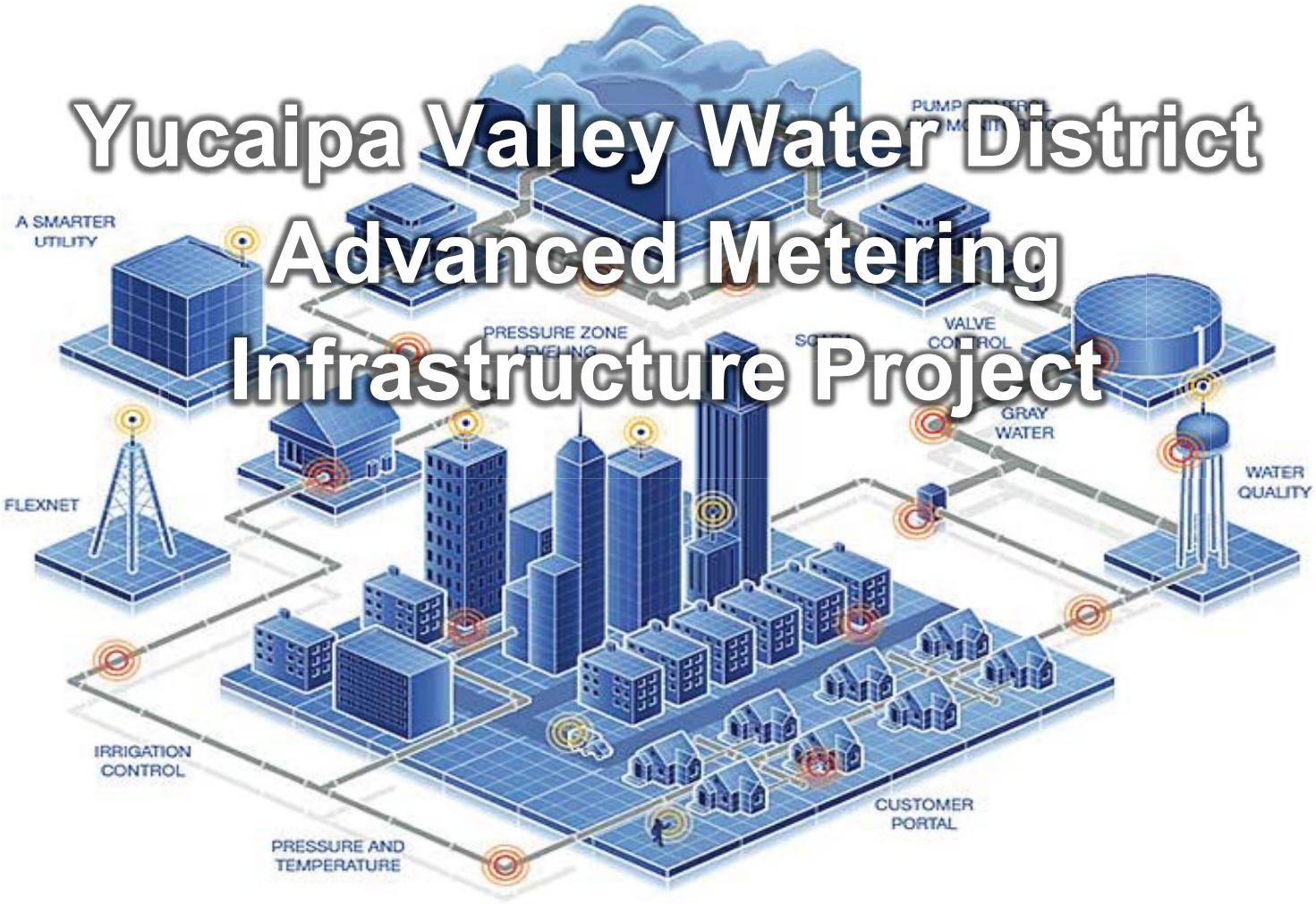
Yucaipa Valley Water District
Advanced Metering Infrastructure Project



WaterSMART: Water and Energy Efficiency Grant Proposal by the Yucaipa Valley Water District - Funding Group II

Bureau of Reclamation - WaterSMART Grants: Water and Energy Efficiency Grants for Fiscal Year 2018
BOR-DO-18-F006

Prepared For:

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Table of Contents

Technical Proposal

Executive Summary

The Yucaipa Valley Water District (YVWD) has received notice of Funding Announcement No. BOR-DO-18-F006 related to the WaterSMART: Water and Energy Efficiency Grants by the United States Department of the Interior, Bureau of Reclamation, Denver, Colorado. YVWD is the project applicant for this grant. As such, YVWD has received authorization from its Board of Directors to pursue this grant with the objective of conserving drinking water and recycled water resources through efficient and effective measurement techniques as provided by the Advanced Metering Infrastructure (AMI) Project. The YVWD requests $1,000,000, or 27% of the $3,697,764 project costs for Phases I and II of the AMI project. The proposed AMI project will complete the conversion of 100 percent of the YVWD's drinking water and recycled water connections, or approximately 12,848 meters, to an efficient Advanced Meter Infrastructure system. The implementation of an AMI system will provide real-time water usage information to customers of leaks, eliminating the lag-time between leak and detection, identify leaks in the distribution system, and help educate customers on water conservation.

The project will include the following aspects:

- **Phase I of the Automated Meter Infrastructure Project (Year 1)**

  YVWD currently has 6,018 smart meters in use throughout the district. A majority of those meters are located in a housing development called Chapman Heights. These smart meters were installed by the developer. Additionally, as water meters need replacement throughout the district they are replaced with smart water meters. ***Installation of these meters has already occurred, is not part of this grant application, and YVWD does not intend to use grant funding to reimburse YVWD for installation costs for these meters.*** These smart water meters already installed are Automated Meter Infrastructure (AMI) capable, but do not have the transceivers or AMI capable meter box lids. Phase I will outfit each of the existing 6,018 AMI capable meters currently installed with a transceiver that will be mounted into an upgraded meter box lid. Also, as part of Phase I the YVWD will establish the regional network interface to activate the 6,018 smart meters installed previously through the Chapman Heights development and meter change outs throughout the district. The tower gateway base stations are already located at existing water reservoir tanks and are responsible for gathering data from the smart water meters via a licensed radio frequency, then back load the compiled data to the Regional Network Interface via a cellular network.

- **Phase II of the Automated Meter Infrastructure Project (Years 2-3)**

  Phase II will replace the remaining 6,830 water meters in the District with smart water meters, transceivers, AMI capable water meter box lids bringing to total number of smart water meters to 12,848, which is every meter YVWD's distribution system.

Though this number is not accounting for current projects building homes. The total conversion to AMI by replacing the existing water meters will be distributed over two years, completing approximately 3,415 meter upgrades each year. The completion of Phase II at the end of year three will result in full AMI functionality district wide.

As a direct result of the proposed Advanced Meter Infrastructure project, YVWD will save approximately 1,335.51 AFY of drinking water per year, all of which will reduce the amount of imported water from the California State Water Project. Based on energy consumption calculations, this project will reduce energy use from the State Water Project by 5,643,465 kWh (4,225.70 kWh/AF x 1,335.51 AFY) plus an additional 481,585 kWh reduction from treatment and distribution activities at the Yucaipa Valley Regional Water Filtration Facility. The area that YVWD serves is experiencing a large amount of growth as detailed in this application. Two large developments of approximately 7,000 homes, schools, commercial, and open space are planned within YVWD boundaries. They have begun building and will be complete within 10 years. The projected water savings per year with the completion of these projects is an additional 445.63 AFY in reduction of water usage, and an additional 2,043,792 kWh/AF reduction in energy usage to pump, treat and distribute 445.63 AFY. The AMI project will also reduce the number of miles driven by district staff Meter Readers by 31,431 miles, also reducing the amount of gasoline used by 3,264 gallons and 29 metric tons of carbon dioxide emissions released into the atmosphere.

This project does not include coordination, use, or installation of Automatic Meters on a Federal facility.

Yucaipa Valley Water District AMI Project:
Water, Energy and Emission Savings

Method	Savings
Reduction in Annual Potable Water Usage	1,1331.51 AF
Additional Reduction in Water Usage: 10 Year	448.88 AF
State Project Water: Energy Savings due to Pump Usage Reduction	481,588 kWh/yr.
State Project Water: Energy Savings due to Pump Usage Reduction 10 Years	190,691 kWh/yr.
Reduction in Vehicle Miles Driven Annually	31,341 miles
Reduction in Vehicle Gasoline Consumption	3,264 gal. gasoline
Reduction of Carbon Dioxide Emission	29 Metric Tons

Background Data

The Yucaipa Valley Water District was formed as part of reorganization, pursuant to the Reorganization Act of 1965, being Division I of Title 6 of the Government Code of the State of California. This reorganization consisted of the formation of YVWD, dissolution of the Calimesa Water District and formation of Improvement District No. 1 of the District as successor-in-interest, and dissolution of Improvement District "A" of the San Bernardino Valley Municipal Water District and the formation of Improvement District "A" of the District as successor-in-interest. On September 14, 1971, the Secretary of State of the State of California certified and declared the formation of the Yucaipa Valley County Water District. YVWD operates under the County Water District Law, being Division 12 of the State of California Water Code (the "Act"). Although the immediate function of YVWD was to provide water service, YVWD has been granted the responsibility for providing sewer service and recycled water service to the cities in the Yucaipa Valley.

YVWD is located about 70 miles east of Los Angeles and 20 miles southeast of San Bernardino in the foothills of the San Bernardino Mountains and has an estimated population of approximately 54,288. The YVWD's sphere of influence is outlined in blue and the service area is shaded in Figure 2 below. The projected buildout for the area YVWD services is a population over 100,000 people and a service area of 68 sq. miles.

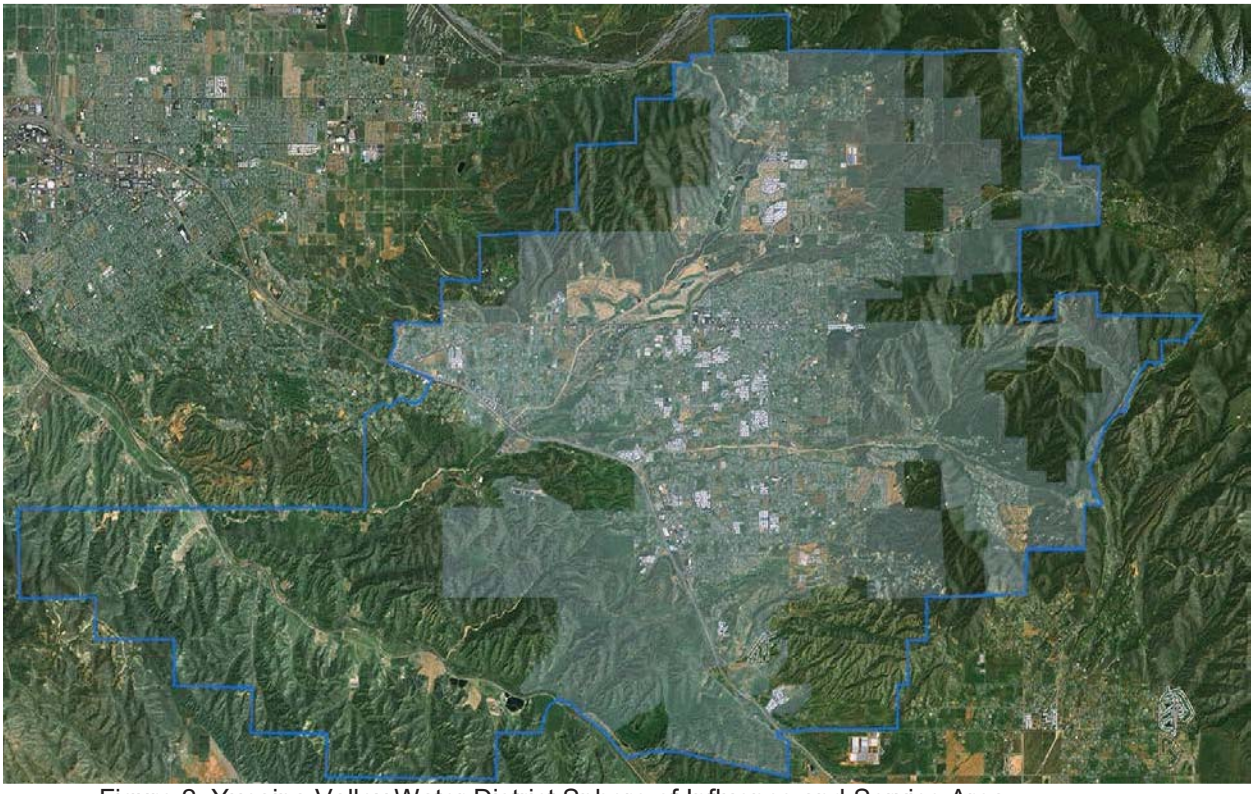

Figure 2: Yucaipa Valley Water District Sphere of Influence and Service Area

The topography within the boundary of the Yucaipa Valley Water District rises from an elevation of about 2,000 feet above sea level at the western end of the Yucaipa Valley to about 5,000 feet at the eastern end, with average elevation of roughly 2,650 feet. The topography of the area is characterized by rolling hills separated by deeply entrenched stream beds, namely, the Yucaipa and Wilson Creeks.

As of April 2018, the Yucaipa Valley Water District provided service to 12,942 water customers (17,382 dwelling units), 13,891 sewer customers (20,975 dwelling units), and 94 recycled water customers. See Table 1: Customer Type and Use below.

	Water Utility		**Sewer Utility**		**Recycled Water Utility**
Customer Type	Number of Connections	Number of Units	Number of Connections	Number of Units	Number of Connections
Single Family	11,504	11,504	12,941	12,941	0
Multiple Units	508	5,253	651	7,725	0
Commercial	262	262	252	252	0
Institutional	91	91	46	56	0
Industrial	13	13	1	1	0
Irrigation	124	124	0	0	59
Fire Detectors	118	118	0	0	0
Construction	17	17	0	0	5
Total	**12,637**	**17,382**	**13,891**	**20,975**	**64**

Table 1: Customer Type and Us

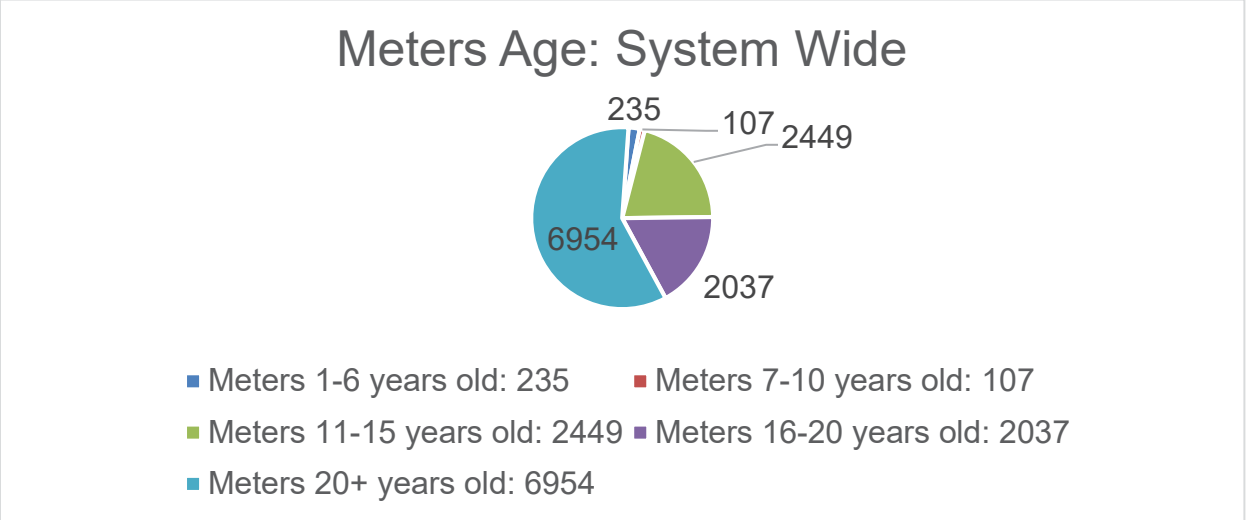

Chart 1: Non-Capable AMI Meters: System Wide

Non-capable AMI meters throughout the District range in years of use, with a majority of the meters being 20 years old or more. Chart 1: Metes Age: System Wide, details the breakdown of age of meters and years in use. The replacement of the older meters is required for AMI functionality and increase the resolution of the data gathered, as well as reduce inaccuracies due to age.

Governance and Management

The Yucaipa Valley Water District is governed by a 5-member Board of Directors (the "Board"), the members of which are elected from five separate divisions of the District for staggered 4-year terms. Day-to-day management of YVWD is delegated to the General Manager who works closely with an executive team who ultimately oversees YVWD's services and functions.

Drinking Water and Recycled Water Demands

The Yucaipa Valley Water District only produces drinking water sufficient to meet the demands of the community. If there is a large demand for water, like in the summer season, YVWD will activate the necessary sources of supply to meet the demand. See Chart 2: 2017 Water Customers – By Demand

The Basins located in the Yucaipa Valley Water District boundaries are managed by the Yucaipa Groundwater Sustainability Agency (YGSA) which was formed by the Sustainable Ground Water Management Act. YVWD is a member of YGSA, as well as the Western Heights Water Company, South Mesa Water Company, South Mountain Water Company, City of Yucaipa, City of Calimesa, City of Redlands, San Bernardino Valley Municipal Water District, San Gorgonio Pass Water Agency, County of Riverside and the County of San Bernardino. The focus of the YGSA is to provide for a sustainable, secure and reliable water supply.

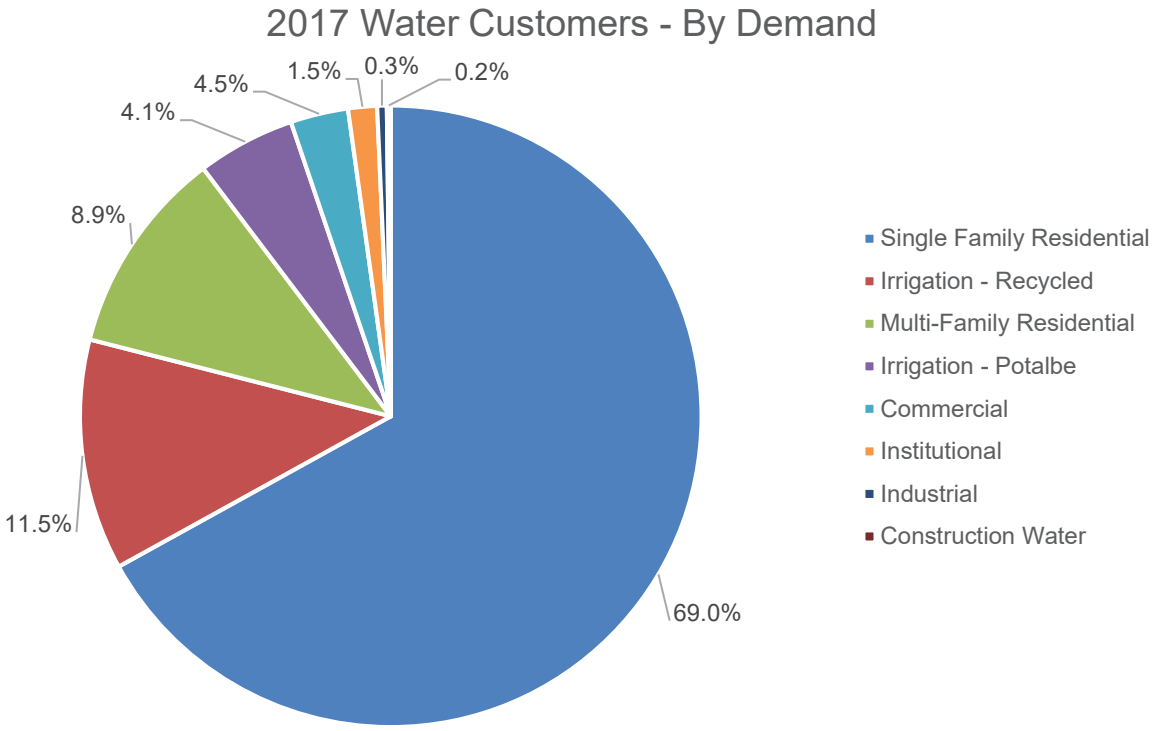

Chart 2: 2017 Water Customers – By Demand

On August 20, 2008, the Board of Directors of the Yucaipa Valley Water District adopted *A Strategic Plan for a Sustainable Future, the Integration and Preservation of Resources*. This document provides a detailed methodology for YVWD and it's customers to ensure a reliable, sustainable, and secure water future. The sustainability plan focused on the full integration of drinking water and recycled water resources for the future of the Yucaipa Valley Water District. The entire document can be found on the District's website at http://www.yvwd.dst.ca.us/sustainability (see Figure 3: Water Resource Management Schematic). Please note YVWD has taken large steps in water conservation and has an extensive recycled water program. YVWD provided 2,102.17 AF of recycled water within the district in 2017.

YVWD is expecting a large amount of growth in the next 10 years. There are two large developments in the City of Calimesa that are in the process of building over the next 10 years. The developments are called Summerwind Trails and Mesa Verde Estates. Summerwind Trails is planning first occupancy for January 2019. This housing development will be 3,600 residential homes, commercial lots, schools and park area with expansive open space. Mesa Verde Estates is similar to Summerwind Trails, in that it will also have 3,400 residential lots, commercial, schools, parks and open space. Both developments are required to be entirely dual plumbed. Meaning that residential homes, commercials businesses, schools and parks will be required to irrigate with recycled water. Residential lots are required to irrigate front and back yards with recycled water. Each home will be equipped with two meters, one for drinking water and one for recycled water. Yucaipa Valley Water District is basing structure and function of the residential dual plumbed system on the successful El Dorado Irrigation District program that originally began in 2001.

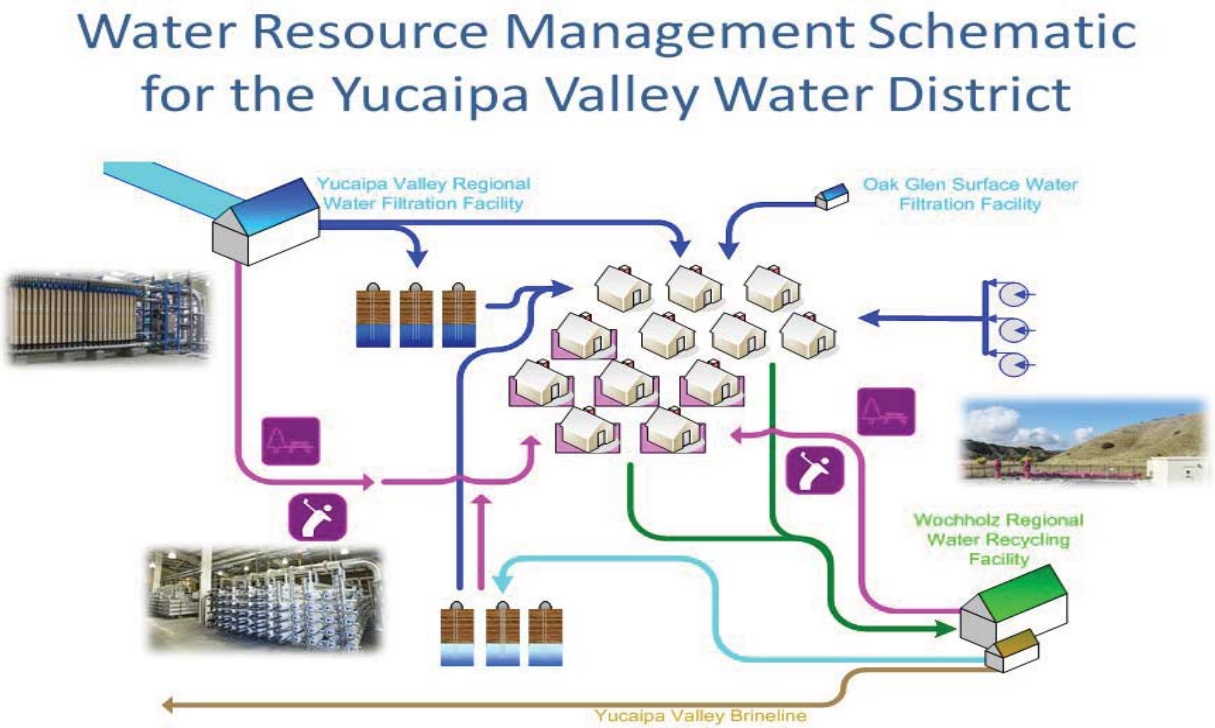

Figure 3: Water Resource Management Schematic

California Drought Conditions

The U.S. Seasonal Drought Outlook shows predicted trends for areas experiencing drought, as well as indicating areas where new droughts may develop. Although California received a considerable amount of rain in 2017, a majority of the rainfall was located in the northern part of the state. As seen in Figure 4, YVWD is located in an area of Southern California that still has a persistent drought. The general large-scale trends depicted are based on numerous indicators, including short and long-range forecasts.

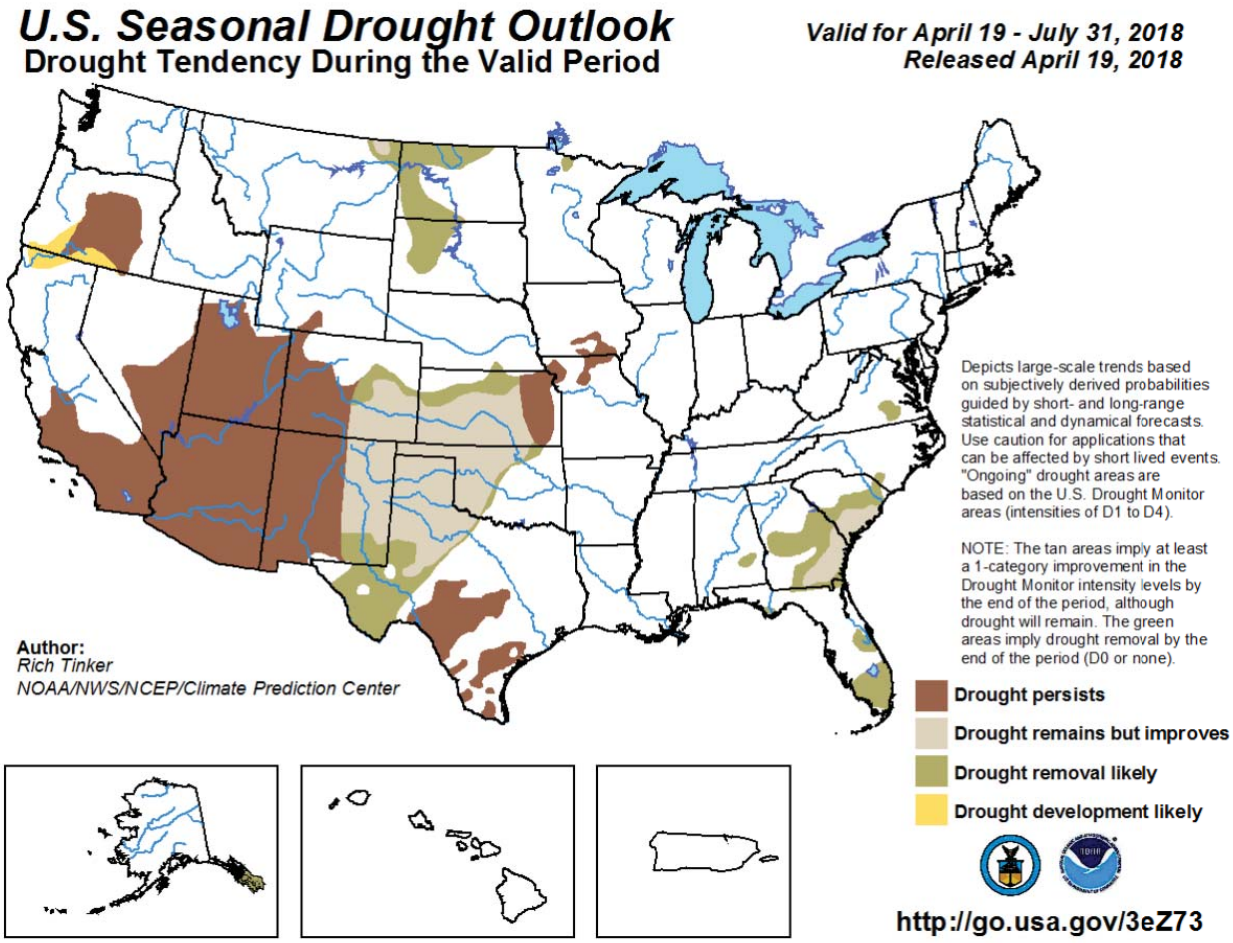

Figure 4: U.S. Seasonal Drought Outlook – April 2018 to July 2018

Project Description

Yucaipa Valley Water District is proposing the completion of a district wide Automated Meter Infrastructure (AMI) system. The major components of an AMI include the smart meter with transceiver, the tower gateway base stations (TGB), and the regional network interface (RNI). Utilizing these components, water meter data is conveyed via radio frequency and cellular communication back to the RNI database where the information is used for billing and consumption reports. The advantages of transmitting the customer meter data with an AMI include hourly meter reads, detailed water consumption analysis, leak detection and backflow alarms, as well as the elimination of manual meter reading. The practice of manually reading each meter in a water distribution system is a daunting task and requires staff to locate and open the meter box, read the meter register and then transfer the information via manual input into a handheld recording device.

Yucaipa Valley Water District conducted a propagation study in March 2015. The propagation study detailed the needed infrastructure for the proposed AMI project. In Figure 5: FlexNet Design – Base Station Coverage, the green signifies the coverage area for the RF signal from the base stations. This requires three base stations that are located on existing District property and have already been installed. The three base stations provide overlapping RF signal coverage to ensure meter data will be conveyed with little interruption. Figure 6: FlexNet Design - Base Station and Smart Meter Location, shows the location of the base stations, as well as the locations of the smart water meters at service connections.

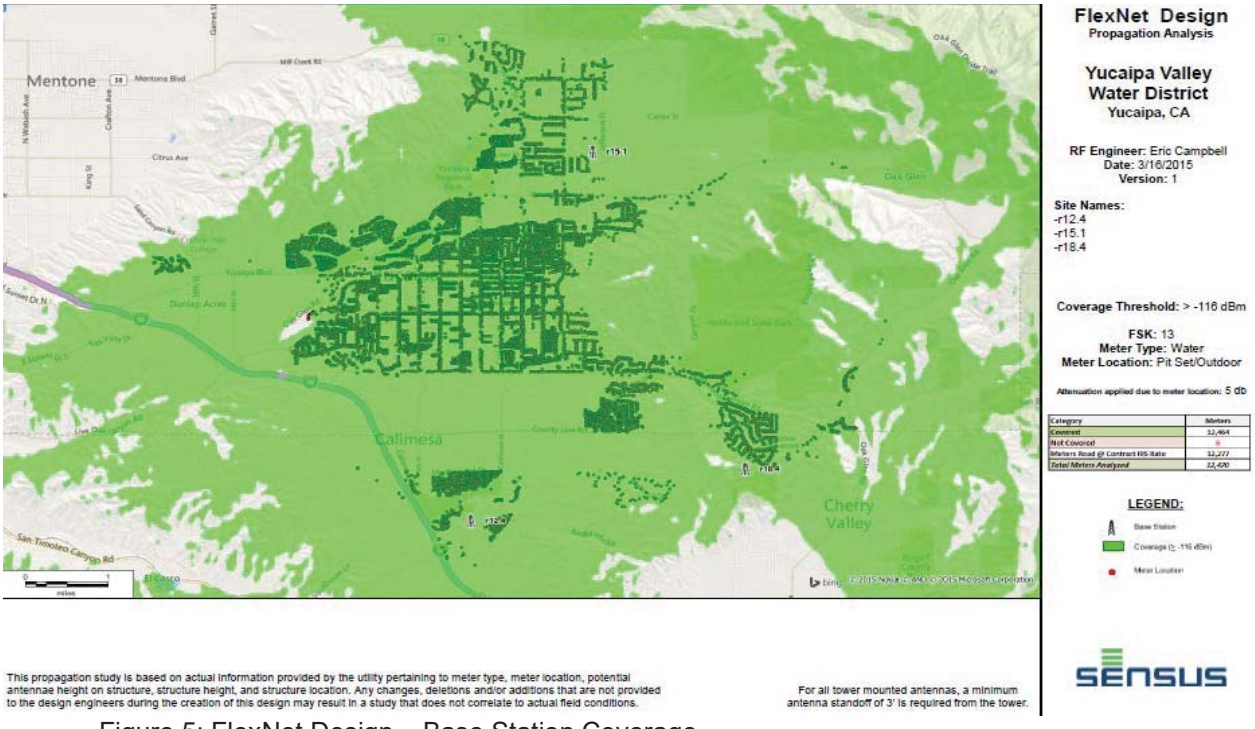

Figure 5: FlexNet Design – Base Station Coverage

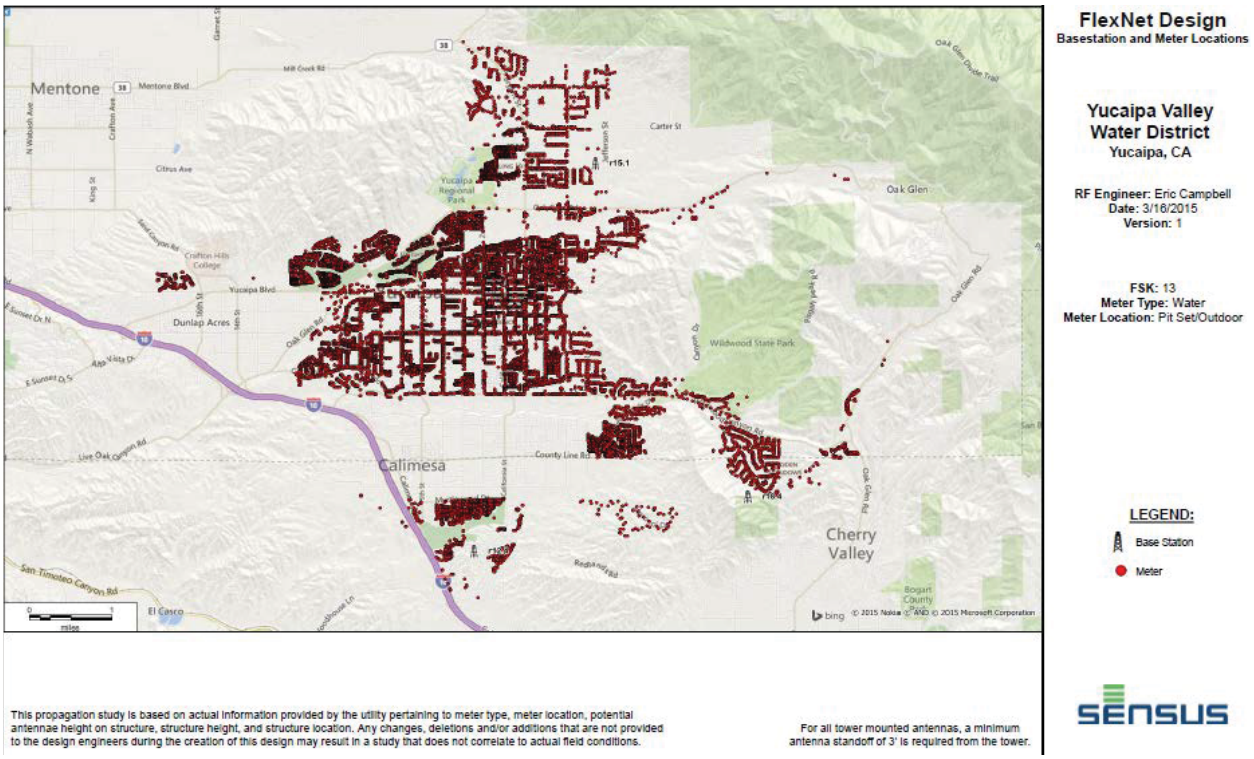

Figure 6: FlexNet Design - Base Station and Smart Meter Location

Yucaipa Valley Water District has completed the installation of 6,018 smart water meters that are AMI capable. This represents about 46% of the YVWD's total 12,848 water meters in the system. Although 46% of total meters in the system have the capability to be read remotely, District staff continues to manually read these meters as YVWD lacks the infrastructure to gather this data remotely. In year one of the Automated Meter Infrastructure project YVWD will complete Phase I outlined below and complete Phase II in years two and three.

Phase I of the Automated Meter Infrastructure Project (Year 1)

YVWD currently has 6,018 smart meters in use throughout the district. A majority of those meters are located in a housing development called Chapman Heights. These smart meters were installed by the developer. Additionally, as water meters need replacement throughout the district they are replaced with smart water meters. ***Installation of these meters has already occurred, is not part of this grant application, and the YVWD does not intend to use grant funding to reimburse the YVWD for installation costs for these meters.*** These smart water meters already installed are Automated Meter Infrastructure (AMI) capable, but do not have the transceivers or AMI capable meter box lids. Phase I will outfit each of the existing 6,018 AMI capable meters currently installed with a transceiver that will be mounted into an upgraded meter box lid. Also as part of Phase I the YVWD will establish the regional network interface to activate the 6,018 smart meters installed previously through the Chapman Heights development and meter change outs throughout the district. The tower gateway base stations are already located at existing water reservoir tanks and are responsible for gathering data from the smart

water meters via a licensed radio frequency, then back load the compiled data to the Regional Network Interface via a cellular network. Once Phase I is complete the regional network interface will be established to integrate the incoming meter data and the existing customer billing system.

Phase II of the Automated Meter Infrastructure Project (Years 2-3)

Phase II will replace the remaining 6,830 meters in the system with smart water meters and transceivers bringing to total number of smart water meters to 12,848, which is every meter in YVWD's current distribution system. The total conversion to AMI by replacing the existing water meters will be distributed over two years, completing approximately 3,415 meter upgrades each year. The completion of Phase II at the end of year three will result in full Automated Meter Infrastructure functionality district wide. It should be noted that all new connections (new home developments) will be required to have smart water meters.

Evaluation Criteria

Evaluation Criterion A: Quantifiable Water Savings

Municipal Metering

How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.

The water being saved from the proposed Advanced Metering Infrastructure project would decrease the amount of water that Yucaipa Valley Water District purchases from the State Water Project. YVWD purchased a total of 9,827.7 AFY in 2017 form State Project Water. The estimated annual water savings that will result from this project is 1,335.51 AFY, which will directly reduce the amount of water YVWD purchases from the SWP. The water that is conserved from this AMI project will not be diverted from the Delta and tributaries.

The estimated average annual water savings for this project is 1,335.51 AFY, which is a combination of an estimated 9% reduction in drinking water consumption (823.9 AFY) and a reduction in distribution water loss (511.61 AFY). This estimate was determined using the following data and calculations:

Yucaipa Valley Water District used a total of 9154.46 AF of potable water in 2017 for residential, commercial and industrial uses as seen in Table 2. According to a 2016 paper in the *Journal of Environmental Management* by Fielding et al.[1], which explores the impact of customer-specific water use information on consumption patterns, daily consumption data from smart water meters can reduce water consumption by an average of 9%. Additionally, a 2014 pilot study at East Bay Municipal Utility District (EBMUD)[2], which supplies water throughout the San Francisco East Bay, installed water AMI systems that provided hourly water consumption data to customers through an online web portal. EBMUD found water savings between 5-50%, with an average of 15%, among residential customers after the installation, while noting that some of these savings are likely due to customer-side leak repair (EBMUD 2014). Another recent report by *Water Research Foundation* by DeOreo et al.[3], "Residential End Uses of Water, Version 2", found that leaks account for 13% of all residential indoor water consumption across the U.S. (2016). For the calculations used for this grant application we used the lowest value of 9% reduction of water consumption to calculate the estimated reduction of water usage through the implementation of AMI.

1) Fielding, K.S., A. Spinks, S. Russell, R. McCrea, R. Stewart, J. Gardner. "An experimental test of voluntary strategies to promote urban water demand management." Journal of Environmental Management, Vol. 114, pp. 343–351. January 2013.
2) East Bay Municipal Utility District. "Advanced Metering Infrastructure (AMI) Pilot Studies Update." November 25, 2014
3) DeOreo, W.B., P. Mayer, B. Dziegielewski, J. Kiefer. "Residential End Uses of Water, Version 2: Executive Report." Water Research Foundation. April 2016.

Yucaipa Valley Water District: Drinking Water Consumption (2017)	
Single Family Homes	7,540.72 AFY
Multi-Family Residential	1,088.23 AFY
Commercial/Institutional	496.48 AFY
Industrial	29.03 AFY
Drinking Water Consumption	**9,154.46 AFY**
9% Reduction of Water AMI Smart Water Meters 9,154.46 AFY X .09 Reduction in Water Usage=	**823.9 AFY Reduction of Water Usage**

Table 2: Drinking Water Consumption (2017)

Distribution Meters Calculations:

Yucaipa Valley Water District completed the AWWA Water Loss Audit for 2016, as seen in Table 3. Current distribution losses have been determined by calculating the total water loss by subtracting the water supplied of 10,051.75 AFY by the authorized consumption of 9,135.75 AFY equaling 915.99 AFY of total water loss for 2016, this is also known as Non-Revenue Water (NRW). Subtracting the apparent losses of 233.78 AFY from the Water Losses of 915.99 AFY the Real Losses were 682.15 AFY. Taking into consideration the EPA's[4] states that 75% of water loss is recoverable, we calculated 511.66 AFY of recoverable loss. These recoverable losses could be identified using the AMI system and metering pressure zones. YVWD has 18 pressure zones. Using customers hourly reads in comparison to the hourly reads of the smart water meters in the distribution system leads to identify leaks in the distribution system.

4) Thornton, J., Strum, R., Kunkel, G., *EPA Water Audits and Water Loss Control for Public Water Systems* report "Average water loss in a system is 16 percent – up to 75 percent of that is recoverable." (2nd Edition) McGraw-Hill. 2008.

Yucaipa Valley Water District: AWWA Distribution System Water Loss (2016)	
Water Supplied	10,051.75 AFY
-Authorized Consumption	9,135.75 AFY
Water Loss	915.99 AFY
-Unauthorized Consumption	25.19 AFY
-Customer Meter Inaccuracies	185.93 AFY
-Systematic Data Handling Errors	22.72 AFY
Real Losses (NRW)	**682.15 AFY**
682.15 AFY Real Losses x .75 EPA Water Loss Recoverable=	**511.61 AFY Recoverable Water**

Table 3: AWWA Distribution System Water Loss (2016)

Yucaipa Valley Water District is expecting a large amount of growth in the immediate future, as well as continued growth for the next 10 years in the City if Calimesa. YVWD's full build out is expected to have a population of over 100,000 people and a service area of 68 sq. miles. The developments are called Summerwind Trails and Mesa Verde Estates. Summerwind Trails is expecting first occupancy tentatively planned for January 2019. This housing development will be 3,600 residential homes, commercial lots, schools and park area with expansive open space. Mesa Verde Estates is similar to Summerwind Trails, in that it will have 3,400 residential lots, commercial, schools, parks and open space. Both developments are required to be entirely dual plumped. Meaning that residential homes, commercials businesses, schools and parks will be required to irrigate with recycled water. Residential lots are required to irrigate front and back yards with recycled water. The new developments will also be equipped with smart water meters and connected in the AMI system. The additional water reduction savings with an AMI system for these two developments would be 445.63 AFY, as seen in the calculation below in Table 4.

Yucaipa Valley Water District: Water Consumption (New Development)	
Single Family Homes	7,000
823.9 AFY / 12,848 Current Service Connections=	0.0641 AFY per Household Reduction in Water Consumption
0.0637 AFY per Household x 7,000 Est. Residential Homes=	**448.88 AFY Reduction in Water Consumption**

Table 4: Water Consumption New Development

How have current distribution system losses and/or the potential for reductions in water use by individual users been determined?

Yucaipa Valley Water District used a total of 9154.46 AF of drinking water in 2017 for residential, commercial and industrial uses as seen in Table 2. Details on how current distribution system losses and potential for reductions were calculated are provided in the answer to the previous questions. YVWD have provided an example of how the AMI system could be used to quickly identify and correct system losses.

For example: Figure 6: Customer Leak Example shows the consumption data for a customer that had a large unusual increase in water usage. The leak was only determined after the meter was manually read on the monthly rotation in November 2017 and December 2017. As you can see in Figure 6, the customers' water consumption for October 2017 was 31 units/31,000 gallons of water. In November 2017 the customers' water consumption was 266 units/266,000 gallons, in comparison to their November 2016 water consumption of 13 units/13,000 gallons. The customer was notified by phone of the increase water usage and advised to look for possible leaks on the property. She believed she had found the leak and fixed it. In December 2017 the customers' water consumption was 334 units/334,000 gallons, in comparison to their December 2016 water consumption of 6 units/6,000 gallons. The customer was then notified again to look on the property for a leak, the customer then found a substantial leak and had it fixed. Had this meter been on an AMI system, YVWD customer service would have been notified when the leak began, and then notified the customer within 48 hours. AMI could have potentially saved approximately 581 units/581,000 gallons of water, with this one example.

The parameters of the AMI system can be manipulated. YVWD can set the alert criteria for the system. For example, YVWD can set up an alert at 48 hours of continuous water usage. This notification would be sent to YVWD and they would contact the customer to let them know that they had continuous water usage for 48 hours and to look for a leak. YVWD could also set alert for large spike in usage showing a large break that could be flooding a home, and YVWD could notify the customer at the time of the alert.

YEAR	MONTH	READ DATE	PREVIOUS READ	CURRENT READ	TOTAL CONSUMPTION	DEMAND READ	DEMAND CONSUMPTION	READING FLAG	READING SOURCE	OCCUPANT
2018	Feb	3/26/18	8793	8805	9			Regular	Hand Held	11
	Jan	2/26/18	8762	8793	23			Regular	Hand Held	11
2017	Dec	1/29/18	8316	8762	334			Regular	Hand Held	11
	Nov	12/29/17	7961	8316	266			Regular	Hand Held	11
	Oct	11/27/17	7920	7961	31			Regular	Hand Held	11
	Sep	10/27/17	7849	7920	53			Regular	Hand Held	11
	Aug	9/25/17	7798	7849	38			Regular	Hand Held	11
	Jul	8/28/17	7724	7798	55			Regular	Hand Held	11
	Jun	7/28/17	7628	7724	72			Regular	Hand Held	11
	May	6/26/17	7565	7628	47			Regular	Hand Held	11
	Apr	5/26/17	7514	7565	38			Regular	Hand Held	11
	Mar	4/24/17	7462	7514	39			Regular	Hand Held	11
	Feb	3/27/17	7451	7462	8			Regular	Hand Held	11
	Jan	2/24/17	7443	7451	6			Regular	Hand Held	11
2016	Dec	1/23/17	7435	7443	6			Regular	Hand Held	11
	Nov	12/26/16	7417	7435	13			Regular	Hand Held	11
	Oct	11/28/16	7387	7417	22			Regular	Hand Held	11
	Sep	10/28/16	7335	7387	39			Regular	Hand Held	11
	Aug	9/26/16	7301	7335	25			Regular	Hand Held	11
	Jul	8/26/16	7231	7301	52			Regular	Meter Reading Input	11
	Jun	7/25/16	7165	7231	49			Regular	Hand Held	11
	May	6/27/16	7114	7165	38			Regular	Hand Held	11

Figure 6: Customer Leak Example

For installing individual water user meters, refer to studies in the region or in the applicant's service area that are relevant to water use patterns and the potential for reducing such use. In the absence of such studies, please explain in detail how expected water use reductions have been estimated and the basis for the estimations.

As stated in Criterion A, a 2016 paper in the *Journal of Environmental Management* by Fielding et al. explores the impact of customer-specific water use information on consumption patterns and found that daily consumption data from smart water meters can reduce water consumption by an average of 9%. Additionally, a 2014 pilot study at East Bay Municipal Utility District (EBMUD), which supplies water throughout the San

Francisco East Bay, installed water AMI systems that provided hourly water consumption data to customers through an online web portal. EBMUD found water savings between 5-50%, with an average of 15%, among residential customers after the installation, while noting that some of these savings are likely due to customer-side leak repair (EBMUD 2014). Another recent report by *Water Research Foundation* by DeOreo et al. report, "Residential End Uses of Water, Version 2", found that leaks account for 13% of all residential indoor water consumption across the U.S. (2016).

Using the research presented in the previous paragraph showing a 9%, 13% and at 15% water consumption savings, for this grant application YVWD used 9% reduction of water consumption as the basis for the estimation of water savings using AMI. Using the 9% reduction of water consumption with AMI in conjunction with YVWD's total drinking water consumption in 2017 at 9,154.46 AF calculates to 823.9 AFY reduction in water usage. A wide range of data collection, controls, and analytics capabilities allow water utilities to utilize advanced metering systems to reduce water loss through improved leak detection, reduce operating costs through streamlined billing, implement volumetric rate structures to incentivize water conservation, and utilize high-frequency, near real-time data for a various strategic system management efforts[5]. Studies have demonstrated that information provided by advanced metering of energy and water can encourage behavioral reductions in consumption by increasing consumer knowledge about their resource use[5]. An example of this is provided in the answer to the previous section.

For calculating potential water savings in the water distribution system, we used the EPA's determination that 75% of water loss is recoverable in a water system. Recoverable in this sense means fixing and replacing distribution mains that have degradation and damage from soil pressure, excavation, and construction threats, tree roots, and earthquakes, etc. Using the data from YVWD's AWWA water loss audit completed in 2016 it was determined the Real Losses in the distribution system were 682.15 AFY, as seen in Table 3. Using the 75% recoverable water loss in conjunction with the 682.15 AFY real water losses calculates to 511.61 AFY of recoverable water. AMI is the most important piece to recover water lost in our distribution systems due to leaks. YVWD's distribution system currently meters well production site and water input at distribution zones. These meters detail the amount of water that is going into each pressure zone. The implementation of AMI would show the hourly reads for the services in that pressure zone, in comparison to the amount of water going into the zone through distribution meters. The difference would help identify leaks in the pressure zone. YVWD is currently looking into Sensus Pressure meters to integrate into the AMI system that will show pressure changes in the distribution system. These pressure monitors will be placed throughout the zone to determine where the loss of pressure is occurring and identifying the areas that are leaking. In the field, cities of Leesburg, Virginia and Monaca, Pennsylvania reduced their non-revenue water NRW from 15% to 7% and 50% to 15%, respectively, after installing AMI to diagnose and reduce distribution leaks (Richie 2015)[6].

5) Berger, M.A., Hans, L., Picsopo, K. and Sohn, S.D. "Exploring the Energy Benefit of Advance Water Metering" Ernest Orlando Lawrence Berkeley National Laboratory. August 2016.
6) Ritchie, E. "AMI Success Stories: Leveraging technology for savings and efficiency." Water Efficiency, Vol. 10, No. 4, pp. 13-21. June 2015.

If installing distribution main meters will result in conserved water, please provide support for this determination (including, but not limited to leakage studies, previous leakage reduction projects, etc.). Please provide details underlying any assumptions being made in support of water savings estimates (e.g., how leakage will be reduced once identified with improved meter data).

Yucaipa Valley Water District has 18 pressure zones within the distribution system. This project would provide the connection of AMI smart water meters within these zones, allowing these zones to be separated and evaluated per zone. The process of segregating each zones' total water consumption and distribution can be conducted for a predetermined amount of time. Using the water consumption data gathered from the AMI service meter connections to customers for an allotted time and comparing it to the water distribution data from the distribution meters for the same allotted time would identify the amount of water lost due to distribution system leaks.

The YVWD has estimated the amount of conserved water to be 1,335.51 AFY using methods described previously in this application.

What types (manufacturer and model) of devices will be installed and what quantity of each?

The proposed project includes the installation of the devices detailed in Table 5: Devices and Quantity Needed for AMI Project.

Device (Manufacture and Model)	Quantity
Armorcast. Smart Point Lid	12,848
Sensus, Transceivers	12,848
Sensus, 1" iPERL (Smart) Meter	451
Sensus, ¾" iPERL (Smart) Meter	6,379

Table 5: Devices and Quantity Needed for AMI Project

How will actual water savings be verified upon completion of the project?

Yucaipa Valley Water District water savings will be verified in three ways:

1) Water Conserved via AMI Leak Detection - Leaks detected from the alarms generated through the AMI system will be recorded throughout each year. The data will be used to estimate the water savings had the leak not been identified through early leak detection but had been identified as if it was on YVWD's current practice of manual monthly meter reads.

Additionally, according to the California Water Plan Update 2013 from the California Department of Water, the City of Sacramento installed AMI smart meters to 17,600 residences. Of those 17,600 AMI smart meters 1,076 leaks were detected through AMI reports, 367 million gallons of aggregate annual water loss calculated through AMI reports, 236 million gallons of water saved; which equates to 12.6 GPCD in water savings. AMI played a major component in helping the City of Sacramento reach the State mandate of 20% per capita reduction by 2020. It is anticipated that AMI will play a similar role in the YVWD.

2) Water Conserved from Main Line Leak Detection: As described previously above, YVWD has 18 pressure zones within the system. This project would provide the installation and connection of AMI smart water meters within these zones, which can be separated and evaluated per zone. This process of segregating each zone's total water consumption (using the AMI smart water meter data) and distribution into the zone can be conducted for a predetermined amount of time. Using the water consumption data gathered from the AMI meter connections for the allotted time and comparing that data to the water distribution data from the distribution meters for the same allotted time would identify the amount of water lost due to distribution system leaks. Once pressure monitors were installed in identified zones main line leaks will be identified, prioritizing pipeline replacements would be conducted, and continuing data would be taken regarding the water savings using the method mentioned previously.

3) Gallon Per Capita Per Day (GPCD) – Yucaipa Valley Water District will use the gallons per capita per day from 2016 and 2017 as the baseline, comparing it to average gallons per capita per day using 2020 data post-project implementation. *Please note ongoing data will be collected during implementation years regarding gallons per capita per day as the system is coming on line. YVWD already has 6,018 iPERL smart water meters in use and those meters will be brought online when the AMI collection system is installed, prior to the remaining 6,830 meters being converted to smart water meters.

Evaluation Criterion B: Water Supply Reliabilty

Does the project promote and encourage collaboration among parties in a way that helps increase the reliability of the water supply?

Yucaipa Valley Water District is active participant of Santa Ana Watershed Project Authority (SAWPA) "One Water One Watershed (OWOW)" program. OWOW is SAWPA's Integrated Water Resources Management Plan. SAWPA Governance and the participants in OWOW provide a collaborative, transparent, and watershed-wide view embraced by the OWOW planning process from the onset seeking to improve the way in which water and other environmental resources are managed in the watershed. The Santa Ana Watershed Basin Study helped SAWPA and its member agencies identify data gaps, conduct tradeoff analyses, address the effects of climate change, and develop effective adaptation strategies[7]. Through this Basin study, SAWPA and Reclamation have provided leadership on the path to a secure and sustainable water future, because without action, the demand for more water will quickly outstrip the amount available to the watershed's populations, agriculture, and industries[7].

This proposed AMI project will conserve water through the use of early leak detection, water consumption education, reduction in distribution losses and using the data that the AMI system will provide to determine where losses are and prevent those losses. This proposed AMI project will have a direct reduction in water consumption of 1,335.51 AFY and a projected savings of 1,781.14 after 10 years once the two large developments discussed previously are completely constructed. The direct energy savings for 1,335.51 AFY is 5,643,465 kWh, and with the projected build out the energy savings will be 7,526,563 kWh. This project will be discussed with YVWD's colleagues in SAWPA's OWOW program. The water conserved allows for an increase in water reliability, because it allows for less water to be diverted from the Delta, increasing the health of the Delta, decreasing water restrictions due to habitat health.

Will the project make water available to address a specific water reliability concern?

Yucaipa Valley Water District will conserve 1,335.51 AFY by year 3 and a projected savings of 1781.14 after 10 years with the implementation of this AMI project. Conserving 1,335.51 AFY of water will decrease the amount of water YVWD will purchase from the State Water Project. Reducing the water demand will reduce the diversions from the Delta. Reducing imported water from the Delta allows the water to stay in the system and support the habitat for the Delta Smelt and other sensitive species (see below for further details).

7) Sims, J. "Santa Ana Watershed Basin Study: Summary Report" Bureau of Reclamation. September 2013

Reducing Yucaipa Valley Water District's reliance on the State Water Project will become a direct benefit to fish and wildlife. The Delta is also a vitally important ecosystem that is home to hundreds of aquatic and terrestrial species, many of which are unique to the area and several of which are threatened or endangered. For example, the endangered Delta Smelt, as seen in Figure 6, which is endemic to the upper Sacramento-San Joaquin Estuary that mainly inhabit the freshwater-saltwater mixing zone. The reduction of fresh water coming to the Delta due to diversion to SWP causes more brackish water to infiltrate the estuary. The Delta Smelt is also important because it's the feeder fish for larger fish important in the estuary, such as the Shad and Striped Bass. The Delta Smelt is important not only for its species, but it is an overall indicator of the Delta's ecosystem. Reduction of fresh water diversion not only allows more fresh water to flow into the Delta, but it also allows for the water diversion pumps to be used less frequently, thus also protecting the Delta Smelt from the pumps they get caught in and killed.

Figures 6, 7 & 8 below are from Department of Water Resources, California State Water Project, Bulletin 132-16. These figures are based on the Department of Fish and Wildlife fall midwater trawl sampling conducted every year (1967-2015) from September through December. As seen from the figure below there was a large decrease in fish over the last 10 years and more predominantly in the last 5, partly due to drought and lower freshwater levels due to diversion for SWP water.

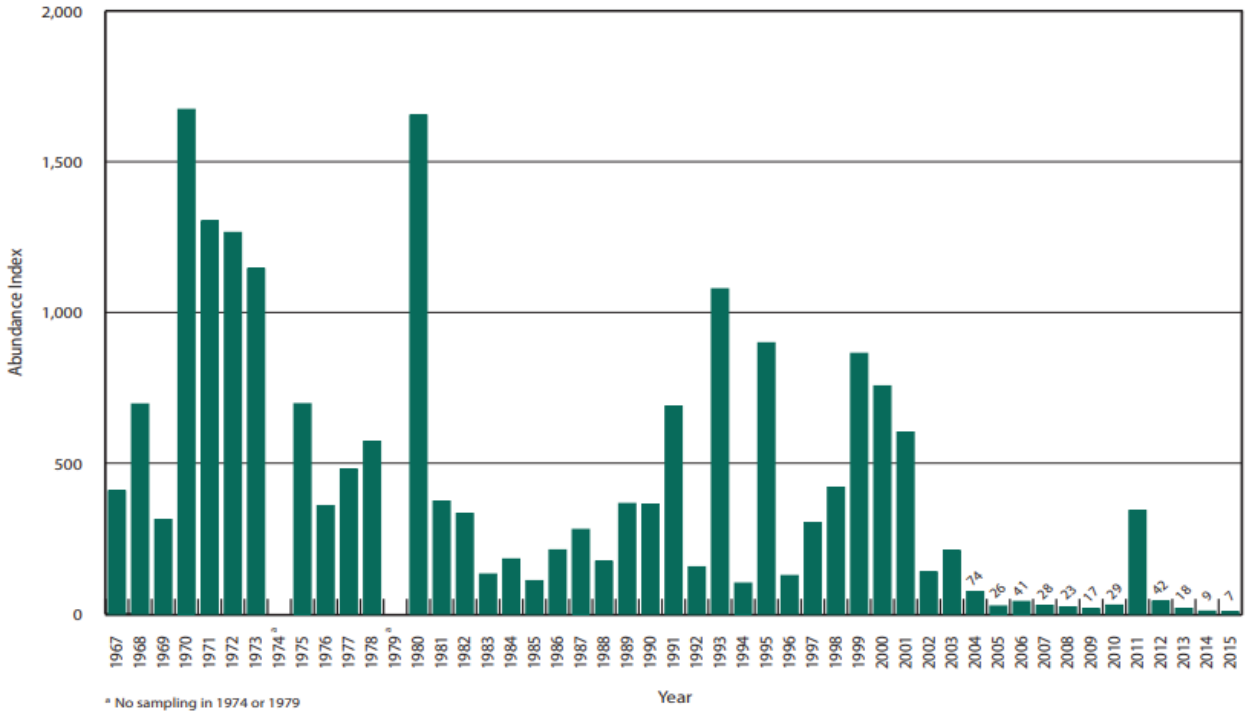

Figure 6: Delta Smelt Fall Midwater Trawl Abundance Index, 1967-2015

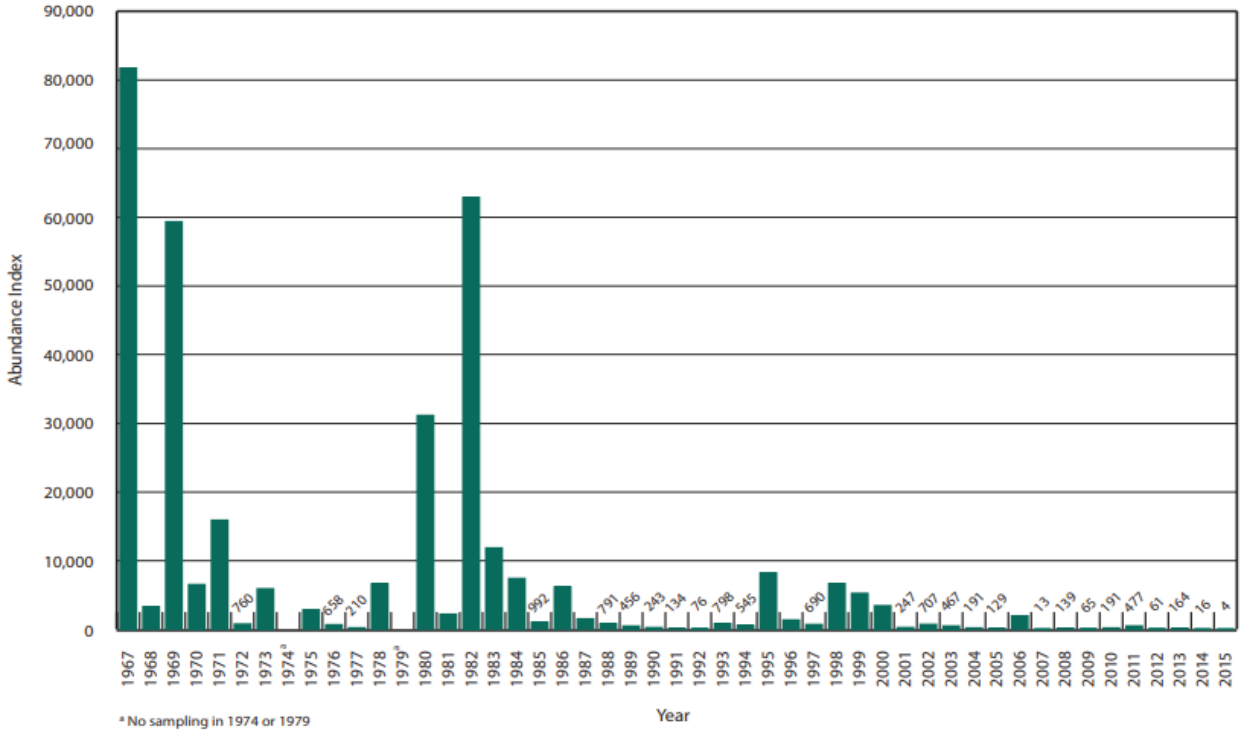

Figure 7: Longfin Smelt Fall Midwater Trawl Abundance Index, 1967-2015

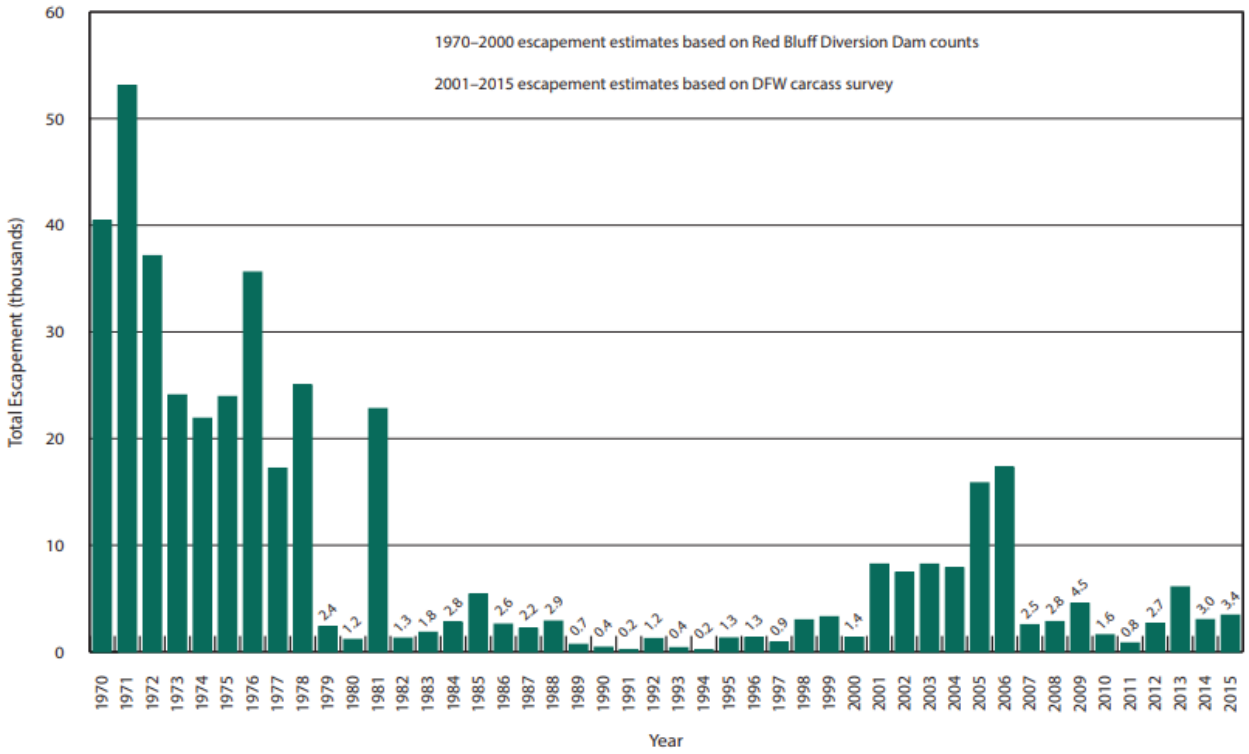

Figure 8: Estimated Total Adult Winter-run Chinook Salmon Escapement, 1970-2015

Please describe the status of the species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular ecological, recreational, or economic importance), the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project.

Since the implementation of this project will reduce the amount of water exported from Northern California stream systems, there will be a positive benefit for the sensitive in the Sacramento–San Joaquin River Delta including the Delta Smelt (federally endangered) and its critical habitat (see Figure 9), and Longfin Smelt. The American Shad and the Striped Bass population increased during the 2017 which was a wet year, indicating that extra fresh water in the Delta had a positive impact on the fish populations. Thus, the less water taken from the Delta during the wet and dry years is beneficial to the habitat and the species that inhabit the Delta. In summary, this project has been designed with the environmental impacts and water supply reliability in mind.

Evaluation Criterion C: Implementing Hydropower

The proposed Automated Meter Infrastructure project does not consist of a hydropower element, but it does save a substantial amount of electricity by decreasing the water consumption, therefore decreasing the energy required to transport SWP water to the southern region of California, also energy is saved through less pumping, treating and boosting the SWP water throughout the distribution system. The AMI project will result in increased energy efficiencies in multiple areas including reduced SWP pumping, reduced water treatment volume, reduced distribution pumping and reduced vehicle run time. The savings in the areas of pumping and water treatment volume are attributed to the estimated water savings that an AMI will provide through improved water conservation and leak detection. As AMI will eliminate the need to manually read each meter in the system, YVWD will also reduce the vehicle run times that are required to drive to each meter resulting in a measurable reduction in carbon emissions.

Embedded Energy of Water:

The task of identifying the amount energy embedded in a unit of water is a directly influenced by the source, location, topography, and treatment process performed. YVWD receives its water from the Pearblossom Pumping Plant and the Crafton Hills Pump Station at 4225.70 kWh/AFY according to Department of Water Resources, Bulletin 132-16. The reduction of water usage from this project is estimated to reduce the average annual energy consumption by 5,643,465 kWh/yr as a result of a 1,335.51 AFY reduction of water usage (4225.70 kWh/AFY x 1,335.51 AFY) by year 3, as depicted in Table 6 below. Also, taking into consideration the current large development projects completion date in 10 years this AMI project is estimated to reduce the average annual energy consumption by 7,526,563 kWh/yr. as a result of a 1,781.14 AFY reduction of water usage (4225.70 kWh/AFY x 1,781.44 AFY) by year 10.

Energy and Water Use Reduction for SWP		
Estimated AFY Saved	**Energy Used (kWh/AFY)**	**Energy Savings (kWh/yr)**
1335.51	4225.70	5,643,465
Energy and Water Use Reduction (10 Years) for SWP		
1,781.14	4225.70	7,526,563

Table 6: Energy and Water Use Reduction

The topography within the boundary of the Yucaipa Valley Water District rises from an elevation of about 2,000 feet above sea level at the western end of the Yucaipa Valley to about 5,000 feet at the eastern end, with average elevation of roughly 2,650 feet. The topography of the area is characterized by rolling hills separated by deeply entrenched stream beds which makes the distribution of water to the 18 different pressure zones an inherent challenge. The distribution system is made up of many

different size pumps and motors. The reduction in water use will reduce pumping costs throughout the District.

The projection of energy savings is from the point of diversion. The water diverted to YVWD from the SWP runs through Pearblossom Pumping Plant, Mojave Siphon Powerplant, Devils Canyon Powerplant, Green Spot Pump Station and Crafton Hills Pump Station, as depicted in Figure 8 below.

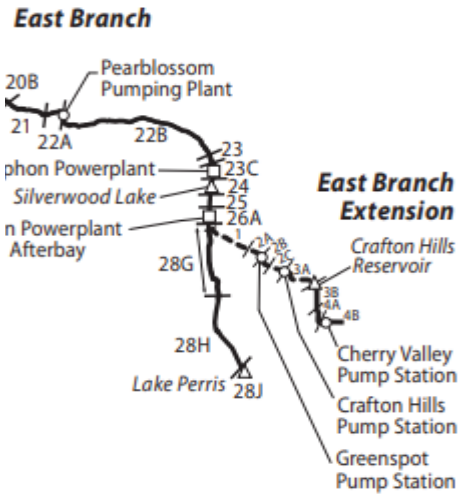

Figure 8: State Project Water: East Branch & East Branch Extension

Energy Savings from the Treatment Process: YVWD's water filtration plant is called Yucaipa Valley Regional Water Filtration Facility (YVRWFF) state-of-the-art water treatment plant utilizes both Micro-Filtration and Nano-Filtration to provide approximately 9827.7 AFY of drinking water in 2017. The average annual energy consumption of the YVRWFF is approximately 3,541,100 kWh; yielding a value of 360.3 kWh/AFY. (3,541,100 kWh / 9827.7 AFY) = 360.3 kWh/AFY. Then, to identify the energy savings from the 1335.51 AFY reduction of water produced at YVRWFF we must apply the following equation, (360.6 kWh/AFY x 1335.51 AFY) = 481,585 kWh reduction per year, this is an estimated $56,656 in energy cost savings per year. This is the energy consumption to treat the water at YVRWFF. To identify the energy savings from the projected 10 years savings once two large developments are completed, the annual saving with this project is 1781.14 AFY reduction of water produced at YVRWFF using the following equation, (360.6 kWh/AFY x 1781.14 AFY) = 642,279 kWh reduction per year, this is an estimated $75,548 in energy cost savings per year.

Energy and Water Use Reduction for YVRWFF		
Estimated AFY Saved	**Energy Used (kWh/AFY)**	**Energy Savings (kWh/yr)**
1335.51	360.6	481,585
Energy and Water Use Reduction (10 Years) for YVRWFF		
1,781.14	360.6	642,279

Table: Energy and Water Use Reduction for YVRWFF

The proposed Automated Meter Infrastructure project will drastically reduce the vehicle runtime compared to the current method of manually reading meters, in turn reducing carbon emissions. The proposed Automated Meter Infrastructure will eliminate the need for normal meter reading and thus result in a reduction of 1,300 hours of vehicle run time per meter reader. (1,300 hours) (4 vehicles) = 5,200 hours of vehicle run time. The primary vehicles used for meter reading are 2012 model year Jeep Wranglers and a 2001 Ford Ranger. The mileage for the three Jeep Wranglers and one Ford Ranger was 31,431 miles in 2017. The gallons of gas used for the three Jeep Wranglers and one Ford Ranger was 3,264 gallons of gas. These vehicles averaged 9.63 mpg, due to frequent stops.

The U.S. EPA specify 1.25 therms/gallons of fuel adm 29.3 kWh/ therm.

(3,264 gal/yr x 1.25 therms/ gal x 29.3 kWh/therm) = 119,544 kWh/yr in energy savings.

Using the U.S. EPA's Greenhouse Gas Equivalency Calculator:

3,264 gallons of gas = 29 metric tons of Carbon Dioxide

This AMI project reduced the amount the vehicles are driven; therefore, the amount of gasoline being consumed, and greenhouse gases put into the atmosphere. This project reduces Carbon Dioxide emissions into the atmosphere by 29 metric tons per year.

Evaluation Criterion D: Complementing On-Farm Irrigation Improvements

Yucaipa Valley Water District has a small amount of farming. The AMI project could help the farms reduce the amount of water they consume by leak notification, seasonal customer information and reports, overall education for the customer on their usage and trends.

Yucaipa Valley Water District offers free recycled water for irrigation purposes. This recycled water must be picked up at YVRWFF, hauled to the customer home, and spread immediately on the property. This has become very popular within the community for small growers to farmers.

Evaluation Criterion E: Department of Interior Priorities

The number one priority of the Department of Interior is "Create a conservation stewardship legacy second only to Teddy Roosevelt." Utilizing science to identify best practices to manage land and water resources and adapt to change in the environment encompasses YVWD's AMI project. The AMI system allows YVWD to implement a new best practice of identifying leaks big and small at the customers property, as well as in the customers distribution system. Decreasing the amount of water YVWD diverts from the Delta. This also facilitates the Department of Interiors Priorities, by keeping water in the Delta it helps keep the Delta healthy and increase the fish population. This will intern allow fishing in the Delta to continue, and not put a stop to it as it did in the past due to the recent drought.

Utilization of natural resources is important and utilizing them effectively without waste is the purpose of this AMI project. The AMI project helps YVWD water district conserve water throughout the system through leak detection at the customers property as well as in YVWD's distribution system. The energy savings from the decrease pumping and treatments of the water conserves also help reduce the natural resources used to produce energy.

Restoring trust with local communities if very important and a key to having a successful AMI project. The hourly water consumption data collected from the AMI project is a tool to reach out to the community and give them personalize water consumption information. YVWD can use the data to educate the community on what their neighbors are using compared to others in the neighborhood, conservation techniques, and YVWD can also show the customers how AMI data has helped the District identify leaks within the distribution system.

Striking a regulatory balance, reducing the amount of water, YVWD diverts from the Delta is helpful in reducing the administrative and regulatory burden on U.S. industry and the public. YVWD reduction in SWP is estimated to be 13.6% less what is currently taken. If all water districts who purchase water form SWP were to have a 13.6% reduction that would leave a lot more water available for the Delta to increase the health of it as well as additional water availability for U.S. Industry; such as farmers in the California's, Central Valley.

The AMI project greatly modernizes YVWD infrastructure. The AMI system allows customer to access their data in real time and educated them on their water usage. The system allows YVWD to set up alerts for leaks and excess water consumption. This information can be passed on the customers to help educate and conserve water. The AMI system will also help YVWD identify leaks within the distribution system and help the District prioritize pipe replacement. As some of the pipes within YVWD are over a 100-year-old, but that doesn't mean they are leaking, it could be PVC pipe that was installed 20 years ago that has larger leaks.

Evaluation Criterion F: Implementation and Results

Subcriterion F.1: Project Planning

The Yucaipa Valley Water District has selected the proposed Automated Meter Infrastructure project as a priority Capital Improvement Project. YVWD has identified this project's direction many years ago and has anticipated the need for AMI by requiring new development to install smart water meters. In addition to new development installing smart water meters, YVWD also replaces worn or broken water meters with smart water meters. YVWD has a total of 6,018 smart water meters currently in the ground awaiting the implementation of this project. YVWD's investment and planning for this project has resulted in a substantial 'head start' with about 46% of the total water meters in the system having AMI capabilities. Please note that YVWD is not seeking reimbursement for these costs as part of this grant application but is only seeking funding to complete the AMI project.

YVWD Urban Water Management Plan focuses on conservation within the District. YVWD has spent a considerable amount of money to build a state-of-the-art water recycling plant called Wochholz Regional Water Recycling Facility (WRWRF). The WRWRF produces an extremely clean recycled water that is distributed throughout the system for irrigation purposes for commercial properties, city mediums, parks, schools and front and back yard irrigation. YVWD's recycled water system used 2,102.27 AF in 2017, directly conserving millions of gallons of drinking water. The AMI Project will continue to help YVWD it water conservation goals.

Subcriterion F.2: Performance Measures

The performance measure that is to be applied to the proposed Automated Meter Infrastructure AMI project will be multifaceted. First YVWD is required to complete a yearly AWWA water loss report. This details the water loos throughout he distribution system. The findings will detail the water audit conducted to determine the real water loss of YVWD. The AWWA Walter Loss Audit will be submitted with the *Final Project Implementation Report* will be submitted to the Bureau of Reclamation. Also included in this *Final Project Implementation Report* will be the actual water usage throughout YVWD prior to implementation of the AMI project compared to the water usage post-implementation of the project to detail the actual water saving due to the benefit of AMI project.

Part of the *Final Project Implementation Report* will include a section for Customer Leak Analysis. The Customer Leak Analysis is a site-specific water savings verification plan that will compare leaks that occur on customer property before and after AMI. The leak detection and notification properties of an AMI system will be proven to be effective tools in conserving wasted water by utilizing the Customer Leak Analysis. This performance measure was selected by YVWD as many of our customers experience leaks that are

only identified by the billing department, as shown previously with the customer leak example on page 20 of this report. Data collected from the AMI system will also be printed on the customer bills for educational purposes. YVWD strives to educate the community and preforms multiple community outreach events to help educate water conservation and YVWD's mission. The community outreach events will be helpful to connect with customers using their own personal consumption data collected from AMI. Data will also be complied for the distribution system to help identify leaks. Leaks are prevalent in the District due to the 18 different pressure zones in the area and the older pipe infrastructure.

Gathering the Data

The Customer Leak Analysis will profile fifty (50) of the largest customer leaks before and after the AMI implementation. The year prior to the AMI system will be compared against subsequent years. The leak profile framework for the Customer Leak Analysis will be as follows:

Customer Leak Analysis
Leak Profile
Before Automated Meter Infrastructure

Leak Number	(B-1)
Total Leak Volume	(Gallons)
Duration of Leak	(Days/Hours)
Means of Identification	(Staff/Customer)

Customer Leak Analysis
Leak Profile
After Automated Meter Infrastructure

Leak Number	(A-1)
Total Leak Volume	(Gallons)
Duration of Leak	(Days/Hours)
Means of Identification	(AMI/Customer)

Performing Analysis

This straight forward comparison will be a valuable tool to measure performance of leak response time and in turn volume of water conserved. Using the data gathered from the fifty largest customer leaks from the year after AMI was implemented, we can drill deeper into the actual savings. (A monthly billing cycle of 30 days will be used for these calculations.) To better illustrate the analysis, the following profile and figures will be used as an example.

[Example] Customer Leak Analysis
Leak Profile
After Automated Meter Infrastructure

Leak Number	(A-1)
Total Leak Volume	(100,000 Gallons)
Duration of Leak	(10 Days)
Means of Identification	(AMI/Customer)

In the example above, the gallons per day (GPD) wasted due to the leak would be 10,000 GPD = (100,000 Gal) / (10 days).

To estimate the water saved by the early detection of the leak from the AMI system, the gallons per day volume is applied to the remaining days of the billing cycle. (10,000 GPD) x (20 remaining days) = 200,000 gallons saved through early AMI detection. The concept of this method is a comparison against the existing practice whereas the leak would be identified at the end of the billing cycle when the meter is read, and the customer is notified due to the unusually high meter read.

Generate Report

At the end of year (and subsequent years) after the implementation of the Automated Meter Infrastructure, the leak profiles and estimated gallons of water saved will be compiled into a report that will identify actual water conservation. It is understood that the assumption of the water leak being repaired on customer property is the responsibility of the customer and may not always occur when notified by the District. The Customer Leak Analysis is merely a tool to measure performance of an ever-changing system before and after the implementation of a technology designed for accuracy. These profiles and reports will focus heavily on pre and post implementation of the AMI project and will be reported in the *Final Project Implementation Report.*

Evaluation Criterion G: Nexus to Reclamation Project

Yucaipa Valley Water District is active participant of Santa Ana Watershed Project Authority (SAWPA) "One Water One Watershed (OWOW)" program. OWOW is SAWPA's Integrated Water Resources Management Plan. SAWPA Governance and the participants in OWOW provide a collaborative, transparent, and watershed-wide view embraced by the OWOW planning process from the onset seeking to improve the way in which water and other environmental resources are managed in the watershed. The Santa Ana Watershed Basin Study helped SAWPA and its member agencies identify data gaps, conduct tradeoff analyses, address the effects of climate change, and develop effective adaptation strategies[7]. Through this study, SAWPA and Reclamation have provided leadership on the path to a secure and sustainable water future, because without action, the demand for more water will quickly outstrip the amount available to the watershed's populations, agriculture, and industries[7].

The Basin study's purpose is to effectively manage the Santa Ana River basin's finite water resources to meet future needs. The study has multiple Santa Ana River Watershed (SARW) Adaption Activities. Reduce Demand: the purpose is to conform to the State's 20x2020 water conservation plan. YVWD's AMI project reduced the amount of water we will need to purchase from SWP an estimated 1,335.51 AFY. Last year YVWD processed 9,827.7 AF of SWP through the District water filtration plant. With the implementation of AMI project, the 13.6% reduction is SWP needed, greatly helping YVWD meet the State's 20x2020 requirement. Resource Stewardship: the purpose is to Improve management of watershed lands, wildlife, and water resources through conservation, preservation, and ecosystem restoration. YVWD's AMI project conserves 1335.51 AFY that will not be purchased from SWP for drinking water purposes, thus not diverting the water from it source in the Delta, thus helping keep more freshwater in the Delta increasing the health of the ecosystem. AB 32 Compliance: the purpose Develop methodology for quantifying energy intensity of SARW water supplies and uses. Perform carbon footprint assessment and use the GHG Calculator Tool to identify additional opportunities for reducing carbon emissions. This application has used tools to identify a partial estimate of YVWD's carbon footprint. This project reduces our carbon footprint by reducing the amount the meter reading vehicle were being driven by 31,431 miles or 3,264 gallons of gasoline or 29 metric tons of Carbon Dioxide emissions. It also reduced the amount of energy to pump the SWP form the north to the south by 5,643,465 kWh, and it reduces the energy needed to pump 1335.51 AFY in water distribution decreasing the need for energy by 481,585 kWh. Public Education: the purpose is increase public outreach and education through the OWOW process, as YVWD is already part of multiple pillars in OWOW.

Is the proposed project connected to Reclamation project activities? If so how?

The proposed AMI project will have considerable reduction of water usage due to the real time data, alerts of customer water leaks, educational reports for District use as well as customer use, and identifying water loss throughout the distribution system. This will lead to a reduction in water diverted for SPW; which directly related to the CALFED Bay-Delta Program.

Does the applicant receive Reclamation project water?

Yucaipa Valley Water District receives Reclamation project water from the California State Water Project, which is directly related to the Central Valley Project.

Is the project on Reclamation project lands or involving Reclamation facilities?

The proposed AMI project does not involve Reclamation lands or facilities.

Is the project in the same basin as a Reclamation project or activity?

The proposed AMI project is located in the Santa Ana Watershed Basin. The Bureau of Reclamation has many projects located in the Santa Ana Watershed Basin. Bureau of

Reclamation and Santa Ana Watershed Project Authority Complete Santa Ana Watershed Basin Study was completed in 2013. The basin study analyzed the future water supply and demand scenarios based on factors such as projected changes in climate, and varying levels of growth for municipal, agricultural and business interests in the Santa Ana River Watershed. The report found this watershed has challenges due to climate change and growing populations. The challenges in this Santa Ana watershed includes increasing demand, earlier snowmelt and runoff, and faster than historical sea level rise threatening coastal communities, improvement of water infrastructure and groundwater basins. The YVWD is a member of SAWPA's OWOW program, as discussed in previous sections.

Will the proposed work contribute water to a basin where a Reclamation project is located?

Yucaipa Valley Water District's proposed AMI project will contribute 1,351.31 AFY per year, after 10 years when the developments discussed previously are completed the project will contribute 1,781.41 AFY per year to SWP.

Will the project help Reclamation meet trust responsibilities to Tribes?

Yucaipa Valley Water District's proposed AMI project does not have any trust responsibilities to tribes.

Evaluation Criterion H: Additional Non-Federal Funding

The Yucaipa Valley Water District (District) is funding 73% of the total project cost for the proposed Automated Meter Infrastructure project. The District is requesting $1,000,000 of funding assistance from the Bureau of Reclamation through the WaterSMART Water and Energy Efficiency Grant. No additional funding is anticipated.

Non-Federal Funding (2,697,764) / Total Project Cost (3,697,764) = .73 (73%)

Project Budget

Funding Plan and Letters of Commitment

Funding Plan - Project funding for the non-Federal cost-share will be provided from the Yucaipa Valley Water District's (District) Water Division Reserve Funds. As shown in the Proposed Budget table on the following page, the total estimated project cost is projected to be $3,697,764 with the District providing $2,697,764and requesting $1,000,000 from the Bureau of Reclamation. YVWD is providing the funds for the non-Federal portion of the cost-share and no other sources of funding from a third party are being considered. Therefore, no additional Letters of Commitment are attached.

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1. Yucaipa Valley Water District	$2,697,764
Non-Federal Subtotal	$2,697,764
Other Federal Entities	
1. N/A	
Other Federal Subtotal	N/A
REQUESTED RECLAMATION FUNDING	1,000,000

Table 3. Summary of Non-Federal and Federal Funding Sources

Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION			TOTAL COST
	$/Unit	Quantity		
Salaries and Wages				
Employee 1	$27.19	(3 x 1,040 yr.) = 3,120		$84,832
Employee 2	$25.49	3,120		$79,528
Employee 3	$21.65	3,120		$67,548
Employee 4	$20.72	3,120		$64,646
Fringe Benefits				
Full Time Employees	4	$31,259		$125,037
Part Time Employees	N/A	N/A		N/A
Equipment				
520-M Smart Point	$148.75	12,848		$1,911,140
Smart Point Lid	$30.00	12,848		$385,440
1" iPearl (Smart) Meter	$172.20	602		$103,664
3/4" iPearl (Smart) Meter	$118.20	6,228		$736,150
Base Station Internet Modem	$775.00	3		$2,325
Contractual/Construction				
SAAS Set Up Fee	$7,725.00	1		$7,725
Analytic Set Up Fees	$5,625.00	1		$5,625
Training	$6,000.00	1		$6,000
Software Annual Fee	$18,825.00	3		$56,475
Internet Modem Annual Fee	$720.00	3(3) years = 9		$6,480
Base Station Maintenance	$3,000.00	3		$9,000
Other				
Other				$
TOTAL DIRECT				**$3,651,615**
				Indirect Costs
de minimis	10	$461,790		**$46,179**
TOTAL ESTIMATED PROJECT COSTS				**$3,697,764**

Table 4: Budget Proposal

Budget Narrative

Salary and Wages involves key personnel that will be working on the AMI project. The personnel needed to complete the implementation of the project will be filled by our meter reading staff. YVWD currently has 4 full-time meter readers, YVWD does not have part-time employees. The AMI project installation of the meter boxes, and installation of any other equipment, as well as programming the project will be done in house at YVWD. Fringe Benefits are benefits that medical, dental, eye, and retirement. The calculation of hours by the employee's conduction the meter change out and lid replacement will be attributed to half their days for the three years for project completion.

Equipment - The equipment listed in Table 4 of the Budget Proposal is required for the AMI project. The radio signal propagation study that has been conducted suggests the installation of three (3) base stations to effectively cover the service area. The base stations are currently installed, construction cost is not included in this report. Although, each of the three M-400 Base Stations will require a **Base Station Internet Modem** to back haul the compiled meter data to the database utilizing cellular communication. The **520-M Smart Point** is a radio transceiver that mounts to the meter box lid and connects to the smart water meters. This project will require 12,848 Smart Points, one for each service connection meter in the system. The **Smart Point Lid** is a water meter box lid that has a specific accommodation for mounting the Smart Point. This project will require 12,848 Smart Point Lids, one for each Smart Point in the system. With 6,018 smart meters already installed of the total 12,848 water meters in the system, the remaining 6,830 meters will need to be replaced with smart water meters. A smart water meter must be capable of many advanced functions and communicate data through the Smart Point to the Base Station. The project will require 451 **1" iPearl (Smart) Meters** and 6,379 **3/4" iPearl (Smart) Meters** resulting in all service connections being equipped with a smart meter.

Contractual/Construction - The Automated Meter Infrastructure generates a large amount of data and must be managed with software that can secure, analyze, and display the information. The one-time cost associated with the initial set up of this service is the **SAAS Set Up Fee**. The acronym SAAS stands for Software As A Service and will provide YVWD with access to meter data analytics without the need install, host, secure, and update software locally on YVWD servers. The **Smart Point Installation/Set Up** cost will cover the programming and installation of the 12,848 Smart Points. The programming aspect involves the initial input of site specific information regarding the water service location and unique identification number. The installation is simply attaching the Smart Point to the Smart Point Lid and plugging in the connection to the smart meter. Onsite **Training** will be provided by the contractor to District staff and will cover system operation and showcase the features of the analytic software. In addition to the SAAS set up fee, the **Software Annual Fee** will be applied for each year of service and this budget proposal includes three (3) years of service at a portion of the total direct cost. As the three Base Stations Internet Modems back haul the compiled meter data to the database utilizing cellular communication, the **Internet Modem Annual Fee** must be applied for all three (3) modems over three (3) years. A **Base Station Maintenance Fee** will be applied after the first year of service, in this instance a total of two installments will be required for the

three-year project. The Base Station Maintenance will assure the equipment is in good working condition and will be a part of the preventative measures in place to provide a robust and reliable system

Indirect Costs - In accordance with 2 CFR Sec. 200.68 regarding Modified Total Direct Cost, the District has included a ***de minimis*** rate of 10% of the Modified Total Direct Costs (MTDC). The MTDC ($461,790.00) is a reflection of the Total Direct Costs minus the equipment costs.

Total Costs - The **Total Estimated Project Costs** are a summation of the direct and indirect cost of the proposed Automated Meter Infrastructure project that will result in quantifiable water savings, promote water use efficiency, and improve to overall service of Yucaipa Valley Water District.

Letter of Support

YVWD has letters of support for the Automated Meter Infrastructure project from the following:

- California State Senate – Senator Mike Merrell, 23rd District
- House of Representatives - Congressman Col. Paul Cook (Ret.), 8th District
- California Assembly – Assemblymen Chad Mays, 42nd District
- Santa Ana Watershed Project Authority – General Manager Rich Haller
- San Bernardino Municipal Water District (SWP Wholesaler) – General Manager Doug Headrick
- City of Yucaipa – City Manager Raymond Casey
- City of Calimesa – City Manager Bonnie Johnson
- Yucaipa/Calimesa Joint Unified School District – District Superintendent Cali Binks

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DISTRICT OFFICE
10350 COMMERCE CENTER DRIVE
SUITE A-220
RANCHO CUCAMONGA, CA 91730
TEL (909) 919-7731
FAX (909) 919-7739

California State Senate

MIKE MORRELL
SENATOR, TWENTY-THIRD DISTRICT

COMMITTEES
ENERGY, UTILITIES AND COMMUNICATIONS
VICE CHAIR
PUBLIC EMPLOYMENT AND RETIREMENT
VICE CHAIR
INSURANCE
TRANSPORTATION AND HOUSING

Brenda Burman

Commissioner

Bureau of Reclamation

1849 C Street NW

Washington DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project.

Dear Commissioner Burman,

I am writing in support of Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) project. This grant will allow the YVWD to further enact its mission, to provide for the "finest customer service" in a dependable and cost effective manner, while professionally managing water resources.

Government agencies entrusted with public dollars, whether collected through taxes, fees, or rates, should administer these funds responsibly. Public agencies have an obligation to manage resources not for not only the sake of conservation, but also to provide for efficient and cost conscience services to their rate payers.

Technology and projects like AMI, enables the YVWD to be good stewards of our natural resources and rate payer dollars. AMI allows the district to continue its strategic planning, focused on proactive measures to aggressively pursue water efficiency and water conservation and assists in the responsible management of public funds. I support Yucaipa Valley Water District's efforts to implement "water wise" tactics in order to further the success of the agency in enacting their mission "to professionally managing the precious water, sewer and recycled water resources of the Yucaipa Valley in a reliable, efficient and cost effective manner in order to provide the finest service to our customers, both present and future."

Sincerely,

Mike Morrell

Mike Morrell

PAUL COOK
8TH DISTRICT, CALIFORNIA

1222 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-5861

Congress of the United States
House of Representatives
Washington, DC 20515–0508

April 26, 2018

Brenda Burman
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project.

Dear Commissioner Burman,

I am writing in support of Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) project. This program will allow for more accurate monitoring and remediation of leaks throughout the cities of Yucaipa and Calimesa. AMI will provide real time radio transmitted data of water consumption, allowing the reduction of water waste through active monitoring leak detection and customer education about their water usage.

Current tracking of water consumption is done monthly, which leaves residents vulnerable to water loss that would not be brought to the resident's attention until the monthly manual meter read. The AMI project will help minimize previous unaccounted water loss and/or pipe breakage, not only helping the residents reduce their cost from leaks but increasing water conservation as well.

Locally addressing California's long-standing water shortages is a high priority for the YVWD, and AMI allows for more accurate and timely information about water usage, including usage on inactive accounts, as well as evidence of possible leaks and water waste. I fully support Yucaipa Valley Water District's efforts to implement "water wise" tactics in the pursuit of water conservation, and I thank you for the opportunity to submit this letter. Should you have any questions, please contact my office at (760) 247-1815.

Sincerely,

Paul Cook

Col. Paul Cook (Ret.)
Representative, 8th Congressional District of California

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FAX (916) 319-2142

Assembly
California Legislature

CHAD MAYES
ASSEMBLYMEMBER, FORTY-SECOND DISTRICT

DISTRICT OFFICE
41608 INDIAN TRAIL, SUITE 1
RANCHO MIRAGE, CA 92270
(760) 346-8342
FAX (760) 346-6506

April 19, 2018

Commissioner Brenda Burman
United States Bureau of Reclamation
1849 C Street NW
Washington, DC 20240-0001

Re: Support of United States Bureau of Reclamation WaterSMART: Water and Energy Efficient Grant for Yucaipa Valley Water Conservation through AMI Project

Dear Commissioner Burman:

On behalf of the constituents of the 42nd Assembly District, I am writing in support of the Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) Project, which will allow for more accurate monitoring and remediation of leaks in the cities of Yucaipa and Calimesa.

AMI will provide real time radio transmitted data of water consumption, allowing reduction of water waste through active monitoring leak detection and customer education about water usage. Current tracking of water consumption is done monthly, unfortunately leaving residents vulnerable to water loss that would not be brought to their attention until the monthly manual meter read. AMI will help minimize previously unaccounted water loss and/or pipe breakage, not only helping residents reduce their cost from leaks but increasing water conservation as well. Locally addressing California's long-standing water shortages is a high priority for the YVWD, and AMI allows for more accurate and timely information about water usage, including usage on inactive accounts, evidence of possible leaks, and water waste. I support YVWD's efforts to implement "water wise" tactics to help conserve water resources.

Should you have any questions or require further clarification, please do not hesitate to contact me.

Sincerely,

CHAD MAYES
ASSEMBLYMEMBER
42ND DISTRICT

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Santa Ana Watershed Project Authority

OVER 45 YEARS OF INNOVATION, VISION, AND WATERSHED LEADERSHIP

One Water One Watershed
AWRA INTEGRATED WATER RESOURCES MANAGEMENT AWARD
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May 2, 2018

Brenda Burman
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington, DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project

Dear Commissioner Burman:

The Santa Ana Watershed Project Authority (SAWPA) wishes to express support of Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) project grant application. This program will allow for more accurate monitoring and remediation of leaks throughout the cities of Yucaipa and Calimesa. AMI will provide real time radio transmitted data of water consumption, allowing the reduction of water waste through active monitoring leak detection and customer education about their water usage.

Current tracking of water consumption is done monthly, unfortunately leaving residents vulnerable to water loss that would not be brought to the resident's attention until the monthly manual meter read. The AMI project will help minimize previous unaccounted water loss and/or pipe breakage, not only helping the residents reduce their cost from leaks but increasing water conservation as well.

Locally addressing California's long-standing water shortages is a high priority for the YVWD and SAWPA, and YVWD's AMI program would allow for more accurate and timely information about water usage, including usage on inactive accounts, evidence of possible leaks and water waste. SAWPA believes that since this effort is in line with SAWPA's Integrated Regional Water Management Plan called One Water One Watershed (OWOW Plan) and our water use efficiency goals and objectives, we support Yucaipa Valley Water District's efforts to implement "water wise" tactics in the pursuit to help conserve water resources.

Sincerely,

Richard E. Haller, P.E., ENV SP
General Manager

11615 Sterling Avenue, Riverside, CA 92503 • 951.354.4220
www.sawpa.org • www.sawpa.org/OWOW

San Bernardino Valley Municipal Water District
380 East Vanderbilt Way
San Bernardino, CA 92408
phone: 909.387.9200
fax: 909.387.9247
www.sbvmwd.com

May 1, 2018

Brenda Burman
Commissioner, Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of Water and Energy Efficient Grant Application for Yucaipa Valley Water District's Advanced Metering Infrastructure based Water Conservation Project.

Dear Commissioner Burman,

As the wholesale water provider for the region, Valley District is writing to support the Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) project. We encourage you to approve YVWD's WaterSMART grant application as this project will allow for more accurate monitoring and remediation of leaks throughout the cities of Yucaipa and Calimesa. The AMI project helps us fulfill our desire to encourage water conservation by providing real time radio transmitted data of water consumption, allowing the reduction of water waste through active monitoring leak detection and customer education about their water usage.

At YVWD, and most other water retailers, current tracking of water consumption is done monthly, leaving residents vulnerable to water loss that would not be brought to the resident's attention until the monthly manual meter read. The AMI project will help minimize previous unaccounted water loss and/or pipe breakage, not only helping the residents reduce their cost from leaks but increasing water conservation as well.

Locally addressing California's long-standing water shortages is a high priority for the Valley District and YVWD, and AMI allows for more accurate and timely information about water usage, including usage on inactive accounts, evidence of possible leaks resulting in less water waste. In light of the various water supply reliability issues facing California, Valley District supports Yucaipa Valley Water District's efforts to implement "water wise" tactics in the pursuit to help conserve water resources. I respectfully request that you approve the YVWD WaterSMART grant application.

Sincerely,

Douglas D. Headrick
General Manager

Board of Directors and Officers

JUNE HAYES	GIL NAVARRO	SUSAN LONGVILLE	MARK BULOT	STEVE COPELAN	DOUGLAS D. HEADRICK
Division 1	Division 2	Division 3	Division 4	Division 5	General Manager

April 18, 2018

Brenda Burman, Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project.

Dear Commissioner Burman,

I am writing in support of Yucaipa Valley Water District (YVWD) Advanced Metering Infrastructure (AMI) project. This program will allow for more accurate monitoring and remediation of leaks throughout the cities of Yucaipa and Calimesa. AMI will provide real time radio transmitted data of water consumption, allowing the reduction of water waste through active monitoring leak detection and customer education about their water usage.

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Sincerely,

Raymond A Casey
City Manager

City of Yucaipa
34272 Yucaipa Boulevard, Yucaipa, CA 92399-9950
(909) 797-2489 ◆ FAX (909) 790-9203 ◆ Yucaipa.org

City of Calimesa
908 Park Avenue • Calimesa, California 92320
Phone (909) 795-9801 • Fax (909) 795-4399

April 23, 2018

Brenda Burman
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project.

Dear Commissioner Burman,

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Sincerely,

Bonnie Johnson
City Manager

YUCAIPA-CALIMESA JOINT UNIFIED SCHOOL DISTRICT

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April 23, 2018

Brenda Burman, Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of USBR WaterSMART: Water and Energy Efficient Grant for YVWD's Water Conservation through AMI Project

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Sincerely,

Cali Binks
District Superintendent
Yucaipa-Calimesa Joint Unified School District

IB ● STEM ● Athletics ● Arts ● Virtual Learning ● Alternative Ed ● AP

San Bernardino Valley Municipal Water District
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May 1, 2018

Brenda Burman
Commissioner, Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Support of Water and Energy Efficient Grant Application for Yucaipa Valley Water District's Advanced Metering Infrastructure based Water Conservation Project.

Dear Commissioner Burman,

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Sincerely,

Douglas D. Headrick

Douglas D. Headrick
General Manager