

Section VII: Water Use Efficiency Information

A. EWMP Implementation and Reporting

1. Critical EWMPs

(1) Water Measurement (Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).)

All of the turnout deliveries within the District are fully metered with propeller flowmeters which register both instantaneous and totalized flows. Meters are repaired and/or replaced as necessary. The District staff is capable of repairing these meters when required.

The District maintains daily delivery records for each turnout being used and maintains records of daily water orders from the SWP. A grower's water use to date and remaining allocation is maintained by the District's comprehensive database system (Latis). The system helps manage water orders, water use, water supply, water contract information, and water delivery system information. The District maintains records on the drainage activities on a monthly basis.

LHWD is confident its existing water measurement devices meet the $\pm 12\%$ accuracy standard, and replacement meters meet the $\pm 5\%$ accuracy standard.

This EWMP is being implemented at a satisfactory level.

(2) Volume-Based Pricing (Adopt a pricing structure for water customers based at least in part on quantity delivered.)

The District revised its method of collecting annual water charges in 1999 with the implementation of the landowner water supply contracts. There are now five components that are used to compute the annual water charges in the District on a per acre-foot (volumetric) basis: the Agency Charge, District Capital Charge, Delivery Charge, Administrative Charge and the ID#9 Charge. In addition to the water charge, the District does levy a drainage charge on a per acre-foot basis for drainwater discharged to the evaporation pond system. In addition other water acquired by the District to meet Water User needs is charged on a per acre-foot basis (volumetric).

The District has implemented volume-based pricing and plans to continue that practice.

2. Conditional EWMPs

(1) Alternate Land Use (Facilitation of alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including problem drainage.)

The District established and maintained a demonstration trial to evaluate several species of salt tolerant trees and plants on a small trial under conditions found within the District to determine if drainwater reuse and selective cropping patterns can be incorporated into the District's drainwater management.

The project involved the irrigation of salt tolerant trees and plants with drainwater collected from the cropped area. The salinity of the drainwater was such that it precluded using the drainwater more than once. The two-acre drainwater reuse demonstration area was managed more like a commercial field rather than a research plot, with the idea being to obtain results that were practical to use in the field. Several new varieties of halophytes and trees were planted, in addition to some trees that District landowners planted in 1997, to see which plants and/or trees do best with the drainwater reuse.

The District has also reviewed a number of alternative approaches to manage drainage water that have been tested and studied in other areas of the Valley that fall under the classification of "Integrated on-Farm Drainage Management" (IFDM). These hold promise as an alternative management strategy to replace and/or reduce the size of evaporation ponds. However as noted earlier, extensive water management activities including canal lining, irrigation system improvements, and improved irrigation management have significantly reduced the quantity of drainwater managed by the District.

The District has also facilitated the long term transfer of contract water from lands considered less productive in the eastern area of the District to lands better suited for permanent crop planting. In addition landowners are able to annually transfer water within the District as long as the transfer doesn't create capacity issues.

This EWMP is being implemented at a satisfactory level.

(2) Recycled Water Use (Facilitation of use of available recycled water that otherwise would not be used beneficially, meets health and safety criteria, and does not harm crops or soils.)

There is no municipal water use and approximately one percent of the total water use within the District is industrial water use. In the future, there may be small amounts of water available from the Lost Hills Utility District in the southern end of the District, and oilfield water from the western boundary of the District. Currently, due to unsuitable water quality (high TDS) of these potential sources of re-use water, there is not an opportunity to reclaim any M&I wastewater within the District.

Adequate funds are not currently available, and are not expected to become available, for implementation of this EWMP during the term of the AWMP.

(3) On-Farm Irrigation Capital Improvements (Facilitate financing of capital improvements for on-farm irrigation systems)

The District is aware of the success of several programs that have been implemented by other agricultural water agencies where assistance is provided to growers to improve their on-farm irrigation systems. However as a result of high water costs and reduced SWP supplies, District landowners have already invested millions of dollars installing and managing state of the art micro-irrigation systems at the highest attainable efficiency on all the permanent crop acreage in the District which accounts for 99.8% of the irrigated land in the District.

This EWMP is being implemented at a satisfactory level.

(4) Incentive Pricing Structure (Implement an incentive pricing structure that promotes one or more of the following goals: A. "More efficient water use at the farm level such that it reduces waste"; B. "Conjunctive use of groundwater"; D. "Reduction in problem drainage".)

Water marketing and transfers already occur routinely within the District and frequently outside the District within the KCWA in accordance with adopted policies. Water marketing, transfers and exchanges offer an opportunity to achieve both the reliability of the water supply and costs at levels economically viable for District water users. Through water transfers and/or exchanges, row crop farmers may release their water entitlement in dry years to permanent crop needs.

The District facilitates transfers and exchanges in accordance with District Rules and Regulations. The District relies on these transfers and exchanges with other water entities to provide the necessary flexibility to optimize beneficial use of the water supplies available to the District.

This EWMP has been implemented at a satisfactory level.

(5) Infrastructure Improvements (Expand line or pipe distribution systems, construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage)

District staff conducted a sizable seepage study in 1995 and 1996 to quantify the seepage losses of various canal reaches on all of the unlined canals in use at that time. As a result of the seepage study and analysis of the results, the District completed the concrete lining of approximately 4.6 miles of canal in Service Area 2 (funded by a SWRCB loan and completed in 1999), 1.4 miles of canal in Service Area 3, and 1.9 miles of canal in Service Area 5 (major funding for both provided by CALFED and completed in 2002). In addition, the District completed the HDPE lining of 1.3 miles of

canal in Service Area 7 in 2004, and the EPDM lining of 2.9 miles of canal in Service Area 4 and 1.0 mile of canal in Service Area 7 (partially funded by a Water Use Efficiency Grant and completed in 2006).

The District lined 2.4 miles of unlined canal in Service Area 7N with geomembrane liner in 2008 to conserve 689 af/yr in seepage losses at a cost of \$800,000 (entirely paid by LHWD).

The District also lined Reservoir 2 with HDPE liner and improved structures to better manage its use as a regulation reservoir in 2011-2012 at a cost of \$190,000 entirely paid by LHWD.

There are no remaining improvements that can be made to LHWD facilities that are regularly used. This EWMP has been implemented at a satisfactory level. No further improvements are planned.

(6) Order/Delivery Flexibility (Increase flexibility in water ordering by, and delivered to, water customers within operational limits)

The District currently tries to be as flexible as possible with water deliveries, but as discussed in Section II.B.1, the major constraint on flexibility is that the District can only be as flexible as DWR and KCWA allows with the water supply. The District does have some capacity to allow growers to adjust their flow rate or shut off at odd times occasionally, but there is not sufficient storage capacity in the District distribution system to allow unlimited rate changes. The District works with all water users who request flexibility to satisfy their needs. The District has employed a night operator for many years to handle changes at night, and is planning on continuing this practice.

The District does utilize small regulation reservoirs as a part of the distribution system. Most of the reservoirs on the upper end of the laterals serve several laterals, which allow some regulation capability. The reservoirs add flexibility to the delivery system enabling the District to better meet grower needs. In 2001 the District completed the expansion of a reservoir in Service Area 1 that served several purposes: a) it allows the District to lift water from the Aqueduct at night when electrical rates are cheaper and then discharge from the reservoir during the day while the lift pumps are idle to avoid peak electrical rates, b) it added regulation capability, and c) it increased the flexibility of deliveries.

Nearly all of the existing reservoirs are lined with paving material on the sides and nearly impervious clay on the bottom. This lining prevents excessive seepage losses. Over time, however, the lining in some of the reservoirs will crack and develop holes that need to be repaired to prevent seepage losses. The District periodically repairs these reservoir linings as required.

Under the present system, water orders are phoned to the District O&M office where they are compiled daily for each lateral. Orders are then placed with the State for the

next day's deliveries at each aqueduct turnout. Check structures and water levels in District canals and reservoirs can be adjusted directly from the O&M office through the District's SCADA system. Operators are in the field every day checking meters and ensuring smooth operation. Constant contact is maintained between the O&M office and the operators in the field. This system works efficiently.

One of the main concerns for the District and its growers is not knowing on a timely basis how much water will be received for that year. The initial water supply forecast received from DWR is often quite different from the final water supply allocation, which generally is not received until April. Modifications that the District can make in this regard are very limited.

An important water management tool that has been available to assist growers with increasing flexibility of deliveries and maximizing limited water supplies is the ability to carry water over from one year to the next. Previously, under certain conditions, the Department of Water Resources allowed entitlement water from one year to be carried over through March 31 of the following year. One of the provisions of the Monterey Amendment expanded the rules for carryover to allow storage by contractors from year to year when space is available. This could be helpful in shortage years when water could be carried over past March 31st.

This EWMP is being implemented at a satisfactory level.

(7) Supplier Spill and Tailwater Systems (Construct and operate supplier spill and tail-water systems)

The District's distribution system is automated which greatly reduces any operational spills. The District does have reservoirs at the end of some canals that will capture any water that does spill, and the reservoirs in Service Area 1 are capable of recirculating these captured spills. Additionally, while the reservoir at the end of the lined portion of canal 2-1 and canal 2-2 has some regulation capabilities, overflows could spill into the unused, unlined sections and not be recoverable. Losses in canals 2-1 and 2-2 are very low however, and do not justify investment in further improvements. The pipeline portion of the system does not require any spill reservoirs. There is currently not a need for additional spill capture reservoirs and because the volume of spill that does occur is small, it is not economically feasible to install any permanent type of recirculation.

The District also lined Reservoir 2 with geomembrane, and improved its inlet and outlet structures in 2011 and 2012 to give the District the operational flexibility to use it as a regulation reservoir. The cost of that project was \$190,000, and was paid entirely by the District.

This EWMP has been implemented at a satisfactory level and there are no plans for further improvements as they would be neither cost effective nor technically feasible.

(8) Conjunctive Use (Increase planned conjunctive use of surface water and groundwater with the supplier service area)

Conjunctive use, the process of jointly using surface water and groundwater to effectively manage both water supplies, is not feasible at this time within the District because there has historically been very little groundwater pumping (due to poor quality). A conjunctive use program normally includes a groundwater recharge program to replenish the groundwater supply in wet years. As discussed in Section IV.A.2 and Section IV.B.2, groundwater recharge is not feasible within the District and hence, a typical conjunctive use program is not applicable. Opportunity for groundwater recharge within the District is negligible because of the soil structure and nearly impervious clay layers in most of the District. The District does bank some groundwater outside District boundaries and will recover this water in dry years to supplement the surface water supplies, but this is not considered a typical conjunctive use program.

This EWMP has been implemented where technically feasible which is by groundwater banking outside District boundaries. The District plans to continue these current practices.

(9) Automated Canal Controls (Automate canal control devices)

Automation of canal systems can reduce the flow variations experienced by growers and improve delivery flexibility. The result can be improved on-farm efficiencies, District and farm labor savings, and reduced operational spills. Much of the District's delivery system is currently automated. Lift pump operation and canal and reservoir water levels can be controlled and monitored through the District's SCADA system. Check structures and water levels can be adjusted from anyplace there is a WiFi connection. This aids in operation and virtually eliminates operational spills.

The District has completed the automation of Service Areas 1, 3, 4, 5 and 7; the remaining Service Areas (2 and 6) which are gravity fed require less automation, and losses are too low to justify additional cost to automate them. The District installed a SCADA program ("Lookout") at the O&M office, which assists system operations and provides better historical records. No other automation within the District is required at this time on existing facilities. Additional need for automation will be periodically reevaluated.

This EWMP has been implemented at a satisfactory level and the District has no further plans to automate canal controls beyond those already automated because they would not be locally cost effective.

(10) Customer Pump Test/Evaluation (Facilitate or promote customer pump testing and evaluation)

As noted earlier, there are very few agricultural water wells in the District. These wells are used on a limited basis and because of the poor water quality, only to blend with higher quality surface water from the CA Aqueduct. Customers do have many booster

pumps on pressurized irrigation systems supplied with power by Pacific Gas and Electric (PG&E). PG&E provides subsidized pump tests to any customer requesting it through a program administered by Fresno State University (Center for Irrigation Technology).

The District will implement this EWMP by further publicizing PG&E's program by providing a link on the District's website to PG&E's website regarding the program.

(11) Water Conservation Coordinator (Designate a water conservation coordinator)

LHWD has designated the District Manager as water conservation coordinator for the purposes of the Memorandum of Understanding for Agricultural Water Suppliers.

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LHWD considers that it has adequately implemented this EWMP and will continue it.

(12) Water Management Services to Customers (Provide for the availability of water management services to water users)

The District has utilized and contributed funding to the mobile lab program since 1989. The mobile lab conducts four to five irrigation evaluations per year, and the District intends to continue funding this program at the current level of \$3,000 per year for the foreseeable future.

Many of the water users in the District have attended workshops sponsored by the Natural Resources Conservation Service. The workshops cover such topics as irrigation scheduling, irrigation system improvements, irrigation system evaluations, improved technology, etc. The District each year notifies each landowner of the date and location of the workshop and encourages them to attend to learn more about efficient irrigation practices.

LHWD considers that it has adequately implemented this EWMP and plans to continue current practices mentioned above.

(13) Identify Institutional Changes (Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional change to allow more flexible water deliveries and storage)

The District has always tried to be responsive to its water users, encouraging their comments and suggestions. Suggestions from these individuals are discussed directly with the District Manager and openly with the Board of Directors. All District Board of Directors meetings are open to the public and are announced well in advance. Additionally, the District operators maintain close personal contact with water users. Over the years this personal contact has benefited both the District and its water users.

As previously noted, the District is nearly entirely dependent on the State Water Project (SWP) for its water supply. The SWP has historically been, and is expected to continue to be, subject to delivery deficiencies. Contractual obligations are 4.1 million acre-feet (MAF) per year while the average annual water supply is approximately 2.5 MAF. As environmental and urban water demands continue to increase, the reliability of the SWP decreases for all SWP contractors. Delivery deficiencies are related to both the reduced quantity of water available and the increased frequency that shortages are imposed. The District continues to look at ways to further stabilize, or firm up, the reliability of the water supply so that production agriculture can continue to flourish in the District.

One method of stabilizing the water supply that the District has initiated is groundwater banking. The District participates in the following groundwater banking/recovery programs:

- KCWA Pioneer Property
- Berrenda Mesa Spreading Grounds

Through 2015, the District and its water users had approximately 68,000 acre-feet (af) in storage in these projects. One District landowner also participates in groundwater banking activities through the Kern Water Bank.

Lost Hills Water District has initiated and will continue efforts to develop programs with other agencies that would alleviate the aforementioned problems regarding water supply stability.

LHWD considers that it has adequately implemented this EWMP, and plans to continue current practices to identify institutional changes.

(14) Supplier Pump Improved Efficiency (Evaluate and improve the efficiencies of the supplier's pumps)

The District does not have any regularly operating groundwater wells but does operate numerous lift pumps to serve a portion of the District acreage. The District retains the services of an electrical engineer (who also works with three neighboring districts) who works with the automation system and the pump stations. Electrical energy is obtained

from Pacific Gas and Electric Co. (PG&E). The consulting electrical engineer periodically tests the efficiency of the lift pumps. The District has taken advantage of some of the efficiency programs offered by PG&E mentioned above (under EWMP 10) and SB5X (California Energy Commission, thru Cal Poly ITRC). Using SCADA, the District can constantly monitor acre-feet per kilowatt hour (af/kWh), which is related pump efficiency, pump amperage and discharge in combination to determine when maintenance is required. The District periodically pulls and repairs the pumps to maintain the highest pump efficiency possible to reduce energy consumption.

LHWD considers that it has adequately implemented this EWMP, and will continue practices mentioned above.

Table 55 summarizes the EWMPs implemented and planned, Table 56 summarizes the EWMPs efficiency improvements, and Table 57 summarizes the schedule to implement EWMPs.

Table 56 includes estimates of Water Use Efficiency (WUE) Improvements that occurred since adoption of the prior Water Management Plan (2005). In most cases data was not available to allow quantification.

The prior Plan's water balance calculations indicated very high overall District WUE had been attained by 2005, with little room for improvement. An exception was related to canal and reservoir lining projects implemented from 2005-2012. Reduced seepage losses resulting from those projects have been estimated as well as the increase in overall District WUE.

WUE improvements from EWMPs to continue and/or be implemented are also in Table 56. These also generally have no available data to allow for an estimate. Given the District's current WUE estimate of nearly 100%, little improvement is expected over the next 5-10 years. Rather, maintenance of high WUE is the expectation.

Table 55. Report of EWMPs Implemented/Planned (Water Code §10608.48(d), §10608.48 (e), and §10826 (e))		
EWMP No.*	Description of EWMP Implemented	Description of EWMPs Planned
Critical EWMPs		
1	Water Measurement	Continue current practices
2	Volume-Based Pricing	Continue current practices
Conditionally Required EWMPs (locally cost-effective and technically feasible EWMPs)		
1	Alternate Land Use	Continue current practices
2	Recycled Water Use	Currently not feasible
3	On-Farm Irrigation Capital Improvements	Implemented by landowners
4	Incentive Pricing Structure	Continue current practices
5	Infrastructure Improvements	No further improvements planned
6	Order/Delivery Flexibility	Continue current practices
7	Supplier Spill and Tailwater Systems	No plans for further improvements
8	Conjunctive Use	Continue current practices
9	Automated Canal Controls	No further plans to automate
10	Customer Pump Test/Evaluation	Publicize PG&E's program on the District's website
11	Water Conservation Coordinator	Continue current practice
12	Water Management Services to Customers	Continue current practices
13	Identify Institutional Changes	Continue current practices
14	Supplier Pump Improved Efficiency	Continue current practices
Other Optional EWMPs (as applicable)		
Notes: *EWMP numbers correspond to (Water Code §10608.48(c))		

Table 56. Report of EWMPs Efficiency Improvements (Water Code §10608.48(d), §10608.48 (e), and §10826 (e))			
Corresponding EWMP No.(s)*	EWMP	Estimate of Water Use Efficiency Improvements That Occurred Since Last Report <i>(Quantitative or Descriptive)</i>	Estimated Water Use Efficiency Improvements 5 and 10 years in future <i>(Quantitative or Descriptive)</i>
Critical 1	Water Measurement	No data available to estimate	0%
Critical 2	Volume-Based Pricing	No data available to estimate	0%
Conditional 1	Alternate Land Use	No data available to estimate	0%
Conditional 2	Recycled Water Use	No data available to estimate	0%
Conditional 3	On-Farm Irrigation Capital Improvements	No data available to estimate	0%
Conditional 4	Incentive Pricing Structure	No data available to estimate	No data available to estimate
Conditional 5	Infrastructure Improvements	No data available to estimate	0%
Conditional 6	Order/Delivery Flexibility	No data available to estimate	0%
Conditional 7	Supplier Spill and Tailwater Systems	No data available to estimate	0%
Conditional 8	Conjunctive Use	No data available to estimate	0%
Conditional 9	Automated Canal Controls	No data available to estimate	0%
Conditional 10	Customer Pump Test/Eval.	Not applicable (new EWMP)	No data available to estimate
Conditional 11	Water Conservation Coordinator	No data available to estimate	No data available to estimate
Conditional 12	Water Management Services to Customers	No data available to estimate	No data available to estimate
Conditional 13	Identify Institutional Changes	No data available to estimate	No data available to estimate
Conditional 14	Supplier Pump Improved Efficiency	No data available to estimate	No data available to estimate
Notes: *EWMP numbers correspond to (Water Code §10608.48(c)).			

Table 57. Schedule to Implement EWMPs (Water Code §10608.56 (d))				
EWMP	Implementation Schedule	Finance Plan	Budget Allotment	1999 AWMC MOU Demand Measures
Critical				
1. Water Measurement	NA	NA	(1)	C-1
2. Volume-Based Pricing	NA	NA	(1)	No equivalent
Conditional				
1. Alternate Land Use	NA	NA		B-1
2. Recycled Water Use	NA	NA		B-2
3. On-Farm Irrigation Capital Improvements	NA	NA		B-3
4. Incentive Pricing Structure	NA	NA	(1)	C-2
5. Infrastructure Improvements	NA	NA		B-5
6. Order/Delivery Flexibility	NA	NA	(1)	B-6
7. Supplier Spill and Tailwater Systems	NA	NA		B-7
8. Conjunctive Use	NA	NA	(1)	B-8
9. Automated Canal Controls	NA	NA		B-9
10. Customer Pump Test/Evaluation	NA	NA		No equivalent
11. Water Conservation Coordinator	NA	NA	(1)	A-2
12. Water Management Services to Customers	NA	NA	(1)	A-3
13. Identify Institutional Changes	NA	NA	(1)	A-5
14. Supplier Pump Improved Efficiency	NA	NA	(1)	A-6
Other EWMPs:				
1999 AWMC MOU A-4: Improve communication and cooperation among water suppliers, users, and other agencies.				
1999 AWMC MOU B-4: Facilitate voluntary water transfers.				
Grand Total all EWMPs				
Note: There is no equivalent AWMC Critical EWMP #2 or Conditional EWMP #10 NA = Not Applicable (1) Budget allocation within District's operation budget				

B. Documentation for Non-Implemented EWMPs

The District has considered, but rejected one conditional EWMPs. The remainder have either been previously implemented, are continuing to be implemented, or will be implemented. Non-implemented EWMP justification/documentation was described previously and is summarized in Table 58.

Table 58. Non-Implemented EWMP Documentation (Water Code §10608.48(d), §10608.48 (e), and §10826 (e))				
Conditional EWMP #	Description	<i>(check one or both)</i>		Justification/Documentation*
		Technically Infeasible	Not Locally Cost- Effective	
2	Recycle Water Use	x		Salinity of industrial and municipal LHUD wastewater exceeds safe re-use limit

Notes:
*Justification/Documentation can include summary cost-benefit analysis or engineering determination with reference to the specific study/agency/engineer responsible for making that determination.