Los Angeles County Waterworks District No. 40, Antelope Valley (District) – 60th Street West Wellhead Arsenic Treatment (Project)

This attachment provides a summary of the proposed Project, including the purpose and how the Proposal meets the needs created by the drought. It also contains the estimated physical benefits of the Project; justifies how the Project is technically feasible; describes how the Project can achieve the claimed level of benefits; and explains whether the benefits will be attained through the least cost alternative.

Project Summary Table

The Project in this proposal meets three of the Drought Project Elements and five of the IRWM Project Elements as indicated in the table.

	Drought Project Element	**60th St. West Wellhead Arsenic Treatment**
D.1	Provide immediate regional drought preparedness	X
D.2	Increase local water supply reliability and the delivery of safe drinking water	X
D.3	Assist water supplier and regions to implement conservation programs and measures that are not locally cost-effective	
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	X
	IRWM Project Element	
IR.1	Water Supply reliability, water conservation, and water use efficiency	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, monitoring	
IR.5	Groundwater recharge and management	X
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	X
IR.7	Water banking, exchange, reclamation, and improvement of water quality	X
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	X
IR.11	Ecosystem and fisheries restoration and protection	

Project Description

(25 Word) The Project will install an arsenic treatment system and produce 3,600 AFY at two existing wells that currently cannot provide water due to arsenic contamination.

(Expanded) The Project consists of installing an arsenic treatment system at two of the District's existing wells in the Antelope Valley that are unable to produce groundwater due to high arsenic (As[V]) contamination levels in that portion of the Antelope Valley Groundwater Basin (Basin). The current arsenic concentrations from the two wells are approximately 50-55 and 80-87 micrograms per liter (ug/L) according to lab results, which exceed the State and Federal maximum contaminant level (MCL) of 10 ug/L. The arsenic concentration is too high to allow blending with State Water Project (SWP) water as a treatment option, even under average year conditions. The Project will install a ferric oxide adsorption technology arsenic treatment system, replace the two pumps and electrical panels for the wells, install a flow meter to monitor pumping, and install approximately 1,500 feet of 12-inch water main to connect the wells to the existing potable water main. The wells will pump directly to the arsenic treatment system and the treated effluent will pump directly to the existing distribution system. The combined flow rate for the two wells is 2,500 to 3,000 gallons per minute (gpm), which would allow the production of approximately 3,600 acre-feet per year (AFY) of previous unusable safe drinking water for distribution to District customers.

This Project provides immediate regional drought preparedness by adding a new local water supply to reduce the District's dependence on imported water from the SWP. The Antelope Valley receives 100% of its imported water from the SWP and is highly dependent on both imported water and groundwater pumped from the Basin. Over the last four years, SWP water accounted for nearly 70% of the District's water supply. With SWP allocations held at only 5% due to the drought emergency in 2014, increasing access to currently unusable groundwater supply will protect District customers from drought impacts.

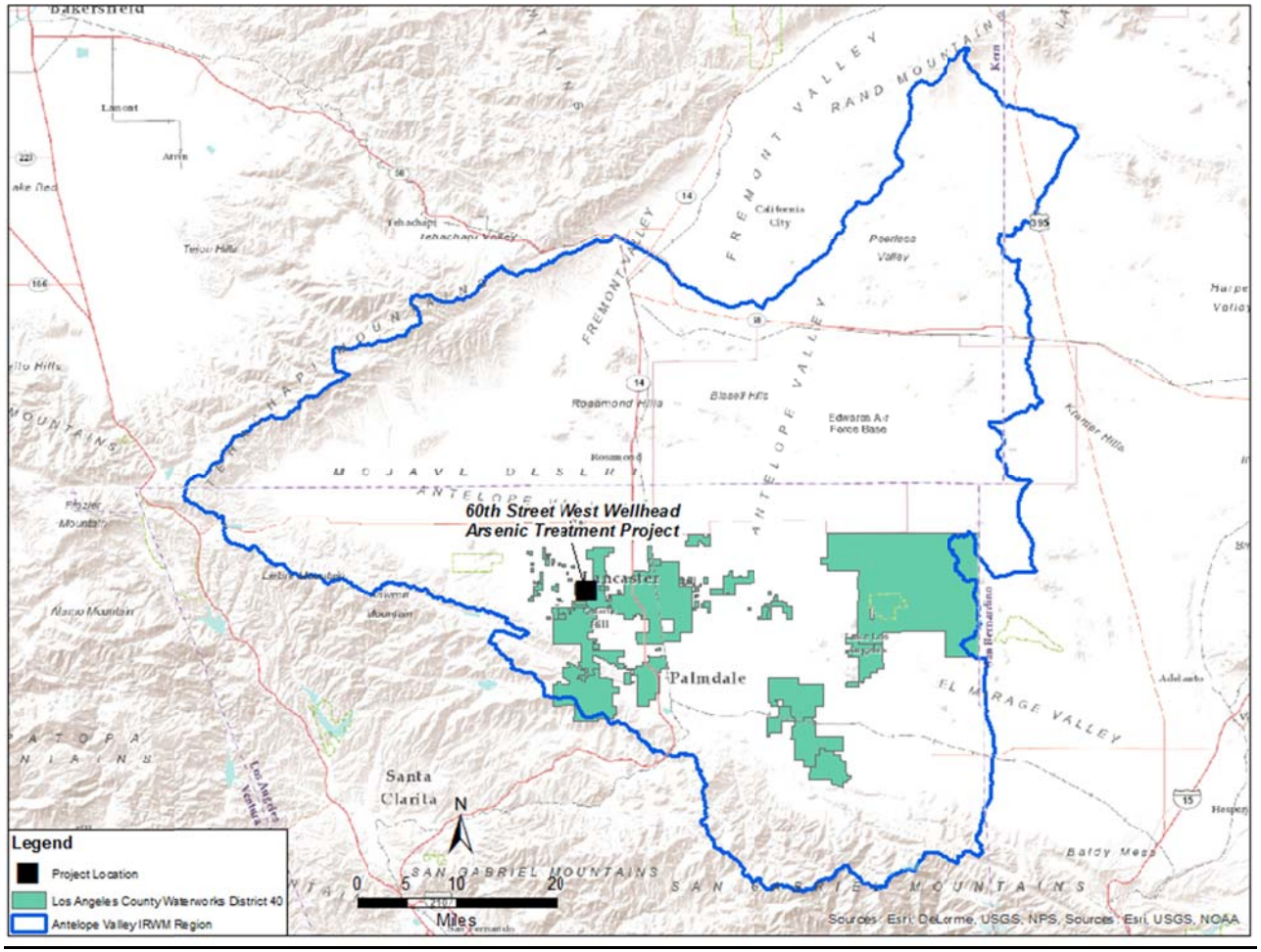
The Project increases local water supply reliability and the delivery of safe drinking water by increasing the ability to better utilize groundwater supplies in the Antelope Valley. The Project will offset 3,600 AFY of potable imported water with locally produced groundwater from an untapped portion of the Basin that is located outside the main depression zone in the aquifer (Lancaster sub-basin). As a result, the Project allows extraction in a portion of the Basin that is not experiencing extreme overdraft and will not contribute to subsidence issues in the Antelope Valley. The arsenic treatment also improves the overall water quality in the Basin, increasing the District's ability to provide reliable safe drinking water to customers.

The Project reduces water quality conflicts created by the drought by removing arsenic from currently unused groundwater well sites. Historically, the District has used both SWP and groundwater to meet customer demand. SWP water is essential for blending groundwater from fifteen of the District's high arsenic well sites to meet regulatory arsenic limits. With the recent drought, there has been an increased reliance on storage supplies; yet SWP water has not been available for blending, resulting in groundwater from fifteen wells not being utilized. The Project will treat arsenic-contaminated water (that would otherwise remain in the Basin) from two wells at another location and provide the District with a new water source that meets the aforementioned State and Federal water quality requirements, even in times of drought.

Expedited funding is needed for this Project to ensure the District can immediately comply with arsenic concentration limits and begin using a previously unusable local groundwater supply for drinking water.

Regional Map

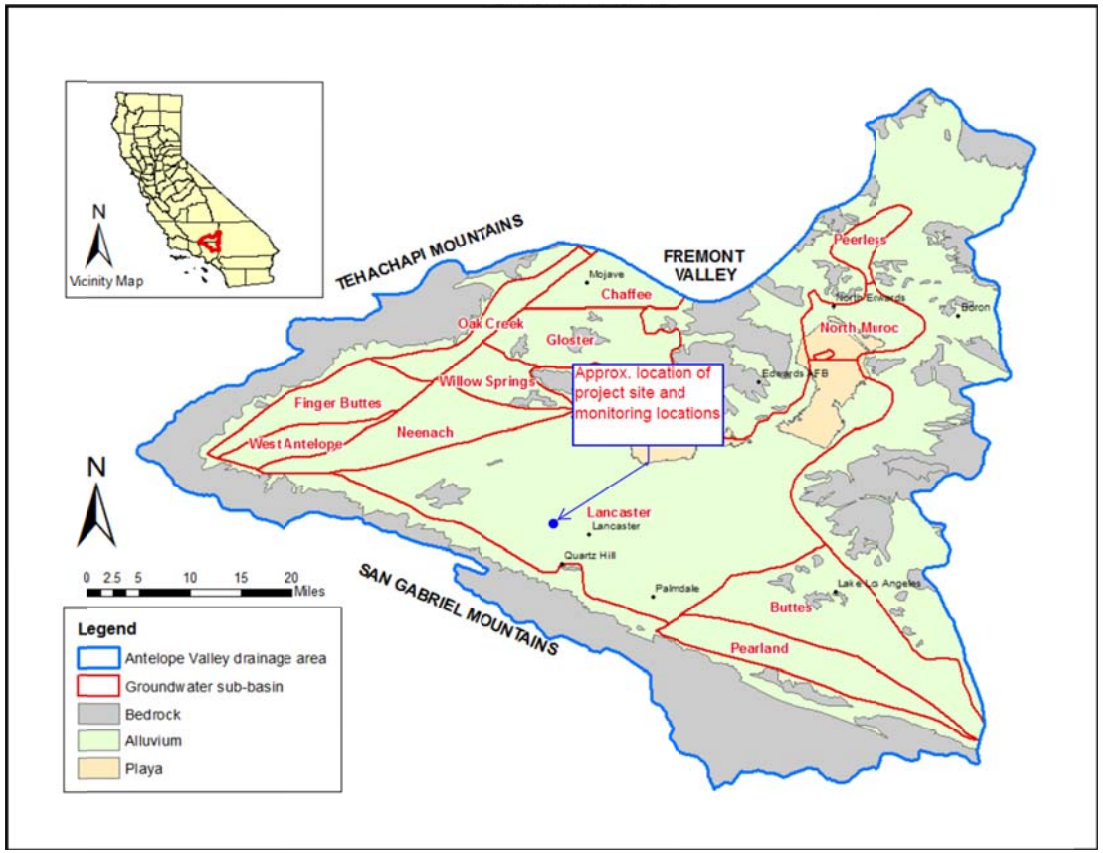
The map below shows the Antelope Valley Integrated Regional Water Management Regional Boundary and the location of the 60th Street West Wellhead Arsenic Treatment Project.



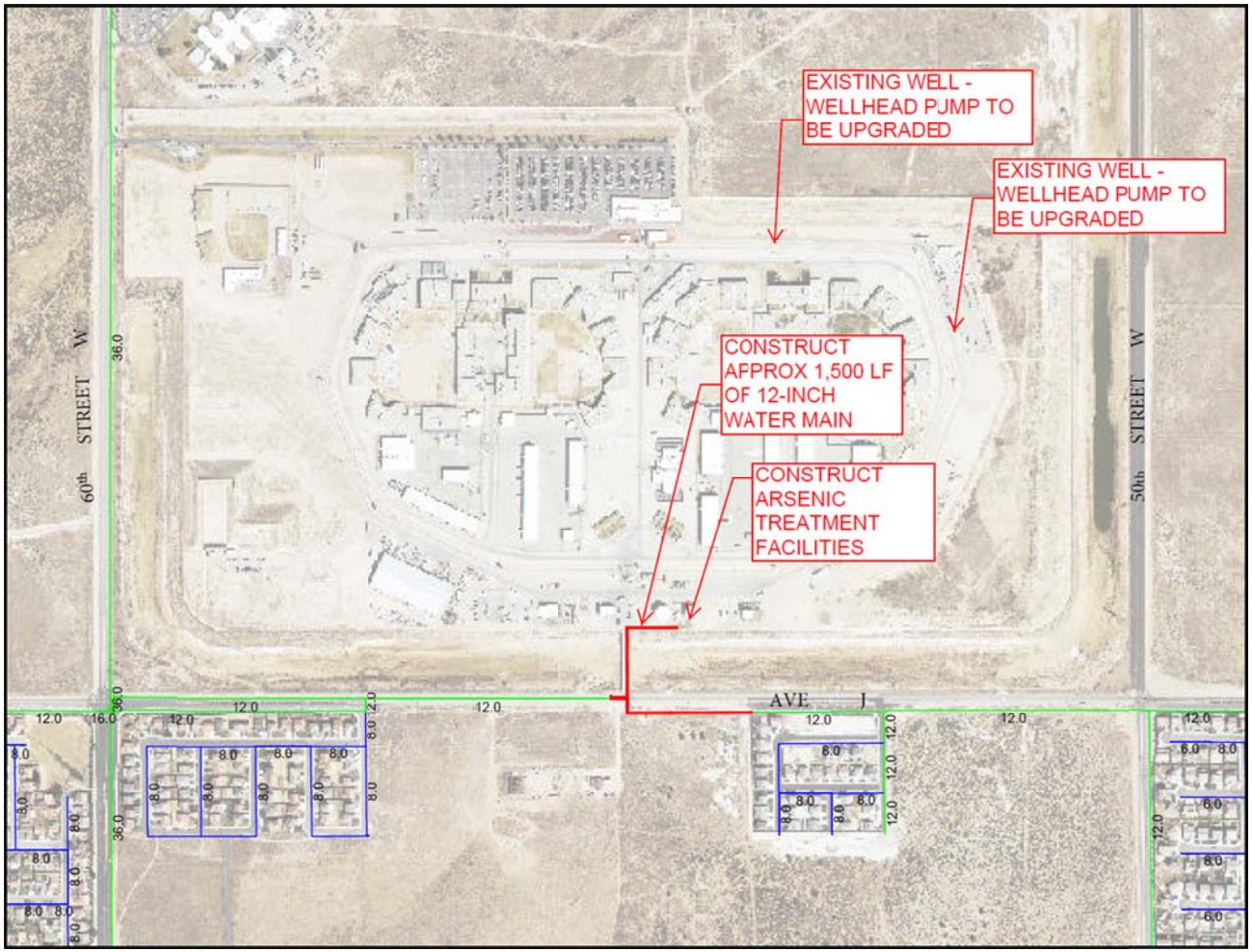
Project Map

The two maps below show the location of the Project. The first map shows the Project's geographical location in relation to the Antelope Valley Groundwater Basin, the water resource that will be affected by the Project, and the monitoring locations of the Project, which are located onsite at the wells. The second map details the Project's geographical location by showing surrounding street names, the Project's surrounding work boundaries, and the facilities that are part of the Project.

Project Vicinity Map with Groundwater Basin



Detailed Project Map



Project Physical Benefits

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increased Local Water Supplies/Reliability and Decreased Dependence on Imported Water
- Reduced Demands on the Bay-Delta
- Reduced Energy Usage
- Reduced Greenhouse Gas Emissions
- Improved Groundwater Quality

Benefit #1 – Increased Local Water Supplies/Reliability and Decreased Dependence on Imported Water

The table below provides information on the benefit of increasing local water supplies and reliability by treating arsenic contaminated groundwater. This increase in local supplies will lead to a direct reduction in imported water demands and represents the same amount as measured in AFY.

Table 5 – Annual Project Physical Benefits

Project Name: 60th Street West Wellhead Arsenic Treatment Project
Type of Benefit Claimed: Increased Local Supplies/Reliability and Decreased Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The volumes below show the increase in local water supply by treating arsenic contaminated water. The volumes below are based on a combined rate of pumping at 3,000 gpm for 18 hours per day. Because construction of the two wells will be complete by the end of December 2015 with performance testing and demobilization the first month of 2016, a full AF benefit is assumed for the year 2016.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	0	0 – Award Contract	0
2015	0	0 – Construction	0
2016 – 2036	0	3,600	3,600

Comments:

- *Test Data Sheet, BW&PC Aquifer Test (Well Efficiency Data), May 19-20, 2014:* Test results show the two existing wells are capable of pumping 3,000 gpm total when pumped together.

Benefit #2 – Reduced Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. The District uses 100% SWP water as its imported water source so all reductions in imported water purchases would lead to an equivalent direct reduction in Bay-Delta demands.

Table 5 – Annual Project Physical Benefits

Project Name: 60th Street West Wellhead Arsenic Treatment Project

Type of Benefit Claimed: Reduced Demands on the Bay-Delta

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The District uses 100% SWP water as its imported water source, so all reductions in imported water purchases would lead to a direct reduction in demands on the Bay-Delta. The volumes below indicate the reduction in demands on the Bay-Delta.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	3,600	3,600 – Award Contract	0
2015	3,600	3,600 – Construction	0
2016 -2036	3,600	0	3,600

Comments:

- *Test Data Sheet, BW&PC Aquifer Test (Well Efficiency Data), May 19-20, 2014:* Test results show the two existing wells are capable of pumping 3,000 gpm total when pumped together.
- *Personal communication with Tim Chen, Los Angeles County Waterworks District No. 40, Antelope Valley (District)*: Proportion imported water used by the District that is SWP water (100% SWP).

Benefit #3 – Reduced Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated SWP water with arsenic-treated groundwater pumped from the Antelope Valley Groundwater Basin. Approximately 3,000 kilowatt-hours (kWh /AF) are required for conveyance and pumping of SWP water to Southern California. It costs approximately $50/AF to pump and treat the groundwater for this Project. The arsenic treatment system utilizes the energy from the production well pump to move the water through the treatment system, resulting in no significant additional energy required for arsenic treatment. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater from the Antelope Valley Groundwater Basin and treat it for arsenic is approximately 281 kWh/AF, creating a net energy savings of 2,719 kWh/AF. Since the Project will offset 3,600 AFY of SWP water, approximately 9,788,400 kWh/year will be conserved. Over the 20-year lifespan of the Project, this totals approximately 195,768,000 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits			
Project Name: 60th Street West Wellhead Arsenic Treatment Project			
Type of Benefit Claimed: Reduced Energy Usage			
Units of the Benefit Claimed: kWh			
Additional Information About this Benefit: Values in column d show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from SWP with locally pumped groundwater treated for arsenic.			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	10,800,000	10,800,000 – Award Contract	0
2015	10,800,000	10,800,000 – Construction	0
2016 -2036	10,800,000	1,011,600	9,788,400

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water.
- *Personal communication with Tim Chen, Los Angeles County Waterworks District No. 40, Antelope Valley (District)*: Proportion imported water used by the District that is SWP water (100% SWP).
- *Personal communication with Tim Chen, Los Angeles County Waterworks District No. 40, Antelope Valley (District)*: Cost to pump and treat groundwater for the Project ($50/AF).
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles County.
- *60th Street West Wellhead Arsenic Treatment Project Calculations* – Contains the detailed breakdown of the energy calculations.

Benefit #4 – Reduced Greenhouse Gas Emissions

The Project would avoid greenhouse gas (GHG) emissions generated by the need to transport imported water to the Antelope Valley. This value is calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total metric tons (MT) of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting 3,600 AFY of imported water demand from the SWP and creating an average energy savings of 2,719 kWh/AF, the Project will avoid GHG emissions of approximately 3,215 MT of CO_2 equivalents per year. Over the 20-year lifespan of the Project, this totals 64,300 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits			
Project Name: 60th Street West Wellhead Arsenic Treatment Project			
Type of Benefit Claimed: Reduced Greenhouse Gas Emissions			
Units of the Benefit Claimed: Metric Tons (MT) of CO_2 Equivalents			
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced as the results of replacing imported water from the SWP with groundwater that has been treated for arsenic.			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	3,547	3,547 – Award Contract	0
2015	3,547	3,547 – Construction	0
2016-2036	3,547	332	3,215

Comments:

- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total metric tons of CO_2 equivalents.
- *60th Street West Wellhead Arsenic Treatment Project Calculations* – Contains the detailed breakdown of the GHG calculations.

Benefit #5 – Improved Groundwater Quality

The table below provides information on the benefit of improving groundwater quality through pumping and treating arsenic contaminated groundwater from the Basin. The values are calculated using arsenic concentration data with and without the Project and converting to pounds per year (lbs/year) of arsenic removed.

Table 5 – Annual Project Physical Benefits

Project Name: 60th Street West Wellhead Arsenic Treatment Project

Type of Benefit Claimed: Improved Groundwater Quality

Units of the Benefit Claimed: lbs of arsenic removed

Additional Information About this Benefit: An average arsenic concentration between the two wells (65 ug/L) was used to assess the reduction in arsenic concentration in the groundwater pumped from the Basin. The values are calculated using arsenic concentration data with and without the Project and converting to pounds per year of arsenic removed.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	0	0 – Award Contract	0
2015	0	0 – Construction	0
2016 -2036	0	558	558

Comments:

- *Test Data Sheet, BW&PC Aquifer Test (Well Efficiency Data), May 19-20, 2014:* Test results show the two existing wells are capable of pumping 3,000 gpm total when pumped together.
- *Analytical Results for Arsenic, County of Los Angeles, Department of Agricultural Commissioner/Weights and Measures, May 19-20, 2014:* Testing results for Wells 2A and 3 show Well 2A has arsenic levels ranging from 51 to 55 ug/L and Well 3 has arsenic levels ranging from 80 to 87 ug/L.
- *Product sheet for Bayoxide Arsenic Removal Media/Ferric Oxide Adsorptive Media, Severn Trent, Page 1*: Describes the arsenic removal technology and the ability of the Media to remove As(V) (the arsenic located at the Project site) to less than 4 ug/L.
- *SORB 33® As Removal System Sizing & Estimate, Severn Trent*: Provides conceptual drawing of the system and states the ability of treatment system to remove arsenic to levels below 7 ug/L at Well 2A and 3. The above calculations assume 8 ug/L as this is the District's blending goal (the State requires treatment to 80% of the MCL of 10 ug/L)
- *60th Street West Wellhead Arsenic Treatment Project Calculations* – Contains the detailed breakdown of the arsenic removal calculations.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increased Local Water Supplies/Reliability and Decreased Dependence on Imported Water **Amount of Benefit:** 3,600 AFY	
Technical Basis of the Project	• *Test Data Sheet, BW&PC Aquifer Test (Well Efficiency Data), May 19-20, 2014:* o Test results show the two existing wells are capable of pumping 3,000 gpm total when pumped together. The two groundwater wells were investigated during the week of May 19, 2014 to determine production capacity as well as arsenic levels. Individually, the wells are capable of pumping 1,750 and 2,050 gpm, respectively. When pumped together, the wells can pump in the range of 2,500 to 3,000 gpm combined. A combined pumping rate of 3,000 gpm was assumed for the physical benefit calculations, pumping 18 hours per day to produce approximately 3,600 AFY of a new supply of treated groundwater [(3,000 gpm)*(60 min/hr)*(18 hours/day)/(892.74 gpd/AFY) = 3,629 AFY; approximately 3,600 AFY].
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	SWP water is the primary source of imported water for the District and accounts for approximately 70% of the overall water use during the last four years. This year the drought emergency has caused SWP allocations to be reduced dramatically to 5% of their full allocations. The two existing wells are capable of producing up to approximately 3,600 acre-feet of potable water annually. The annual production is based on a 3,000 gpm combined pumping rate and 18 hours of pumping per day.
Description and Estimates of Without-Project Conditions	Without the Project, the two assets (wells) will remain inoperable and the arsenic contaminated groundwater will not be available as a locally-generated potable water supply. Therefore, 3,600 AFY of SWP water will continue to be necessary to supply customers with potable water.
Methods Used to Estimate the Physical Benefit	The two groundwater wells were investigated during the week of May 19, 2014, to estimate the pumping capacity of the two wells. The pumping capacity of the two wells pumping together was used and it was assumed the wells will operate at 3,000 gpm, 18 hours per day, 7 days a week. Flow meters on the wells will record the volume of water supply made available by the Project.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project involves the replacement of pumps, electrical panel components, flow meters, and transducers for two existing wells. The Project also includes SCADA installation, an arsenic treatment system, and approximately 1,500 feet of 12-inch water main to connect to existing potable water main along Avenue J.
Any Potential Adverse Physical Effects	No adverse physical effects. The wells are located outside the main depression zone in the groundwater basin and as a result, will not impact groundwater levels in the principal pumping areas that are affected by overdraft.

Secondary Physical Benefits

Type of Physical Benefit:	Reduced Demands on the Bay-Delta	Reduced Energy Usage	Reduced Greenhouse Gas Emissions
Amount/ Volume and Unit:	**3,600 AFY**	**9,788,400 kWh /year**	**3,215 MT /year**
Technical Basis of the Project	The two groundwater wells were investigated during the week of May 19, 2014 to determine production capacity as well as arsenic levels. Individually, the wells are capable of pumping 1,750 and 2,050 gpm, respectively. When pumped together, the wells can pump in the range of 2,500 to 3,000 gpm. A combined pumping rate of 3,000 gpm was assumed for the physical benefits calculations, pumping 18 hours per day to produce approximately 3,600 AFY of a new supply of treated groundwater. • *Personal communication with Tim Chen, Los Angeles County Waterworks District No. 40, Antelope Valley (District)*: o Proportion imported water used by the District that is SWP water (100% SWP).	• *References as mentioned in the primary benefits table to assess AFY water supply benefit from Project.* • *Personal communication with Tim Chen, Los Angeles County Waterworks District No. 40, Antelope Valley (District)*: o Proportion of imported water used by the District that is SWP water (100% SWP). o Estimated cost to pump and treat groundwater for the Project ($50/AF). • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP (3,000 kWh/year) to Southern California. • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*: o Page 2: Estimates an average of 17.8 cents per kWh paid for electricity in Los Angeles County.	• *References listed for the Reduce Energy Usage benefit to calculate energy usage.* • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Converts energy saved to a reduction in emissions of CO_2 equivalents.

Type of Physical Benefit:	Reduced Demands on the Bay-Delta	Reduced Energy Usage	Reduced Greenhouse Gas Emissions
Amount/ Volume and Unit:	**3,600 AFY**	**9,788,400 kWh /year**	**3,215 MT /year**
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	SWP water is the primary source of water for the District and accounts for approximately 70% of the overall water use during the last four years. 100% of the imported water used by the District is from SWP, originating from the Bay-Delta. This year, the drought emergency has caused SWP allocations to be reduced dramatically (currently 5% of Table A amounts). The two existing wells are capable of producing up to 3,600 acre-feet of potable water annually. The annual production is based on a 3,000 gpm combined pumping rate and 18 hours of pumping per day.	SWP water is the primary source of water for the District and accounts for approximately 70% of the overall water use during the last four years. The SWP water used by the District requires energy for conveyance from the Bay-Delta at a higher rate than pumping and treating local groundwater.	The imported water delivered to the Project service area requires energy for conveyance from the Bay-Delta at a higher rate than pumping and treatment of local groundwater. This energy usage generates GHG emissions that cause climate change.
Description and Estimates of Without-Project Conditions	Without the Project, the District would need to continue to purchase 3,600 AFY of imported water from the SWP to supply to customers as potable supplies.	Without the Project, 10,800,000 kWh/year of energy would be used to serve 3,600 AFY of imported water to the Antelope Valley, which is 9,788,400 kWh/year more than the energy required to serve arsenic-treated local groundwater to this area.	Without the Project, 3,547 MT of CO_2 equivalents per year would be emitted by serving 3,600 AFY of imported water to the Antelope Valley, which is 3,215 MT of CO_2 equivalents per year more than the emissions generated by serving arsenic-treated local groundwater to this area.

Type of Physical Benefit:	Reduced Demands on the Bay-Delta	Reduced Energy Usage	Reduced Greenhouse Gas Emissions
Amount/ Volume and Unit:	**3,600 AFY**	**9,788,400 kWh /year**	**3,215 MT /year**
Methods Used to Estimate the Physical Benefit	The two groundwater wells were investigated during the week of May 19, 2014 to estimate the pumping capacity of the two wells. The pumping capacity of the two wells pumping together was used and it was assumed the wells operate 18 hours per day, 7 days a week. The resulting 3,600 AFY that could be pumped and treated with the Project was assumed to replace imported water supplies. Because the only imported water supplies in the Antelope Valley come from the SWP, this is a 1:1 offset of SWP water with the Project.	The SWP imported water use volumes and corresponding groundwater volumes were applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the Project compared to imported water supplies was calculated. Energy estimates for conveyance of SWP water supplies were compared to the energy estimate for pumping and treating arsenic contaminated groundwater.	The SWP imported water use volumes and corresponding groundwater volumes were applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the Project compared to imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project involves the replacement of pumps, electrical panel components, flow meters, and transducers for two existing wells, SCADA installation, an arsenic treatment system, and approximately 1,500 feet of 12-inch water main to connect to the existing potable water main along Avenue J.	The Project involves the replacement of pumps, electrical panel components, flow meters, and transducers for two existing wells, SCADA installation, an arsenic treatment system, and approximately 1,500 feet of 12-inch water main to connect to the existing potable water main along Avenue J.	The Project involves the replacement of pumps, electrical panel components, flow meters, and transducers for two existing wells, SCADA installation, an arsenic treatment system, and approximately 1,500 feet of 12-inch water main to connect to the existing potable water main along Avenue J.

Type of Physical Benefit:	Reduced Demands on the Bay-Delta	Reduced Energy Usage	Reduced Greenhouse Gas Emissions
Amount/ Volume and Unit:	**3,600 AFY**	**9,788,400 kWh /year**	**3,215 MT /year**
Any Potential Adverse Physical Effects	No adverse physical effects. The wells are located outside the main depression zone in the groundwater basin and as a result, will not impact groundwater levels in the principal pumping areas that are affected by overdraft.	No adverse physical effects. The wells are located outside the main depression zone in the groundwater basin and as a result, will not impact groundwater levels in the principal pumping areas that are affected by overdraft.	No adverse physical effects. The wells are located outside the main depression zone in the groundwater basin and as a result, will not impact groundwater levels in the principal pumping areas that are affected by overdraft.

Secondary Physical Benefits Continued

Type of Physical Benefit: Improved Groundwater Quality **Amount of Benefit:** 558 lbs of arsenic removed/year	
Technical Basis of the Project	• *Test Data Sheet, BW&PC Aquifer Test (Well Efficiency Data), May 19-20, 2014:* o Test results show the two existing wells are capable of pumping 3,000 gpm total when pumped together. This totals 3,600 AFY treated with the Project as described in the Primary Benefits table. • *Analytical Results for Arsenic, County of Los Angeles, Department of Agricultural Commissioner/Weights and Measures, May 19-20, 2014:* o Results of arsenic testing in Wells 2A and 3 show concentrations are well above the regulatory limit of 10 ug/L. Well 2A has arsenic levels ranging from 51 to 55 ug/L. Well 3 has arsenic levels ranging from 80 to 87 ug/L. • *Product sheet for Bayoxide Arsenic Removal Media/Ferric Oxide Adsorptive Media, Severn Trent*: o Page 1: Describes the arsenic removal technology and the ability of the Media to remove As(V) to less than 4 ug/L. • *SORB 33® As Removal System Sizing & Estimate, Severn Trent:* o Provides conceptual drawing of the system and verifies the ability of treatment system to remove arsenic to levels below 7 ug/L at Well 2A and 3. The Project assumes reduction to 8 ug/L as this is the District's blending goal (the State requires treatment to 80% of the MCL of 10 ug/L). *Case Studies for Ferric Oxide Adsorption Technology (Bayoxide):* • *Arsenic Treatment: Process Optimization Using Granular Ferric Oxide Adsorption. (Seven Trent, 2005).* Retrieved from: http://www.severntrentservices.com/News/Arsenic_Treatment__Process_Optimization_Using_Granular_Ferric_Oxide_Adsorption_nwMFT_532.aspx o Describes treatment system history and background. • *How U.K., U.S. Teams Optimized Arsenic Removal Process and Media Over Nearly a Decade. (Seven Trent, 2007).* Retrieved from: http://www.severntrentservices.com/News/How_U.K._U.S._Teams_Optimized_Arsenic_Removal_Process_and_Media_Over_Nearly_a_Decade_nwMFT_520.aspx o Describes treatment system optimization. • *Teamwork Rids Southern California City of Arsenic Problem (Seven Trent, 2008).* Retrieved from: http://www.severntrentservices.com/News/Teamwork_Rids_Southern_California_City_of_Arsenic_Problem_nwMFT_576.aspx o Describes system designed to treat similar flow rate of 3,000 gpm. • *Optimizing Arsenic Treatment System Yields Significant Cost Savings. (Seven Trent, 2010).* Retrieved from: http://*www*.severntrentservices.com/News/Optimizing_Arsenic_Treatment_System_Yields_Significant_Cost_Savings_nwMFT_487.aspx o Describes pilot project for treatment system treating arsenic levels up to 82 ug/L.
Recent and Historical Conditions that Provide Background for the	Naturally-occurring arsenic is an issue in the Antelope Valley groundwater basin in several locations. The District uses SWP water to blend arsenic contaminated groundwater below the arsenic blending goal of 8 ug/L as part of

Benefit Being Claimed	their blending plan to meet State and Federal arsenic concentration limits. At the Project location, the two existing wells pump groundwater with arsenic levels well above State and Federal regulations (51 to 55 ug/L and 80 to 87 ug/L, compared to the regulatory limit of 10 ug/L). Arsenic levels in this area are too high to blend with SWP water which has resulted in the two wells being inoperable and groundwater not being pumped in this area of the Basin. Installation of an arsenic treatment system will allow use of groundwater area and remove arsenic from the Basin in the process.
Description and Estimates of Without-Project Conditions	Without the Project, the District will not be able to pump groundwater at these wells and they will remain inoperable due to high arsenic concentrations between 50 and 87 ug/L. Because the contaminated water will not be pumped and treated, 558 lbs of arsenic/year will not be removed from the Basin. Groundwater will continue to be pumped in other areas of the Basin; but where blending is required, the supply will be at risk of not meeting blending ratio requirements if not enough SWP is available due to drought conditions in 2014 and 2015. Without the ability to pump 3,600 AFY from the existing wells in the Project area, 3,600 AFY will need to continue to be purchased from the SWP.
Methods Used to Estimate the Physical Benefit	The two wells were tested May 19th and 20th, 2014 to estimate the without Project levels of arsenic concentrations in the groundwater. Multiple sources (listed above) were used to confirm that the system could reduce arsenic concentrations to below the District's blending goal of 8 ug/L as required by the State. The approximate pumping rate of 3,000 gpm for 18 hours per day was assumed as described above to produce 3,600 AFY of treated water. The reduction in arsenic concentration was then converted to pounds of arsenic removed. The District will prepare State mandated monthly reports with arsenic testing results to confirm the reduction in arsenic levels. The two wells will be sampled and tested every month. Effluent from the arsenic treatment system will be sampled and tested every week.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Installation of the Bayoxide® Arsenic Removal Media arsenic treatment system at the two wells at the two existing wells is required as well as installation of pumps, electrical panel components, flow meters, and transducers for two existing wells, SCADA installation, and approximately 1,500 feet of 12-inch water main to connect to the existing potable water main along Avenue J.
Any Potential Adverse Physical Effects	No adverse physical effects. The wastewater generated is minimal (< 0.1%) and non-hazardous. The spent media is non-hazardous and will be sent to landfills. Upon completion of the Project, there will be a maintenance agreement. The maintenance agreement vendor will be responsible for media replacement and disposal of spent media and brine.

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis		
Project name: 60th Street West Wellhead Arsenic Treatment Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increased local supplies/reliability and decreased dependence on imported water • Reduced demands on the Bay-Delta • Reduced energy usage • Reduced Greenhouse Gas emissions • Improved water quality
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Yes.
	If no, why?	Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs.	One alternative method is the purchase of additional SWP entitlement. This is estimated to cost $36M for 3,600 AF (stated on page 2 of the attached MOU between the District and AVEK); but while this achieves the water supply benefit, it does not achieve any of the other benefits claimed above for this Project. The second alternative is to drill new wells in another location. The existing District Well Nos. 4-76 and 4-77 cost about $3.8 million to implement (see enclosed KBHome invoice for construction costs of two wells). This cost is provided as justification for the potential cost of two new wells, though the true cost would be even higher because it does not include the cost of land acquisition (which would be required for this alternative but is not required for the proposed Project), as well as other non-construction related activities that are included in the proposed Project cost of $4.1M. The construction of two new wells (approximately $3.8M) can be compared to the construction and treatment system costs of the proposed Project (approximately $3.3M for Task 10: Construction), plus new wells would also have land acquisition costs and potentially treatment system costs if the pumped water does not meet MCLs. The total costs for drilling new wells are anticipated to be significantly higher than for the Project when all costs are included.

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.**	The proposed Project is the least cost alternative. The proposed Project provides water supply benefits similar to both of the two alternatives, but the proposed Project also pumps and removes arsenic from the Basin. Additionally, the alternative of increasing the District's SWP entitlement will not reduce demands on the Bay-Delta or reduce energy usage and GHG emissions. If the alternative of drilling new wells is conducted at a location that would also require treatment for arsenic, the alternative might provide the same types of benefits as the proposed Project (including arsenic removal), but would cost significantly more due to drilling costs and potential land acquisition costs.

Comments:

- *Memorandum of Understanding between the Antelope Valle-East Kern Water Agency (AVEK) and Los Angeles County Waterworks District No. 4 (August 2013), Page 2*: Acquiring additional imported water supplies is estimated to cost $10,000/AF.
- *KBHome Utility Site, County Reimbursement Submission (July 21, 2009*): Provides the amount it cost to construct District Well Nos. 4-76 and 4-77.