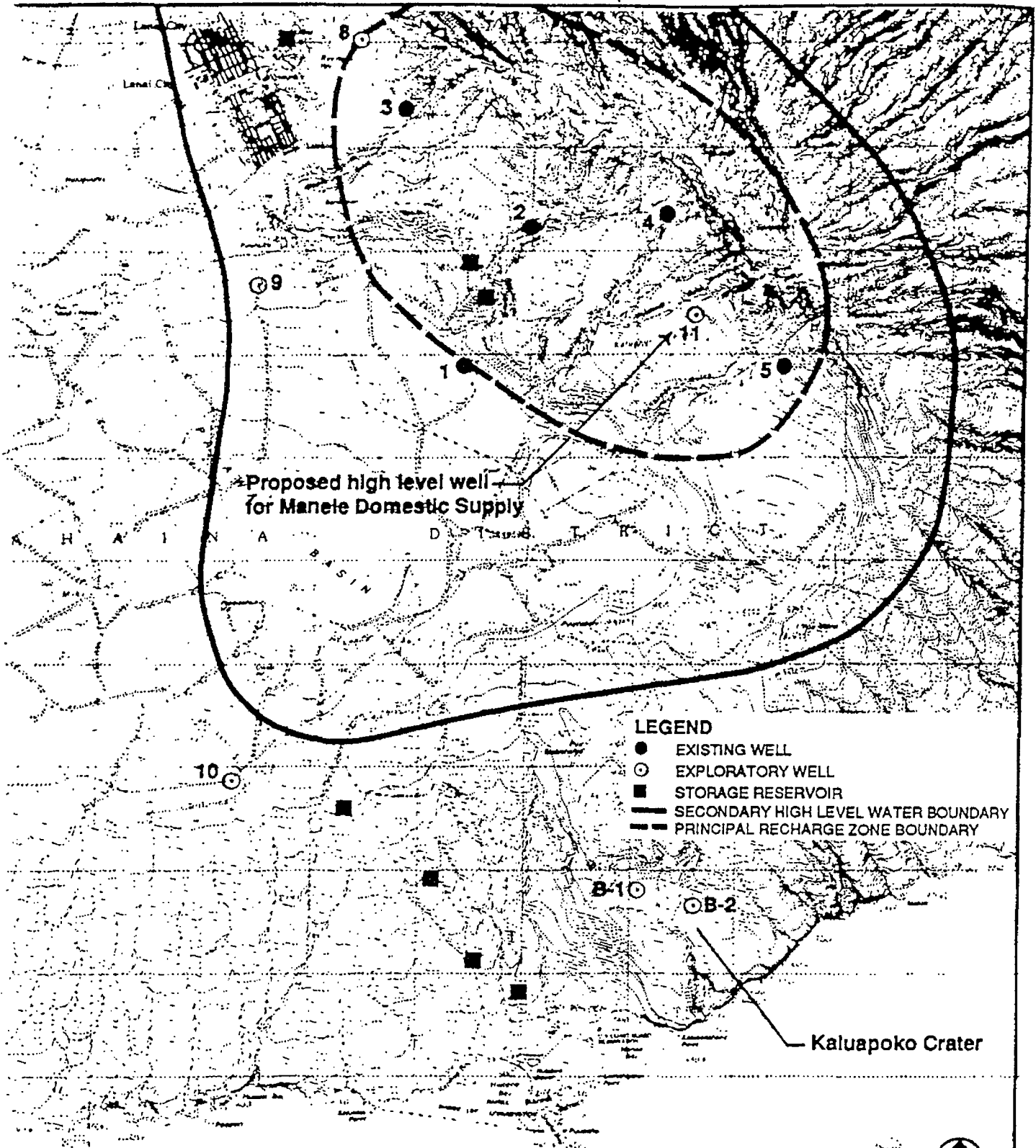

MANELE
GOLF COURSE AND
GOLF RESIDENTIAL PROJECT
LANAI, HAWAII

FINAL
ENVIRONMENTAL
IMPACT STATEMENT

Prepared for:
Lanai Company, Inc.
October 1991

EXHIBIT I-5



Map Note: Locations of all water system components are approximate.

FIGURE IV-3
SOUTH LANAI WATER SOURCES-
WELLS AND STORAGE

TABLE IV-1

PROJECTED LONG-TERM WATER DEMAND ON LANAI
CALCULATED IN 1990

<u>WATER USER</u>	<u>WATER UTILIZATION (mgd)</u>	
	<u>HIGH LEVEL AQUIFER (POTABLE)</u>	<u>ALTERNATIVE SOURCE (NONPOTABLE)</u>
EXISTING:		
Lanai City	0.38	
Dole Plantation	0 ¹	.0
IN PROCESS:		
Divers. Agriculture	1.0	
Lalakoia III	0.086	
Koele Hotel	0.04	
Koele Landscaping	0.11	
Lanai City Apts.	0.013	
Lower Wailua	0.072	
Wailua Multi-fam.	0.078	
Other Housing	0.08	
Hulopoe Beach	0.07	
Central Service Facility	0.03	
Comm. Landscaping	0.03	
Koele Golf Course	0.0	0.25
Manele Bay Hotel	0.22	
IN PLANNING:		
Manele Golf Course	0.0	0.80
Manele Club House	0.015	
Commercial	0.05	
Landscaping (Manele)	0.0	0.40
Koele Residential	0.22	
Manele Residential	<u>0.25</u>	
TOTAL	2.74	1.45

Source: Lanai Water Company. Water Management Plan presented to the State Commission on Water Resource Management, November 1990.

¹ Water for pineapple irrigation is included under diversified agriculture.

2.2.2 Probable Impacts

The primary impact of the proposed development is increased water use, mostly for golf course and landscape irrigation. Although development of the proposed project would increase somewhat demand for potable water on the island of Lanai, this new demand appears to be within the present estimated sustainable yield from the high level aquifer providing the existing well system is modified to improve pumpage (see Section 6.4, Water Supply, for more detail). The total estimated potable water use for Manele Golf Course and Golf Residential Project is 0.26 mgd; an additional 1.2 mgd required for golf course and landscape irrigation would be served by alternate sources. Details of the water requirements for the proposed project are shown in Table IV-2. Irrigation water for the golf course does not have to be potable. (The potable water limit for chloride is considered 250 mg/l). With pineapple being phased out as an agricultural land use, it is difficult to quantify the water demand of diversified agriculture. The termination of pineapple as a major crop frees a large portion of the water budget (1.80 mgd) for alternative agricultural uses, and the quantity of variable crop irrigation requirements is presently unknown. However, a conservative estimate of 1.0 mgd is included in this water demand table for estimating purposes (Lanai Water Company, 1990).

Concerns have been raised at the Koele Golf Course about the possibility of leaching of chemical fertilizers or pesticides used on the golf course into the ground water. Several studies have investigated this issue through a number of different methods including simulation experiments (Nicklaus Golf Services, 1990; M & E Pacific, Inc., 1989; Environmental Assessment Company, 1990; Mink, 1983). The possibility of leaching of these materials is slight under the proposed management practices. The maximum application of nitrogen for the proposed golf course is 1 lb. per 1,000 sq. ft. per month. A study evaluating the leaching potential of nitrogen application to sugar crops (about 1/2 pound per month per 1,000 square feet) showed nitrogen leaching resulted in a nitrate concentration in the water of 1.4 mg/l (M & E Pacific, 1990). By direct extrapolation, the potential for leaching at the golf course could be 2.8 mg/l. The actual amount of material leached could be lower because of the ion exchange and nitrogen fixing microflora of the soil as the leachate passes through the soil strata to the basal aquifer. It should be noted that the aquifer beneath the project site is not a potable water aquifer and hence no source of drinking water could be affected. What remains is then the concern about the quality of the groundwater input into clean waters. The amounts of added nitrogen do not point to potential significant impact on offshore waters.

Use of collection sumps, dense turf grass, and soil with proper organic carbon content and particle size distribution influences the leaching process which might contribute to pesticide concentration in the basal lens aquifer. Since these features (along with other surface drainage controls) are part of the proposed golf course design, the impact of pesticides on surface runoff is considered unlikely (see Appendix D, Integrated Management Plan for Manele Golf Course).

The Commission on Water Resource Management, State Department of Land and Natural Resources evaluated the island of Lanai's water resources and decided not to designate it as a water management area. They did instate strict testing and reporting guidelines pursuant to the State Water Code. Under their guidelines, the cumulative effect of current and proposed projects should not exceed 70 percent of the estimated

sustainable yield on the island (i.e., 3.3 mgd). If the water demand begins to approach this value, the Water Commission will re-evaluate their decision.

TABLE IV-2
ESTIMATED WATER DEMAND FOR THE PROPOSED ACTION

PROJECT	WATER DEMAND (mgd)	
	HIGH LEVEL AQUIFER (POTABLE)	ALTERNATIVE SOURCE (NONPOTABLE)
Manele Golf Course	0.0	0.80
Manele Club House	0.015	0.0
Manele Residential	0.25 ¹	0.0
Manele Landscaping	<u>0.0</u>	<u>0.40</u>
TOTAL	0.26	1.20

¹ Remains essentially the same with or without the project.

2.2.3 Mitigation Measures

While figures for agricultural water use on Lanai may be uncertain at present, specific actions can be taken to ensure potable water consumption would not exceed projected levels for the Project. Mitigation measures to regulate water demand in the project area include:

- Using alternate water sources for golf course irrigation and other landscape irrigation
- Providing guidelines to homeowners for landscaping features using plants and grasses with low irrigation requirements
- Monitoring consumption, unreasonable use, and leakage from storage and distribution system

2.3 Surface Water and Drainage

2.3.1 Existing Conditions

The project site is covered with aa lava flows characterized by rocky surficial geology and natural, sloping terraces. The project terrain contains a natural mauka-makai drainage system formed by several gulches. Three of these extend about one third of the way up-slope to the Palawai Basin. Two gulches on the east side drain into Kapihaa Bay (which forms a portion of the larger Hulopoe Bay), and the third drains into Kaluakoi

traffic noise attributable to project traffic are expected to occur along Manele Road. Fortunately, noise sensitive developments are not located in close proximity to the high speed sections of Manele Road, and adverse traffic noise impacts from the proposed project are not expected.

Along the project's circulation roadways, traffic noise levels are expected to be less than 55 Ldn at 50, 70, and 110 feet setback distances from the centerlines of the roadways whose PM peak hour traffic volumes are approximately 100, 200, and 400 vehicles per hour. Because the project's development plan allows for adequate setback distances to the proposed residences, adverse noise impacts on future residents from project traffic are not expected. With the Hotel also over 100 feet from the circulation roadways, no adverse noise impacts are expected there.

The proposed project should not cause adverse aircraft noise impacts on the golf course or on project residences. Also, the location of the project site should not impact the future airport expansion potential at Lanai Airport. Based on existing and forecasted aircraft noise levels over the project site, special aircraft noise attenuation measures are not considered mandatory within the project site.

Audible construction noise will probably be unavoidable during the entire project construction period. The noise sensitive areas which are predicted to experience the highest noise levels during construction activities on the project site are within the Manele Bay Hotel complex, which is presently under construction. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation.

Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources, and due to the exterior nature of the work. The use of properly muffled construction equipment should be required on the job site. The incorporation of State Department of Health construction noise limits and curfew times is another noise mitigation measure which can be applied.

Blast induced ground and air vibrations have the potential to startle or annoy surrounding guests, and to also cause damage to structures. It is recommended that air blast and ground vibration levels be monitored closely; that the timing of blasting be scheduled to avoid unnecessary disturbance to the guests; and that blast engineering techniques be used to minimize vibration and air blast damage.

6.4 Water Supply

In years past, Lanai's water requirement was almost exclusively for pineapple cultivation and domestic use as no other major users were on the island. With the establishment of the Lanai Project Districts at Koele and Manele (Maui County Code 19.70 and 19.71), subsequent resort development, and introduction of diversified agriculture, the trends for water use are rapidly changing on Lanai.

September 1990, Castle & Cooke, Inc. announced the phase out of pineapple plantations on Lanai whereby over a two to three year period the cultivation of pine-

apple would be reduced from the existing 6,500 acres to approximately 100 acres to be used for local consumption. Consequently, the current water demand of 1.8 mgd would likely drop substantially. How much of that water could then be used by the resorts or would be transferred to other agricultural uses on the island has not been determined and is not part of this analysis. Nevertheless, each new development brings with it a potable water requirement (or supply) and the implicit need for evaluating the adequacy of the source and storage capacity and the transmission capability and water pressure.

Lanai's water sources, transmission, and storage capabilities, as well as future water resource management and system improvements are described thoroughly in the Lanai Water Master Plan: Final Report (M & E Pacific, Inc., 1990). The Water Master Plan is a complete evaluation of Lanai's water sources and water system needs and it provides recommendations for island-wide improvements to domestic and irrigation water systems. The following section briefly describes the existing setting for the water system at the Manele Project District only and analyzes the impacts and future requirements of the proposed Manele Golf Course and Golf Residential Project.

6.4.1 Existing Potable and Non-potable Water System

6.4.1.1 Existing Regional Water Sources

A single high level aquifer in which wells, shafts, and tunnels have been developed, serves the island of Lanai. The average total recharge is estimated to be 9.1 mgd and the sustainable yield is 6.0 mgd. The present Lanai water system, as it is configured, can be counted on to supply 3.0 mgd on a sustained basis, expressed as an average daily flow. The total system peak instantaneous capacity is 8,300 gallons per minute (gpm), comprised of simultaneous flow of 300 gpm for plantation needs, 3,000 gpm for fire flow, 1100 gpm for domestic supply, and 1200 gpm for landscape irrigation. New developments on Lanai are estimated to demand a supply capacity of 10,300 gpm; therefore, improvements to source and storage capacity, and transmission systems are necessary.

The Maunalei area wells (1 through 5) are located in the principal high level recharge zone, a 4.6 square mile area in the highlands southeast of Lanai City (Figure IV-3). Wells 6 and 7 were added to the system in the 1980s. An exploratory water well drilling program (M & E Pacific, Inc., 1990) for other wells resulted in the following:

- Well 8 is suitable for potable use (test rate 1,100 gpm).
- Well 9 is suitable for irrigation but not direct potable use (test rate 340 gpm).
- Well 10 is not suitable for potable or irrigation use unless treated or blended (test rate 47 gpm).

Alternative water sources include rain catchment, brackish water, and sewage effluent reclamation. Upper elevation developments could factor rain catchment into the water availability. Lower level ground sources lie outside of the secondary high level water zone or consist of alternate sources such as treated sewage effluent or desalinated brackish water. Water obtained from Well 10 is indicative of an alternative low-level source (Figure IV-3). It is south of the Palawai Basin and remote from the principal high level recharge zone. Thus its hydraulic head is disparately different from the high level,

the water is of higher temperature (104.5 degrees F), and it contains different constituent concentrations.

6.4.1.2 Lanai Project District 1 - Manele Water Sources

The Manele area is served by an existing high pressure (250 psi) 10-inch irrigation main (Figure IV-12). The Manele Bay Hotel (including 400 rooms) and Phase I improvements to the Hulopoe Beach Park could require an average day demand of 448,270 gpd for human consumption and landscape irrigation (M & E Pacific, Inc. 1987). Approximately 65,000 gpd of irrigation water will be supplied from the wastewater treatment plant. Test hole T-6 is planned to supply the remaining water for the hotel and Hulopoe Beach Park improvements (M & E Pacific, Inc., 1987).

6.4.1.3 Manele Distribution

The existing Manele Project District distribution system consists of an interconnected network with several pumping sources supplying both the domestic and the irrigation needs (Figure IV-12).

Manele Bay Hotel is serviced off an existing 10-inch diameter main. Back-flow preventers have been installed to prevent agricultural fertilizers, pesticides, etc., from entering the domestic water supply line.

Castle & Cooke, Inc. own the existing system serving the Hulopoe Beach and Manele Small Boat Harbor. This is a separate system from that of the Lanai Community and it provides approximately 3,000 gpd.

6.4.1.4 Manele Storage

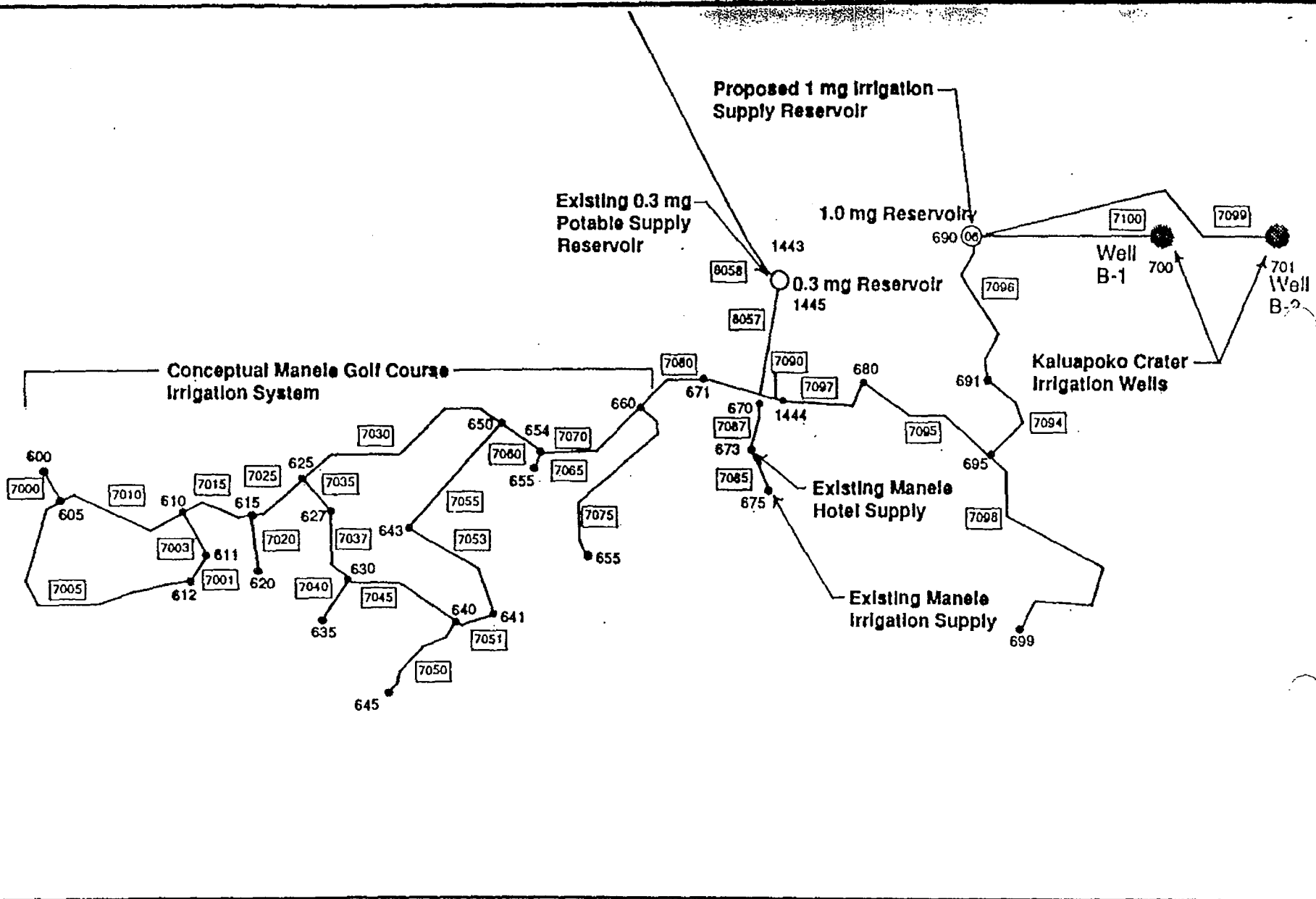
A new reservoir system (0.5 mg) has been constructed to serve the Phase I developments at Manele, Hulopoe Beach Park and Manele Small Boat Harbor (Figure IV-12); however, additional storage would eventually be required as the capacity of this unit is too small for the proposed Manele Residential development needs if the hotel is expanded to 400 rooms as planned.

6.4.2 **Proposed System**

Proposed water infrastructure improvements for the Manele Resort will include pressure breaker tanks, a storage reservoir, and a buried transmission main (Figure IV-12). In addition, two new high level wells would be necessary to maintain adequate instantaneous peak flow and pressure in the total island water system. To meet the irrigation requirement at Manele, two wells, a storage reservoir, and distribution lines are recommended.

6.4.2.1 Proposed Domestic Wells

The Final Water Master Plan (Lanai) recommended completion of Wells 8 and 9 for domestic supply and landscape irrigation and exploration for a new high level well



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 ENVIRONMENTAL IMPACT STATEMENT
 For: Lanai Co., Inc.
 By: Belt Collins & Associates November 1990

FIGURE IV-12
 SCHEMATIC OF MANELE HOTEL
 AND GOLF COURSE WATER SYSTEM

and alternate water source wells for Manele domestic and irrigation supplies. The new high level well (Well 11) would be constructed above Kaluanui Flats midway between Well 4 and 5 to provide domestic water into the agricultural distribution system to replace water used in the irrigation system for Manele development (Figure IV-3). The water source for the domestic use and the golf clubhouse would be primarily from this high-level aquifer in the Central Sector. A new high level well and pump system is proposed to serve the Manele Development. It will be installed and tested under the State Water Code (HRS 174C) requirements as outlined in the State "Well Construction Permit and Pump Installation Permit" guidelines.

6.4.2.2 Proposed Transmission

Testing of the exploratory wells at Kaluapoko (i.e., B-1 and B-2 on Figure IV-12) is required prior to determining the availability of these wells for domestic or irrigation use. If the water quality tests prove satisfactory for domestic use, the system could be used for the Manele potable water demand. New distribution lines would be required from the wells to the Manele reservoir and alternate transmission lines are warranted for back-up in the event of mechanical failure and transmission loss.

A distribution system will be constructed to serve the Lanai Project District 1-Manele. The water distribution system will be designed to meet construction standards of the County of Maui. The system will be operated and maintained by the Lanai Company.

6.4.2.3 Proposed Storage

The Project will require additional storage reservoirs. Potable water would be required for the residential units; the existing Manele Bay Hotel and expansion would be served from the new 0.5 mg reservoir system; however, additional capacity would be required for the proposed residential use.

Additional non-potable water storage is needed for the Manele golf course development and a new 1 mg irrigation supply reservoir could be sited in close approximation to the Kaluapoko test wells, B-1 and B-2, if they prove feasible (Figure IV-12).

6.4.3 **Probable Impacts**

As previously discussed (Section 2.2), estimated water demand for the Project would be 1.46 mgd, including 0.80 mgd for the golf course irrigation and 0.40 mgd for the landscape irrigation which would be served by an alternate non-potable water source.

6.4.3.1 Potential Manele Residential Domestic Demand

The water required for the domestic supply for the 425 units is not appreciably greater than the amount for 416 units, previously authorized under the existing Project District ordinance. The County of Maui standards allow 560 gpd/unit for multi-family (i.e. condominiums) and 600 gpd/unit for single-family homes. The estimated water demand under the amended project district residential development from the proposed 425 units would be 56,000 gpd for multi-family (100 units) and 195,000 gpd for single-family

(325 units) or 251,000 gpd (0.25 mgd) as compared to the authorized Project District requirement of 246,640 gpd (0.25 mgd) or 41,440 gpd for multi-family and 205,200 for single-family residential units. Therefore, the estimated water demand in mgd with and without the project district boundary amendment would be essentially the same (variance of 4,360 gpd).

6.4.3.2 Potential Residential Landscape Irrigation Demand

Since the proposed action lowers the density of the developed area, it is likely that there will be a subsequent increase in landscaped area surrounding the homes. The water requirement for landscaping would be met by nonpotable sources and is estimated to be 0.3 mgd greater than without the project. Daily air temperature fluctuations and evapotranspiration rates, type of plants requiring water, size and aspect of landscaped area, and number of residences occupied during that time of the year influence the estimate. Therefore, this estimate assumes that all homeowners landscape and or lawn two-thirds of their property and the average single family lot would be 32,670 square feet (0.75 acres). Total irrigated area would be 243.75 acres and approximately half of those homes will be in the amendment area (122 acres). The irrigation for multi-family condominium landscaping would remain essentially the same as in the existing project district requirement. The evapotranspiration rate is estimated at 6,340 gpd/acre (M & E Pacific, November 1989 Environmental Assessment for LUC Petition). Therefore, the resultant water requirement for landscape irrigation would be 0.4 mgd. This is compared with the landscape irrigation requirement under the existing project district configuration of approximately 0.1 mgd.

6.4.3.3 Potential Manele Golf Course Demand

The irrigated portion of the golf course under the "target course" concept would be 110 acres and the grass species used for turf were selected for their low water requirement. Therefore, under these mitigative measures, the estimate for irrigation of the golf course is approximately 0.55 mgd (Leppert, 1990).

Wells B-1 and B-2 in the Kaluapoko Crater have been recommended for irrigation use (Figure IV-12); however, the yield from these exploratory wells has not been verified. It is expected that the irrigation requirement could be met by development of Wells B-1 and B-2, supplemented by reclaimed water from the wastewater treatment plant (estimated at 70,000 gpd to be increased as the plant is being used to 140,000 gpd).

6.4.4 **Mitigation Measures**

6.4.4.1 Ongoing Evaluation

The water demand estimates for proposed changes on Lanai have been systematically calculated by the Lanai Water Company (Table IV-1). Estimates that could significantly change this scenario and thus affect the region's total demand, now estimated as 2.74 mgd for potable and 1.45 mgd for alternative sources by the year 1996, include the following:

- Planned versus actual phaseout of Dole pineapple plantation.
- Planned versus actual increase in diversified agriculture use.
- Delays in approval and construction of any of the proposed resort, residential, or golf course projects.
- Type, total area, and frequency of landscape irrigation for community, resort-residential developments.

6.4.4.2 Irrigation Using Non-potable Water Sources

Alternative sources proposed for irrigation use include: brackish water from the non-potable wells, blended water, or surface water. Programs to explore each of these alternatives are underway at this time. Results from these tests will reveal if any of these sources are viable for Manele. If the irrigation requirement for the golf course could be met by these alternative sources, the impact on the potable water supply would not be as great.

6.4.4.3 Landscaping and Water Conservation Measures

Use of natural plants that have low water requirement is an excellent way of reducing the irrigation needs in landscaping. Landscape design guidelines could include plant lists of attractive dryland plants and residents encouraged to use them in their lawns and landscapes.

6.4.4.4 Water Resource Management Measures

After years of water resources being managed by several groups on the island, an agreement has been reached to consolidate the management tasks under the sole responsibility of the Lanai Company. This consolidation and centralization should engender better communication, better record keeping, and focus on the planning and implementation of the water system improvements island-wide. One of the first steps in the Lanai Company's management plan was the development of the Lanai Water Master Plan (July 1990).

Other measures that could be taken are to impose covenants on water consumption for dwelling units and creating a management organization to ensure the compliance with these covenants and the success of the water saving measures.

The State of Hawaii Commission on Water Resource Management (Water Commission) has reviewed a petition to designate Lanai as a Water Management Area; and although they did not designate it as such at the time (1989), they instituted strict reporting requirements on water use and planned use on the island. The reporting should provide the State a means of monitoring the effects of actual development including the Manele projects. The Water Commission, through review and follow-up on the reports, will be in a position to work with the Lanai Company in managing the water resource in the future on Lanai. The Lanai Company has implemented one of the Water Commission's recommendations to investigate ways to make greater use of the non-potable water for irrigation (State of Hawaii, Commission on Water Resource Management, Department of Land and Natural Resources, 1990).