ATTACHMENT 3. PROJECT JUSTIFICATION
POSO CREEK IRWM DROUGHT GRANT PROPOSAL

The Poso Creek IRWM Drought Proposal (Proposal) includes three projects; locations are shown in relation to the IRWM Region on a regional map, Figure 3.0 Project Locations.

Project 1 – North Kern Water Storage District (NKWSD) Calloway Canal Improvements
Project 2 – Lost Hills Utility District (LHUD) New Well and Water Storage Tank
Project 3 – City of McFarland (City) Reservoir, Booster Pump Station, and System Intertie

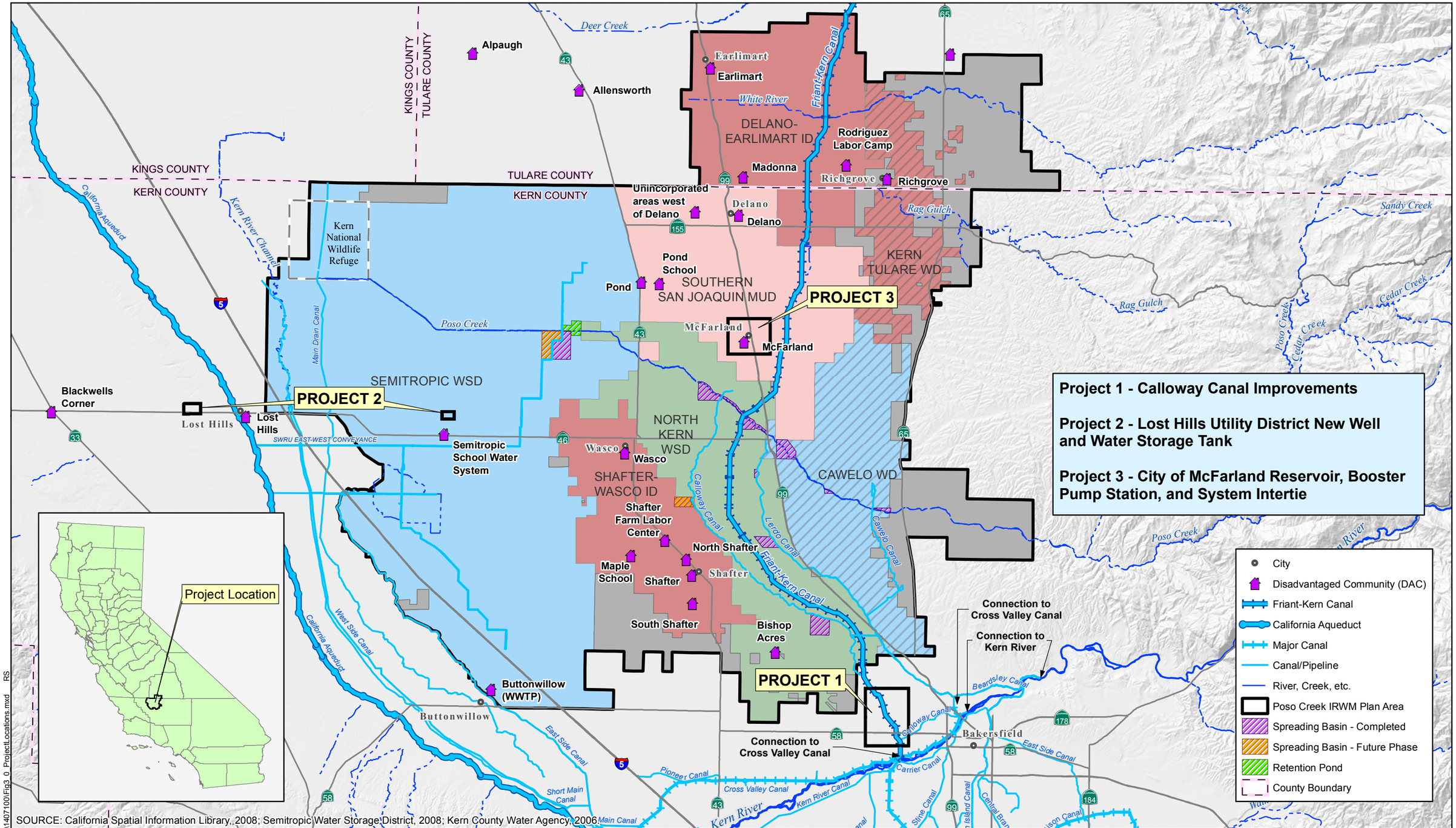
Two of the projects proposed in this Grant Proposal assist economically disadvantaged communities (DACs) to improve reliability and address their critical drinking water needs, regarding arsenic levels, to ensure their access to clean, affordable drinking water. Another of the proposed projects completes a regional conveyance improvement, specifically, the lining of the regional Calloway Canal conveyance channel, that addresses long-term drought preparedness by conserving surface water supplies and contributing water to recharge the region's groundwater basin for use during intense water shortages.

Improving conveyance efficiency in the region increases the effectiveness of conjunctive use practices. Improving the Calloway Canal, in particular, contributes to efficient groundwater basin management in this region by conserving groundwater in areas of better quality, and provides an effective conveyance link that matches multiple sources of available surface supplies to meet demands in several districts. The Calloway Canal will utilize four recently constructed system interties between Kern River, SWP, and CVP contractors, now operational in the Region. The Calloway Canal Improvements will increase the Region ability to adopt to climate change effects by increasing the flexibility in matching timing of supplies with regional demand and by reducing GHG emissions by decreasing the amount of energy consumption for delivery of surface water supplies, realized by utilizing this newly constructed and operational regional conveyance route.

PROJECT SUMMARY TABLE

How each of the projects contained in the Proposal are applicable to both the Drought Project Element and IRWM Project Element are indicated in sections of Table 4.

	Table 4 – 2014 IRWM Drought Solicitation Project Summary Table			
	Drought Project Element	Project 1	Project 2	Project 3
D.1	Provide immediate regional drought preparedness	X	X	X
D.2	Increase local water supply reliability and the delivery of safe drinking water	X	X	X
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective		X	X
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	X	X	X
	IRWM Project Element			
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management			
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands			
IR.4	Non-point source pollution reduction, management, and monitoring			
IR.5	Groundwater recharge and management projects	X	X	X
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users			
IR.7	Water banking, exchange, reclamation, and improvement of water quality	X	X	X
IR.8	Planning and implementation of multipurpose flood management programs			
IR.9	Watershed protection and management			
IR.1	Drinking water treatment and distribution		X	X
IR.1	Ecosystem and fisheries restoration and protection			



SOURCE: California Spatial Information Library, 2008; Semitropic Water Storage District, 2008; Kern County Water Agency, 2006

Poso Creek IRWM
Drought Grant Proposal

Poso Creek IRWMP Region

GEI Consultants
Bookman-Edmonston Division

PROJECT LOCATIONS

JULY 2014

FIGURE 3.0

24-Jun-2014 Z:\Projects\1407100\Fig3_0_ProjectLocations.mxd RS

PROPOSAL DESCRIPTION

The purpose of this Grant Proposal is to help alleviate the drought impact(s) identified in *Attachment 2*. Each project will help provide immediate regional drought preparedness. The regional conveyance improvement will promote regional water conservation, conjunctive use, improve efficiency of groundwater management, increase utilization of existing interties, expand the water supply reliability element consistent with agriculture water management plans and the Poso Creek IRWM Plan, assist the Region in adopting to climate change by expanding conjunctive management of multiple water supply sources, reduce energy required for conveyance, and reduce GHG emissions. Project 2 and 3 will increase local water supply reliability through construction of a new well, storage tanks, and a system intertie, to ensure adequate and reliable delivery of safe drinking water for two DACs. The DAC improvements will protect and provide access of safe drinking water to small DACs in areas presently faced with managing their drinking water supply to meet acceptable concentration levels for arsenic. The DAC projects increase the participation of DACs in the implementation component of the IRWM process, addresses the Human Right to Water Policy to ensure safe drinking water needs are met for DAC and advances the consideration of Human Right to Water needs within the Region by providing access to safe, clean, and affordable water, adequate for human consumption and cooking for the DACs.

The Proposal improves urban water purveyor and agricultural water supplier, local reliability and assists with delivery of safe drinking water to the Region by replenishment and conservation of groundwater. The Proposal assists urban and agricultural water suppliers within the Region to reduce water quality conflicts among neighboring water users. Due to the severity of the 2014 drought, expedited funding is needed for the DACs to provide safe drinking water at a reasonable, affordable rate and for the agricultural water providers to complete an important regional conveyance improvement during a time of limited water district revenue due to lack of surface water deliveries. Since 2011, about the time the three year drought started, North Kern has participated in the construction of four interties leading up to the Calloway Canal Improvements; these improvements utilized federal grants and $10M in local bond funds. The DACs have also invested in their local drinking water systems, but, do not have an adequate rate base to make the larger capital improvements needed to ensure continued access to safe and affordable drinking water.

PROPOSAL BENEFITS

The projects proposed in this Grant Proposal shall be implemented in order to alleviate the impacts of the 2014 drought in the Poso Creek region, as well as, to mitigate the impacts of future droughts and water shortages. The primary and secondary benefits of the proposed projects are explained below.

Project 1, the concrete lining of the Calloway Canal, primary benefits include:

- 4,400 Acre-Feet per Year (220,000 AF over the estimated 50 year life of the project) conserved surface water by decreased seepage over an unusable groundwater section. Preserved surface water deliveries decrease dependence on groundwater pumping in the basin, required to meet local agricultural, municipal, and environmental demands. Surface water supplies conserved during normal and wet hydrologic year conditions (i.e., as opposed to the use of groundwater) preserves groundwater for managed use during dry (drought) years.
- $381,527 per year (~$19M over the estimated 50 year life of the project) by reduced energy requirements from groundwater pumping; based on the reduced lift for pumping groundwater in the area.
- 1,436 MT of CO_2 per year reduced, on average over the life of the project, due to reduction of pumping lifts and associated energy requirements.

Project 1 secondary benefits include:

- Increase conveyance flexibility for receiving surface water supplies from outside of the region to allow timing of delivery around the environmental water management needs of the Sacramento-San Joaquin River Delta and San Joaquin River Settlement.
- Added conveyance capacity to deliver surface water supplies to recharge and replenish the regional groundwater basin in regional groundwater recharge efforts.
- Supports maintaining economically viable pumping lifts for agriculture growers and regional DACs

Project 2 and 3, the DAC assistance projects, primary benefits include:

- Addressing arsenic levels (water quality) and water supply concerns for DACs to ensure access to reliable, safe, clean, affordable drinking water.
- Reduced arsenic treatment costs to maintain reasonable and affordable water rates for DACs.
- Reduced energy operating (pumping) costs to maintain reasonable and affordable water rates for DACs.

Project 2 and 3 secondary benefits include:

- Increase participation of DACs in the implementation component of the IRWM process in the Region.
- Increase awareness of the 'Human Right to Water Policy' to ensure safe drinking water needs are met for all DACs in the Region.

NKWSD Calloway Canal Improvements: Concrete line 12,554 LF of the canal to reduce seepage to poor quality groundwater and deliver conserved water to districts.

The Calloway Canal Improvements is to be concrete lined, 12,554 LF (2.38 miles), as shown in Figure 3.1. Individual sections of the canal, or "reaches", A through D (five total reaches; A, B, C1, C2, and D) lie outside the service areas of both North Kern and Cawelo, and are located above a portion of the regional groundwater basin that is of diminished quality due to past land uses, particularly industrial and petrochemical seepage on the northern end of the City of Bakersfield. The estimated amount of water to be conserved by water conveyance operations of North Kern and Cawelo, from the lining of Reaches A through D, is estimated as 4,400 acre-feet per year or approximately 220,000 acre-feet over the 50-year service life of the project.

The Calloway Canal lining program is expected to conserve groundwater by providing an improved route for the delivery of surface water supplies directly to agricultural users in the three districts (North Kern, Cawelo, and Shafter-Wasco ID) located in the Poso Creek IRWM Region (Region), and by exchange with two additional districts (Kern-Tulare Water District and Delano-Earlimart Irrigation District). Minimizing current seepage amounts from the Calloway Canal will reduce the irrecoverable losses that result when surface water deliveries seep into the poor quality groundwater below, and the degraded seepage cannot be recovered for later use without substantial treatment (both costly and energy intensive). Moreover, the enhanced delivery of surface water supplies reduces district requirements for groundwater pumping to meet demands, which produces important, related benefits of reducing groundwater pumping lifts, saving energy from groundwater pumping, and reducing greenhouse gases emissions produced from the energy required to meet those pumping demands.

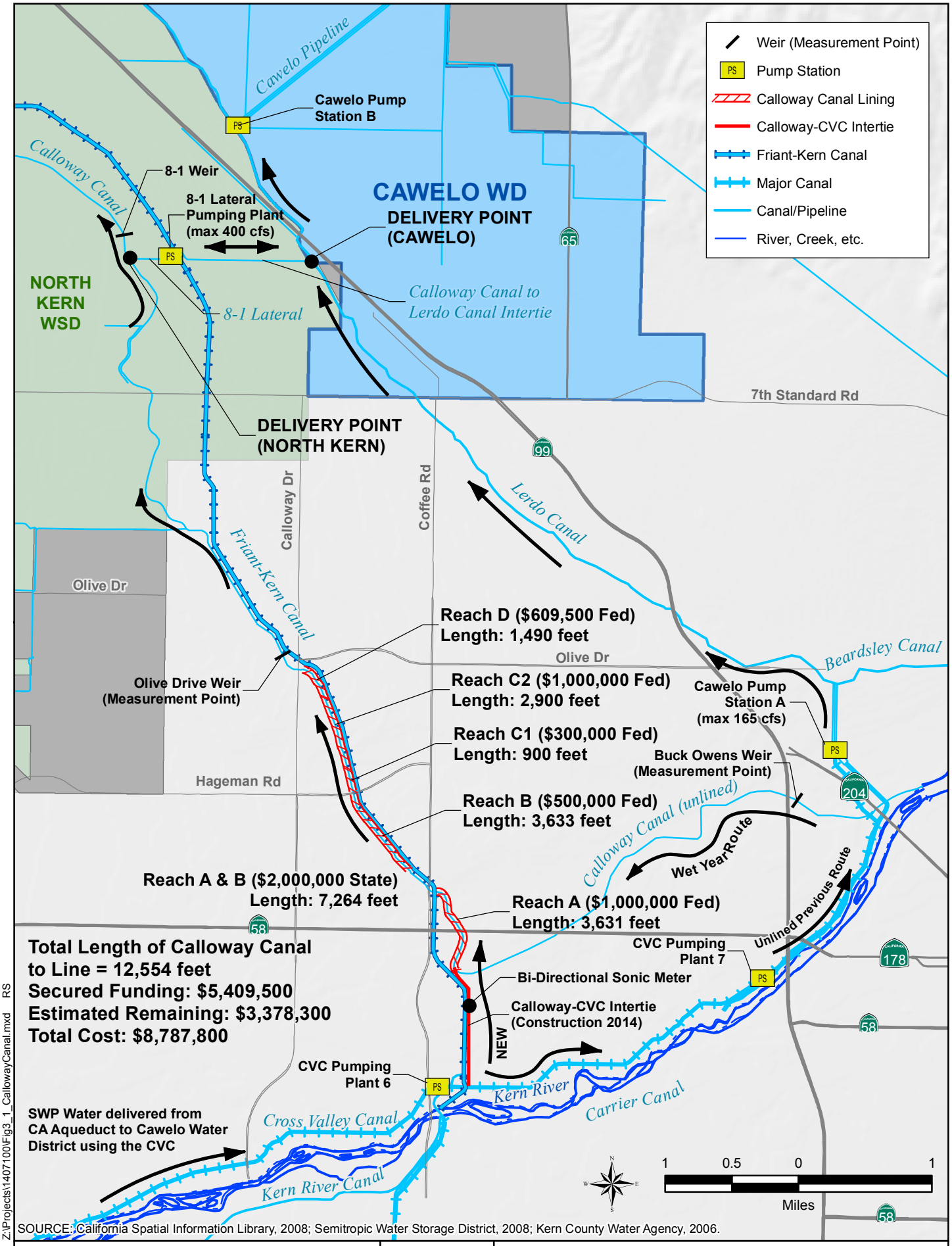
North Kern's principal source of supplemental surface water is the Kern River, conveyed via the Calloway Canal and into the district's delivery network. This Project was developed collaboratively with neighboring Central Valley Project (CVP) and State Water Project (SWP) contractors as part of the Poso Creek IRWM Plan and the Water 2025 System Optimization Review for the Region. The Project will allow for a new, more effective conveyance route for delivery of surface supplies from principal delivery sources, such as the California Aqueduct via the Cross Valley Canal, and for more coordinated use of the Calloway Canal for regional water management in dry and normal water years in addition to its historical use in wet periods. Figure 3.1 identifies the location of the improvements, including five individual Federal (USBR) funding sources and prior State (DWR) funding source secured to help complete the entire canal lining program.

North Kern has utilized Kern River surface water to meet agricultural water demands under a schedule of long-standing diversion rights. They contribute to the underlying groundwater basin, primarily through infiltration, through the purposeful recharge of excess surface water supplies and through deep percolation from crop irrigation. Historical water supplies to North Kern from the Kern River have ranged from less than 10,000 acre-feet per year to nearly 400,000 acre-feet per year, owing to the highly variable nature of the Kern River whose principal inflow source is snow melt runoff from the Sierra Nevada Mountains. As a result of this highly variable water supply, North Kern has developed an extensive groundwater recharge and extraction program utilizing groundwater to regulate its water supplies. Improving the effectiveness of the Calloway Canal as a water conveyance route improves North Kern's long-term water management by providing a shorter conveyance path to the district with greater conveyance capacity and efficiency.

Cawelo has a contract for 38,200 acre-feet of SWP water; with a long-term reliability estimated near 60% of that value according to the DWR's latest SWP reliability report. With the 2014 drought conditions, however, the SWP allocation was set to 5% due to a lack of surface water supplies across the state.

This project will enhance the Calloway Canal between two major regional interties, the Cross Valley Canal to the Calloway Canal Intertie (A 400 cfs Intertie to be completed in Fall of 2014, partially funded by DWR IRWM Round1 Grant) and the Calloway to Lerdo Canal Intertie (A 400 cfs Intertie, completed in 2011, partially funded with federal ARRA funds). Water delivered through these new interties can reach two other recently completed interties constructed by the Poso Creek IRWM RWMG; the North (75 cfs) and South (50 cfs) Interties between North Kern WSD and Shafter-Wasco ID (a CVP contractor) that support federal water supply management, including the San Joaquin River Settlement Water Management Goal. The RWMG identified this project as the next in a series of regional conveyance improvements, sequentially planned and implemented to improve water supply and conveyance reliability in and around the region.

The RWMG has completed CEQA (November, 2011) and NEPA (May, 2012) documents for a 25-year Banking, Transfer, and Exchange Program that allows the six districts in the Region to utilize this conveyance facility, once constructed, since these facilities were identified in the environmental documents. The use of this regional conveyance facility is immediately available for water management measures and drought preparedness once constructed. The Poso Creek IRWM Plan identified these regional conveyance improvements as part of the overall program to gain local water supply reliability lost to the Region by court actions limiting water diversions south of the Delta that have affected the availability and timing of deliveries from the CVP or SWP to the Region. Constructing facilities that increase flexibility to allow delivery of water supplies to the Region, when available, helps the Region prepare both for drought, adapt to climate change affects, and reduce ecosystem conflicts created by regulatory constraints on delivery of surface water, further exacerbating shortages from drought.



SOURCE: California Spatial Information Library, 2008; Semitropic Water Storage District, 2008; Kern County Water Agency, 2006.

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26-Jun-2014

Poso Creek IRWM Drought Grant Proposal	GEI Consultants	NKWSD CALLOWAY CANAL IMPROVEMENTS CANAL LINING
Poso Creek IRWMP Region		JULY 2014 — FIGURE 3.1

LHUD New Well and Water Storage Tank: Construct well screened for target aquifer zones with lower arsenic concentrations and tank for source reliability and blending.

Lost Hills is a DAC located 42 miles northwest of Bakersfield. LHUD provides water and sewer to the residents of the Town of Lost Hills. Specifically, LHUD provides water service to the I-5 Travel Center, residential, commercial, and industrial customers that were formerly part of the Berrenda Mesa Water District (BMWD). LHUD took over the BMWD domestic water system in 2013, and it is now part of the District's water system. In 1989, LHUD took over a water system built in the 1950s by an oil company that was active in the Lost Hills area. The primary system included two wells, one storage reservoir, one fire water tank with a booster station, and transmission and distribution pipelines. Water underlying the Town is not potable so the wells are located approximately 12 miles east of the Town and within the Semitropic WSD.

LHUD has made several upgrades, including upsize and replacement of the transmission main, upsize and replacement of distribution pipelines, rehabilitation of both wells, and addition of an arsenic treatment system. The BMWD domestic water system includes a booster pump station near LHUD's storage reservoir, 18 miles of pipeline, and three distribution tanks, each with booster pump stations. The proposed New Well No.3 project site is located approximately 1,000 feet east of the existing East Well. The site is located on the western side of an 80-acre property owned by LHUD, 12 miles east of the service area, within Semitropic WSD. The proposed New Tank project site is located approximately 300 feet north of the existing tank.

Recent drought conditions have caused groundwater levels to decrease severely in the vicinity of the LHUD's wells, as such two primary urgent issues face LHUD as it risks losing reliability of their drinking water supply: 1) the existing well pumps will be at risk of failure if groundwater levels drop below minimum NPSH and 2) reduced flows from each existing well causing LHUD to be at risk of not meeting maximum daily demand (MDD) with the highest capacity well offline. To address these issues LHUD will construct a new well that is at adequate depth and with adequate flow capacity to address existing drought and future needs. In addition, the well would be developed using zone testing to minimize the arsenic concentration being pumped. The existing wells were developed prior to the knowledge of the arsenic issue so LHUD has little control over arsenic concentrations being produced from existing wells. A new well has the potential to reduce the need for arsenic treatment and reduce the associated AsWTP O&M costs.

This Project proposes installation of a new well sized to provide 300-800 gpm of flow with 40 to 100 hp motors, which account for the recent decrease in groundwater levels.

- Develop well to a depth of at 800 feet
- Place pump at 520 feet minimum
- Screened intervals to be determined based on zone testing
- New 40-100 hp motor depending on final sizing
- New 8-in diameter pipeline from the well to the existing AsWTP raw water storage tanks
- Receipt of well development approval from CDPH

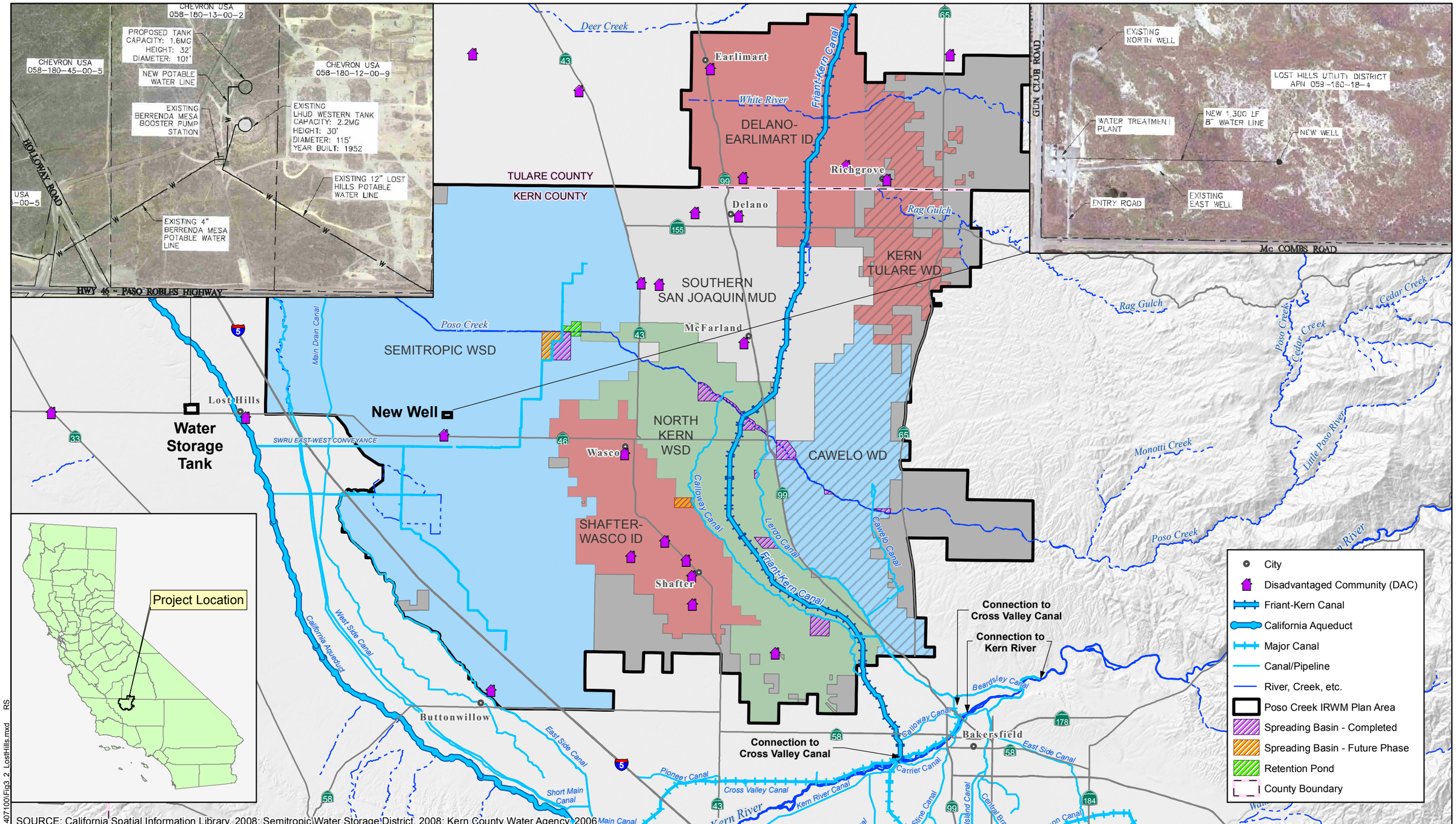
The new well would serve multiple purposes:

- Increase reliability of safe drinking water
- Provide adequate flows to meet existing MDD at current groundwater levels.
- Reduce reliance on 60+ year old East Well and, as a result, increase reliability of meeting future MDD
- Reduce use of wells producing high arsenic concentrations

Installing an 800 gpm well will allow for less dependence on the North and East well. Additionally, the well may eliminate the need for Arsenic treatment altogether. Water quantity should not be an issue since the pump will be located well below existing groundwater levels. To address the issue of water quality due to the presence of arsenic in the groundwater LHUD plans to conduct zone testing during development of the new well to minimize pumping in arsenic zone(s). Selective screening may reduce the arsenic concentration in pumped groundwater and the associated cost of operating the AsWTP.

The Storage Reservoir has been an integral part of supplying water to LHUD's demands and the Water Master Plan listed the Tank as the highest priority project to maintain potable water service to this DAC. The two wells, WTP and Transfer pumps generally operate to supply the system demands while filling the 2.0 MG storage tank. Once the tank is full, water demands for the following day are satisfied through further well pumping and from the "operational" storage in the tank.

Expedited funding for this project is being sought to assist LHUD maintain a reliable source of drinking water without additional economic burden on their economically disadvantaged users. Without this funding the community runs the risk of not having a reliable and safe water supply.



SOURCE: California Spatial Information Library, 2008; Semitropic Water Storage District, 2008; Kern County Water Agency, 2006

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N W E S

Poso Creek IRWM
Drought Grant Proposal

Poso Creek IRWMP Region

GEI Consultants
Bookman-Edmonston Division

LOST HILLS UTILITY DISTRICT
NEW WELL AND WATER STORAGETANK
PROJECT LOCATION

JULY 2014

FIGURE 3.2

23-Jun-2014 Z:\Projects\1407100\Fig3_2_LostHills.mxd RS

City of McFarland Reservoir, Booster Pump Station, and System Intertie: Intertie lower arsenic concentration well and add reservoir for improved reliability, blending, and reduced energy.

The proposed project, shown in Figure 3.3, includes the construction of a new 1.0 million gallon welded steel reservoir, a booster pump station, and system intertie improvements to improve the conveyance capacity of the water system between the east and west side of Highway 99. Construction of a new water storage reservoir and booster pump station at the existing Browning Road Well facility will improve the water supply system's reliability. Currently the system has only one storage tank which is located west of Highway 99. PG&E provides electricity west of Highway 99 and SCE provides electricity east of Highway 99.

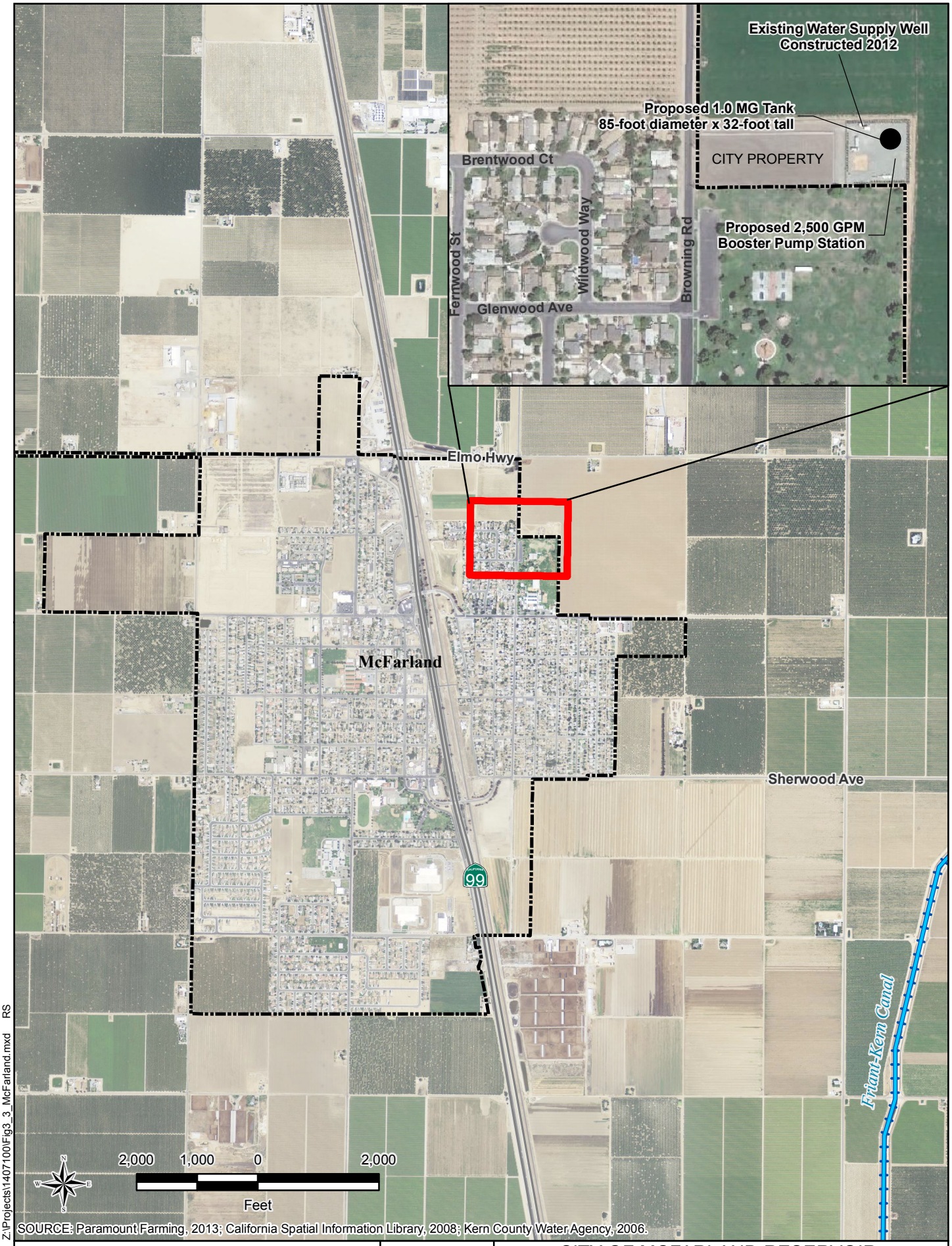
The City of McFarland relies exclusively on groundwater as its water supply source, with three active supply wells including the recently constructed Browning Road Well. The City is immediately surrounded by agriculture including a mix of vineyards and orchards. Due to ongoing drought conditions, groundwater pumping has increased for irrigation to meet the water requirements of the agriculture crops.

Two of the City's existing water supply wells, Taylor Well and Well No. 6, have Arsenic concentration levels that are historically borderline of the Arsenic maximum contaminant level (MCL) ranging generally between 8-9 ppb during routine well sampling. Worsening drought conditions could negatively affect the existing source water quality. This would occur by lowering the of the groundwater level such that the well(s) draw from a lower portion of the aquifer thereby reducing or eliminating the water production from upper zones of the aquifer that normally yield lower arsenic concentrations. This could potentially lead to an increase in the Arsenic concentration of the groundwater above the established (MCL) of 10 ppb.

The proposed Project will provide a pipeline intertie between the distribution system piping west of Highway 99 and east of Highway 99 to increase the conveyance capacity of the Browning Road Well Facility booster pump station to supply the west side of the City. Completing the system intertie will allow the city to protect and increase the reliability of safe drinking water to the disadvantaged community west of Highway 99. The Project would provide an overall increase in the amount of the production capacity of the Browning Road Well Facility to meet the drinking water needs of the entire service area. The Browning Road Well was constructed recently using targeted placement of the well screen in aquifer zone of lower arsenic concentrations, has lower arsenic concentrations compared to Taylor Well and Well No. 6. Therefore, once these system improvements are completed, the City can better blend the production from the wells and could better absorb the loss of production and quality in the event that lowering groundwater levels cause the loss of a well and affect the groundwater production and quality. In the event that groundwater levels in and around the City drop below the pump setting depth of any of the City's supply wells, having additional storage capacity would aid in allowing the City to continue water service to the City's residents for several days until provisions could be made to lower the affected well(s) pump setting depth.

The City currently uses a storage reservoir and booster pump station on the west side of Highway 99 to provide water to its customers during peak and off-peak hours to reduce the usage of the supply wells during this time period. This is done both in an effort to reduce the electricity cost and also reduce the electricity demand during the peak hours of the day. Installing the proposed 1.0 million gallon reservoir would allow the City to further reduce electrical demand during peak hours and take advantage of time- of-use pumping. Over the long term operation of the reservoir and booster pump station, funding the project would provide the economic capacity for drought preparedness, significantly reduce energy usage during peak hours, and allow the City to maintain reasonable, affordable water rates in the disadvantaged community.

An additional benefit is that by constructing a new storage reservoir and pump station on the east side of Highway 99, in the event of a power loss by either electric utility provider the new storage tank and booster pump station would remain operational until power is restored as the Browning Road Well Facility is equipped with a diesel generator which was adequately sized to power the proposed booster pumps and the Browning Road Well pump simultaneously.



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26-Jun-2014

Poso Creek IRWM Drought Grant Proposal	GEI Consultants	CITY OF MCFARLAND RESERVOIR, BOOSTER PUMP AND SYSTEM INTERTIE
Poso Creek IRWM Region		JULY 2014 FIGURE 3.3

PROJECT PHYSICAL BENEFITS

Project 1 Physical Benefits

Project 1, Calloway Canal Improvements for lining the Calloway Canal will provide a new, effective conveyance route, or pathway, for delivering water from the California Aqueduct to Cawelo, North Kern, and Shafter-Wasco, reduce seepage losses, and reduce energy demands by avoiding the need to lift water along a portion of the CVC and from the CVC to the Beardsley Canal at Pump Station A, and increase operational flexibility for both North Kern and Cawelo. North Kern growers will benefit from routing water through the Calloway Canal as it will give them flexibility and access to surface water that may be made available to North Kern for storage on behalf of neighboring districts, routed through the CVC to Calloway Canal Intertie to the Calloway Canal sections improved by the lining.

Estimated amount of water saved following project completion: The estimated amount of water conserved by lining Reaches A through D of the Calloway Canal is 4,400 acre-feet per year. This volume is estimated by examining the 2,515 acre-foot average annual seepage now lost to irrecoverable groundwater during present operations in Reaches A through D and adding the additional 1,885 acre-feet per year expected to be conserved once construction of the CVC to Calloway Canal Intertie and the Calloway Canal Lining are completed and the lined Calloway Canal becomes the primary regional route for water conveyance, as seen on Figure 3.1.

Estimated amount of water conserved by the project is 4,400 acre-feet per year.

Energy-Use and GHG Emission Reduction: As previously explained lining of Reaches A through D of the Calloway Canal would result in a net increase to annual water supplies of approximately 4,400 acre-feet based on avoided seepage to unusable groundwater, irrecoverable losses. The 'additional' yearly supply would be applied to meet existing irrigation demands thereby decreasing groundwater pumping requirements and reducing the energy consumed for groundwater pumping. This correlates to an average annual energy savings of 3,179 MWh and a reduction of GHG of 1,436 MT CO2e.

Reduced groundwater pumping in the District of 4,400 acre-feet per year represents an annual energy savings of $381,527 per year (based on average energy costs of $0.12 per kWh) and 1,436 MT CO2e.

Project 2 Physical Benefits

Lost Hills Utility District has 299 residential, 3 multi-family, and 85 commercial service connections and production over one year is approximately 125 MG or 383.6 AF per year (according to the LHUD Engineer).

Given the "with" or "without" Project conditions, both meet the drinking water needs; however, the Project costs capital to ensure the DAC with short-term drought and long-term reliability of safe water. The "with" Project condition can realize operational treatment saving.

Both this Project and Project 3 will increase local water supply reliability and protect and provide access of safe drinking water to a small DAC in an area presently managing their water supply for arsenic.

Both the DAC Projects, Project 2 and Project 3, will increase the participation of DACs in the implementation component of the IRWM process, addresses the safe drinking water needs of DACs, and advances the consideration of Human Right to Water needs within the Region by providing access to safe, clean, and affordable water, adequate for human consumption and cooking for the DACs.

Project 3 Physical Benefits

McFarland has approximately 2,623 service connections and produced approximately 2,185 ac-ft in 2013 (last year), (according to the City of McFarland Engineer). The "with" Project condition protects the arsenic levels (quality) of the City's groundwater supply served to customers as the Project would provide an overall increase in the production capacity of the existing Browning Road Well, meaning an increase in the proportion of the water served originating from the newer well that has lower arsenic concentrations compared to Taylor Well and Well No. 6.

Construction of this project would enhance the local water supply reliability by providing the City with increased storage capacity and system redundancy. Constructing a new water storage reservoir east of Highway 99 will enhance the system's reliability in the event of a failure of one of the City's water supply wells to meet minimum standards for meeting demand and MCL levels for Arsenic, and would allow the City to still meet the water demand while repairs are made. In addition, the new water storage reservoir and booster pump station will be constructed at the existing Browning Road Well facility which is equipped with an emergency backup diesel generator which can power the booster pumps and the existing well pump simultaneously and remain fully operational in the event of a power outage east of Highway 99. The Project also increases the water system's operational flexibility by providing additional water storage capacity.

Energy Conservation during Peak Hours: In addition, the project will improve the overall efficiency of the City's water system by allowing the City to take advantage of time of use pumping and run the groundwater supply well during non-peak hours to reduce the electricity cost. By increasing the overall efficiency of the system and adding to the system's time-of-use pumping capacity, energy costs for operation of the system will decrease, thereby helping the City maintain reasonable water rates for this disadvantaged community.

Installing the proposed reservoir will allow the City to take advantage of time-of-use pumping and reduce or eliminate usage of well pumps during summer period peak hours between May 1st and October 31st from 12:00 pm to 6:00 pm, when electricity costs are at their highest. This will significantly reduce electrical costs by approximately 30%-35%.

The estimated energy cost savings during summer period peak hours as a result of the proposed construction of the water storage reservoir and booster pump station is estimated as a Projected Annual Savings of $9,745 and a Total Savings over Life of the Project (50 yrs) of $487,233. The project is not locally cost effective on the basis of these energy cost savings as the estimated project capital cost is 2.6 million dollars. However; over the long term, operation of the water storage reservoir and booster pump station during peak hours will significantly reduce energy costs and continue to allow the City to maintain reasonable water rates in the disadvantaged community.

Table 5.1.1 – Annual Project Physical Benefits

Project Name: North Kern WSD Calloway Canal Improvements
Type of Benefit Claimed: Reduced Seepage, Conservation of Groundwater
Units of the Benefit Claimed: Acre-Feet per Year (Average Annual)
Additional Information About this Benefit Reduced seepage to poor water quality area

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	0	4,400	4,400
2016-2066	0	220,000	220,000
Comments: Based on flow measurements along the canal (Buck Owens Weir and the Olive Drive Weir) , Page 7 Calloway Canal Improvements Technical Report			

Table 5.1.2 – Annual Project Physical Benefits

Project Name: North Kern WSD Calloway Canal Improvements
Type of Benefit Claimed: Energy Conservation
Units of the Benefit Claimed: Dollars per Year
Additional Information About this Benefit Economic Efficiency

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	$3,439,378	$3,057,851	$381,527
2016-2066	$171,968,900	$152,892,550	$19,076,350
Comments: Based on average pre project pumping, and average energy rate of $0.12/kWh. Table 5-6 Calloway Canal Technical Report			

Table 5.2.1 – Annual Project Physical Benefits Project Name: Lost Hills New Well and Tank Replacement Type of Benefit Claimed: Avoided Operation Cost Units of the Benefit Claimed: Dollars per Year Additional Information About this Benefit Includes treatment chemical costs and equipment power cost savings			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	39,000	0	($39,000)
2016-2065	516,204	0	(516,204)
Comments: Based on information provided to the Poso Creek IRWM RWMG from the LHUD Engineer			

Table 5.2.2 – Annual Project Physical Benefits Project Name: Lost Hills New Well and Tank Replacement Type of Benefit Claimed: Provide access to safe drinking water Units of the Benefit Claimed: Connections Served Additional Information About this Benefit Safe Drinking water reliability increases with Project			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	387	387	0
2016-2066	387	387	0
Comments: Based on number of connections Lost Hills Utility District services 299 residential, 3 multi-family, and 85 commercial connections and yearly production according to the LHUD Consultant Engineer. It costs capital to maintain water reliability.			

Table 5.2.3 – Annual Project Physical Benefits Project Name: Lost Hills New Well and Tank Replacement Type of Benefit Claimed: Access to clean water allowing for blending, avoiding treatment costs Units of the Benefit Claimed: Parts Per Billion (ppb) Additional Information About this Benefit Provides the community with access to safe drinking water			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	11-15	7-9	4-6
2016-2065	11-15	7-9	4-6
Comments: Based on LHUD Well Tests, levels of Arsenic before and after new well and storage tank improvements; without Project LHUD is treating the source water.			

Table 5.3.1 – Annual Project Physical Benefits Project Name: City of McFarland Browning Road 1.0MG Reservoir, Booster Pump Station, and System Intertie Type of Benefit Claimed: Provide access and local reliability to safe drinking water Units of the Benefit Claimed: Connections Served Additional Information About this Benefit Provides DAC access to safe drinking water			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	2,623	2,623	0
2016-2066	2,623	2,623	0
Comments: McFarland has approximately 2,623 service connections and produced approximately 2,185 AF in 2013, according to the City of McFarland Consultant Engineer.			

Table 5.3.2 – Annual Project Physical Benefits Project Name: City of McFarland Browning Road 1.0MG Reservoir, Booster Pump Station, and System Intertie Type of Benefit Claimed: Energy Conservation Units of the Benefit Claimed: Dollars Saved Per Year Additional Information About this Benefit Economic Efficiency			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2016	$9,744.66	$0	$9,744.66
2016-2066	$487,233	$0	$487,233
Comments: Estimate assumes continuous operation at 1,000 gpm throughout the summer period (May 1st – October 31st), 2013 POSO IRWM Table 3; Engineer's estimate was based on what would be saved or reduced by the operation with new system components.			

If awarded funding, a Project Performance Monitoring Plan will be developed to track the performance of each project that receives funding. The following lists each Project's benefits with the main tools to be used to track the targets to determine performance of the Proposal, therefore, tracking the benefits with measured performance parameters.

Table A-2 – Project Performance Monitoring Project: Poso Creek IRWM 2014 Drought Proposal, Projects 1, 2, and 3		
Proposed Physical Benefits	Measurement tools and methods	Targets
Project 1 – AFY Surface Water delivered	Flow measurements at weirs or bi-directional sonic flow meter	Annual AF differences between measurement points, upstream and downstream of the canal lining.
Project 2 – Cost of Treatment	Annual Treatment Volumes, cost to treat	Reduction of treatment costs once system improved as compared to past operations
Project 3 – Avoid costly treatment, reduced energy of annual operations	Annual volumes of drinking water served to customers in service area; level of treatment and annual cost to treat; annual energy costs.	Annual volumes of drinking water served to customers in service area; level of treatment, blending or additional treatment costs; annual energy costs per million gallons served.

TECHNICAL ANALYSIS OF PHYSICAL BENEFITS CLAIMED

Project 1 Physical Benefits

The methods for determining the quantifiable water savings and improved water management are discussed in pages 7-9 of the Calloway Canal Technical Report the District. Historical analysis supplementing the water savings are reported in the North Kern Water Storage District Calloway Canal Diversion Summary available from the annual Kern River Report prepared by the City of Bakersfield. The Diversion Summary demonstrates that the Calloway Canal has been predominantly used by the regional districts, including North Kern, during "wet" hydrologic years when excess surface water supplies were distributed around the region for groundwater recharge. By contrast, the canal has been little used during dry periods, largely because of the high seepage losses associated with its current unlined condition.

To determine the average annual seepage losses two different flow measurement locations along the canal were compared, specifically the Buck Owens Weir and the Olive Drive Weir, which includes the Reaches A through D. Taking into account deliveries and inflows to the Calloway Canal, the difference in water measures at the two weir locations was considered the amount of water lost due to seepage (with evaporative losses considered to be negligible). As summarized in Table 5-2, the 6.2 mile canal length between the weirs lost on average 6,975 acre-feet annually (1,125 acre-feet per year per mile of canal). However, because the canal was only operated for parts of the year, average annual or monthly values are not reflective of daily seepage rates. Table 5-3 considers only the summer periods when the canal was typically operated for an entire month. During these periods, the average monthly loss was 1,994 acre-feet per month or 322 acre-feet per month per mile, a rate equivalent to an **average daily seepage rate of 11 acre-feet per day per mile**.

As noted in the Diversion Summary, Calloway Canal operations averaged 3.14 months per year (96 days per year). The length of Reaches A through D to be lined as part of this project is roughly 12,554 feet (2.38 miles). Therefore, the amount of water saved along this reach can be calculated as 2,515 acre-feet per year (11 acre-feet per day-mile x 2.38 miles x 96 days per year) based solely on the historical use of these facilities. Table 5-1 of the Calloway Canal Technical Report also shows the average annual flow in this reach of the Calloway Canal is 31,458 acre-feet. Therefore the percentage of the historical flow to be conserved by lining Reaches A through D is about 8.0 percent (2,515 acre-feet water saved along the reaches / 31,458 acre-feet annual flow).

The volume of water conserved from future conveyance in the Calloway Canal was estimated by examining historical data for water conveyance along the current delivery route and assuming a similar quantity will be delivered through the "new" delivery route (shown in Figure 3-1). The average annual conveyance shown in Table 5-5 of 24,833 acre-feet reflects the average annual delivery to Cawelo, North Kern and the KCWA, that typically occurs over 3.1 months per year. Comparing these monthly operations (Table 5-5 of the Calloway Canal Technical Report) with Calloway Canal historical monthly operations (Table 5-1 of the Calloway Canal Technical Report) suggests that that the Calloway Canal could see an increased operation of around 2.4 months per year (72 days per year). As such, the amount of avoided seepage due to increased water use in canal would be approximately 1,885 acre-feet per year (11 acre-feet per day-mile x 2.38 miles x 72 days), representing 7.6 percent of the expected deliveries (1,885 acre-feet water saved along reaches / 24,833 acre-feet of increased annual flow).

Adding the projected average annual additional flows of 24,833 acre-feet to the historic wet year flows of 31,458 conveyed in the Calloway Canal yields, an average of 56,291 acre-feet per year with water conservation benefits due to lining of Reaches A through D being credited to the full amount while the additional flow value of 24,833 acre-feet would be credited as being better managed. The conserved water represents about 7.8 percent of the combined historic and future flows (4,400 acre-feet water saved along reach / 56,291 acre-feet of total flow along canal). Note that the post-project seepage losses are expected to be negligible since the concrete lining will dramatically decrease the current seepage losses.

The analysis concerning the energy benefits of the project are further discussed in pages 9-10 of the Calloway Canal Technical Report. The lining of Reaches A through D of the Calloway Canal is expected to have a useful life of 50 years resulting in an additional 220,000 acre-feet in storage at the end of 50 years. Over North Kern's gross irrigated area of about 55,000 acres, this amounts to 4.0 acre-feet per acre (220,000 acre-feet / 55,000 acres). The corresponding water level rise at the end of 50 years would be about 22.2 feet (4.0 acre-feet per acre / 0.18 acre-feet per acre per foot of water level rise). The average water level rise over this period would be one-half of this amount, or about 11.1 feet. Based on an average pumping lift of 250 feet and average energy cost of $0.12 per kWh, both typical values for water users in the District, the value of the decreased pumping lift along with reduced groundwater pumping of 4,400 acre-feet per year represents an average annual energy savings of $381,527 per year as shown on Table 5-6. This correlates to an average annual energy savings of 3,179 MWh and a reduction of GHG of 1,436 MT CO2e. Given the hydraulic continuity of the underlying groundwater with adjoining districts (i.e., shared regional groundwater basin); it is not likely that North Kern would realize all of this benefit; however, it would be realized by the region as a whole. While the lift benefit would be less on a regional basis, more groundwater pumping would be involved in the larger area. Accordingly, making the energy benefit calculations strictly on the basis of North Kern is believed to be representative of the magnitude of the benefit.

Project 2 Physical Benefits

The Lost Hills Utility District (LHUD or District) has prepared a Master Water Plan (May 2014) and two Preliminary Engineering Reports (PER) to assist the District's decision to construct a new groundwater well to address short-term impacts from existing drought conditions, to provide more reliable water system infrastructure for the community, and to assist the District's construction of a water storage tank replacement to address the severe condition of the existing storage tank. In addition, the tank provides daily storage to better match production with peak demand on top of the ability for the water system wells to match production with demand. Due to the falling ground water table, the District has lost some supply (production capacity) from the existing wells. Replacing the existing tank will restore the District' ability to provide an adequate and reliable water supply.

LHUD's two existing wells, North Well and East Well, pump groundwater from the lower or confined layer. Poor water quality exists above layer, and the water quality beneath the layer is adequate but deteriorates with depth. The wells are sited approximately 12 miles east of the Town due to groundwater with high total dissolved solids concentrations in the west side of San Joaquin Valley. High levels of arsenic occur locally and appear to be associated with lakebed areas that exist along the west side of the Valley. Concentrations vary from just below 10 ppb to 50 ppb and instigated the need for construction of the AsWTP in 2008. LHUD has little control over management of their groundwater basin since agricultural pumping surrounds the community and agricultural pumping far exceeds the District's groundwater production. LHUD does not have any alternative water supplies to groundwater so the District must be conservative in anticipating groundwater basin issues affecting their sole water supply, such as significant decreases in groundwater levels.

LHUD's recently completed Water System Master Plan identified the need for a new well to meet maximum day demand (MDD) with the highest capacity well offline and in case of significant failure of the East Well and replacement of the existing distribution system storage tank to provide reliable drinking water. The master plan did not address near-term impacts from the current drought, which has resulted in static groundwater levels decreasing since finalizing the Master Plan. Groundwater levels, while pumping at the District's existing wells, are within 70 feet of the pump net pressure suction head (NPSH) limit. NPSH is the minimum head above the pump inlet required to keep the pump from cavitation. LHUD staff measured the water table in December 2013 and April 2014. The depth to water table is 327 ft bgs in the North Well and 317 ft bgs in the east well.

LHUD's East Well was constructed in 1954 at a depth of 615 feet, and the North Well was drilled in 1988 to a depth of 623 feet and screened from 450 feet to 600 feet. Static water depth, historically, ranges between 200 and 300 below ground surface, however, the water levels are dropping due to the severity of the 2014 drought that was preceded by two years of drought. Both well pumps are 75 hp and have a rated flow of 500 gpm at total design head of 384 feet. Generally, the East Well produces groundwater with lower arsenic concentrations than the groundwater produced by the North Well. Both wells were rehabilitated in 2008.

	North Well	**East Well**	**Well 3 (Proposed)**
Pumping/Flow Rate (gpm)	520	560	300-800
Pump Motor Size (HP)	75	75	50-100
Current Water Table (ft bgs)	327[3]	317b	-317
Pump Depth (ft bgs)	420	420	520
Well Depth (ft bgs)	625	615	800
Screened Interval Depth (ft bgs)	450 - 600	450 - 600	TBD
Well Yield (gpm)	450[3]	450[3]	800
Well Casing Material	steel	steel	steel
Well Casing Diameter (in)	14	14	16
Age (years)	26	62	-

Project 2 Physical Benefits

As groundwater levels continue to fall as a result of the 2014 drought conditions, the well pumps must lift the groundwater higher in order to reach ground surface for delivery into the distribution system or storage tank. This decreases the well's pumping capacity and effectively reduces McFarland's production from their groundwater supply. In several areas in the Region, decreasing groundwater levels have forced agricultural water management districts to lower their pumps deeper in existing wells to avoid cavitation and maintain the required net positive suction head while operating their wells. In some cases these districts have been forced to stop groundwater pumping altogether due to groundwater levels being too low to operate their wells, there is a legitimate concern that similar scenarios could occur to DACs in and around the region, including McFarland.

The lowering groundwater levels can also affect the quality. McFarland's newer well was drilled to average depth of approximately 1,000-feet to achieve water quality that meets US Environmental Protection Agency's (EPA) Drinking Water Standards and also as long-term preparation for drought and to prepare for decreasing groundwater levels. Arsenic is the primary contaminant of concern for McFarland and the regulated contaminant occurs naturally in the soil. Previous zone testing results show that the arsenic concentration in the groundwater is generally highest at depths greater than 750 feet below ground surface (BGS), with concentrations highest between approximately 930-970 feet BGS. As groundwater levels continue to fall in the region, more water is pulled from the lower strata in the aquifer which could potentially cause the arsenic concentration levels to increase above the MCL. This may lead to required treatment for arsenic removal in order to comply with the State MCL of 10 ppb.

Additional system storage capacity may also allow McFarland to meet system demands in the event a well must be turned off due to water quality changes. Should the City be forced to lower any of the well pumps, they will temporarily be without one of their water supply sources and thus construction of a new one million gallon welded steel reservoir and booster pump plant at the Browning Road Well Facility would be vital in providing the City with the flexibility to continue supplying water to the system out of the storage reservoir while the well pump is being lowered. If the drought or dry year conditions continue into 2015, the Region will see continued use of ground water and the conjunctive use condition where the amount of water extracted exceeds the amount of ground water recharging the basin. The estimated energy cost savings during summer period peak hours as a result of the proposed construction of the water storage reservoir and booster pump station is shown below.

	Water Horsepower (WHP)	**Energy Demand (KW)**	**Energy Cost ($/kw-hr)**	**Energy Cost ($/hr)**	**Hours per year**	**Total cost**
Municipal Well to Tank (During Off-Peak Hours)	96	75.0	$0.23	$17.25	774	$13,351.50
Booster Pump Station to System(During Peak Hours)	32	25.1	$0.40	$10.04	774	$7,770.96
Municipal Well to System(During Peak Hours)	123	99.7	$0.40	$39.88	774	$30,867.12
			Projected Annual Savings:			$9,744.66
			Total Savings over Life of the Project (50 yrs):			$487,233.00

COST EFFECTIVE ANALYSIS

A cost effective analysis is provided as follows for each project to evaluate whether the physical benefits provided by the project are provided at the least possible cost. Table 6 is provided for each project.

Table 6 – Cost Effective Analysis Project name: North Kern WSD Calloway Canal Improvements	
Question 1	Types of benefits provided as shown in Table 5 Reduced Seepage, Conservation of Groundwater, Reduced Energy, and Reduced GHG Emissions.
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** No.
	If no, why? Lining the Calloway Canal in necessary to necessary remaining component to complete the improvements to the regional conveyance system that will allow a new, higher conveyance capacity route for delivery of surface supplies, when available, into the region. Lining this portion of the Calloway Canal links two regional Interties, each intertie cost roughly over $12,000,000 each to construct. An alternative method for canal lining is being used north of the proposed section, which is to apply bentonite to reduce seepage, is adequate where seepage contributes to the groundwater in areas near the districts and into groundwater suitable for reuse without treatment. However, the bentonite is less effective and not a long-term, 50-year solution in comparison to the concrete lining that will avoid seepage of water to the poor quality groundwater area. Alternative methods to reducing canal seepage losses in terms of an improved route to deliver the surface water to the districts was considered, such as, purchasing of water to replenish the local groundwater, was evaluated by the Poso Creek IRWM RWMG as part of the Prop 84 IRWM Implementation Grant application for the Cross Valley Canal to the Calloway Canal Intertie. Since that time, 2011, the districts have experienced three years of drought. The estimated cost of surface supplies has drastically increased. Especially in the drought year of 2014, the water purchase price has basically, doubled, tripled, and quadrupled in a matter of months.
	If yes, list the methods (including the proposed project) and estimated costs.
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** Canal lining is the preferable, long-term solution that will allow the region to conserve groundwater resulting from operating the new regional conveyance route.
Comments:	

Table 6 – Cost Effective Analysis Project name: Lost Hills New Well and Water Storage Tank	
Question 1	**Types of benefits provided:** Water Quality, Water Supply Reliability
Question 2	**Have alternative methods of providing the same types and amounts of physical benefits as the proposed project been identified?** Yes. LHUD completed a Water Water Plan, funded by DWR through the Poso Creek IRWM Round 1 Proposal. LHUD has also completed two Preliminary Engineering Reports, in May 2014, which contain an alternatives analysis for the Well and for the Tank. DWR is providing Technical Assistance funding to LHUD in 2014 for the final design of the Tank.
	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs: An alternative to pumping groundwater would be for Lost Hills Utility District (LHUD) to begin receiving State Water Project (SWP) water and construct a treatment facility or to connect with the nearest community system, over 9 miles away. LHUD's Engineer completed an alternative analysis as part of the Preliminary Engineering Report, May 2014. Obtaining SWP and construction of a water treatment facility would exceed $7 million. Obtaining water from nearest community is estimated at roughly $10 million. A new water storage tank would still need to be constructed with either of these this alternatives. The District came to the conclusion that the alternatives were much more expensive, time consuming, and did not provide the same level of benefit as the New Well and Tank Replacement Project.
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** **As stated in the PERs….** To address immediate issues caused by the falling groundwater levels, the District could: • Lower the pump column and add pump bowls to increase the pump head output and restore historical well production capacity • Lower the pump column and install a new pump to increase upon historical well production capacity Another approach is to address longer-term issues at the same time that immediate issues are addressed. For example, the District could: • Construct a new well that is at adequate depth and with adequate flow capacity to address existing and future needs. • Acquire SWP rights and construct a WTP • Import groundwater pumped by the City of Wasco, which is the closest municipal water supplier and located approximately 9 miles to the east In order to address the replacement of the existing reservoir, a few alternatives were considered and evaluated. For example, the District could: • Optimization of the existing reservoir. • Acquire SWP rights and construct a WTP • Import groundwater pumped by the City of Wasco, which is the closest municipal water supplier and located approximately 9 miles to the east. Also stated in the PERs, the existing Tank was diver inspected and found to be of such poor condition that is cannot be repaired and still meet structural integrity.
Comments: The tank replacement was identified as needed in all Project alternatives. The District has determined that the benefit/cost ratio of drilling a new groundwater well is greater than the benefit/cost ration of receiving SWP water and constructing a water treatment facility or obtaining water from the nearest community.	

Table 6 – Cost Effective Analysis Project name: City of McFarland Reservoir, Booster Pump, and System Intertie	
Question 1	**Types of benefits provided:** Provide access to local, reliable safe drinking water that meets MCLs
Question 2	**Have alternative methods of providing the same types and amounts of physical benefits as the proposed project been identified?** No.
	If no, why? The City of McFarland has invested in their local drinking water infrastructure with several improvements, including recently constructing a new well to improve production from better quality zones of their groundwater source, preparing for times of lower groundwater levels. The proposed Project is to construct the remaining components that will allow for safe and reliable drinking water to reach the entire service area and alleviate the drought affects that are putting a portion of the service area at risk of loss of a safer drinking water supply. A portion of the serviced area on the west side of highway 99 cannot presently be served by the new well without the improvements. The City of McFarland's Engineer has provided the recommendation on the sizing of the Reservoir, booster pump, and system intertie to make use of the City's recent investments in their new well.
	If yes, list the methods (including the proposed project) and estimated costs:
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.
Comments:	