td>ND ug/l</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Bromacil</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Butachlor</td>
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<tr>
<td>06/19/97 ( ML/EPA 525.2 ) Caffeine</td>
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<td>06/19/97 ( ML/EPA 525.2 ) Chrysene</td>
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<td>ND ug/l</td>
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<td>0.050</td>
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</table>
MONTGOMERY WATSON LABORATORIES
555 East Walnut Street
Pleasant, California 91310
818 564 6400 Fax: 818 564 6321
1 609 564 LABS 11 100 564 5227

Maui, County of, Department of Water Supply
(continued)

<table>
<thead>
<tr>
<th>Date</th>
<th>Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
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<tbody>
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Aldicarb Surrogate Perylene-d12

<table>
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<th>Date</th>
<th>Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
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<tbody>
<tr>
<td>15/17/97</td>
<td>ML/EPA 531.1</td>
<td>3-Hydroxycarbofuran</td>
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<tr>
<td>16/17/97</td>
<td>ML/EPA 531.1</td>
<td>Aldicarb (Temik)</td>
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<td>06/17/97</td>
<td>ML/EPA 531.1</td>
<td>Aldicarb sulfone</td>
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Laboratory Report #34716
<table>
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<th>Units</th>
<th>MDL</th>
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<td>(Surrogate)</td>
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<td>% Rec</td>
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### Diquat and Paraquat

<table>
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<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
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<tr>
<td>06/18/97 (ML/EPA 549.1)</td>
<td>Diquat</td>
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### EDB and DBCP by GC-ECD

<table>
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<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
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<tr>
<td>06/16/97 (ML/EPA 504.1)</td>
<td>Dibromochloropropane (DBCP)</td>
<td>ND</td>
<td>ug/l</td>
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<tr>
<td>06/14/97 (ML/EPA 504.1)</td>
<td>Ethylene Dibromide (EDB)</td>
<td>ND</td>
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<tr>
<td>(Surrogate)</td>
<td>1,2-dibromopropane</td>
<td>121</td>
<td>% Rec</td>
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### Herbicides by 515.1

<table>
<thead>
<tr>
<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/21/97 (ML/EPA 515.1)</td>
<td>2,4,5-T</td>
<td>ND</td>
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<td>0.20</td>
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<tr>
<td>06/21/97 (ML/EPA 515.1)</td>
<td>2,4,5-TP (Silvex)</td>
<td>ND</td>
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<td>06/21/97 (ML/EPA 515.1)</td>
<td>2,4-D</td>
<td>ND</td>
<td>ug/l</td>
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<td>06/21/97 (ML/EPA 515.1)</td>
<td>2,4-DB</td>
<td>ND</td>
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<tr>
<td>06/21/97 (ML/EPA 515.1)</td>
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<td>ND</td>
<td>ug/l</td>
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<tr>
<td>06/21/97 (ML/EPA 515.1)</td>
<td>Acifluorfen (qualitative)</td>
<td>ND</td>
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<td>06/21/97 (ML/EPA 515.1)</td>
<td>Bentazon</td>
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<td>06/21/97 (ML/EPA 515.1)</td>
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<td>3,5-Dichlorobenzoic acid</td>
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<td>4-Nitrophenol (qualitative)</td>
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<td>(Surrogate)</td>
<td>2,4-Dichlorophenylacetic acid</td>
<td>102</td>
<td>% Rec</td>
<td></td>
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</tbody>
</table>
# Laboratory Report
## #34716

MONTGOMERY WATSON LABORATORIES
555 East Walnut Street
Pasadena, California 91101
818 566 6622; FAX 818 566 6224;
1 800 566 LAB (1 800 566 5227)

Maui, County of, Department of
Water Supply
(continued)

<table>
<thead>
<tr>
<th>Anal Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/13/97 (EPA/ML 200.8)</td>
<td>Arsenic, Total, ICAP/MS</td>
<td>ND</td>
<td>ug/l</td>
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<td>06/13/97 (EPA/ML 200.8)</td>
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<td>06/13/97 (EPA/MS 200.8)</td>
<td>Chromium, Total, ICAP/MS</td>
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<td>06/13/97 (EPA/ML 200.8)</td>
<td>Copper, Total, ICAP/MS</td>
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<td>06/13/97 (EPA/ML 200.8)</td>
<td>Nickel, Total, ICAP/MS</td>
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<td>06/13/97 (EPA/ML 200.8)</td>
<td>Lead, Total, ICAP/MS</td>
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<td>06/13/97 (EPA/ML 200.8)</td>
<td>Antimony, Total, ICAP/MS</td>
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<tr>
<td>06/13/97 (EPA/ML 200.8)</td>
<td>Selenium, Total, ICAP/MS</td>
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<td>ug/l</td>
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</tr>
<tr>
<td>06/13/97 (EPA/ML 200.8)</td>
<td>Thallium, Total, ICAP/MS</td>
<td>ND</td>
<td>ug/l</td>
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</tr>
</tbody>
</table>

Itesults by IC as NO3 & N
| 06/10/97 (ML/EPA 300.0) | Nitrate-N by IC | 1.7 | mg/l | 0.10 |
| 06/10/97 (ML/EPA 300.0) | Nitrate as NO3 by IC | 7.5 | mg/l | 0.44 |

SDWA Pesticides
| 06/19/97 (ML/EPA 508) | PCB 1016 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1221 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1232 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1242 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1248 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1254 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | PCB 1260 Aroclor | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | Alpha-BHC | ND | ug/l | 0.010 |
| 06/19/97 (ML/EPA 508) | Alachlor (Alanex) | ND | ug/l | 0.050 |
| 06/19/97 (ML/EPA 508) | Aldrin | ND | ug/l | 0.010 |
| 06/19/97 (ML/EPA 508) | Beta-BHC | ND | ug/l | 0.010 |
| 06/19/97 (ML/EPA 508) | Chlordane | ND | ug/l | 0.10 |
| 06/19/97 (ML/EPA 508) | Chlorothalonil (Draconil, Bravo) | ND | ug/l | 0.010 |
| 06/19/97 (ML/EPA 508) | Delta-BHC | ND | ug/l | 0.010 |
| 36/19/97 (ML/EPA 508) | p,p' DDD | ND | ug/l | 0.010 |
Maui, County of, Department of Water Supply
(continued)

<table>
<thead>
<tr>
<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/19/97 (HL/EPA 508)</td>
<td>p,p’ DDE</td>
<td>ND</td>
<td>ug/l</td>
<td>0.010</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>p,p’ DDT</td>
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<td>ug/l</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Dieldrin</td>
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<td>ug/l</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Endrin</td>
<td>ND</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Endosulfan I (alpha)</td>
<td>ND</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Endosulfan II (beta)</td>
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<td>06/19/97 (ML/EPA 508)</td>
<td>Endosulfan sulfate</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Heptachlor</td>
<td>ND</td>
<td>ug/l</td>
<td>0.010</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Heptachlor Epoxide</td>
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<tr>
<td>06/19/97 (ML/EPA 508)</td>
<td>Lindane (gamma-BHC)</td>
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<td>06/19/97 (ML/EPA 508)</td>
<td>Methoxychlor</td>
<td>ND</td>
<td>ug/l</td>
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<td>06/19/97 (ML/EPA 508)</td>
<td>Tetrachlorometaxylene</td>
<td>ND</td>
<td>Rec</td>
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</tbody>
</table>

Volatile Organic Compounds

<table>
<thead>
<tr>
<th>Anal. Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1,1,2-Tetrachloroethane</td>
<td>ND</td>
<td>ug/l</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1,1-Trichloroethane</td>
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<td>ug/l</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1,2,2-Tetrachloroethane</td>
<td>ND</td>
<td>ug/l</td>
<td>0.50</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1,2-Trichloroethane</td>
<td>ND</td>
<td>ug/l</td>
<td>0.50</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1-Dichloroethane</td>
<td>ND</td>
<td>ug/l</td>
<td>0.50</td>
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<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1-Dichloroethylene</td>
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<td>ug/l</td>
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<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,1-Dichloropropene</td>
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<td>ug/l</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
<td>1,2,3-Trichloropropane</td>
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<td>ug/l</td>
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<tr>
<td>06/17/97 (ML/EPA 502.2)</td>
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<td>06/17/97 (ML/EPA 502.2)</td>
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Malig County of, Department of Water Supply
(continued)

<table>
<thead>
<tr>
<th>Date</th>
<th>Method</th>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
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<tbody>
<tr>
<td>06/17/97</td>
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<td>06/17/97</td>
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<td>06/17/97</td>
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<td>06/17/97</td>
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<td>ug/l</td>
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<tr>
<td>06/17/97</td>
<td>ML/EPA 502.2</td>
<td>Dibromochloromethane</td>
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<td>ug/l</td>
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<td>ML/EPA 502.2</td>
<td>Dibromomethane</td>
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<td>ug/l</td>
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<tr>
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<td>ML/EPA 502.2</td>
<td>1,2-Dibromoethane</td>
<td>ND</td>
<td>ug/l</td>
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<tr>
<td>06/17/97</td>
<td>ML/EPA 502.2</td>
<td>Ethylbenzene</td>
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<td>ug/l</td>
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<td>06/17/97</td>
<td>ML/EPA 502.2</td>
<td>Hexachlorobutadiene</td>
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<td>Isopropylbenzene</td>
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<tr>
<td>06/17/97</td>
<td>ML/EPA 502.2</td>
<td>m+p-Xylenes</td>
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<td>06/17/97</td>
<td>ML/EPA 502.2</td>
<td>Naphthalene</td>
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## Laboratory Report #34716

Maui, County of, Department of Water Supply  
(continued)

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EXHIBIT B-2

WATER QUALITY ANALYSIS

KUPAA WELL NO. 1
STATE WELL NO. 5731-03
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo
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<th>Rec. Dilution</th>
<th>Det. Limit</th>
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<th>Analyzed By</th>
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### Laboratory Report

**Sample ID: KUPAA WELL**

**Sample Type: Water**

**Sample Date Collected:** 19-Mar-1999

**Received Date:** 23-Mar-1999

**Reported Date:** 26-Mar-1999

**Location:** Kalalau, HI 96732

**AUTH:** Carl Cerise

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Report # 52801

Page 4
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Report #: 528000

Lab No.: 528000

Sample Type Water: Sampled 18-Mar-1999

Received: 18-Mar-1999

Reported: 19-Apr-1999

Sample: 910318769

Sample ID: UPAA WELL

Project PHASEV

Kahului, HI 96732

ATTN: Cari Cortez
### Laboratory Report

**Sample # 220139269**  
Sample ID: RUPAA WELL  
Sample Type: Water  
Sampled: 18-Mar-1999  
Received: 25-Mar-1999  
Reported: 25-Apr-1999  

**ICPMS Metals (ML 200.8)**

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**Volatile Organic Compounds (ML/EPA 502.2)**

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### Volatile Organic Compounds (ML/EPA 502.2)

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<th>Units</th>
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Report #: S2809
**Volatile Organic Compounds** (ML/EPA 502.2)

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Report #: 52869

13
## Laboratory Report

**Sample #:** 990317269   **Sample ID:** KUPAA WELL  
**Sample Type:** Water   **Sampled:** 18-Mar-1999  
**Received:** 19-Mar-1999  
**Reported:** 19-Apr-1999

### 525 Semivolatile by GC/MS (ML/EPA 525.2)

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## Laboratory Report

Mun, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96732

### Sample Information
- **Sample #:** 99119367
- **Sample ID:** KUPAA WELL
- **Sample Type:** Water
- **Sampled:** 18-mar-1999
- **Received:** 19-mar-1999
- **Reported:** 19-apr-1999

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### Laboratory Report

**Sample** KUPAA WELL

**Sample Type** Water

**Sampled** 18-Mar-1999, **Received** 19-Mar-1999, **Reported** 19-Apr-1999

#### Herbicides by 515.1 (ML/EPA 515.1)

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**Data Entry** 03-31-99

Report N°: 52800

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*Montgomery Watson America's, Inc.*

555 East Walnut Street
Pasadena, California 91101

Tel: 626 568 6400 Fax: 1800586 LABS (1 800 586 5277)

---

**Laboratory Report**

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

ATTN: Carl Cerizo
**Sample Type** Water  
**Sampled** 19-Mar-1999  
**Received** 19-Mar-1999  
**Reported** 19-Mar-1999

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Report #: 52800
## Method Blank Report

**Dioxins**

- **Client Lot #:** G9C240155
- **MB Lot-Sample #:** G9C300000-256
- **Work Order #:** CT55C101
- **Matrix:** WATER
- **Analysis Date:** 04/06/99
- **Prep Date:** 03/30/99
- **Dilution Factor:** 1

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**Notes:**

Calculations are performed before rounding to avoid round-off errors in calculated results.
Lot-Sample #: G9C240155-001  Work Order #: CRX0Q101  Matrix: WATER

Dioxins

Date Sampled: 03/18/99  Date Received: 03/24/99
Prep Date: 03/19/99  Prep Batch #: 909256
Prep Date: 03/30/99

Dilution Factor: 1

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Percent Recovery

RESULT DETECTION LIMIT UNITS METHOD
ND 1.8 pg/L EPA-5 1613B-Tetra

Client Sample ID: 990319269

04/07/99 04/07/99

Analysis Date: 04/07/99

Date Received: 03/24/99

Date Sampled: 03/18/99

Prep Date: 03/19/99

Prep Batch #: 909256

Dilution Factor: 1

2,3,7,8-TCDD

RESULT DETECTION LIMIT UNITS METHOD
ND 1.8 pg/L EPA-5 1613B-Tetra

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Percent Recovery

RESULT DETECTION LIMIT UNITS METHOD
ND 1.8 pg/L EPA-5 1613B-Tetra

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Percent Recovery
REPORT DATE: MAR 22, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: [REDACTED]

MATRIX: WATER

SAMPLER:

EPA METHOD: CHLORIDE: 4500-CI

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APPROVED BY: C.CERIZO
W.M. IV
EXHIBIT B-3

WATER QUALITY ANALYSIS

KANOA WELL NO. 1
STATE WELL 5731-02
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo

JUN 11 1999

Report#: 54445
ACKNOWLEDGMENT OF SAMPLES RECEIVED

Maui, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96732
Attn: Cari Cerizo

Customer Code: MAUI
Group#: 54445
Project#: PHASEV
Proj Mgr: Hillary Strayer
Phone: 

The following samples were received from you on 05/20/99. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

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Test Acronym Description

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Report Summary of positive results, PR54445

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**Laboratory Report**

**Sample**

- **Sample ID**: KANOA WELL
- **Sample Type**: Water
- **Sampled**: 18-May-1999
- **Received**: 20-May-1999
- **Reported**: 11-Jun-1999

**Sample Details**

- **Sample Number**: 990520027

**Laboratory Information**

- **Location**: Maui, County of, Department of Water Supply
- **Address**: 614 Palapala Dr, Kahului, HI 96732
- **Analyst**: Cari Cerizo
- **Report #: 54445

**Parameter** | **Units** | **Result** | **Conc.** | **Rec.** | **Dilution** | **Det. Limit** | **Prepared By** | **Prepared** | **Analyzed By** | **Analyzed** |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
Diquat | ug/l | ND | | | 0.4 | | 20-May-1999 YLP | 21-May-1999 1ls |
Paraquat | ug/l | ND | | | 2 | | 20-May-1999 YLP | 21-May-1999 1ls |
### Laboratory Report

**Sample #** 990520027  |  **Sample ID** KANOA WELL  |  **Project** PHASEV  
**Sample Type** Water  |  **Sampled** 18-may-1999  |  **Received** 20-may-1999  |  **Reported** 11-jun-1999

#### EDB and DBCP by GC-ECD (ML/EPA 504.1)

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**Data Entry** 06/26/99

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Report #: 54445
Sample # 990520027  Sample ID KANDA WELL  Project PHASEV
Sample Type Water  Sampled 18-May-1999  Received 20-May-1999  Reported 31-Jun-1999

**ICPMS Metals**  (ML 200.8)

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**Project** PHASEV  
**Sample Type** Water  
**Sampled** 18-May-1999  
**Received** 20-May-1999  
**Reported** 11-Jun-1999  

## Volatile Organic Compounds (ML/EPA 502.2)  

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Data Entry: 05/26/99  
Report #: 54445  

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Maui, County of, Department of Water Supply  
614 Palapala Dr  
Kahului, HI 96732  
ATTN: Cari Cerizo
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Report #: 54445
**Sample ID** KANOA WELL  
**Sample Type** Water  
**Sampled** 18-may-1999  
**Received** 20-may-1999  
**Reported** 11-Jun-1999

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### Herbicides by 515.1 (ML/EPA 515.1)

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**Data Entry** 05/26/99

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Report #: 54445
**Sample ID** KANOA WELL  
**Sample Type** Water  
**Sampled** 18-May-1999  
**Received** 20-May-1999  
**Reported** 11-Jun-1999  

### SDWA Pesticides

#### (ML/EPA 508)

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Report #: 54445
Laboratory Report

for

Maui, County of, Department of Water Supply
614 Palapala Dr

Kahului, HI 96732

Attention: Cari Cerizo
Montgomery Watson Laboratories
555 East Walnut Street
Pasadena, CA 91101
Ph. [Redacted] Fax [Redacted]

Ship To  Nanny Estrada
Quanterra Environmental Services
880 Riverside Parkway
West Sacramento, CA 95605

Bill Recipient: FEDEX ACCT: 2060-8019

MWL Project #  Report Due:  55058  6/28/99

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Reporting: One report for this MWL Project Number: 55058

Do Not Combine Report with any other samples submitted under different MWL project numbers!

Report & Invoice must have the MWL Project Number and Sub PO#: 99-0669

Report all quality control data according to Method. Include dates analyzed, date extracted (if extracted) and Method reference on the report. Fax results to [Redacted]

Faxed results must have complete data & QC. Hardcopy report is due in hand on due date. Please advise us immediately if Due Date will be missed.

HARDCOPY REPORT, FORMS, & INVOICE MUST BE SENT TO ATTENTION
Martha Frost, Sub-contracting Administrator
Montgomery Watson Laboratories 555 East Walnut Street Pasadena, CA 91101
Phone [Redacted] Fax [Redacted]

An Acknowledgement of Receipt is requested to attn: Martha Frost.
June 28, 1999

QUANTERRA INCORPORATED PROJECT NUMBER: G9F120155
PO/CONTRACT: 99-0669

Martha Frost
Montgomery Laboratories
555 East Walnut Street
Pasadena, CA 91101

Dear Ms. Frost,

This report contains the analytical results for the aqueous sample received under chain of custody by Quanterra Incorporated on June 12, 1999. This sample is associated with your project number 55058.

All applicable quality control procedures met method-specified acceptance criteria.

If you have any questions, please feel free to call me.

Sincerely,

[Signature]

Nanny Estrada
Project Manager
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Sample ID: KANDA WELL (990520027)  
Sample Type: Water  
Sampled: 18-May-1999  
Received: 11-Jun-1999  
Reported: 30-Jun-1999  

Laboratory Report

Maui, County of, Department of Water Supply  
614 Palapala Dr  
Kahului, HI 96732  
ATTN: Cari Cerizo
**Montgomery Laboratories**

**Client Sample ID:** 990611009

**Dioxins**

**Lot-Sample #:** G9FL20155-001  
**Work Order #:** CWTJF101  
**Matrix:** WATER

**Date Sampled:** 05/18/99  
**Date Received:** 06/12/99

**Prep Date:** 06/18/99  
**Analysis Date:** 06/25/99

**Prep Batch #:** 9167334

**Dilution Factor:** 1

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**INTERNAL STANDARDS**

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**Dioxins**

**Client Lot #:** G9F120155  
**MB Lot-Sample #:** G9F150000-334  
**Analysis Date:** 06/25/99  
**Dilution Factor:** 1

**Work Order #:** CX0CE101  
**Prep Date:** 06/13/99  
**Prep Batch #:** 9157334  
**Matrix:** WATER

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**Note(s):**

Calculations are performed before rounding to avoid round-off error in calculated results.
PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
KANOA WELL NO. 2
(State Well No. 5731-04)
Waihee, Maui, Hawaii

PREPARED FOR:
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, HAWAII 96793

PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 2000
PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
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PREPARED BY:
C. TAKUMI ENGINEERING, INC.
18 CENTRAL AVENUE
WAILUKU, HAWAII 96793

AUGUST 2000
The undersigned, being a licensed professional engineer, certifies that:

1. He has prepared the attached report and the information contained therein is true to the best of his information and belief; and

2. The water produced by Kanoa Well No. 2 (State Well No. 5731-04), the potable water system identified in the attached report, will comply with the State primary potable water regulations contained in Hawaii Administrative Rule, Title 11, Chapter 20, Rules Relating to Potable Water Systems, and will comply with the Rules and Regulations of the Department of Water Supply, County of Maui, when said drinking water system is operated and maintained in accordance with the instructions and information contained in this report.

This work was prepared by me or under my supervision.

Carl K. Takumi, P. E.
C. Takumi Engineering, Inc.
TO:  Mr. Charley Ice  
    State Water Resource Commission  
FROM: Carl K. Takumi  
DATE: February 14, 2001  
SUBJECT: North Waihee Water Development Project  
          Kanoa Well 1 & 2, Kupaa Well 1  

I am faxing location of the three wells relative to the USGS map. Hopefully this will help clear the air on well numbering and location.

If you have any questions please call Carl Takumi at (808) [redacted]
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# FIGURES

Well Location

Site Topographic Map & Preliminary Site Plan - Kanoa 1 Well Site
Water System Service Area
Example Pump Curve

# EXHIBITS

Exhibit A: North Waihee Aquifer, Kanoa 2 Well, Well Completion and Testing
Exhibit B: Water Quality Testing Results
PRELIMINARY ENGINEERING REPORT
FOR NEW
POTABLE WATER SOURCE
KANOA WELL NO. 2
(STATE WELL NO. 5731-04)

1. Introduction

This Preliminary Engineering Report was prepared to conform to the provisions of Hawaii Administrative Rules, Title 11, Chapter 20, relating to new potable water source development. The rules requires all new potable water sources serving a public water system be approved by the Director of Health prior to its use.

2. General Information

a. Description of project and location, including phasing schedule, persons served by new water source and/or service connection, name and public water system number.

The Kanoa Well No. 2 (State Well No. 5731-04) project is part of the North Waihee Water Source Development Project and consists of developing a basal well located on the northern slopes of West Maui Mountains on the Island of Maui. The project consists of clearing, grubbing, grading, installation of a pump and related electrical controls, electrical building, piping, fencing and related work.

Water from Kanoa Well No. 2 be used to service the Department of Water Supply’s Wailuku District or commonly known as the Central Maui Water System (CMWS), Public Water System #212, which provides water for the area bounded by the communities of Paia-Kuau on the east, Kihei-Makena on the south, Maalaea on the west and Waihee on the north. The project is needed to meet the rising demands for water in the Central Maui Region and relieve some of the stress being made on the lao Aquifer.

The North Waihee Wells 1 and 2 (State Well No. 5631-02 & 5631-03 respectively), is also located in the Waihee Aquifer (60103) and have been placed into operation. Kanoa Well No. 1 (State Well No. 5731-02) and Kupaa Well No. 1 (State Well No. 5731-03), also in the Waihee Aquifer, is in the process of being developed by the Department of Water Supply.
b. Owner and authorized representative

The owner of the Kanoa Well No. 2 (State Well No. 5731-04) facility will be the Board of Water Supply, County of Maui. Upon completion, the Maui County Department of Water Supply (DWS) will operate and maintain the facility. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the well and its appurtenances.

c. Site Plan with contours and drawn to scale.

A preliminary site grading plan with existing and proposed contours is attached. Besides the well and pump, the site will have an electrical building, piping, parking, fencing and related site work. Disinfection facility will be located at the site. The disinfection facility will be also used for disinfection of waters coming from Kanoa Well 1 and the two North Waihee Wells. A preliminary site plan of the Kanoa Well 2 site is attached.

3. Physical and Hydrological Characteristics of Area

a. Location.

The project is on the northern slopes of the West Maui Mountains north of the village of Waihee and Waihee Stream on the Island of Maui. The tax map key for the parcel is TMK (2) 3-2-1: 3. A location map is attached. Kanoa Well No. 2 is located within pasture land. The well is located on a one acre perpetual easement at approximate elevation 280 mean sea level (MSL) and approximately 2,000 feet from the ocean. The nearest residence is over a 1,000 feet east of the well.

b. Climate.

The site is influenced by the northeasterly trade winds as is typical of windward areas of the Hawaiian Islands. The annual rainfall at the site averages 30 to 40 inches with average temperatures in mid 60's to mid 80's range.

c. Topography including detailed study of project site.

A preliminary site plan of the well site with existing contours is attached. No significant grading is anticipated at this site for the proposed improvements. The site is located at about elevation 280 feet MSL. The area slopes in the west-east direction with slopes around 24%. A natural swale lies north of the site and will be used to dispose of storm runoff generated by the site.
d. Geology and foundation conditions.

The geological profile of the area consists of alluvium at the surface above Honolua series andesitic basalt lavas and the highly permeable Wailuku series basalts. The alluvium and andesitic lavas are fairly low permeability which suggests that wells to basal ground water would not interfere with stream flows above the low permeability layers.

e. Earthquake considerations and design parameters.

According to Seismic Zone Maps in the Uniform Building Code, the island of Maui is in Zone 2B. This translates to only moderate seismic hazard. All structures will be designed accordingly. On Maui, there is no record of deep well casings being damaged by earthquakes.

f. Groundwater conditions.

"The North Waihee Aquifer, An Additional Water Supply Source for Central Maui," Dr. John Mink, Mink and Yuen, Inc. dated April 10, 1997 provides initial studies for the project. Since information on the aquifer and other groundwater conditions is limited in the area, this project will help with the accumulation of data on the North Waihee Aquifer. In summary, the report states that the North Waihee Aquifer is adjacent and hydraulically connected to the Iao Aquifer; however, the lack of response in the test holes within the Iao Aquifer during test pumping of the North Waihee Wells suggests that the Waihee Aquifer is quasi-independent aquifer. The estimated sustainable yield of the Waihee Aquifer is 8 MGD. The North Waihee Wells has a pumping capacity of 1.5 MGD each well but it is anticipated that the pumps will not run simultaneously nor run continuously except under emergency conditions. The Kanoa Well will help quantify the aquifer sustainable yield and generally provide better information of the Waihee Aquifer for future development potential.

Information on aquifer conditions was provided in "Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation," Mink & Yuen, June 21, 1999 after pump testing the Kupaa 1 and Kanoa 1 wells.

"North Waihee Aquifer System, Kanoa 2 Well," John F. Mink, Mink & Yuen, July 12, 2000 presents aquifer conditions at Kanoa Well 2 and is presented as Exhibit A.
g. Flood problems including tsunami inundation zones and preventive measures that may be used.

The elevation of the site makes it obvious that the site is not located within any tsunami inundation zone. According to the Federal Emergency Management Agency (FEMA) Flood Zone maps, the site is in an area of minimal flooding (zone c). The site project work area is small (approximately 9,500 sq. ft.). Exposed areas not covered by paving or roof will be grassed as part of the project.

h. Information confirming the conformance with local land use planning and zoning regulations.

The site is located within an area designated as "Agricultural" by the State Land Use Commission. The Maui County Wailuku-Kahului Community Plan designates the project site as within "Agricultural" lands. The proposed project is considered as a minor utility facility and a permitted use within the "Agricultural" designation.

i. Discussion of water rights and future uses by others.

The wells within the Waihee Aquifer on record with the CWRM are as follows:

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<th>State Well No.</th>
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<td>5631-03</td>
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<td>5631-04</td>
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<td>5631-05</td>
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<td>5731-01</td>
<td>Mendes Well (Private)</td>
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<td>5731-03</td>
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<td>Kanoa Well 1 (DWS)</td>
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<tr>
<td>5832-03</td>
<td>Kahakuloa Acres (Wailena) (Private)</td>
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The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields within Wailuku Agribusiness Company properties between Waihe'e Stream and Kupa'a Gulch. North Waihe'e Well 1 & 2 (5631-02 & 5631-03) is in well field one (TMK: 3--2-01:04); well field two is the Kanoa Well 2 (5731-04); well field three is the Kanoa Well No. 1 (5731-02) and the Kupa'a Well No. 1 (5731-03) is located in well field five. The DWS can potentially develop one additional well (well field 4); however, future well development will require well drilling and pump installation permits from...
the CWRM and analysis of pump test results. The proposed Kanoa Well No. 2 site is designated as well field 2. The CWRM has received no new well applications for wells in this aquifer.

4. **Extent of Water Works System.**

   a. **Description of the nature and extent of the existing area and future area to be served.**

   The North Waihee Water Source Development project will be used to service the Maui County Department of Water Supply’s Wailuku District Water System which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala. The water system service area is bounded by Paia/Kuau to the east, Kihei/Makena to the south, Maalaea on the west and Waihee on the north and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei, Maalaea and Puunene. The water system service area is shown in the attached figure.

   Upon completion of the proposed improvements, the well will be connected to an existing nearby water transmission line from the North Waihee Wells source to the existing 1.0 MG North Waihee Reservoir which is already serving the CMWS.

   b. **Description of population served, land use and consumption data including forecasting the water demands.**

   The Central Maui area varies in land use, population and services. The Kahului-Wailuku communities serves as the business-industrial hub and the population center of the island with Kahului Airport and Kahului Harbor as the main transportation centers for traveling off the island and importing and exporting goods and produce. Wailuku is also the governmental center of Maui. Destination resorts of Wailea and Makena are also served by the Central Maui Water System. Paia-Kuau present a more residential setting with small stores serving the community and limited tourist activity. The Maui County Water Use and Development Plan, 1992, estimates that residential consumption for Wailuku to be about 52%, compared to Kihei at 72% and Kahului at 48%.

   Anticipated water demand from the “Maui County Water Use and Development Plan” (Water Use and Development Plan), 1992, estimates that the year 2010 demand within the Central Maui Water System to range between 25 million gallons per day (mgd) to 30 mgd depending upon the method of forecast used. The “Historical Trend” adopted by the DWS
used in the Water Use and Development Plan uses a linear extrapolation of 0.5 mgd/year which equates to a forecasted a water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd or a 8.5% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 and 1998 is 18.1 mgd and 18.6 mgd respectively. Comparatively, the water consumption reported in the Board of Water Supply, County of Maui, annual report averaged 19.3 mgd for 1997 and 19.8 mgd for 1998.

c. **Appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional and other water supply needs.**

The future requirements of service as forecasted above is based upon a mix of residential, commercial, institutional and other needs of the community as development occurs. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes. As stated previously, the DWS uses a linear demand model based upon historical experience for predicting future water demand. The model includes potential residential, industrial, commercial, institutional and other water supply needs.

d. **Provisions for extending water works system to include consideration of additional area required, easements, and right-of-way acquisition for facilities and utilities.**

A 12-inch transmission waterline is planned to be constructed as part of this project to connect to an existing 24-inch transmission waterline passing through the well site. The 24-inch waterline carries water from the existing North Waihee Wells (5631-02 & 5631-03) and Kanoa Well 1 (5731-03) to the existing 1.0 MG North Waihee Reservoir. The transmission waterline will be placed within an existing easement; the same easement is also being used for access and to bring power to the site.
The Central Maui Water System has been primarily dependent on water from the Iao Aquifer and withdrawal from the Iao Aquifer is nearing the aquifer's 20 MGD sustainable yield as set by the State Commission on Water Resource Management (CWRM). Hence, the DWS started seeking new sources of water to meet the increasing demand.

Attention was initially given to developing of groundwater in East Maui. Two wells in the Hamakuapoko area have been drilled; however, the East Maui initiative has been delayed due to the discovery of pesticides in the wells and legal challenges, leaving the North Waihee groundwater source as the choice for timely water source development. It may be several years before any East Maui Sources can be utilized for Central Maui.

The "Water Resource Protection Plan, Volume I & II," CWRM, June 1990, estimates that the sustainable yield for the Waihee Aquifer (60103) is 8 MGD. The two North Waihee Wells (5631-02 & 5631-03) have been placed on line within the water system to relieve the stress being placed on the Iao Aquifer. The Kanoa Well 1 (5731-03) and Kanoa Well No. 2 (5731-04) will be the third and forth well in the Waihee Aquifer to be placed into production.

A fifth well, Kupaa Well No. 1, (5731-03) is also being developed and a separate Preliminary Engineering Report for New Potable Water Source has been submitted to the State Department of Health for approval. The Kupaa Well and the Kanoa Well will reduce DWS dependence on the Iao Aquifer and the possibility of over pumping the Iao Aquifer while allowing the Maui County Department of Water Supply to meet the needs of their consumers.
adequate water supply to meet the demand anticipated in the County Community Plans. The project is not being completed to encourage any special development nor any single developer.

The short term economic impacts of the project by itself creates construction jobs. The monies will come from the Board of Water Supply. The long term economic impacts of the project will mean continuous maintenance, electricity and the purchase of disinfectants. The well will reduce stress upon the lao Aquifer and allow growth as anticipated by the Maui County Community Plans.

5. Potential Sources of Contamination.

a. Description of well site:

1) coordinates (latitude, longitude), State Well No., and Tax Map Key Number.

Latitude: 20° 56' 49"
Longitude: 156° 31' 07"
State Well No. 5731-04
Tax Map Key: (2) 3-2-1: por. of 03

2) land surface elevation, topographic map of well site.

A preliminary site plan and topographic map of the well site is attached. The ground elevation at the well is approximately 280 feet MSL.

3) Size and topography of catchment area, slope of ground surface.

The "Water Resources Protection Plan," CWRM, Department of Land and Natural Resources, State of Hawaii, June 1990, reports that the aquifer catchment area is approximately 12.87 square miles. Elevation ranges from sea level to elevation 4,480 at Eke Crater over a distance of approximately 24,000 feet from the ocean to the top of the crater. This equates to an average overall slope of 18%.

4) General summary of soil and substrata.

"The North Waihee Aquifer, An Additional Water Supply for Central Maui," Mink & Yuen, April 10, 1997 was initially prepared for this project. The report also provides insight as to the soil and
substrata and the initial design criteria for the well. Substrata information at the well site is provided in the “North Waihee Aquifer System, Kanoa 2 Well Completion and Testing,” John F. Mink, Mink & Yuen, July 12, 2000 attached as Exhibit A.

5) Anticipated well depth and depth of groundwater.

The well has been drilled 330 feet below ground surface or approximately 50 feet below mean sea level. The water surface elevation of the basal aquifer encountered is at elevation 7.16.

b. Design well draft.

The design well draft is 1,200 gpm.

c. Water quality data on any existing wells in the area.

Water sample was taken at Kanoa Well 2 (State Well No. 5731-04) during the continuous well test. The water quality results are attached as Exhibit B. Water quality data was provided for North Waihee Well #2 (5631-03), Kanoa Well #1 (5731-02) and Kupaa Well No. #1 (5731-03). Water quality data was previously reported for these wells in the Preliminary Engineering Report for New Potable Water Source, Kanoa Well No. 1 (State Well No. 5731-02), July 1999. The recently constructed Kanoa Well No. 1 is within the same aquifer and part of the same project.

d. Land use classification of surrounding area.

e. Existing or potential sources of contamination in recharge area:
   1) extent of recharge area likely to contribute water to source including population.
   2) type of contaminants.
   3) distance to proposed well.
   4) method of disposal, i.e. surface, subsurface - above groundwater table, subsurface - in groundwater table.
   5) depth from base on contaminant source to groundwater table including but not limited to urban development, agricultural areas, pasture lands, feedlots, sanitary landfills, dumps, subsurface disposal units.

The recharge area estimated for the Waihee Aquifer 60103) is about 12 square miles. Located between the Waihee and Kahakuloa Valleys. The well is located within an agricultural zoned area. The area is relatively undeveloped and is used as rangeland; no known pesticides have been used on the property for decades. There is no public (County) wastewater system serving the area and existing residences are serviced by individual
waster water disposal systems. The nearest existing residence is located more than 1,000 feet east (makai) of the well. Forest reserve lands are approximately 4,700 feet west (mauka) of the site.

The Kanoa Well No. 2 is located in a recharge area composed of conservation and agricultural lands and away from dense populated areas, potential for contamination from external sources appears unlikely. The agricultural zoned areas will allow for limited residences to be built. However, no development can occur in the conservation zoned forest reserve area with out proper permits and authorizations. The geology of the area, consisting of a thick andesite layer makes potential for contamination unlikely from sources makai of the well.

Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. The area is being used as rangeland and has been for a very long time. The agricultural/conservation zoning within the recharge area limits land use and population. There are no feedlots, sanitary landfills or public dumps within the aquifer recharge area. Wastewater disposal for the few residences are limited to individual wastewater disposal units.

f. Approximate groundwater contour.

"North Waihee Aquifer System, Kanoa 2 Well, Well Completion and Testing," prepared by John F. Mink, Mink & Yuen, Inc., July 12, 2000 provides well data, pump test results, estimated ground water contours and transmissivity of the aquifer. The report is attached as Exhibit A.

6. Sources of Water Supply.

a. Nature of soil and stratum within and overlaying the water source, with special emphasis on identification of fissures and faults as it relates to the natural purification or treatment of percolating fluids from existing or future activities.

   Discussed previously.

b. The probability and effect of surface drainage or contaminated underground water entering the subject water source.

   Discussed previously.
c. Depth to water table, location and description of wells in vicinity in use and/or abandoned.

Discussed previously.

d. Slope of water table, preferably as determined from observation wells, or studies of wells in the area.

Discussed previously.

e. Site data relating to potential flooding and/or earthquake data.

Discussed previously.

f. Data relating to quality and quantity of the source waters under normal conditions and during stress periods of drought or heavy precipitation, as determined by field and laboratory analysis and investigations of available records; if records are not available or are inadequate to determine source quality under stress conditions, an estimate of expected quality and quantity during stress conditions should be established and related to the hydrologic budget to the aquifer or isopiestic area. At a minimum, analysis for all of the contaminants listed in the table "Contaminants to be Tested in All New Sources of Potable Water" shall be performed by the Department of Health, State Laboratories Division, for all sources being addressed in the report. For example, when approval of a well field is being sought, all of the wells must be tested for all of the required contaminants.

Laboratories performing the analysis must be currently certified by the Hawaii Department of Health, State Laboratories Division. While the lab data has often been conveniently summarized in a table, some reports have failed to note when analyses have been subcontracted to another lab. The lab reports from all of the laboratories involved must be included in the engineering report to allow the Department to verify that the analyses were performed by an approved lab. Failure to do so may delay the review process.

A water sample was taken during well testing. The sample was analyzed by Montgomery Watson Laboratories. The results are included in this report as Exhibit B.
g. Identification of all significant factors having potential for contaminating or reducing the quality of the water source or which would cause the quality of water delivered to users of the system to be in violation of any state primary drinking water regulation.

h. For each present and projected potential source of contamination, identification and evaluation of alternative control measures which could be implemented to reduce or eliminate the potential for contamination of the water source, including treatment of the water source if subject to contamination, and evaluation of the physical, economic and social effects of implementing such control measures.

The lands surrounding the site is zoned either agricultural or conservation. The zoning in itself limits the potential for contamination. The conservation lands are mauka of the site. Conservation land uses are restrictive and requires a permit to develop the land. Similarly, agricultural development has limited uses. Presently, the lands are used mainly for cattle grazing. Waste water treatment facilities for the existing homes in the area do not penetrate down to the aquifer and water quality samples show that individual waste water treatment facilities have not affected the quality of water from the aquifer. Therefore, the only anticipated source of contamination is biological; water treatment to mitigate potential contamination will consist of disinfection.

i. A summary section indicating how the proposed development and improvements will provide reasonable assurance that the new water source is not subject to actual or potential contamination such as may result in the water not complying with any state primary drinking water regulation or as may otherwise adversely affect the health of persons.

The annular space around the well casing has been grouted from just above aquifer water level to ground surface to prevent surface waters from entering the well.

The Maui County Community Plan for the area shows that the lands have been designated as either agricultural lands or conservation lands. The conservation lands are above the project site. Land zoning restrictions further limit the potential of source contamination.

7. Proposed Treatment Works.
a. **Summary description of proposed processes and unit parameters for treating the specific water under consideration. Include pertinent information on built up and packaged plant systems.**

Water samples taken during well testing show that only disinfection will be needed. Water from the well will be treated by an 12.5% premixed sodium hypochlorite solution disinfection system. It is estimated that approximately 8.4 pounds (equivalent Cl$_2$) per day would be normally used and 11.4 lbs (equivalent Cl$_2$) if the pumps ran for 24 hours. The hypochlorite solution will be injected before the water enters 1,000,000 gallon North Waihee control reservoir. The reservoir should provide sufficient contact period to allow thorough disinfection of the basal waters. The system located in a separate room within the control building (electrical and chlorine residual analyzer to be located in adjacent electrical room) at the Kanoa Well 2 site includes the following:

- Storage for 12.5% sodium hypochlorite solution with spill containment.
- Potable water supply.
- Metering pumps.
- Chlorine Residual Analyzer.
- Plastic tubing accessories and PVC Schedule 80 piping within the control building, below ground to a common injection point.

A chlorine residual analyzer will be used to monitor chlorine residual and connected to the DWS SCADA system at their baseyard. Low chlorine alarm at the site and at the baseyard will warn maintenance personnel. Normal operation and maintenance consist of field visits to the site primarily to measure chlorine residual and to resupply sodium hypochlorite solution when required. Adjustments to chlorine injection will be made to assure adequate chlorine residual.

b. **Site: Discuss various sites available indicating proximity to developed areas, availability of utilities, and accessibility of plant site. Show on a topographic map the treatment plant and arrangement of present and proposed treatment facilities.**

The project is a water development project within the Waihee Aquifer (60103) and therefore, the well site north of the Waihee Stream was selected. The Kanoa Well No. 2 site is one of five well fields that is available to the Department of Water Supply. The remainder of the well fields are located between the North Waihee Wells (State Well No. 5631-02 & 5631-03) and Kupaa Well No. 1 (5731-03). A preliminary site plan of the proposed well development site is attached. Access to the well site will be via existing easement. A paved driveway passes next to the site as
part of a previous project. Electrical power is also available next to the site by Maui Electric Company, the local electric utility, through the existing easement.

The water treatment facility (hypochlorination) will be located at the site and a site plan is attached.

c. Basis of Design:
1) Design Period
2) Design population and flow demand data
3) Nature and characteristics of flow
4) Design flow rate for plant
5) Reserve capacity
6) Treatment processes and unit parameters including calculations for design of units. Include description of equipment, capacities, size, operational factors and plant hydraulics.
7) If components are to be modified in stages, discuss staging, sequence, and future changes as required.

The sustainable yield of the lao Aquifer is 20 MGD. In the past, the DWS has come close to pumping near the sustainable yield levels. It is important to provide additional sources of water to reduce the stress being placed on the lao Aquifer and to provide an adequate supply of water to meet the demands of the water system. The well, pumping, storage and appurtenances will be designed and constructed in compliance with the County of Maui Department of Water Supply and State Department of Health Drinking Water Standards. The facility will be owned and operated by the DWS. Their staff is thoroughly familiar with and have the experience and qualified personnel that are committed to provide water that will be in compliance with the requirements of the State Safe Drinking Water Regulations. Water samples taken from the North Waihee Well during the well testing phase shows that disinfection is the only treatment needed for the water.

d. Waste Disposal: Discuss various wastes from the water treatment plant, their volume, proposed treatment and disposal, and points of discharge.

No wastes are anticipated for the treatment process.
e. Operation and maintenance: provide general information operation and maintenance requirements, automatic equipment and justification for system proposed.

The operation and maintenance of the disinfection system will be by the Maui County Department of Water Supply. The Department has several similar disinfection systems and the qualified personnel to operate and maintain the equipment. Regularly scheduled field visits will be made to the site to measure chlorine residual and to resupply hypochlorite solution for injection.

8. Pumping Facilities. In addition to information required under sections 2 through 4, the following information should be provided in the engineering report:
   a. Purpose of service
   b. Pumping layout and sizing of force main
   c. Design flow requirements including maximum, average, minimum, variations in demand, and effect of storage
   d. Liquid characteristics
   e. Pump selection including system and characteristic curves
   f. Pumping arrangement.

Submersible deep well pumps are planned for the project. The layout of the project site is shown in attached figure. Potable water will service the CMWS. The pumping facility will have the following attributes:

Pump Type: Deepwell Submersible
Pump Rating: 1,200 gpm @ 450' TDH
Motor: Submersible, 200 HP, 1750 RPM
Power Supply: 480 volt, 3 phase, 60 Hz.
Piping: Ductile Iron
Appurtenances: Check Valve, Pump control valve, air and vacuum Valve.
Flow Tubes: Cast Iron with a bronze liner with transmitters and receivers.

Pump Control: Pump controls will be through a pressure sensing line (water level) which has been already placed in the existing 1.0 MG North Waihee Reservoir. A signal proportional to tank level will be sent to a receiver in the control building on site. As water level in the reservoir reaches a certain level (to be set by operator), the pump will turn on. After reservoir fills, the pump will turn off by signal from the reservoir level sensor. High level and low level alarms will be installed to warn operator of malfunction.

Well level control: An electronic well drawdown sensing device will be
placed in a well level monitoring tube to record water levels within the well. The information will be used as part of the data gathering information that will provide better understanding of aquifer conditions of the Waihee Aquifer and will set off an alarm if well level get below a certain draw down.

A 12-inch transmission waterline is planned to carry water from the Kanoa well to an existing 24-inch transmission waterline from the North Waihee Well Project where the water will stored in a 1.0 MG reservoir. As water is needed in the Central Maui Water System, a signal by SCADA will activate the booster pumps. Additional booster pumps will be activated as demand increases. The water level in the North Waihee 1.0 MG reservoir will control the four wells.

The Kanoa Well No. 2 is part of a system of wells planned for the area by the Department of Water Supply. The design and operation of the well will be in conformance with the "Water System Standards," Department of Water Supply, County of Maui, 1985. Since the Maui County Department of Water Supply is a public agency, the pumping unit must go through a bidding process. A specific pumping unit with pump curves cannot be presented at this time; however, the pump parameters were previously provided.

g. Electric power available:

Electrical power will be brought to the site. Electrical power will be supplied by Maui Electric Company. A 350 KW diesel generator at the site will provide emergency power. A automatic transfer switch will immediately activate the emergency power should emergency power be required. Emergency power will be capable of powering the deep well pump and hypochlorinator units at the site. A SCADA signal will notify the DWS that the site is on emergency power when power outages occur.

h. Proposed building and other structural improvements

A control building will be constructed as part of the project. The building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other electrical appliances and a separate, enclosed room will house the disinfection facility. A roofed slab connected to the building will house the emergency generator. The building will be a slab on grade, CMU building with asphalt shingle roofing.
i. Water hammer consideration.

Water hammer effects will be mitigated by the use of slow opening/slow closing control valves and check valves. In addition, the 1.0 MG North Waihee Reservoir would act as a surge relief outlet.

j. Descriptions of essential features of construction and operation, including staging sequence if applicable

The staging sequence will be left up to the contractor; however, the following is the most likely staging sequence for the project construction:

a. Mobilize.
b. Clear and grub site.
c. Grading and earthwork to the well site, construct access road and install transmission waterline.
d. Grass exposed slopes.
e. In the meantime, the building can be constructed, the pump and related piping installed and the paved area prepared for paving.
f. Complete the paving within the well site. The booster pump at the 1.0 North Waihee Reservoir will be installed.
g. Electrical and telemetry equipment installation simultaneously with the disinfection equipment. Meanwhile, MECO will provide power to the site.
h. Finally, the fence can be completed.

k. Electrical system including provisions in the event of power failure, and telemetering and supervisory control systems

Electrical Power will be obtained from Maui Electric Company, the local power company providing service to the island. A 350 KW stand-by generator will be activated by an automatic transfer switch during power emergencies. The generator will be capable of running the deep well pump and treatment facility and will be automatically activated during power outages.

9. Finished Water Storage. Describe location, type and sizing of storage facilities. Include discussion on drains, overflows, telemetering and supervisory controls, painting and protective coating and other important and pertinent considerations.

Finish water storage will be the existing 1.0 MG North Waihee Reservoir. The reservoir is equipped with water level sensors to control the well pump. The controller shall have a pump off setting, pump on setting and a low level alarm. The system will be connected to the Department of Water Supply SCADA system.
for monitoring at their Central Maui Baseyard.

10. **Water Distribution Systems.**
    a. Provide general layout of the system.
    b. Indicate materials, valves, hydrants, meters, etc.
    c. Proximity of other utilities
    d. Include effects of incremental or phased construction, possibilities of future developments as applicable
    e. Provide information, profiles or sections showing pipe cover, location, groundwater conditions and other important data affecting installation of the distribution system.

The Central Maui System service area has been described previously. A layout of the Central Maui Water System is attached. A description of the total service area was previously described. The water distribution system is one of the existing public water systems maintained by the Maui County Department of Water Supply. The water system materials, construction and maintenance are in accordance to the standards set forth by the Maui County Department of Water Supply. This project is not planned for any specific development but to meet the rising demand for water throughout the water system and to reduce stressing the Iao Aquifer.

11. **Financing.** Provide information on estimated costs of installation, phasing, operation and maintenance and other related information.

The project will be funded by the Maui County Board of Water Supply. A preliminary cost estimate is attached. Operation and maintenance will be performed by the Department of Water Supply as part of their daily operations on all of the wells in the area.

An estimate of the project construction cost are as follows:

Site improvements including pump, electrical/equipment building, electrical, disinfection, fencing, paving, drainage and miscellaneous piping: $530,000.00
Emergency Generator $100,000.00
Booster Pump at existing 1.0 MG North Waihee Reservoir: $150,000.00
12" Transmission Waterline from site to connect to existing transmission line including connection to existing waterline: $15,000.00
Total construction estimate for project: $780,000.00
Contingencies: $80,000.00
Total project cost not including MECO charges: $860,000.00
REFERENCES


3. NORTH WAIHEE AQUIFER SYSTEM, Kupaa 1 and Kanoa 1 Well Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.


9. East Maui Development Plan, Department of Water Supply

KANOA WELL NO. 2

FIGURES

WELL LOCATION (USGS MAP)

KANOA 2 WELL SITE TOPOGRAPHIC MAP & SITE PLAN

WATER SYSTEM SERVICE AREA

EXAMPLE PUMP CURVE
NO. OF STAGES   EFF. CHANGE  (NO. OF POINTS)
1               -3
2               -1
3               -0

HORSEPOWER WILL BE EFFECTED
BY CHANGE IN EFFICIENCY

PERFORMANCE FOR:
Bowl Pattern No.: 547612-A-RO
Imp. Pattern No.: 547611-A-RO

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NOTES

Performance indicated based on cold water with a specific gravity of 1.0.
* Standard construction.
** Minimum submergence over lip of bell to prevent vortexing.
Efficiency improvements are available in certain instances. Please contact the factory.

10FKH ENCLOSED TYPE IMPELLER 1770 RPM

NO. OF STAGES   EFF. CHANGE  (NO. OF POINTS)
1               -2½
2               -1
3               -0

HORSEPOWER WILL BE EFFECTED
BY CHANGE IN EFFICIENCY

PERFORMANCE FOR:
Bowl Pattern No.: 548320-A-RO
Imp. Pattern No.: 548324-A-R1

PUMP DATA

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NOTES

Performance indicated based on cold water with a specific gravity of 1.0.
* Standard construction.
** Minimum submergence over lip of bell to prevent vortexing.
Efficiency improvements are available in certain instances. Please contact the factory.

FLOWAY VERTICAL PUMPS TURBINE DATA HANDBOOK
EXHIBIT A

NORTH WAIHEE AQUIFER SYSTEM
KANOA 2 WELL
WELL COMPLETION AND TESTING

JOHN F. MINK
MINK & YUEN, INC.
NORTH WAIHEE AQUIFER SYSTEM
KANOA 2 WELL

Well Completion and Testing

John F. Mink
Mink and Yuen, Inc.

July 12, 2000

Kanoa 2 (5731-04) was completed and tested in April, 2000, and the well completion report was submitted to CWRM by Mike Robertson (Wailani Drilling Co.) on June 7, 2000. The driller’s log and pump test results were also submitted.

Kanoa 2, like Kupaa and Kanoa 1, is an excellent well, and its water levels reacted to pumping during the tests very similarly to the previously drilled wells. Quality of the pumped water among the three wells is identical, having a salinity of only 20 to 25 mg/l chloride.

The completed configuration of Kanoa 2 is as follows.

- Ground elevation ... 281 feet
- Depth ... 331 feet (50 feet BSL)
- Measuring point (sounding tube) elevation ... 281.38 feet
- Depth to water at start of test ... 274.67 feet
- Head ... 7.16 feet
- Boring diameter 22.5 inches, 0 to 330 feet
- Blank casing diameter 16 inches, 0 to 277 feet
- Perforated casing diameter 16 inches, 277 to 330 feet
- Grout, 0 to 263 feet
- Gravel, 263 to 330 feet

The head measured at Kanoa 2 before the start of the initial step drawdown test was 7.16 feet, which is comparable to 7.8 feet at Kanoa 1 and 7.41 feet at Kupaa, also measured before testing a year earlier in March – May, 1999. It is not possible to unambiguously identify the thickness of the Honolua formation and the thickness of the weathered zone of the underlying Wailuku basalt from the
driller's log, but the unconformity probably lies at a depth similar to that at Kanoa 1, about 70 to 130 feet below ground level. The driller's log has been submitted to CWRM by Wailani Drilling Co. and C. Takumi Engineering, Inc.

Pump Test Results and Interpretation

A step drawdown test was conducted on April 28, 2000, over a period of 2.5 hours. The drawdown results as measured with a tape and as estimated from the transducer record are as follows.

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<tr>
<td>1200</td>
<td>3.40</td>
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The stable drawdown toward the end of the continuous test at 1200 gpm was 2.80 feet.

Assuming total drawdown is stable for each step of the step drawdown test and that it can be decomposed into aquifer (laminar) and well loss (turbulent) drawdowns, the computed transmissivity (T) is approximately 150,000 sq.ft./day. This is comparable to the T values computed for the step drawdown tests at Kanoa 1 (124,770 sq.ft./day) and Kupaa (178,930 sq.ft./day). The data for Kanoa 2 does not plot as neatly as for Kanoa 1 and Kupaa.

The drawdown and recovery data for the Kanoa 2 continuous test (4 days, 1200 gpm) also is less coherent than that for Kanoa 1 and Kupaa. However, the somewhat erratic drawdown data inserted into the computer program, THEISFIT, yields a T value of 345,370 sq.ft./day with an S (storage coefficient) approaching zero (which is not realistic). The straight Jacob plot gives a T of approximately 265,000 sq.ft./day and S = .014. The drawdowns used in the calculations occurred during the first 90 minutes of the test during which time a steady, though small, increase in drawdown took place.

All of the calculated values for T are similar in magnitude to the T computed for the North Waihee wells (1 and 2), Kanoa 1 and Kupaa. Exact values are not possible to determine because water levels were measured in the pumping wells and are therefore inherently ambiguous. The meaningful conclusion is that the transmissivity of the aquifer is very high and hydraulic conductivity (k) exceeds 1,000 ft./day. The T and k values pose no constraint on pump capacity in any of
the wells; the primary constraint is the threat of up-coning if pump capacity is excessive.

No attempt was made to employ the North Waihee wells and Kanoa 1 as observation wells. A transducer was placed in Kupaa, but the well is too distant from Kanoa 2 to have yielded usable data. Kanoa 1 and the North Waihee wells were being pumped during the tests to help relieve demand on the Iao Aquifer.

**Recommended Pump Size**

The recommended pump size is 1200 gpm (1.73 mgd), the same as recommended for Kanoa 1 and Kupaa. For the DWS factor of .444, average production will be 0.77 mgd; for the liberal factor of .67, the average will be 1.15 mgd.

**Concluding Remarks About the North Waihee Aquifer System**

A serious misrepresentation about the sustainable yield of the North Waihee, Kupaa and Kanoa wells as totalling 8 mgd has appeared in newspaper reports and repeated at public hearings. The sustainable yield of 8 mgd is that proposed for the entire North Waihee Aquifer System, which extends from the axis of Waihee Valley to Kahakuloa Valley. The portion of the System to be exploited by the existing wells extends from Waihee Valley to the Brewer property line at the south boundary of the Makamakaole drainage. For this segment of the North Waihee Aquifer System the sustainable yield has been estimated at just 4 mgd.

If the three new wells (Kanoa 1 and 2, and Kupaa) are controlled by the .444 factor, the average production will be 2.3 mgd, while with the .67 factor it will be 3.5 mgd. In addition to these new wells, North Waihee 1 and 2 are in this portion of the Aquifer System. With all five wells pumping at capacity as amended by the factors, a sustainable yield of 4 mgd can be readily obtained.
EXHIBIT B

WATER QUALITY TESTING RESULTS
KANOA WELL 2
## Laboratory Report

**Sample ID:** 2005110022  
**Sample ID:** KANDA 2  
**Sample Type:** Water  
**Sampled:** 16-may-2000  
**Received:** 11-may-2000  
**Reported:** 02-jun-2000

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**Report #: 65850**
Group Validation Comments

(TCDD) Analyzed by STL, Sacramento, CA.
ACKNOWLEDGMENT OF SAMPLES RECEIVED

Maui, County of, Department of Water Supply
614 Palapala Dr
Kahului, HI 96732
Attn: Carl Cerizo

Customer Code: MAUI
Group#: 65850
Project#: PHASEV
Proj Mgr: Hillary Strayer
Phone: 

The following samples were received from you on 05/11/00. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

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Test Acronym Description

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<th>By</th>
<th>Analyzed</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic, Total, ICAP/MS</td>
<td>µg/l</td>
<td>HD</td>
<td></td>
<td>1.00</td>
<td>18-may-2000</td>
<td>jps</td>
<td>18-may-2000</td>
<td>jps</td>
<td></td>
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<tr>
<td>Barium, Total, ICAP/MS</td>
<td>µg/l</td>
<td>3.7</td>
<td></td>
<td>2.00</td>
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<td>jps</td>
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<td>Beryllium, Total, ICAP/MS</td>
<td>µg/l</td>
<td></td>
<td>HD</td>
<td>1.00</td>
<td>18-may-2000</td>
<td>jps</td>
<td>18-may-2000</td>
<td>jps</td>
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<tr>
<td>Cadmium, Total, ICAP/MS</td>
<td>µg/l</td>
<td></td>
<td>HD</td>
<td>0.500</td>
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<td>jps</td>
<td>18-may-2000</td>
<td>jps</td>
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<tr>
<td>Chromium, Total, ICAP/MS</td>
<td>µg/l</td>
<td></td>
<td>HD</td>
<td>2.00</td>
<td>18-may-2000</td>
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<td>18-may-2000</td>
<td>jps</td>
<td></td>
</tr>
<tr>
<td>Copper, Total, ICAP/MS</td>
<td>µg/l</td>
<td>2.2</td>
<td></td>
<td>2.00</td>
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<td>jps</td>
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<td>jps</td>
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<tr>
<td>Nickel, Total, ICAP/MS</td>
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<td></td>
<td>HD</td>
<td>5.00</td>
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<tr>
<td>Lead, Total, ICAP/MS</td>
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<td>jps</td>
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<td></td>
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<td>jps</td>
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<td>HD</td>
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### Laboratory Report

Sample ID: KAMU 2
Sample Type: Water
Sampled: 10-May-2000
Received: 11-May-2000
Reported: 25-May-2000

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
<th>Prepared</th>
<th>Analyzed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>(SH2O2IR/EP10.1) mg/l</td>
<td>80</td>
<td>1.00</td>
<td>1.00</td>
<td>15-May-2000 tof</td>
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<td></td>
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<tr>
<td>Calcium, Total. ICAP</td>
<td>(ML/EP 250.7) mg/l</td>
<td>3.0</td>
<td>1.00</td>
<td>12-May-2000 with</td>
<td>12-May-2000 with</td>
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<tr>
<td>Specific Conductance</td>
<td>(ML/EP 2510) mS/cm</td>
<td>245</td>
<td>4.00</td>
<td>18-May-2000 sal</td>
<td>18-May-2000 sal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride</td>
<td>(EP/ML 140.2) mg/l</td>
<td>0.17</td>
<td>0.056</td>
<td>15-May-2000 sal</td>
<td>15-May-2000 sal</td>
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<tr>
<td>Mercury</td>
<td>(EPA/ML 2451.1) mg/l</td>
<td>ND</td>
<td>0.290</td>
<td>15-May-2000 gpr</td>
<td>15-May-2000 gpr</td>
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<tr>
<td>Nitrite, Nitrogen by IC</td>
<td>(ML/EP 100.0) mg/l</td>
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<td>11-May-2000 sal</td>
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<tr>
<td>Nitrate-N by IC</td>
<td>(ML/EP 300.0) mg/l</td>
<td>1.04</td>
<td>0.100</td>
<td>11-May-2000 sal</td>
<td>11-May-2000 sal</td>
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</tbody>
</table>
Report Summary of positive results, PR65851

<table>
<thead>
<tr>
<th>Date</th>
<th>Parameter</th>
<th>Result</th>
<th>MDL</th>
<th>UNITS</th>
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</thead>
<tbody>
<tr>
<td>5/18/00</td>
<td>Barium, Total, ICAP/MS</td>
<td>3.7</td>
<td>2.000</td>
<td>UGL</td>
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<tr>
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<td>Copper, Total, ICAP/MS</td>
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<td>2.000</td>
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</tr>
<tr>
<td>5/18/00</td>
<td>Lead, Total, ICAP/MS</td>
<td>4.1</td>
<td>.500</td>
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<tr>
<td>5/15/00</td>
<td>Alkalinity</td>
<td>80</td>
<td>1.000</td>
<td>MGL</td>
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<td>5/15/00</td>
<td>Calcium, Total, ICAP</td>
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<td>MGL</td>
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<tr>
<td>5/15/00</td>
<td>Fluoride</td>
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<td>.050</td>
<td>MGL</td>
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<tr>
<td>5/11/00</td>
<td>Nitrate-N by IC</td>
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<td>.100</td>
<td>MGL</td>
</tr>
<tr>
<td>5/18/00</td>
<td>Specific Conductance</td>
<td>245</td>
<td>4.000</td>
<td>UMHO</td>
</tr>
</tbody>
</table>
Acknowledgment of Samples Received

Maui, County of, Department of Water Supply
674 Palapala Dr
Kula, HI 96732
Actn.: Cari Cerizo

Customer Code: MAUI
Group#: 65851
Project#: PHASEV
Proj Mgr: Hillary Strayer
Phone: (626)

The following samples were received from you on 05/11/00. They have been scheduled for the tests listed beside each sample. If this information is incorrect, please contact your service representative. Thank you for using Montgomery Watson Laboratories.

<table>
<thead>
<tr>
<th>Sample#</th>
<th>Sample Id</th>
<th>Matrix</th>
<th>Tests Scheduled</th>
<th>Sample Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>05110023 KANOA 2</td>
<td>Water</td>
<td>@MET-HI ALK CA EC F HG NO2-N NO3</td>
<td>05/10/00</td>
<td></td>
</tr>
</tbody>
</table>

Test Acronym Description

- @MET-HI: ICPMS Metals
- ALK: Alkalinity
- CA: Calcium, Total, ICAP
- EC: Specific Conductance
- F: Fluoride
- HG: Mercury
- NO2-N: Nitrite, Nitrogen by IC
- NO3: Nitrate-N by IC
METHOD BLANK REPORT

Trace Level Organic Compounds

Client Lot #: G0E130155
MB Lot-Sample #: G0E230000-508

Work Order #: DDL0D101
Prep Date......: 05/24/00
Prep Batch #: : 0144508

Matrix.........: WATER

Analysis Date..: 05/26/00
Dilution Factor: 1

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RESULT</th>
<th>LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,7,8-TCDD</td>
<td>ND</td>
<td>1.7</td>
<td>pg/L</td>
<td>EPA-5 16138-Terra</td>
</tr>
</tbody>
</table>

NOTE(S): Calculations are performed before rounding to avoid round-off error in calculated results.
## QC DATA ASSOCIATION SUMMARY

G08130155

Sample Preparation and Analysis Control Numbers

<table>
<thead>
<tr>
<th>SAMPLE#</th>
<th>MATRIX</th>
<th>ANALYTICAL METHOD</th>
<th>LEACH BATCH #</th>
<th>PREP BATCH #</th>
<th>MS RUN#</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>WATER</td>
<td>EPA-S 1613B-Tetra</td>
<td></td>
<td>0144508</td>
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</tbody>
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Client Sample ID: 2005110022

Trace Level Organic Compounds

Lot-Sample #: G0E130155-001  Work Order #: DDSXV101  Matrix.........: WATER
Date Sampled...: 05/10/00  Date Received...: 05/12/00
Prep Date......: 05/24/00  Analysis Date..: 05/26/00
Prep Batch #:..: 0144508
Dilution Factor: 1

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RESULT</th>
<th>DETECTION LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,7,8-TCDD</td>
<td>ND</td>
<td>4.2</td>
<td>pg/L</td>
<td>EPA-5 1613B-Tetra</td>
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</table>

INTERNAL STANDARDS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RESULT</th>
<th>RECOVERY LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>13C-2,3,7,8-TCDD</td>
<td>48</td>
<td>(25 - 141)</td>
</tr>
</tbody>
</table>
SAMPLE SUMMARY

DD5XV 001 2005110022

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity, pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

DATE 05/10/00
TIME
ANALYTICAL REPORT

PROJECT NO. 65850
MWL-65850/Sub PO# 99-2407
Lot #: GOE130155

Martha Frost
Montgomery Laboratories

SEVERN TRENT LABORATORIES, INC.

Nanny Estrada
Project Manager

May 30, 2000
May 31, 2000

QUANTERRA INCORPORATED PROJECT NUMBER: G0E130155
PO/CONTRACT: 99-2407

Martha Frost
Montgomery Laboratories
555 East Walnut Street
Pasadena, CA 91101

Dear Ms. Frost,

This report contains the analytical results for the drinking water sample received under chain of custody by Quanterra Incorporated on May 12, 2000. This sample is associated with your project number 65850.

All applicable quality control procedures met method-specified acceptance criteria.

If you have any questions, please feel free to call me at (916) 374-4348.

Sincerely,

Nanny Estrada
Project Manager
Ship To  
Nannie Estrada  
Severn Trent Laboratories  
880 Riverside Parkway  
West Sacramento, CA 95605-1501  

Bill Recipient: FEDEX ACCT: 2060-8019

Report No. 65850

Do Not Combine Report with any other samples submitted under different MWL project numbers!

Report & Invoice must have the MWL Project Number and Sub PO#: 99-2407

Report all quality control data according to Method. Include dates analyzed, date extracted (if extracted) and Method reference on the report. Fax results to 626-568-6324

Faxed results must have complete data & QC. Hardcopy report is due in hand on due date.

Please advise us immediately if Due Date will be missed.

HARDCOPY REPORT, FORMS, & INVOICE MUST BE SENT TO ATTENTION
Martha Frost, Sub-contracting Administrator
Montgomery Watson Laboratories 555 East Walnut Street Pasadena, CA 91101

Phone ___________ Fax ___________

MWL Project #  Report Due:  
65850  05/25/00

<table>
<thead>
<tr>
<th>Qty</th>
<th>Test Code</th>
<th>Lab # for ID</th>
<th>Client Sample ID for reference only</th>
<th>Analysis Requested</th>
<th>Sample Date &amp; Time</th>
<th>Matrix</th>
<th>Container</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>TCDD-DW</td>
<td>2005110022</td>
<td>KANOA 2</td>
<td>Dioxin in drinking water 1613b</td>
<td>05/10/00</td>
<td>dw</td>
<td>1L amber glass / no preservative</td>
</tr>
</tbody>
</table>

RECEIVED IN GOOD CONDITION UNDER COC

MAY 13 2000

An Acknowledgment of Receipt is requested to ali: Martha Frost

Relinquished by: ____________________________ Sample Control Date 05/11/00 Time 17:06

For Specific Questions about samples  
(626) 568-6412

Hillary Strayer
### Laboratory Report

**Sample #: 39511001**  Sample type: Water

**Sample ID: WANNA 2**  Sampled: 10 May 2000  Received: 11 May 2000  Reported: 01 Jun 2000

**Project: PHASEV**

**Sample Type: Water**

**Received:** 11 May 2000  **Reported:** 01 Jun 2000

### SDWA Pesticides (ML/EPA 508)

<table>
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<tr>
<th>Parameter</th>
<th>Units</th>
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<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
<th>Prepared By</th>
<th>Analyzed By</th>
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<tbody>
<tr>
<td>PCB 1016 Aroclor</td>
<td>µg/l</td>
<td>ND</td>
<td>ND</td>
<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<td>PCB 1211 Aroclor</td>
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<td>ND</td>
<td>ND</td>
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<td>12-May-2000</td>
<td>phk</td>
<td>19-May-2000</td>
</tr>
<tr>
<td>PCB 1232 Aroclor</td>
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<td>ND</td>
<td>ND</td>
<td>0.100</td>
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<td>19-May-2000</td>
</tr>
<tr>
<td>PCB 1242 Aroclor</td>
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<td>ND</td>
<td>ND</td>
<td>0.100</td>
<td>12-May-2000</td>
<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>PCB 1264 Aroclor</td>
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<td>ND</td>
<td>0.100</td>
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<td>19-May-2000</td>
</tr>
<tr>
<td>PCB 1246 Aroclor</td>
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<td>ND</td>
<td>ND</td>
<td>0.100</td>
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<td>19-May-2000</td>
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<tr>
<td>Atrazine</td>
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<td>ND</td>
<td>0.0100</td>
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<td>19-May-2000</td>
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<td>Betaxane</td>
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<td>ND</td>
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<td>Chlorobenzene</td>
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<td>ND</td>
<td>ND</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>Chlorothalonil (Bravo)</td>
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<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>Delta-BHC</td>
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<td>ND</td>
<td>ND</td>
<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>p,p' DDE</td>
<td>µg/l</td>
<td>ND</td>
<td>ND</td>
<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>p,p' DDT</td>
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<td>ND</td>
<td>ND</td>
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<td>19-May-2000</td>
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<tr>
<td>Dieldrin</td>
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<td>19-May-2000</td>
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<tr>
<td>Endosulfan I (alpha)</td>
<td>µg/l</td>
<td>ND</td>
<td>ND</td>
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<td>19-May-2000</td>
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<tr>
<td>Endosulfan II (beta)</td>
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<td>19-May-2000</td>
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<td>Endosulfan sulfate</td>
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<td>19-May-2000</td>
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<tr>
<td>Heptachlor</td>
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<td>ND</td>
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<td>19-May-2000</td>
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<tr>
<td>Heptachlor Epoxide</td>
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<td>ND</td>
<td>0.0100</td>
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<td>19-May-2000</td>
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<tr>
<td>Lindane (gamma-BHC)</td>
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<td>ND</td>
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<td>12-May-2000</td>
<td>phk</td>
<td>19-May-2000</td>
</tr>
<tr>
<td>Methoxychlor</td>
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<td>ND</td>
<td>ND</td>
<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>Tetrachlor</td>
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<td>ND</td>
<td>ND</td>
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<td>12-May-2000</td>
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<td>19-May-2000</td>
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<tr>
<td>Methoxychlor</td>
<td>µg/l</td>
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<td>ND</td>
<td>0.0100</td>
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<td>phk</td>
<td>19-May-2000</td>
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<tr>
<td>Toxaphene</td>
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<td>ND</td>
<td>ND</td>
<td>0.500</td>
<td>12-May-2000</td>
<td>phk</td>
<td>19-May-2000</td>
</tr>
</tbody>
</table>

Report #: 05849
### Laboratory Report

**Sample:** 200511001  
**Sample ID:** KAHOA 2  
**Sample Type:** Water  
**Sample Date:** 10-May-2000  
**Received Date:** 11-May-2000  
**Reported Date:** 01-Jun-2000

**Project:** PHASEV  
**Location:** Maui, County of, Department of Water Supply  
**Address:** 614 Palapala Dr  
**City:** Kahului, HI 96732  
**ATTN:** Carli Cerizo

---

#### Herbicides by 515.1 (ML/EPA 515.1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>Conc.</th>
<th>Dilution</th>
<th>Det Limit</th>
<th>Prepared</th>
<th>By</th>
<th>Analyzed</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4,5-T</td>
<td>ug/l</td>
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**Data Entry:** 05/31/00

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**Report #:** 45849

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**Sample #:** 200511001  
**Sample ID #:** KAHOA 2  
**Sample Type #:** Water  
**Sample Date #:** 10-May-2000  
**Received Date #:** 11-May-2000  
**Reported Date #:** 01-Jun-2000

---

**Project #:** PHASEV  
**Location #:** Maui, County of, Department of Water Supply  
**Address #:** 614 Palapala Dr  
**City #:** Kahului, HI 96732  
**ATTN #:** Carli Cerizo

---

**Parameter:** Herbicides by 515.1 (ML/EPA 515.1)  
**Units:** ug/l  
**Result:** ND  
**Conc.:**  
**Dilution:**  
**Det Limit:**  
**Prepared By:**  
**By:**  
**Analyzed By:**  

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**Report #:** 45849
**Sample ID:** 20051100021  
**Sample ID-Phases:** 2  
**Sample Type:** Water  
**Sampled:** 10-May-2000  
**Received:** 11-May-2000  
**Reported:** 01-Jun-2000

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### Aldicarbs (ML/EPA 531.1)

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Report #: 65849
### Laboratory Report

**Sample ID**: 2005110031  **Sample ID**: KANNA 2  **Project**: PHASEV

**Sample Type**: Water  **Sampled**: 10-May-2000  **Received**: 11-May-2000  **Reported**: 01-Jun-2000

**525 Semivolatiles by GC/MS (ML/EPA 525.2)**

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Report #: 65849

15
## Laboratory Report

**Sample #:** 2005110721  |  **Sample ID:** KA0A 2  |  **Project:** PHASEV
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**Sample Type:** Water  |  **Sampled:** 10-May-2000  |  **Received:** 11-May-2000  |  **Reported:** 01-Jun-2000

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<th>Det. Limit</th>
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Report #: 65849
## Laboratory Report

**Sample ID:** RANOA 2  
**Sample Type:** Water  
**Sampled:** 10-May-2000  
**Received:** 11-May-2000  
**Reported:** 01-Jun-2000

### Volatile Organic Compounds (ML/EPA 502.2)

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<th>Conc.</th>
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<td>Carbon Tetrachloride</td>
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Report No: 65849
**Parameter** | **Units** | **Result** | **Conc.** | **Dilution** | **Det. Limit** | **Prepared By** | **Analyzed By**
--- | --- | --- | --- | --- | --- | --- | ---
Dibromochloropropane (DBCP) | ug/l | ND | | 0.010 | 17-May-2000 | eyw | 19-May-2000 | eyw
Ethylene Dibromide (EDB) | ug/l | ND | | 0.010 | 17-May-2000 | eyw | 19-May-2000 | eyw
Data Entry | | | | 08/25/00 | 0.00000000 | 17-May-2000 | eyw | 19-May-2000 | eyw
### Diquat and Paraquat

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<th>Conc.</th>
<th>Dilution</th>
<th>Det. Limit</th>
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Report #: 65849
Summary of positive results, PR65849

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Group Validation Comments

(525.2) Except for hexachlorocyclopentadiene from the LFM, recoveries from the LFM and LFB are within method QC limits. This sample was not selected for fortification.
(531) Recoveries from the LFM and LFB are within method QC limits.
(508) LCS recoveries failed low for heptachlor and aldrin. Refer to 525 data for sample results. QIR-GC-00-153.
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<th>Temp Control Initial (°C)</th>
<th>Temp Control Final (°C)</th>
<th>Percentage</th>
<th>MF</th>
<th>Total Coliform Verification (LTB/BGB)</th>
<th>Plate Count*</th>
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</table>

**Footnotes:**
- MF: Microbial Foster
- LTB: Listeria monocytogenes
- BGB: Bacillus Subtilis
- E.coli: Escherichia coli
- EC: Enterococcus coli
- E. coli: Enterobacter coli
- HPC: Total Coliform Count
- POF: Pathogen Occurrence Factor
- POF*: Pathogen Occurrence Factor 10
- Positive Neg: Positive at 10
- Positive Neg 10*: Positive at 10
- Agar: Col1, Col2, Col3
- System: Number of Samples Collected

*Note: The table contains specific values for each column but is not fully transcribed here due to the nature of the question.
### Microbiological Laboratory Daily Sampling, Processing and Analyses Record

**Membrane Filtration Method for the Detection of Total Coliform Bacteria* Fecal Coliform Test (EC Medium), and Heterotrophic Plate Count**

**COUNTY OF MAUI • DEPARTMENT OF WATER SUPPLY**

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</table>

**Collected by:**

**Processed by:**

**Received by:**

**Membrane:***

**Controls:**

**Verification:**

**Reported by:**

**Agar type:**

**System:**

**Number of Samples Collected:**

---

*Note: The table contains detailed information about the sampling process, including dates, times, and results of various tests. The specific details are not fully transcribed here due to the nature of the table format.*
DRAFT
ENVIRONMENTAL ASSESSMENT

North Waihee Water Source Development
Kanoa Well Nos. 1 and 2
(Project No. 97-023)

Waihee, Maui, Hawaii
TMK 3-2-01:por.3

SEPTEMBER 1999
BM INSTALLED BY YWS/UYS ON 9/03
ELEVATION DETERMINED BY RTH GVS
March 27, 2003

Mr. George Y. Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, HI 96793

Dear Mr. Tengan:

Well Completion Report for Well No. 5731-02

We received your Well Completion Report Part II for the Kanoa #1 (Well No. 5731-02) on March 21, 2003 and acknowledge that it is complete as of March 21, 2003, with our telephone conversation. Other than the continuing reporting requirements, this completes the permitting requirements for this well.

If you have any questions, please contact Charley Ice of the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Sincerely,

[Signature]

ERNEST Y.W. LAU
Deputy Director

C: Beylik Drilling, Inc.
MEMO and ROUTE SLIP

WCR 2 Check for Well No. 5731-02 (survey to regulation memo)

1. **Pump Tests Check** (special condition of PIP? Yes/No) Glenn Bauer (initial if yes)
   - Yes
   - No
   - If no, describe deficiency

   **Step-Drawdown Test:**
   - followed WCPI Stds
   - analysis attached
   - proposed pump cap o.k.

   **Aquifer Pump Test:**
   - followed WCPI Stds
   - T & S analysis attached

   **Well Interference:**
   - estimated Steady-State drawdown at 1-mile radius is ___________ ft.
   - analysis attached

2. **Pump Installation Check** Mitch Ohye (initial)
   - Yes
   - No
   - If no, describe deficiency

   - data complete
   - followed Special Cond & Elev.
   - well database updated

3. Charley/Lenore/Ryan (initial) take action based on above analysis

4. Roy (initial) check

5. Subia (initial) finalize

6. Dean (initial) signature

7. Charley/Lenore/Ryan File

---

Note: The document contains additional text which appears to be unrelated to the main content.
March 11, 2003

Mr. Peter Leong, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Leong:

Subject: Kanoa Well #1 (Well No. 5731-02)

Attn: Mr. Charley Ice

We are enclosing the Well Completion Report - Part II for Pump Installation for Kanoa Well #1 (Well No. 5731-02) along with pump curve for a 1200 gpm pump and the well test pump results and raw data. We are also enclosing a copy of the FEA and publication notice for development of Kupaa Well #1. We will be submitting the application for pump installation for Waikapu Mauka Well in the very near future.

Thank you for the reminder. If there are any questions, please call our Engineering Division at

Sincerely,

George Y. Tengan
Director

hk
enc.

"By Water All Things Find Life"
FAX: Transmitting 3 pages, including this one; call [REDACTED] with any reception problems.

TO: Herb Kogasaka
FROM: Charles Lee

Date: 06 March 03

Transmitting WCR 2 form for Kāneʻa 1.
After looking at files, three wells have requirements to proceed.
Kāneʻa 1: WCR 2 (current form), pump test results (date),
  pump curve

Kūpāʻa 1: documentation of completed Ch. 343 process

Waikapū Mauka: need application for pump installation

Return Fax: [REDACTED]
Return Post: P.O.Box 621, Honolulu 96809
February 27, 2003

Mr. George Tengan, Director
Department of Water Supply
County of Maui
200 South High Street
Wailuku, HI 96793

Dear Mr. Tengan:

Permanent Pump Installation
Kānoa Well #1 (Well No. 5731-02)

This is to inform you that the permanent pump installation permit for a 1200-gpm pump, issued in September of 1999, has expired. You submitted a well completion report, part 2 (WCR2, pump installation) in May of 2000 for a temporary 870-gpm pump. Since then, we have received no further correspondence on this matter, and have not accepted the WCR2 as complete, due to the following:

1. We are anticipating your directions concerning the 1200-gpm permanent pump.
2. We have no pump curve for the 870 gpm pump.
3. We have not received any raw data to review for this well's pump test.

We would like to know your plans concerning the temporary status of this pump as it has been over two years since your last update on this well, especially as the Waihee Aquifer System is the subject of designation proceedings.

If you have any questions, please call Charley Ice of the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Sincerely,

[Signature]
Peter T. Young
Chairperson

Cl:ss
May 10, 2002

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson,

RE: Final Environmental Assessment (FEA), for the Kupaa Well No. 1 and Water Transmission Line at Waihee, Maui, Hawaii (TMK: 3-2-001:003 portion)

The Department of Water Supply has reviewed the final environmental assessment for the subject project, and has determined that a Findings of No Significant Impact (FONSI) is warranted. Please publish notice of availability for this project in the May 23, 2002, OEQC Environmental Notice.

We have enclosed four (4) copies of the Final EA, and will be transmitting a completed OEQC Publication form and project summary via e-mail (e-mail will be transmitted by Chris Hart & Partners). Should you have any questions, please call our Engineering Division at [phone number] or Mr. Rory Frampton of Chris Hart & Partners at [phone number] very truly yours,

David Craddick, Director
County of Maui, Department of Water Supply

Encls.

Cc: Mr. Herbert Kogasaka
    Mr. Carl Takumi
    Mr. Rory Frampton

"By Water All Things Find Life"
Development of the project will consist of clearing, grubbing, grading; installation of a pump and related electrical controls; 500,000 gallon reservoir; equipment building with disinfection and electrical equipment; piping, fencing, and related work. A 16-inch transmission waterline is planned to carry water from the Kupa'a 500,000 gallon reservoir to Kanoa Well No. 1 where the water will then be transported via an existing 24-inch transmission line to the Central Maui Water System. The short-term impacts associated with these activities are not anticipated to have a significant impact upon existing land uses at the site or in the region.

The project is not anticipated to have any adverse impacts upon existing environmental features such as flora and fauna, topography, soils, or air quality. The project is not anticipated to have an impact upon archaeological or historical features.

The proposed project will not have an adverse impact upon existing socio-economic conditions nor will it have an adverse effect upon existing public services or infrastructure.

In light of the forgoing, the proposed project will not result in significant environmental impacts to the environment and a Finding of No Significant Impact (FONSI) is warranted.

Previously Published Projects
Pending Public Comments

Environmental Impact Statement Preparation Notices

Lahaina Watershed Flood Control Project
Applicant: County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawai‘i 96793
Contact: Joe Krueger

Approving Agency/Accepting Authority: Mayor, County of Maui
200 South High Street
Wailuku, Hawai‘i 96793

Public Comment Deadline: June 7, 2002 (see also, page 16).
## Kanoa Step Down Data

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INSTALLATION REPORT

DATE 10 DEC 01
JOB 1197 D KANOA #1 6-5731-02

SWL 301' 7''
DEPTH 364' 4''

AS BUILT

17' 14''
3'
312'
8' 9''
8' 10''
329' 7''

NO. CONDUCTOR
440 VOLT POWER CABLE

10'' COLUMN PIPE IN RANDOM 20' LENGTHS

CABLE CLAMPS EVERY 10 FT.

CHECK VALVE(S) LOCATED 7' ABOVE PUMP

PUMP MODEL # 0104AF000957-1
2STAGE MAKE BJ 12MB SUB.

SER. # 24395034-01
MFG. MODEL # 24395034-0 SIZE 12''

HP 200 RPM VOLTS 460
PH 3 CY 60 FRAME
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FINAL
ENVIRONMENTAL ASSESSMENT

North Waihee Water Source Development
Kanoa Well Nos. 1 and 2
(Project No. 97-023)

Waihee, Maui, Hawaii
TMK 3-2-01:por.3

NOVEMBER 1999
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ENVIRONMENTAL ASSESSMENT

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Kanoa Well Nos. 1 & 2
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Waihee, Maui, Hawaii
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Prepared for:
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793

Engineering Consultant:
C. Takumi Engineering, Inc.
18 Central Avenue
Wailuku, Maui, Hawaii 96793

Planning Consultant:
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Landscape Architecture and Planning
1955 Main Street, Suite 200
Wailuku, Maui, Hawaii 96793
Phone: (808) ...

NOVEMBER 1999
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- Figure 3 – Hydrologic Unit Map
- Figure 4 – Proposed Site Plans
- Figure 5 – Site Photos
- Figure 6 – Central Maui Water System Map

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- Appendix B – The North Waihee Aquifer: An Additional Water Source for Central Maui
- Appendix C - Draft EA Comment Letters and Responses
I. INTRODUCTION

A. IDENTIFICATION OF THE PROPOSING/ACCEPTING AUTHORITY AND CONSULTANTS

Proposing Agency/Accepting Authority:
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793

Engineering Consultant:
C. Takumi Engineering, Inc.
18 Central Avenue
Wailuku, Hawaii 96793

Planning Consultant:
Chris Hart & Partners
Landscape Architecture and Planning
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

B. OVERVIEW OF THE REQUEST

The County of Maui Department of Water Supply (DWS) is proposing the development of two wells in Waihee, Maui, Hawaii (TMK 3-2-01: por. 03) (See Figure 1 and 2). The project will involve the well development and pump installation for Kanoa Well Nos. 1 and 2 (previously known as Waihee Well Nos. 4 and 3, respectively).

DWS prepared and processed a Final Environmental Assessment (EA) for the Waihee Wells and Transmission line in March 1994 (Michael T. Munekiyo Consulting, 1994). The 1994 Final EA document examined the activation of Waihee Well Nos. 1 and 2, installation of a new 500,000-gallon water tank, construction of approximately 4.26 miles of underground transmission line, and the drilling of Kupaa Well No. 1 and Kanoa Well No. 1. (This project is now collectively referred to as the North Waihee Water Source Project.) The particular focus of the 1994 Final EA document was the activation of Well Sites 1 and 2 and the construction of the 4.26 miles of transmission line, including the Waihee Stream crossing, and connection to the Central Maui Water System. Development of Kupaa Well No. 1 and Kanoa Well No. 1 were discussed, however, at the time the actual sites had not been chosen and thus the specific impacts could not be assessed. Thereafter, the DWS prepared and processed a Final Environmental Assessment (EA) to assess the potential impacts associated with the exploratory drilling of Kupaa Well No. 1 and Kanoa Well No. 1 (Chris Hart & Partners, 1997).
Well pumping and water quality test results from Kanoa Well No. 1 have been completed and results support well development and pump installation at the proposed capacities. Kanoa Well No. 2 is proposed within the same general vicinity as Kanoa Well No. 1.

The purpose of this Draft EA is to assess the potential impacts associated with the well development of Kanoa Well Nos. 1 and 2.

C. BACKGROUND INFORMATION

The Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, demand from Central Maui has already reached this sustainable yield and threatens to exceed it in the next few years. As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring indicates that the North Waihee Aquifer can adequately supplement the Iao System.

The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. Testing has indicated that the Waihee Aquifer is quasi-independent from the Iao Aquifer System and that the direction and flow of the Iao Aquifer is toward and across Waihee Valley (Mink and Yuen, Inc., 1997). It has been estimated that the entire North Waihee Aquifer could supply the Central Maui Water System with an additional average annual yield of 8 mgd (Mink and Yuen Inc., 1997).

The North Waihee Water Source Development Project presently comprises 5 wells, associated transmission lines, pumps, electrical buildings, and related improvements. North Waihee Wells Nos. 1 and 2 (State Well No. 5631-02 & 5631-03, respectively) and transmission lines to the Central Maui Water System were placed into operation in 1999 and have a pumping capacity of 1.5 mgd each. The DWS is in the process of developing Kupaa Well No. 1 (State Well No. 5731-03). Kanoa Well No. 1 (State Well No. 5731-02) had exploratory drilling and water quality testing conducted in 1999 and is currently proposed for development along with Kanoa Well No. 2 (State Well No. 5731-04), which is in the same general vicinity as Kanoa Well No. 1. The following 5 wells comprise the DWS's North Waihee Water Source Project:

<table>
<thead>
<tr>
<th>WELL</th>
<th>STATUS</th>
<th>PUMPING CAPACITY</th>
<th>AVE. DAILY USE</th>
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<tr>
<td>North Waihee Wells 1 and 2</td>
<td>Developed</td>
<td>3.0 mgd</td>
<td>1.980 mgd</td>
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<td>(State Well Nos. 5631-02, 03)</td>
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<td>Kanoa Well Nos. 1 and 2</td>
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<td>3.4 mgd (proposed)</td>
<td>2.244 mgd</td>
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<td>Kupaa Well</td>
<td>Future</td>
<td>1.7 mgd (proposed)</td>
<td>1.122 mgd</td>
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<tr>
<td>(State Well Nos. 5731-03)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>8.2 MGD</td>
<td>5.4 MGD</td>
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According to the State Commission on Water Resource Management (Commission), the pump tests for the Kanoa Well No. 1 and Kupaa Well No. 1 wells indicate that the average pump capacity will not exceed 1.15 mgd. Commission staff will base their pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

Several private wells also exist within the North Waihee Aquifer System. These wells include:

<table>
<thead>
<tr>
<th>WELL</th>
<th>STATUS</th>
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<tr>
<td>Marino Well A and B (State Well Nos. 5631-04, 05)</td>
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<tr>
<td>Mendes Well (State Well No. 5731-01)</td>
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<td>144,000 gpd</td>
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<tr>
<td>Unknown (State Well No. 5832-01)</td>
<td>Developed</td>
<td>Unknown</td>
</tr>
<tr>
<td>Kahakuloa Acres</td>
<td>Developed</td>
<td>Unknown</td>
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<tr>
<td>Kahakuloa Acres / Wailena State Well No. 5832-03</td>
<td>Developed</td>
<td>288,000 gpd</td>
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The Marino and Mendez Wells are small residential wells. The Kahakuloa and Wailena wells are used for residential and irrigation purposes. Current water use in the area has been limited due to limited development in the region. The North Waihee Aquifer has not been designated as a water management area; as such, the Commission on Water Resource Management has not established controls on the use of this water.

The North Waihee Water Source Development Project is being implemented to develop new sources of water to meet the needs of future development in the Central Maui Service Area.

D. DESCRIPTION OF PROPOSED ACTION

The DWS is proposing the development of Kanoa Well Nos. 1 and 2. Kanoa Well No. 1 is located mauka (west) of Kahekili Highway, approximately 100 feet inland from the existing Kanoa monitoring well and at an approximate elevation of 310 feet above mean sea level. Kanoa Well No. 2 is situated approximately 600 feet to the southwest of Kanoa Well No. 1, adjacent to the existing access road for the North Waihee Reservoir, at an approximate elevation of 275 feet above mean sea level. (See Figures 1 and 2).

Development of Kanoa Well No. 1 will consist of clearing, grubbing, grading, installation of a pump and related electrical controls, construction of a small electrical building, piping, fencing, and related work. The proposed electrical building will house the electrical equipment for the pump motor controls, well level, SCADA equipment and other appliances (See Figure 4a). The well has been drilled 359 feet below ground surface or about 50 feet below mean sea level. The water surface elevation of the basal aquifer is at elevation 7.93 feet.
Kanoa Well No. 2 will be developed in the same manner as Kanoa Well No. 1, but will also support a chlorination facility that will be attached to the proposed electrical building. The chlorination facility will be used to disinfect water from both wells and will be built slab on grade with asphalt shingle roofing (See Figure 4b). Kanoa Well No. 2 will be drilled approximately 330 feet below ground surface or about 50 feet below mean sea level.

The pumping facility for each site will have the following specifications:

- **Pump Type:** Deepwell Submersible
- **Pump Rating:** 1,200 gpm @ 450' TDH
- **Motor:** Submersible, 200 HP, 1750 RPM
- **Power Supply:** 480 volt, 3 phase, 60 Hz
- **Piping:** Ductile Iron
- **Appurtenances:** Check Valve, Air and Vacuum Valve
- **Flow Tubes:** Cast Iron with a bronze liner with transmitters and receivers

A 12-inch transmission water line is planned to transport water approximately 800 feet from Kanoa Well No. 1 along the existing access route to an existing 24-inch transmission waterline where the water will be transported to the existing 1.0 MG North Waiheea Reservoir. Water developed from Kanoa Well No. 2 will also be transported to the North Waiheea Reservoir via the existing 24-inch waterline (See Figure 2). Water from the proposed wells will be used to service the Department of Water Supply's Central Maui Water System.

Each respective site will be cleared, grubbed, and graded. The adjacent slopes will be grassed, and access roads and well sites will be paved. Installation of transmission water lines, construction of accessory buildings, and pump installation and related piping will be required at each site. Electrical and telemetry equipment will also be installed at each site while disinfection equipment is proposed for just the Kanoa Well No. 2 site. Each site will be fenced.

Electrical power will be obtained from the Maui Electric Company. A generator will be located at the chlorination facility (Kanoa Well No. 2) and will be automatically activated during power outages.

The Maui County Board of Water Supply will provide funding for the project. Operation and maintenance will be the responsibility of the Department of Water Supply. It is estimated that the cost of the proposed improvements will be approximately $1.74 million (C. Takumi Engineering, Inc.). The design and operation of both wells will be in conformance with the "Water System Standards," Department of Water Supply, County of Maui, 1985 (C. Takumi Engineering, Inc., 1999).

Access to Kanoa Well No. 1 will be via a paved driveway that traverses an existing access easement over undeveloped pasture owned by Wailuku Agribusiness Co. The access easement is on slightly sloping lands that are relatively easy to access.

4
Access to Kanoa Well No. 2 will be via the existing paved roadway that services the North Waihee Reservoir.
II. EXISTING ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Orientation/Land Use Data

   Tax Map Key:                  (2) 3-2-001:003 (portion)
   State Land Use Classification: Agricultural
   County Zoning:                Agricultural
   Wailuku/Kahului Community Plan: Agricultural
   Flood Zone:                   C

The proposed wells are located on the northern slopes of the West Maui Mountains north of the village of Waihee on the Island of Maui (See Figure 1). Each respective well is located on a one-acre perpetual easement mauka of Kahekili Highway at approximate 310 feet (Kanoa 1) and 275 feet (Kanoa 2) above mean sea level. The proposed wells are approximately 2,000 feet from the ocean and the nearest adjacent structure is over 1,000 feet east of each well.

2. Existing Land Uses for the Subject Property

Kanoa Well No. 1 is located within an area that was previously cleared during the well drilling phase. The surrounding area is pastureland and is presently covered with various grass, weeds, and shrubs. An existing monitoring well, Kanoa, is located approximately 100 feet east (makai) of the existing well site. The subject property has been used in recent times for agricultural pursuits, principally the grazing of cattle and horses.

The proposed Kanoa Well No. 2 site is located adjacent to the existing North Waihee Reservoir access road in an area that was previously cleared for installation of electrical transmission lines. Grazing of cattle and horses has been the predominant land use for the last several decades.

Kanoa Well Nos. 1 and 2 each maintain an easement area of approximately 1-acre, but only a small portion of each respective site will be impacted by the proposed developments (See Figure 4).

Analysis. The proposed wells, and appurtenant facilities, are located within a sparsely populated and largely undeveloped area that is buffered by pasturelands, gullies, and
hills. Only a small portion of each site will be affected by the short-term activities associated with the proposed project, i.e. grading, grubbing, drilling, and other construction related activities. A majority of each site will be retained in open space while the electrical and electrical/chlorification buildings will be small one-story structures, approximately 500 sq. ft. and 1,600 sq. ft., respectively. Access to each site will be provided via a paved driveway with parking provided on-site. Thus, it is not anticipated that the proposed action will have a significant impact upon existing land uses at the sites or in the project area.

3. Surrounding Land Uses

The well sites, which are located approximately five (5) miles north of the urbanized region of Wailuku Town, are surrounded by an area that is characterized by a open pastoral setting, comprised of various agricultural settlements interspersed with low density residential uses (See Figure 5).

Specific uses surrounding the sites include the following:

**Kanoa Well No. 1**

- **North**: Vacant undeveloped lands in pastoral use. Further north are the Kahakuloa Homesteads.

- **South**: Vacant undeveloped lands in pastoral use. Further south is the town of Waihee.

- **East (Makai)**: Across Kahekili Highway, additional lands in pastoral use and further east is the rugged shoreline.

- **West (Mauka)**: Vacant undeveloped lands in pastoral use. Further west is the West Maui Forest Reserve.

**Kanoa Well No. 2**

- **North**: Vacant undeveloped lands in pastoral use. Further north is Kanoa Well No. 1 and further beyond are the Kahakuloa Homesteads.

- **South**: Vacant undeveloped lands in pastoral use. Further south is the DWS reservoir and booster pump site and beyond is the town of Waihee.

- **East (Makai)**: Across Kahekili Highway, additional lands in pastoral use and further east is the rugged shoreline.

- **West (Mauka)**: Vacant undeveloped lands in pastoral use. Further west is the West Maui Forest Reserve.
Analysis. As noted above, each site maintains an area of approximately 1-acre, but only a small portion of each site will be affected by the wells. A significant majority of each site will be retained in open space while the electrical and electrical/chlorification buildings will be small one-story structures. Access to each site will be provided via a paved driveway with parking provided on-site. The short-term activities associated with drilling and construction, are not anticipated to have a significant impact upon land uses in the vicinity of the project.

4. Climate

Located on the coastal uplands of the West Maui Mountains, Waihee’s climatic pattern is heavily influenced by the northeasterly tradewinds as is typical of windward areas in the Hawaiian Islands. In the absence of the tradewinds, diurnal heating and cooling of the Island produces onshore sea breezes during the day and offshore land breezes at night. The average annual rainfall at the well sites is approximately 30 to 40 inches, with showers usually more frequent during the night and early morning. Average temperatures range from lows in the mid 60's to highs in the mid 80's.

The proposed wells will have no effect upon existing climatic conditions.

5. Topography

The topography of the surrounding area is characterized as having slopes cut by numerous erosional gullies and established drainage patterns. The elevation at Kanoa Well No. 1 is approximately 311 feet above mean sea level while the elevation at Kanoa Well No. 2 is approximately 350 feet above mean sea level. The topography slopes in a mauka-makai direction with the slopes around 20%. There does not appear to be any significant topographical constraints within the areas proposed for the wells.

Analysis. Development of each respective site will be implemented using best management practices and steps will be taken to avoid permanent changes to topographical features in the vicinity of the well sites. At the Kanoa No. 1 site a natural swale lies north of the site and will be used to dispose of storm runoff generated by the site. Access provided to each site will be via a paved driveway and the disturbed area around the project sites will be to minimize runoff and erosion during periods of heavy rain. As such, once completed, the proposed project is not anticipated to have a significant impact upon topographical features of the surrounding area.

6. Soils

The soil type specific to Kanoa Well Nos. 1 and 2 is Rough Broken land (rRR). rRR soils consist of very steep land broken by numerous intermittent drainage channels. Runoff is rapid and geologic erosion is active. The proposed wells will not have a significant effect upon existing soils at the site or those that surround the site.
7. Flood and Tsunami Hazard

Kanoa Well No. 1 and 2 lie within Flood Zone C, an area of minimal flood and tsunami hazard, as determined by the Flood Insurance Rate Map for this region. A Drainage and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction.

The proposed project will have no effect upon the existing flood or tsunami areas.

8. Aquifer Unit Status

Sustainable Yield: The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley (See Figure 3). However, the basal aquifer may be disrupted near Makamakaole Valley by massive Honolua dikes. The sustainable yield for the entire North Waihee Aquifer is estimated at 8 mgd and the estimated sustainable yield for the area between Waihee and Makamakaole will be less. The proposed wells will aid in determining the aquifer conditions and sustainable yield for the North Waihee Aquifer System.

Current pump capacity: The Board of Water Supply, by agreement with Wailuku Agribusiness Co., Inc. has lots or perpetual easements for the development of 5 well fields within Wailuku Agribusiness Company properties between Waihee Stream and Kupaa Gulch. North Waihee Wells 1 & 2 are in well field one; Kanoa Well Nos. 1 and 2 are proposed for development and are within well fields 2 and 3, respectively; Kupaa Well is part of well field 5 is in the early design/development planning stages.

Current pump capacity in the North Waihee Aquifer consists of the North Waihee Wells 1 and 2 with a combined pumping capacity of 3 mgd. Private well use is limited and consists of the Mendes Well (State Well No. 5731-01), a small residential well; the Wailena well (State Well No. 5832-03), a residential subdivision well at Wailena; and, the Marino Well (State Well No. 5631-04), a small residential subdivision well. The lack of development in the area has kept pumpage of these wells to a minimum. The Commission on Water Resource Management has no record of the current water use totals.

Current and pending installed capacity: The two existing North Waihee Wells have a pumping capacity of 3 mgd. The Mendes well is too small for either the quality or quantity of its pumpage to be affected. The well at Wailena was drilled and successfully tested at 200 gpm. Pumping from the proposed sites should not affect the Wailena Well because of its distance from the proposed wells. The Marino Well has a 100 gpm pump.

Kupaa Well is currently being developed and will have a pumping capacity of 1.7 mgd. Once on line, Kanoa Well Nos. 1 and 2 will have a combined pumping capacity of 3.4 mgd. Thus, total pumping capacity from the North Waihee Aquifer will be just over 8.2 mgd. It is not anticipated that the pumps will run simultaneously, nor continuously,
except under emergency conditions. Average daily pumping is expected to be about 16 hours per day, which would produce an average daily yield of approximately 5.4 mgd, depending upon demand.

**Authorized water use by the Commission on Water Resource Management:** The Commission on Water Resource Management has not designated The North Waihee Aquifer as a water management area; therefore, authorized water use controls have not been implemented by the Commission.

9. **Contamination Analysis and Vulnerability Assessment**

The recharge area estimated for the Waihee Aquifer is about 12 square miles between the Waihee and Kahakuloa Valleys. The proposed wells are located within an agriculturally zoned area that has predominantly been used for rangeland. No known pesticides have been used on the property for decades. There are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. Agricultural and conservation zoning within the recharge area limits future land use options and restricts population growth in the area. Conservation zoning requires that permits be obtained prior to urban or agricultural uses being conducted. There are no feedlots, sanitary landfills, or public dumps within the aquifer recharge area. The limited residential development that exists is serviced by individual wastewater disposal systems.

Water quality samples taken from the North Waihee Wells 1 and 2, Kupaa Well, and Kanoa Well 1 during well pumping testing confirms that the subject water is free of pesticides and other contaminants. The only anticipated source of contamination is biological; thus, water treatment to mitigate potential contamination will consist of disinfection (C. Takumi Engineering, Inc., 1999). The space around the well casing will be grouted from just above the aquifer level to ground surface to prevent surface waters from entering the well.

10. **Hydrologic Impact Analysis**

The North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. Testing has indicated that the Waihee Aquifer is quasi-independent from the Ioa Aquifer System and that the direction and flow of the Iao Aquifer is toward and across Waihee Valley (Mink and Yuen, Inc., 1997). It has been estimated that the entire North Waihee Aquifer could supply the Central Maui Water System with an additional average annual yield of 8 mgd (Mink and Yuen Inc., 1997). As discussed, water quality samples taken from the North Waihee Aquifer System confirms that the subject water is free of pesticides and other contaminants. The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards” to insure that the proposed action does not result in pollutants penetrating the aquifer. In addition, average daily pumping is
anticipated to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield. Thus, the proposed action should not significantly impact ground water resources.

Streams: There are no perennial streams in close proximity to the well sites. The nearest perennial streams are Waihee and Makamakaole.

Makamakaole stream flows on the Honolua formation and nowhere does it intersect the Wailuku formation, which is the aquifer proposed for development. Pumping in the Wailuku formation will have no effect on the Makamakaole stream flow. The stream is located approximately 3,500 feet away from the proposed wells.

Except for the mouth of Waihee Stream, the water table in the aquifer lies below the invert of the Waihee stream channel. Any effect on stream flow will be very small and not likely to be measurable. The stream is about 4,000 feet distant from the proposed wells.

Wetlands: A large wetland occurs in the headwater region of Makamakaole Stream, and a smaller wetland occurs at the mouth of Waihee Stream.

The Makamakaole wetlands extend irregularly over a distance of about 2.5 miles from Eke crater toward the sea and range in elevation from 4,500 feet above MSL to 2,800 feet above MSL. They lie on the Honolua formation and are sustained by perched water in the formation. There is no hydraulic continuity between these wetlands and the Wailuku formation. They will not be affected by pumping in the Wailuku aquifer. The lowest reach of the wetlands is two miles from the proposed wells.

The wetlands at the mouth of Waihee Stream are a mile away from the proposed wells. A reduction in head in the Wailuku aquifer may diminish seepage into the wetlands but probably not enough to be detectable. The wetlands are in valley fill alluvium and are sustained mostly by seepage from Waihee Stream.

11. Watershed and Land Use Analysis

As noted, the Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, demand from Central Maui has already reached the system’s sustainable yield and threatens to exceed it within the next few years. As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring indicates that the North Waihee Aquifer can adequately supplement the Iao System with an average daily sustainable yield of 8 mgd.

The Central Maui Water System services the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kuau, Kihei and Puunene (See Figure 6). This region comprises the majority of the County’s
economic activity, and maintained a resident population of approximately 49,750 persons in 1990, about 54% of the Island of Maui’s resident population.

The Department of Water Supply estimates that year 2010 demand within the Central Maui Water System will range from 27 mgd to 29 mgd depending upon the method of forecast (Per conversation with DWS). The “Historical Trend” method, utilized by the DWS in the Water Use and Development Plan, uses a linear extrapolation of 0.5 mgd/year, which equates to a forecasted water use of 17.1 mgd in 1995. The 1995 water consumption reported in the Annual Report for Fiscal Years 1994, 1995, Board of Water Supply, County of Maui for the Wailuku District averaged nearly 18.7 mgd, or a 8.5% deviation. Using the linear extrapolation of 0.5 mgd/year, the estimated water use in 1997 was 18.1 mgd. Comparatively, the water consumption reported by the Annual Report for Fiscal Year 1997, Board of Water Supply, County of Maui, averaged 19.3 mgd, or a 6.6% deviation (C. Takumi Engineering, Inc., 1999).

The future requirements of service as forecasted above are based upon a mix of residential, commercial, institutional and other needs of the community. The Community Plans for the Kihei-Makena, Wailuku-Kahului, and Paia-Haiku regions are the primary planning documents adopted by the County to assess and zone potential growth areas within the Central Maui Water System. The DWS is charged with the responsibility of providing a sufficient water supply for the area. Potential growth and future requirements may vary due to changes in the Community Plans, economy, and population changes.

The following table summarizes projected water demand relative to existing and proposed supply for the year 2010.

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Demand/Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iao Aquifer</td>
<td>20 mgd</td>
</tr>
<tr>
<td>North Waihee Aquifer</td>
<td>8 mgd</td>
</tr>
<tr>
<td>Iao Tunnel</td>
<td>1.5 mgd</td>
</tr>
<tr>
<td>Wastewater Reuse</td>
<td>1.2 mgd</td>
</tr>
<tr>
<td>Retrofit and Conservation</td>
<td>.50 mgd</td>
</tr>
<tr>
<td>Total Supply</td>
<td>31.2 mgd</td>
</tr>
<tr>
<td>Projected Demand*</td>
<td>29 mgd</td>
</tr>
<tr>
<td>Net Surplus/Deficit</td>
<td>2.2 mgd</td>
</tr>
</tbody>
</table>

* Conservative estimate of projected water demand.

12. Flora and Fauna

The exploratory well sites are situated within the pastoral setting of Waihee. Natural environmental features, such as plant and animal life, therefore, are reflective of this pastoral setting. Existing vegetation at the actual well sites is non-existent due to previous clearing for well drilling and access way construction. There are no rare, endangered or threatened species of plants at the well sites.
Animal life in the vicinity similarly reflects the pastoral setting of the region. Avifauna typically found within Waihee's pastoral area include the common myna, several species of dove, cardinal, house finch, and house sparrow. Mammals common to this area include cats, dogs, rodents, and mongoose.

There are no known significant habitats of rare, endangered or threatened species of flora and fauna located at the exploratory well sites. Therefore, the proposed wells will not have an adverse impact upon the flora or fauna found in the area.

13. Air Quality

Waihee's constant exposure to tradewinds creates a clean air environment. There are no point sources of airborne emissions in the immediate vicinity of the exploratory well sites, and the air quality at the sites is considered good.

Air quality impacts attributed to the development of each well and appurtenant facilities could include dust generated by short-term drilling and construction-related activities. Mitigation measures for dust control, such as regular watering and sprinkling, will be implemented as needed to minimize wind-blown emissions. The pumps utilized during drilling will be diesel driven and may produce diesel fumes which could impact local air conditions. Permanent pumps will be electrical and will produce no air emissions. During drilling, the DWS will adhere to the State Department of Health's rules and requirements for air emission controls regarding this issue. As such, the proposed wells are not anticipated to be detrimental to local air quality.

14. Noise Characteristics

Background noise at the well sites is natural, except for intermittent noise generated by vehicles on Kahekili Highway.

It is anticipated that drilling related activities may impact noise levels, however, the nearest potentially sensitive receptor site is a dwelling located more than 1000 feet to the east. This distance will mitigate potential noise impacts. In addition, in order to minimize noise related impacts, the applicant proposes to limit drilling activities to normal daylight working hours and adhere to the State Department of Health's noise regulations for drilling equipment. Once completed, it is anticipated that the wells will not have an adverse impact upon existing noise characteristics.

15. Visual Resources

The well sites are located on the mauka side of Kahekili Highway. Scenic resources within proximity to the well sites include views of the nearby shoreline, open space natural drainage ways (gulch areas), and views of Haleakala's northshore.

Once completed, the wells will be at or near grade. The proposed single-story accessory structures are minimal in mass and bulk and are permitted within the State and County
Agricultural Districts. As such, the proposed project is not anticipated to have an adverse affect upon scenic resources.

16. Archaeological/Historical Resources

An Archaeological Reconnaissance Surface Survey was conducted for Kanoa No. 2 on July 6, 1993, (Michael T. Munekiyo Consulting, 1994) and for Kanoa Well No. 1 on March 27, 1997. SEE APPENDIX A - ARCHAEOLOGICAL RECONNAISSANCE SURFACE SURVEY.

The Archaeological Reconnaissance Surface Survey conducted in 1993 examined a 300/1000 ft-long alignment (Transect “B”) extending upslope within the immediate area of Kanoa Well No. 2. The study states that “nothing of archaeological or historical value was observed in this transect” (Michael T. Munekiyo, 1994).

At Kanoa Well No. 1 a rock feature was noted within 300 feet of the existing monitoring well.

The March 1997 Reconnaissance Surface Survey recommended the following:

Kanoa Well No. 1

1) Limited subsurface testing at the inventory level should be undertaken if the permanent well will be placed beyond the area previously cleared for the existing Kanoa monitoring well.
2) Monitoring of the initial placement of the permanent well should be undertaken. Care must be utilized in order to avoid the adjacent areas covered with trees. The possibility exists that 1 or more indigenous sites are contained in the densely wooded areas.

Kanoa Well No. 1 was not to be located beyond the area previously cleared for the existing Kanoa monitoring well. The adjacent areas, which are covered with trees, were not to be affected or altered. Agricultural activities continuing since the late historic period have extensively affected the areas proposed for both of the wells. Recent clearing for the Kanoa Well No. 1 site and the Reservoir access road has already disturbed the existing project sites. As such, the proposed project is not anticipated to have an impact upon archaeological or historical features.
B. SOCIO-ECONOMIC ENVIRONMENT

1. Population and Economy

The population of the County of Maui has exhibited relatively strong growth over the past decade with the year 2000 population estimated to be 124,562, an approximate 24% increase over the 1990 population of 100,504 (County of Maui Data Book, 1996-97). Growth in the County is expected to continue, with resident population to the year 2005 and 2010, estimated to be 134,064 and 140,060, respectively.

The Wailuku-Kahului region is the island’s center of commerce, including a wide range of commercial, service, professional, and governmental activities. The large agricultural tracts of lands that encompass the region, mainly owned by Hawaiian Commercial & Sugar and Wailuku Agribusiness Company, are also a vital part of the region's economy.

The Central Maui Water System services both the residential and commercial areas of Central Maui, including Paia and South Maui, which are expected to continue to grow. The growth rate of these regions continues to place additional stress on the Iao Aquifer System, which is currently at or near its sustainable yield. The North Waihee Water Source Development Project is intended to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. The wells are intended to provide additional alternatives to service the region’s population and economic centers.

C. PUBLIC SERVICES

1. Recreational Facilities

The well sites are in close proximity to numerous recreational opportunities, including Maui War Memorial Complex, Maui Zoological and Botanical Gardens, Waihee Beach Park, and Waiehu Golf Course. In addition, there are numerous ocean related activities near by.

The subject wells will not impact existing recreational facilities.

2. Police and Fire Protection

Police protection for the region is provided by the County Police Department headquartered at the Wailuku station approximately six (6) miles away. The Central Maui Patrol includes approximately 100 full time personnel.

The County Department of Fire Control’s Wailuku Station and Kahului Station provide fire prevention, suppression, and protection services.

The proposed project is not anticipated to affect police or fire protection.
3. Solid Waste

The County of Maui provides weekly solid waste collection services to residential properties in the area. Drilling will produce residual crushed rock and soil materials. These materials will be spread out evenly at the drilling sites. After completion of the wells, there will be no long-term generation of solid waste products. Therefore, the project will have no impact upon solid waste services.

4. Health Care

Medical facilities are located approximately six (6) miles from the well sites at Maui Memorial Hospital and at various private practices and clinics in Kahului and Wailuku.

The exploratory wells are not anticipated to have an impact upon medical services in terms of service area.

5. Schools

Public schools that serve residents in the Waihee area include Waihee Elementary School, Grades K-5; Maui Waena Intermediate, Grades 6-8; and Maui High School, Grades 10-12.

The exploratory wells are not anticipated to have an impact upon the region's public school system.

D. INFRASTRUCTURE

1. Roadways

Access to the proposed wells is off of Kahekili Highway, a two-lane State highway that provides access from Central Maui to Kahakuloa and further on to Kapalua.

No roadway improvements are proposed as part of the project. In the short-term, during the construction phase, the project may involve a relatively insignificant increase in traffic levels for the region. However, once completed, the wells will have no impact upon local traffic conditions.

2. Wastewater

Wastewater disposal in the Waihee community is accommodated via cesspools or individual wastewater treatment systems such as septic tanks. There are no existing County or private wastewater collection and treatment facilities in this area.

The proposed wells will not have any impact upon the County's wastewater system.
3. Water

As noted in the background section, the Central Maui Water System receives its water from the Iao Aquifer System, which has an assigned sustainable yield of 20 mgd. However, the demand from Central Maui has already reached this sustainable yield and threatens to exceed it in the next few years (Mink and Yuen Inc., 1997). As such, the DWS has initiated the North Waihee Water Source Development Project as a means to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. Preliminary testing and monitoring of the North Waihee Aquifer has indicated that it can adequately supplement the Iao System. It has been estimated that the North Waihee Aquifer project could supply the Central Maui Water System with an additional average yield of 8 mgd.

DWS has completed construction of the transmission lines to connect North Waihee Well Nos. 1 and 2 to the Central Maui Water System. Kupaa Well No. 1 is now in the design/development-planning phase. As part of the County's North Waihee Water Source Project, Kanoa Well Nos. 1 and 2 will provide alternate sources of water for the Central Maui Water System, and as such, should have a beneficial impact upon the Iao Aquifer System by minimizing the potential for over pumping. In addition, the proposed wells will provide valuable data regarding the long-term sustainable yield potential from the North Waihee Aquifer.

4. Drainage

Storm-water runoff generated at the well sites percolates into the ground or sheet flows across the sites from the high points to the low points and eventually into adjacent gulches.

The proposed action involves minimal land alteration activities and will not significantly alter drainage patterns in the area.

Normal erosion control measures during construction should be adequate to control soil loss from the well sites. These measures include the following:

- Leave natural vegetation undisturbed in areas not needed for immediate construction;
- Use sprinklers to control dust; and
- Water down any disturbed areas after drilling activity has ceased for the day and during weekends and holidays.

In addition, access roads to each site will be paved and surrounding vegetation planted to mitigate runoff and erosion during periods of heavy rain. As such, the subject wells are not anticipated to have an adverse affect upon the existing hydrologic conditions, adjoining or downstream properties, or coastal waters.
III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICT

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural" and "Conservation". The subject parcel is within the "Agricultural" District. The proposed project is permitted within the "Agricultural" District.

B. MAUI COUNTY GENERAL PLAN

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter, "The purpose of the General Plan is to recognize and state the major problems and opportunities concerning the needs and the development of the County and the social, economic and environmental effects of such development and set forth the desired sequence, patterns and characteristics of future development."

The proposed action is in keeping with the following General Plan Objective and Policies:

Objective:

To supply an adequate supply of potable and irrigation water to meet the needs of Maui County's Residents.

Policy:

Support the improvement of water transmission systems to those areas that historically experience critical water supply problems provided the improvements are consistent with the water priorities and the County's Water Use Development Plan provisions for the applicable community plan area.

Policy:

Seek new sources of water by exploration in conjunction with other government agencies.

C. WAILUKU-KAHULUI COMMUNITY PLAN

The well sites are located in the Wailuku-Kahului Community Plan region, one of nine Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui
County General Plan. Each Community Plan contains recommendations and standards that guide the sequencing, patterns, and characteristics of future development in the region.

The well sites are designated "Agricultural" by the Wailuku-Kahului Community Plan Land Use Map. The proposed project is consistent with the "Agricultural" designation.

Approval of the proposed request would be consistent with the Wailuku-Kahului Community Plan by addressing the following objectives:

- Coordinate water system improvement plans with growth rates to ensure adequate supply and a program to replace deteriorating portions of the distribution system. Future growth should be phased to be in concert with the service capacity of the water system.

IV. LIST OF ALTERNATIVES

The Department of Water Supply (Department) has studied alternative means of water supply, i.e. surface water treatment and desalinization. Groundwater development remains the most viable alternative for potable water due to the high cost associated with meeting new surface water treatment rules promulgated by the Safe Drinking Water Act, and as experienced during the course of operating several surface water treatment plants currently in use. The Department has also promoted water conservation, wastewater reuse, and non-potable water use.

Wastewater Reuse: The County of Maui has long initiated wastewater reuse measures in the Central Maui Water Service Area. Presently, wastewater reuse is used for irrigation at The Silversword Golf Course, Kalama Park, Kihei Fire Station and Kihei Library, Haleakala Ranch, Dekalb Seed Corn Project, Kihei Waste Water Treatment Plant, Kahului Wastewater Treatment Plant, and for dust control.

Catchment: Rainfall catchment is not a viable alternative in the dry central Maui area where long dry periods occur during the summer.

Conservation: The Department of Water Supply and the County of Maui have already initiated programs to promote conservation measures. The use of low flow fixtures is required by County ordinance for all new construction and renovations. In addition, the Department of Water Supply is engaged in promoting a xeriscape program, leak detection and repair program, and a low flow fixture retrofit program.

Non-potable Sources: Many central Maui parks and golf courses have their own irrigation wells that use predominantly non potable (brackish) water. Sugar growing, the primary agricultural crop in Central Maui, is supported by long developed surface water and non potable water sources.

Despite the active pursuit of the alternatives listed above, the Department needs to initiate additional source development in order to relieve the stress on the Iao Aquifer and to accommodate increased demand for water.
V. OTHER REQUIRED PERMITS AND APPROVALS

In order to proceed with the proposed action, DWS will need approval of a Pump Installation Permit from the Commission on Water Resource Management.

VI. ENVIRONMENTAL ASSESSMENT SIGNIFICANCE CRITERIA

In accordance with Title 11, Department of Health, Chapter 200 and Subchapter 6, Section 11-200-12, Environmental Impact Statement Rules, and based on the detailed analyses contained within this document, the following conclusions are supported:

1. The proposed action will not result in an irrevocable commitment to loss or destruction of natural or cultural resources.

   Analysis. Development of the proposed wells will involve a relatively small area within each respective one-acre site. The proposed sites have been used for cattle grazing for several decades and the proposed action will not affect this use. In addition, the proposed action will relieve stress on the Iao Aquifer System by providing additional source and transmission systems. It is not anticipated that the pumps will run simultaneously, nor continuously, except under emergency conditions. Average daily pumping from current, proposed, and future wells is expected to be about 16 hours, which would produce an average daily yield of approximately 5.4 mgd, depending upon demand. The estimated sustainable yield from the North Waihe'e Aquifer system is 8.0 mgd.

2. The proposed action will not curtail the range of beneficial uses of the environment.

   Analysis. The minimal scope of the proposed action should not have a significant impact upon existing or future land uses in the area. The proposed wells are a permitted use within the State and County Agricultural Districts. As discussed, water drawn from the wells will be used to service the Central Maui Water System, which serves the eastern slopes of the West Maui Mountains, the Central isthmus of Maui, and the lower western slopes of Haleakala. The water will be available to existing and future residential, commercial, and agricultural users.

3. The proposed action will not conflict with State or County long-term environmental policies and goals as expressed in Chapter 344, HRS.

   Analysis. As noted, the purpose of the proposed action is to relieve stress currently being placed upon the Iao Aquifer System and to meet projected demand for residential, commercial, industrial, and agricultural water uses. The proposed wells will obtain all
required permits prior to construction and will comply with all required State and County water quality standards.

4. The proposed action will not substantially affect the economic or social welfare and activities of the community, county or state.

Analysis. The Iao Aquifer System is the primary source of water for Central Maui residents. Unfortunately, the system is now being pumped at or near its sustainable yield. The proposed action will benefit the County of Maui by providing an alternative source of water to supplement the Central Maui Water System; thereby, relieving stress currently being placed upon the Iao Aquifer System, while accommodating future water demand.

5. The proposed action will not substantially affect public health.

Analysis. The proposed wells will be owned and operated by the Department of Water Supply. As noted previously, water samples taken from North Waihee Wells during well testing indicated that disinfection is the only necessary treatment for the water. All applicable State Safe Drinking Water Regulations will be strictly adhered to.

6. The proposed action will not result in substantial secondary impacts.

Analysis. The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards.” As noted, the purpose of the wells is to provide an alternative source of water for the County’s Central Maui Water System; thereby, relieving stress currently being placed upon the Iao Aquifer System. The water will be available to existing and future residential, commercial, and agricultural users. In addition, development of the wells will also provide valuable information regarding the condition of the aquifer system.

7. The proposed action will not involve substantial degradation of environmental quality.

Analysis. The recharge area for the Waihee Aquifer System is about 12 square miles between the Waihee and Kahakuloa Valleys. Presently, there are no known sources of agricultural and industrial pollutant sources in the area that would affect the source. Water quality samples have indicated the North Waihee Aquifer System is free of contaminants. The proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, “Hawaii Well Construction & Pump Installation Standards” to insure that the proposed action does not result in pollutants penetrating the aquifer. In addition, average daily pumping is anticipated
to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield.

8. The proposed project will not produce cumulative impacts and does not have considerable effect upon the environment or involve a commitment for larger actions.

**Analysis.** As noted, the proposed wells will be utilized to supplement the Central Maui Water System, which serves the eastern slopes of the West Maui Mountains, the central isthmus of Maui, and the lower western slopes of Haleakala and includes the communities of Wailuku/Kahului, Waikapu, Maalaea, Kihei/Makena, Waiehu, Waihee, Spreckelsville, Paia/Kaau, Kihei, Maalaea, and Puunene. The proposed wells are necessary to relieve stress being placed upon the Iao Aquifer System, which is being pumped near its sustainable yield, and to accommodate increasing demand arising from projected population growth.

9. The proposed project will not affect a rare, threatened, or endangered species, or its habitat.

**Analysis.** The proposed well sites are located on pasturelands. Natural environmental features, such as plant and animal life, therefore, are reflective of this pastoral setting. Existing vegetation within the well sites include various weeds, grasses, and shrubs. There are no rare, endangered, or threatened species of plants or animal life at the well sites.

10. The proposed action will not substantially or adversely affect air and water quality or ambient noise levels.

**Analysis.** As discussed, the proposed wells will be developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, "Hawaii Well Construction & Pump Installation Standards" to insure that the proposed wells do not result in pollutants penetrating the aquifer. In addition, average daily pumping is anticipated to be approximately 5.4 mgd, depending upon demand, but will not exceed the systems sustainable yield. Surface water resources will not be impacted since there are no perennial streams in close proximity to the well sites. The discharge water from the well tests will be transported and discharged into nearby drainage gulches and will avoid any perennial streams. Inasmuch as there are no surface streams that traverse or border the well sites, the proposed exploratory wells are not anticipated to produce any long-term affect upon the region's surface waters. As noted previously, there are not anticipated to be any adverse air or ambient noise level impacts.

11. The proposed action will not substantially affect or be subject to damage by being located in an environmentally sensitive area, such as flood plain, shoreline, tsunami zone, erosion-prone areas, estuary, fresh waters, geologically hazardous land or coastal waters.

**Analysis.** The proposed wells lie within Flood Zone C, an area of minimal flood and tsunami hazard, as determined by the Flood Insurance Rate Map for this region. A Drainage
and Erosion Control Plan conforming to the Maui County Grading Permit requirements will be prepared to mitigate local flooding and erosion during construction. The proposed project will have no effect upon the existing flood or tsunami areas.

12. The proposed action will not substantially affect scenic vistas or view planes identified in county or state plans or studies.

Analysis. The proposed wells will be situated approximately 650 feet mauka (west) of Kahekili Highway and will not create a significant impact to adjacent property owners or to vehicles traveling along Kahekili Highway. Thus, visual resources will not be significantly affected.

13. The proposed action will not require substantial energy consumption.

Analysis. Electric pumps will be utilized in the proposed wells. It is not anticipated that these pumps will require substantial energy consumption.

VI. FINDINGS AND CONCLUSIONS

The North Waihee Water Source Development Project is intended to relieve stress on the Iao Aquifer System by providing additional source and transmission systems. The development of Kanoa Well Nos. 1 and 2 will provide additional alternatives to service the region’s population and economic centers.

Development of Kanoa Well Nos. 1 and 2 will require clearing, grubbing, grading, installation of pumps, and construction of electrical buildings, fencing and related work. The short-term impacts associated with these activities are not anticipated to have a significant impact upon existing land uses at the sites or in the region.

The project is not anticipated to have any adverse impacts upon any existing environmental features such as flora and fauna, topography, soils, or air quality. The project is not anticipated to have an impact upon archaeological or historical features.

The proposed project will not have an adverse impact upon existing socio-economic conditions nor will it have an adverse effect upon existing public services or infrastructure.

Therefore, as a result of the findings of this report, the proposed project is not anticipated to have any significant environmental impacts and it is anticipated that a "Finding of No Significant Impact" (FONSI) will be made by DWS.
VII. AGENCIES CONTACTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

County of Maui

- Department of Water Supply
- Department of Planning

Private/Public Individual

- Wailuku Agribusiness Co., Inc.
REFERENCES


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FIGURES
HYDROLOGIC UNITS - ISLAND OF MAUI

Source: Department of Water Supply

Kanoa Wells Draft Environmental Assessment
HYDROLOGIC UNIT MAP

FIGURE 3
Kanoa Wells Draft Environmental Assessment
CENTRAL MAUI WATER SYSTEM MAP

Source: Department of Water Supply
KANOA WELL SITE No. 2

EASEMENT "C"

AREA = 1.00 Acres

Source: C. Takumi Engineering, Inc.
Kanoa 1 Site

Kanoa 1 Access Road

Kanoa 2 Site (mauka view)

Kanoa 2 Site (makai view)

Example of a completed well

Kanoa Wells Draft Environmental Assessment
SITE PHOTOS
APPENDIX – A
Archaeological Reconnaissance Surface Survey
SUBJECT: Letter report on a reconnaissance surface survey for a proposed exploratory well (Kupa'a Well No. 1) and an existing monitoring well (Kanoa Well No. 1) site in the North Waihe'e Water Source Development, Phases 6 & 7, Waihe'e, Island of Maui. (TMK: 03-02-01: 03) [Note: Proposed water transmission line easement not finalized.]

An archaeological reconnaissance surface survey was conducted for C. Takumi Engineering, Inc. by Xamanek Researches on 27 March 1997. An earlier field visit was made on 25 March 1997 with Mr. Wade Shimabukuro of C. Takumi Engineering, Inc. to view the study area. The survey was undertaken in order to assess the presence of cultural resources at 2 proposed wells (Kanoa Well No. 1 and Kupa’a Well No. 1) that will eventually feed into the North Waihe’e Water Transmission system.

The first proposed well project (Kanoa Well No. 1) will be located c. 30 to 50 m. from an existing monitoring well. The present monitoring well rests at c. 300 ft. AMSL and the proposed well will likely be situated at a higher elevation. Vegetation in the general vicinity consists of pasture grasses and annual weeds in the low lying areas with moderately dense tree growth covering the surrounding slopes. At least two native plant species observed growing on the slopes include *kukui* (*Aleurites moluccana*) and *'ulei* (*Osteomeles anthyllidofolia*). Kanoa Well No. 1 will not be placed on the slopes where a probable rock feature was noted within c. 100 m. of the existing monitoring well.

The second proposed well project (Kupa’a Well No. 1) will be located in a pasture likely between 630 to 640 ft. AMSL. Two possible areas were inspected (A and B) in this pasture. At location A (c. 635 ft. AMSL), the surface was vegetated with pasture grasses and alien weed species. There was no surface evidence of significant material culture remains in the immediate vicinity. However, a likely site remnant was observed c. 100 m. to the north. It consisted of stacked basalt cobbles and small boulders. A portion of it appears to have been bulldozed in the past. At location B (c. 550 ft. AMSL) the surface was also vegetated with pasture grasses and alien weed species. This second possible location (less favored than A) is near the north boundary of the parcel. A possible site remnant lies at this location. It was covered with lantana and consists of
roughly stacked rocks. Portions of this feature may have been pushed by a bulldozer. No other surface evidence of material culture remains was observed in area B.

Both of the proposed well sites are in relatively open locations. The Kanoa Well No. 1 site will be located in pasture land within 30 to 50 m. of the present monitoring well and away from thick vegetation and the 1 probable rock feature in the vicinity of the existing monitoring well. The exploratory Kupa’a Well No. 1 will likely be drilled at area A in open pasture land. Location B is less favorable and may contain a site remnant. Both Kanoa Well No. 1 and Kupa’a Well No. 1 will eventually feed into the North Waihe’e Water Transmission Line project. Kupa’a Well No. 1 will need to be tested before water transmission line design can be finalized. The following recommendations are based on the results of the reconnaissance surface survey.

**Kanoa Well No. 1**

1. Limited subsurface testing at the inventory level should be undertaken if the permanent well will be placed beyond the area previously cleared for the existing monitoring well.
2. Monitoring of the initial placement of the permanent Kanoa Well No. 1 should be undertaken. Care must be utilized in order to avoid the adjacent areas covered with trees. The possibility exists that 1 or more indigenous sites are contained in the densely wooded areas.

**Kupa’a Well No. 1**

1. Area A is the recommended location for this exploratory well. This portion of the pasture appears to have been bulldozed in the past and has a low probability of containing subsurface cultural materials. Area B may contain a site remnant.
2. Work at the inventory level is recommended for Area B if it is chosen for the exploratory well.

**Future pipeline trench pathways**

1. An archaeological inventory survey is recommended for future transmission lines associated with both Kanoa Well No. 1 and Kupa’a Well No. 1.

Please contact us if you have any questions about this letter report.

Sincerely,

Erik Fredericksen

[Signature]

Erik Fredericksen

c. Sara Collins, SHPD
APPENDIX – B
The North Waihee Aquifer: An Additional Water Source for Central Maui
THE NORTH WAIHEE AQUIFER

AN ADDITIONAL WATER SUPPLY SOURCE FOR CENTRAL MAUI

John F. Mink
Mink and Yuen, Inc.

April 10, 1997

Introduction

The Iao Aquifer System, which for managerial purposes is defined as the region between Waikapu Valley and Waihee Valley, has satisfactorily supplied Central Maui with drinking water since the Mokuhau wells were drilled more than 30 years ago. The aquifer system is large with an assigned sustainable yield of 20 mgd, but demand has already reached this level and threatens to substantially exceed it in the next few years. New sources of drinking water are needed to meet increasing demand.

As the exploitation of the Iao Aquifer was undergoing considerable expansion with the drilling of the Waiehu Heights and Waiehu wells in the late 1970s and the early 1980s, it became evident that additional sources needed to be located and put on line a decade or so in the future. The region north of Waihee Valley was considered a prime
candidate for groundwater production, but at first most attention was given to developing groundwater in East Maui. The East Maui initiative has been delayed, however, by the discovery of pesticides in newly drilled wells and by legal challenges, leaving the North Waihee groundwater resource as the obvious choice for timely additional development.

Construction of a pipeline connecting North Waihee with the Central Maui distribution network is underway, and two potential production wells are in place. The North Waihee Aquifer will be developed in phases, the first of which incorporates the existing wells and the drilling of two new wells. Details of future phases will depend on the behavior of the aquifer in response to pumping following completion of the first phase.

**Relationship Between Iao and North Waihee Aquifer Systems**

After it was recognized that production from the Iao Aquifer System would not be able to match the increasing demand in Central Maui, attention turned to the region north of Waihee Valley as a prospective source of additional groundwater. In 1980 Dan Lum, then hydrologist with the State Department of Water and Land Development (DOWALD), suggested that exploratory drilling be attempted on the slope of the ridge
just north of the Waihee River to test whether the area was an extension of the Iao Aquifer System or could be treated as an independent groundwater province. About at the same time Stephen Bowles, consulting hydrologist, recommended essentially the same course of action. Subsequently John F. Mink was retained by C. Brewer Co., owner of the land, to locate drilling sites and design a drilling and testing program.

Two wells were drilled in 1981 and the groundwater data compared with the original premise that if North Waihee was an uninterrupted extension of the Iao Aquifer System, the head should be at least 15 feet, based on the head at Test Hole A-1 located 4000 feet across the valley to the south, and the corollary that if the head were 5 feet or less, the aquifer would be independent of the Iao System. In fact, the head at the exploratory wells was about 10 feet while the head at Test Hole A-1 was nearly 20 feet. This relationship suggested that the Iao Aquifer System was hydraulically connected to North Waihee but that Waihee Valley behaved as a low permeability impediment to hydraulic continuity. The lack of response of groundwater levels at Test Hole A-1 to pumping at the North Waihee wells further suggested that North Waihee could be treated as a quasi-independent aquifer
The connection between the Iao and North Waihee Aquifer Systems, as well as the dampening effect on hydraulic continuity exercised by the low permeability associated with the alluvium and weathered zone in Waihee Valley, is indicated by comparing the continuous head records at Test Hole A-1 and North Waihee Well 1. The head trace for the test hole is synchronous with that at North Waihee but higher by about 7 feet. If the normal groundwater gradient in basal aquifers of the shield basalts characteristic of every island in Hawaii governed flow, the difference in head would be less than 1 foot. The exaggerated difference is a result of head loss as the groundwater moves through the valley. Global hydraulic conductivity in the valley is at least two magnitudes less than in the unweathered basalt aquifer. A derivation based on Darcy's law indicates that the global hydraulic conductivity of the impediment is about 25 ft./day compared with normal basalt conductivity of 1500 ft./day.

Knowledge of the hydrogeology of both the Iao and North Waihee Aquifer Systems is insufficient to unequivocally establish the pattern of groundwater flow in and from the system.
aquifers. However, assuming that the general direction of groundwater flow in the Iao Aquifer is toward and across Waihee Valley, the North Waihee System would then be recharged by excess groundwater from Iao as well as by recharge from the high rainfall region north of Waihee Valley. As a result, the sustainable yield of the North Waihee System is substantial. Its magnitude, now estimated to be 8 mgd, will be more accurately determined after an operational record of pumping is established. The sustainable yield refers to the entire North Waihee Aquifer System, which extends from Waihee Valley north to Kahakuloa Valley.

Hydrogeology of the North Waihee Aquifer System

In the Iao Aquifer System the basal aquifer in the Wailuku basalt formation is covered by a caprock of sediments extending to approximately 8000 feet inland of the coast. The inland boundary of the basal aquifer is the rift zone lying about 12,000 feet from the coast and approximately parallel to it. Heads are high in the aquifer because the low permeability of the caprock sediments prevent easy discharge of the groundwater.

This sedimentary blanket, which north of Iao Valley is more
than 1200 feet deep at the coast, is truncated at Waihee Valley. North of Waihee the volcanic rock formations reach to the coast; if a sedimentary blanket exists, it lies below sea level and does not play a role in the North Waihee hydrogeology. The absence of sediments north of Waihee Valley suggests that the sector to the south was displaced downward as a result faulting, and that the fault itself is along what is now Waihee Valley. South of Iao Valley the deep sediments continue beyond Waikapu, but are absent where the Isthmus terminates. The faulted block, therefore, is a wedge truncated on the north at Waihee Valley and ending in the south where the isthmus sediments abut the basalt bedrock.

Although a sedimentary caprock does not exist in the North Waihee Aquifer System, nevertheless north of Waihee Valley a caprock composed of a volcanic formation resists drainage from the basal lens into the sea. The formation constituting the aquifer is the Wailuku basalt, a highly permeable medium equivalent to other premium aquifers such as the Koolau basalt of Oahu in its water bearing properties. In the region between Waihee Valley and Waiolai Gulch, and perhaps beyond to Wailena Gulch, the Wailuku basalt is covered by the Honolua formation, a low permeability combination of
andesite and trachyte in which even lower permeability soil and ash layers are stratified. The Honolua averages about 100 feet in thickness and completely caps the Wailuku basalt to the coast and out to sea. This formation behaves as a caprock in the region where the proposed additional groundwater development is to take place. Figure 1 illustrates the geology of the region.

The Honolua formation is a pale tan to gray to white rock, massive and dense with platy cleavage. Individual andesite layers average about 40 feet thick, and trachyte layers are as much as 150 feet thick. In contrast, the primitive basalt of the Wailuku formation is piled in layers normally 10 feet or less thick throughout which many highly permeable clinker layers occur. A weak unconformity separates the Wailuku from the overlying Honolua, but the volcanism that produced these rocks was continuous, though eruptions were less frequent during the extrusion of the Honolua formation. Nowhere in West Maui is the Honolua exploited as an aquifer.

For convenience in classification and management, the North Waihee Aquifer System is defined as the region extending northward from Waihee Valley to Kahakuloa Valley. The basal portion may be disrupted near Makamakaole Valley by massive
Honolua dikes that connect the trachyte eruptive centers at Puu Kukui and Eke at the crest of the West Maui Mountains with trachyte bulbous domes near the coast, such as Puu Olai (Figure 1). Inland the basal sector ends at the rift zone which is about at and parallel to the Forest Reserve boundary 7000 feet from the coast. In the entire North Waihee Aquifer System the sustainable yield is estimated as 8 mgd; between Waihee and Makamakaole it is less.

North Waihee Wells 1 and 2: Drilling and Testing

In 1981 C. Brewer Co. had two wells drilled in its property on the north bank of Waihee Valley. The wells are located about 500 feet from the axis of the valley and 5200 feet inland from the valley mouth at Waihee Point. The purpose of drilling was exploratory, to determine aquifer characteristics, ground water levels and quality, but the wells were constructed and completed for use as production wells. The locations of wells in the North Waihee Aquifer System is given in Figure 2.

The wells were located to avoid a deep section of valley fill sediments. They were driven from elevation 280 feet through 100 feet of talus into the the Wailuku basalt. The Honolua formation is missing at this level on the slope of
the ridge. The initial head was 9 to 10 feet, which was higher than expected if the aquifer were independent of the Iao Aquifer System to the south yet lower if it were connected. At the time the head at Test Hole A-1, 4000 feet to the south in the Iao Aquifer, was 20 feet during periods of low to no pumping at the Mokuau and Waiehu wells.

Each well was drilled to 105 feet below sea level (BSL) and fitted with 16 inch diameter blank casing to 5 feet BSL, and screen between 5 and 25 feet BSL. The remaining 80 feet was left open.

The pump test in 1982 employed North Waihee 2 as the pumping well and North Waihee 1 as an observation well. The wells are on a line parallel to the valley, 176 feet apart. A continuous 48 hour test at a rate of 1700 gpm (2.45 mgd) was performed. Analysis of the test results determined the transmissivity of the aquifer as 325,000 sq.ft./day and the storage coefficient as .25. Salinity of the pumped water was very low and constant at 15 mg/l chloride. No effect on the head at Test Hole A-1 could be detected, nor were any boundary effects indicated by the drawdown curve.

The test proved the occurrence of a substantial groundwater
resource north of Waihee Valley, and the results implied that the connection with the Iao Aquifer System was weak. The wells were capped. Interest in them flagged because draft in the Iao Aquifer System was still significantly less than the assigned sustainable yield.

Interest was rekindled in 1989 when Iao pumpage began to approach sustainable yield. A longer test with expanded data collection opportunities was designed. An observation well was drilled in Kanoa Valley about 2000 feet north of the North Waihee wells and equipped with a continuous water level recorder. An existing small diameter well in Wailena, 13,500 feet north of the North Waihee wells, was also equipped with a continuous water level recorder. The Wailena well had been drilled in 1987. Test Hole A-1 and North Waihee Well 1 also had continuous water level recorders. North Waihee 2 was selected as the pumping well. Another well in the region, the Mendes well (Figure 2), was not available for measurements. This well has a 4 inch diameter casing and is fitted with a 5 HP pump capable of yielding 20 to 30 gpm. It is infrequently pumped.

Ground elevation at the Kanoa observation well is 305 feet. The drilling log places the Honolua/Wailuku contact at depth
248 feet (57 feet ASL). The initial head was 12.4 feet. The Wailena well ground surface is at 608 feet, and the well lies at the inland turn of the road nearly on the axis of the valley. The Honolua formation is absent in Wailena, and the well penetrated only the Wailuku basalt. The initial head at completion of drilling in 1987 was 6.4 feet while just before commencement of the test it was 6.6 feet. At the start of the test head in North Waihee 1 was 11.5 feet and in North Waihee 2 it was 10.7 feet. At Test Hole A-1 in the Iao Aquifer System the head was 18.1 feet. Heads at Kanoa and North Waihee were inconsistent with a flow net that would have groundwater passing northward from Waihee Valley toward Makamakaole as might be interpreted if flow crossed Waihee Valley from Iao to North Waihee.

The pump test lasted four days, from May 15 to May 19, 1989. The average rate of pumping over the 96 hours was 2400 gpm (3.46 mgd). Drawdown in North Waihee 2, the pumping well, stabilized at 5.5 feet, and in North Waihee 1, 176 feet away, it reached 0.7 feet. At the Kanoa observation well drawdown peaked at 0.4 feet. Tidal efficiency at Kanoa is high because the well lies just 2000 feet from the coast, and the range and distribution of drawdowns on the chart reflected this efficiency. At Wailena and Test Hole A-1 no
change in head attributable to the pumping could be detected. The drawdown curves for North Waihee 1 and Kanoa did not indicate the presence of flow boundaries.

The test results were evaluated both graphically and by computer program to yield values for the fundamental aquifer properties of transmissivity and storage coefficient (effective porosity). At North Waihee 1 transmissivity computed from drawdown data was 320,000 sq.ft./day and storage coefficient .30, about the same as that determined for the 1982 test. The Kanoa data was not as easily interpreted because of the imposition of the tidal signal on the drawdown values. Transmissivity fell between 260,000 and 334,000 sq.ft./day and storage coefficient between .013 and .034. The transmissivity values are consistent with those obtained at North Waihee 1, but the storage coefficient values are a magnitude lower. At the North Waihee wells the computed storage coefficients may represent local phenomena, whereas the values determined at Kanoa may reflect a regional characteristic. For planning the arrangement of a well field the smaller storage coefficient is likely to be more realistic than the larger one. In the Pearl Harbor region of Southern Oahu, for example, where the Koolau formation resembles the Wailuku basalt the regional storage
coefficient is about .05.

For predictive purposes a transmissivity of 325,000 sq.ft./day and coefficient of storage of .05 will be employed. The transmissivity is representative of a highly permeable aquifer having a substantial depth of fresh water flow. Assuming a hydraulic conductivity of 1500 ft./day, which is a value typical of primitive basalts like the Wailuku formation, and accepting the Ghyben-Herzberg relationship that depth below sea level to the 50 percent sea water isochlor is 40 times the head, the thickness of the fresh water core is calculated as 217 feet and that of the upper limb of the transition zone as 40*h - 217 (e.g. for a 10 feet head the upper limb would be 183 feet thick). The calculated thickness of the fresh water core is further constrained by the assumption that the groundwater flow contributing to transmissivity is restricted to this zone. These assumptions lead to approximate, not accurate, estimates of zonation in the basal lens. Nevertheless it is clear that the fresh water core is thick because even under the intense stress of pumping 3.46 mgd from a single well the salinity of the pumped water did not increase.
Proposed Development of the North Waihee Aquifer

The first phase of the North Waihee groundwater development program calls for activation of the two existing North Waihee wells and drilling two new wells. The existing wells were completed to construction standards meeting both the Department of Health and Commission on Water Resources Management recommendations. One of the new wells, Kupaa 1, will be located at an elevation of approximately 575 feet near the C. Brewer Co. property boundary line on a slope inland of Kahekili Highway. The other, Kanoa 1, will be drilled about 75 to 100 feet inland of the existing Kanoa monitor well.

The North Waihee wells are 16 inch diameter (casing) and bottom at 105 feet BSL. The new wells also will be completed as 16 inch diameter wells after testing proves acceptable production capability. However, the first stage in the drilling protocol for the new wells will consist of a pilot hole driven to 50 feet BSL into which a pump can be lowered for a preliminary test. An option will be included to drill deeper in 25 feet increments if results of the preliminary test fail to predict adequate production.

General specifications and the drilling protocol for the two
new wells are as follows.
1. Drill pilot hole to depth 50 feet BSL.
2. Conduct preliminary pump test in open hole; duration two hours or less.
3. Option to deepen drilling in 25 feet increments if preliminary tests fail to show sufficient production capability.
4. At selected depth, ream boring so it can hold 16 inch diameter casing while allowing for a 3 inch annular space for grouting.
5. Conduct another preliminary test of a few hours duration.
6. Select length of blank casing on basis of preliminary tests.
7. Screen is optional; at most, 10 to 20 feet of screen, the remainder of boring open hole.
8. Grout to water table, which is expected to lie about 10 feet above sea level.

Although the North Waihee 2 well was tested for a continuous run of 96 hours at 3.46 mgd, this rate is about twice that allowable for a production well. Upon reviewing the results of the pumping tests of 1982 and 1989, the preliminary recommendation was to fit the wells with 2 mgd (1390 gpm) pumps. This recommendation envisioned a single well field
comprising two wells in the North Waihee Aquifer. Expansion to more than two wells justifies a more prudent recommendation of 1.5 mgd (1040 gpm) per well. The new wells will be tested to determine whether a 1.5 mgd pump would be appropriate, but final pump size will depend on the results of the long term continuous test.

Total well capacity will be 6.0 mgd if each of the four wells is fitted with a 1.5 mgd pump. A scenario in which one of the existing North Waihee wells serves as an inactive stand-by but the other three wells are producers, and assuming that a peaking factor of 1.5 times average output is exercised for the three active wells, average production will total 3.0 mgd. If the capacity of the inactive well is included, the average output will be 4.0 mgd. Whether or not the North Waihee Aquifer between the C. Brewer Co. property line and Waihee Valley can sustain an average yield of 4.0 mgd is not predictable until a record of the effects of pumping operations on water levels and the quality of the pumped water accumulates.

The proposed location of Kupaa 1 is 1000 feet from the Mendes well and 2 miles south of the new Wailena well. At the time of testing the Wailena well had a 4 inch diameter
casing. In 1994 a new well with 6 inch diameter casing was drilled and successfully tested at 200 gpm. Pumping at Kupaa and Kanoa should not affect the Wailena well because of its distance from the proposed wells. The capacity of the Mendes well is too small for either the quality or quantity of its pumpage to be affected.
APPENDIX - C
DRAFT EA COMMENT LETTERS
AND RESPONSES
Mr. Michael J. Summers
Chris Hart and Partners
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

Dear Mr. Summers:

SUBJECT: Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04), Draft Environmental Assessment

FILE NO.: 97-023

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county’s Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer’s acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.

[ ] We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

1) Please be advised of our naming convention for these wells to avoid confusion. The original North Waihe’e Water Source Development Plan called for four wells, which originally were anticipated to be in the same general vicinity. The first two wells were alternatively known simply as “Waihe’e Wells” 1 & 2, very similar to nearby private wells (Waihe’e Tunnels 1 & 2, Well Nos. 5434-01 & 02; and “Waihe’e” (Marino) Wells, of which there may be two or three, Well Nos. 5531-04, for which we have drilling information, and Well Nos. 5531-05 and/or 06, for which permits have expired without any well completion information). It became apparent that the North Waihe’e site could only support two wells, and not at the original hoped-for capacity. Two new sites were identified, which are now called Kanoa #1 and Kupaa #1 (Well Nos. 5731-02 & 03), rather than their original designations as North Waihe’e 3 & 4. Subsequently, Maui Board of Water Supply has applied for and received a permit approval for the construction of a second Kanoa Well (Kanoa #2, Well No. 5731-04).

2) The pump tests for the Kanoa #1 and Kupaa #1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd. Our staff will base our pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

If there are any questions, please contact Charley Ice at

Sincerely,

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

RE: Kanoa Wells 1 & 2, Draft Environmental Assessment (Well Nos. 5731-02 & 04)  

Dear Ms. Nishioka,

Thank you very much for your comments dated September 24, 1999, regarding the above-referenced Draft Environmental Assessment.

We have incorporated your comments regarding State Well Nos. and pumping capacity at Kanoa Well No. 1 and Kupaa Well No. 1 into the Final Environmental Assessment for the reader’s clarification.

Should you have any questions, Please call our Engineering Division at 808- or Mr. Rory Frampton of Chris Hart & Partners at .

Sincerely,

David R. Craddick  
Director  

Cc: Mr. Herbert Kogasaka, DWS Engineering Div.  
Mr. Carl Takumi, Takumi Engineering, Inc.  
Mr. Rory Frampton, Chris Hart & Partners  

"By Water All Things Find Life"
October 22, 1999

Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 South High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Subject: Draft Environmental Assessment for the North Waihee Water Source Development, Kanoa Well Nos. 1 and 2, Maui

Thank you for the opportunity to review the subject document. We have the following comments and questions.

1. Please provide data on the anticipated depth of the wells and the water surface elevation of the basal aquifer.

2. In some instances, a well is developed by private financing, the transfer of public lands to government or private developers, or in return for a water allocation credit to supply an urban development. The EA should include a full discussion of any institutional, financial or land use arrangements or commitments related to developing the well and delivering water to end users.

These arrangements may include the formation of public utility companies and subsequent rate-setting, the establishment of county water commitments, the co-funding of state or county water system development, an executive order or other set-aside of state lands, and purchase of land or easements by public entities.

Any or all of these arrangements and all permits or governmental approvals required to fulfill these commitments should be listed.
If you have any questions please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

c: Chris Hart and Partners
November 9, 1999

Ms. Genevieve Salmonson
Director
State of Hawaii
Office of Environmental Quality Control
235 South Beratania Street, Suite 702
Honolulu, Hawaii 96813

RE: Draft Environmental Assessment for the North Waihee Water Source Development Project, Kanoa Well Nos. 1 and 2

Dear Ms. Salmonson:

Thank you very much for your comments dated October 26, 1999, regarding the above-referenced Draft Environmental Assessment.

1. Anticipated well depth and depth of groundwater.

   Kanoa Well No. 1 -- The well is situated at approximately 310 feet above mean sea level (msl) and has been drilled 359 feet below ground surface, or about 50 feet below msl. The water surface elevation of the basal aquifer is at elevation 7.93 feet above msl.

   Kanoa Well No. 2 -- The well is situated at approximately 275 feet above msl and will be drilled approximately 325 feet below ground surface, or about 50 feet below msl.

2. Institutional, financial, or land use arrangements.

   The Board of Water Supply, County of Maui, will finance both wells. Upon completion, the Maui County Department of Water Supply will operate and

"By Water All Things Find Life"
maintain the facilities. There will be no water allocation credits, institutional, financial, or land use arrangements or commitments related to developing the wells and delivering water to end-users. The landowner is Wailuku Agribusiness, Inc. and the Board of Water Supply has a perpetual easement for the wells and their appurtenances.

Should you have any questions, Please call our Engineering Division at 808- or Mr. Rory Frampton of Chris Hart & Partners at

Sincerely,

David R. Craddick  
Director

Cc: Mr. Herbert Kogasaka, DWS Engineering Div.  
Mr. Carl Takumi, Takumi Engineering, Inc.  
Mr. Rory Frampton, Chris Hart & Partners
Mr. Michael Summers  
Chris Hart & Partners  
1955 Main Street, Suite 200  
Wailuku, Hawaii 96793

Dear Mr. Summers:

RE: Draft Environmental Assessment (DEA) for the North Waihee Water Source Development Kanowa Well Nos. 1 and 2

Thank you for the opportunity to comment on this DEA. We have reviewed the document and have no comments to offer at this time.

If you have any questions, please contact Mr. William Spence, Staff Planner, of this office at

Very truly yours,

JOHN E. MIN  
Planning Director

JEM:WRS:cmb  
c: Clayton Yoshida, AICP, Deputy Director of Planning  
William Spence, Staff Planner  
General File  
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PART II.
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(PART II.
(PART II. (TEMPORARY) PUMP INSTALLATION REPORT

20. Pump Installation Company: Roscoe Moss HI, A Division of Beylik Drilling, Inc.
21. Name of person performing work: Mole, John
22. Date Pump Installation Completed: 03/07/00
23. PUMP INSTALLATION:
   Pump Type, Make, Serial No.: Byron Jackson, 12MQ, 5 STG
   Capacity: 870 gpm
   Motor type, H.P., Voltage, rpm: G.E. 150 H.P.
   Depth of Pump Intake Setting: 328 ft. below Ground, which elevation is -19 ft.
   Depth to bottom of airline: 315 ft. below Ground, which elevation is -5 ft.
   Pumping Head: 420 ft.
   Type of flow meter: Signet which measures in gpm.
24. As-built drawings attached? Yes X No
25. Other remarks/comments: (See below)

Pump Installation Contractor (print)  Beylik Drilling Inc.  C-57 Lic. No.  C-21896
Signature  
Date 4/17/00

Applicant (print)  Department of Water Supply
Signature  COUNTY OF PAUT
Date 4/17/00

8.(cont'd) DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Water Level Dates (ft.)</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks, Dates</th>
</tr>
</thead>
<tbody>
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</table>

STATE OF HAWAII
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

(Check Appropriate Box) □ Well Construction □ (Permanent) Pump Installation

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 808-586-8800 or Extension 70225.

1. State Well No.: 5731-02 Well Name: Kānoa Well Island: Maui
2. Location/Address: North Waihe'e, Wailuku Tax Map Key: 3-2-1:3

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: __________________________
4. Name of driller who performed work: __________________________
5. Type of rig/construction: __________________________
6. Date(s) Well Construction and pump tests (if any) completed: __________________________
7. GROUND ELEVATION (referenced to mean sea level, msl): _________ ft.
   Well Bench Mark (description/location): __________________________
   Elevation(msl): _________ ft.
8. DRILLER’S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.) Rock Description, Water Level, Dates, etc. Depths (ft.) Rock Description, Water Level, Dates, etc.
   _______ to _______ _______ to _______
   _______ to _______ _______ to _______
   _______ to _______ _______ to _______
   (If more space is needed, continue on back.)
9. Total depth of well below ground: _________ ft.
10. Hole size: _______ inch dia. from _______ ft. to _______ ft. below ground
     _______ inch dia. from _______ ft. to _______ ft. below ground
     _______ inch dia. from _______ ft. to _______ ft. below ground
11. Casing installed: _______ in. I.D. x _______ in. wall solid section to _______ ft. below ground
     _______ in. I.D. x _______ in. wall perforated section to _______ ft. below ground
12. Annulus: Grouted from _______ ft. below ground to _______ ft. below ground
     Gravel packed from _______ ft. below ground to _______ ft. below ground
13. Initial water level: _______ ft. below ground. Date and time of measurement: __________________________
14. Initial chloride: _______ ppm Date and time of sampling: __________________________
15. Initial temperature: _______ °F Date and time of measurement: __________________________
16. PUMPING TESTS: Reference Point (R.P.) used: __________________________, which elevation is _________ ft.
   (1) Step-Drawdown Test Date __________________________
   Start water level _______ ft. below R.P.
   End water level _______ ft. below R.P.
   (2) Long-term Aquifer Test Date __________________________
   Start water level _______ ft. below R.P.
   End water level _______ ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs (1/96 LTAT Form) attached? __ Yes __ No
18. As-built drawings attached? __ Yes __ No
19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) __________________________ C-57 Lic. No. __________________________
Signature __________________________ Date __________________________

Surveyor (print) __________________________ Lic. No. __________________________
Signature __________________________ Date __________________________

Applicant (print) __________________________
Signature __________________________ Date __________________________
PUMP INSTALLATION PERMIT
Kanoa #1 Well (Well No. 5731-02)

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the pump installation for Kanoa #1 Well (Well No. 5731-02) at, Kanoa, North Waihee, 3-2-1:3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1200 gpm capacity, or less, pump in the well.

3. The permittee shall provide and maintain an approved meter or other appropriate means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly/annual basis, on forms provided by the Chairperson (attached).

4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

5. The permittee shall complete and submit as-built drawings and Part II - (Permanent) Pump Installation Report of the Well Completion Report (attached) to the Chairperson within sixty (60) days after completion of work.

6. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

7. The pump installation permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97). If the HWCPIS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.

8. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the pump installation permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

9. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

10. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.

11. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 27, 1999
Expiration Date: September 27, 2001

TIMOTHY E. JOHNS, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the pump installer have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day starting from the permit date of approval.

Permittee’s Signature: [Signature]
Date: 4/17/00

Printed Name: DAVID CRADDICK
Firm or Title: Director of Water Supply

Installer’s Signature: [Signature]
Date: 4/19/01

Printed Name: WILLIAM C. MOORE
C-57, C-57a, or A License #: C-21896

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments
c. USGS
Department of Health/ Safe Drinking Water & Wastewater Branch
May 5, 2000

Mr. Timothy Johns, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: Pump Installation Permit
Kanoa #1 Well (Well No. 5731-02)

We are submitting the pump installation permit completion report for a temporary pump to be used until the permanent installation can be completed.

If there are any questions please call me at [Redacted]

Sincerely,

David R. Craddick
Director

enc
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, Hawaii 96793  

Dear Mr. Craddick:

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)  

Enclosed are two (2) originals of your approved Pump Installation Permit for the captioned well(s) that authorize permanent pump installation work for your well(s). As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 11:

**Special Conditions**

1. None

The permittee is responsible for all conditions of the permit. This includes ensuring that the pump installation contractor, or other party who installs the pump, submits a completed Part II of the Well Completion Report form (enclosed) within sixty (60) days after the pump installation work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions starting from the permit approval date.

To validate your pump installation permit, please sign and have the contractor sign both permit originals and return one for our files. A copy of the Well Completion Report (Part II) and a copy of your water use report form are enclosed for your use.

**IMPORTANT** - Unless specifically exempted, pump installation may not proceed without a validated permit returned to the Commission. Except for the monthly water use report form, please provide copies of all the information in this packet to your pump installation contractor.

Finally, this letter is notice that we have accepted your Well Completion Report - Part I as complete.

If you have any questions, please call the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Aloha,

TIMOTHY E. JOHNS  
Chairperson

Enclosure
TO: BAUER, G.  
INIT:  
TO: LUM, A.  
INIT:  
FOR: Approval  
PLEASE: See Me  

TO: CHING, F.  
INIT:  
TO: NAKAMA, L.  
INIT:  
FOR: Signature  
PLEASE: Review & Comment  

TO: DANBARA, S.  
INIT:  
TO: NAKANO, D.  
INIT:  
FOR: Information  
PLEASE: Take Action  

TO: FUJII, N.  
INIT:  
TO: NISHIOKA, L.  
INIT:  
FOR:  
PLEASE: Type Draft  

TO: HARDY, R.  
INIT:  
TO: OHYE, M.  
INIT:  
FOR:  
PLEASE: Type Final  

TO: HIRANO, E.  
INIT:  
TO: SAKODA, E.  
INIT:  
FOR:  
PLEASE: File  

TO: ICE, C.  
INIT:  
TO: SUBIA, S.  
INIT:  
FOR:  
PLEASE: Xerox copies  

TO: IMATA, R.  
INIT:  
TO: UYENO, D.  
INIT:  
FOR:  
PLEASE:  

TO: JINNAI, R.  
INIT:  
TO: YODA, K.  
INIT:  
FOR:  
PLEASE:  

TO: KUNIMURA, I.  
INIT:  
TO:  
INIT:  
FOR:  
PLEASE:  

---

The translated AP for Kuma (5781-03) received (what about Kuma (5781-02) redraction letter?) of draft approval.

should we have also submitted Kuma 2 (5781-04) if

as needed (53 requirements, I know we already asked for
who is still previous's only draft as shown)
TO: Commission on Water Resource Management  
1151 Punchbowl Street, Room 227  
Honolulu, Hawai‘i 96813  
Phone ________ FAX ________

DATE: November 29, 1999

PROJECT: Final EA for Kanoa Wells Nos. 1 and 2

SUBJECT: Final EA

THE FOLLOWING ARE ENCLOSED:
( ) FOR APPROVAL  (X) FOR YOUR USE  ( ) AS REQUESTED
( ) FOR YOUR REVIEW AND COMMENT  ( ) FOR YOUR INFORMATION  ( ) OTHER

COPIES / DATE / DESCRIPTION
1 / November 29, 1999 / Final Environmental Assessment

REMARKS:

Enclosed is one (1) copy of the Draft Environmental Assessment for your use.

Should you have any questions, please call me at ________

COPY TO: Project File

BY: Michael J. Summers
November 16, 1999

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P. O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Craddick:

SUBJECT: PUBLIC WATER SYSTEM NO. 212, Wailuku
KANOA WELL NO. 1
STATE WELL NO. 6-5731-02

We have completed our review of the engineering report submitted for the Kanoa Well No. 1, State Well No. 6-5731-02, prepared by Carl Takumi Engineering, Inc. dated August 1999, water quality data submitted on September 30, 1999 and supplemental information submitted on October 19, 1999. The Department of Health hereby grants conditional approval for the use of the Kanoa Well No. 1 as a drinking water source for a public water system. In addition, the use of this well as a drinking water source shall be subject to the following conditions:

1. The Kanoa Well No. 1, State Well No. 6-5731-02, shall deliver potable water of the quality in compliance with Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Related to Potable Water Systems." The water quality shall be subject to verification by the Department of Health.

2. The Maui Department of Water Supply, in its operation of the Kanoa Well No. 1, State Well No. 6-5731-02, shall comply with all other relevant provisions of Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Related to Potable Water Systems."

3. The Maui Department of Water Supply shall notify the Department of Health of any condition that may arise or be revealed which may contaminate the source and pose a threat to human health.
4. The Maui Department of Water Supply shall notify the Safe Drinking Water Branch of the planned well activation date(s), at least ten (10) days in advance. This will help the Department incorporate the well into its monitoring schedules.

5. The Kanoa Well No. 1, State Well No. 6-5731-02, shall be installed with sampling tap located prior to the point of disinfection.

6. The Maui Department of Water Supply shall provide adequate disinfection to Kanoa Well No. 1, State Well No. 6-5731-02, on a continuous basis based on information that indicates a potential microbiological problem.

7. Immediately prior to or upon startup, the Maui Department of Water Supply shall resample the Kanoa Well No. 1, State Well No. 6-5731-02, to retest for barium, chromium, fluoride, and nitrate to confirm the presence of these contaminants. A laboratory approved by the Hawaii Department of Health, State Laboratories Division, using EPA approved drinking water methods must perform the analyses. At a minimum, the chains of custody and laboratory reports need to be submitted. In the event that the presence of these contaminants is confirmed, the Maui Department of Water Supply will issue a press release.

8. The Maui Department of Water Supply must sample and analyze the Kanoa Well No. 1, State Well No. 6-5731-02, for all required contaminants that are not analyzed by the Department of Health, State Laboratories Division.

Presently, the Department of Health cannot analyze the following EPA regulated contaminants:

- 2,4-D
- Cyanide
- Benzo(A)Pyrene
- Dalapon
- Di(ethylhexyl)-Adipate
- Di(ethylhexyl)-Phthalate
- Dinoseb
- 2,3,7,8-TCDD (Dioxin)

- Diquat
- Endothall
- Pentachlorophenol
- Picloram
- 2,4,5-TP (Silvex)

Please note that the drinking water regulations are frequently revised and the preceding list may be subject to change.
9. It is also important to note that the drinking water well may affect future development plans. Hawaii Administrative Rules, Title 11, Chapter 23, "Underground Injection Control", prohibits the siting of an injection well within 1/4 - mile of any drinking water well. In addition, Hawaii Administrative Rules, Title 11, Chapter 62, "Wastewater Systems" requires septic tank effluent disposal systems (page 9, section 4.e.4) to be located at least 1,000 feet from the drinking water well.

10. Hawaii Revised Statutes, Chapter 340E-24, requires suppliers of water to notify the Department of Health, in writing, of any previously undetected chemical contaminant found in a source of drinking water, within seven days of the positive detection.

The Department of Health reserves the right to suspend or revoke this conditional approval upon either a finding of violation on any of the above conditions or a determination of a threat to public health from factors which may arise in the future.

Thank you for your attention and concern to these matters. If you should have any questions, please contact Ms. Queenie Komori of the Safe Drinking Water Branch, Engineering Section, at [blank]

Sincerely,

THOMAS E. ARIZUMI, P.E., CHIEF
Environmental Management Division

QK:la

C: SDWB Monitoring Section
SDWB Enforcement Section
Charlie Ice, DLNR, CWRM
Stuart Yamada, SDWB Engineering Section
Mr. Michael J. Summers  
Chris Hart and Partners  
1955 Main Street, #200  
Wailuku, HI 96793  

Dear Mr. Summers:

Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04)  
Draft Environmental Assessment, File No. 97-023

It is our understanding from phone calls with John Mink and Carl Takumi that there is some concern over our comment on the Environmental Assessment for the captioned wells. We had stated that "pump tests for the Kanoa 1 and Kupaa 1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd". This comment was made to recognize results of pump testing rather than to infer any limits to average pumping from these wells. Our staff based its pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

We recognize that installed pump capacity is determined by several factors, and that daily pumpage might fluctuate higher and lower than the average. Rated pump capacity is typically greater than the anticipate average pumpage, and the approved permit, in fact, allows installation of a 1200 gpm capacity pump, with a daily pumpage capacity far greater than 1.15 mgd.

If you have any questions, please call Charley Ice at [redacted] or toll-free at [redacted] extension 70251.

Sincerely,

[Signature]

LINNEL T. NISHIOKA  
Deputy Director

Cl:ss

c: John Mink  
Carl Takumi
A wells w/ incomplete report held up PIP: Wai'iu (Hana) "A" damaged, covered; no pump, may become monitor well (still no WCR); Waipu'ka #2 (herby OK); Wai'kapu Mauka (still no WCR: "imminent"); Maui H.S. sealing difficulties, still no WCR.
Ms. Linnel T. Nishioka, Deputy Director  
Commission on Water Resource Management  
Department of Land and Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Ms. Nishioka:

Subject:  Kanoa Well No. 1 (Well No. 5731-02)

Attn:  Charles Ice

To complete the inquiry on the Kanoa Well No. 1 (well No. 5731-02), we are enclosing the well completion report for Waipuka Well No. 2 (Well No 5339-02).

Your consideration in accepting the Pump Installation Permit application for Kanoa Well No. 1 (Well No. 5731-02). If there are any questions, please call our Engineering Division at

Sincerely,

David R. Craddick  
Director

hk
October 19, 1999

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

Dear Ms. Nishioka:  

Subject: Kanoa Well No. 1(Well No. 5731-02)  

In reference to your request for status of the various wells, our comments as follows:  

1. The Waiiku Well “A” was removed, but because of some structural damage or failure, we have not installed the pump. The well is covered and plans are being made in anticipation of replacing it in the proximity. We may want to use this as a possible monitoring well, at least temporarily, until the replacement well is developed. At this time we do not anticipate installing a pump at this well. We will update you as soon as some decision on its disposition is made. 

2. The Waipuka Well No. 2 well completion report will be filed. 

3. We request a two month extension from now to seal the Maui High School Well (Well No. 5420-01). The pump is stuck in the well and has to be taken out or otherwise sealed. 

4. The Waikapu Mauka Well was previously addressed in a separate letter. 

Your consideration on the above request is greatly appreciated. If there are any questions, please call our Engineering Division at [redacted] 

Sincerely, 

David R. Craddick  
Director  

hk  

"By Water All Things Find Life"
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)

Enclosed are two (2) originals of your approved Pump Installation Permit for the captioned well(s) that authorize permanent pump installation work for your well(s). As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 11:

**Special Conditions**

1. None

The permittee is responsible for all conditions of the permit. This includes ensuring that the pump installation contractor, or other party who installs the pump, submits a completed Part II of the Well Completion Report form (enclosed) within sixty (60) days after the pump installation work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions starting from the permit approval date.

To validate your pump installation permit, please sign and have the contractor sign both permit originals and return one for our files. A copy of the Well Completion Report (Part II) and a copy of your water use report form are enclosed for your use.

**IMPORTANT** - Unless specifically exempted, pump installation may not proceed without a validated permit returned to the Commission. Except for the monthly water use report form, please provide copies of all the information in this packet to your pump installation contractor.

Finally, this letter is notice that we have accepted your Well Completion Report - Part I as complete.

If you have any questions, please call the Commission staff at [redacted] or toll-free at [redacted] extension 70251.

Aloha,

TIMOTHY E. JOHNS  
Chairperson

Enclosure
PUMP INSTALLATION PERMIT
Kanoa #1 Well (Well No. 5731-02)

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management’s Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the pump installation for Kanoa #1 Well (Well No. 5731-02) at Kanoa, North Waihee, Maui, TMK 3-2-1-3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson to the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified in writing, at least two (2) weeks before any work covered by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.

2. The pump installation permit shall be for installation of a 1200 gpm capacity, or less, pump in the well.

3. The permittee shall provide and maintain an approved meter or other means for measuring and reporting withdrawals and water levels, and appropriate devices or means for measuring chlorides and temperature. These data shall be measured monthly and reported to the Commission on a monthly/annual [choose reporting period] basis, on forms provided by the Chairperson (attached).

4. The proposed use shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to pump water from a well shall not constitute a determination of correlative water rights. The permittee is notified and by this provision understands that the quantity of water taken from the well could be reduced by the Commission in the future. This permit is not a commitment that the pump capacity permitted here or even some lesser amount is guaranteed in the future.

5. The permittee shall complete and submit as-built drawings and Part II - (Permanent) Pump Installation Report of the Well Completion Report (attached) to the Chairperson within sixty (60) days after completion of work.

6. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

7. The pump installation permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97). If the HWCPIS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.

8. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the pump installation permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

9. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

10. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.

11. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 27, 1999
Expiration Date: September 27, 2001

TIMOTHY E. JOHNS, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the pump installer have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day starting from the permit date of approval.

Permittee’s Signature: ________________________________ Date: __________
Printed Name: ________________________________ Firm or Title: ________________________________

Installer’s Signature: ________________________________ C-57, C-57a, or A License #: __________ Date: __________
Printed Name: ________________________________ Firm or Title: ________________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachments:
C: USGS
Department of Health/ Safe Drinking Water & Wastewater Branch
COMMISSION ON WATER RESOURCE MANAGEMENT

FROM: [Signature]
DATE: 29 Sep 79
SUSPENSE DATE:

TO: BAUER, G.   INIT: [Init Initial]   TO: LUM, A.   INIT: [Init Initial]   FOR: Approval
CHING, F.   INIT: [Init Initial]   TO: NAKAMA, L.   INIT: [Init Initial]   Signature
FUJII, N.   INIT: [Init Initial]   TO: NAKANO, D.   INIT: [Init Initial]   Information
HARDY, R.   INIT: [Init Initial]   TO: NISHIOKA, I.   INIT: [Init Initial]   Information
HIGA, D.   INIT: [Init Initial]   TO: OHYE, M.   INIT: [Init Initial]   Information
HIRANO, E.   INIT: [Init Initial]   TO: SAKODA, E.   INIT: [Init Initial]   Information
ICE, C.   INIT: [Init Initial]   TO: SUBIA, S.   INIT: [Init Initial]   Information
IMATA, R.   INIT: [Init Initial]   TO: SWANSON, S.   INIT: [Init Initial]   Information
JINNAI, R.   INIT: [Init Initial]   TO: UYENO, D.   INIT: [Init Initial]   Information
KUNIMURA, I.   INIT: [Init Initial]   TO: YODA, K.   INIT: [Init Initial]   Information

GILL 5731-243.pip

[Handwritten note:]

Charley, please see me on this.

[Handwritten note:]

Agreed not to list spec rooms.

Need to discuss w/gloom - I don't understand how we arrived at 6.65 yd/gal figure. Upcoming well interference, depth of well etc.?
Mr. David Craddick, Director  
Department of Water Supply  
County of Maui  
200 S. High Street  
Wailuku, HI 96793  

Dear Mr. Craddick:  

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)  

We have received your pump installation permit application for the Kanoa #1 Well (Well No. 5731-02). However, matters which must be addressed before we accept your application as complete are as follows:  

1. The Pump Installation Permits for two wells expired without a well completion report being filed:  
   a. Wakiu (Hana) Well "A" (Well No. 4600-02)  
   b. Waipuka Well #2 (Well No. 5339-02)  

2. The Well Construction Permits for two wells that have expired without a well completion report being filed:  
   a. Waikapu Mauka Well (Well No. 5131-01)  
   b. Maui High School Well (Well No. 5420-01) (to be sealed).  

Please provide information on the status of these projects, and well completion reports, if applicable. Upon receipt of this information, we will accept your application as complete and you can then expect your application to be processed within ninety (90) days.  

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at [redacted] or toll free at [redacted] extension 70251.  

Sincerely,  

LINNEL T. NISHIOKA  
Deputy Director  

Cl:ss
State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
APPLICATION FOR PERMIT

1. (a) WELL OWNER: Maui Dept. of Water Supply
   Contact Person: David Craddock
   Phone: 270-7816
   Mailing Address: 200 South High Street, Wailuku, HI 96793
   Fax: 270-7833
   E-mail: ______

   (b) LAND OWNER: Maui Dept. of Water Supply
   Contact Person: David Craddock
   Phone: 270-7816
   Mailing Address: 200 South High Street, Wailuku, HI 96793
   Fax: 270-7833
   E-mail: ______

   (c) CONTRACTOR: Maui Dept. of Water Supply
   Contact Person: David Craddock
   Phone: 270-7816
   Mailing Address: 200 South High Street, Wailuku, HI 96793
   Fax: 270-7833
   E-mail: ______

2. WELL LOCATION/NAME: RANGE WELL NO. 1
   Island: Maui
   Address: Wailuku, Maui, Hawaii
   Tax Map Key: (2) 3-02-01: 03

3. PROPOSED WORK:
   (Check all that apply)
   - Drill New Well
   - Modify Existing Well
   - Abandon/Seal
   - Deepen
   - Install New Pump
   - Drift Redriv
   - Modify Pump
   - Replace Pump
   - * Well No.: ________

   Be sure to complete and submit well abandonment report upon completion of work.

4. CONSTRUCTION:
   - Dug
   - Bored
   - Driven
   - Drilled
   - Radial

   Is this well a part of a battery of wells?  Yes  No (Please describe)

5. PROPOSED PUMP INFORMATION:
   Rated Pump Capacity: ________ gallons per minute
   Rated Pump Capacity: ________
   Pump Type (Check one):
   - Deep Well Turbine
   - Submersible
   - Centrifugal
   - Rotary
   - Rotary-Displacement
   - Rotary-Gear

   Powered by:
   - Propeller
   - Impulse
   - Impulse
   - Gas
   - Electric, rated horsepower: ________

   (Check all that apply)
   - Municipal (including hotels, stores, etc.)
   - Domestic (individual, noncommercial water system)
   - Irrigation (crop)
   - Military

6. PROPOSED USE:
   (Check all that apply)
   - Industrial
   - No. of Dwelling Units:
   - No. of Acres:
   - Other (explain):

7. (a) PROPOSED AMOUNT OF WITHDRAWAL: ________ gallons per day

    (b) METHOD OF FLOW MEASUREMENT:
    - Flowmeter
    - Open Pipe
    - weir
    - Orifice

8. OTHER IMPORTANT INFORMATION:
   PENDING ACTIONS:
   - CDUA
   - SCA
   - EIS
   - EA
   - None
   - Other (explain)

9. THE LANDOWNER CERTIFIES THAT THE SUBJECT PROPERTY, OR A PORTION THEREOF, WAS OR WAS NOT A STATE OF HAWAII LAND PATENT GRANT ISSUED AFTER 1960. (CHECK WITH YOUR TITLE SEARCH COMPANY OR THE LAND DIVISION, DEPT. OF LAND AND NATURAL RESOURCES AT FOR HELP)

10. REMARKS, EXPLANATIONS:

   (If more space is needed, please attach additional sheet)

I understand that approval of this application attaches the following standard conditions: 1) the proposed work is to be completed within two (2) years of the approval date; 2) the contractor shall submit to the Commission a well completion/abandonment report within 30 days after the completion date of the permitted work; 3) monthly water use data shall be submitted to the Commission; 4) such approval shall not constitute a determination of correlative water rights and shall not guarantee the pump capacity of future use up to the permitted pump capacity.

Well Owner: Maui Dept. of Water Supply
Signature: [Signature]
Date: 01/14/99

Landowner: Maui Dept. of Water Supply
Signature: [Signature]
Date: 01/14/99

Contractor: [Signature]
Date: [Signature]

Field Checked By: [Signature]
Latitude: ________
AQUIFER SYSTEM NAME: [Name]
Date: [Date]
Longitude: ________
State Well No: [Well No]

WCPIFORM (2/23/99)
9. PROPOSED WELL SECTION

Elevation at top of casing: 310 ft., msl
(Survey to nearest 0.01 ft.)

Minimum of 2' Radius & 4" Thick Concrete Pad

Ground Elevation: 335 ft., msl

Cement Grout: 292 ft.
(min. 70% of distance from ground elevation to top of water surface or 500 ft., whichever is less.)

Total Depth: 359 ft.

Minimum annular space between hole and casing ≥ 3"

Rock or Gravel Packing: 67 ft.

Water Level Elevation: 8 ft., msl

Open Casing: □ Perforated □ Screen

Material: □ Crushed Basalt □ Rounded Gravel

Material Standard: □ API Spec.

ASTM A139

Length: 54 ft.

Diameter: 16 in.

Wall Thickness: 3/16 in.

Openings: □ 1/4 sq in./F

Bottom Elevation: -1.5 ft., msl

Open Hole:

Material: □ Crushed Basalt □ Rounded Gravel

Material Standard: □ API Spec.

ASTM A139

Length: 54 ft.

Diameter: 16 in.

Bottom Elevation: -1.5 ft., msl

For non-salt water Basal Wells - bottom elevation of well should not be deeper than 1/4 of aquifer thickness or,

Bottom Elevation of Well Limit = (Water Elevation - 0.25 X Water Level Elevation)

Example: Estimated + 2 ft. Water Level Elev. → Bottom Elevation of Well Limit = (2 + 0.25 X 2) = 2.5 ft.

* The approximate elevation must be referenced to mean sea level (msl) at the time of application. Final elevations of well components shall be submitted in the Well Completion/Well Abandonment reports and referenced to a benchmark which has been established by a surveyor licensed by the State.

Solid Casing Material:

Steel: compliant with (check one or more):
□ ANSI/AWWA C200 □ API Spec. 5L □ ASTM A53 □ ASTM A139
And compliant with (check one or more):
□ ASTM A420 □ Type E □ Type S □ Grade B □ Other __________

Stainless Steel: (check one):
□ ASTM A409 □ ASTM A312

ABS Plastic conforming to ASTM F460 and ASTM D1527: (check one)
□ Schedule 40 □ Schedule 80

PVC Plastic conforming to ASTM F460 and (ASTM D1795 or ASTM D2241): (check one):
□ Schedule 40 □ Schedule 80

Thermoset Plastic: (check one)
□ Filament Wound Resin Pipe conforming to ASTM D2906
□ Centrifugally Cast Resin Pipe conforming to ASTM D2907
□ Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
□ Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
□ PTFE Fluorocarbon Tubing conforming to ASTM D3296
□ FEP Fluorocarbon Tubing conforming to ASTM D3296

Open Casing Material:

Steel: compliant with (check one or more):
□ ANSI/AWWA C200 □ API Spec. 5L □ ASTM A53 □ ASTM A139
And compliant with (check one or more):
□ ASTM A420 □ Type E □ Type S □ Grade B □ Other __________

Stainless Steel: (check one):
□ ASTM A409 □ ASTM A312

ABS Plastic conforming to ASTM F460 and ASTM D1527: (check one)
□ Schedule 40 □ Schedule 80

PVC Plastic conforming to ASTM F460 and (ASTM D1795 or ASTM D2241): (check one):
□ Schedule 40 □ Schedule 80

Thermoset Plastic: (check one)
□ Filament Wound Resin Pipe conforming to ASTM D2906
□ Centrifugally Cast Resin Pipe conforming to ASTM D2907
□ Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
□ Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
□ PTFE Fluorocarbon Tubing conforming to ASTM D3296
□ FEP Fluorocarbon Tubing conforming to ASTM D3296

Please refer to the HAWAII WELL CONSTRUCTION AND PUMP INSTALLATION STANDARDS to assure that your construction plans are in compliance with all existing regulations.

Solid Casing: ≥ (90% x (Ground Elev. - Water Level Elev))
Material: □ Steel □ PVC Plastic □ Thermoset

Material Standard: □ ASTM A53

Length: 54 ft.

Diameter: 16 in.

Wall Thickness: 3/16 in.

Bottom Elevation: -1.5 ft., msl
THEIS DRAWDOWN CALCULATION

FILE NAME = Kanoa Well 1
TEST NAME = Long-Term Test
DATE = May 14-21, 1999

INPUT PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>T = 124,770 ft²/day</td>
</tr>
<tr>
<td>Storage Coeff.</td>
<td>S = 0.300 dimensionless</td>
</tr>
<tr>
<td>Time</td>
<td>t = 200,000 days</td>
</tr>
<tr>
<td>Pumping Rate</td>
<td>Q = 154,010.7 ft³/day</td>
</tr>
</tbody>
</table>

OBSERVATION WELL

Radial distance r from pumping well = 5280 ft

Theoretical drawdown a mile (5,280 ft) from the pumping well when u< 0.01

\[
T = 124,770 \text{ ft}^2/\text{d} \\
Sp. yield = 0.2 \\
t = 365 \text{ days} \\
s = 0.286 \text{ ft} \\
\]
Predicted rise of the saltwater interface

\[ Z_t = \frac{pQ}{2\pi (ps-pf)K_x L} \left( 1 - \frac{2pfnL}{(2pfnL + (ps-pf)K_z t)} \right) \]

Where:

- \( Z_t \): rise of cone center at time \( t \)
- \( Q \) (ft\(^3\)/d): well discharge
- \( L \): Depth of mid-pt. below bottom of well before pumping
- \( K_x \): Horizontal K
- \( K_z \): Vertical K
- \( n \): porosity of aquifer
- \( p_s \): density of salt water
- \( p_f \): density of freshwater

Well Name: Kanoa Well 5731-02
Kx analysis by: Glenn Bauer

Assume \( K_x/K_z = 200 \)

### Table:

<table>
<thead>
<tr>
<th>( t ) (days)</th>
<th>( t ) (years)</th>
<th>( Z_t )</th>
</tr>
</thead>
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<tr>
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</tr>
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<td>1.41286</td>
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# Table 2 (CRPTD Form 12/17/97)

**CONSTANT-RATE PUMP TEST DATA**

<table>
<thead>
<tr>
<th>Suggested elapsed time</th>
<th>Actual elapsed time</th>
<th>Depth to water</th>
<th>Drawdown (unadjusted to nearest 0.1 ft)</th>
<th>Pumping rate Q (gpm)</th>
<th>EC (μhos)</th>
<th>Cl- (mg/l)</th>
<th>Temp. (°F or °C)</th>
<th>Data in this table is for:</th>
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</thead>
<tbody>
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<td>-45</td>
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<td>Pumped Well</td>
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<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start Test</td>
</tr>
</tbody>
</table>

- Start pump/Cl- taken

| 1 | 9:00 Am | 303.80 | 2.58 | 1200 | 152 | 25 | 69. |
| 1.5 |         |       |      |      |     |    |     |
| 2 |         |       |      |      |     |    |     |
| 2.5 |         |       |      |      |     |    |     |
| 3 |         |       |      |      |     |    |     |
| 4 |         |       |      |      |     |    |     |
| 5 |         |       |      |      |     |    |     |
| 6 |         |       |      |      |     |    |     |
| 7 |         |       |      |      |     |    |     |
| 8 |         |       |      |      |     |    |     |
| 9 |         |       |      |      |     |    |     |
| 10 |        |       |      |      |     |    |     |
| 15 |        |       |      |      |     |    |     |
| 20 |        |       |      |      |     |    |     |
| 25 |        |       |      |      |     |    |     |
| 30 |        |       |      |      |     |    |     |
| 40 |        |       |      |      |     |    |     |
| 50 |        |       |      |      |     |    |     |
| 60 | 10:00 Am |       |      |      |     |    |     |
| 70 |         |       |      |      |     |    |     |
| 80 | 10:20   |       |      |      |     |    |     |
| 90 | 10:30   |       |      |      |     |    |     |

Flow Meter Reading Start: 10 8 2 3 8 gals

START TEST Date: 5/17/99 Time of day: 9:00 Am

Water level measurements by: ☑ steel tape ☐ pressure transducer ☐ airline

Pumped Well No. 5731-02 Observation well no.

Pumped Well Name: Kamea Well 1 Distance between Obs. & Pumped Well

Target Q: 1200 gpm Reference pt. for depth to water: 309.15 ft. msl

Static Water Level @ start of test: 301.22 ft. msl

Pumped Well Name: Kamea Well 1

Distance between Obs. & Pumped Well: 309.15 ft.

Static Water Level @ start of test: 301.22 ft.

Water level measurements by: steel tape

START TEST Date: 5/17/99 Time of day: 9:00 Am

Flow Meter Reading Start: 10 8 2 3 8 gals

Suggested elapsed time: 45 min

Actual elapsed time: 0 min

Depth to water: 301.22 ft.

Drawdown: 0.00 ft.

Pumping rate: 1200 gpm

EC: 152 μhos

Cl-: 25 mg/l

Data in this table is for: Pumped Well

Remarks: Start Test

Start pump/Cl- taken

Flow Meter Reading Start: 10 8 2 3 8 gals

Suggested elapsed time: 45 min

Actual elapsed time: 0 min

Depth to water: 301.22 ft.

Drawdown: 0.00 ft.

Pumping rate: 1200 gpm

EC: 152 μhos

Cl-: 25 mg/l

Data in this table is for: Pumped Well

Remarks: Start Test

Start pump/Cl- taken
<table>
<thead>
<tr>
<th>Suggested elapsed time (min)</th>
<th>Actual elapsed time (min)</th>
<th>Depth to water (nearest 0.1 ft)</th>
<th>Drawdown elapsed to pumping time (unadjusted to nearest 0.1 ft)</th>
<th>Pumping rate (unadjusted Q) (gpm)</th>
<th>EC (umhos)</th>
<th>Cl⁻ (mg/l)</th>
<th>Temp. °F or °C</th>
<th>Remarks</th>
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</tr>
</tbody>
</table>

*Max possible duration, water level or quality did not stabilize for any 24 period*

*Begin recovery data next page*

Flow meter reading at end of pumped period: 178745 x 100 gallons

1 Chloride sampling required
2 Use same ending drawdown figure as start for recovery
<table>
<thead>
<tr>
<th>Suggested elapsed time (min)</th>
<th>Actual elapsed time (min)</th>
<th>Depth to water (nearest 0.1 ft)</th>
<th>Recovery Drawdown (unadjusted to nearest 0.1 ft)</th>
<th>Pumping rate (gpm)</th>
<th>EC (µhos)</th>
<th>Cl⁻ (mg/l)</th>
<th>Temp. or °F/°C</th>
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END TEST Date: 5/21/99 Time of day: 10:10 Am

ADDITIONAL REMARKS: 6.51.31.02

Person in charge of pump test (print): Mike Robertson

Signature: Mike Robertson

The signature above indicates that the data reported on this form is accurate and true to the best of my knowledge.
## Table 1 (SDPTD Form 12/17/97)

**STEP-DRAWDOWN PUMP TEST DATA**

*(not required for wells producing < 100,000 gpd or 70 gpm)*

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<th>Pumped Well No.</th>
<th>Observation well no.</th>
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<table>
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<tr>
<th>Pumped Well Name</th>
<th>Distance between Obs. &amp; Pumped Well</th>
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<td>Kāneʻa Well</td>
<td>ft.</td>
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<table>
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<th>Target Q</th>
<th>Reference pt. for depth to water</th>
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<td>ft. msl</td>
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<th>Water level measurements by:</th>
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**START TEST**

- **Date:** 5/14/99
- **Time of day:** 7:45 Am

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### Elapsed Time

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<th>Actual Elapsed Time (min)</th>
<th>Depth to water (nearest 0.1 ft.)</th>
<th>Drawdown S (unadjusted to nearest 0.1 ft.)</th>
<th>Pumping rate Q (at least 3 steps) (gpm)</th>
<th>EC (μmhos)</th>
<th>Chloride (mg/l)</th>
<th>Temperature (\text{°} \text{F} \ or \ ^\circ \text{C} )</th>
<th>Remarks</th>
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- **Data in this table is for:**
  - ✔ Pumped Well
  - ☐ Observation Well

- **Remarks:**
  - Chloride sample taken
  - Step 2 begin?
Table 1 (SDPTD Form 12/17/97)

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<th>Suggested Elapsed Time (min)</th>
<th>Actual Elapsed Time (min)</th>
<th>Depth to Water (nearest 0.1 ft)</th>
<th>Drawdown $S$ (unadjusted to nearest 0.1 ft)</th>
<th>Pumping Rate $Q$ (at least 3 steps) (gpm)</th>
<th>EC (μmhos)</th>
<th>Cl⁻ (mg/l)</th>
<th>Temp. °F or °C</th>
<th>Remarks</th>
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Data in this table is for:
- Pumped Well
- Observation Well

Remarks

Note: Suggested and Actual times are approximate.
<table>
<thead>
<tr>
<th>Suggested Elapsed Time (min)</th>
<th>Actual Elapsed Time (min)</th>
<th>Depth to Water (nearest 0.1 ft)</th>
<th>Drawdown S (unadjusted to nearest 0.1 ft)</th>
<th>Pumping Rate Q (at least 3 steps) (gpm)</th>
<th>EC (μmhos)</th>
<th>Cl⁻ (mg/l)</th>
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</table>

Data in this table is for:
- X Pumped Well
- O Observation Well

Max possible duration, water level or quality did not stabilize for any 24 period

Begin recovery data next page

Flow meter reading at end of pumped period:

108238 gals

1 starting pumping rate Q
2 minimum length of step period of constant pumping rate
3 minimum mandatory Chloride (Cl⁻) measurement/sampling at end of every step
4 Use same ending drawdown figure as start for recovery
### Table 1 (SDPTD Form 12/17/97)

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<th>Actual elapsed time (min)</th>
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<th>Recovery Drawdown S (unadjusted to nearest 0.1 ft)</th>
<th>Pumping rate Q (gpm)</th>
<th>EC (μmhos)</th>
<th>Cl⁻ (mg/l)</th>
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**END TEST** Date: 5/14/99 Time of day: 2:52

**ADDITIONAL REMARKS:**

Person in charge of pump test (print): **Mike Robertson**

Signature: **Mike Robertson**

The signature above indicates that the data reported on this form is accurate and true to the best of the person's knowledge who operated this pump test.
Please review and comment on whether test results support simultaneous pumping of both wells @ 0.15 mgd.

9/27/99

Based upon the Their Eq. (worst case) and all of the Their assumption, the wells should be able to handle 0.15 mgd each. 1
LETTER OF TRANSMITTAL

TO: COMMISSION ON WATER RESOURCE MANAGEMENT
    State of Hawaii
    P.O. Box 621
    Honolulu, HI 96809

DATE: June 30, 1999

JOB NO. CWS-002

SUBJECT: NORTH WAIHEE WATER SOURCE PROJECT
          DEVELOPMENT OF KANOA WELL 1 AND KUPAA WELL
          TMK: (2) 3-2-01: 03

We are sending you [X] Attached [_____] Under separate cover the following:

<table>
<thead>
<tr>
<th>NO. OF COPIES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Well Completion Report-Kanoa Well 1 (State well 5731-02)</td>
</tr>
<tr>
<td>1</td>
<td>As-Builts of Well</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED (AS CHECKED BELOW):

- For Signature/Approval
- For Review and Comment
- X For Information/Use
- As Requested

REMARKS:

C. TAKUMI ENGINEERING, INC.

Wade Shimabukuro

cc: ____________________________
NORTH WAIHEE AQUIFER SYSTEM

Kupaa 1 and Kanoa 1 Wells
Test Results and Interpretation

John F. Mink
Mink and Yuen, Inc.

June 21, 1999

Kupaa 1

The location of the well, which was completed in March of 1999, is plotted on Figure 1. The completed configuration of the well is as follows.

Depth 687 ft. (49 ft. BSL)
Boring diameter, 21 in.
Blank casing diameter, 16 in.; depth 633 ft. (4 ft. ASL)
Perforated casing, diameter 16 in.; length 53 ft.
Grout, 0 to 630 ft. (7 ft. ASL)
Gravel, 633 to 686 ft.

Further details are given in the Driller’s Well Completion Form, which is attached. Note that the measuring point (MP) on the form differs from the surveyed elevation. The driller’s MP elevation on the top of the casing is listed as 638.1 feet; the actual elevation is 639.37 feet, which is based on a vertical survey from a benchmark elevation of 631.87 feet located about 200 feet from the well. This correction affects computation of head but not of drawdown measured during the pumping tests.

Examination of the drill cuttings indicates that the unconformity between the overlying Honolua trachyte formation and the Wailuku basalt formation is 70 to 80 feet below ground surface, and that the weathering zone of the Wailuku extends another 55 feet before fresh Wailuku basalt is struck. The driller’s lithology log is attached. Also attached is a drawing illustrating the relationship between the Honolua and Wailuku at both the Kupaa and Kanoa wells.
Step Drawdown Test

Head before pumping started was 7.41 feet (MP 639.37 ft. - DTW 631.96 ft. = 7.41 ft.), as measured with the Driller's tape. Putative stable drawdown at each pumping rate was:

<table>
<thead>
<tr>
<th>Rate (gpm)</th>
<th>Drawdown (ft)</th>
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</thead>
<tbody>
<tr>
<td>400</td>
<td>.35</td>
</tr>
<tr>
<td>700</td>
<td>.82</td>
</tr>
<tr>
<td>1000</td>
<td>1.34</td>
</tr>
<tr>
<td>1400</td>
<td>2.14</td>
</tr>
</tbody>
</table>

In the Appendix these data are used to calculate a transmissivity (T) value of 178,928 sq.ft./day employing the standard laminar-turbulent flow relationship between drawdown and pumping rate. Assuming depth of flow to the well equal to penetration of the well below the water table (about 50 feet), hydraulic conductivity (k) is 3566 ft./day This value is of the magnitude consistent with the usual values derived for other primary basalt aquifers in Hawaii.

Constant Rate Pump Test

The constant rate test at 1200 gpm began at 0900 on March 15, 1999, and went on for four days (96 hours). Initial drawdown was rapid, but after about 40 minutes it no longer decreased monotonically but began to oscillate within a range of approximately 0.5 feet. Tidal and barometric perturbations, randomized by apparent hysterisis in the transducer readings, contributed too much noise to the record to allow an accurate extraction of drawdowns due to pumping alone.

For the first 44 minutes of the test, however, the monotonic drawdowns can be employed in the Theis equation to derive an approximate value of T. The computer program, THEISFIT, yields a T value of 91,363 sq.ft./day, which for a 50 feet depth of flow translates to hydraulic conductivity of 1827 ft./day. This value is of the same magnitude as the one obtained from the step drawdown test data but is probably more accurate and is more consistent with typical values for other Hawaiian basalt aquifers (e.g. The Koolau aquifer of southern Oahu, which has an average hydraulic conductivity of 1500 ft./day). The printout of the THEISFIT computation is included in the Appendix. A realistic value for storage coefficient (S) is impossible to derive because a meaningful radius value for the pumping well is unknowable. The total bore diameter may be one or two feet, but the apparent diameter is likely to be greater.
The effort to disassociate tidal changes in groundwater level from drawdown did not produce clearly identifiable results. However, the tidal efficiency at the well site and Kanoa is 5 to 10 percent. For the maximum tidal change, about 2 feet, the effect on the water level in the well would be 0.10 to 0.20 feet. Change of this magnitude could not be discriminated from barometric and random perturbations after drawdown reached approximately 1.35 feet in less than an hour following the start of the test.

An effort was made to measure water levels in nearby wells during the test. The North Waihee wells were shut down to avoid interference. None of the wells (Kanoa monitor, Mendes, North Waihee) provided unambiguous, interpretable drawdown data.

During the four days of the test chloride content remained steady at 20 to 25 mg/l and temperature was 68 F. The temperature indicates that the source of recharge is from higher elevations where rainfall is copious, and the steady chloride content confirms that at 1200 gpm sea water intrusion does not affect the pumped water. A full spectrum analysis shows that the water is not contaminated with either volatile organics or heavy metals.

**Recommended Pump Size**

The sustained constant rate, 1200 gpm (1.73 mgd), is the recommended pump size. Initial head at Kupaa was 7.41 feet, which is adequate to avoid upconing of sea water during pumping in a well penetrating 50 to 100 feet below the water table. Should adherence to the full breadth of the DWS protocol on pumping be required, average daily yield will be 0.77 mgd (.444 x 1.73 mgd); if only the 16 hr/day pumping portion of the protocol were followed, average yield would be 1.15 mgd (.667 x 1.73 mgd).

**Kanoa 1**

Kanoa 1 was completed in April and tested in May, 1999. Its location is plotted on Figure 1. Final configuration of the well is as follows.

Depth: 359 ft. (50 ft. BSL)
Boring diameter: 22 in.
Blank casing diameter: 16 in.; depth
Perforated casing diameter: 16 in.;
Grout: 0 to 300 ft.
Gravel: 300 to 389 ft.
fluctuations compounded by inconsistencies in transducer readings relegate the use of the data to speculation. Similarly the transducer data from the Kanoa monitor well evidently did not reliably reflect pumping drawdown. During testing transducer readings have to be supplemented by tape measurements to check their accuracy and reliability.

Chloride content during the test remained constant at 20 to 24 mg/l (see Appendix), the same as at Kupaa, and temperature fell between 69 and 71 F.

Clearly the North Waihee aquifer is highly permeable and capable of supplying low salinity water at satisfactory pumping rates. When the North Waihee 1 and North Waihee 2 wells were tested in 1981 and 1989, the transmissivity values were 325,000 sq.ft./day for the original test, and 320,000 sq.ft./day for the 1989 test. The associated storage coefficient values were .25 and .30.

Recommended Pump Size

As for Kupaa, the recommended pump size is 1200 gpm (1.73 mgd). For the DWS standard factor of .444, average production will be 0.77 mgd, for the more liberal factor of .667, the average will be 1.15 mgd.
APPENDIX

Kupaa 1 Step Drawdown

A value of transmissivity (T) can be calculated from a step drawdown test by assuming that drawdown at each rate is stable and that it is expressed by the equation,

\[ s = aQ + bQ^2 \]

in which \( s \) is drawdown, \( Q \) is pump rate, \( a \) is the laminar flow (aquifer) constant, and \( b \) is the turbulent flow (well loss) constant. The equation is linearized by dividing by \( Q \),

\[ \frac{s}{Q} = a + bQ \]

which plots as a straight line with \( s/Q \) as the ordinate and \( Q \) the abcissa. The value, \( a \), is the intercept, and \( b \) is the slope of the line. An attached graph shows the linear form of the step drawdown curve for Kupaa 1.

To determine \( T \), the intercept, \( a \), is substituted in the Thiem steady state formula for drawdown as a function of pumping. The Thiem equation is,

\[ s = \frac{Q}{2\pi T} \ln \left( \frac{R}{r} \right) \]

in which \( R \) is the nearest distance from the well where \( s = 0 \), and \( r \) is the effective radius of the well. The value of \( R \) is unknown and has to be approximated.

Because \( s = aQ \) in the step drawdown equation refers to laminar flow in the aquifer, substitution in the Thiem equation gives,

\[ aQ = \frac{Q}{2\pi T} \ln \left( \frac{R}{r} \right), \]

and,

\[ T = \left( \frac{1}{2\pi a} \right) \ln \left( \frac{R}{r} \right). \]

The intercept, \( a \), has a value of .00067 (see graph), thus,

\[ T = (237.6) \ln \left( \frac{R}{r} \right). \]
The value of \( R \) is estimated as equal to the length of penetration of the well below the water table (Zanger; Polybarunova-Kochina), and assuming the radius of the well as 1 foot,

\[
T = (237.6) \ln (50) = 929.5 \text{ gpm/ft}
\]

which when converted to consistent units (feet and days) is,

\[
T = 178,928 \text{ sq.ft./day.}
\]

For a depth of flow of 50 feet, \( k = 3566 \text{ ft/day} \).

**Kupaa 1 Constant Rate**

Drawdown during the period of monotonic decline before oscillation of the water level set in is plotted on an attached graph. If the Jacob simplification is employed, the \( T \) value from the graph is calculated as,

\[
T = (264) \frac{1200}{\Delta s}
\]

In which \( \Delta s \) is drawdown over one log cycle of time. Thus, \( T = 70,588 \text{ sq.ft./day} \), which is comparable to the THEISFIT value of 91,363 sq.ft./day.

Unfortunately, none of the test result data allows for calculation of storage coefficient (\( S \)). In the most thoroughly studied Hawaii basaltic aquifer similar to the Wailuku basalt, the Koolau aquifer, storage coefficient as effective porosity is approximately \( .05 \), but rigorously conducted tests at North Waihee 1 and North Waihee 2 in 1981 and 1989 gave \( S \) values of .25 and .30, respectively.

**Kanoa 1 Step Drawdown**

Employing the same applicable parameters as for the Kupaa 1 step drawdown analysis and a value of .0009606 ft./gpm for the aquifer constant, \( a \), the computed value of \( T \) is 124,770 sq.ft./day. If depth of flow is equal to depth of penetration of the well below the water table (50 ft.), hydraulic conductivity is 2495 ft./day.

**Kanoa 1 Constant Rate**

The water level data derived from transducer readings was too imprecise to allow for realistic determination of aquifer parameters.
Figure 1 - Vicinity Map
Proposed Exploratory Well Sites
Kupaa Well No.1 & Kanoa Well No.2
Waihee, Maui, Hawaii

Scale: 1" = 2000'
Source: U.S.G.S. Map Waikaku and Kahakuloa Quadrangles
**PART I.  WELL CONSTRUCTION REPORT**

3. Drilling Company: Wai'anae Drilling Inc.
4. Name of driller who performed work: Mike Robertson
5. Type of rig/construction: Air Rotary
6. Date(s) Well Construction and pump tests (if any): completed: 5/18/99
7. GROUND ELEVATION (referenced to mean sea level, msl): 637 ft.
   Well Bench Mark (description/location): Top of Casing
8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.) Rock Description, Water Level, Dates, etc.
   Depths (ft.) Rock Description, Water Level, Dates, etc.

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<tr>
<th>Depth (ft.)</th>
<th>Rock Description, Water Level, Dates, etc.</th>
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<tbody>
<tr>
<td>0 to 6</td>
<td>Red Clay and Assorted Rock</td>
</tr>
<tr>
<td>6 to 18</td>
<td>Tan Clay and Assorted Rock</td>
</tr>
<tr>
<td>18 to 36</td>
<td>Gray Clay and Assorted Rock</td>
</tr>
</tbody>
</table>

9. Total depth of well below ground: 637 ft.
10. Hole size: 2.2 in. dia. from 0 ft. to 637 ft. below ground
    3 in. dia. from 637 ft. to 638 ft. below ground
11. Casing installed: 16 in. I.D. x 3/4 in. wall solid section to 633 ft. below ground
    16 in. I.D. x 5/16 in. wall perforated section to 630 ft. below ground
12. Annulus: Grouted from 0 ft. below ground to 630 ft. below ground
    Gravel packed from 633 ft. below ground to 638 ft. below ground
13. Initial water level: 631.35 ft. below ground.
14. Initial temperature: 71 °F
15. Initial salinity: 2.5 ppm
16. PUMPING TESTS: Reference Point (R.P.) used: well casing which elevation is 638.10 ft.
(1) Step-Drawdown Test Date: 3/12/99
    Start water level: 631.90 ft. below R.P.
    End water level: 632.05 ft. below R.P.
(2) Long-term Aquifer Test Date: 3/15/99
    Start water level: 631.90 ft. below R.P.
    End water level: 631.20 ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? Yes No
18. As-built drawings attached? Yes No
19. Other remarks/comments: (On back of this form)

**Well Drilling Contractor (print)** Wai'anae Drilling Inc. C-57 Lic. No. C20115
**Signature** Mike Robertson
Date: 5/12/99

**Surveyor (print)** EUGENIO V. VALERA
**Signature**
Lic. No. L.P.L.S. # 5276
Date: May 4, 1999

**Applicant (print)** Dept. of Water Supply
**Signature**
Date: 6/22/99

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT
4/25/97 WCR Form

[Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 921, Lihue, Hawaii 96766. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission's Waimea Branch at 827-0255, or 1-800-96-4644 Extension 9223.]
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: ____________________________

21. Name of person performing work: ________________________

22. Date Pump Installation Completed: ________________________

23. PUMP INSTALLATION:

- **Pump Type, Make, Serial No.:** ____________________________
- **Capacity:** ________ gpm
- **Motor type, H.P., Voltage, rpm:** ________________________
- **Depth of Pump Intake Setting** ________ ft. below ________ ft. which elevation is ________ ft
- **Depth to bottom of airline** ________ ft. below ________ ft. which elevation is ________ ft
- **Pumping Head is** ________ ft. Type of flow meter: ________ which measures in ________

24. As-built drawings attached? Yes __ No __

25. Other remarks/comments. (See below)

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<th>Pump Installation Contractor (print)</th>
<th>C-57 Lic. No.</th>
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| Applicant (print) | |
| Signature | Date |


driller's log

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19 & 25. Remarks: ____________________________
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<th>Tooling/Geologic Formation</th>
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<th>Bit Press.</th>
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<td>31-36</td>
<td></td>
<td></td>
<td>add 69 x 12 inch stabilizer/ GREY CLAY AND ASSORTED ROCK</td>
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<td>2:12</td>
<td>36-41</td>
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<td>41-46</td>
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<td>3:20</td>
<td>46-49</td>
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<td>add 67 x 12 inch stabilizer/ BLUEROCK</td>
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<td>3:31</td>
<td>49-54</td>
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<tr>
<td>3:45-4:30</td>
<td>54-60</td>
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<td>add 67 x 12 inch stabilizer/ BLUEROCK-LAST FOOT (59-60.41) WEATHERED BASALT</td>
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<tr>
<td>8/31</td>
<td></td>
<td></td>
<td></td>
<td>all pilot tools installed-install diverter-</td>
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<tr>
<td>8:00</td>
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<td>DENSE BASALT</td>
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<tr>
<td>11:23</td>
<td>60-80</td>
<td># 1</td>
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<td>start drill pipe #1/ DENSE BASALT</td>
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<td>Depth</td>
<td>Drift Degree</td>
<td>Tooling / Geologic Formation</td>
<td>Air Press.</td>
<td>Bit Press.</td>
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<td>9/2/98 Rain - No Drilling Today</td>
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<td>355-360</td>
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<td># 13</td>
<td>360-375</td>
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<tr>
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<td>375-385</td>
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<td># 19</td>
<td>510-535</td>
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<td>BASALT-BROWN ROCK-RED CINDERS</td>
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<td># 20</td>
<td>535-560</td>
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<td>#23</td>
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<td>0.02</td>
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<td>#24</td>
<td>665-660</td>
<td>0.02</td>
<td>BLACK + RED CINDERS</td>
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<td>660-675</td>
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<td>BLACK + RED CINDERS (Bit Stuck)</td>
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<td>11/30</td>
<td>#25</td>
<td>675-685</td>
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<td>BLACK + RED CINDERS</td>
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</table>
Kupaa 1 Step Drawdown Test
Rank 1 Eqn 8160 [Line Robust None, Gaussian Errors] y=a+bx
$\hat{r}^2=0.9667389$  DF Adj $\hat{r}^2=0.90036669$  FitStdErr=6.1934602e-05  Fstat=58.220822
a=0.00066990868
b=6.386758e-07

Pump Rate, Q, gpm

$\frac{s}{Q} \text{ ft/gpm}$
CALCULATION OF 'BEST FIT' TRANSMISSIVITY AND STORAGE COEFFICIENT BY AUTOMATICALLY FITTING EXPERIMENTAL PUMPTEST DATA TO THE THEIS EQUATION IN A LEAST SQUARES SENSE.

constant rate test

*************** INPUT DATA ***************

ENGLISH UNITS

PUMPAGE RATE: 1200 [GAL/MIN]
OBSERVATION DISTANCE FROM PUMPING WELL: 1 [FT]
NUMBER OF ENTERED TIME-DRAWDOWN DATA PAIRS: 8

EXPERIMENTAL TIME-DRAWDOWN DATA

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<th>DRAWDOWN [FT]</th>
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<td>1.08</td>
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<td>16</td>
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<td>1.25</td>
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<td>32</td>
<td>1.26</td>
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<td>36</td>
<td>1.35</td>
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<tr>
<td>44</td>
<td>1.36</td>
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CALCULATED GUESS FOR TRANSMISSIVITY SC: 475.845 [GAL/MIN/FT]
CALCULATED GUESS FOR STORAGE COEFFICIENT SC: 7.113292

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<th>GUESS [GAL/MIN/FT]</th>
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<td>ITERATION 3</td>
<td>475.845</td>
<td>[GAL/MIN/FT]</td>
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<td>ITERATION 4</td>
<td>474.31</td>
<td>[GAL/MIN/FT]</td>
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<td>ITERATION 5</td>
<td>474.31</td>
<td>[GAL/MIN/FT]</td>
<td>1</td>
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<tr>
<td>ITERATION 6</td>
<td>474.31</td>
<td>[GAL/MIN/FT]</td>
<td>1</td>
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<tr>
<td>ITERATION 7</td>
<td>474.31</td>
<td>[GAL/MIN/FT]</td>
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Kupaa 1 Pump Test 1200 gpm 3/15/99

Drawdown, ft.
COUNTY OF M powerhouseanghai
DEPARTMENT OF WATER SUPPLY
WATER QUALITY LAB
614 PALAPALA DRIVE
KAHULUI, MAUI, HAWAII 96732

REPORT DATE: MAR 22, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: [redacted]

MATRIX: WATER

SAMPLER:

EPA METHOD: CHLORIDE: 4500-CI

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<tr>
<th>SAMPLE ID</th>
<th>CHLORIDE</th>
<th>SAMPLE ID</th>
<th>CHLORIDE</th>
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<td>KUPAA WELL 1</td>
<td>mg/L</td>
<td>KUPAA WELL 1</td>
<td>mg/L</td>
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<td>20</td>
<td>3/18/99 @ 0806 by KK</td>
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<tr>
<td>3/15/99 @ 2100 by ?</td>
<td>22</td>
<td>3/18/99 @ 0900 by WS</td>
<td>25</td>
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<tr>
<td>3/16/99 @ 0900 by ?</td>
<td>22</td>
<td>3/18/99 @ 2100 by NR</td>
<td>20</td>
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<tr>
<td>3/16/99 @ 2100 by MR</td>
<td>20</td>
<td>3/19/99 @ 0900 by NR</td>
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<td>3/17/99 @ 0900 by MR</td>
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<tr>
<td>3/17/99 @ 2100 by MR</td>
<td>25</td>
<td></td>
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</tr>
</tbody>
</table>

APPROVED BY: C.CERIZO
W.M. IV
WELL COMPLETION REPORT

PART I. WELL CONSTRUCTION REPORT

1. State Well No.: 5731-02
   Well Name: Kona Well
   Island: Maui
2. Location/Address: North Wahi'a, Wailuku
   Tax Map Key: 3-2-1.2

4. Name of driller who performed work: Mike Robertson
5. Type of rig/construction: Air Rotary
6. Date(s) Well Construction and pump tests (if any) completed: 5/25/99
7. GROUND ELEVATION (referenced to mean sea level, msl): 300.15 ft.
   Well Bench Mark (description/location): Taper of pump base plate Elevation (msl)
8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)
   Depths (ft.)    Rock Description, Water Level, Dates, etc.
   Depths (ft.)    Rock Description, Water Level, Dates, etc.

9. Total depth of well below ground: 359 ft.
10. Hole size: Round from 2 3/8 in. to 2 1/2 in. Sample with test clay

11. Casing installed: 1 10 in. I.D. x 31/8 in. wall solid section to 306 ft. below ground
     1 1/2 in. I.D. x 31/16 in. wall perforated section to 359 ft. below ground

12. Annulus: Gravel packed from 0 ft. below ground to 300 ft. below ground
     Gravel packed from 300 ft. below ground to 359 ft. below ground

13. Initial water level: 294.83 ft. below ground
14. Initial chloride: 26 ppm
15. Initial temperature: 68°F
16. PUMPING TESTS: Reference Point (R.P.) used: Pump base plate, which elevation is 309.15 ft.
   (1) Step-Drawdown Test Date 5/14/99
      Start water level 301.34 ft. below R.P.
      End water level 301.3 ft. below R.P.
   (2) Long-term Aquifer Test Date 5/17/99
      Start water level 301.23 ft. below R.P.
      End water level 301.3 ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/98 LAT Form) attached? Yes No
18. As-built drawings attached attached? Yes No
19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print): Mike Robertson
License No.: C-57 Lic. No. 28211.5
Signature: Mike Robertson
Date: 5/15/99

Surveyor (print): Edward U. Laeya
License No.: 74.46, 82.4
Signature: Edward U. Laeya
Date: 6/16/98

Applicant (print): Department of Water Supply
Signature: [Signature]
Date: 6/28/99
PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: ________________________________

21. Name of person performing work: ____________________________

22. Date Pump Installation Completed: __________________________

23. PUMP INSTALLATION:
   - Pump Type, Make, Serial No.: _____________________________ Capacity: _______ gpm
   - Motor type, H.P.; Voltage, rpm: __________________________
   - Depth of Pump Intake Setting _______ ft. below _______ ft., which elevation is _______ ft.
   - Depth to bottom of air-lift _______ ft. below _______ ft., which elevation is _______ ft.
   - Pumping Head is _______ ft. Type of flow meter _______ which measures in _______.

24. As-built drawings attached? Yes No

25. Other remarks/comments: (See below)

Pump Installation Contractor (print) ____________________________ C-57 Lic. No. ________

Signature ____________________________ Date ____________________________

Applicant (print) ____________________________ Date ____________________________

8.(cont'd) DRILLER'S LOG (cont'd):

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<thead>
<tr>
<th>Dates (ft.)</th>
<th>Water Level</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks</th>
<th>Dates (ft.)</th>
<th>Water Level</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks</th>
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<tbody>
<tr>
<td>6.5 to 13.5</td>
<td>Hard Basalt</td>
<td>Bluestone</td>
<td></td>
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<tr>
<td>13.5 to 26.5</td>
<td>Weathered Basalt</td>
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<td>27.5 to 34.5</td>
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<td>34.5 to 36.5</td>
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<td>Bluestone</td>
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<td>38.5 to 40.5</td>
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<td>Bluestone</td>
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20 & 25. Remarks:

________________________________________________________________________
________________________________________________________________________
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<thead>
<tr>
<th>Date / Time</th>
<th>Drill Pipe #</th>
<th>Drift Degrees</th>
<th>Depth in feet</th>
<th>Tooling / Geologic Formation</th>
<th>Air Press.</th>
<th>Bit Press.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/15/99 8:30</td>
<td>1</td>
<td>0-22</td>
<td>12 in. x 7 ft. hammer + 17 ft. stabilizer</td>
<td>white gray weathered rock and clay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:15</td>
<td>2</td>
<td>22-38</td>
<td>add 5 ft. 8in. x 12 in stab / gray rock and clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:40 12:05</td>
<td>3</td>
<td>38-60</td>
<td>add 30 ft. of stabilizers total= 60 ft stabilization</td>
<td>same formation - gray rock and less clay</td>
<td></td>
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<tr>
<td>1:30</td>
<td>4</td>
<td>0.3</td>
<td>70-85</td>
<td>gray rock - weathered basalt</td>
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<tr>
<td>4:30</td>
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<td>0.4</td>
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<td>3/16/99 8:00</td>
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<td>10:20</td>
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<td>11:15</td>
<td>9</td>
<td>0.7</td>
<td>185-210</td>
<td>same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:10</td>
<td>10</td>
<td>0.6</td>
<td>225</td>
<td>same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:15</td>
<td>11</td>
<td>0.5</td>
<td>225-250</td>
<td>hard dense basalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:10</td>
<td>12</td>
<td>0.3</td>
<td>250-285</td>
<td>same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/17/99 8:00</td>
<td>13</td>
<td>0.4</td>
<td>285-305</td>
<td>same</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>10:10</td>
<td>14</td>
<td>0.6</td>
<td>305-310</td>
<td>blue rock basalt</td>
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<td></td>
</tr>
<tr>
<td>3/17/99</td>
<td>15</td>
<td>0.4</td>
<td>310-325</td>
<td>same</td>
<td>150</td>
<td>18</td>
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<tr>
<td></td>
<td>16</td>
<td>0.4</td>
<td>325-335</td>
<td>black and red cinders - hit water table</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>0.6</td>
<td>335-359</td>
<td>black and red cinders - water bearing</td>
<td>163</td>
<td>32</td>
</tr>
</tbody>
</table>

Static Water Level = 299.68 ft.
Reference elevation point = 307.76 ft.
Static Head = 8.08 ft.
REPORT DATE: JUNE 2, 1999

CLIENT: TAKUMI ENGINEERING
18 CENTRAL AVENUE
WAILUKU, MAUI, HAWAII 96793
PHONE #: 249-0411

MATRIX: WATER

EPA METHOD: CHLORIDE: 4500-CI

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
<th>SAMPLE ID</th>
<th>CHLORIDE mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>KANOA WELL 1</td>
<td>5/14/99 by WS</td>
<td>5/19/99 @ 0900 by MR</td>
<td>20</td>
</tr>
<tr>
<td>KANOA WELL 1</td>
<td>5/17/99 @ 0930 by WS</td>
<td>5/20/99 @ 1430 by WS</td>
<td>20</td>
</tr>
<tr>
<td>KANOA WELL 1</td>
<td>5/18/99 @ 0820 by LP</td>
<td>5/21/99 @ 0900 by WS</td>
<td>21</td>
</tr>
</tbody>
</table>

ANALYST: L. AMANO

APPROVED BY: C. CERIZO
W. M. IV
Mr. David Craddick, Director  
Department of Water Supply.  
County of Maui  
200 S. High Street  
Wailuku, HI 96793  

Dear Mr. Craddick:  

Pump Installation Permit  
Kanoa #1 Well (Well No. 5731-02)  

We have received your pump installation permit application for the Kanoa #1 Well (Well No. 5731-02). However, matters which must be addressed before we accept your application as complete are as follows:  

1. The Pump Installation Permits for two wells expired without a well completion report being filed:  
   a. Wakiu (Hana) Well "A" (Well No. 4600-02)  
   b. Waipuka Well #2 (Well No. 5339-02)  

2. The Well Construction Permits for two wells that have expired without a well completion report being filed:  
   a. Waikapu Mauka Well (Well No. 5131-01)  
   b. Maui High School Well (Well No. 5420-01) (to be sealed).  

Please provide information on the status of these projects, and well completion reports, if applicable. Upon receipt of this information, we will accept your application as complete and you can then expect your application to be processed within ninety (90) days.  

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at [contact information] or toll free at [contact information] extension 70251.  

Sincerely,  

LINNEL T. NISHIOKA  
Deputy Director  

[Stamp: Pump Installation Permit Kanoa #1 Well (Well No. 5731-02)]  

[Stamp: Wakiu (Hana) "A" damaged, covered, no flow, may be monitor]
Mr. Michael J. Summers
Chris Hart and Partners
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

Dear Mr. Summers:

SUBJECT: Kanoa Wells 1 & 2 (Well Nos. 5731-02 & 04), Draft Environmental Assessment
FILE NO.: 97-023

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

[X ] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.

[ ] We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X ] OTHER:

1) Please be advised of our naming convention for these wells to avoid confusion. The original North Waihe'e Water Source Development Plan called for four wells, which originally were anticipated to be in the same general vicinity. The first two wells were alternatively known simply as "Waihe'e Wells" 1 & 2, very similar to nearby private wells (Waihe'e Tunnels 1 & 2, Well Nos. 5434-01 & 02; and Waihe'e (Marino) Wells, of which there may be two or three, Well Nos. 5631-04, for which we have drilling information, and Well Nos. 5631-05 and/or 06, for which permits have expired without any well completion information). It became apparent that the North Waihe'e site could only support two wells, and not at the original hoped-for capacity. Two new sites were identified, which are now called Kanoa #1 and Kupaa #1 (Well Nos. 5731-02 & 03), rather than their original designations as North Waihe'e 3 & 4.

2) The pump tests for the Kanoa #1 and Kupaa #1 Wells indicate that the appropriate pump capacity will not exceed 1.15 mgd. Our staff will base our pump installation approval upon an assessment of expected results from simultaneous pumping from all wells in the area.

If there are any questions, please contact Charley Ice at [Blank]

Sincerely,

LINNELL T. NISHIOKA
Deputy Director
September 16, 1999

Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809

SUBJECT: KANOA WELL #1
Waihee, Maui, Hawaii
State Well # 5731-02

Dear Sir:

On behalf of the Maui County Department of Water Supply, we are submitting the pump installation permit application for the Kanoa Well #1 (State Well #5731-02) at Waihee, Maui, Hawaii. In addition to the permit application, we are attaching the following:


B. North Waihee Aquifer System, Kupaa 1 and Kanoa 1 Wells Test Results and Interpretation, John F. Mink, Mink & Yuen, June 21, 1999.

C. Reduced TMK: 3-2-01 showing well location on TMK.

D. The Draft Environmental Assessment is being published in the September 23, 1999 OEQC Bulletin. A copy of the Draft Environmental Assessment will be sent under a separate cover as part of the Environmental Assessment Review process.

E. The pump installation permit is for the County of Maui, Department of Water Supply. No filing fee is being submitted.

If you have any questions, please do not hesitate to call Carl Takumi, C. Takumi Engineering, Inc. at [redacted] or Herb Kogasaka, Maui Department of Water Supply at [redacted]

Very truly yours,

Carl K. Takumi, P.E.

C. Takumi Engineering, Inc.

cc: Department of Water Supply
**WCR 1 Check for Well No. 5731-02**  
(survey to regulation memo)

### 1. Pump Tests Check  
Glenn Bauer (initial)

<table>
<thead>
<tr>
<th>Step—Drawdown Test:</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>acceptable</td>
<td>☑</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>followed WCPI Stds</td>
<td>☑</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>analysis attached</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>proposed pump cap o.k.</td>
<td>☑</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

Aquifer Pump Test:
- acceptable: ☑
- followed WCPI Stds: ☑
- T & S analysis attached: ☐

Well Interference:
- estimated Steady-State drawdown at 1-mile radius is __________ ft.
- analysis attached: ☐

Stream Surface Water Impacted: ☐

---

### 2. Construction Check  
Mitch Ohye (initial)

<table>
<thead>
<tr>
<th>data complete</th>
<th>Yes</th>
<th>No</th>
<th>If no, describe deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>followed WCPI Stds</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>wellphys.dbf updated</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>welapplc.dbf updated</td>
<td>☐</td>
<td>☑</td>
<td></td>
</tr>
</tbody>
</table>

07/06/99

*Signature*

\[Signature\]
State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
WELL COMPLETION REPORT - PART II
Pump Installation

1. State Well No.: 5731-02  Well Name: KANOA WELL 1  Island: MAUI
2. Address: NO. WAIHEE  Tax Map Key: 3-2-1:003
3. Pump Installation Company: BEYLIK DRILLING, INC.
4. Date Pump Installed: 12-10-01
5. PERMANENT PUMP INFORMATION
   Pump Type, Make, Serial No.: SUB/BJ/0104AF00957-1  Rated Capacity: 1200 gpm
   Motor Type, H.P., Voltage, rpm: SUB/BJ/200/460/1742
   Type of flow meter: ________ which measures in GPM
6. Method of flow measurement:
   □ Flowmeter  Manufacturer: PRATT  Make: SX-2 H. Keoeoea  21 Mar ’03
   □ Weir  □ Open Pipe  □ Orifice  □ Other*, explain below
   *attach schematic
7. Fill in the as-built section on the other side of this sheet.
8. Other remarks/comments:
   VENTURI FLOW TUBE - MEASURES PRESSURE DIFFERENTIALS

Pump Installation Contractor (print) BEYLIK DRILLING, INC. C-57/C-57a/A Lic. No. AC-21896
Signature: GLEN R. DAVIS  Date 1-16-02
Permittee (print)  GEORGE Y. TENGAN, DIRECTOR
County of Maui/Department of Water Supply
Signature:  Date 3/7/03

WCR2 Form 5/2/00
9. AS-BUILT PUMP SECTION (Please attach as-built if different from diagram provided below)

Bench mark elevation surveyed to nearest 0.01 ft. = 301.7 ft. mean sea level

identify reference point elevation for water level measurements through chase tube

Chase tube depth = -5 ft. (referenced to bench mark)

if airline installed, bottom of airline elevation = _____ ft. mean sea level
TO: COMMISSION ON WATER RESOURCE MANAGEMENT  
State of Hawaii  
P.O. Box 621  
Honolulu, HI 96809  

DATE: June 30, 1999  
JOB NO. CWS-002  

SUBJECT: NORTH WAIHEE WATER SOURCE PROJECT  
DEVELOPMENT OF KANOA WELL 1 AND KUPAA WELL  
TMK: (2) 3-2-01: 03  

We are sending you X Attached Under separate cover the following:  

<table>
<thead>
<tr>
<th>NO. OF COPIES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Well Completion Report-Kanoa Well 1 (State well 5731-02)</td>
</tr>
<tr>
<td>1</td>
<td>As-Builts of Well</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED (AS CHECKED BELOW):  

For Signature/Approval X For Information/Use  
For Review and Comment As Requested  

REMARKS:  

C. TAKUMI ENGINEERING, INC.  

Wade Shimabukuro  

cc: ___________________________
Constant Rate Pump Test (1200 gpm.)
Kansa Well #1
5/17/19 9:00 A.M.
Step Draw Down Pump Test
Kanoo Well #1
5/14/99    7:45 A.M.
State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

FAX: Transmitting 14 pages, including this one; call [redacted] with any reception problems.

TO: Ed Sentinella
FROM: Charley Ike

Date: 16 March 99

Transmitting pages from 2 files:

1) Wells 5731-02 & 03 "North Waihe'e Wells 3 & 4", or
   Ka'aua Well 5731-02 • permits & transmittal ltr
   Kupapa Well 5731-03 • map
   (4 pp)

2) Kahakuloa Acres Well 5832-03
   • 1990 ltr from Commission Deputy to Council Chair
   • Pump Installation Permit (final step)
   • map
   (6 pp)

Return Fax: [redacted]
Return Post: P.O.Box 621, Honolulu 96809
**WELL COMPLETION REPORT**

4/25/97 WCR Form

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at Extension 70225.

1. **State Well No.: 5731-02**
   - **Well Name:** Kanoa Well
   - **Island:** Maui
   - **Tax Map Key:** 2-2-13

2. **Location/Address:** North Waihe'e, Wailuku

## PART I. WELL CONSTRUCTION REPORT

3. **Drilling Company:** Wailani Drilling Inc.
4. **Name of driller who performed work:** Mike Robertson
5. **Type of rig/construction:** Air Rotary
6. **Date(s) Well Construction and pump tests (if any) completed:** 5/25/99
7. **GROUND ELEVATION** (referenced to mean sea level, msl): 307.79 ft.
   - **Well Bench Mark (description/location):** Top of pump base plate
   - **Elevation (msl):** 309.15 ft.
8. **DRILLER'S LOG:** Please attach geologic log (if available or if required by permit)

<table>
<thead>
<tr>
<th>Depths (ft.)</th>
<th>Rock Description, Water Level, Dates, etc.</th>
<th>Depths (ft.)</th>
<th>Rock Description, Water Level, Dates, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 38</td>
<td>Gray Weathered Back+Clay</td>
<td>10 to 30</td>
<td>Gray Rock</td>
</tr>
<tr>
<td>38 to 50</td>
<td>Same with less Clay</td>
<td>40 to 50</td>
<td>Weathered Basalt</td>
</tr>
</tbody>
</table>

9. **Total depth of well below ground:** 359 ft.
10. **Hole size:**
    - 22 inch dia. from 2 to 359 ft. below ground
    - 24 inch dia. from 2 to 359 ft. below ground
11. **Casing installed:**
    - 16 in. I.D. x 3 1/8 in. wall solid section to 305 ft. below ground
    - 16 in. I.D. x 5 1/16 in. wall perforated section to 359 ft. below ground
    - **Casing Material/Slot Size:** 1/4" full flow Louvered
12. **Annulus:**
    - Grouted from 0 ft. below ground to 300 ft. below ground
    - Gravel packed from 300 ft. below ground to 359 ft. below ground
13. **Initial water level:** 299.83 ft. below ground
14. **Initial chloride:** 25 ppm
15. **Initial temperature:** 69 °F
16. **PUMPING TESTS:** Reference Point (R.P.) used:
    - **Pump Baseline**, which elevation is 309.15 ft.
    - **Step-Drawdown Test Date:** 5/17/99
      - **Start water level:** 301.3 ft. below R.P.
      - **End water level:** 301.3 ft. below R.P.
    - **Long-term Aquifer Test Date:** 5/17/99
      - **Start water level:** 301.3 ft. below R.P.
      - **End water level:** 301.3 ft. below R.P.
17. **Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached?** Yes No
18. **As-built drawings attached?** Yes No
19. **Other remarks/comments:** (On back of this form)

**Well Drilling Contractor (print):** Mike Robertson  C-57 Lic. No. 20115
**Date:** 5/25/99

**Surveyor (print):**
**Signature:**
**Lic. No.:** P.B. 1207 F.C.C.
**Date:** June 1, 1999

**Applicant (print):**
**Signature:**
**Date:** 6/28/99

**Director:**

---

**Department of Water Supply**

---

**State of Hawaii**

**COMMISSION ON WATER RESOURCE MANAGEMENT**

**Department of Land and Natural Resources**
**PART II. (PERMANENT) PUMP INSTALLATION REPORT**

20. Pump Installation Company: ____________________________

21. Name of person performing work: _______________________

22. Date Pump Installation Completed: ______________________

23. PUMP INSTALLATION:
   - Pump Type, Make, Serial No.: ____________________________  Capacity: ________ gpm
   - Motor type, H.P., Voltage, rpm: __________________________
   - Depth of Pump Intake Setting ______ ft. below __________, which elevation is __________ ft.
   - Depth to bottom of airline ______ ft. below __________, which elevation is __________ ft.
   - Pumping Head is __________ ft. Type of flow meter: __________ which measures in __________

24. As-built drawings attached?  Yes  No

25. Other remarks/comments: (See below)

<table>
<thead>
<tr>
<th>Pump Installation Contractor (print)</th>
<th>C-57 Lic. No.</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Applicant (print)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.(cont'd) DRILLER'S LOG (cont'd):

<table>
<thead>
<tr>
<th>Water Level</th>
<th>Depth (ft.)</th>
<th>Rock Description, Remarks,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>(ft.)</td>
<td></td>
</tr>
<tr>
<td>20.5  to 325</td>
<td>Hard Basalt, Blueroak</td>
<td></td>
</tr>
<tr>
<td>32.5  to 325</td>
<td>Weathered Basalt</td>
<td></td>
</tr>
<tr>
<td>325  to 340</td>
<td>Hard Basalt</td>
<td></td>
</tr>
<tr>
<td>340  to 350</td>
<td>Hard Tuff Rock</td>
<td></td>
</tr>
<tr>
<td>350  to 360</td>
<td>Weathered Basalt</td>
<td></td>
</tr>
<tr>
<td>360  to 385</td>
<td>Softer Black Lava (qq)</td>
<td></td>
</tr>
<tr>
<td>385  to 395</td>
<td>Dense Blueroak</td>
<td></td>
</tr>
<tr>
<td>395  to 399</td>
<td>Black + Red Cinders + Water</td>
<td></td>
</tr>
</tbody>
</table>

19. & 25. Remarks:

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
July 17, 1998

Mr. Michael D. Wilson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Well Construction Permit
Kanoa Well 1 and Kupaa Well 1 (Well No. 5731-02 & 03)

We are enclosing the signed copies of the permits. The Department has awarded the contract for both wells to Wailani Drilling Company. The Contractor will be drilling one well at a time starting with Kupaa Well No. 1.

If there are any questions, please call our Engineering Division at [redacted].

Sincerely,

David R. Craddick
Director

hk
enc.

"By Water All Things Find Life"
Mr. David Craddick, Director  
Maui Department of Water Supply  
200 S. High Street  
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Extension of Start Work Deadline  
Waikapū Mauka Well (Well No. 5131-01)  
Kānoa #1 & Kūpaa #1 Wells (5731-02 & 03)

We received your May 19, 1998 request for an additional three-month extension of your start work deadline (permit condition #10) on the Waikapū Mauka Well, and a second two-month extension of the start date for Kānoa and Kūpaa Wells. We understand that the contracts for construction are being finalized.

By this letter, your request is approved. All other conditions of your permit remain the same. Your new deadlines to start work are:

Waikapū Mauka Well (Well No. 5131-01) - August 12, 1998  
Kānoa #1 and Kūpaa #1 Wells (Well No. 5731-02 & 03) - July 22, 1998

If you have any questions, please call Charley Ice at 587-0251 or toll-free at [redacted] (Maui), extension 70251.

Sincerely,

[Signature]
TIMOTHY E. JOHNS  
Deputy Director

Cl: ss

DATE: ________________ SUSPENSE DATE: ________________

TO: LUM, A. NAKAMA, L. NAKANO, D. OHYE, M. SAIBA, S. SWANSON, S. UWAIN, J. UYENO, D. YODA, K.

INIT. __________ __________ __________ __________ __________ __________ __________ __________

FOR: Approval Signature Information

PLEASE: See Me Review & Comment Take Action Type Draft Type Final File

Xerox ____ copies
May 19, 1998

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

Dear Mr. Sakoda:

Subject: Kanoa and Kupa’a Well (Well No 5731-02 and 03)

The Department has selected Wailani Drilling to perform the well construction work and is in the process of executing a contract with them. We anticipate the contractor to start within a month from now. As such we respectfully request a two month extension for the start work deadline.

If there are any questions, please call me at [redacted]

Sincerely,

David R. Craddick
Director

hk
Ed Sakoda, Acting Deputy Director
Commission on Water Resource Management
Department of Land & Natural Resources
PO Box 621
Honolulu, Hawaii 96809

RE: Transmitting Signed Well Construction Permits for Wells
5131-01 Waikapu Mauka Well; 5731-02 Kanoa Well; 5731-03 Kupaa Well

April 30, 1998

Dear Mr. Sakoda,

Transmitted herewith are signed well construction permits for the subject wells.

Please feel free to contact me at Ellen Kraftsow of my Water Resources & Planning Division staff at or Ed Kagehiro of my Engineering Division staff at should you require further information.

Sincerely,

David Craddick
Director
elk
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management’s Administrative Rules, Section 13-168, entitled “Water Use, Wells, and Stream Diversion Works”, this document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Wallie’e, Walluku, Maui, TMK 3-2-1-3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences.
2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.
3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.
4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.
5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department’s Historic Preservation Division (587-0045) immediately.
6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.
7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, ma) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.
8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.
9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).
10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.
11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.
12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee’s Signature: ___________________________ Date: ___________
Printed Name: ___________________________ Firm or Title: ___________________________

Driller’s Signature: ___________________________ License #: __________
Printed Name: ___________________________ Firm or Title: ___________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment
C: USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
Mr. David Craddick, Director
Maui Department of Water Supply
200 S. High Street
Wailuku HI 96793

Dear Mr. Craddick:

Extension of Start Work Deadline
Waikapū Mauka Well (Well No. 5131-01)
Kānoa #1 and Kūpa‘a #1 Wells (5731-02 and 03)

We received your request for a two-month extension of your six-month start work deadline (permit condition #10). We understand that the bidding process has been initiated but that more time is needed to secure a contractor for the well drilling.

By this letter, your request is approved. All other conditions of your permit remain the same. Your new deadlines to start work are:

Waikapū Mauka (Well No. 5131-01) - May 12, 1998
Kānoa & Kūpa‘a (Well No. 5731-02 and 03) - May 22, 1998

If you have any questions, please call Charley Ice at [redacted] or toll-free at [redacted] (Maui), extension 70251.

Sincerely,

EDWIN T. SAKODA
Acting Deputy Director
March 5, 1998

Mr. Michael D. Wilson, Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Well Construction Permit
Kanoa Well 1 and Kupaa Well 1 (Well Nos. 5731-02 & 03)

The Department of Water Supply, County of Maui respectfully requests an extension of time to start work on the subject well. The bidding process is initiated but selection of the contractor has not been completed. A two-month extension for the start of work will provide us with sufficient time to assure securing a contractor for the well drilling.

Thank you for your support. If there are any questions, please call our Engineering Division at [redacted].

Sincerely,

[Signature]

David R. Craddick
Director

hk

cc: Carl Takumi
Mr. David Craddick, Director
Maui Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Well Construction Permit
Kānoa Well 1 and Kūpaa Well 1 (Well Nos. 5731-02 & 03)

Enclosed are two (2) copies of your approved Well Construction Permit for the captioned well(s) which authorizes well construction activities but excludes installation work for your permanent pump. As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 12:

Special Conditions

1. The hole diameter shall allow for a minimum three-inch grouted annulus for the casing.
2. The depth of the well shall not exceed one-quarter of the thickness of the aquifer.
3. Casing materials shall conform to the strength and thickness specifications of the Hawaii Well Construction and Pump Installation Standards.

This permit does not authorize work for your permanent pump installation. Approval and issuance of your pump installation permit is contingent upon information provided to and accepted by Commission staff as required in the Well Construction & Pump Installation Standards (1/23/97) and any special conditions performed under this permit. Please note that special conditions may simply highlight application deviations from the Standards.

The well owner is responsible for all conditions of the permit. This includes ensuring that the well construction contractor, or other party who constructs the well(s), submits a completed Part I of the Well Completion Report form (enclosed) within sixty (60) days after the well construction work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions.

To validate your permit, please sign and have the contractor sign both permit originals and return one for our files. Also, copies of the aquifer pump test worksheet and the well completion report form are enclosed for your use. Please provide all the information in this packet to your well drilling contractor.

Also attached for your information is a copy of the Department of Health's review comments.

If you have any questions, please call the Commission staff at 587-0251 or toll-free at (Maui), extension 70251.

Aloha,

MICHAEL D. WILSON
Chairperson

Enclosures
Mr. David Craddick, Director
Maui Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Well Construction Permit
Kānoa Well 1 and Kūpaa Well 1 (Well Nos. 5731-02 & 03)

Enclosed are two (2) copies of your approved Well Construction Permit for the captioned well(s) which authorizes well construction activities but excludes installation work for your permanent pump. As part of the Chairperson’s approval, the following special conditions were added and are part of your permit under Permit Condition 12:

Special Conditions

1. The hole diameter shall allow for a minimum three-inch grouted annulus for the casing.
2. The depth of the well shall not exceed one-quarter of the thickness of the aquifer.
3. Casing materials shall conform to the strength and thickness specifications of the Hawaii Well Construction and Pump Installation Standards.

This permit does not authorize work for your permanent pump installation. Approval and issuance of your pump installation permit is contingent upon information provided to and accepted by Commission staff as required in the Well Construction & Pump Installation Standards (1/23/97) and any special conditions performed under this permit. Please note that special conditions may simply highlight application deviations from the Standards.

The well owner is responsible for all conditions of the permit. This includes ensuring that the well construction contractor, or other party who constructs the well(s), submits a completed Part I of the Well Completion Report form (enclosed) within sixty (60) days after the well construction work is completed. Be advised that you may be subject to fines of up to $1000 per day for any violations of your permit conditions.

To validate your permit, please sign and have the contractor sign both permit originals and return one for our files. Also, copies of the aquifer pump test worksheet and the well completion report form are enclosed for your use. Please provide all the information in this packet to your well drilling contractor.

Also attached for your information is a copy of the Department of Health’s review comments.

If you have any questions, please call the Commission staff at [number] or toll-free at [number] (Maui), extension 70251.

Aloha,

MICHAEL D. WILSON
Chairperson

Enclosures
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Waihe'e, Wailuku, Maui, TMK 3-2-1:3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences.

2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.

3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.

4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.

5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division (587-0045) immediately.

6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.

7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.

8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).

10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.

12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee's Signature: ___________________________ Date: ____________

Printed Name: ___________________________ Firm or Title: ___________________________

Driller's Signature: ___________________________ License #: ___________ Date: ____________

Printed Name: ___________________________ Firm or Title: ___________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment:

USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
WELL CONSTRUCTION PERMIT
Kānoa Well, Well No. 5731-02

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Kānoa Well (Well No. 5731-02) at North Waihe'e, Wailuku, Maui, TMK 3-2-1:3, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences.

2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.

3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.

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5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division immediately.

6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.

7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
   b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
   c. As-built sectional drawing of the well.
   d. Plot plan and map showing the exact location of the well.
   e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.

8. The permittee shall comply with all applicable laws, rules, and ordinances, and non-compliance may be grounds for revocation of this permit.

9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97).

10. The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

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12. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: September 22, 1997
Expiration Date: September 22, 1999

MICHAEL D. WILSON, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to $1000 per day.

Permittee's Signature: ____________________________ Date: 7/14/98
Printed Name: David Craddick
Firm or Title: Director of Water Supply

Driller's Signature: ____________________________ License #: 20145 Date: 7/18/98
Printed Name: ____________________________
Firm or Title: ____________________________

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment:
C: USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
TO: Honorable Lawrence Miike, Director  
Department of Health  
Attention: Dennis Tulang, Wastewater Branch  
William Wong, Safe Drinking Water Branch

FROM: Michael D. Wilson, Chairperson  
Commission on Water Resource Management

SUBJECT: Well Construction Permit Application  
Kānoa Well #1 and Kūpa’a Well #1 (Well No. 5731-02 & 03)

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. Please respond by returning this cover memo form by August 1, 1997.

Please find a map, attached, to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Charley Ice of the Commission staff at [Contact Information].

CI: ss  
Attachment(s)

RESPONSE:

This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 30 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.

This well does not qualify as a source serving a public water system (serves less than 25 people or more people at least 30 days per year or 15 service connections) and if the well water is used for drinking, the private owner should test for bacteriological and chemical presence before initiating such use and routinely monitor the water quality thereafter. However, if future planned use from any source increases to meet the public water system definition then Director of Health approval is required prior to implementation.

If the well is used to supply both potable and non-potable purposes in a single system, the user shall eliminate cross-connections and backflow connections by physically separating potable and non-potable systems by an air gap or an approved backflow preventer, and by clearly labeling all non-potable spigots with warning signs to prevent inadvertent consumption of non-potable water. Backflow prevention devices should be routinely inspected and tested.

It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.

For the applicant’s information, a source of possible wastewater contamination [ ] is [ ] is not located near the proposed well site (information attached).

Other relevant DOH rules/regulations, information, or recommendations are attached.

[ ] No comments/objections

Contact Person: Bill Wong  
Phone: 586-258

Signed: Bill Wong  
Date: 7/9/97
TO: Honorable Lawrence Miike, Director  
Department of Health  
Attention: Dennis Tulang, Wastewater Branch  
William Wong, Safe Drinking Water Branch

FROM: Michael D. Wilson, Chairperson  
Commission on Water Resource Management

SUBJECT: Well Construction Permit Application  
Kānoa Well #1 and Kūpa’a Well #1 (Well No. 5731-02 & 03)

Transmitted for your review and comment is a copy of the captioned well application.

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CI:ss  
Attachment(s)

RESPONSE:  

[ ] This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 60 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.

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[ ] For the applicant’s information, a source of possible wastewater contamination [ ] is [ ] is not located near the proposed well site (information attached).

[ ] Other relevant DOH rules/regulations, information, or recommendations are attached.

[ ] No comments/objections

Contact Person: Lori N. Kajiwara

Signed: Lori N. Kajiwara

Phone: 90-4894

Date: 7-15-97
Mr. David Craddick  
Maui Department of Water Supply  
200 South High Street  
Wailuku, HI 96793  

Dear Mr. Craddick:

Well Construction Permit Application for Well No. 5731-02 & 03

We acknowledge receipt, on July 14, 1997, of your completed well construction permit application for the Kānoa Well #1 and Kūpā‘a Well #1 (Well Nos. 5731-02 & 03). You can expect your application to be processed within ninety (90) days from this date.

For your information, the process of constructing a well is normally regulated and permitted in two (2) steps. First, a well construction permit is issued for drilling and testing purposes only. Based upon information provided by you through a Well Completion Report Part I (Well Construction), a pump installation permit may then be issued to authorize pump work. If a pump is installed then a Well Completion Report Part 2 (Pump Installation) is required.

If you have any questions about your permit application, please contact Charley Ice of the Commission staff at [contact information] or toll-free at [contact information] extension 70251.

Sincerely,

[Signature]

RAE M. LOUI  
Deputy Director

Cl:ss
TO: Honorable Lawrence Miike, Director
Department of Health
Attention: Dennis Tulang, Wastewater Branch
William Wong, Safe Drinking Water Branch

FROM: Michael D. Wilson, Chairperson
Commission on Water Resource Management

SUBJECT: Well Construction Permit Application
Kānoa Well #1 and Kūpa‘a Well #1 (Well No. 5731-02 & 03)

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. Please respond by returning this cover memo form by August 1, 1997.

Please find a map, attached, to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Charley Ice of the Commission staff at [contact information]

CI: ss
Attachment(s)

RESPONSE:

This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 60 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.

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If the well is used to supply both potable and non-potable purposes in a single system, the user shall eliminate cross-connections and backflow connections by physically separating potable and non-potable systems by an air gap or an approved backflow preventer, and by clearly labeling all non-potable spigots with warning signs to prevent inadvertent consumption of non-potable water. Backflow prevention devices should be routinely inspected and tested.

It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.

For the applicant’s information, a source of possible wastewater contamination [ ] is [ ] is not located near the proposed well site (information attached).

Other relevant DOH rules/regulations, information, or recommendations are attached.

No comments/objections

Contact Person: ___________________________ Phone: _________________________

Signed: _________________________________ Date: _________________________
**SECTION 1: WELL LOCATION INFORMATION**

<table>
<thead>
<tr>
<th>Island</th>
<th>MAUI</th>
<th>Proposed Use</th>
<th>Municipal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifer System</td>
<td>WAILUKU</td>
<td>Proposed Withdrawal</td>
<td>Sustainable Yield</td>
</tr>
<tr>
<td>Aquifer Sector</td>
<td>WAIMEE</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

**SECTION 2: WELL SECTION DATA** *(enter data in grey cells only)*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Data</th>
<th>Solid Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation at top of casing</td>
<td>402 ft. m.s.l.</td>
<td>Material: Steel</td>
</tr>
<tr>
<td>Ground Elevation</td>
<td>400 ft. m.s.l.</td>
<td>Designation: ASTM A242</td>
</tr>
<tr>
<td>Cement Grout</td>
<td>400 ft.</td>
<td>Length: 400 ft.</td>
</tr>
<tr>
<td>Rock Packing</td>
<td></td>
<td>Diameter: 16 in.</td>
</tr>
<tr>
<td>Hole Diameter</td>
<td>9 in.</td>
<td>Wall Thickness: 0.375 in.</td>
</tr>
<tr>
<td>Total Depth</td>
<td>450 ft.</td>
<td></td>
</tr>
<tr>
<td>Estimated Head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculated Aquifer Thickness</td>
<td>5 ft. m.s.l.</td>
<td></td>
</tr>
<tr>
<td>County Water Supply (Y/N ?)</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

**SECTION 3: CHECKLIST** *(values to check are shaded)*

<table>
<thead>
<tr>
<th>Well Depth</th>
<th>Data</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Thickness of Aquifer</td>
<td>0 ft.</td>
<td>Aquifer Thickness: too deep (refer to HWCPIS Section 2.2)</td>
</tr>
<tr>
<td>1/4 Aquifer Thickness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of Well below Sea Level</td>
<td>50 ft.</td>
<td></td>
</tr>
<tr>
<td>Well Casing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Wall Thickness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Steel</td>
<td></td>
</tr>
<tr>
<td>County or Non-County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Thickness per standards</td>
<td>0.375 in.</td>
<td></td>
</tr>
<tr>
<td>Wall Thickness Provided</td>
<td>0.375 in.</td>
<td>okay (refer to HWCPIS Section 2.4 c)</td>
</tr>
<tr>
<td>Minimum Length of Solid Casing</td>
<td>360 ft.</td>
<td></td>
</tr>
<tr>
<td>90% of ground to top of aquifer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of solid casing Provided</td>
<td>400 ft.</td>
<td>okay (refer to HWCPIS Section 2.4 d)</td>
</tr>
<tr>
<td>Casing Material</td>
<td>ASTM A242 - N/A</td>
<td></td>
</tr>
<tr>
<td>Annular Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of Grouting</td>
<td>280 ft.</td>
<td></td>
</tr>
<tr>
<td>Calculated Depth of Grouting</td>
<td>400 ft.</td>
<td>okay (refer to HWCPIS Section 2.6 c)</td>
</tr>
<tr>
<td>Depth of Grouting provided</td>
<td>8 in.</td>
<td>too small (refer to HWCPIS Section 2.6 d)</td>
</tr>
<tr>
<td>Thickness of Annular Space</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
July 3, 1997

Ms. Rae Loui
Commission on Water Resource Management
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Loui:

Subject: North Waihee Exploratory Wells
Kupaa Well No. 1 and Kanoa Well No. 1
TMK: (2) 3-2-01:003

We are enclosing completed applications and two copies of well construction permit for Kupaa Well No. 1 and for Kanoa Well No. 1 for approval. We understand that the filing fees is not required of the Department.

The final environmental assessment and finding of no substantial impact is published in the June 23, 1997 OEQC Bulletin.

If there are any questions, please call our Engineering Division at [insert phone number].

Sincerely,

David R. Craddick
Director

hk
enc.
cc. Carl Takumi Engineering

"By Water All Things Find Life"
APPLICATION FOR PERMIT P1:55

1. APPLICANT: (circle primary contact a, b, or c)
   (a) WELL OWNER     COUNTY OF MAUI
      Family Name: Department of Water Supply
      Contact Person: David B. Craddock Ph: 243-7730
      Address: 200 South High Street
                 Wailuku, HI 96793
   (b) LANDOWNER
      Family Name: Wailuku Agribusiness Co., Inc.
      Contact Person:          Ph: 244-9570
      Address: 90 Waiheo Road P.O. Box 520
                 Wailuku, HI 96793
   (c) CONTRACTOR
      Family Name:                             Ph:          Contractor's C-57 License No.
      Address: ___________________________________________________

2. WELL LOCATION/NAME: Kanoa Well #1 (N. Waiheo Well Site #3) Island: Maui
   Address: Wailuku, Maui, HI
   Tax Map Key: 3-2-01: 03
   (Attach a USGS map, scale 1"=2000', and a property tax map showing well location referenced to established property boundaries.)

3. (a) PROPOSED WORK: # New Well # Alter Location
      # Drill New Well # Replace Pump # Modify Pump
      # Modify Existing Well # Reduct # Deepen # Abandon/Seal
      # Install New Pump # Replace Pump # Modify Pump
      * Be sure to complete and submit well abandonment report upon completion of work.
      
      (b) WELL TYPE:
      # Deep  # Bore  # Driven  # Cased  # Non-Drilled  # Radial
      Is this well a part of a battery of wells? Yes No
      (Briefly describe and fill in the diagrams on the back of this form)

4. PROPOSED PUMP INFORMATION: Rated Pump Capacity: 1400 gallons per minute
   Pump Type:
   # Deep Well  # Topside  # Submersible
   # Rotary  # Rotary Drive  # Centrifugal
   # Propeller  # Submersible  # Motor:
   # Diesel  # Electric, rated horsepower of:

5. PROPOSED USE: # Municipal (including hotels, stores, etc.) # Military
      # Domestic (individual, noncommercial water supply) # Industrial
      # Irrigation (crop) # Other (explain)
      # State Land Use District: # Urban # Agriculture # Rural # Conservation
      County Zoning (specific): County Interim

6. (a) PROPOSED AMOUNT OF WITHDRAWAL:
      (b) METHOD OF FLOW MEASUREMENT:
      gallons per day
      Flow meter  Open pipe  Office Flow  Web

7. PENDING ACTIONS: # COUA # SMA # EIS # EAA # NONE # Other (explain)
      Completion Date: 

8. REMARKS, EXPLANATIONS:
   Preliminary test in pilot hole at depth of 450' (elev. 50')
   Option to increase pilot hole in 25 foot increments. Final depth of blank
   16" dia. casing to be determined later.
   (If more space is needed, continue on back)

   STATE OF HAWAII
   COMMISSION ON WATER RESOURCE MANAGEMENT
   Department of Land and Natural Resources

   Well Owner: ____________________________   Contractor: ____________________________
   Signature: ____________________________   Date: ____________________________

   Landowner: ____________________________   President: ____________________________
   Signature: ____________________________   Date: ____________________________

   For official use only:
   Date Issued: ____________________________   Date Accepted: ____________________________
   Field Checked By: ____________________________   Aquifer System Name: ________________
Remarks, Explanations (cont'd): Grout to extend to bottom of blank casing.  
10 to 20 feet of screen may be added to bottom of solid casing - depending on test results.

9. PROPOSED WELL SECTION

Elevation at top of casing 402 ft., ngl.

Cement Grout: 400 ft.

Rock Packing: 0 ft.

Hole Diameter: _____ In.

Total Depth 450 ft.

Ground Elevation: 400 ft., ngl.

Solid Casing:
- Material: steel
- Length 400 ft.
- Diameter 16 in.
- Wall thickness 0.375 in.

Casing: [ ] Perforated [ ] Screen
- Material
- Length 10 to 20 ft.
- Diameter 16 in.
- Wall thickness
- Openings [ ] sq. in./LF.

Open Hole:
- Length 50 ft.
- Diameter 10 in.

Approximate elevation at time of filing application. Ground elevation above mean sea level (ft) by a surveyor licensed by the State must be submitted at time of construction. Final elevations of well components shall be submitted in the well completion/well abandonment reports.