

**Maui County Water Use and Development Plan**  
**Upcountry District**  
**Final Candidate Strategies Report**

**Upcountry Water Advisory Committee**  
**Review Draft**

**July 27, 2009**

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# Executive Summary

## THE MAUI COUNTY WATER USE AND DEVELOPMENT PLAN

The Maui County Water Use and Development Plan (WUDP) is being prepared in six sections according to geographic district. The Upcountry District Final Candidate Strategies Report is expected to be the final document draft addressing the Upcountry Department of Water Supply District until a complete Water Use and Development Plan is compiled including all six districts. This Report Review Draft is being circulated for comment to the Upcountry District Water Advisory Committee, Maui County Board of Water Supply, Maui County Council and the Hawaii Commission on Water Resource Management (CWRM).

The WUDP is prepared in accordance with the CWRM "Statewide Framework for Updating the Hawaii Water Plan". An "integrated resource planning" approach is used which includes identifying planning objectives, determining future water needs, identifying all feasible means to meet future water needs and determining the best strategy to meet the planning objectives and future needs.

## THE UPCOUNTRY DISTRICT WUDP PROCESS

The WUDP process for the Upcountry district began with identification of planning objectives. These objectives include a broad range of considerations including water service availability, reliability, quality, cost and broader considerations including protection of streams, water resources, cultural resources, sustainability, equity, viability, and conformance with general and community plans. Strategies to meet future water needs were evaluated with respect to each of the planning objectives. Several programs and "resources" were incorporated into the strategies to address particular objectives as necessary.

Future water needs for the Upcountry District were projected based on the planning assumptions currently being used in the preparation of the Maui general, island and community plan update. A range of high, base, and low water projections was developed to address uncertainty in future water demand. Water consumption for the DWS Upcountry District system is expected to grow from 7.2 million gallons per day (MGD) in 2005 to 8.8 MGD in 2030 (base case). Water production requirements are higher than consumption requirements by about ten percent to account for unmetered uses (such as fire protection and line flushing) and system losses.

A wide range of possible "resource options" was identified and considered. These included various options to provide new sources of water, options to conserve and use water more efficiently and options to protect stream and groundwater resources.

The most promising resource options were examined in detail using an integrated capacity expansion and production cost simulation model. This analysis tool evaluates various combinations of resources (candidate strategies) in the context of operation of the overall Upcountry District water system.

The most promising candidate strategies (final candidate strategies) were investigated, characterized and analyzed in greater detail. This is the subject of this report.

The final candidate strategies presented in this report are:

- A. Incremental Basal Well Development
- B. Expansion of Raw Water Storage Capacity
- C. "Drought-Proof" Full Basal Well Backup
- D. Improved Kamole Water Treatment Plant Capacity
- E. Limited Growth With Extensive Conservation Measures

## **County - Wide Measures**

### **Watershed Protection and Restoration**

Watershed protection and restoration measures are consistent with all of the candidate strategies and are presumed to be part of all of the candidate strategies. These measures will be discussed in detail in a separate section of the WUDP.

Maintaining healthy forests is essential to maintaining the healthy streams and groundwater aquifers that are the source of our water supplies. These resources need protection and, in some places, substantial restoration. Healthy forests invite and capture precipitation, retain water to replenish aquifers, maintain base flow in streams, prevent soil erosion and flooding and maintain stream water quality.

The DWS currently supports watershed partnership agreements, control of invasive species that threaten watershed areas and reforestation programs.

These measures serve several WUDP planning objectives including: Environment, Sustainability, Quality, Streams, and Resources.

### **Stream Restoration Measures**

Stream restoration measures are consistent with any of the candidate strategies and may be an integral component of some of the surface water treatment strategies. The county has supported the establishment of appropriate amended interim instream flow standards and endorsed the concept of “mauka to makai” flow for Maui’s streams.

Stream restoration measures affect several WUDP planning objectives including: Availability, Cost, Environment, Equity, Sustainability, Streams, Resources, Agriculture and Culture.

### **Wellhead Protection Ordinance**

A wellhead protection ordinance was presented to the WAC and will be described in detail in a separate section of the WUDP. A wellhead protection ordinance would limit activities in areas around potable wells that could potentially contaminate groundwater aquifers.

A wellhead protection ordinance would serve several WUDP planning objectives including: Environment, Sustainability, Quality, and Resources.

### **Well Development Policies and Regulation**

Well development policies and regulation measures are possible options to ensure that wells are sited in suitable and preferred locations, and that contracts for the development of water sources are fair and provide equitable benefits to developers and DWS customers. Provisions of a well development policy could address the following matters:

- Determination of well locations to ensure water quality, proximity to DWS water lines, minimize DWS system operation costs and allow wellhead protection measures to maintain water quality
- Determination and denomination of source credits and water entitlements in source development contracts

Specific recommendations are provided in the Recommendations section of this report.

These measures would serve several WUDP planning objectives including: Cost, Efficiency, Environment, Quality, and Resources.

vide the drought period reliability associated with groundwater sources but at the cost of higher electrical power consumption required to pump water from the basal aquifer (near sea level) to the elevation of Upcountry District water uses. Assuming that groundwater withdrawals would be maintained within sustainable pumping yields, this strategy could be sustainable in terms of water source use but would commit the DWS system to increased electric power use.

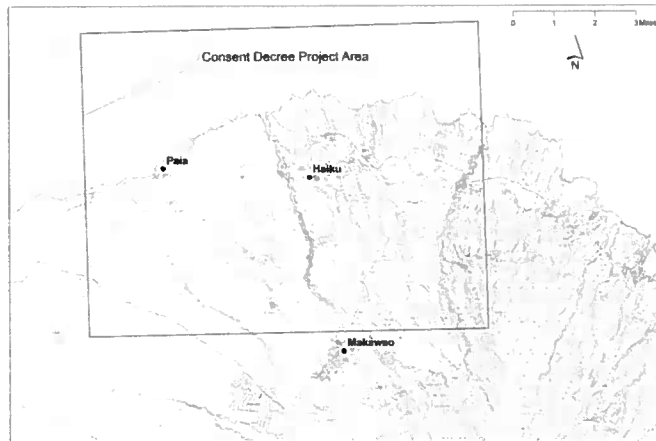
### **Hydrology**

The sustainable yield of the Upcountry District area is sufficient to provide new basal groundwater well development. Since basal wells are substantially more expensive to operate than available surface water production, it is expected that new basal wells would not operate at capacity except in the drier summer months and for more extended periods in drought years.

The efficacy and water quality of new wells in the Upcountry District is difficult to predict prior to drilling and testing. Wells drilled in relatively close proximity can prove to be very different in terms of effective production yields. Because of historical use of agricultural fertilizers and pesticides there is a possibility of contamination of source aquifer water in some areas.

### **Compliance with EMPLAN Consent Decree**

The 1990 Maui County WUDP identified the development of wells in the Haiku aquifer (and associated water transmission) as a featured strategy to supply water to the Central District system. A concurrent East Maui Water Study was commissioned to develop this strategy. The draft 1992 WUDP update (never adopted) also featured this strategy as the primary means to provide new Central District water supply. The project, named the East Maui Water Development Plan (EMPLAN), moved forward with preparation of an environmental impact statement (EIS) and a supplemental EIS which were challenged in court. The court case was settled between the plaintiffs and the County by a Consent Decree.



The County is bound by a list of terms specified in the EMPLAN Consent Decree including the following:

- Only Phase I of the EMPLAN will be implemented until a completely new EIS is prepared. This includes construction of the Hamakuapoko wells and limited transmission connection to the Central District system.
- The County will not develop groundwater in an agreed upon portion of the East Maui region until a rigorous cost / benefit analysis is performed which shall, among other things, address planning for stream restoration in the agreed upon region.
- The County will "rigorously investigate and pursue the availability of surface water" from the Waikapu, Iao and Waihee areas including a rigorous cost / benefit analysis.
- Any new groundwater development projects in the agreed upon East Maui region will be consistent with the County WUDP and the State Water Code.
- The County will work with the USGS and plaintiffs to develop a test well to determine whether development of groundwater resources in the agreed-upon East Maui region would affect surface water resources in the region.

- As long term agricultural water needs are reduced, a stream restoration program will be studied, developed and initiated by the County.

Compliance with the terms of the EMPLAN Consent Decree would be necessary prior to development of wells within the EMPLAN area. This area is shown on the map above.

### **DWS versus Non-DWS Well Development Issues**

#### Project Design, Construction, Ownership and Operation - DWS vs Developer

New basal wells could be constructed, owned and/or operated either by the DWS or by a project developer. Some combinations are possible. For example, a project could be designed and constructed by a project developer and, upon completion and testing, the ownership and operation could be transferred to the DWS.

It is presumed that, generally, a private project developer could install new wells in less time than the County. Several new well projects by developers in the Upcountry District are in various stages of design, drilling and completion.

New basal wells could be owned and operated by the project developer or transferred to a third party. If the well would not be operated by the County, the water produced by the well either would be sold to the County or would be distributed to users by an independently developed water transmission and distribution system. In order for a non-County entity to sell water directly to the general public (more broadly than to its owner-operators), it would have to become a public utility regulated by the Hawaii Public Utility Commission.

#### Project Capitalization

New wells could be financed by several methods. The County could provide all necessary financing. Financing could be provided by a project developer. Financing could be shared. Some of the financing (or project funds outright) could be provided by State or Federal sources.

The method of financing affects costs to the County and DWS customers. Clearly any financing or project funds provided by the State or Federal government could reduce costs to the County and DWS customers. Financing by project developers may reduce or may increase costs to the County and DWS customers depending upon the terms of contractual agreements. This is discussed further below.

Recent well projects by Upcountry developers have been financed by project developers. For wells that would be turned over to the DWS for ownership and operation, it is expected that the project developer would be reimbursed by the DWS by provision of "source credits". Source credits are good towards payment of the source component of the System Development Fees due for obtaining water meters for future land development projects. It is not clear what entitlements or priority access to acquiring future water meters would be included in the contracts for transfer of the wells to the County. This is discussed in more detail in the section below.

#### Capitalization, Credits and Entitlements

Generally speaking, there are two distinguishable instruments of property created in contracts for developer financed water source projects.

#### **SOURCE CREDITS**

First is a "source credit" which is a "fiscal" credit good towards payment of the source component of the system development fee which is required to obtain a new water meter account with the DWS. Depending upon the terms of the applicable contract, source credits may or may not be tradable to other parties and may or may not expire at a determined date. Source credits can be denominated either in terms of a specified number of water meters (or meter equivalents) or in terms of a specified amount of dollars towards payment of system development fees.

#### **ENTITLEMENTS**

## **Policy and Feasibility Considerations**

### **Cost vs. Reliability vs. Sustainability**

The final candidate strategies differ from one another regarding the balance between the objectives of minimizing cost, providing reliable water service and enhancing the sustainability of the system operations. The Expansion of Raw Water Storage Capacity strategy would require large initial capital expenditures that would reduce future energy consumption and system operating costs. This strategy would provide incremental increases in Upcountry District system service reliability but would not, by itself, provide the same drought period reliability as groundwater development strategies. Overall, additional raw water storage capacity would contribute substantially to a balance of the objectives of minimizing long term system costs, increasing system reliability and promoting sustainability.

With the strategies that incorporate the addition of raw water storage reservoirs there is a trade-off between near term drought period reliability and long term cost effectiveness. The analysis presented in this report indicates that the most economic and sustainable strategy may be to provide raw water storage for the Upcountry system instead of relying on extensive additions of basal groundwater wells which require high long term energy expenditures. There would be an extended period of time, however, before one or more storage reservoirs can be installed. The most economical approach might be to commit to a strategy that incorporates water storage reservoir(s) and maintain the existing level of system reliability until the reservoirs are commissioned. If a substantial number of basal wells are added to the system prior to commissioning the reservoir(s), this would enhance near term system reliability (and perhaps allow more meters to be issued) but would diminish the long term economic advantage of a storage reservoir strategy.

### **Budgeting for Project Capital Costs**

The economic analyses presented below indicate that additional raw water storage reservoir capacity is cost effective considering long term Upcountry District system capital and operating costs. Even though reservoir construction may be economical considering long term levelized costs, the need for budgeting the large necessary capital requirements for reservoir construction presents immediate challenges, especially in the current economic climate. Funding needs must also consider the capital requirements of other DWS Districts.

### **Agricultural vs. Municipal Service Objectives**

Raw water storage to meet drought period water demand is necessary to meet both domestic and agricultural needs. These objectives may conflict with one another in drought periods as growth in Upcountry District system demand challenges the sufficiency of the finite supply of economical surface water. Even with substantial increases in the amount of raw water storage the supply of surface water on the Upcountry District system is limited to the source streamflow and collector system capacities.

The 100 million gallon Kahakapau reservoir addition to the Upper Kula system was constructed with substantial federal funding targeting agricultural water service needs. The existing use of the reservoir serves both domestic and agricultural needs. A new non-potable water line has been constructed that would draw water from the Kahakapau reservoir bypassing water treatment at the Olinda water treatment plant to serve agricultural needs of the Upper Kula system area. The water demand projections used in the analyses presented in this report presume that when non-potable water becomes available from the agricultural water line this will displace the use of potable water that is now use for agricultural purposes. Depending on the pricing and policies regarding the drought period availability of water from the non-potable line, however, agricultural uses may increase beyond what is assumed.

production capability is important in determining the dates that additional production resources are needed to maintain system reliability.

### **Reservoir Reliability and Economic Analysis**

Several of the final candidate strategies presented in this report have differing characteristics regarding service reliability, capital versus operation costs and reliance on electrical power for pumping. Generally, strategies relying on surface water sources are more susceptible to drought period reliability deficiencies than strategies that rely upon groundwater sources. Additional raw water storage reservoirs are capital intensive whereas groundwater production sources have substantial long term operating costs, primarily for electrical energy for pumping. Meaningful comparison of these differing strategies must properly account for incremental contributions of each strategy to water system service reliability and must provide proper accounting of future streams of capital versus operating costs.

The approach used in the analyses presented in this report includes several phases:

- Mass flow analysis of historical streamflows, anticipated reductions in stream base flows and collection system and treatment plant characteristics to determine incremental contribution to system service reliability in drought period and normal conditions for various assumed reservoir capacities for each Upcountry subsystem.
- Estimates of costs of various raw water storage reservoir options.
- Integrated analysis of the operation of the Upcountry District water system and subsystems in drought period and normal conditions.
- Comparisons of the economics of different strategies assuming maintenance of equivalent service reliability.

The economic analysis of the Expansion of Raw Water Storage strategy was conducted in several iterative rounds. Initial analysis focused on determining the optimal additional reservoir capacity for each Upcountry District subsystem and comparison of the value of additional reservoir capacity between systems. These analyses were then refined regarding several factors including reservoir operation protocols, integrated operation of subsystems, characterization of drought versus normal period assumptions, anticipated impacts of reductions in source base flows and consideration of a range of assumed electric power costs.

Alternate assumptions regarding reductions in base flows available to the Kamole WTP were incorporated in several rounds of analysis. First, analyses are presented for various reservoir addition options independent of anticipated reductions in base flows (presuming that reductions would be mitigated by other means). Further analyses are presented evaluating various combinations of reservoir additions in conjunction with mitigation of alternate possible base flow reduction scenarios.

Alternate assumptions regarding possible future power costs were incorporated in several rounds of analysis. In the analyses presented in this report strategies are characterized for two alternate electric power cost scenarios representing lower and higher future energy prices.

All of the analyses in this section focus on system economics irrespective of specific constraints on project timing and phasing. Analysis considering project timing constraints is presented in the later section of this report: "Comparison of Final Candidate Strategies".

### **Presentation of Results of the Economic Analysis**

The results of the economic analyses are presented in charts that show the net present value of total DWS Upcountry District system costs over a twenty-five year planning period and a fifty year study period.<sup>7</sup> The charts show the net present value of the following cost categories for each of the strategies:

shown by comparing the 100 MG reservoir strategies for each system. For the Lower Kula system (2nd column from the left) the total system costs are slightly higher than the reference strategy (as shown by the black total cost bar slightly above zero). For the Upper Kula and Makawao system (two columns at the far right) the 100 MG reservoir strategies have substantially higher total costs than the reference strategy. This is a result of several contributing factors including the streamflow and collection system characteristics, the demand requirements and the elevation of each system, as well as the resulting interactive economic opportunities and service demand needs for transfers of water between systems. Primarily, the Lower Kula system has more source water availability, more subsystem demand and less existing reservoir capacity than the Upper Kula system.

The benefits of adding storage to serve the Kamole WTP depicted here are relatively small. Note that this analysis of a reservoir at Kamole WTP strategy only examines reservoir reliability benefits presuming that anticipated reduced flows to the Kamole WTP are mitigated by other means. As shown in analyses presented below, a reservoir at the Kamole WTP site is a cost effective strategy to mitigate anticipated Wailoa Ditch base flow reductions.

The historical flow characteristics of the Koolau/Wailoa ditch system that serves the Kamole WTP are already “regulated” by the water storage capacity of the large watershed area that contributes to the base flow of the extensive system of contributing streams. Under these historical water flow conditions, relatively large reservoir capacity would be required to substantially increase the drought period reliable capacity of the Kamole WTP. Also, additional storage on the Makawao system would not provide substantial economic benefits (compared to the Upper Kula and Lower Kula systems), since water would need to be boosted to the upper systems in drought periods. Considering substantially reduced base flows in the Koolau/Wailoa ditch system, however, raw water storage reservoir capacity becomes necessary to provide reliable capacity in dry or drought periods.

## RESERVOIR CAPACITY

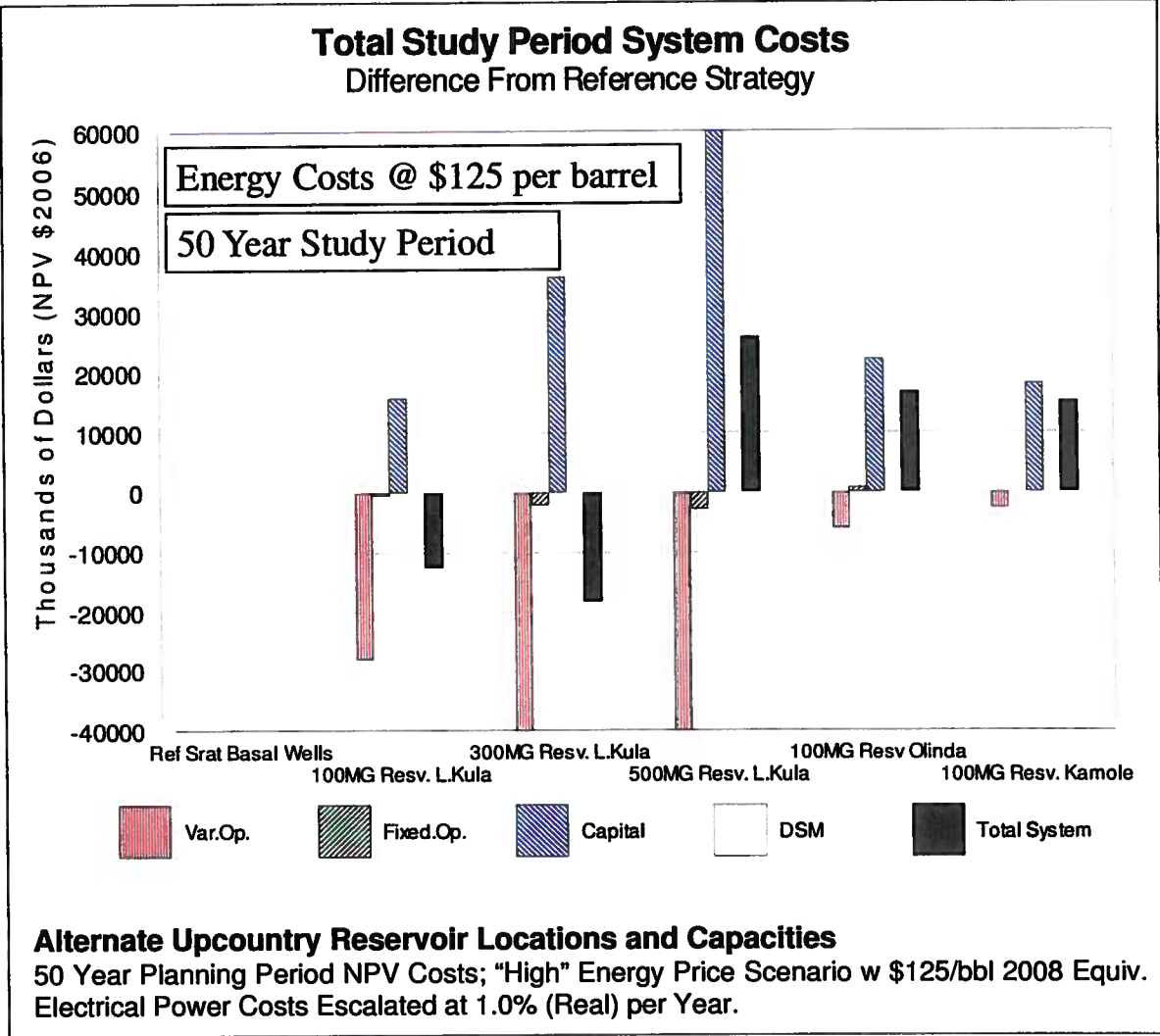
The optimum capacity for water system source storage is a function of several factors including the source water streamflow characteristics, system water demand characteristics and economics. If a water source is constant with no variation in flow and water demands are constant, there would generally be no need for source storage capacity. If a water source is “flashy” or is dry for some periods of time (like the Upper Kula and Lower Kula sources) then storage reservoir capacity is important to provide a reliable way to meet persistent water demands. Adding reservoir capacity increases system reliable service capability... but only to a certain point and with diminishing returns. Clearly, no matter how large a reservoir is provided, the average output of a water system cannot be greater than the average source input. The optimal reservoir size, considering the diminishing returns for progressive increases in reservoir capacity depends upon economics. At some point the costs of progressive additional reservoir capacity are not justified by diminishing incremental system reliable output.

The economic analyses of water storage reservoirs in this report are based on mass flow analyses that consider the historical (and anticipated) daily source flow characteristics and simulation of reservoir levels over extended periods of time to determine system reliable output for various reservoir configurations. The economics of various reservoir configurations depicted in the charts shown here are determined the integration model examining the operation of the whole Upcountry District water system over an extended planning period (twenty five years) and study period (fifty years).

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10. The analysis of reservoir location here considers only on which system a reservoir would be located. No specific sites were presumed or evaluated. It is presumed that any reservoir would be located somewhere between the existing source diversions and the existing water treatment plants at the elevation (hydraulic gradient) of the water transmission system. Cost estimates for reservoir construction are broad generic estimates that are not site specific.





The chart above shows the same strategies as the previous chart except that higher energy costs are assumed. The electrical costs assumed in the analyses shown on this chart are the "high" energy cost scenario. These costs reflect crude oil prices of \$125 per barrel in 2008 (\$0.34 per KWH marginal cost in the high power consumption block for large customer MECO Schedule P tariff) assumed to escalate at 1% per year in real terms (1% higher than general inflation).<sup>11</sup>

Considering higher energy costs the 100 MG and 300 MG Lower Kula storage reservoir strategies appear substantially cost effective. Larger reservoir capacity (500 MG) on the Lower Kula system and additional reservoir capacity on the other water systems is not cost effective.

**Analysis Including Mitigation of IIFS Wailoa Ditch Base Flow Reduction Impacts**

The recent and anticipated further amendments to the IIFS for the East Maui streams will result in decreased base flows in the Koolau/Wailoa ditch system which serves as the water source for the Kamole WTP. With base flows in the ditch system reduced, the reliability of the Kamole WTP

11. The marginal power costs included in the variable costs do not include customer charge and demand charge components of electricity bill. These components of electrical costs are included in fixed operating costs.

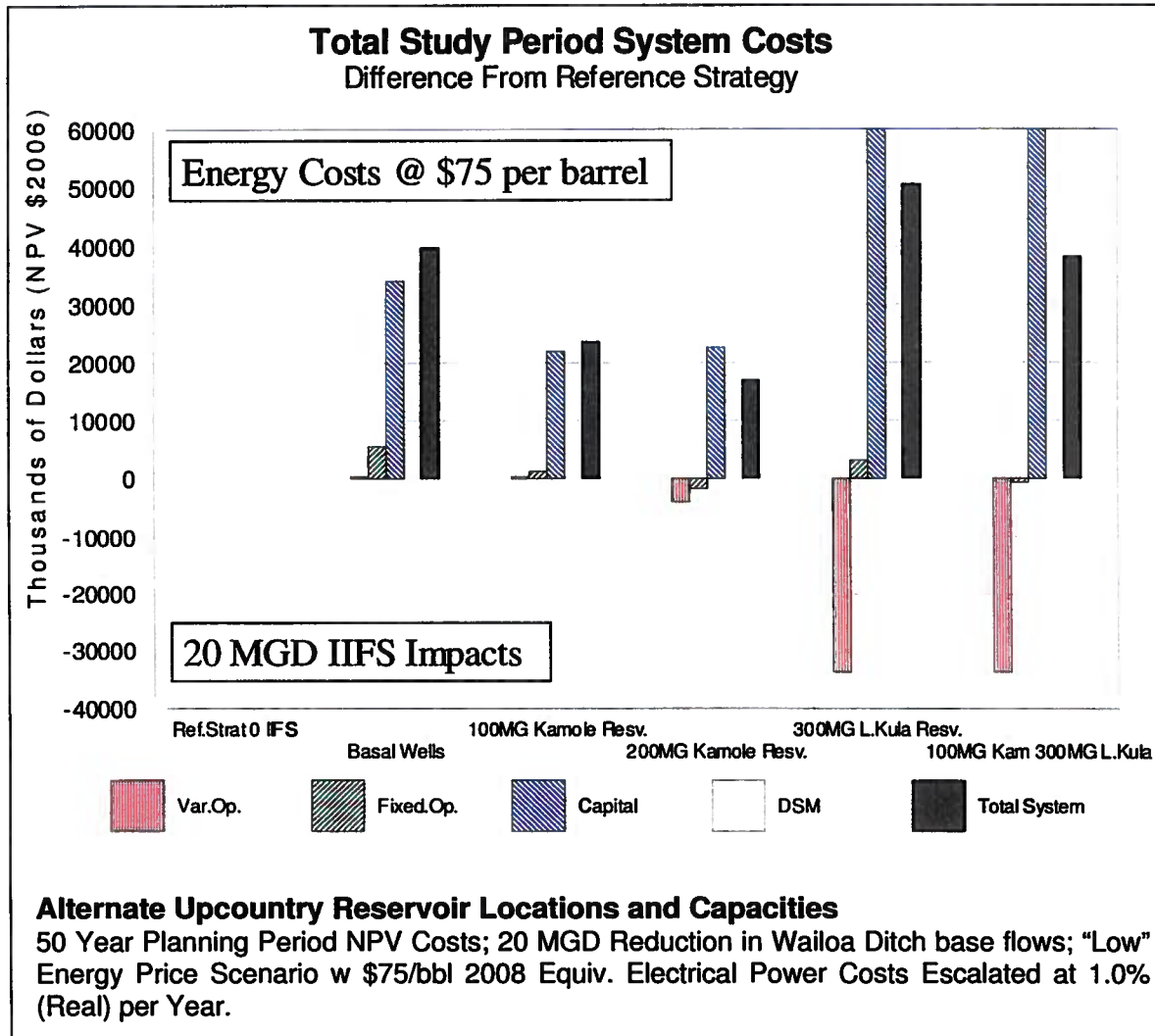
would be reduced which would erode the drought period reliability of the Upcountry District system unless some mitigating actions would be implemented. The reduction in drought period reliability resulting from amendments to the IIFS on East Maui streams could be mitigated by installing additional basal groundwater wells to provide alternate drought period capacity or by installing a raw water storage reservoir to serve the Kamole WTP.

A series of analyses was performed to determine the drought period reliable yield of the Kamole WTP system assuming various sizes of raw water storage reservoirs and considering various levels of reductions in Wailoa Ditch streamflows resulting from IIFS amendments. These analyses are presented in detail in Appendix C to this report and are discussed in the section below presenting the strategy *D. Improving Kamole Water Treatment Plant Capacity*. The analyses show that, in order to maintain the existing 4.5 MGD drought period reliable capacity of the Kamole WTP:

- A reservoir of approximately 100 MG would be required to mitigate the impacts of a 20 MGD reduction in Wailoa Ditch base flows
- A reservoir of approximately 200 MG would be required to mitigate a 30 MGD reduction in base flows.
- A reservoir of approximately 300 MG would be required to mitigate a 50 MGD reduction in base flows.

Based on the results of the mass flow analyses presented in Appendix C a series of economic analyses is presented below that consider various strategies and assumptions to mitigate reductions in Wailoa Ditch base flows.

Note that the economic analyses presented in this section presume that providing raw water storage capacity in order to provide drought period reliable capacity would avoid the need to provide basal groundwater wells for this purpose. If basal wells would be provided by the DWS or acquired from private developers as interim measures prior to commissioning a reservoir, the cost effectiveness of the reservoir strategies would be diminished. See further discussion of the impacts of the timing of resource projects in the later section of this report: "Comparison of Final Candidate Strategies".

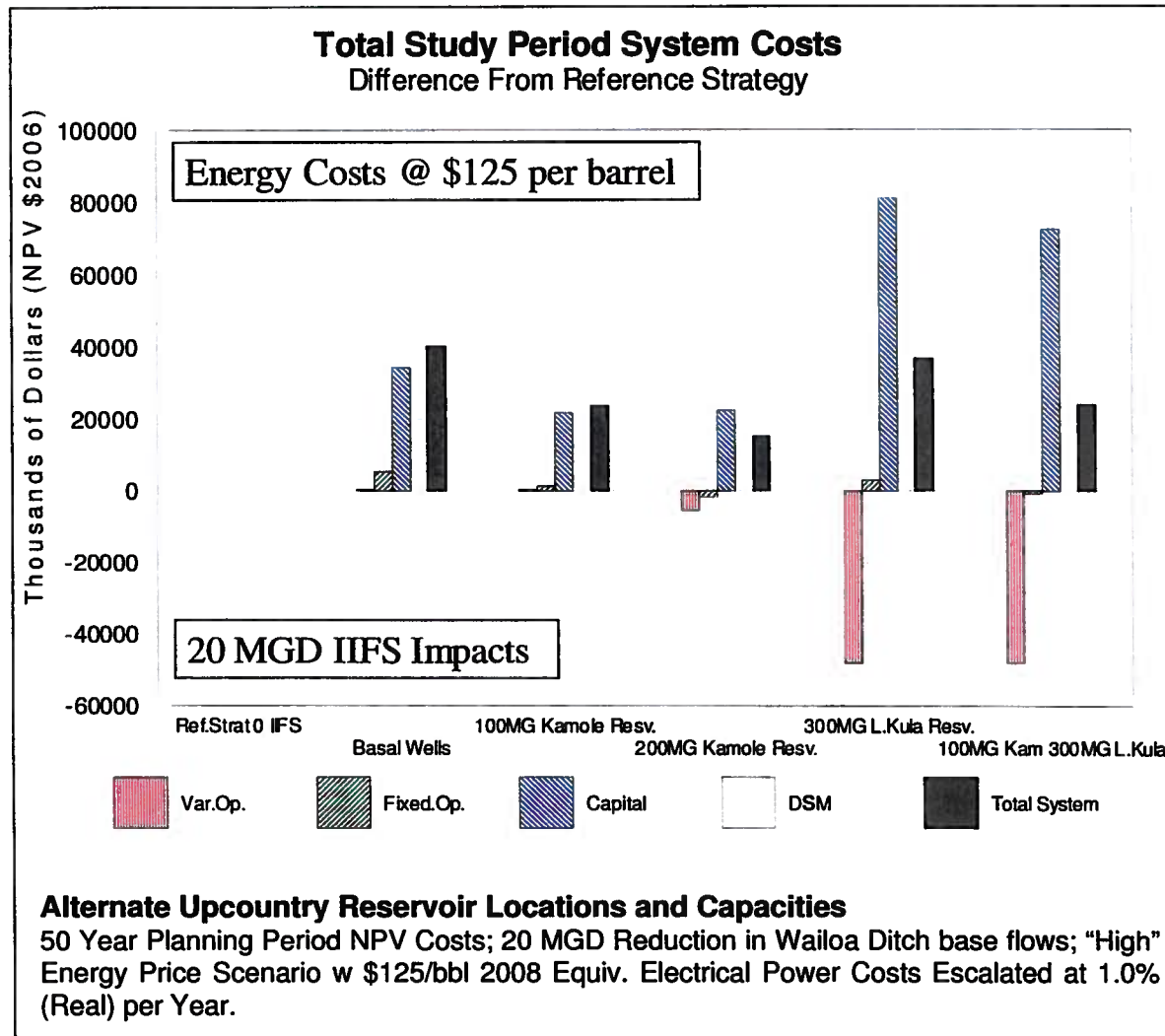


The chart above shows a comparison of several strategies including the costs and impacts of measures to mitigate a 20 MGD reduction in Wailoa Ditch base flows that could result from recent and anticipated amendments to the interim instream flow standards for East Maui streams. The "low" energy cost scenario is assumed.

The strategy depicted in the left-most column is the same reference strategy depicted in previous charts showing zero Wailoa Ditch base flow reductions. All of the other strategies depicted include the costs and impacts of mitigating a 20 MGD reduction in Wailoa Ditch base flows. The strategy in the second column from the left is the reference strategy using only additions of basal wells to provide additional needed resources. The remaining columns show strategies that provide additional needed resources using raw water storage reservoirs in several configurations.

The center two columns show strategies incorporating 100 and 200 MG reservoirs at the Kamole WTP respectively. In all other respects the strategies are the same as the reference strategy using basal wells to provide needed capacity. The analysis depicted in these columns shows that raw water storage at the Kamole WTP is more cost effective than providing backup capacity exclusively by addition of basal wells. All of the analyses that include addition of reservoir capacity for the Kamole WTP in this chart and the following charts include the capacity benefits resulting from improvements to the intake structures of the WTP discussed previously in this section of this report.

The strategy depicted in the second column from the right shows that addition of a 300 MG reservoir on the Lower Kula system is not as cost effective as a reservoir at the Kamole WTP as the only raw water storage addition to the Upcountry District systems considering the impacts of lower base flows on the Wailoa Ditch. The strategy in the rightmost column includes a combination of a 100 MG reservoir at the Kamole WTP and a 300 MG reservoir on the Lower Kula system which is more cost effective than the Lower Kula reservoir alone.



The chart above shows the same strategies and 20 MGD Wailoa Ditch base flow reduction impacts as the previous chart except that the high energy cost scenario is assumed. With higher energy costs the operational efficiency of the Lower Kula reservoir additions are more prominent.

Note that all of the costs shown in this chart are depicted as differences from the reference basal well development strategy depicted in the left-most column. The costs of all of the strategies are substantially higher assuming the high energy cost scenario. The chart shows the *differences* in costs of the various strategies for the whole Upcountry District systems over the fifty year study period.

Considering the economics of developing basal wells raw water storage reservoirs, including the need to mitigate anticipated reductions in Wailoa Ditch base flows, strategies that include the addition of reservoir capacity for the Kamole WTP are most cost effective.

- CONTINUE INVESTIGATION OF SURFACE WATER TREATMENT DISINFECTION BYPRODUCT REDUCTION MEASURES

### **Long Term Resources**

In previous sections of this report several final resource strategies were examined that posed alternative approaches to providing new water supply for the DWS. The recommended strategy recognizes that there is substantial uncertainty regarding the feasibility, costs and timing of the availability of some of the final resource strategies.

#### **Discussion:**

- Additional raw water storage reservoir capacity for the Lower Kula system would be cost effective and would provide long term benefits in terms of reduced electrical power consumption and operating costs.
  - Optimum added reservoir capacity from an economic and system operation standpoint would be between 100 to 300 million gallons.
  - Permitting and construction of a 300 million gallon reservoir east of the existing reservoir may not be practical due to environmental concerns at the candidate sites east of the existing Piiholo reservoir.
    - ◆ Candidate reservoir sites for a 300 MG reservoir east of the existing reservoir are located where roads through protected subzones with identified endangered species would be required. A Habitat Conservation Plan and Incidental Take License(s) would be required which could add substantial costs to the project
  - A reservoir of at least 100 MG may be feasible near the existing Piiholo reservoir outside of environmentally sensitive areas.
  - Budgeting for the large initial capital expenditures for reservoir construction has not been determined or committed.
- New raw water storage capacity to serve the Kamole WTP would cost less than addition of basal wells as a means to mitigate the expected reductions in Wailoa Ditch base flows resulting from implementation of amendments to the interim instream flow standards on East Maui streams. However, if a substantial number of basal wells would be added to the Upcountry system prior to commissioning a Kamole WTP reservoir, the cost effectiveness of the installing the reservoir would be diminished.
  - A 100 MG reservoir would mitigate a 20 MGD reduction in Wailoa Ditch base flows.
  - A 200 MG reservoir would mitigate a 30 MGD reduction in Wailoa Ditch base flows.
  - With reductions in base flows exceeding 30 MGD it would be more cost effective to provide drought period reliable capacity by additional basal wells than adding reservoir capacity for the Kamole WTP.
  - Budgeting for the large initial capital expenditures for reservoir construction has not been determined or committed.
- Basal groundwater wells are being drilled and developed by non-DWS entities. These wells are being offered to the DWS in trade for source credits and water entitlements or are being offered to meet subdivision requirements to identify a source of water to serve new services.
  - The addition of basal well capacity does not provide all of the infrastructure necessary to provide an economical source of water.

- SUPPORT WATERSHED PARTNERSHIP AGREEMENTS
- SUPPORT FENCING AND UNGULATE CONTROL PROGRAMS TO PROMOTE REFORESTATION
- SUPPORT PROGRAMS TO CONTROL INVASIVE SPECIES

**Wellhead protection**

- IMPLEMENT A WELLHEAD / AQUIFER PROTECTION ORDINANCE FOR EACH ISLAND

**Stream restoration**

Healthy streams are essential to support Hawai'i's unique stream fauna and provide sufficient cool water necessary for growing taro.

- SUPPORT APPROPRIATE AMENDMENT OF INTERIM AND OR PERMANENT INSTREAM FLOW STANDARDS BY CWRM
- SUPPORT PROGRAMS TO PROTECT AND RESTORE STREAMS
- CONSIDER IMPACTS ON RELIANCE ON WATER FROM STREAMS IN COUNTY LAND USE DETERMINATIONS

**Protection of Cultural Resources**

- SUPPORT STREAM RESTORATION MEASURES
- CONSULT WITH BURIAL COUNCIL AND LOCAL KULEANA REPRESENTATIVES REGARDING DWS ACTIONS

**Energy Efficiency and Energy Production**

Energy costs are the single largest expense of the DWS. The DWS is the largest aggregate customer of Maui Electric Company (MECO). Opportunities to use energy more efficiently, manage the timing of electrical loads with MECO and to generate electrical energy can all benefit the County and DWS customers.

Efficient use of energy by the DWS will reduce costs to the County and DWS customers and reduce the impacts associated with electrical power production. Cost effective energy efficiency measures are consistent with all of the WUDP planning objectives.

Managing the timing of electrical energy use (load management) can be a valuable resource to MECO. The DWS can benefit by existing MECO load management incentives and by negotiating benefits resulting from future power management protocols with MECO.

The DWS has several opportunities to produce renewable energy for its own use that would reduce system costs. Renewable energy production opportunities are site specific due to the nature and availability of renewable energy sources and proximity to the DWS system electrical loads. Several specific opportunities for potential wind and hydroelectric generation have been identified for the Upcountry District. Opportunities for the Upcountry District will depend on the location of future resource development.

- ESTABLISH DWS ENERGY RESOURCE COORDINATOR POSITION
  - Establish a full time staff position or contract for assistance to monitor, investigate and implement energy efficiency programs, load management measures and energy generation opportunities
- IDENTIFY AND IMPLEMENT ENERGY EFFICIENCY OPPORTUNITIES
  - Participate in existing MECO energy efficiency programs

**Capital Improvement Program**

CBS No: CBS-1106

Project Name: Upcountry Reliable Capacity

Department: Department of Water Supply

District: Makawao-Pukalani-Kula

Project Type: Water Supply

Anticipated Life: 50 years

Prior Years	Appr	Ensuing	Subsequent Years					Total
Expend/Encb	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	6-Year
0	0	1,500,000	4,300,000	15,300,000	0	2,500,000	1,650,000	25,250,000

**PROJECT DESCRIPTION**

FY15: Land acquisition for Kamole storage reservoir phase I; FY16: Kamole reservoir design, Olinda WTF upgrades. FY 17: Kamole Reservoir construction, Phase I; FY 19 & FY 20.

**PROJECT JUSTIFICATION**

The intent is to accommodate the current/future demand, provide service reliability/efficiency, prevent service disruption, and/or prevent any potential health/safety problems.

**STRATEGIC PLAN ALIGNMENT**

**Department's Strategic Plan**

**Countywide Priority Results**

Goal: Ensure facilities meet future needs. Objective(s): Minimize adverse impacts to the water system

A Suitable Public Infrastructure  
An Efficient, Effective, and Responsive Government

**Operating Impact Narrative**

No impact is anticipated.

**FUNDING DETAILS**

Phase Description	Fund Code	Appr FY 2014	Ensuing FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Design	GB	0	0	300,000	0	0	0	650,000
Design	WR	0	0	0	300,000	0	500,000	0
New Construction	GB	0	1,500,000	0	0	0	0	0
New Construction	SRF	0	0	4,000,000	15,000,000	0	2,000,000	0
New Construction	WR	0	0	0	0	0	0	1,000,000

**Schedule of Activities**

Activity	Start	End	Amount
Design	07/01/2014	12/31/2020	1,750,000
New Construction	07/01/2014	12/31/2020	23,500,000
<b>Total Capital Project Costs</b>			<b>25,250,000</b>
Total O&M Costs			0
<b>Total Capital &amp; Operating Costs</b>			<b>25,250,000</b>

**Methods of Financing (Ensuing + 5 Years)**

Funding Source	Amount
General Obligation Fund	2,450,000
State Revolving Loan Fund	21,000,000
Water Supply Fund - Restricted	1,800,000
<b>Total Funding Requirements</b>	<b>25,250,000</b>

IN THE CIRCUIT COURT OF THE SECOND CIRCUIT  
STATE OF HAWAII

THE COALITION TO PROTECT  
EAST MAUI WATER RESOURCES, an  
unincorporated association; HUI ALANUI O  
MAKENA, a Hawaii non-profit corporation;  
THE SIERRA CLUB, a California non-profit  
corporation registered to do business in the  
State of Hawaii; MARK SHEEHAN;

Plaintiffs,

vs.

THE BOARD OF WATER SUPPLY,  
COUNTY OF MAUI; DEPARTMENT OF  
WATER SUPPLY, COUNTY OF MAUI,  
GEORGE TENGAN, in his capacity as  
Director of the Water Department, County of  
Maui; and JOHN DOES 1-100,

Defendants.

CIVIL NO. 03-1-0008(3)  
(Declaratory Judgment and other Civil Action)

DECLARATION OF DAVID TAYLOR

**DECLARATION OF DAVID TAYLOR**

I, DAVID TAYLOR, hereby declare as follows:

1. I am employed by the County of Maui as the Director of the Department of Water Supply ("DWS"). I have held that position since January 2, 2011. I have personal knowledge of the matters stated in this Declaration, except as to matters stated on information and belief, as to those matters, I believe them to be true. If called upon, I could testify competently thereto.

2. DWS has several separate water systems that serve potable water to the general public. DWS's Central Maui system serves the communities of Paia, Waihee, Waiehu, Waikapu, Maalaea, Kahului, Kihei, Wailea, and Makena, among others.



16. The County has no current plans to develop groundwater from east Maui.
17. DWS intends to use the data drawn from the USGS proposed test wells as a first step to discern whether withdrawal of groundwater from this region is feasible, desirable, and/or cost-effective.
18. Only after many studies have been done, and data has been gathered, will DWS make any determination that the geographic region of east Maui is a feasible, desirable, and cost-effective location to extract groundwater.
19. DWS cannot and/or will not undertake an EA/EIS until it has formulated a plan or intent to develop groundwater in East Maui.

I, DAVID TAYLOR, declare under penalty of law that the foregoing is true and correct.

DATED: Wailuku, Maui, Hawaii, December 23, 2014.

  
DAVID TAYLOR