

BEFORE THE  
COMMISSION ON WATER RESOURCE MANAGEMENT  
STATE OF HAWAII

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In Re: Petition to )  
Designate the Island of Lanai )  
as a Water Management Area )  
\_\_\_\_\_ )

WMA No. L-1

LANAI WATER RESOURCES  
FINDINGS OF FACT

Commission on Water Resource  
Management  
Department of Land and Natural  
Resources  
January 31, 1990

## PREFACE

This FINDINGS OF FACT has been prepared for the Commission on Water Resource Management for its consideration in designating the island of Lanai as a water management area under the authority of Chapter 174C, HRS.

On March 2, 1989, John D. Gray submitted a petition, with 168 signatures of Lanai residents, to the Commission requesting the designation of the island of Lanai as water management area under Chapter 174C, HRS.

On May 17, 1989, the Commission approved the recommendation to continue of the designation process for the island of Lanai. The Commission's staff investigation of the water resources commenced immediately thereafter.

On August 29, 1989, the Commission held public hearings on Lanai to receive public comments regarding the proposed designation of the island.

These FINDINGS OF FACT summarize the Commission staff investigations and research, the public's written and oral comments received at the public hearings and otherwise, existing information on file with the Department of Land and Natural Resources, and information and comments from consultation with the County of Maui.

Finally, the Commission staff makes ultimate FINDINGS OF FACT and Conclusions to the Commission.

TABLE OF CONTENTS

PREFACE . . . . .	ii
LIST OF TABLES . . . . .	iv
LIST OF FIGURES . . . . .	v
SUMMARY . . . . .	vi
Lanai's Ground Water Resources . . . . .	vi
Findings of Fact . . . . .	vi
Conclusion . . . . .	vii
I.    PURPOSE . . . . .	1
II.   DESIGNATION BACKGROUND . . . . .	1
A.  Petition . . . . .	1
B.  Consultation . . . . .	2
C.  Recommendation for Continuance . . . . .	2
D.  Public Hearing . . . . .	2
E.  Findings of Fact Report . . . . .	3
III.  PROPOSED LANAI WATER MANAGEMENT AREA . . . . .	4
A.  General . . . . .	4
B.  Lanai Hydrology . . . . .	5
C.  Current Water Use . . . . .	15
D.  Future Development and Projected Water Use . . . . .	18
IV.   CRITERIA FOR DESIGNATION . . . . .	21
V.    FINDINGS OF FACT . . . . .	25
VI.   CONCLUSION . . . . .	25
REFERENCES CITED . . . . .	26
APPENDIX A  Petition and Addendums	
APPENDIX B  Maui County Comments to Petition	
APPENDIX C  Commission Action to Continue Designation	
APPENDIX D  Written Testimony from 8/29/89 Public Hearing	
APPENDIX E  Petition for Contested Case Hearing	
APPENDIX F  Maui County Comments to Findings of Fact Report	
APPENDIX G  M & E Water Development Estimations	

LIST OF TABLES

Table I.	High-Level Aquifer Recharge Estimations . . . . .	10
Table II.	Current Ground Water Levels, 1988 . . . . .	11
Table III.	Current Well Chloride Concentrations . . . . .	13
Table IV.	Lanai High-level Aquifer Sustainable Yield . . . . .	15
Table V.	Average Daily Water Demand for Lanai . . . . .	17
Table VI.	Future Projected Water Demand for Lanai . . . . .	19
Table VII.	Ground Water Designation Criteria . . . . .	21

LIST OF FIGURES

Figure 1.	Island of Lanai . . . . .	4
Figure 2.	Ground Water Occurrence on Lanai . . . . .	5
Figure 3.	Annual Rainfall at Lanai City (1930-1988) . . . . .	6
Figure 4.	Median Rainfall for Lanai . . . . .	7
Figure 5.	Existing Well Depths in High-Level Aquifer . . . . .	12
Figure 6.	Lanai Co. Water Distribution System . . . . .	16

## SUMMARY

The Commission on Water Resource Management directed its staff to investigate the island of Lanai for possible designation as a Water Management Area under the authority of Chapter 174C, HRS. This document reviews Lanai's water resource situation and makes FINDINGS OF FACT based upon information on file in the Department of Land and Natural Resources, the research of independent investigators, the written and oral comments submitted to the Commission at the public hearing and other planning and scientific literature.

### Lanai's Ground Water Resources

The petition to designate the entire island of Lanai as a water management area which would allow the Commission to regulate ground water withdrawals through a water use permit system.

Lanai has no surface water sources of substance. Potable ground water on Lanai is found only in the island's high-level aquifer system. All basal ground water is brackish.

Existing potable water demand originates from pineapple cultivation and domestic consumption (approximately 2,200 residents). Lanai's high-level aquifer is the only source which supplies these potable demands.

Future development in the Manele and Koele project districts will increase potable water demand on Lanai's high-level aquifer. Developments are projected to the year 1991.

The existing water distribution system owned and operated by the island's sole purveyor of water, Lanai Co., must be upgraded to handle future water needs. Alternative water source development is planned to partially supply future non-potable demands. Renovation of Lanai's water distribution is currently underway with the replacement of certain transmission lines and exploratory drilling of new high-level aquifer wells.

### Findings of Fact

Given the existing hydrologic data, analyses, and recent exploratory drilling on Lanai, this report makes the following conclusions:

1. The ultimate sustainable yield of the high-level aquifer on Lanai, independent of the existing well distribution system, is not less than 6 mgd;

2. All future planned development listed in Table VI will increase total annual average withdrawals from the high-level aquifer to no more than 5 mgd. However, upgrading of the existing water distribution system is necessary to achieve an efficient 5 mgd capacity. In addition, future basal aquifer sources and treated wastewater effluent shall supply 1.4 mgd to non-potable demands from planned development;
3. With an ultimate sustainable yield of 6 mgd, a future potable water demand of 5 mgd will result in withdrawals totaling 83% of Lanai's ultimate sustainable yield;
4. Efforts are presently underway to upgrade the existing water distribution system to accommodate future potable demand. Deeper wells should also attenuate past water shortages brought about by droughts and existing water distribution infrastructure. Alternative non-potable sources of treated effluent are available but a basal source has yet to be discovered;
5. If planned alternative sources do not come to fruition and full development continues it is possible that future withdrawals may exceed 90% of Lanai's high-level ultimate sustainable yield;
6. None of the 8 ground water criteria cited in §174C-44, HRS, have been met which would mandate designation.

### Conclusion

At this time, the factual information now available does not support a finding that Lanai's ground water should be designated for regulatory permitting of water uses under any of the 8 criteria listed in HRS §174C-44.

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STATE OF HAWAII

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I. PURPOSE

By petition, a request has been made to the Commission on Water Resource Management for the designation of Lanai as a water management area whereby all uses of ground water on the island be regulated and controlled by the Commission under Chapter 174C, HRS. Accordingly, this Findings of Fact Report has been prepared for the Commission on Water Resource Management and its consideration of the petition to designate the island of Lanai as the LANAI WATER MANAGEMENT AREA.

II. DESIGNATION BACKGROUND

A. Petition

On March 3, 1989, a petition, with 168 signatures of Lanai residents, was received by the Commission from a Mr. John D. Gray requesting the designation of Lanai, TMK 4-9, as a water management area. Subsequent addendums to the original petition were also submitted on March 7, 1989 and March 15, 1989. The petition and addendums, in Appendix A, cited reasons from Chapter 174C, HRS requiring designation, as follows:



1. Future authorized planned development on the island would or may cause the water withdrawal to exceed 90% of the island's sustainable yield;
2. Current ground water levels are excessively declining or have declined in the past during droughts;
3. Serious disputes are occurring concerning current actual water use, future water demands, and future distribution of water between residents and resorts on Lanai;
4. That current state approved well developments will result in one of the previous issues.

In accordance with Chapter 174C, HRS the chairperson of the Commission had until May 1, 1989 (60 days) to recommend continuation or discontinuance of the designation process.

#### **B. Consultation**

Consultation with the County Mayor and Department of Water Supply was initiated on April 7, 1989. Responses were returned on April 28, 1989 and May 1, 1989 respectively. During this response period the Commission approved a 16-day extension to the 60-day Lanai recommendation deadline period at its April 19, 1989 meeting. This was done to allow Commission staff sufficient time to review county responses and that action on the recommendation be taken at the Commission's regularly scheduled May 17, 1989 meeting. County responses may be found in Appendix B.

#### **C. Recommendation for Continuance**

At its May 17, 1989 meeting the chairperson of the Commission put the recommendation to a vote with Commission members and continuance of the designation process was approved. This action initiated Commission investigation into Lanai's water resources. Commission approved action may be found in Appendix C.

#### **D. Public Hearing**

On August 29, 1989 the Commission held a public hearing on the island of Lanai to receive testimony from the public concerning designation.

Pro-designation testimony, both written and oral, restated much of the petition contentions. Other pro-designation comments, besides those mentioned in the petition and subsequent addendums, included the following:

1. Lack of proper scientific basis for estimating sustainable yield;
2. Former company workers recall internal "safe" annual withdrawals much less than the consultant estimates and that from their personal observations existing wells are overstressed;
3. Reoccurring drought conditions on the island and past water shortages indicate that resources are near their limit;
4. Potential sale of island to foreigners;
5. Cost of living increases due to development;
6. That the above concerns, and any others, are valid since criteria for designation in Chapter 174C, HRS are not specifically limited to those outlined in the statute.

Testimony against designation came from Maui County Department of Water Supply and Lanai Company. The testimony referred to recent consultant studies done on Lanai's water resources and development plans which show that the high level aquifer would not be endangered by future planned development.

Testimony also included a request for a contested case hearing on the proposed designation matter. Public hearing written and oral testimony can be found in Appendix D. The Commission received an official written petition for a contested case hearing on September 7, 1989 less than 10-days after the public hearing. The State Attorney General reviewed the petition and advised the Commission that the Law does not require contested case hearings in the designation process. The petition for a contested case can be found in Appendix E.

#### **E. Findings of Fact Report**

Subsequent to the public hearings and completion of staff investigations on the Lanai designation issue, these FINDINGS OF FACT were prepared accordance with Chapter 174C, HRS. This document was sent to the Mayor, County Council, and Department of Water Supply of Maui for their comments, which are attached in Appendix F.

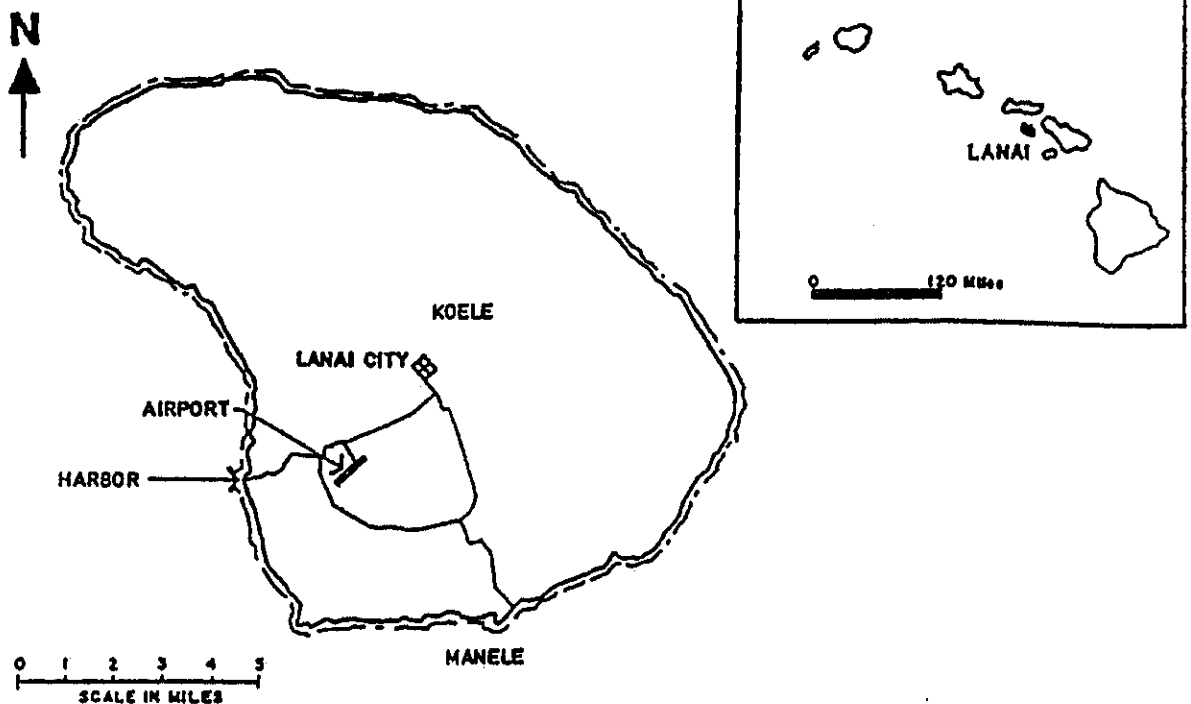
### III. PROPOSED LANAI WATER MANAGEMENT AREA

#### A. General

The petition before the Commission requested that the entire island of Lanai, TMK 4-9, be designated as a water management area. Lanai has a land area of approximately 90,000 acres (141 square miles, (see Fig. 1)) and a maximum elevation of 3,370 feet above mean sea level. Most of its 2,200 people reside in Lanai City on the island's central plateau. A few small communities exist along the shores of the island near Kaumalapau Barge Harbor, Manele Bay, and the windward side of the island. Castle & Cooke, Inc. owns 98% of the island.

Lanai's economy is based upon its cultivation of over 12,000 acres of pineapple and is presently operated by Lanai Company, a subsidiary of Castle and Cooke, Inc. Lanai Company is also the sole purveyor of water on the island for both agricultural and domestic uses and is regulated by the State Public Utilities Commission. Recent plans by Lanai Company call for the development of the island's economic potential of tourism through the construction of the Koele & Manele Bay resort projects and their supporting infrastructure. These developments which have raised concerns regarding the water resources of Lanai and the need for designation.

Figure 1. Island of Lanai

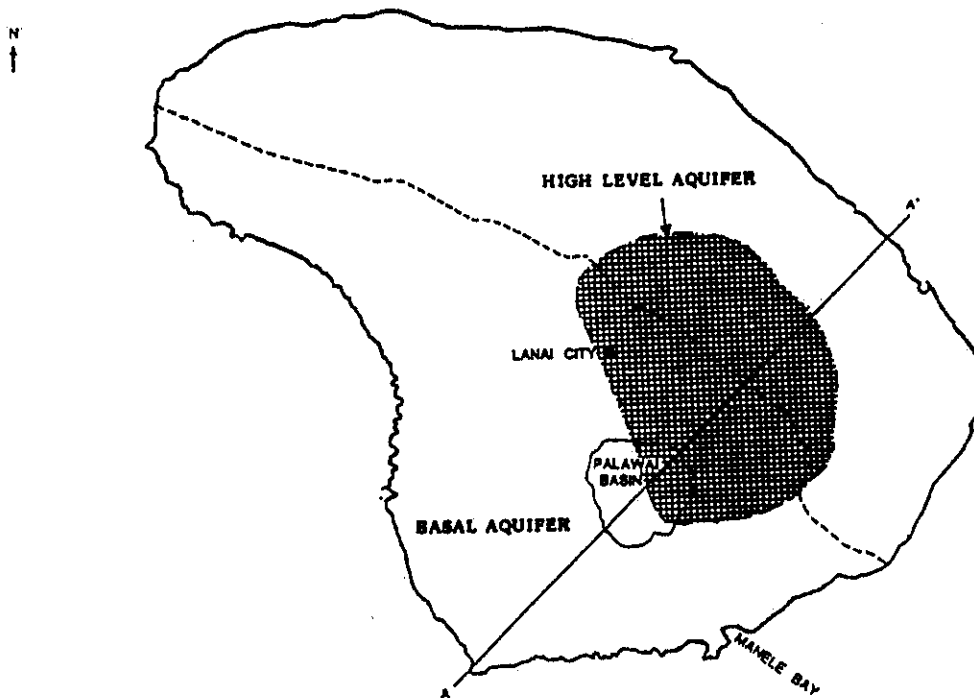


## B. Lanai Hydrology

### 1. Ground Water Occurrence

Ground water on Lanai occurs in both the central high-level aquifer and in the surrounding basal aquifer (see Figure 2). Potable groundwater on Lanai is found only in the high-level aquifer system. All basal groundwater is brackish. Past investigations have estimated that the high-level aquifer covers an area between 11.3 (Anderson, 1961) to 24 (Mink, 1983) square miles or 8% to 17% of the island's total land area. During the recent drilling of exploratory well 10 (State well no. 4555-01) on the southern rim of the Palawai Basin, high-level dike water at an elevation of [600] feet above mean sea level was encountered. This indicates that the extent of the high level aquifer is probably closer to the upper range of 24 square miles. 212

**Figure 2. Ground Water Occurrence on Lanai**

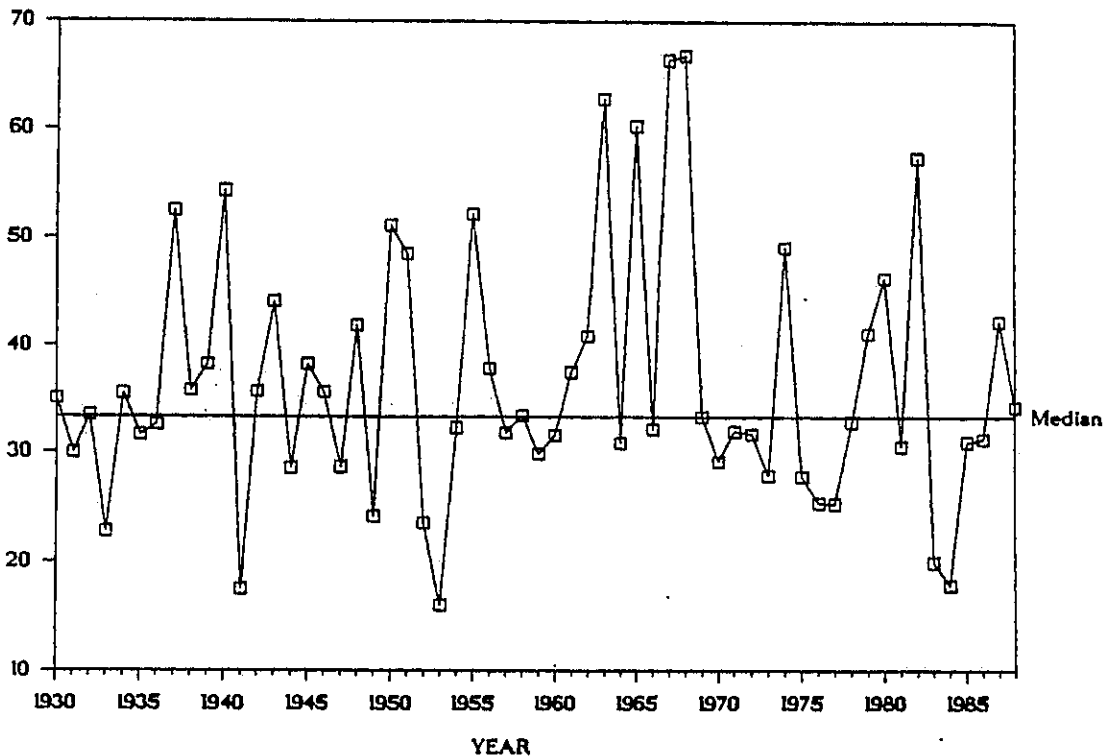


## 2. Rainfall

Lanai lies in the rain shadow of West Maui and East Molokai and, consequently, the island receives relatively little rainfall. Hydrologists (Mink, 1983; MacDonald, 1970; Sterns, 1940) agree that the long-term average rainfall near the summit of the island is about 38 inches. However, short-term fluctuations of rainfall are common. For example, during 1955 through 1957, a cloud interception study at the summit recorded a 3-year average annual rainfall of 50 inches per year (Ekern, 1964) but during the 1983-86 state-wide drought Lanai City recorded an average annual rainfall of 25 inches per year.

Since 1914, a total of 52 rain gauge stations at various time scales and locations have measured rainfall. There are currently 18 rain gauge stations still in service; 8 maintained by the National Weather Service, 6 by Lanai Company, and 4 by the United States Geological Survey. These stations report rainfall monthly. The longest record of rainfall comes from the Lanai City rain gauge, state key no. 672, which has recorded daily rainfall since 1930 (59 continuous years) these values are plotted in Figure 3. The average annual rainfall for Lanai City over this 59-year period is 36.4 inches while the annual median is 33.3 inches.

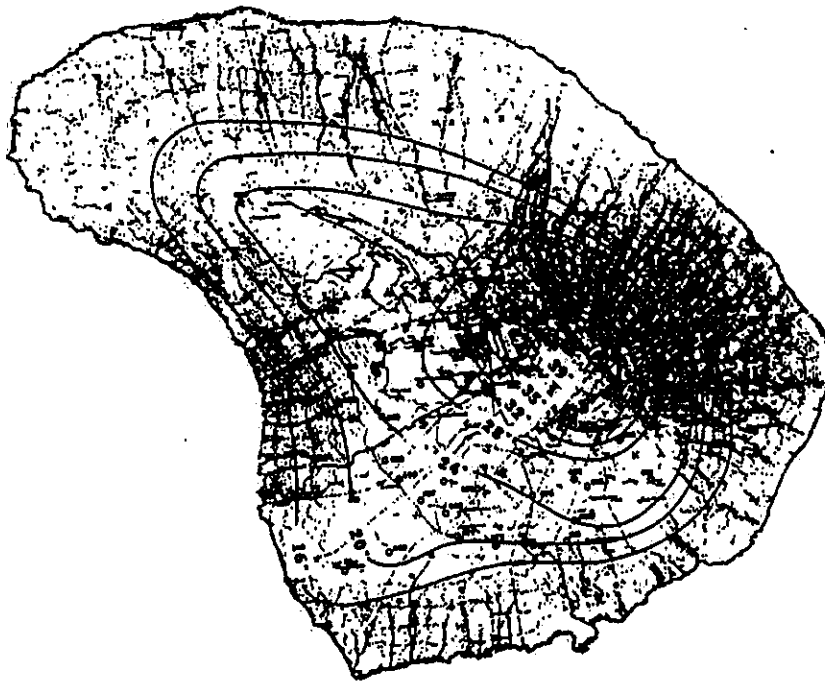
**Figure 3. Annual Rainfall at Lanai City (1930-1988)**



The aggregate of all rainfall data has been used to construct the isohyetal contours for the island. The most recent isohyetal analysis is from the State's "Rainfall Atlas of Hawaii, Report R76, 1986". Isohyet contours reflect a median annual rainfall of 32 inches for Lanai City (see Figure 4) which is consistent with Lanai City Station median annual rainfall of 33.3 inches. Further examination indicates that the summit area of the island has a median annual rainfall in excess of 39 inches.

Comparing hydrologists' estimations of average, or mean, annual rainfall which affect the high level aquifer with Report R76 median annual rainfall it is clear that the estimations are reasonable based on existing rainfall data. Hydrologist estimations of average rainfall are actually slightly lower than the median isohyets found in Report R76. Emphasis is added to the comparison between average and median to clarify any confusion which may arise between the two different statistical measures. Generally, the median of a rainfall data set is more conservative than its corresponding average value. To illustrate this; the 1930-1988 average annual rainfall at Lanai City is 36.4 inches while for the same period the median annual rainfall is 33.3 inches. Hydrologists' estimations of rainfall near Lanai City is more representative of the conservative median value. Therefore, rainfall estimations affecting the high-level aquifer from previous reports on Lanai are reasonable.

**Figure 4. Median Rainfall for Lanai**



### 3. Fog Drip

Besides rainfall, fog drip is a major contributor to Lanai's water resources. Fog drip is the direct interception of water from clouds and fog by condensation on surface areas such as vegetation. During 1955 through 1957 a study by Ekern (1964), was performed to estimate the impact which fog drip on Lanai's water supply. Surprisingly, water from fog drip augmented rainfall by 30 inches per year near the summit of Lanai Hale over the 3-year period. Fog drip studies on the Big Island have had similar results.

Calculations for fog drip used by Mink (1983) in estimating recharge utilized a maximum of 22.8 inches over a 4.5 square mile recharge area and 6.84 inches over 9.5 square miles in his calculations which is reasonable. Anderson (1984) also states that fog drip "unquestionably" contributes to ground water recharge and considers it in his most recent hydrologic calculations.

### 4. Runoff

Current runoff from Lanai is quite meager except during major storms. Many factors, such as island geology, soil permeability, antecedent soil-moisture, precipitation, etc. contribute to surface water occurrence but probably the most telltale evidence of Lanai's scanty runoff from streams is the existence of only one major stream valley; Maunalei. The lack of any other perennial streams on the island testify that the majority of runoff, thus loss of water from the island's water supplies, occurs only during major storms on the island.

Current estimates of runoff are reasonable. Mink (1983) had assigned an annual runoff estimate from the High-Level Aquifer recharge area 8.9 inches of rainfall, or in excess of 20% of the annual average rainfall.

### 5. Evapotranspiration

Evapotranspiration occurs as the combination of evaporation of surface water exposed to the atmosphere and through the process of transpiration whereby plants increase water loss through their utilization of water beneath the ground surface.

The only reported Lanai pan evaporation measurements, found in State Report R74, comes from a single station, State Key No. 687, during 1957-58; a period which experienced near median rainfall (refer back to Figure 3). The 19-month average pan evaporation measured 26.85 inches. Frequent cloud cover and low temperatures would together explain the low pan evaporation and the reason for Stearns's observation that the ground near the island's summit is damp for most of the year despite the relatively low rainfall.

Evapotranspiration due to vegetation depends on plant and climatological factors. For a relative sense, evapotranspiration from a water hungry plant such as sugarcane is estimated by multiplying pan evaporation by a factor which typically ranges from range from 0.8, for sugarcane in wet areas, to 1.2, sugarcane in very hot and dry areas. Thus, it would be conservative to assume that evapotranspiration equals pan evaporation near Lanai City. Such conservatism has been exhibited in past studies; Mink used 25 inches in his estimates of evapotranspiration while Stearns attributed 75% of average rainfall, 26 inches, to both evapotranspiration and runoff.

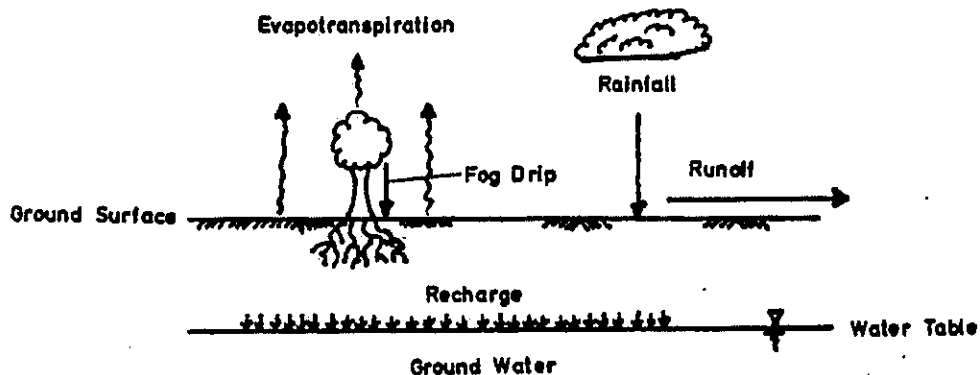
It is insightful to compare Stearns's estimates for runoff and evapotranspiration, 26 inches, with Mink's estimates, where evapotranspiration (25 in.) and runoff (9 in.) total of 34 inches. It is evident that Mink's water loss estimates (34 in.) are more conservative than Stearns (26 in.).

### 6. Ground Water Recharge

Ground water recharge is that amount of water which, after applied to the ground surface, reaches and becomes part of an aquifer. Recharge to the ground water on Lanai takes place over both the high-level and basal aquifers.

In the past, estimates of recharge were taken as conservative percentages of rainfall. For example, Stearns (1940) attributed 25% of total rainfall in the 15 square miles of highest rainfall on Lanai to recharge. Hydrologists now use the more systematic method of a water balance to estimate ground water recharge. Such methods were undoubtedly used by Anderson (1984), Bowles (1974), and Mink (1983). Mink used the following water balance equation to calculate recharge:

$$\text{Recharge} = \text{Rainfall} + \text{Fog Drip} - \text{Runoff} - \text{Evapotranspiration}.$$





The water balance equation accounts for all sinks and sources of water relative to the aquifers except subterranean leakage between the both aquifers and the ocean. However, leakage occurs after water has entered the ground water system and is thus separate from recharge (leakage is addressed further in section III.2.i).

Hydrologists have estimated recharge for the high-level aquifer over the centermost 14 square miles of the high-level ground water occurrence. This recharge area accounts for 58% of the 24 square mile high-level aquifer area. Using water balances or conservative percentages recharge to the 14 square mile area is shown in Table I.

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**Table I. High-Level Aquifer Recharge Estimations**

		<u>mgd</u>
<b>Anderson</b>	<b>(1989)</b>	<b>8.9</b>
<b>Bowles</b>	<b>(1974)</b>	<b>6.5</b>
<b>Mink</b>	<b>(1983)</b>	<b>9.3</b>
<b>Stearns</b>	<b>(1940)</b>	<b>6.4</b>

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Earlier estimates by ignored the impact of fog drip and did not have the benefit of recent well drilling data which further substantiated the extent of the high-level aquifer. Given the conservative approach exhibited by Mink and Anderson their estimates are reasonable. Therefore, the best current estimate of recharge to the high-level aquifer approximates 9 mgd.

It is clear that precipitation over the basal aquifer does not create enough recharge to make this aquifer a potable source. However, it is possible that brackish water may be found to accommodate non-potable water needs.

### 7. Water levels

Water levels from the high-level aquifer are greatly above sea level, on the order of 1000 feet above mean sea level (msl), and is typical of high-level aquifers throughout the Hawaiian islands. For the most part, water levels in all wells had remained relatively constant from 1948 to 1975.

Since 1948, water levels have declined about 100 feet. Present water levels are shown in Table II.

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Table II. Current Ground Water Levels, 1988

<u>Well</u>	<u>Elevation (ft. MSL)</u>
Shaft 2	700
Shaft 3	902
1	760
2	1400
3	1025
4	1560
5	1410
6	1000
7	684

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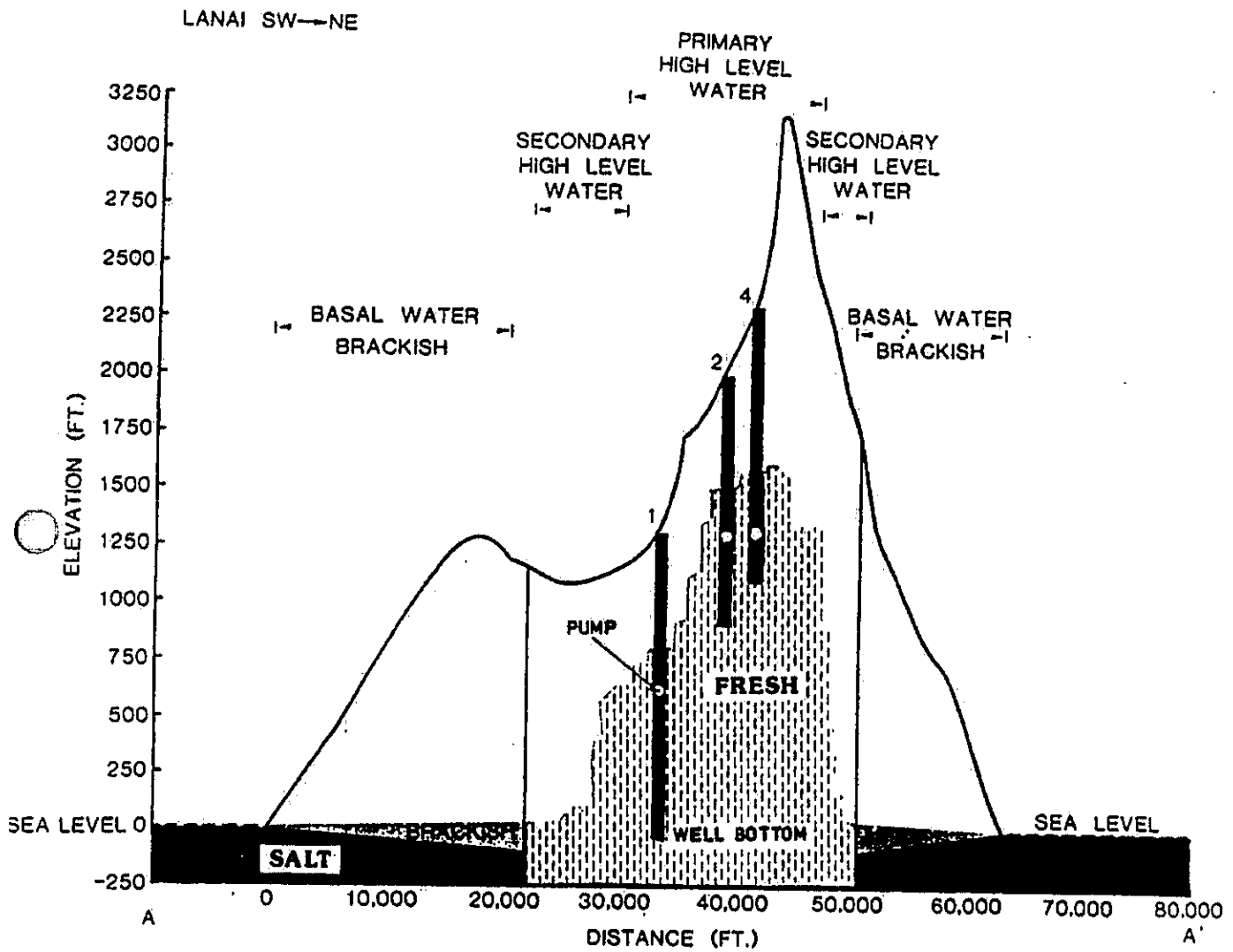
Although water levels have been generally declining since 1948 there are years in which water levels make significant recoveries. This would indicate that mining of storage ground water is not occurring since the aquifer is evidently recharging at times when pumpage is temporarily decreased.

The major reason for the decline in water levels can be attributed to the increased irrigation of pineapple. Prior to 1980, irrigation use approximated 1.5 mgd. Irrigation water usage increased an additional 1 mgd after the 1983 introduction of full-time drip irrigation to increase crop yields. Meanwhile, domestic uses have remained constant since 1948. Thus, much of the decline in water levels has occurred relatively recently over the past 15 years.

It is also important to understand that low water levels with respect to existing wells do not mean water levels are low with respect to the aquifer as a whole. The depths of existing wells, with the exception of well 1, do not penetrate deeply into the high level aquifer (see Figure 5). It is easy to see that while certain existing wells may dry up, as water levels decrease throughout the aquifer with increased pumpage, actual water levels would still remain high above sea level.

Recently drilled exploratory wells 9 & 10 have proved the existence of high-level water in their respective locations. Water levels measured at well 9 & 10 were 871 and 212 feet above mean sea level respectively. This is strong evidence that the high-level aquifer underlies a wide area of Lanai.

Figure 5. Existing Well Depths in High-Level Aquifer



## 8. Current Water Quality

Current water quality of water from operating high-level wells is generally very good. For comparison, American Water Works Association standards limits chloride concentrations for potable uses at 250 mg/l. Chloride concentrations for existing wells are tabulated in Table III.

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Table III. Current Well Chloride Concentrations, 1989

<u>Well</u>	<u>Chlorides (mg/l)</u>
Lower Tunnel	22 *
Upper Tunnel	NA
Shaft 2	34 *
1	407
2/Shaft 3	41
3	48
4	30
5	31
6	62
7	67

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\* 1983 measurements

This is typical of high-level water quality found throughout the state.

Water qualities at exploratory wells 9 & 10 are not potable. Preliminary well logging of exploratory well 9 encountered warm water (81.5 °F) with a chloride concentrations of 1045 mg/l while exploratory well 10 encountered warmer water (98.7 °F) with a chloride concentration of 330 mg/l. These warm temperatures and non-potable chloride concentrations are probably a result of the well locations in the Palawai Caldera and remnants of geothermal activity. In addition, it is believed that well 10 has had some contamination from drilling which has affected its chloride concentration. Better assessment of these wells will can be done when full scale pumping tests are performed.

Water quality in existing shafts and wells are not threatened by the drilling of new wells. The fact that brackish water was found in exploratory well Nos. 9 & 10 does not mean waters in existing wells and shafts will experience quality changes due to water source development. Wells 1, 9, & 10 all exhibit that geothermal activity is present within the Palawai basin.

## 9. Sustainable Yield

Sustainable yield is defined in Chapter 174C, HRS as follows:

*§174C-3 - "Sustainable yield" means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission.*

To state the maximum rate of withdrawal more succinctly, sustainable yield would be, what is described by Mink as the ultimate sustainable yield, as the total water available in an aquifer on a sustained basis independent of existing well configurations, source development, and operational costs. In other words, sustainable yield should be dependent upon aquifer characteristics rather than hardware installation.

Since both Mink (1983) and Anderson (1989) considered fog drip and have had the benefit of new knowledge obtained from recent well drilling logs their estimates for sustainable yield deserve greater consideration than earlier studies.

Anderson (1989) and Mink (1983), as well as all other hydrological studies performed on Lanai, have acknowledged that sustainable yield is certainly less than the upper limit defined by recharge. This due to unknown amounts of leakage between aquifers and the ocean. All studies have acknowledged the potential for leakage on Lanai.

Anderson and Mink use different methods to account for leakage and estimating sustainable yield. Anderson (1989) accounts for leakage by using a fairly conservative percentage of recharge, 70%, to estimate a sustainable yield of 6.22 mgd. Mink (1983) estimates sustainable yield through use of a hydraulic ground water model similar to that used to estimate sustainable yield in the Pearl Harbor Water Management Area.

The hydraulic model used by Mink (1983) is a much more rigorous method of estimating sustainable yield than the application of conservative percentages. The model employs mass-balance, Darcy's Law, and dimensional analysis relationships to formulate the fundamental model which accounts for leakage. The formulation of this model is similar to that used in the Pearl Harbor Ground Water Control Area. The model is applicable to both basal (Pearl Harbor) and high-level (Lanai) ground water because the phreatic surface in both aquifers, i.e. the water table, are under atmospheric pressure rather than confined aquifer type pressures.

A major insight of Mink's model is the gradual decay of leakage as the water table lowers. Leakage decreases as water levels decline because hydrostatic pressures which drive leakage are reduced.

Using his sustainable yield curves which incorporate leakage Mink arbitrarily set the ultimate sustainable yield of the high-level aquifer as the point where the water level of all wells reach one-half of the original heads encountered when wells were first drilled. Such water levels would still be several hundred feet above sea level, ranging between 350 to 800 feet in elevation, and provide a factor of safety to Mink's sustainable yield estimates.

For easy reference, Table IV outlines the best estimates to date for sustainable yield.

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**Table IV. Lanai High-level Aquifer Sustainable Yield**

Mink (1983)	6.0 mgd
Anderson (1989)	6.2 mgd

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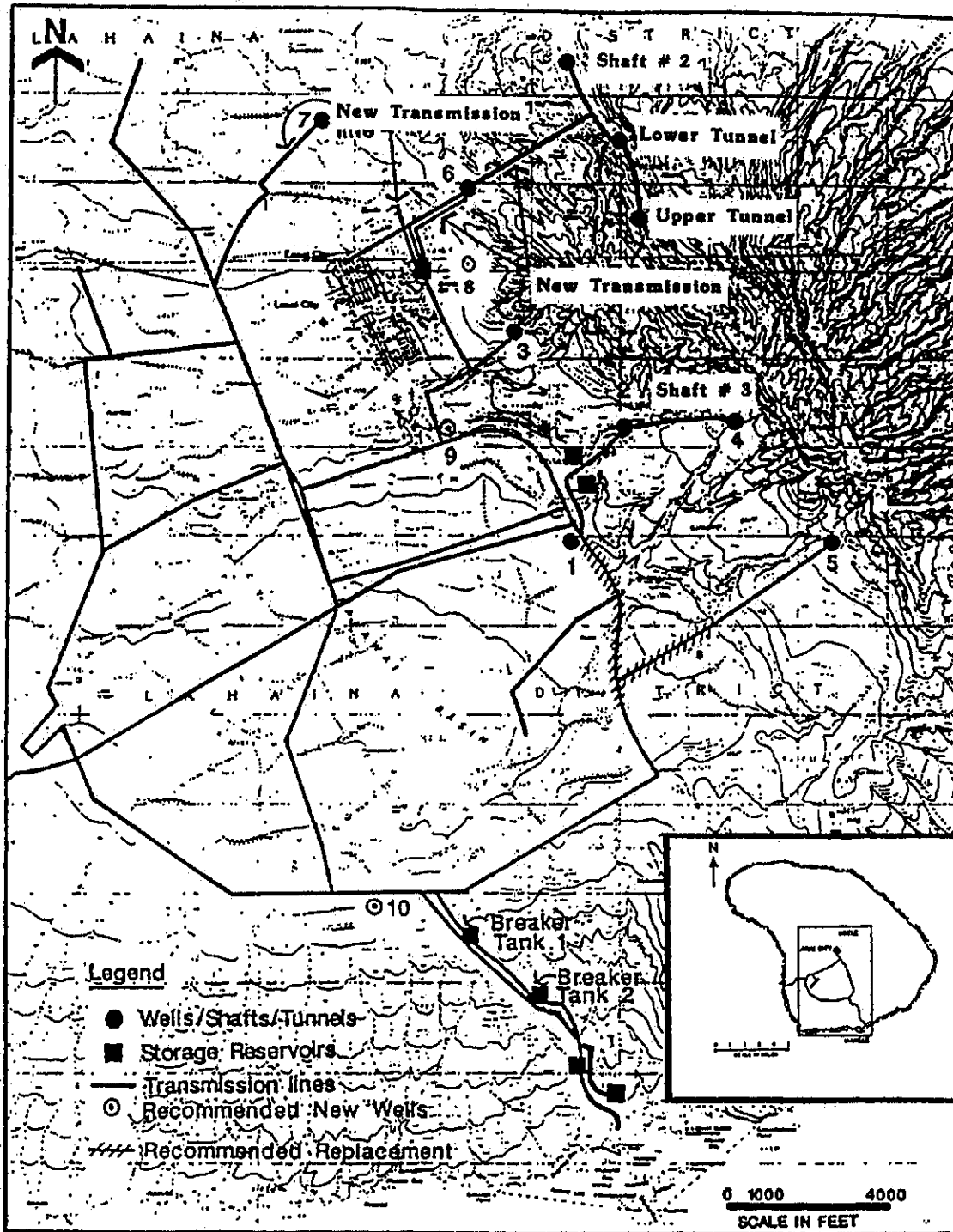
Previous comments from the petition, public hearing testimony, and consulting reports refer an existing sustainable yield of 3 mgd. These refer to the capacity of the existing water supply system and is not distinctive of the high-level aquifer itself. As mentioned in Mink (1983), existing wells will have to be deepened to take advantage of the available sustainable water supply from the high-level aquifer. For conservative purposes the sustainable yield should be considered 6 mgd.

### **C. Current Water Use**

Current water use on Lanai is for domestic and agricultural purposes and withdrawn from 9 existing ground water developments. All source are owned and operated by Lanai Co. and regulated by the State Public Utilities Commission. [Three] additional wells, wells [8]<sup>6</sup> to 10, are in various stages of development and will also be incorporated into Lanai's water distribution system. Lanai's water system is composed of various wells, well shafts, and transmission lines as shown in Figure 6.

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Figure 6. Lanai Co. Water Distribution System



Total annual water withdrawals from the high-level aquifer are tabulated in Table V.

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**Table V. Average Daily Water Demand for Lanai**

<u>Year</u>	<u>Total Withdrawal (mgd)</u>
1980	1.38
1981	1.90
1982	1.70
1983	3.14
1984	2.79
1985	2.63
1986	2.84
1987	2.68
1988	3.51
<b>9-year average</b>	<b>2.51</b>

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The withdrawals incorporate the impact from drip irrigation which has increased agricultural water demand for pineapple from an annual average of 1.5 mgd to 2.4 mgd. Before 1983, irrigation water was only used to "start-up" pineapple or for pesticide application. Otherwise, the pineapple relied on natural precipitation for most its water needs. With the technological advances of drip irrigation, the year round application of water to pineapple was feasible and implemented in 1983. The greater application of water increases crop yield.

The 1983 to 1986 annual average pumpage deserves more consideration as the benchmark of "current water use" to fairly assess the impact from future planned developments. The State of Hawaii suffered a severe drought during '83-'86 and Lanai experienced below median rainfall throughout this period (refer to Figure 3). During this 4-year drought Lanai City received rainfall averaging 25 inches per year. During this drought much of the planned development had not yet started. Combining the drought and pre-development situations make for a fair water use datum to which future developments' projected water demands may be added. High-level withdrawals for the '83-'86 period averaged 2.85 per year.



An average water use estimate of 2.85 mgd is reasonable given the drought pumpage and other assessments of pre-development water use. In accordance with §174C-26, the statewide water resource registration and declaration program, Lanai Company declared an average water use during 1983-1987 of 2.74 mgd. According to the March 1989 M&E Report, the average quantity of ground water withdrawn over recent years is 2.78 (also see Appendix G). According to Anderson's research on Lanai's water use (March 1989), total average water withdrawals between 1980-1989 has been approximately 2.6 mgd.

Comments from the petition and public hearings requested 1988 water use. Lanai reported its 1988 water use to the U.S. Geological Survey as 3.3 mgd. Written testimony from Lanai Company also indicated a 1988 withdrawal of 3.51 mgd. These pumpages seemingly contradict the previous estimate of 2.78 but it is important to understand that water use fluctuates from year to year depending on numerous conditions such as weather, crop cycles, construction needs, and even maintenance of the water system. More importantly, 1988 was a year of construction for both the Manele, Koele Hotels, and other planned developments which has most certainly increased water demands to some extent. Thus, 1988 would not be a fair benchmark to measure pre-development water use.

#### **D. Future Development and Projected Water Use**

Proposed development on Lanai is concentrated on the Koele and Manele project districts. Both project areas will contain a major resort hotel, golf course, park areas, open areas, roadways, and multi & single family residential developments. Additionally, the Manele project area will have commercial and sewage treatment plant developments. Construction of developments began around 1987 and the Koele Hotel and golf course are nearing completion.

It is anticipated that future development will double the island's resident population from 2,200 to 4,800 by the year 2010. Roughly 70% of this growth will occur by 1995. The maximum visitor population will be limited to approximately 1,100 based on the planned total of 550 hotel rooms from both Koele (250) and Manele (300) hotels.

Projected estimates of both potable and non-potable future water demands fluctuate slightly among various environmental assessments and other development plans and projections. To be conservative, the highest projected estimates from all development related documents for each project are tabulated in Table VI.

Table VI. Future Projected Water Demand for Lanai

<u>Year</u>	<u>Project</u>	<u>Potable Demand (mgd)</u>	<u>Non-potable Demand (mgd)</u>
* 1988	Lanai City	0.40	
	Dole Plantation	2.45	
1989	Koala Hotel	0.18	
	Lalakoa III	0.09	
	Eulopoe Beach		0.07
	Lanai Industrial Community Gardens	0.03	0.11
	Lanai City Apartments	0.02	
1990	Koala Golf Course	0.40	
	Lower Waialua	0.07	
	Queen's Multi-fam	0.07	
	Manele Bay Hotel	0.20	
	Manele Golf Course		1.00
	Other landscpa		(0.54)
	Commercial Downtown	0.25	
	Koala SFR	0.02	
Lalakoa (additional)	0.08		
1991	Manele Residential	0.25	
	Koala Residential	0.20	
Total		4.71	1.72

\* Pre-development demand ('83-'86 average)

Projected domestic demands in Table VI are based on reasonable measures of domestic water use. Projected resident domestic water demands are based on Maui County standards of 600 gpd per single family unit (150 gpd per capita) while visiting tourists were assigned 175 gpd per person. Per capita consumption can vary anywhere within a range of 70 to 200 gpd. In 1985, a high usage year during the '83-'86 state-wide drought, the Honolulu Board of Water Supply pumpages, which included agricultural services, recorded a per capita maximum day use of 195 gpd and a minimum of 154 gpd. Statewide, domestic water use for 1985 was 173 gpd per capita which included small agricultural users supplied by municipal sources. Lanai's existing domestic water use is approximately 180 gpd per capita which is on the higher end of the scale for domestic usage.

Projected golf course irrigation requirements are reasonable given that actual water use for similar size golf courses on Oahu in arid coastal areas ranges between 0.5 to 1.6 mgd; averaging 1 mgd. Projected water demand for Manele's 18-hole golf course is projected to consume 1 mgd but may exceed this given its arid location. However, Manele golf course water requirements are to be augmented by alternative water sources from treated sewage effluent and non-

potable basal ground water which could provide ample supply should more water be required. Projected water demand for Koele's 18-hole golf course is slightly below the lower range observed golf courses water usage but it is important to remember that the elevated Koele region receives more rainfall and fog drip while losing less to evapotranspiration than near ocean golf courses.

From Table VI, the reasonably conservative estimates for future total potable demand, hence demand on the high-level aquifer, total 4.71 mgd while non-potable future demand will be 1.72. However, since it is anticipated that non-potable sources will only produce 1.4 mgd it is assumed that potable sources can and will make up the 0.32 mgd difference. This would effectively produce an annual average potable demand of 5.02 mgd from the high-level aquifer. Given the conservative nature of the estimations, it would be reasonable for the Commission to consider a future average annual potable demand of 5 mgd.

Future potable demands of Lanai must be met through further development of Lanai Company's existing (pre-1987) water system. Existing well shafts and wells 1 through 7 are capable of withdrawing a total 3 mgd from the high-level aquifer but are too shallow to effectively increase withdrawals. By deepening existing wells or drilling new and deeper wells the water system can increase withdrawal rates up to the 5 mgd required by future developments.

Lanai company is presently demonstrating efforts to increase the water system delivery capability. New exploratory wells 8 to 10 are in various stages of development and the company will be replacing old transmission lines to decrease system leakage losses. Well 8 has been relocated to the upper plateau above Lanai city and well 9 is under consideration for further pump testing and development. Well 10 has confirmed the regional extent of the high-level dike water but preliminary sample pumping of this well indicates that it will not be useful. The company may require an additional well to replace well 10 and possibly more wells to augment the existing water system depending on the productivity of wells 8 and 9.

#### IV. CRITERIA FOR DESIGNATION

Chapter 174C, HRS presents a listing of criteria which the Commission must consider in determining the designation of a ground water management area. These criteria are listed in Table VII.

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**Table VII. Ground Water Designation Criteria (8 items)**

1. [§174C-44(1)] Whether an increase in water use or authorized use may cause the maximum rate of withdrawal from the ground water source to reach ninety percent of the sustainable yield of the proposed water management area;
  2. [§174C-44(2)] There is an actual or threatened water quality degradation as determined by the department of health;
  3. [§174C-44(3)] Whether regulation is necessary to preserve the diminishing ground water supply for future needs, as evidenced by excessively declining ground water levels;
  4. [§174C-44(4)] Whether rates, times, spatial patterns, or depths of existing withdrawals of ground water are endangering the stability or optimum development of the ground water body due to upconing or encroachment of salt water;
  5. [§174C-44(5)] Whether the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses;
  6. [§174C-44(6)] Whether excessive preventable waste is occurring;
  7. [§174C-44(7)] Serious disputes respecting the use of ground water resources are occurring; or
  8. [§174C-44(8)] Whether water development projects that have received any federal, state, or county approval may result, in the opinion of the Commission, in one of the above conditions.
-

**Criterion 1.    *Whether an increase in water use or authorized 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.***

**Discussion**

From the analysis of existing data and methodology used by hydrologists in determining a sustainable yield for the island of Lanai, the estimate of 6 mgd for potable water from high-level dike aquifer is considered reasonable. A sustainable yield for the basal aquifer is unknown although it is anticipated that it can supply useful non-potable water.

Maximum future projected potable water demand for all projects augmented by non-potable sources could reach 5 mgd. This demand is based on conservative estimates and consideration of maximum demands stated from all development related reports.

Given a sustainable yield of 6 mgd for the high-level aquifer and a total projected future demand of 5 mgd, the maximum annual average withdrawal from Lanai's high-level ground water source would be 83%. This condition would not warrant designation although the Commission, pursuant to 174C, HRS, may coordinate an informational meeting for all water users to devise mitigative measures.

Development of well sources is necessary to increase the present potable water supply infrastructure. Once hardware is in place, it should not be ignored that if planned alternative water sources fail to materialize then withdrawals from the high-level aquifer may reach the 90% of its the sustainable yield.

Conclusion:        NO DESIGNATION

**Criterion 2.    *There is an actual or threatened water quality degradation as determined by the Department of Health.***

**Discussion**

There is no evidence of water quality degradation. Neither the Department of Health nor any individual has found or shown actual or threatened water quality degradation on Lanai.

Conclusion:        NO DESIGNATION

**Criterion 3.    *Whether regulation is necessary to preserve the diminishing ground water supply for future needs, as evidenced by excessively declining ground water levels.***

**Discussion**

Declining groundwater levels have been observed since 1975 in all wells except the Maunalei Tunnels. These reductions have been mainly due to the increase of pineapple irrigation from the introduction of full time drip irrigation.

Future reductions in head levels will affect well configurations rather than the high-level ground water supply. If wells are modified then reduction in water table levels can be tolerated without harming the ground water supply for future needs.

Conclusion:        NO DESIGNATION

**Criterion 4.    *Whether rates, times, spatial patterns, or depths of existing withdrawals of ground water are endangering the stability or optimum development of the ground water body due to upconing or encroachment of salt water.***

**Discussion**

None of the existing wells have exhibited any evidence that upconing or salt water encroachment will be a problem. Recently drilled exploratory well Nos. 9 and 10 have yielded warm and brackish water from the Palawai basin but there is no reason to believe that, if developed, these wells would endanger other wells or the stability of the entire high-level ground water aquifer.

Conclusion:        NO DESIGNATION

**Criterion 5.    *Whether the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses.***

**Discussion**

There has not been any observable chloride concentration increases in existing wells over the past 50 years. Recently drilled wells 9 & 10 show high chloride contents which are due to geothermal activity isolated within the Palawai caldera.

Conclusion:        NO DESIGNATION

**Criterion 6.    *Whether excessive preventable waste is occurring.***

**Discussion**

No comment has been made through petitions or testimony regarding preventable waste and there is no evidence of excessive preventable water waste occurring on Lanai. However, the 180 gpd per capita on Lanai is slightly high compared to normal domestic use elsewhere in the state.

Conclusion:        NO DESIGNATION

**Criterion 7.    *Serious disputes respecting the use of ground water resources are occurring.***

**Discussion**

Since there is a single private purveyor and developer of water on Lanai, actual serious disputes are not now and have not occurred on the island in the sense that there are separate competing water sources drawing from a common aquifer. However, some dispute has arisen based on speculation that future water from the sole purveyor may be allocated to the disadvantage of the residents of Lanai should drought conditions or unforeseen events limit water withdrawals.

Conclusion:        NO DESIGNATION

**Criterion 8.    *Whether regulation is necessary to preserve the diminishing ground water supply for future needs, as evidenced by excessively declining ground water levels.***

**Discussion**

Ground water levels have declined since water development began on Lanai but at a relatively safe rates given the elevations of the water tables and their corresponding responses to region wide pumping. Recent increases in pumpages due to drip irrigation and development construction will lower water levels which will later stabilize at an equilibrium head. It is foreseen that future needs will be met without harm to the high-level aquifer according to the planning efforts of Lanai Company.

Conclusion:        NO DESIGNATION

## V. FINDINGS OF FACT

From the analysis of Lanai's current and future water resource conditions this report makes the following conclusions:

1. Recent scientific analyses estimating the ultimate high-level aquifer sustainable yield at 6 mgd are reasonable. Earlier reports of sustainable yield either support recent studies or refer to "operating" sustainable yields limited by well configuration hardware rather than the characteristics of the high-level aquifer itself. Thus, the ultimate sustainable yield of the high-level aquifer on Lanai is not less than 6 mgd;
2. Future planned development on Lanai will increase total annual average withdrawals from the high-level aquifer to no more than 5 mgd. However, augmentation to the existing water distribution system is necessary to achieve an efficient 5 mgd capacity. In addition, future basal aquifer sources and treated wastewater effluent shall supply 1.4 mgd to non-potable demands from planned development;
3. With an ultimate sustainable yield of 6 mgd, a future potable water demand of 5 mgd will result in withdrawals totaling 83% of Lanai's ultimate sustainable yield.
4. Efforts are presently underway to augment to existing water distribution system to accommodate future potable demand. Deepening of wells should also attenuate past water shortages brought about by droughts and existing water distribution infrastructure. Alternative non-potable sources of treated effluent are available but a basal source has yet to be discovered;
5. If planned alternative sources do not come to fruition and full development continues it is possible that future withdrawals may exceed 90% of Lanai's high-level ultimate sustainable yield;
6. None of the 8 ground water criteria cited in §174C-44, HRS, have been met which would mandate designation.

## VI. CONCLUSION

At this time, the factual information now available does not support a finding that Lanai's ground water should be designated for regulatory permitting of water usage under any of the 8 criteria in HRS §174C-44.



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**APPENDIX A Petition and Addendums**

WL

JOHN D. GRAY  
P.O. Drawer E  
Lanai City, HI 96763  
(808) 565-6901

February 28, 1989

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RECEIVED

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DEPT. OF LAND  
& NATURAL RESOURCES  
STATE OF HAWAII

Hon. William W. Paty  
Chairperson  
Commission on Water Resource Management  
P.O. Box 621  
Honolulu, HI., 96809

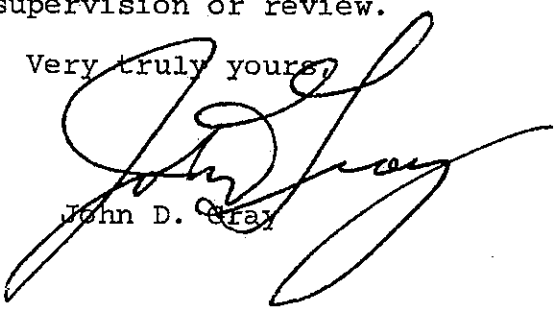
Honored Sir:

Enclose please find the Petition to Designate the Island of Lanai a Water Management Area.

You will note that there are over 160 signatories for this petition. Among them Lanai's representative on the Maui Planning Commission and members of the Lanai Local Advisory Commission. Lanai is known as a "dry island" and we all recall the past drought years. I am a golfer but I do not think that the local populace should suffer merely to keep golf courses alive.

Please give this petition your most serious consideration. Castle and Cooke, Inc. could not be seriously prejudiced by requiring it to justify its projected water use, while the local people could be seriously prejudiced if the company can go ahead without supervision or review.

Very truly yours,



John D. Gray

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

Petition for Designation of Island of Lanai as a  
WATER MANAGEMENT AREA

John D. Gray  
514 Ilima Ave.  
P.O. Drawer "E"  
Lanai City, HI., 96763

1. This petition is to request that the entire island of Lanai be designated a Water Management Area pursuant to section 174 C-41 of the Water Code of the State of Hawaii. The designation of the entire island is required as all of Lanai's water comes from the area of the Lanaihale. All water is groundwater.

2. All of the petitioner's are residents of Lanai City, and the principal petitioner and signatory owns the real property located in Lanai City, Hawaii, commonly described as 514 Ilima Avenue.

3. Petitioner is unable to comply with section 13-171-4 of the Administrative Rules requiring the petition to designate a Water Management Area to be on forms provided by the commission, for the reason that there are no forms yet available. See attached letter , marked exhibit A 2 from the Chairman.

4. The island of Lanai is over 90% owned by Castle & Cooke, Inc. and its subsidiaries. Water has been furnished by the Koele Company and The Lanai Water Company, Inc., both Castle & Cooke subsidiaries, to the domestic users on Lanai.

Oceanic Properties and other subsidiaries of Castle & Cooke, Inc. appear to be responsible for real estate development on the island. Hereafter petitioners will refer to Castle & Cooke, Inc., and its subsidiaries collectively as "The Company."

c. That present withdrawals of ground water are endangering the stability and optimum development of the ground water body.

d. That serious disputes respecting the use of ground water are occurring, in that, petitioners believe that insufficient water exists on the island to service and maintain existing uses and the proposed new uses for two hotels, two golf courses, 600 new homes, additional landscaping required and proposed additional residential developments. Present available ground water sources have barely been sufficient for existing uses.

e. additional issues that may be shown when "Company" water reports become available to the Commission.

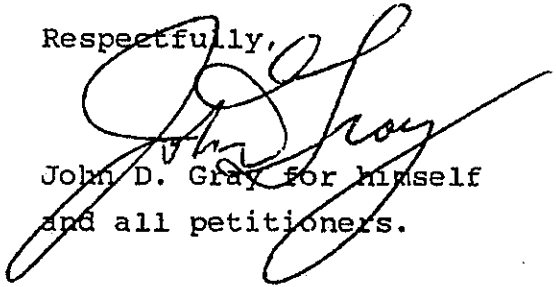
5. (RELIEF SOUGHT BY PETITIONERS)

The relief sought by the petitioners is that the island of Lanai be designated a Water Management Area.

6. (PERSONS WHO MAY BE AFFECTED)

All residents of the island of Lanai are persons who will be affected by the relief sought, plus such businesses and entities who may be embraced within the term "persons" as set for in the Administrative Rules.

Respectfully,



John D. Gray for himself  
and all petitioners.

5. "The Company" is in the process of a large development on Lanai, including two hotels (one of 250 rooms and one of 104 rooms), a championship golf course (called a "Target Course"), approximately 300 new homes and apartments, a land development to sell lots and large homes in the Manele area plus extensive landscaping. All of the foregoing will require large amounts of water, as will be later discussed. *SEE PAGE 7A*

6. In October of 1988 "The Company" held a public meeting on the island at which Mr. John Mink, a hydrologist, stated that in his opinion there was a potential water supply for the island of five to seven million gallons per day. Mr. Mink refused to answer questions concerning the projected required uses by the hotels, golf, etc., stating that he would "turn that over to Mr. Oda." (Robert Oda, Vice President of The Lanai Company) Petitioner asked Mr. Oda what were the anticipated usuaages for: a. the Manele Beach Hotel (250 rooms), the Koele Hotel (104 rooms), the golf course, and who had to suffer first if there wasn't sufficient water. Mr. Oda stated that he wasn't able to answer any of the questions, but that "The Company" would be very careful about the water needs of the community. Needless to say, its incredible that a water meeting would be held with responsible officers and consultants for "The Company" where no one of them has any idea of the possible needs for the development. This incredible inability prompted the belief that the availability of water to sustain the development was marginable at best. It also ocassioned a study of available records. (Preactically all records are in the custody of "The Company.")



7. Petition has requested the opportunity to see the reports of the various hydrologists which have been rendered over the years and the well pumping reports to no avail. (The well pumping are required to be filed within a few months to comply with the State Water Code) Copies of the letters requesting such access are attached hereto, collectively marked exhibit "B". Petitioner did receive one response from Mr. Oda indicating that another water meeting would be held in the next two months and "if at all possible I will try to get together with you and provide a preview of the contents of this report prior to the scheduled meeting." A copy of this letter is attached and marked exhibit "C". Petitioner has phoned on numerous occasions to no avail.

Petitioner wrote to the Hon. Velma Santos on the Maui County Council, a person personally known to him in October and again on December 9, 1988, a copy of this letter is attached hereto and marked exhibit "D". Mrs. Santos responded on January 19, 1989, a copy of this letter is attached hereto as exhibit "E".

8. (Publicly Available Water Information for Lanai is Scanty)

So far as petitioner has been able to ascertain there is only the following publicly available information on water on Lanai:

a. U.S. Geological Survey of Water Use in Hawaii published in cooperation with this Department which shows scanty information for Lanai, all of which information was furnished by "The Company."

1975, 590 Million G per year for Agricultural	(1,616,438 daily)
130 " " " " " Domestic	(356,164 " )
1980, 330 mil. G per yr. for Agricultural	(904,109 daily)
140 " " " " " Domestic	(383,000 " )
1985, 941 MG/yr for Agricultural	(2,580,000 daily)
149, " " Domestic	(410,000 daily)

There is no surface water; all is ground water

b. "Geology and Ground Water Resources of Lanai and Kahoolawe Hawaii," by H.T. Stearns, published by the Territory of Hawaii circa 1940. For background purposes some quotes from Stearn's book may be informative:

Page 72. "In a dry island like Lanai only a small part of the rain sinking into the soil reaches the water table."

Page. 73 "No records of transpiration or evaporation are available."

Page 73. "The top 7 sq. miles is the only place with sufficient rainfall to take care of the transpiration requirements of plants. Elsewhere when the rains come the soil is so dry that most of the rain that soaks into the ground is returned to the atmosphere later by evaporation and transpiration. Consequently there must be very little ground water recharge except in the summit area. This conclusion is supported by the general absence of fresh water springs entering the sea along the coast."

Page 73. "Groundwater is the lifeblood of Lanai."

Page 74. "Since 1924 when the Hawaiian Pineapple Company built Lanai City the water supply has been barely adequate. The faucets in the laborer's homes had special devices to reduce the flow of water. (This on top of 1/2 inch pipe) The supply was insufficient for a sewer system. A shortage of water often occurred if a drought coincided with the harvesting season when the number of laborers was increased. "

Stearns estimated the available rechargeable supplies of water to be around 600,000 gallons per day.

c. Pursuant to petitioner's request this Commission furnished a "Ground Water Index -- Lanai Code 5. This index showed existing wells and their location, but no pumping reports. It described the length of shafts, depths, and indicated that "Records avail at USGS." Inquiry at USGS failed to reveal any records, hence petitioner believes that this is just a general part of the form, which would be applicable to all islands where additional data might be a matter of public record.

9. Petitioner is informed that a 1949 report prepared for the Company shows that there was 850 M/G per year developed, (2,328,767 per day) and a total potential on a sustained basis of 1,325 M/G per year (3,630,136 G per day).

DOUGLAS

10. (Estimated Usuages Required for New Developments)

The following estimates of water usage per day are believed to be reasonable and probably on the low side:

Hotel at Manele (250 rooms)	100,000
Hotel at Koele (104 rooms)	52,000
Extensive grounds at hotels	50,000

Hotel estimates are from Honolulu Water Dept. for Waikiki

Championship golf course at Manele	1,000,000	750,000
from USGA Turf Management book.		
Lalako III (100 homes)	100,000 <i>(1,000 gals/d)</i>	50,000 <i>How does criteria (500 gpd)</i>
Waialue (120 units)	84,000 <i>700 gals/d</i>	42,000 <i>(400 gpd)</i>
New homes on West side (200 homes)	200,000 <i>(1,000 gpd)</i>	100,000 <i>(500 gpd)</i>
Housing sites at Manele <i>(# of homes ?)</i>	125,000	25,000
<b>Total</b>	<b>1,686,000</b>	<b>1,073,000</b>

Present usage per 1985 U.S.G.S. figures 2,990,000

Anticipated usage per day 4,676,000 *is 4 mgd*

The total is 1,000,000 gallons per day more than the highest available estimate of potential water on Lanai, and over 2,000,000 gallons per day higher than the 1949 amount of developed water. It is 1,686,000 higher than the 1985 usage. Well pumping reports will indicate what the present sustainable daily water yield is for Lanai. Its a reasonable assumption that water available is considerably less than the water needed if all projects are completed.

10. (Estimated Usuages Required for New Developments)

The following estimates of water usage per day are believed to be reasonable and probably on the low side:

Hotel at Manele (250 rooms)	100,000
Hotel at Koele (104 rooms)	52,000
Extensive grounds at hotels	50,000

Hotel estimates are from Honolulu Water Dept.  
for Waikiki

Championship golf course at Manele	1,000,000
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from USGA Turf Management book.

Lalakoa III (100 homes)	100,000
Waialue (120 units)	84,000
New homes on West side (200 homes)	200,000
Housing sites at Manele	125,000

Total 1,686,000

Present usage per 1985 U.S.G.S. figures	2,990,000
Anticipated usage per day	4,676,000

The total is 1,000,000 gallons per day more than the highest available estimate of potential water on Lanai, and over 2,000,000 gallons per day higher than the 1949 amount of developed water. It is 1,686,000 higher than the 1985 usage. Well pumping reports will indicate what the present sustainable daily water yield is for Lanai. Its a reasonable assumption that water available is considerably less than the water needed if all projects are completed.

After the typing of this petition, at the local golf banquet, a representative of Rockresorts, Inc. (The Company in charge of operating the hotels) stated that the present plan is to build two golf courses. The second course to be located at Koele. Koele is not in as dry an area as the Manele course. Hence the daily water requirement would be lower. Probably somewhere in the neighborhood of five to six <sup>thousand</sup> thousand gallons per day (figure from the U.S.G.A. Turf Management Manual)

This changes the requirement for NEW water to 2,186,000 gallons per day, and an overall requirement of 5,176,000 gallons per day for the island. This amount would clearly exceed even the most optimistic estimates for daily usage for the island. Couple this with the 90% rule of Section 174C-44 (1) of the State Water Code and the need for designation is pressing and very necessary.

The Commission should also take into account that Lanai is regularly afflicted with two consecutive drought years about every eight to ten years.

11. (Need for Water Management Area Designation)

a. "The Company" which owns over 95% of the island treats the island and its residents as though it were a feudal fiefdom.

b. Failure to make the well pumping reports available to local citizens reflects either (1) that the reports show that there is insufficient water, or (2) a disregard of the rights of the residents to try to protect their right to water.

c. "The Company" is engaged in an impetuous rush to build the projects. For example: it is believed that the construction of the Manele Hotel was commenced before there were final plans for the hotel.)

d. The inability and unwillingness to project potential water usage of the projects. Its incredible that this wouldn't have been thoroughly checked out before commencing construction.

e. past experience in drought years of the residents would indicate the need for the State's assistance in verifying water availability.

For years information which should be furnished to local people has been dispensed or withheld in the arbitrary judgment of "The Company." Local people have no way of protecting themselves against what could be a life and death situation to Lanai City without the intervention of the Commission to protect their water supply.

Present appearances would indicate that water availability is marginal at best and that the new usages should be justified.

12. (Signatures Approving the Petition)

Most people on the island work for 'The Company' either directly or indirectly and are naturally fearful for the preservation of their jobs. The numerous signatures approving this petition are testimony to the need for protection by designation of Lanai as a Water Management Area.

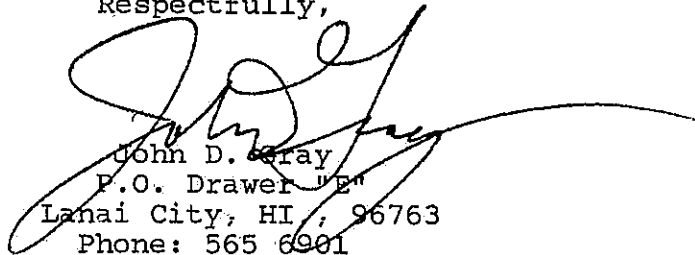
13. (Notices)

Petitioner requests that Notices regarding public meetings be furnished to Martha Evans, P.O. Box 374, Lanai City, HI., 96763, phone 565 6944, also to petitioner and "The Company. Mrs. Evans is an officer of Lanaiians for Sensible Growth. Previously governmental agencies have relied on "The Company" to post such notices. This resulted in notices being posted on the day of the meeting "by mistake" and at other times so close in point of time that the word didn't get around. This has resulted, in the past, to almost no notification. On one occasion the only local resident present was there as a result of a chance phone call from Maui a half hour before the meeting. No local notification was made. Mrs. Evans is very reliable and will see that notices of any meetings are posted.



Petitioner submits that it is imperative to designate Lanai a Water Management Area, so that "The Company" will be required to justify future uses and to demonstrate that there will still be adequate water for the domestic use of the community, and that future uses comply with the mandates of the State Water Code, and avoid what may be a rush to disaster.

Respectfully,



John D. Gray  
P.O. Drawer "E"  
Lanai City, HI, 96763  
Phone: 565 6901

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RECEIVED JOHN D. GRAY  
P.O. Drawer E  
Lanai City, HI 96763  
(808) 565-6901

39 MAR 9 AIO: US March 3, 1989

DIV. OF WATER &  
LAND DEVELOPMENT

RECEIVED  
39 MAR 7 11:50  
DEPT. OF LAND  
& NATURAL RESOURCES  
STATE OF HAWAII

Hon. William W. Paty, Jr., Chairman  
Department of Land and Natural Resources  
Commission on Water Resource Management  
1151 Punchbowl Street  
Honolulu, Hawaii, 96813

Honored Sir:

ADDENDUM TO PETITION TO DESIGNATE THE  
ISLAND OF LANAI A WATER MANAGEMENT AREA

Since the typing and mailing of the Petition to Declare the Island of Lanai a Water Management Area additional consideration have been brought to the attention of petitioners and which should be brought to the attention of the Commission.

1. The State Water Code declares as its policy that "The water of the State are held for the benefit of the citizens of the State. It is declared that the people of the State are beneficiaries and have a right to have the waters protected for their use." State Water Code Section 174 C-2.

2. All of the constructions proposed to be made and now underway on the island are for the purpose of catering to very wealthy non-residents from the mainland and foreigners from Europe, Asia and the South Pacific. The proposed project is to build two exclusive hotels together with facilities required for their support and two golf courses for the benefits of

their guests. The hotels are proposed to be "Top of the line" establishments operated by Rockresortd, Inc.. Rockresorts has a well deserved reputation for operating only the most exclusive and expensive hotels.

3. Except to the extent that menial jobs are available to residents it is anticipated that the "improvements" will be of little benefit to local residents.

4. The local people of Lanai are in a very disadvantageous position in trying to preserve their water rights against the power of the Company and need the protection that the designation can provide.

5. It is also anticipated that the hotels and the golf courses and subdivisions will be sold off in the future to non-residents and foreigners

6. There will be an unfair distribution of the water resources of Lanai. At the time of droughts (which are a regular occurrence on Lanai) it is obvious that local residents will be the first to suffer by deprivations of water and that the tourists, hotels, golf courses and residential subdivisions will be first provided for.

7. All the additional uses proposed will result in a falling water table in Lanai's dikes as a result of over-pumping. Some of the existing wells can only be pumped every other day or every three days because of lack of recharge. Lanai's water is principally developed from dikes and there is a severe danger that over pumping of those sources may result in isolation thereby depleting the island of presently existing sources of water. Even if over pumping is not ocas-

sioned in a particular well there will be an extra cost, both in higher rates and in time to develop other resources if any, because of the extra use occasioned by the improvements.

8. It is most likely that water will only be able to be pumped for limited hours because of insufficient recharge. There are only seven square miles on the island which provide recharge for the Lanai water table. (On Lanaihale)

9. A major question is: Do the residents suffer in times of water shortage so that the resorts may survive? It would be the part of prudence to have a gradual growth for a required time to prove the sufficiency of developed water rather than the lumped massive development that the Company proposes. Time is required to prove if new sources are sustainable.

10. It is believed that the uncertainty of the availability of sufficient water is one of the reasons that CSX, a former partner in the developments has pulled out of the transaction with the Company. It is also rumored that Rockresorts, Inc. may withdraw also and that lack of provable water is also one of the reasons.

11. It is believed that recently the local water company failed and refused to sign off on an application for a building permit on the ground that there wasn't sufficient water. The proposed construction was for a 600 square foot Ohana addition.

12. The Company has in its possession pumping reports of the wells on which the residents rely for their water supply as well as hydrologic reports which may shed light on the existence or non-existence of adequate water to comply with

the State Water Code. (NOT made available to local residents)  
Teh Company must be required to demonstrate that the projected  
increased use will comply with Section 174 C-44 (1) and that  
the rate of use will not deplete the wells above 90 per cent  
of their sustainable yield.

Respectfully submitted,



John D. Gray for all Petitioners

JOHN D. GRAY  
P.O. Drawer E  
Lanai City, HI 96763  
(808) 565-6901  
March 12, 1989

Hon. William W. Paty, Chairman  
Commission on Water Resource Management  
Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii, 96813

Honored Sir:

Second Addendum to petition to designate the island  
of Lanai a water a Water Management Area

This second addendum to the Petition to declare the Island of Lanai a Water Management Area is filed because of new information coming to petitioners since the filing of the Petition and First Addendum and because it is believed that this new information will ease the work of the Commission in determining the factual situation on Lanai.

On March 7, 1989 a Lanai Community Meeting was called by The Company on the subject of water.

Present for the Company were Robert Oda, Vice President of The Lanai Company, Messrs. Anderson and Mink, (hydrologists for The Company, and Mr. Kumagai, an engineer.

Each spoke on the water situation on Lanai, and hand-out sheets were distributed reflecting the Company's estimation of the present water situation and the future needs and future development contemplated. Copies of these hand-outs are attached hereto as exhibits to this second addendum.

Present sustainable water capability was placed at three million gallons per day. (Water estimate chart, center column)

Eventual water usage as of 1991 is estimated at 5,840,000 gallons per day. (Estimate chart under Cumulative Demand.)

Eventual water development, to increase the present sustainable supply from three million gallons per day to 5,840,000 gallons per day is to come from four and possibly 5 new wells, plus the use of effluent and brackish water to the anticipated amount of 1,400,000 mgd.

Petitioners might argue with the optimistic estimates and hopes (i.e. that all of the wells will prove productive and sustainable, and that the effluent and brackish water will suffice for the purposes for which it is to be sued) but for purposes of this petition it appears to be conceded as a matter of fact that there is not presently sufficient water for any of the new improvements. This would appear to be a classical factual situation for a Water Use Designation.

The Company is gambling that the prospective wells will provide sustainable yields to fulfill its needs. (plus the effluent) It will indeed be a wondrous event if all the wells prove to be bountiful and provide sustainable water. Petitioners may well hope so, but they should not be left exposed to what would appear to be the incredible optimism of the Company. If hydrologists could predict with 100% success that a well or series of wells (as here) could be brought in with reasonable certainty, then the world has indeed taken another giant step. Petitioners submit that the realm of hydrology has not yet advanced to that state as yet.

Local people have demonstrated a spirit of resistance that has brought about a new candor on the part of the Company that was never evidenced before. This is refreshing and hopefully proclaims a new spirit on the part of the Company. Even so, neither the State in enforcing the State Water Code, nor the local people should be forced to join in the gambling spirit evidenced by the

Company. None of the petitioners are hydrologists (amateur or professional). Present conditions on Lanai require an objective determination by a dispassionate source, hence the imperative necessity for Management by the Commission under the Water Management provisions of the Code and Administrative Rules. New developments must not be brought on line without a satisfactory demonstration that sustainable water yield is able to service them without interfering with existing usage.

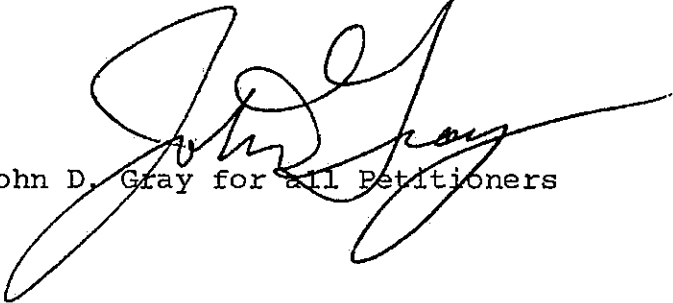
The need for immediate action is demonstrated by chart showing Project Water Demand and Resource Development. Construction of two hotels is well under way and the Koele Hotel appears to be 90% complete. A 1989 opening is envisaged. Lalakoa III will soon be completed. These items could be soon on line, but the wells are lagging far behind. Wells 6 & 7 have been drilled, but it is stated that pumping reports will not be available for three to four months. Permits reportedly have been applied for wells 8 and 9. The treatment plants to process the effluent have not been started. The sources of the brackish water are wells not yet started.

It is obvious that the fears of the local people are well justified; the Company proceeds as though it had an abundant supply of water from non-existent wells on the strength of optimistic reports from hydrologists.

Consideration should also be given to the question of who is to bear the cost of the additional water development, so that it is not to be tacked on to local people when it is solely for the benefit of the new developments.



Petitioners respectfully submit that it is abundantly clear that they need the protection of the designation of the Island of Lanai as a Water Management Area, and that no new improvements should be brought on line that require the use of Lanai's precious groundwater until the Company demonstrates that the rate of new use will not deplete the existing wells above 90 per cent of their sustainable yield.

  
John D. Gray for all Petitioners

Lanai Projected Water Demand and Resource Development

<u>Time Line</u>	<u>Demand MGD</u>	<u>Cumulative Demand</u>	<u>Water Transmission Capability (MGD)</u>	<u>Source Wells/Other</u>	<u>New Well(s) Schedule</u>
1988					
Lanai City	0.38				
Dole Plantation	2.40	2.78	3.00	Maunalei Wells 1-5 Shaft 3	Wells #6 & 7 Complete
1989					
Koele Hotel	0.15		3.80		• Locate "Alternate Water Resources (1.5 mgd) Drill Test Well(s)
Lalakoia III	0.09				
Hulopoe Beach Park (Phase I)	0.07			Wells #6 & 7 On Line (0.4 mgd each)	• Start Well #8
Lanai Industrial (Central Support)	0.03				• Start "Alternate Water Development
Community Gardens	0.11				• Start System to Utilize Treated Effluent
Assumes 27.5 ac. @ 4,000 gpd/ac.	0.02				
Lanai City Apartments	(0.47)	3.25 ✓			
1990					
Koele Golf Course	0.40		4.20	Well #8 - On Line (0.4 mgd)	• Complete
Lower Maialua (122 units @ 600 gpd)	0.07		4.60	Treated Effluent System On Line (0.4 mgd)	
Queen's Multi-Family (128 units)	0.07				
Manele Bay Hotel	0.20				
Manele Golf Course	1.0		5.60	Alternate Water Resource On Line (1.0 mgd)	Develop Well #9
Other Landscape Clubhouse, Roadways	0.5				
Beach Park Phases II - IV					
Commercial Area (Downtown Redevelopment)	0.05	(4.16 High level)			Develop Well (High level)
Koele (SPR) assumes 35 units	0.02	(0.40 Effluent)			subject to review of operating conditions of wells and demand
	(2.31)	5.56			
1991					
Manele Residential (133 s.f.)	0.08		6.00	Well #9 - On Line (0.4 mgd)	
Koele Residential (200 units)	0.20		6.40	High level Well On Line (0.4 mgd)	
	(0.28)	5.84			
		4.44 High level	5.00		
		.40 Effluent	.40		
		1.00 Alternative	1.00		