

**Section 11**

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**Priority Recommendations and  
Implementation Plan**

## 11. Priority Recommendations and Implementation Plan

Recommendations for CWRM programs are summarized in Section 11.1 below. Recommended actions are identified for either short-term implementation (one- to five-year time frame) or long-term implementation (timeframe beyond 5-years) in Section 11.2. Cost estimates are provided for short-term implementation actions and are intended for planning purposes only.

### 11.1. WRPP Priority Recommendations

There are three general areas in need of CWRM program development and expansion. CWRM should seek funding and staff resources to pursue the following priority recommendations:

1. **Statewide Water Resource Monitoring and Data Collection Program Development:** An integrated, statewide CWRM resource monitoring and data collection program should be developed with equal emphasis on surface and ground water.
2. **Statewide Water Resource Investigation and Assessment Program Development:** To refine components of the hydrologic budget and improve estimates of water resource availability, a statewide investigation and assessment program should be developed. The program should include long-term investigations to evaluate recharge, sustainable yield, ground water/surface water interaction, and instream flow standards and present these in timely updates to the WRPP.
3. **Statewide Water Conservation and Water Shortage Program Development:** A statewide water conservation and water shortage program should be developed and should include provisions for the exploration of alternative water source development and for a water emergency declaration process.

Specific supporting actions for each priority recommendation are described below.

#### 11.1.1. Priority Recommendation 1: Statewide Water Resource Monitoring and Data Collection Program Development

The statewide water resource monitoring and data collection program should be developed to coordinate and implement CWRM monitoring activities, direct the expansion of monitoring networks, and enforce regulatory requirements for water use reporting. The program should also identify funding requirements and seek federal, State, and cooperative funding to implement program actions. The program should be designed to address the following supporting actions:

##### A. Ground Water Resource Monitoring Actions:

1. **Increase Funding for the CWRM-USGS Cooperative Monitoring Program:** Funding for the CWRM-USGS cooperative monitoring program should be increased. The increased funding would reflect inflationary costs as well as expanding the data collection network to monitor new centers of water development.

- 2. Evaluate Existing Monitoring Well Network:** The existing monitoring well network should be reviewed to: 1) identify monitor wells located in or near large pumping batteries, that are directly influenced by upconing; and 2) identify former production and/or existing water-level observation wells where it may be feasible to convert existing wells to deep monitoring wells.
- 3. Resurvey All Measuring Points for Deep Monitor Wells and Water-Level Observation Wells:** Geodetic-control benchmarks in the State of Hawaii should be resurveyed to ensure consistent and accurate water level measurements. This action would include all new wells and existing wells.
- 4. Conduct Additional Synoptic Water-Level Surveys:** Synoptic water level surveys should be conducted regularly in all important areas. All water-level tapes should be calibrated against the USGS reference steel tape at least once every two years to update correction factors. With the modernization of geodetic benchmarks, the synoptic water levels will provide an accurate “snapshot” into the direction of ground water movement.
- 5. Drill New Deep Monitor Wells and Improve Spatial Coverage:** Deep monitor wells sites should be identified and drilled in most of the basal aquifers in Hawaii. Deep monitor wells within an aquifer should be located to provide coverage at an inland or mauka site, a middle site near withdrawal areas, and a makai site to monitor changes in the distal portion of the basal lens. As part of the evaluation of the existing monitoring network, CWRM should identify and prioritize areas and location for new deep monitor well development statewide.
- 6. Drill New Water-Level Observation Wells:** Dedicated water-level monitor wells should be located or drilled in all of the aquifers in Hawaii. The primary considerations for drilling new observation wells is to better delineate the basal aquifer boundaries, to locate geological boundaries and/or structures that would affect ground water flow, and to possibly provide observation wells for new well pumping tests. New water-level observation wells or test holes should be drilled or developed in interior areas following a mauka-to-makai orientation. Priority areas and locations should be identified as part of the evaluation of the existing monitoring network.
- 7. Improve Existing Data Collection Sites:** 1) Outfit all new CWRM deep monitor wells with devices that will collect water-level data on a continuous basis. 2) Add transducers (or other devices) to provide continuous water-level data collection at existing BWS and USGS deep monitor wells in the network throughout the Pearl Harbor Aquifer Sector Area. 3) Eliminate redundant data collection from some monitoring sites.
- 8. Collect Data on Additional Ground Water Parameters:** Existing wells or new wells should be outfitted with nested piezometers or multiple piezometers to observe vertical flow in the aquifer system areas where such information is important. Conductivity data loggers should be lowered to depths identified in the conductivity profile logs that suggest vertical flow, and left to monitor changes in conductivity over time. Where available,

calibrated dispersion coefficients from deep monitor well data should be included in existing analytical and new 3-D solute transport ground water flow models.

9. **Map Water-Level Data in GIS Format:** Where adequate data are available, use GIS software and deep monitor well data to map the top of the transition zone, the midpoint of the transition zone, and the elevations of water-levels, to allow the illustration of actual water levels and expected water levels.

**B. Well Pumpage, Water-Level, and Chloride Monitoring Actions:**

1. **Complete CWRM's Water Use Reporting Database:** Completion and operation of this database is a priority. CWRM should focus on obtaining pumpage reports from all users in designated water management areas and from large users in non-designated areas. Subsequently, CWRM should pursue statewide reporting of all active pumpage, water-level, and chloride data.
2. **Integration of Databases and Public Access to Databases:** Pursue integration of any historical pumpage, chloride, and water-level data from large users beginning with the Honolulu BWS. Historical data should be integrated with CWRM and USGS database information in an appropriately managed database with the goal of public access this master database, which should be provided in a secure format. The database should eventually be expanded to include information from other county water departments and large users (military, agriculture, etc.)
3. **Application of Internet and GIS Technology:** CWRM should utilize Internet technology to facilitate water use reporting by well operators/owners and GIS software to improve spatial reporting and analysis of well pumpage, chloride, and water-level data.

**C. Spring Discharge Monitoring Actions:**

1. **Integration of Databases:** Secure commitments from other agencies collecting spring data to facilitate the integration of various spring discharge and chemistry databases. Explore options for data application and future studies to help understand flow dynamics of basal lenses. Use spring discharge data as calibration targets in numerical ground water models.
2. **Conduct Additional Analyses:** To provide insight on the velocity of ground water flux over time, analyze spring data for additional parameters, such as nitrate, and compare the results with that of analyses performed on well water samples.
3. **Conduct Additional Monitoring:** Use data loggers to monitor temperature and conductance at spring orifices, logging daily changes. Temperature and conductance data may provide greater insight into the movement of the basal lens.

**D. Surface Water Resource Monitoring Actions:**

1. **Adopt Guidelines for Surface Water Monitoring:** CWRM should adopt guidelines for surface water monitoring and develop a standardized set of methods for measuring diverted flow and water use. Surface water users and diversion works operators should be educated on the correct application of water use metering and gaging methods that are appropriate for different end uses.
2. **Streamflow Monitoring Program:** CWRM should plan and develop a streamflow monitoring program. The program should include staff training, protocol establishment, and assessment of the existing USGS stream-gaging network, and developing a schedule to measure streams at regular time intervals on a regional scale. The program should provide data to support the establishment of instream flow standards.
3. **Increase Partnership Activities:** Seek involvement from public agencies, private entities, and community organizations in watershed partnerships, alliances, and other collaborative efforts to identify water uses and assess watershed conditions. Apply collaborative approaches to planning, funding and implementation of stream-related studies and programs.

**E. Water Use Reporting Actions:**

1. **Require Ground Water Use Reporting of all Well Owners:** CWRM should more actively pursue all owners of wells to report monthly water usage from their ground water source. CWRM should obtain additional funding and staff resources for the water use reporting program and amend its current policy to instead require currently-exempt individual water systems using less than 1,700 gpd to report water use.
2. **Improve Ground Water Use Reporting Process:** CWRM should utilize Internet technology to provide well owners and water users the option of submitting pumpage reports online. This will be far more efficient for ground water users and should also reduce data input errors.
3. **Improve Ground Water Use Reporting Compliance:** CWRM should continue development of the ground water use database to implement an automatic notification system that will flag delinquent reports, and send notices to well owners/water users that have neglected to send in pumpage reports.
4. **Disseminate Ground Water Use Information:** CWRM should consider resurrecting the monthly newsletter (see Section 5.2) to provide up-to-date information on deep monitor well, chloride, water-level, and/or water use information currently collected by CWRM.
5. **Establish Protocols for Measuring Surface Water Use:** Due to the wide variety of existing surface water diversion structures, CWRM should develop

protocols and make equipment recommendations for the standard measurement of surface water use.

6. **Establish a Surface Water Use Reporting Program:** CWRM should complete the development of the SWIM System and begin implementing a monthly surface water use reporting program. The program should first focus on large irrigation systems and should include broad notification of water users, development of a reporting form, and the distribution of the form and information reporting via the Internet. CWRM should seek additional staff for field investigations and water use data collection and management. Funding mechanisms should be established to support the program. Upon completion of statewide field verification of surface water diversions, CWRM should utilize the information to identify key surface water users to focus implementation of surface water use reporting requirements.
7. **Revise CWRM Policies Regarding Surface Water Use Reporting:** CWRM should revise surface water use reporting policies, in conjunction with the development of a surface water use reporting program.

**F. Regulatory and Administrative Actions:**

1. **Examine Water Use Assessment Methods:** CWRM should further explore the use of different statistics, methods, and measures to assess water use over time, such as a 5-year moving average. If an alternative measure is identified, the State Water Code should be updated to include the assessment measure.
2. **Improve Regulatory Coordination:** CWRM should support and participate in efforts to improve regulatory coordination between government agencies that regulate water resources. CWRM should support efforts to prevent duplication of effort, excessive regulation, and unnecessary regulation.
3. **Establish Continuing Education Programs for Well Construction and Pump Installation:** CWRM should explore further education programs for well drillers in addition to DCCA licensure testing on construction standards to ensure they are knowledgeable of updated and current construction standards.
4. **Establish Funding for Well Abandonment/Sealing:** CWRM should explore available funding sources and mechanisms to immediately address priority abandoned wells that need to be sealed (list of priority abandoned wells recommended for sealing is included in Table 11-1). CWRM should secure a continuous, dedicated funding source to acquire and maintain the specialized equipment and additional staff required. Because improperly abandoned wells are largely a contamination and pollution issue, CWRM should coordinate with the DOH to identify funding sources and implement a program for sealing wells that pose existing or potential pollution concerns.

- 5. Identify and Specify Follow-up Actions for Potentially Abandoned Wells:** A comprehensive, statewide survey of all potentially abandoned wells has been conducted, including estimated costs for sealing such wells if they are verified as abandoned wells. Specific follow-up actions should be identified for each well. A sample priority sealing (Table 11-1) has been developed by CWRM staff, but should include all applicable wells including prioritizing which wells need to be sealed first.

<b>Name</b>	<b>Estimated Cost<sup>1</sup></b>
BWS Punaluu VB 3453-10	\$12,600
Punaluu Sproat 3453-05	\$10,000
EP10 wells (select wells)	\$32,300
Kailua Kona 3758-01	\$8,900
Kaloko Irr I 1 4160-01	\$13,300
Pahoehoe well 3657-02	\$31,000
Lau Taro Farm 2356-70	\$6,500
Kapahulu 1749-08	\$5,900
Waipahu Yoshimura D 2459-21	\$7,500
Waialae golf course 1646-02	\$4,300
EP 18 2102-11, 16 to 22	\$34,400
Kauai Kealia Wells 0618-03 to 07	\$26,200
Waialua Sugar (96 unused wells)	\$755,800
State Aiea 2256-11 210 ft. 12 in	\$7,200
State WP 5 (6 wells in a shaft 2203-01 to 06)	Unknown (very expensive)
<b>TOTAL</b>	<b>\$955,900</b>

<sup>1</sup> Note: The above cost estimates are in 2006 dollars and are based on the volume of cement required and a \$3,000 contractor set-up charge. The cost estimates do not include the cost of mobilization/demobilization, which can be as much as \$30,000 for a large job.

- 6. Establish Enforcement Mechanisms for Well Abandonment/Sealing:** If sufficient funding cannot be obtained for CWRM to seal abandoned wells, which the landowner/well owner will not or cannot properly seal, then CWRM should consider revising the State Water Code to give CWRM clear authority to order landowners/well owners to seal abandoned wells, subject to daily fines for noncompliance.

### **11.1.2. Priority Recommendation 2: Statewide Water Resource Investigation and Assessment Program Development**

CWRM should champion the development of a statewide investigation and assessment program to refine components of the hydrologic budget and improve estimates of water resource availability. The program should include long-term investigations to evaluate precipitation, recharge, sustainable yield, ground water/surface water interaction, and instream flow standards. Many of the action items listed below will require data from CWRM and other agency monitoring programs. To leverage staff and funding resources, it is anticipated that investigation and research activities will be executed in cooperation with other State agencies, federal agencies, county agencies, and members of the academic community. The program should address the following supporting actions:

**A. Rainfall Monitoring Actions:**

- 1. Increase Rainfall Data Collection:** Collection additional rainfall data, especially in watershed and agricultural areas. Data collection at long-term rain-gage stations should be continued, or reestablished if station activity has been discontinued. Rainfall analysis of all types should be updated.
- 2. Coordinate Rainfall Data Sharing:** Coordinate rainfall data sharing between major data collection networks. Improve data delivery and data format for public consumption (including the acquisition and review of historic plantation data kept by the Hawaii Agricultural Research Center).
- 3. Update Drought Frequency Information:** Conduct regular drought frequency analyses.
- 4. Update Climate Station Information:** Update the statewide, comprehensive climate station index and accompanying maps.
- 5. Update Statewide Rainfall Frequency Information:** Update the statewide rainfall frequency study and maps.
- 6. Update Statewide Median/Average Rainfall Information:** Update the statewide median/average rainfall maps.
- 7. Investigate the Potential Impacts of Long-Term Climate Trends:** The State and counties should cooperatively undertake climate studies in support of long-term water resource planning. Investigations should explore precipitation patterns, El Niño forecasting, impacts to hydrologic cycle, impacts to potable and non-potable water demands, and potential mitigation actions.

**B. Cloud Water Interception and Fog Drip Monitoring Actions:**

- 1. Increase Cloud Water Interception Data Collection:** Investigate cloud water interception and its contribution to the hydrologic budget, aquifer sustainable yield, and watershed hydrology, especially in important watershed areas.
- 2. Develop Methods to Estimate Cloud Water Interception:** Develop regional estimates of cloud water interception.

**C. Evaporation Monitoring Actions:**

- 1. Identify Evapotranspiration Data Sources:** Identify sources of evaporation and evapotranspiration data and improve access to this data. Historic evaporation plantation data kept by the Hawaii Agricultural Research Center should be acquired and reviewed.
- 2. Establish Evapotranspiration Monitoring Stations:** Establish monitoring stations to collect evapotranspiration data and evaluate its contribution to the

hydrologic budget. Additional research should be conducted in areas where aquifer sustainable yields should be reassessed or refined.

3. **Develop Methods to Estimate Evapotranspiration:** Develop regional estimates of evapotranspiration estimates, especially in areas where aquifer sustainable yields need to be reassessed or refined.
  4. **Update Statewide Pan Evaporation Maps:** Update the statewide pan evaporation maps in DLNR's *Pan Evaporation: State of Hawaii 1894-1983*, R74, 1986 based on best available information.
- D. Recharge Assessment Actions:**
1. **Improve Recharge Estimates:** Achieve a more standardized estimation of the rate of natural recharge through further study of relevant hydrologic processes such as precipitation, fog drip, surface runoff, soil-moisture storage, evapotranspiration, and time-steps used. Update recharge estimates statewide for complete island coverage using the general ground water recharge equation in its entirety, and consider excluding basal recharge from caprock and valley fill geology.
  2. **Establish Standard Rainfall and Evaporation Data Inputs:** Identify the rainfall isohyets described in DLNR's *Rainfall Atlas*, R76, 1986 and the isopleths described in DLNR's *Pan Evaporation: State of Hawaii 1894-1983*, R74, 1986 as the standards to be used in estimating ground water recharge until more updated maps are developed.
  3. **Consult Other Agencies:** Review ground water recharge components with other state and federal agencies and produce GIS coverage formats for various time-steps (annual, monthly, and if feasible, daily).
  4. **Disseminate Recharge Information:** Provide recharge updates in GIS coverage format to be placed on the State GIS system.
- E. Ground Water/Surface Water Interaction Assessment Actions:**
1. **Conduct Seepage Runs:** Identify sites statewide where it would be appropriate to conduct seepage runs and incorporate seepage run data collection into the monitoring program.
  2. **Collect Baseline Stream Data:** Ensure adequate coverage of long-term stream gage sites and identify appropriate low-flow partial record sites. Ensure adequate baseline data collection prior to new source development. Coordinate data collection based upon long-range county plans for water development.
  3. **Utilize Numerical Models Appropriately:** Promote and encourage the use of calibrated local and island-scale numerical models of ground water flow in relation to aquifer system and sector areas to assess ground water/surface water interaction. Utilize data from hydrologic monitoring to calibrate and

validate numerical models of ground water/surface water interaction. This may be used as part of the well permitting process depending on the user friendliness and timeliness of getting results from such numerical models.

**F. Sustainable Yield Assessment Actions:**

- 1. Apply Revised Recharge Estimates to Assess Sustainable Yield:** CWRM should use the revised estimates of recharge to evaluate sustainable yield statewide. CWRM should apply revised recharge estimates in all analytical and numerical models deemed appropriate by the agency, including three dimensional models, and should use the results in future sustainable yield revisions.
- 2. Apply Information on Ground Water/Surface Water Interaction to Reassess Sustainable Yield:** CWRM should utilize information on ground water/surface water interactions in its evaluation of sustainable yield and in its review of well-permit applications. This would require the establishment of instream flow standards. CWRM should also consider the impacts of pumping on coastal leakage and sustainable yield estimates.
- 3. Utilize New Ground Water Monitoring Data to Study Transition Zone:** CWRM should utilize salinity profiles observed at deep monitoring wells to improve estimates of the dispersion coefficient and monitor behavior of the Transition Zone. 3-D models should use deep monitor well data to justify dispersion coefficients used to estimate chloride movement within ground water.
- 4. Utilize Numerical Models Appropriately:** Promote and encourage the use of calibrated local and island-scale numerical models of ground water flow in relation to aquifer system and sector areas to assess infrastructure safe yields. Spatially detailed analysis of safe yield and well infrastructure should be conducted. This would be in conjunction with selected scenarios defined in each counties water use and development plan to safeguard the public trust needs of domestic use within a municipal system. This may be used as part of the well permitting process depending on the user friendliness and timeliness of getting results from such numerical models. To support modeling efforts and sustainable yield estimates, CWRM should improve its water use reporting program statewide and explore the incorporation of adaptive management concepts where appropriate.

**G. Instream Flow Standard Assessment Actions:**

- 1. Assess and Adopt Interim Instream Flow Standards:** CWRM should implement the agency's process for adopting interim instream flow standards.
- 2. Implement Instream Use Protection Program Implementation Plan:** Continue to execute work tasks described in the CWRM Stream Protection and Management Branch, Instream Use Protection Section Program Implementation Plan, as updated.

3. **Assess Stream-Related Cultural Resources:** Develop, fund, and conduct cultural resource studies or surveys in priority areas.
  4. **Inventory Stream Channel Alterations:** Fund and complete an inventory of stream channel alterations. Activities should include field verification and GIS mapping.
- H. **Assess Impacts of Climate Change on Statewide Water Resources:**
1. **Study the Impacts of Climate Change to Hawaiian Hydrology:** CWRM should study the potential impacts of climate change on aquifer recharge, groundwater levels, stream flows, and how sea level changes may impact coastal aquifer systems.
  2. **Study the Impacts of Climate Change on Long-Range Water Resource Planning:** CWRM should study how climate change will impact future supply and demand on Hawaii's water resources, taking into consideration resource protection and source development in a changing climate. CWRM should encourage county water departments to design and implement mitigation measures to address the range of potential impacts to Hawaii's water resources.

#### 11.1.3. Priority Recommendation 3: Statewide Water Conservation and Water Shortage Program Development

Several State and county agencies currently implement various water conservation and water shortage measures. CWRM should develop a statewide water conservation and water shortage program to coordinate supply and demand management activities at the State and County level. The program should provide guidelines and recommendations for government agencies, water system operators, water use permittees, and the general public. CWRM's program should provide a planning framework for the integration of water conservation and water shortage response activities. Provisions for the exploration of alternative water source development should be included. CWRM should also identify a process for the declaration of a water emergency. Specific actions to be addressed in the statewide water conservation and water shortage program are listed below:

- A. **Water Conservation Planning Actions:**
1. **Implement DLNR Water Conservation Plan:** DLNR should implement the site-specific recommendations of the DLNR Water Conservation Plan. Funds should be sought from the Legislature and DAGS, and other financing options should be pursued, such as rebate programs, performance contracting, and public/private partnerships.
  2. **Encourage State Agency Water Conservation Planning:** All State agencies should be encouraged to apply the water conservation planning method described in the DLNR Water Conservation Plan and follow through with plan implementation. Each facility/site should designate a project manager to develop and implement a conservation plan for each facility.

Existing and developing State agency conservation efforts should be identified in the next update of the SWPP. The SWPP should also suggest specific agency conservation goals and actions.

- 3. Encourage Military Water Conservation Planning:** Military installations should be encouraged to develop site/facility-specific water conservation plans that expand on the existing general conservation policies of the Army, Navy, and Air Force. Site/facility-specific military conservation plans should delineate conservation goals and present implementation schedules for these measures. The military should undertake conservation planning efforts with sensitivity to local, regional, and statewide water resource management issues and incorporate extensive personnel and public outreach programs to encourage a conservation and stewardship ethic in the context of Hawaii's particular water concerns.
  - 4. Encourage Water System Conservation Planning:** Water purveyors should encourage large industrial, commercial, agricultural, and institutional users to develop operational water conservation plans, introduce financial incentives to reward users who implement conservation measures and demonstrate reduced consumption, and explore greater application of tiered pricing to encourage water conservation.
  - 5. Encourage Business and Facility Conservation Activities:** CWRM should promote and coordinate ongoing water conservation efforts across the state, to provide guidance for businesses lacking conservation programs. A dedicated funding source for water conservation outreach should be secured. Cooperative efforts between the State and counties can enhance program development and expand program application.
  - 6. Identify Funding Sources to Support Conservation Activities:** Government agencies should pursue public/private partnerships to contribute funds, implement and promote water conservation efforts, and increase public awareness.
- B. Water Resource Augmentation Planning Actions:**
- 1. Provide Guidance in Resource Augmentation:** CWRM should establish a resource augmentation planning program and framework to identify augmentation goals, objectives, and priorities to promote the use of alternative water resources and to encourage the development of these supplies in an efficient and sensible manner. CWRM should act in an advisory capacity, guiding policies and planning efforts for augmentation projects. CWRM should explore partnerships with governmental agencies and stakeholders in order to coordinate resource augmentation planning and policies. Water resource augmentation planning efforts and policies must be designed to complement the water conservation programs
  - 2. Promote Use of Alternative Water Sources:** CWRM should require the use of dual line water supply systems in new industrial and commercial developments located in designated water management areas where

recycled water is available. CWRM should coordinate with county agencies to obtain regular updates for recycled-water service areas and capacities, and apply the dual line water supply system requirement to permit applications within the portions of water management areas served by recycled water distribution systems. CWRM and the DOH should also explore the use and application of gray water and gray water systems, and pursue the development of DOH use guidelines for gray water, to encourage county governments to include provisions for gray water systems in the county planning codes.

**C. Wastewater Reclamation Actions:**

- 1. Explore Potential Recycled Water Initiatives:** The results of the *2004 Hawaii Water Reuse Survey and Report* should be used by the counties as a guidance document to assist county reuse initiatives. It is recommended that county governments examine the potential recycled water expansion and application projects identified in the *2004 Hawaii Water Reuse Survey and Report* and outline strategies to develop and expand water reuse within their jurisdictions.
- 2. Include Water Recycling Programs in County Water Use Planning:** Counties should include current water recycling programs, or strategies for program development, into subsequent updates of the County WUDPs to maintain consistency with the WRPP. County recycled water rates should be published or made available upon inquiry to users, potential customers, and the general public.
- 3. Provide Regulatory Controls for Water Quality:** The DOH should develop controls and regulations for the application of recycled water to address potential safety and public health concerns, including but not limited to the application of recycled water over potable water aquifers.

**D. Stormwater Reclamation Actions:**

- 1. Explore Potential Stormwater Reclamation Initiatives:** Counties should consider stormwater reclamation opportunities to provide alternative water sources for non-potable uses. County governments should encourage the use of small-lot and source-reuse technologies to manage precipitation and runoff as close to the source as feasible. The county could also provide incentives, in the form of water credits or speedy-permit processing, to encourage the implementation of on-site stormwater reuse. The feasibility of large-scale stormwater reclamation should be assessed.
- 2. Explore the Use of Stormwater Reclamation to Control Non-Point Source Pollution:** The DOH administers the National Pollution Discharge Elimination System and Total Maximum Daily Load programs that regulate the discharge of stormwater. State and county governments should encourage the use of stormwater reclamation and reuse measures that could be used to meet some of these program requirements.

**E. Drought Planning Actions:**

- 1. Continue Implementing 2005 Hawaii Drought Plan Update:** CWRM should continue implementation of the 2005 Hawaii Drought Plan Update, including recommendations summarized in Section 8 of the WRPP.
- 2. Complete Regular Updates of the Hawaii Drought Plan:** CWRM should secure funding and contracts to execute the timely update and revision of the Hawaii Drought Plan every five years. Plan recommendations and the drought communication protocol should likewise be reevaluated and revised as appropriate.

**F. Watershed Protection Actions:**

- 1. Support DOFAW's Watershed Protection Initiatives:** CWRM should become more active and support DOFAW's watershed management activities and the division's leadership role in watershed management. CWRM should focus on improving coordination between DOFAW's land management programs and CWRM's water management programs. CWRM and DOFAW should pursue appropriate funding to support and implement watershed protection programs and objectives to protect water resources.
- 2. Assess Watershed Protection Policies:** Agencies should become familiar with legislative means to protect and preserve our watersheds against contamination and encroachment of intake areas. Federal, State, and county agencies should collaborate with existing watershed partnerships and Conservation Districts to map the relationships between land management programs, land use regulations, economic and agricultural issues, and water quality and resource protection programs. Existing policies should be assessed and amended as appropriate to improve watershed protection.
- 3. Improve Communication between Watershed Interests:** CWRM should work with DOH and CZM to improve communication and encourage dialogue between watershed interests. Agencies should support the recommendation of the Hawaii Ocean Resources Management Plan to create a watershed coordinating committee, as such a body could facilitate the development of common goals and an integrated watershed management framework. Agencies should cooperatively develop a watershed planning process and guidance document to be overseen and informed by the watershed coordinating committee. This effort should include the development of innovative public outreach methods and the acknowledgement of existing programs and organizations to maximize funding, staff, and volunteer resources through watershed-scale management and protection programs.
- 4. Explore Potential Watershed Protection Initiatives:** Agencies should study existing government and community efforts in watershed management and protection, watershed planning approaches, and lessons learned, and encourage sharing of information and experiences. Agencies should explore means to expand and improve watershed protection statewide, including

opportunities to coordinate with the CZM and DOH in the Coastal Nonpoint Pollution Control Program.

**G. Water Shortage Planning Actions:**

- 1. Develop Water Shortage Plans for All Water Management Areas:** CWRM should pursue the development and adoption of Water Shortage Plans for all designated water management areas, in coordination with drought, conservation, and resource augmentation plans and programs. CWRM should seek legislation to provide for formulation and implementation of the Water Shortage Plan and plan provisions, including funding and the mechanism for timely enforcement of the penalty policy for non-compliance with water shortage restrictions, which will be developed as part of the plan. CWRM should formulate and adopt rules to streamline the public hearing process for the water shortage declarations.
- 2. Require Water Shortage Plans From All Water Use Permittees:** Water shortage plans are and shall continue to be required from all water use permittees. Plans shall be submitted as part of the permit application so that CWRM can perform actions on the water use permits and updates to the regional plan simultaneously. HRS §174C-51(8) and HRS §174C-62(a) & (c) of the State Water Code provide the authority for CWRM to implement this recommendation. Permittees whose individual water shortage plan indicates a 0% reduction in water use shall be required to provide supporting justification. CWRM shall conduct site visits as necessary to verify the permittee's inability to reduce water use during shortage conditions. If it is determined that the permittee has the ability to reduce water use during water shortage conditions, CWRM shall modify the permittee's individual water shortage plan. CWRM should consider requiring all artesian wells and other free-flowing sources to be outfitted with a flow control device such as a valve. Permittees of sources which are not required to have flow control devices shall be exempt from water shortage plan provisions.
- 3. Monitor Water Use for Compliance:** CWRM shall review and compare the current monthly water usage data of all permittees with their permitted allocation in order to determine if there are any permittees whose monthly pumpage is greater than their permitted allocation. For those permittees whose water usage exceeds their allocation, CWRM shall proceed with enforcement of permit restrictions.
- 4. Identify Domestic Water Use from Public Water Systems:** CWRM shall request all large water users (e.g., BWS, United States military) to separate out and make known any of their permitted water uses or users that fall within the domestic water use class, which is an identified public trust purpose.
- 5. Evaluate Unused Water Allocations:** CWRM should field verify all water use permits who either have sources out of service or not in use (for a period of four years or longer), and CWRM shall consider revoking the water use permits of such permittees.

## H. Water Emergency Planning Actions:

1. **Develop Water Emergency Declaration Process:** CWRM, in consultation with county water agencies and other public/private water system purveyors who operate systems, should formulate and adopt rules specifically for the issuance of a water emergency declaration. Such rules should detail:
  - Criteria for determining when a water emergency exists;
  - A streamlined process for emergency declaration, notification, public comment processes;
  - Extent of the regulatory authority of a water emergency declaration;
  - Restrictions that may be imposed by CWRM under a water emergency declaration; and
  - Suggested relief measures to be taken by county water agencies and water system operators.

### 11.2. WRPP Implementation Plan

Table 11-2 illustrates the implementation plan for the WRPP priority recommendations. Actions identified for short-term phasing are anticipated to be implemented within five years. Long-term actions are anticipated for implementation beyond 5-years. As noted earlier in Section 11.1, CWRM should seek funding and staff resources to pursue these priority recommendations. Cost estimates are provided for the initial implementation of short-term actions, and do not reflect additional annual operating costs to CWRM. Cost estimates should be refined based upon scope of implementation and related studies that may be required. Long-term actions, especially those requiring the participation and cooperation of other agencies and entities, should be re-examined upon progress of CWRM program development.

<b>Table 11-2: WRPP Implementation Plan</b>		
<b>Priority Recommendation</b>		
<b>Action Item</b>	<b>Phasing</b>	<b>Cost Estimate (\$1000)</b>
<b>1. Statewide Water Resource Monitoring and Data Collection Program Development</b>		
<b>A. Ground Water Resource Monitoring Actions:</b>		
1. Increase Funding for the CWRM-USGS Cooperative Monitoring Program.	Short-Term	\$400
2. Evaluate Existing Monitoring Well Network.	Short-Term	\$50
3. Resurvey All Measuring Points for Deep Monitor Wells and Water-Level Observation Wells.	Short-Term	\$350
4. Conduct Additional Synoptic Water-Level Surveys.	Short-Term	\$150
5. Drill New Deep Monitor Wells and Improve Spatial Coverage.	Long-Term	TBD
6. Drill New Water-Level Observation Wells.	Long-Term	TBD
7. Improve Data Collection.	Short-Term	\$250
8. Collect Data on Additional Ground Water Parameters.	Short-Term	\$250
9. Map Water-Level Data in GIS Format.	Short-Term	\$75
<b>B. Well Pumpage, Water-Level, and Chloride Monitoring Actions:</b>		
1. Complete CWRM's Water Use Reporting Database.	Short-Term	\$50
2. Integration of Databases and Public Access to Databases.	Long-Term	TBD
3. Application of Internet and GIS Technology.	Short-Term	\$40
<b>C. Spring Discharge Monitoring Actions:</b>		
1. Integration of Databases.	Short-Term	\$20
2. Conduct Additional Analyses.	Short-Term	\$250
3. Conduct Additional Monitoring.	Short-Term	\$75
<b>D. Surface Water Resource Monitoring Actions:</b>		
1. Adopt Guidelines for Surface Water Monitoring.	Short-Term	\$50
2. Streamflow Monitoring Program.	Long-Term	TBD
3. Increase Partnership Activities.	Long-Term	TBD
<b>E. Water Use Reporting Actions</b>		
1. Require Ground Water Use Reporting of All Well Owners.	Short-Term	\$20
2. Improve Ground Water Use Reporting Process.	Short-Term	\$40
3. Improve Ground Water Use Reporting Compliance.	Short-Term	\$10
4. Disseminate Ground Water Use Information.	Short-Term	\$10
5. Establish Protocols for Measuring Surface Water Use.	Short-Term	\$100
6. Establish a Surface Water Use Reporting Program.	Short-Term	\$500
7. Revise CWRM Policies Regarding Surface Water Use Reporting.	Short-Term	\$40
<b>F. Regulatory and Administrative Actions:</b>		
1. Examine Water Use Assessment Methods.	Long-Term	TBD
2. Improve Regulatory Coordination.	Long-Term	TBD
3. Establish Continuing Education Programs for Well Construction and Pump Installation.	Short-Term	\$50
4. Establish Funding for Well Abandonment/Sealing.	Long-Term	TBD
5. Identify and Specify Follow-up Actions for Potentially Abandoned Wells.	Long-Term	TBD
6. Establish Enforcement Mechanisms for Well Abandonment/Sealing.	Long-Term	TBD

<b>Table 11-2: (continued) WRPP Implementation Plan</b>		
<b>Priority Recommendation</b>		
<b>Action Item</b>	<b>Phasing</b>	<b>Cost Estimate (\$1000)</b>
<b>2. Statewide Water Resource Investigation and Assessment Program Development</b>		
<b>A. Rainfall Monitoring Actions:</b>		
1. Increase Rainfall Data Collection.	Long-Term	TBD
2. Coordinate Rainfall Data Sharing.	Long-Term	TBD
3. Update Drought Frequency Information.	Long-Term	TBD
4. Update Climate Station Information.	Short-Term	\$50
5. Update Statewide Rainfall Frequency Information.	Long-Term	TBD
6. Update Statewide Median/Average Rainfall Information.	Long-Term	TBD
7. Investigate the Potential Impacts of Long-Term Climate Trends.	Long-Term	TBD
<b>B. Cloud Water Interception and Fog Drip Monitoring Actions:</b>		
1. Increase Cloud Water Interception Data Collection.	Long-Term	TBD
2. Develop Methods to Estimate Cloud Water Interception.	Long-Term	TBD
<b>C. Evaporation Monitoring Actions:</b>		
1. Identify Evapotranspiration Data Sources.	Long-Term	TBD
2. Establish Evapotranspiration Monitoring Stations.	Long-Term	TBD
3. Develop Methods to Estimate Evapotranspiration.	Long-Term	TBD
4. Update Pan Evaporation Maps	Long-Term	TBD
<b>D. Recharge Assessment Actions:</b>		
1. Improve Recharge Estimates.	Long-Term	TBD
2. Establish Standard Rainfall and Evaporation Data Inputs.	Short-Term	\$75
3. Consult Other Agencies.	Short-Term	\$75
4. Disseminate Recharge Information.	Short-Term	\$10
<b>E. Ground Water/Surface Water Interaction Assessment Actions:</b>		
1. Conduct Seepage Runs.	Short-Term	\$600
2. Collect Baseline Stream Data.	Short-Term	\$500
3. Utilize Numerical Models Appropriately.	Long-Term	TBD
<b>F. Sustainable Yield Assessment Actions:</b>		
1. Apply Revised Recharge Estimates to Assess Sustainable Yield.	Short-Term	\$250
2. Apply Information on Ground Water/Surface Water Interaction to Reassess Sustainable Yield.	Short-Term	\$50
3. Utilize New Ground Water Monitoring Data to Study Transition Zone.	Short-Term	\$500
4. Utilize Numerical Models Appropriately.	Long-Term	TBD
<b>G. Instream Flow Standard Assessment Actions:</b>		
1. Assess and Adopt Interim Instream Flow Standards.	Long-Term	TBD
2. Implement Instream Use Protection Program Implementation Plan.	Short-Term	\$750
3. Assess Stream-Related Cultural Resources.	Short-Term	\$800
4. Inventory Stream Channel Alterations.	Short-Term	\$250
<b>H. Assess Impacts of Climate Change on Statewide Water Resources:</b>		
1. Study the Impacts of Climate Change to Hawaiian Hydrology	Long-Term	TBD
2. Study the Impacts of Climate Change on Long-Range Water Resource Planning.	Long-Term	TBD

<b>Table 11-2: (continued) WRPP Implementation Plan</b>		
<b>Priority Recommendation</b>		
<b>Action Item</b>	<b>Phasing</b>	<b>Cost Estimate (\$1000)</b>
<b>3. Statewide Water Conservation and Water Shortage Program Development</b>		
<b>A. Water Conservation Planning Actions:</b> 1. Implement DLNR Water Conservation Plan. 2. Encourage State Agency Water Conservation Planning. 3. Encourage Military Water Conservation Planning. 4. Encourage Water System Conservation Planning. 5. Encourage Business and Facility Conservation Activities. 6. Identify Funding Sources to Support Conservation Activities.	Short-Term Long-Term Long-Term Short-Term Short-Term Long-Term	\$1,500 TBD TBD \$75 \$100 TBD
<b>B. Water Resource Augmentation Planning Actions:</b> 1. Provide Guidance in Resource Augmentation. 2. Promote Use of Alternative Water Sources.	Long-Term Long-Term	TBD TBD
<b>C. Wastewater Reclamation Actions:</b> 1. Explore Potential Recycled Water Initiatives. 2. Include Water Recycling Programs in County Water Use Planning. 3. Provide Regulatory Controls for Water Quality.	Long-Term Long-Term Long-Term	TBD TBD TBD
<b>D. Stormwater Reclamation Actions:</b> 1. Explore Potential Stormwater Reclamation Initiatives. 2. Explore the Use of Stormwater Reclamation to Control Non-Point Source Pollution.	Long-Term Long-Term	TBD TBD
<b>E. Drought Planning Actions:</b> 1. Continue Implementing 2005 Hawaii Drought Plan Update 2. Complete Regular Updates of the Hawaii Drought Plan	Short-Term Short-Term	\$400 \$75
<b>F. Watershed Protection Actions:</b> 1. Support DOFAW's Watershed Protection Initiatives. 2. Assess Watershed Protection Policies. 3. Improve Communication between Watershed Interests. 4. Explore Potential Watershed Protection Initiatives.	Long-Term Long-Term Long-Term Long-Term	TBD TBD TBD TBD
<b>G. Water Shortage Planning Actions:</b> 1. Develop Water Shortage Plans for All Water Management Areas. 2. Require Water Shortage Plans From All Water Use Permittees. 3. Monitor Water Use for Compliance. 4. Identify Domestic Water Use from Public Water Systems. 5. Evaluate Unused Water Allocations.	Long-Term Short-Term Short-Term Short-Term Short-Term	TBD \$100 \$50 \$50 \$75
<b>H. Water Emergency Planning Actions:</b> 1. Develop Water Emergency Declaration Process.	Long-Term	TBD

Note: "TBD" indicates cost estimates to be determined.