EL PASO WATER

2021 INTEGRATED WATER MANAGEMENT STRATEGIES

January 1, 2021

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1. INTRODUCTION

The Chihuahuan Desert environment of Far West Texas provides numerous water supply challenges. El Paso Water (EPW) has strategically planned to secure water supply for a growing population and has diligently worked to diversify water sources to enhance reliability while striving to reduce rates by delaying infrastructure costs. EPW has worked closely with all their customers and the Far West Texas Regional Water Planning Group (FWTRWPG) to project future demands and plan for appropriate strategies at the appropriate time.

The EPW "integrated" water resources plan is designed to provide cost effective and efficient water supplies through a combination of recommended strategies including conservation, groundwater, surface water, reuse, aquifer storage and recovery and others. In addition, the plan includes alternate strategies that provide a safeguard if recommended strategies can't be implemented as scheduled due to unforeseen difficulties or delays.

2. EPW CUSTOMERS, DEMANDS AND EXISTING SUPPLY

EPW provides water to the City of El Paso and wholesale and retail water supplies to other entities and industries within El Paso County (Table 1).

Table 1. EPW Customers

El Paso Water	City of El Paso	
	Fort Bliss (25%)	
	Lower Valley Water District	Socorro
		Clint
		San Elizario
	Paseo Del Este MUD #1	
	East Montana Water System	
	Haciendas Del Norte WID	
	Manufacturing	
	Mining (12%)	
	Steam Electric Power (75%)	
	County Other | Vinton Hills	
	County Other	

Projected Water Demand

The non-agricultural water supply demand in El Paso County is projected to be 237,449 acre-feet per year (afy) by 2070, of which EPW is projected to provide to the City of El Paso and other retail and wholesale customers approximately 198,364 afy (84 percent) of that water supply (Table 2).

Table 2. EPW Wholesale Water Provide Projected Water Demand

(Acre-Feet Per Year)

Wholesale Water Provider	Receiving Entity		Water Demand					
			2020	2030	2040	2050	2060	2070
El Paso Water	City of El Paso ***only***		110,572	120,315	129,713	139,978	150,601	160,792
	Fort Bliss (25%)		1,420	1,430	1,456	1,495	1,532	1,570
	Lower Valley Water District	Socorro	2,686	2,887	3,107	3,316	3,584	3,818
		Clint	57	66	74	83	92	100
		San Elizario	2,971	3,610	4,217	4,891	5,513	6,127
	Paseo Del Este MUD #1		1,054	1,167	1,278	1,397	1,515	1,629
	East Montana Water System		806	891	974	1,064	1,155	1,241
	Haciendas Del Norte WID		196	218	240	262	285	306
	Manufacturing		7,028	8,157	8,157	8,157	8,157	8,157
	Mining (12%)		481	555	631	714	803	905
	Steam Electric Power (75%)		7,909	7,909	7,909	7,909	7,909	7,909
	County Other | Vinton Hills		213	282	346	414	478	538
	County Other		2,086	2,758	3,395	4,055	4,680	5,272
Total			**137,479**	**150,245**	**161,496**	**173,735**	**185,304**	**198,364**

Water Availability

For planning purposes, "water availability" is defined as the volume of water available to an entity that can be converted into "water supply" with the proper investment into infrastructure such as wellfields, treatment plants, pipelines, water-conserving technology, etc. EPW has significant water availability that can be converted to "water supply" with the proper planning, funding and project implementation. For example, EPW owns groundwater rights in Dell City, Texas that represent significant water availability. However, that groundwater is not a current water supply because there is no wellfield or pipeline to bring the water to El Paso. If EPW develops the infrastructure to bring that water to El Paso, then the available water becomes a "water supply".

To plan appropriately for the future, EPW compares the volume of existing water supplies to the current and future demand. For the purposes of this Integrated Water Resources Plan, the planning horizon is out to year 2070 and supply and demand are based on decadal estimates. When the existing water supply is less than the demand in a future decade, there is a "need" for which a water management strategy is developed to ensure that supply is always greater than demand. EPW desires to maintain a reasonable supply buffer over the projected need in each decade but also realizes that developing water supplies is expensive. In some cases, investing too early or on too many strategies might not be the best financial decision for customers. Therefore, the planning goal for an ongoing supply buffer in each decade was set to 10,000 afy. Based on the needs and volumes associated with strategies implemented in each decade, the projected water supply buffer may be more or less than 10,000 afy.

Existing Water Supply

EPW current supplies (based on current infrastructure) are composed of combinations of surface water from the Rio Grande Project, groundwater from local aquifers, and from wastewater reuse. On a year to year operational basis and under the conjunctive use approach, pumping from groundwater is increased when the surface water availability is limited due to drought or other factors. EPW's conjunctive use plan currently provides an average of 10,000 acre-feet of surface water, 141,331 acre-feet of groundwater, and 6,000 acre-feet of reuse water for a combined 157,331 acre-feet of supply per year (Table 3).

Reuse

EPW currently releases treated wastewater to streams and the Rio Grande River. The volume of treated wastewater released to streams is significantly larger than the current supply of water from reuse. The volume of available wastewater can increase as EPW develops strategies to reuse that water. As EPW develops facilities to treat and distribute this wastewater through advanced purification techniques, the water supply from reuse can increase.

Table 3. EPW Wholesale Water Provider Existing Supplies in 2020

(Acre-Feet Per Year)

Wholesale Water Provider	Receiving Entity		EPW Supplied				Self-Supplied		Total
			Hueco/ Mesilla	Rio Grande	Reuse	EPW Total	Hueco/ Mesilla	Rio Grande Alluvium	
El Paso Water	City of El Paso ***only***		100,000	10,000	3,535	113,535			131,000
	Fort Bliss (25%)		2,100			2,100	12,600		14,700
	Lower Valley Water District	Socorro	2,959			2,959			2,959
		Clint	276			276			276
		San Elizario	1,121			1,121			1,121
	Paseo Del Este MUD #1		1,629			1,629			1,629
	East Montana Water System		1,241			1,241			1,241
	Haciendas Del Norte WID		306			306			306
	Manufacturing		7,297			7,297			7,297
	Mining (12%)		259			259		1,898	2,157
	Steam Electric Power (75%)				2,465	2,465	821		3,286
	County Other | Vinton Hills		400			400			400
	County Other		6,278			6,278			6,278
Total			**123,866**	**10,000**	**6,000**	**139,866**	**13,421**	**1,898**	**172,650**

Future Supply Needs

Table 4 compares the projected water demand by decade (from Table 2) to the projected water supply available (from Table 3).

Table 4. EPW Wholesale Water Provider Needs Analysis

(Acre-Feet Per Year)

El Paso Water	2020	2030	2040	2050	2060	2070
Existing Water Supply	139,866	139,866	139,866	139,866	139,866	139,866
Projected Water Demand	137,479	150,245	161,496	173,735	185,304	198,364
Water Supply Surplus / **Needs**	2,387	**-10,379**	**-21,630**	**-33,869**	**-45,438**	**-58,498**

The volume of supply exceeds the demand by 2,387 afy in 2020. However, the following decades show an increasing supply deficit for each future decade, and by 2070, the estimated need is 58,498 afy. Figure 1 shows EPW's existing water supply and the amount of water needed in future decades to meet the growing demand for additional water supply. The necessity of planning for and developing additional supplies to meet these future needs is the justification for new water management strategies discussed in the following section.

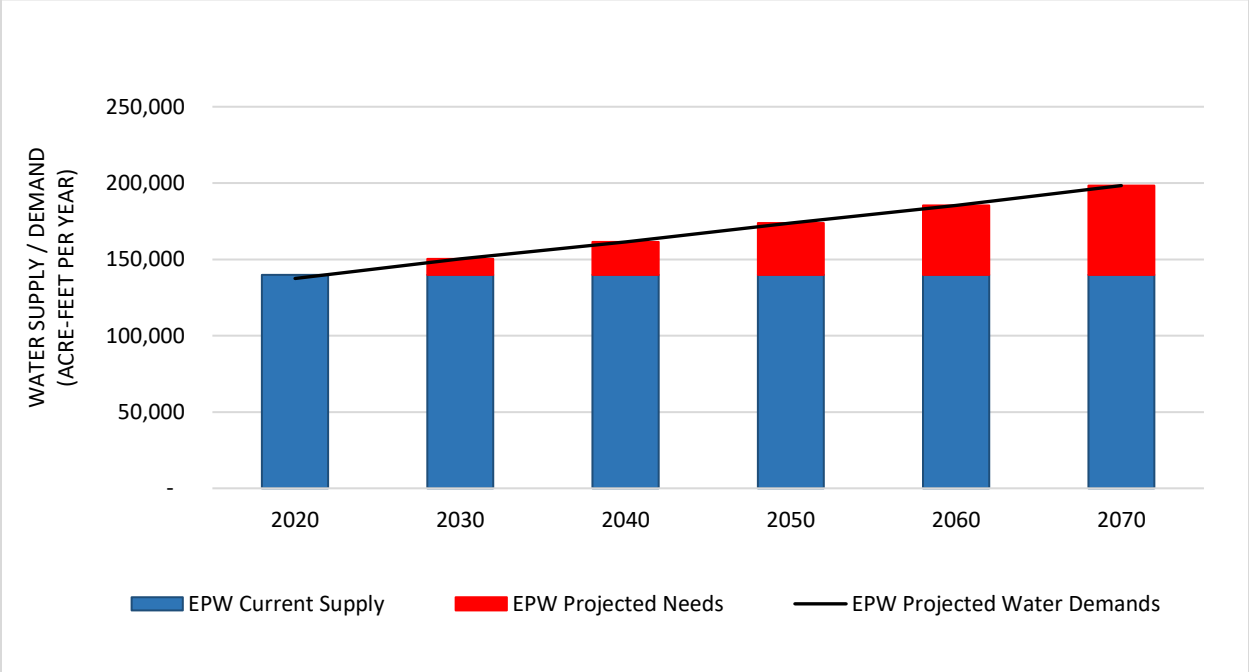


Figure 1. EPW Current Supply and Projected Water Demands and Needs

3. INTEGRATED WATER MANAGEMENT STRATEGY

The El Paso Water Integrated Water Management Strategy evolved from an analysis of integrated water management strategies for the City and County of El Paso in the *2016 Far West Texas Water Plan*. This report provides the latest assessment, which will be included in the *2021 Far West Texas Water Plan*. The objective of this report is to present an analysis of proposed EPW water management strategies to meet future water supply demands within El Paso County. The analysis includes a discussion of the infrastructure requirements, volume of new water supply generated, capital cost of construction, and decade of planned implementation. Four strategies are Recommended that are designed to meet the future demand for additional water supplies for the growing population of El Paso County. Nine Alternative water management strategies are also considered that potentially could be considered for implementation if any of the Recommended strategies fail to generate the projected supply needs.

The four recommended water management strategies proposed in this Plan will generate approximately 53,420 acre-feet of new water by the year 2070, at a total capital cost of $1,029,018,400. The nine alternate water management strategies included in this Plan will generate approximately 75,730 acre-feet of new water by the year 2070, at a total capital cost of $605,137,036.

Table 5 lists the four Recommended water management strategies and includes the source of the supply, volume of water generated, and the capital cost to implement. Recommended strategies have been selected by EPW as the highest priority projects to create additional supplies to meet future needs identified in Table 4. Table 6 lists the nine Alternate water management strategies and includes the source of the supply, volume of water generated, and the capital cost to implement. Alternate strategies have been selected by EPW as potential replacements or substitutes if Recommended strategies cannot be implemented as envisioned for any reason.

The first strategy, and the one that is always being implemented, is municipal conservation. EPW is highly regarded as one of the most successful cities in the State for its conservation initiatives. Conservation and reuse of existing supplies are critical components of insuring the availability of water supplies to meet future needs. Additional conservation and reuse projects will satisfy 31 percent of the future supply need.

Figure 2 illustrates how the four Recommended strategies are projected to be implemented to meet the future water supply needs starting in the 2030 decade. The estimated additional supply of water generated from the Recommended strategies will increase from 13,450 afy in 2020 to 53,420 afy in 2070.

Table 5. EPW Recommended Water Management Strategies

EPW Strategy Number	Recommended Water Management Strategy	Source	Strategy Supply by Decade (Acre-Feet Per Year)						Total Capital Cost
			2020	2030	2040	2050	2060	2070	
R-1	Municipal Conservation Programs	Conservation	4,950	5,530	5,080	9,950	13,140	17,820	$1,071,000
R-2	Advanced Water Purification at the Bustamante WWTP	Municipal Wastewater	8,500	9,200	9,900	10,600	10,600	10,600	$100,361,400
R-3	Hueco Bolson Artificial Recharge	Rio Grande		5,000	5,000	5,000	5,000	5,000	$38,003,000
R-4[1]	GW from Dell City Area (Phase I)	Capitan Reef Complex Aquifer			10,000	10,000	10,000	10,000	$569,357,000
	GW from Dell City Area (Phase II)	Bone Spring–Victorio Peak Aquifer				10,000	10,000	10,000	$320,226,000
Total			**13,450**	**19,730**	**29,980**	**45,550**	**48,740**	**53,420**	**$1,029,018,400**

1 – The costs included for Strategy R-4 do not reflect the cost of previous land purchases equal to approximately $250,000,000.

Table 6. EPW Alternate Water Management Strategies

EPW Strategy Number	Alternate Water Management Strategy	Source	Strategy Supply (Afy) by Decade						Total Capital Cost
			2020	2030	2040	2050	2060	2070	
A-1	Advanced Water Purification at Haskell Street WRP	Municipal Wastewater						10,000	$189,356,000
A-2	Treatment and Reuse of Agricultural Drain Water	Agricultural Drain Water			2,700	2,700	2,700	2,700	$21,466,000
A-3	Expansion of Canutillo Mesilla Bolson Well Field	Mesilla Bolson Aquifer		7,760	11,640	15,520	19,400	23,280	$6,444,000
A-4	Lower Valley Wellhead RO Desalination	Rio Grande Alluvium Hueco Bolson Aquifer			5,000	5,000	5,000	5,000	$52,681,000
A-5	Expansion of the Kay Bailey Hutchison Desalination Plant	Brackish Hueco Bolson Aquifer					5,000	5,000	$26,490,000
A-6	Expansion of the Jonathan Rogers WTP	Rio Grande			6,500	6,500	6,500	6,500	$88,679,000
A-7	Riverside Regulating Reservoir	Rio Grande & Stormwater Runoff			3,250	3,250	3,250	3,250	$6,754,036
A-8	Conjunctive Treatment of Groundwater and Surface Water at the Upper Valley WTP	Rio Grande		10,000	10,000	10,000	10,000	10,000	$72,873,000
A-9	Advanced Water Purification at the Fred Hervey WRP	Municipal Wastewater			10,000	10,000	10,000	10,000	$140,394,000

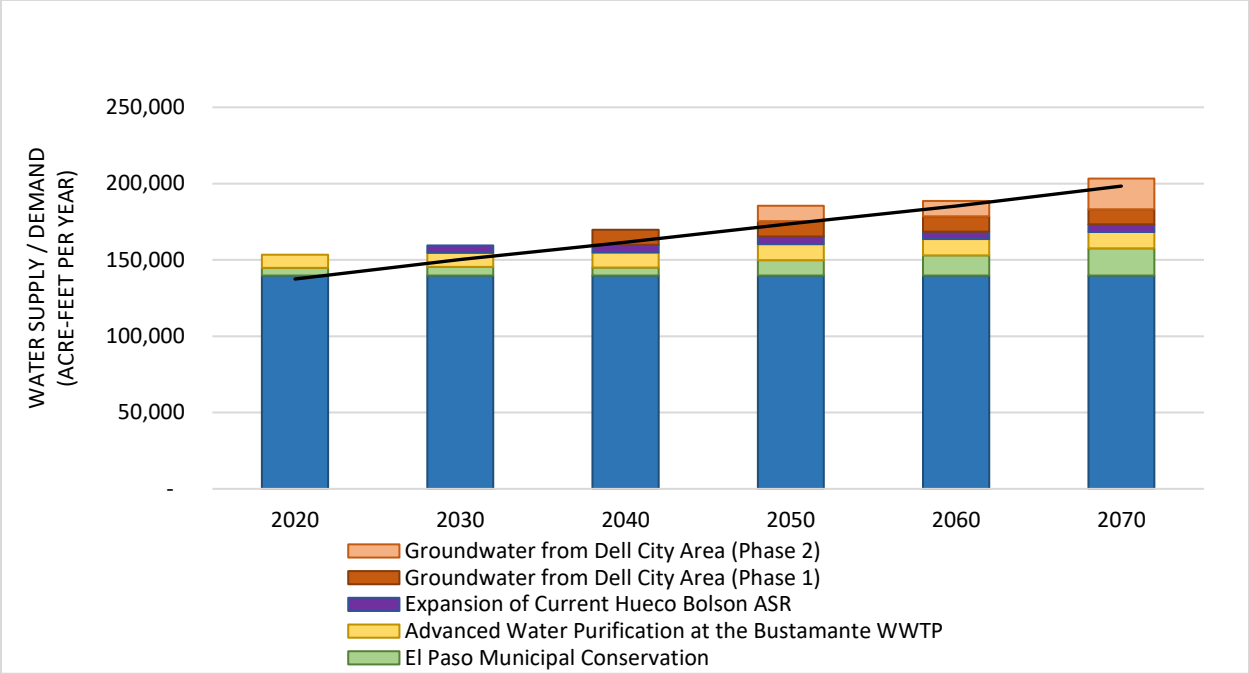


Figure 2. Recommended Water Management Strategies to Meet EPW Projected Water Demands

Recommended Water Management Strategies

As summarized in Table 5, the four recommended water management strategies include:

- R-1 Municipal Conservation Programs
- R-2 Advanced Water Purification at the Bustamante WWTP
- R-3 Expansion of Current Hueco Bolson ASR, and
- R-4 Groundwater from Dell City Area Phase 1 & 2

Figure 3 illustrates the location of Recommended and Alternate Strategies and Figure 4 shows the strategies in El Paso County. Each of the Recommended Strategies is described in more detail below.

Detailed costing sheets used to estimate project costs are included in Appendix A. These costing sheets are consistent with the TWDB Regional Water Planning process and the 2021 Far West Texas (Region E) Water Plan.

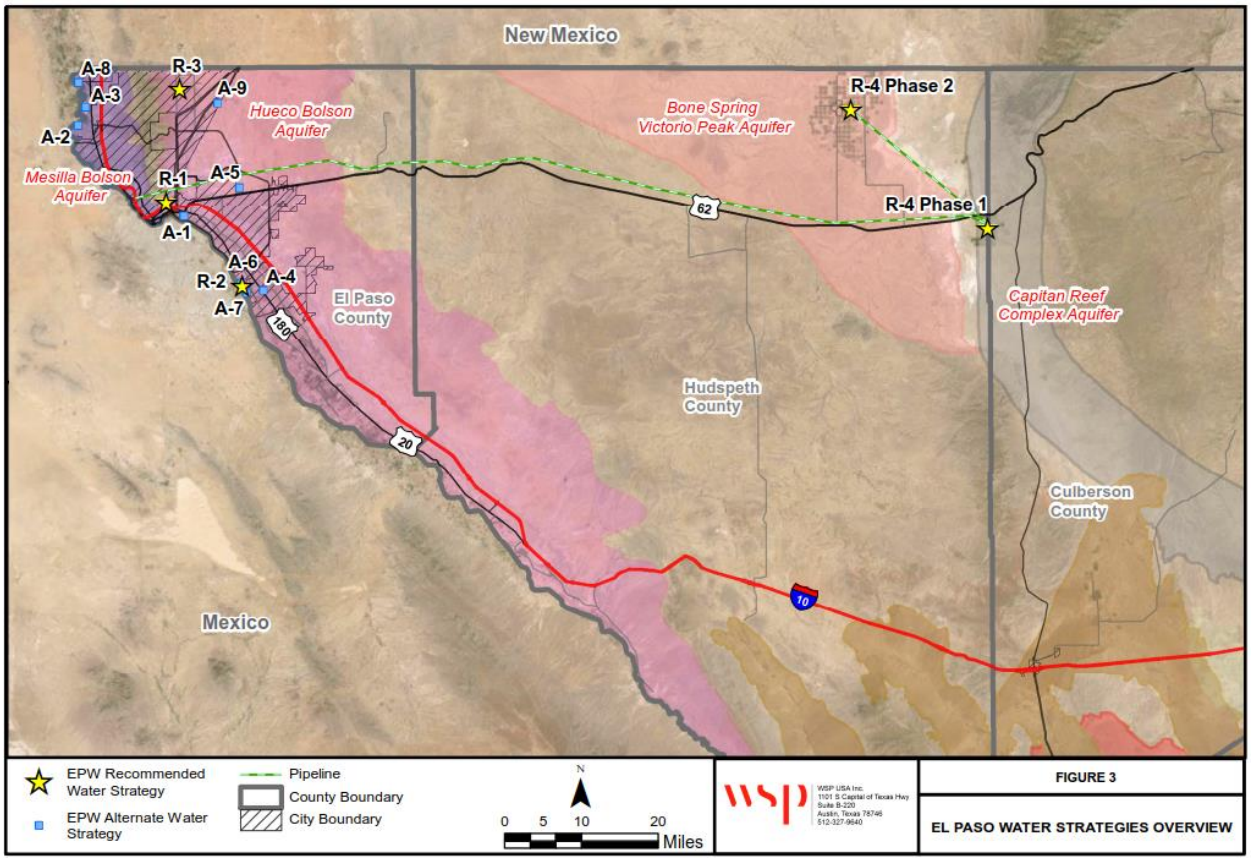


Figure 3. Location of EPW Recommended and Alternate Strategies

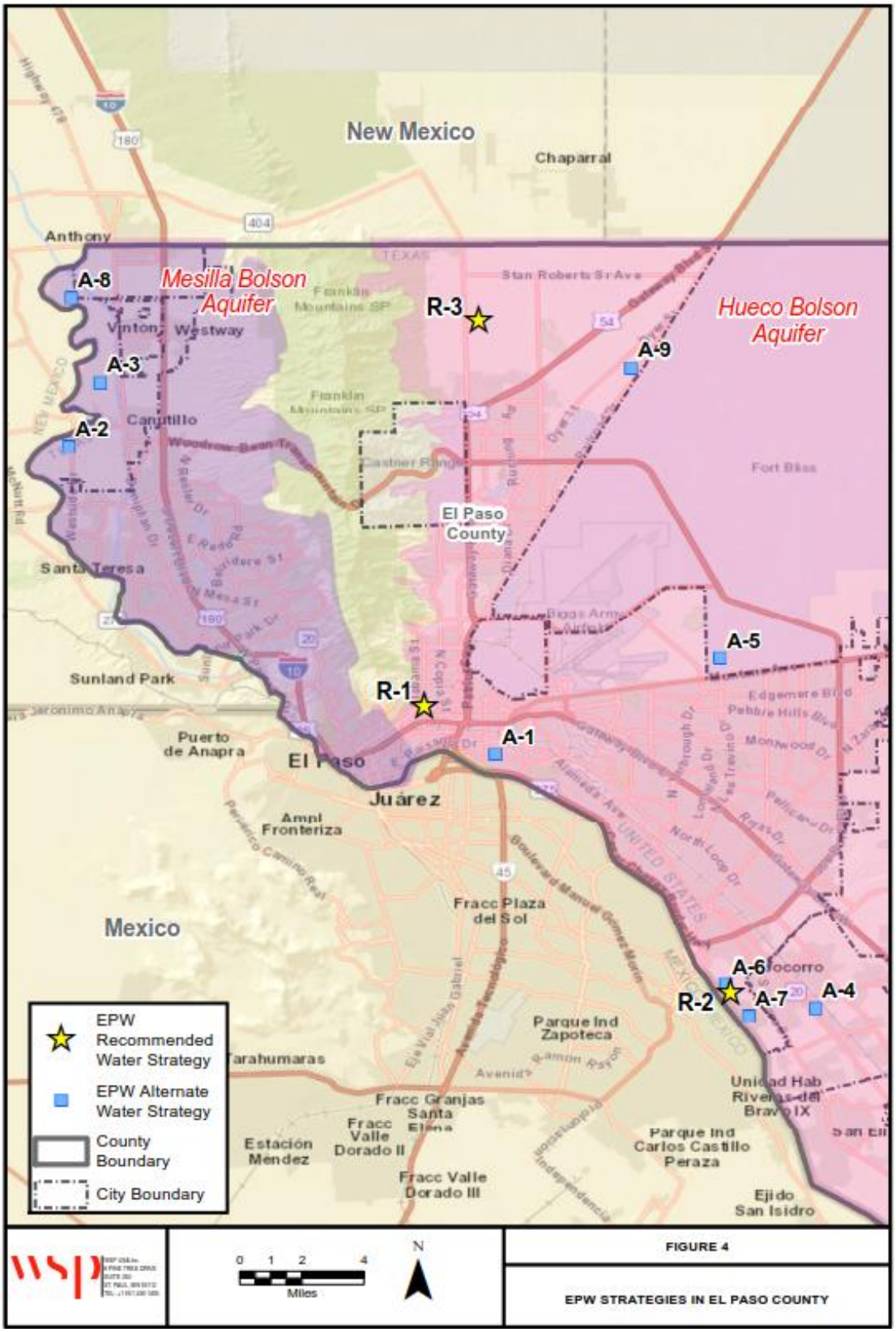


Figure 4. Location of EPW Recommended and Alternate Strategies in El Paso County

R-1 Municipal Conservation Programs

Reduction of municipal water consumption may be achieved with the implementation of conservation programs that reduce per capita usage and prevent water waste. El Paso Water (EPW) has been implementing an aggressive water conservation program for nearly 30 years with actions such as adoption of a rate structure that penalizes high consumption, restrictions on residential watering, rebate programs for replacing appliances and bathroom fixtures for low consumption units, plumbing fixtures to reduce leaks, native landscaping programs to reduce landscape irrigation, public education, control of water losses, and enforcement.

Since 1990, the City has had a water conservation department with at least seven full time staff members overseen by a Water Conservation Manager (for a total of eight full time staff members). The department develops and oversees the City's conservation program, collects data, provides enforcement, and develops public outreach programs.

Reuse is considered a conservation strategy by the TWDB. The City currently has a 'purple pipe' water reuse program that provides treated wastewater for irrigation of golf courses, city parks, school grounds, and apartment landscapes, construction and industrial use, as well as indirect reuse by using treated wastewater for artificial recharge. The City is also in the process of implementing a direct reuse strategy, which is evaluated separately.

EPW's water conservation efforts have reduced per capita municipal use in El Paso from about 225 gallons per capita per day (gpcd) in the late 1970s to a current level of 128 gpcd. Residential per capita consumption was 72 gpcd in 2018. The overall per capita potable water use for EPW and its wholesale customers, including steam electric and industrial use, was about 128 gpcd in 2018. This strategy assumes the continuation of EPW's aggressive water conservation efforts and estimates that demand can be reduced by conservation efforts to approximately 112 gpcd by 2070. Table 7 presents the additional supplies that would result from this strategy's projected level of conservation.

Table 7. Projected Conservation Supply (Acre-Feet)

	2020	2030	2040	2050	2060	2070
Projected Population Served by El Paso Water WUG	734,031	822,625	904,900	986,455	1,063,672	1,136,275
TWDB Projected gpcd[1]	134	131	128	127	126	126
EPW Expected gpcd[2]	128	125	123	118	115	112
Savings above TWDB Projections (acre-feet/year)	**4,950**	**5,530**	**5,080**	**9,940**	**13,140**	**17,820**

1. TWDB Project gpcd includes savings from plumbing code
2. Expected gpcd goals are based on conversations with EPW and are equal to or lower than the 2019 Water Conservation Plan (WCP) goals

Table 8. Projected Cost of EPW Conservation Strategy

	2020	2030	2040	2050	2060	2070
Annual Cost	$1,071,000	$1,071,000	$1,071,000	$1,071,000	$1,071,000	$1,071,000
Cost per Acre-Foot	$216	$194	$211	$108	$82	$60
Cost per 1,000 gallons	$0.66	$0.59	$0.65	$0.33	$0.25	$0.18

EPW has successfully reduced per capita demands resulting in considerable water savings. Water demand projections prepared by TWDB already account for water efficiency savings through time due primarily to plumbing code savings. The savings reported in Table 8 are the result of "active" water conservation strategies that conserve water above and beyond what would happen as a result of "passive" water conservation measures that stem from federal and state legislation requiring more efficient plumbing fixtures in new building construction. The trend in expected gpcd is consistent with EPW's 2019 Water Conservation Plan (WCP) through the 2040 decade. Beginning in 2050, the gpcd goals are lower than the goals laid out in the 2019 WCP.

EPW budgeted $1.07 million for water conservation programs in their annual budget for fiscal year 2019-2020. Because of the importance of conservation, it was assumed that EPW will invest a similar amount in conservation over the planning period. The projects annual costs for water conservation are shown in the table above.

R-2 Advanced Water Purification at the Bustamante WWTP

The Roberto R. Bustamante Wastewater Treatment Plant (Bustamante WWTP) is located in southern El Paso near the community of Socorro. The plant is adjacent to the Jonathan Rogers Water Treatment Plant and the Rio Bosque wetlands. The wastewater plant currently discharges approximately 27 million gallons per day (MGD) into the Riverside Irrigation canal and 1.5 MGD to reclaimed water "purple pipe" customers as part of the Mission Valley Reclaimed Water Project.

The Bustamante Advanced Water Purification strategy has been studied in detail by Arcadis and Carollo Engineers. Project components recommended by Arcadis include additional conventional wastewater treatment at the existing plant to remove nutrients, an advanced treatment facility (microfiltration/ultrafiltration, nanofiltration or reverse osmosis, ultraviolet/advanced oxidation process, activated carbon and chlorine disinfection) and storage. The purified water will be placed directly into the distribution system.

Carollo estimated that the amount treated by the advanced treatment facility would be 10.7 MGD initially and increase to 13.3 MGD at build-out. Approximately 70% of this influent would become finished drinking water. For this evaluation, disposal of the waste stream was assumed to be by deep well injection and to be approximately 30% of the amount treated. Construction costs and annual operation and maintenance costs for the Advanced Water Treatment Facility (AWTF) were based on a 2019 cost estimate by Carollo Engineers. Construction costs for the additional wastewater treatment plant improvements and for conveyance from the Bustamante WWTP to the AWTF were based on a 2014 cost estimate by Arcadis and indexed up to 2018 costs. For this evaluation, costs were added for the necessary connection piping to the distribution system and the disposal well system.

Currently, most of the wastewater from the Bustamante WWTP that is not being reused is discharged into a canal system. Much of that water is then used for downstream irrigation, although some of the flow may also serve to maintain environmental functions. Reuse of additional water may impact those functions, but the overall impact is expected to be small. The current conceptual design for this project uses deep well injection to dispose of the brine waste stream, which should have minimal environmental impact. If this was to change and the brine was released to a stream, impacts to the receiving water body would need to be evaluated.

The Advanced Water Purification strategy will treat only part of the effluent from the Bustamante WWTP. EPW will continue to meet its contractual obligations to purple pipe customers and to provide a portion of the wastewater that originates as surface water for downstream irrigators. There may be other impacts from reducing the amount of wastewater that is not covered by contractual obligations.

It is anticipated that this strategy will be implemented by 2020. After reviewing data from a pilot facility, the Texas Commission on Environmental Quality (TCEQ) gave EPW approval to proceed with design of the of the full-scale facility. EPW officials hope to break ground on the

Advanced Water Treatment Facility in the next few years and supply their customers with reclaimed water within 10 years.

This project is part of EPW's Integrated Water Strategy and is inherently related to other EPW strategies and sources of supply. The availability of water from this strategy is affected by the portion of the treated effluent that originates as surface water, a portion of which is dedicated by contract to downstream irrigators. There may be some reduction in return flows that EPW is not obligated to discharge, but this impact is expected to be small.

Based on estimates from Carollo, this strategy would initially provide approximately 8,500 afy in 2020, stepping up by 2MGD per decade, and expanding to about 10,600 afy by 2070. Because of the quantity of wastewater treated at the plant, the supply should be very reliable, even after accounting for the portion of the supply committed to irrigators and purple pipe customers. The capital cost for this strategy is estimated at $100.36 million.

R-3 Hueco Bolson Artificial Recharge

Water treatment plant capacity and the timing of demand for water currently limit the use of surface water by El Paso Water. Early in the irrigation season, the water available from the Rio Grande exceeds the demand that can be supplied by surface water. Later in the irrigation season, the demand can exceed the treatment plant capacity. To make use of the available surface water early in the irrigation season, EPW is developing a facility to recharge the Hueco Bolson Aquifer with excess treated surface water.

The Hueco Bolson Aquifer is the primary source of water for the City of El Paso, Fort Bliss, Ciudad Juarez and private industries in the area. Since 1903 groundwater levels have declined by as much as 150 feet in some areas of the aquifer, thus developing a cone-of-depression around the major pumping center. This area is located over an ancient watercourse of the Rio Grande and is well suited for both short- and long-term groundwater storage due to the high porosity and permeability of the de-saturated vertical portion of the aquifer formation. The substantial depression in the water table surface thus affords ample underground storage space and reasonably high assurances of long-term recovery of stored water. The recharge basin area described in this strategy is in the northern portion of the cone-of-depression and water percolating downward through the basins will naturally gravity drain in the subsurface toward the existing production wells located approximately two miles away.

Previous projects and studies have shown the practicality of aquifer recharge in the El Paso area. The Hueco Bolson Aquifer has been successfully recharged with tertiary treated wastewater from the Fred Hervey Water Reclamation Plant. Injection rates of up to about 10,000 afy through deep injection wells and spreading basins have occurred since the mid-1980s. Aquifer recharge using both treated wastewater effluent and available surface water provide an opportunity to mitigate aquifer overdraft and potentially restore groundwater supplies for continued use.

The treated water strategy will expand the recharge basins and supplement the artificial recharge supply with excess treated water from the Jonathan Rogers WTP, and does not include the expansion of the Fred Hervey Reclamation Plant. This strategy will require approximately 10,000 feet of 20-inch pipe and six new spreader basins for the treated water. It is anticipated that this strategy will be implemented by 2030.

This strategy is estimated to provide 5,000 acre-feet of additional supply from the Hueco Bolson Aquifer starting in year 2030; however, the supply is contingent on surface water supplies availability. For costing purposes, it is assumed that the pressure from the distribution system will be sufficient to deliver the water to the spreader basins. Capital costs for this project is approximately $38.0 million.

R-4 Groundwater from Dell City Area

Importation of groundwater from the Dell City area has been part of the Far West Texas Water Plan since 2006. This strategy includes obtaining water rights through the purchase of properties, drilling and completion of public-supply permitted water wells, construction of a desalination water treatment facility, and installation of a pipeline to El Paso. Project water will be obtained from two wellfields, the first capturing Capitan Reef Aquifer underlying property referred to as Diablo Farms (Phase 1), and the second wellfield developed in the Bone Springs-Victorio Peak Aquifer underlying the local Dell Valley irrigated area (Phase 2).

Phase 1 – Supply from Diablo Farms

In 2003 and 2004, EPW purchased about 28,000 acres of land (Diablo Farms) overlying the Capitan Reef Aquifer. The property straddles the Hudspeth and Culberson County lines adjacent to the Salt Basin southeast of Dell City. The property is currently leased out for irrigated agricultural use, and until the construction phase is started, the land will continue to be used for agricultural purposes. The proposed strategy calls for production of up to 10,000 afy from six new wells beginning in 2040. The 2021 Far West Texas (Region E) Water Plan assumes that 5,525 afy will come from Culberson County and 4,475 afy will come from Hudspeth County.

EPW has completed preliminary evaluations of groundwater availability in the area and estimates that recharge to this portion of the Capitan Reef Aquifer ranges from 10,000 to 20,000 afy. TDS concentrations in the area range from 850 to 1,500 mg/L. All the currently operating irrigation wells on Diablo Farms have TDS values below 1,000 mg/L. However, it is expected that significant increases in pumping amounts may result in movement of poorer quality groundwater into the wellfield area.

The evaluation concluded that pumping less than 10,000 afy would not require desalination. Pumping between 10,000 and 25,000 afy would not result in mining of the aquifer, but the groundwater would likely have to be desalinated over time as the intrusion of poorer quality water into the wellfield area increases salinity.

It is assumed that the transmission facilities for this project would be shared by with the Dell City groundwater project (Phase 2), and that the pipeline will have sufficient capacity to carry the volume of water at full development of both projects (10,000 afy from Diablo Farms and 20,000 afy from Dell City). EPW already owns the property at Diablo Farms, so land acquisition is limited to pipeline right-of-way (100 foot).

Using these assumptions, the capital cost of the project is approximately $569.4 million. The initial unit cost is $15.66 per 1,000 gallons. Once the debt has been paid, the unit cost drops to $2.38 per 1,000 gallons.

Phase 2 – Supply from Dell City

Dell City is located approximately 75 miles east of El Paso, near the New Mexico-Texas border and is underlain by the Bone Spring-Victorio Peak Aquifer, which covers 130 square miles on the Texas side of the state border. Importation of 10,000 afy from the Bone Spring-Victorio Peak Aquifer is proposed by 2050.

The Hudspeth County Underground Water Conservation District No.1 (HCUWCD #1) manages the aquifer with the goal of long-term stability of water levels and sustainability of water supply through the District's rules and management plan. The modeled available groundwater (MAG) established for the aquifer is 101,400 afy assuming an irrigation return flow of 30 percent. Aquifer withdrawals from the Bone Spring-Victorio Peak Aquifer at the proposed pumping rates for this strategy are at a sustainable level based on the current rules of the HCUWCD #1.

Approximately 45 afy is withdrawn from the aquifer for municipal use by the community of Dell City, with the remainder used for irrigated agriculture. Water from this aquifer has concentrations of iron, chloride, nitrate, sulfate, and aluminum that exceed water quality standards for municipal supply. With total dissolved solids ranging from 1,810 to 3,900 mg/l, desalination would be required before the source could be used for municipal purposes.

The first decade (2050) of the Dell City project includes rehabilitation of seven wells plus one contingency well with accompanying pumps, pipelines and other appurtenances, a pump station, 12 miles of 42-inch pipeline, expansion of the existing pump stations on the Diablo Farms (Phase 1) to El Paso pipeline, and an 18 MGD desalination facility with disposal wells. The water from the desalination facility will be blended with untreated water to produce the desired water quality.

The second decade (2060) of the project adds rehabilitation of eight more wells with the associated facilities, another expansion of the pump stations on the pipeline to El Paso, and an 18 MGD expansion of the desalination facility. Also included is $55 million for purchase of additional property, for a total of $110 million between the two decades of the project.

The capital cost for this strategy is estimated at $320.23 million. The unit cost during debt service is $12.44 per 1,000 gallons. After debt repayment, the unit cost drops to $4.91 per 1,000 gallons.

Alternate Water Management Strategies

A-1 Advanced Water Purification at the Haskell Street WRP

The Haskell R. Street Wastewater Treatment Plant (WWTP) is located in south central El Paso on the Rio Grande and has a capacity of 27.7 MGD. A portion of the treated wastewater effluent from this plant is the source for the Central Reclaimed Water Project (purple pipe reuse), which is used to irrigate several central El Paso schools and parks, including Ascarete Park and Golf Course. Remaining effluent from the Haskell WWTP is discharged into either the American Canal, which may then be used for irrigation downstream, or the Rio Grande.

This strategy is assumed to treat wastewater effluent to potable safe drinking water standards. The purified water would flow directly into the EPW distribution system. Currently most of the wastewater that is not already being reused as part of a purple pipe reuse project is discharged into a canal system. Much of that water is then used for downstream irrigation, although some of the flow probably also serves to maintain environmental functions. Reuse of additional water may impact those functions, but the overall impact is expected to be small. The conceptual design for this project uses deep well injection for brine disposal.

The advanced purified water treatment strategy would treat effluent from the Haskell Street WWTP and would continue to provide treated water to the Ascarete Golf Course. EPW will continue to meet its contractual obligations to provide a portion of the wastewater that originates as surface water for downstream irrigators. There may be other impacts by reducing the volume or changing the timing of effluent discharges that are not covered by contractual obligations. It is anticipated that this strategy will be implemented in the 2070 decade.

For this strategy analysis, it is assumed that the capacity of the project would provide a supply of approximately 10,000 afy. The total capital cost of this project is estimated to be approximately $189.4 million, with a unit cost of water during debt service at approximately $9.04 per 1,000 gallons, reducing to approximately $4.45 per 1,000 gallons once the debt has been repaid.

A-2 Treatment and Reuse of Agricultural Drain Water

The 2011 Far West Texas Water Plan included a strategy to develop two 5 MGD desalination plants at the Rogers and Canal Water Treatment Plants to treat agricultural drain water for municipal use. Hazen and Sawyer, P.C. since completed a study on the treatment of drain water near the Upper Valley Water Treatment Plant using conventional treatment and blending with other sources to meet water quality standards. This strategy in the 2016 Plan proposed using the same combination of conventional treatment and blending at the Rogers and Canal Plants for the facility at the Upper Valley WTP examined in the Hazen and Sawyer study. This current 2021 strategy now assumes that a 2.41 MGD (2,700 afy) plant renovation (see strategy E-14) will be built at the Upper Valley WTP in the 2030 decade.

The use of conventional treatment eliminates the need for brine disposal. However, it does require the availability of lower TDS treated water source in sufficient quantity for blending. The Hazen and Sawyer study found that hardness was a controlling factor, along with TDS, in determining blending ratios with treated water from the Upper Valley WTP. Blend ratios varied from approximately 4 to 1 to more than 14 to 1, depending on target water quality. If additional treatment such as desalination becomes necessary, the strategy's cost estimate will be impacted. This strategy assumes that the treatment waste stream will most likely be discharged directly into the sewer system with solids going to a landfill.

The total capital cost for the water treatment plant is estimated to be approximately $21.4 million, with a unit cost of water during debt service at approximately $2.88 per 1,000 gallons, reducing to approximately $1.17 per 1,000 gallons once the debt has been repaid.

A-3 Expansion of Canutillo Mesilla Bolson Wellfield

A portion of EPW's groundwater supply is obtained from their Canutillo wellfield in the Mesilla Bolson Aquifer on the west side of the Franklin Mountains. Groundwater in this location of the aquifer occurs in three separate horizons with varying water quality, including elevated levels of arsenic which must be treated to drinking-water standards. Groundwater retrieved from the Canutillo wellfield is transported to the Upper Valley WTP for further treatment including arsenic remediation (see Strategy E-14).

This strategy is scheduled to begin initial implementation by 2030 with the production of 7,760 afy of new supply and increases each decade to a total of 23,280 by the 2070 decade. The strategy includes the completion of 10 new wells at an average depth of 200 feet and pumping capacity of 500 GPM in the existing wellfield and a pipeline to transport the groundwater to the Upper Valley WTP. Wellhead RO filtration is also being considered for wells contending with high arsenic levels, but is not included in this current analysis. Pumping from the Canutillo wellfield can impact flows in the Rio Grande and is monitored by the Bureau of Reclamation.

The cost of drilling and equipping 10 new wells in this wellfield is approximately $423,179. An additional contingency of 35 percent has been added to the cost, as well as allowances for permitting and mitigation, land acquisition, and interest during construction. Annual costs are based on a lift of 200 feet for the Canutillo wells. The strategy also includes a pipeline to the Upper Valley WTP. Total capital cost for this strategy is $6.4 million. The initial unit cost is approximately $0.44 per 1,000 gallons. Once the debt has been paid, the unit cost decreases to approximately $0.10 per 1,000 gallons.

A-4 Lower Valley Wellhead RO Desalination

This strategy assumes that five new water wells will be drilled and completed in the Rio Grande Alluvium Aquifer in the Lower Valley to provide an additional 5,000 afy of municipal supply beginning in 2040. As the raw groundwater from this aquifer is slightly brackish, each well will be equipped with a reverse osmosis desalination filtration system. The resulting supply that will meet safe drinking water standards will be connected directly to the nearest distribution pipeline. The brine concentrate generated from the wells will be discharged to the sewer system.

The five new wells are assumed to be drilled at a depth of 500 feet to provide an additional supply of 5,000 afy. Historical municipal, agricultural and industrial use indicates that the Rio Grande Alluvium Aquifer is a viable source. The total capital cost of this project will be approximately $52.6 million. This cost estimate includes the five new wells, associated pipelines, storage, pumps and power. The initial unit cost is approximately $4.29 per 1,000 gallons. Once the debt has been paid, the unit cost decreases to approximately $2.02 per 1,000 gallons.

A-5 Expansion of the Kay Bailey Hutchison Desalination Plant

The Kay Bailey Hutchison Desalination Plant is one of the world's largest inland desalination facilities. The facility is a joint project of El Paso Water (EPW) and Fort Bliss and currently has the capacity to treat 27.5 MGD of brackish groundwater. Disposal of brine reject from the facility is through deep well injection. The project not only provides a safe and reliable supply for the City of El Paso and Fort Bliss, but it also protects fresh groundwater supplies by intercepting the flow of brackish groundwater toward the freshwater wells.

This strategy would expand both the production of brackish groundwater and increase the capacity of the plant by 5.0 MGD for a total of 32.5 MGD. This will involve expanding the existing facility, adding four new source wells and associated piping. For planning purposes, it is assumed that this strategy will be implemented in a single phase. It is assumed that EPW's current disposal facilities are adequate for the project. It is anticipated that this strategy will be implemented by 2060.

This project will provide additional water supply in EPW's conjunctive use portfolio. The combination of new wells and another 5.0 MGD of capacity will provide approximately 5,000 acre-feet of water per year. This supply is assumed to be very reliable. The project is expected to cost approximately $26.5 million. The initial cost of water is $2.73 per 1,000 gallons. Once the debt has been paid, this cost will decrease to approximately $1.58 per 1,000 gallons.

A-6 Expansion of the Jonathan Rogers WTP

EPW currently obtains surface water from the Rio Grande in accordance with a series of contracts with EPCWID #1, the U.S. Bureau of Reclamation, and the Lower Valley Water District. These contracts allow the conversion of water allocated for irrigation of lands owned or leased by EPW into municipal supply. Over time, EPW may increase the annual diversion from surface water by converting additional water allocated to irrigated lands in El Paso County. The conversion of water for municipal supply will require amendments to contracts or agreements with the U.S. Bureau of Reclamation and EPCWID #1.

This strategy assumes that the increased surface water supply will require additional treatment capacity. Currently, the Jonathan Rogers Water Treatment Plant capacity is 60 MGD. The proposed strategy will increase the capacity to 80 MGD by replacing and enhancing existing treatment facilities. A preliminary design of the plant expansion by CH2M Hill Engineers, Inc. is the basis for the cost estimates for this strategy. It is anticipated that this strategy will be implemented by 2040 and, based on a 7-month irrigation season and assuming a peaking factor of 2, this strategy will provide up to 6,500 acre-feet of treated water per year. The actual quantity of water is dependent on new irrigation properties acquired by EPW and the availability of surface water from the Rio Grande Project, which varies from year to year.

The estimated total capital cost for this strategy is approximately $88.6 million. The unit cost of water during debt service is $4.25 per 1,000 gallons. Once the debt has been repaid the unit cost decreased to approximately $1.30 per 1,000 gallons. Costs associated with the acquisition of irrigation rights are not included.

A-7 Riverside Regulating Reservoir

In order to make more efficient use of surface water supplies, EPCWCID #1 has proposed purchasing the City of El Paso former Socorro Pond Sewage Treatment Facility located in the city limits of El Paso near the Bustamante Waste Water Facility.

The regulating reservoir will allow more efficient use of stored water releases from the Rio Grande Project storage reservoirs, as well as flows that originate as stormwater runoff below Caballo Reservoir. The primary source of water stored in the reservoir would be from excess flows diverted at American Dam and conveyed to the heading of the Riverside Canal. These excess flows primarily consist of storm runoff and operation spills from upstream water users. The temporary stored water would be used either from downstream irrigators or be pumped to the nearby Jonathan Rogers Water Treatment Plant for municipal use. All of the water sources are already authorized through existing state and federal contracts, agreements and water rights.

The primary benefits of the project are: (1) Improved farm delivery scheduling and flows; (2) Conservation of water stored in upstream storage reservoir through using water captured in regulating reservoirs to meet downstream demands; and (3) A five-day supply of raw water for use by City of El Paso in case of an emergency such as failure or contamination of American Canal system.

Portions of the project have already been completed, including improvements to the Riverside Franklin Feeder Check Structure; a concreate bridge to the Jonathan Rogers WTP; - canal lining; and a flood waste-way to the river.

EPCWID #1 is collaborating with municipalities in El Paso County to make capacity upgrades to existing irrigation drain infrastructure to mitigate flooding while facilitating the capture and reuse of stormwater from local storm events. Stormwater capture and reuse would lead to the development of a new water source for EPCWID #1. Additional studies are needed to determine the quantity and quality of the stormwater that can be captured and the upgrades that are necessary for reuse. EPCWID #1 intends to pursue a mixture of funding options to develop stormwater capture and ruse infrastructure, such as any programs resulting from flood-related legislation passed by the 86th Texas Legislature, including Senate Bill (SB)7, SB 8, SB 500, and House Joint Resolution 4.

The primary benefit of this strategy is allowing for more efficient use of existing supplies of water. Previous studies of this project have estimated that the project could provide 6,500 acre-feet of water per year. However, there may be some years where the strategy could provide more or less water, depending on available river supplies and the amount of excess water in the canal. The total capital cost of approximately $13.5 million and supply of 6,500 acre-feet developed from this project is equally split between EPW and the EPCWID#1.

A-8 Conjunctive Treatment of Groundwater and Surface Water at the Upper Valley WTP

The Upper Valley Water Treatment Plant located north of Vinton is one of the largest water-treatment facilities in the nation built as a direct result of the EPA revision to the federal regulation of arsenic levels in drinking water. The areas served by the plant include Upper Valley, West Side, Canutillo, Vinton and Westway. The existing plant removes arsenic occurring within groundwater pumped from wells in the Canutillo Wellfield (see strategy E-6), and treats up to 30 MGD of this groundwater for blending with up to 30 MGD of untreated groundwater to produce a finished product with an arsenic concentration of 8 ppm or less. For this strategy, the existing plant will be enlarged and renovated to treat proposed new water sources including additional groundwater from the Canutillo Wellfield and, raw Rio Grande surface water delivered from a proposed new La Union diversion point (see EPCWCID#1 strategy), and other agricultural drain water sources.

The improvement to the plant will produce 10,000 acre-feet per year of additional water supply and is planned to go into operation in 2030. The estimated total capital cost for this strategy is approximately $72.8 million. The unit cost of water during debt service is $2.60 per 1,000 gallons. Once the debt has been repaid the unit cost decreased to approximately $1.07 per 1,000 gallons.

A-9 Advanced Water Purification at the Fred Hervey WRP

The Fred Hervey Water Reclamation Plant treats 12 MGD of wastewater from nearby homes, businesses and industries. The reclaimed water is sent to irrigation and industrial customers including the Newman Power Plant, Painted Dunes Golf Course and the Northeast Regional Park. The plant further treats reclaimed water to drinking water standards and uses it to replenish the aquifer through injection wells and infiltration basins. It was among the first in the nation to create drinking-quality water by treating used water and demonstrate the feasibility of artificial aquifer recharge.

The Fred Hervey Advanced Water Purification strategy includes additional conventional wastewater treatment at the existing plant to remove nutrients, an advanced treatment facility (microfiltration/ultrafiltration, nanofiltration or reverse osmosis, ultraviolet/advanced oxidation process, activated carbon and chlorine disinfection) and storage. The conceptual design and cost for the strategy were based on the Bustamante Advanced Water Purification Plant. The additional purified water will be placed directly into the distribution system. Disposal of the waste stream was assumed to be by deep well injection and to be approximately 30% of the amount treated.

The improvement to the plant will produce around 10,000 afy of additional water supply and is planned to go into operation in 2040. The capital cost for this strategy is estimated at $140.4 million. The unit cost during debt service is $5.51 per 1,000 gallons. After debt repayment, the unit cost drops to $2.48 per 1,000 gallons.

APPENDIX A

R-1 Municipal Conservation Programs

Calculation of Projected GPCD

	2018 Historical Data	2020	2030	2040	2050	2060	2070
Population Served by El Paso Water	759,004	734,031	822,625	904,900	986,455	1,063,672	1,136,275
EPWater Municipal Demand (ac-ft/yr)		110,572	120,315	129,713	139,978	150,601	160,792
ac-ft/day		302.1	329.6	354.4	383.5	411.5	440.5
Gallons/Day	97,152,507	98,442,614	107,410,310	115,483,909	124,964,305	134,080,564	143,545,847
gpcd	128	134	131	128	127	126	126

Projected Conservation Supply

	2018 Historical Data	2020	2030	2040	2050	2060	2070
Projected Population Served by El Paso Water	759,004	734,031	822,625	904,900	986,455	1,063,672	1,136,275
Historical/Projected gpcd	128	134	131	128	127	126	126
Expected gpcd		128	125	123	118	115	112
~~TWDB Projected Savings (ac-ft/yr)~~	-	~~8,240~~	~~11,980~~	~~16,260~~	~~18,780~~	~~21,510~~	~~22,910~~
~~**EPWater Expected Savings (ac-ft/yr)**~~	-	~~**13,190**~~	~~**17,510**~~	~~**21,340**~~	~~**28,730**~~	~~**34,650**~~	~~**40,730**~~
Savings above TWDB Projected (ac-ft/yr)		4,950	5,530	5,080	9,940	13,140	17,820
savings above TWDB Projected (gpcd)		6	6	5	9	11	14

Projected Cost of Additional Savings due to EPW Conservation Strategy

		2020	2030	2040	2050	2060	2070
Annual Cost		$1,071,000	$1,071,000	$1,071,000	$1,071,000	$1,071,000	$1,071,000
Cost per ac-ft		$216	$194	$211	$108	$82	$60
Cost per 1,000 gallons		$0.66	$0.59	$0.65	$0.33	$0.25	$0.18

~~**Projected Cost of Total Savings due to EPW Conservation Strategy and TWDB Plumbing Code Savings**~~

~~-~~	~~-~~	~~**2020**~~	~~**2030**~~	~~**2040**~~	~~**2050**~~	~~**2060**~~	~~**2070**~~
~~Cost per ac-ft~~	~~-~~	~~$81~~	~~$61~~	~~$50~~	~~$37~~	~~$31~~	~~$26~~
~~Cost per 1,000 gallons~~	~~-~~	~~$0.25~~	~~$0.19~~	~~$0.15~~	~~$0.11~~	~~$0.09~~	~~$0.08~~

MEMORANDUM

ADVANCED WATER PURIFICATION FACILITY COST ESTIMATION

El Paso Water

Date: 5-13-2019
Project No.: 10745A.10

Prepared By:	Joe Baca, P.E.
Reviewed By:	S. Villalobos, P.E. , Jim Gallovich, P.E.
Subject:	Advanced Water Purification Facility - Cost Estimation Summary

Purpose

This memorandum describes the cost estimates that were developed for the Advanced Water Purification Facility. Carollo developed a Class 3 Cost Estimate based on the 30% design documents. A third party cost estimator was also contracted to provide an estimate similar to what would be developed by a construction contractor.

Cost Estimate Comparisons

Carollo's cost estimate is attached as Attachment A. The 3rd party cost estimator's estimate is attached as Attachment B. Carollo's cost estimate includes an estimating contingency of 25%, which is appropriate for a Class 3 estimate. The 3rd party estimate does not include a contingency, as this is intended to be a cost similar to an actual construction bid for the project.

The table below summarizes the estimated construction costs by process area/discipline from both Carollo and the 3rd Party Estimator.

Table 1 Estimated Construction Costs by Process Area/Discipline

Line Item	Carollo	3rd Party Estimator
Mechanical Piping	$1,963,400	$3,492,400
NF/RO	$8,100,100	$10,178,200
MF/UF	$5,312,700	$6,580,800
Structural	$3,661,000	$4,328,800
Electrical	$6,274,500	$4,444,300
I&C	$3,871,400	$437,000
HVAC/Plumbing/Fire Protection	$958,000	$799,500
UV/AOP	$1,672,300	$1,332,400
GAC	$1,825,800	$1,613,000
Chemical System	$2,467,400	$1,624,000

Line Item	Carollo	3rd Party Estimator
High Service Pump Station	$719,800	$1,423,100
Groundwater Blending	$2,669,700	$2,669,700(1)
Architectural	$1,023,300	$2,944,900
Civil	$2,065,900	$942,500
General Conditions	$5,110,200	$4,014,100
Direct Construction Cost	**$47,695,500**	**$46,824,700**
Contingency	$11,923,900	NA
General Contractor Overhead, Profit, and Risk	$8,942,900	$5,619,000
Escalation to Mid- Point - 12.6% (Year 2023)	$8,638,800	NA
Total Estimated Construction Cost	**$77,201,100.00**	**$52,443,700.00**
Engineering, Legal & Administration Fees (30%)	$23,160,300.00	NA
Total Estimated Project Cost	**$100,361,400.00**	**NA**

Note:
(1) Cost estimate for groundwater blending cost was not provided by the 3rd party estimator. Cost shown equals Carollo's cost estimate for this line item

The 30% design drawings did not include details regarding the groundwater blending system; therefore, the 3rd Party Estimator was not able to provide costs for the well equipment, piping, and pipeline infrastructure. For that reason, Carollo's estimate for the groundwater blending system was included in the 3rd Party Estimate to provide a complete cost.

The table above indicates that although there are differences in some of the individual line items, the overall direct construction cost from the 3rd party estimator and Carollo are close, with a cost differential of only approximately 1.8%.

As noted above, it is appropriate for a 30% level design to include a design contingency to account for unknowns at this stage of design and any changes that may occur as the project moves forward. This is large project with multiple complex processes that are not fully defined at the 30% level.

The direct costs for both Carollo and the 3rd party estimator are based on today's dollars. To properly budget for this project, it is important that these costs be escalated to represent the cost anticipated at the midpoint of construction. This escalation assumes an annual escalation of 3% for 4 years.

Initial and Build-Out Costs

Carollo also developed cost estimates for the initial design phase and future buildout phase of the facility. Flows, along with their associated capital, O&M, and unit costs are summarized in the table below.

Table 2 Initial Design Phase and Build-Out Cost Estimates

Category	Initial	Build-Out
Flows (mgd)		
Influent	10.7	13.3
Finished Water (without blending)	7.6	9.5
Finished Water (with 2 mgd blending)	9.6	11.5
Minimum flow finished water (with 0.5 mgd blending)	3.0	3.0
Costs		
Total Estimated Construction Cost	**$77,201,100**	**$83,454,200**
Total Estimated Capital Cost (includes 30% allowance for engineering and administrative fees)	$100,361,400	$108,490,500
Annual Costs		
Annualized Capital Cost (5.5% interest over 20 years)	$5,070,600	$5,481,300
Annual Operation and Maintenance Cost (year round operation at full capacity)	$5,100,000	$5,551,000
Annual Operation and Maintenance Cost (base flow operation for 10 months, full capacity for 2 months)	$2,565,000	$2,640,167
Unit Costs		
Cost/Acre-Foot (until amortized) (year round at full capacity)	$1,255	$1,136
Cost/Acre-Foot (after amortization) (year round at full capacity)	$474	$431
Cost/Acre-Foot (until amortized) (base flow for 10 months, full capacity for 2 months)	$2,387	$2,369
Cost/Acre-Foot (after amortization) (base flow for 10 months, full capacity for 2 months)	$559	$534

PROJECT SUMMARY

Project:	El Paso Water Advanced Utility Purification Facility	**Estimate Class:**	
Client:	**El Paso Water Utilities**	**PIC:**	**SV**
Location:	**El Paso**	**PM:**	**SV**
Zip Code:	**79925**	**Date:**	**March 11, 2019**
		By:	**VB**
Carollo Job #	**10745A.10**	**Reviewed:**	**JB**

NO.	DESCRIPTION		TOTAL
01	Mechanical Piping		$1,963,352
02	NFRO System		$8,100,087
03	MFUFSystem		$5,312,707
04	Structural		$3,660,953
05	Electrical		$6,274,499
06	Instrumentation and Controls		$3,871,384
07	HVAC Plumbing		$958,000
08	UVAOP		$1,672,321
09	GAC		$1,825,804
10	Chemical System		$2,467,439
11	High Service Pump Station		$719,782
12	GW Blending		$2,669,672
13	Architectural		$1,023,334
14	Site Work		$2,065,895
15	General Conditions		$5,110,227
	TOTAL DIRECT COST		**$47,695,455**
	Contingency	25.0%	$11,923,864
	Subtotal		**$59,619,319**
	General Contractor Overhead, Profit & Risk	15.0%	$8,942,898
	Subtotal		**$68,562,217**
	Escalation to Mid-Point (Year 2023)	12.6%	$8,638,839
	Subtotal		**$77,201,056**
	Sales Tax	0.0%	$0
	Subtotal		**$77,201,056**
	Bid Market Allowance	0.0%	$0
	TOTAL ESTIMATED CONSTRUCTION COST		**$77,201,056**
	Engineering, Legal & Administration Fees	30.0%	$23,160,317
	Owner's Reserve for Change Orders	0.0%	$0
	TOTAL ESTIMATED PROJECT COST		**$100,361,373**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

ATTACHMENT B

El Paso Advanced Water Purification Facility Estimate - 30% Design

		Quantities	Vendor	Subcontractor	Equipment / Material	Subcontractor or Installation	Total	Category Subtotals
Mechanical Piping								
	UG piping earthwork					234,000	234,000	
	UG piping installation					33,000	33,000	
	Process piping installation				2,800,000	172,000	2,972,000	
	Self-cleaning strainers		Amiad		245,000	8,400	253,400	
Mechanical Subtotal								3,492,400
NF/RO System								
	NF/RO	4 ea	Westech		8,000,000	76,800	8,076,800	
	Vertical turbine pumps & cans	4 ea	Flowserve		1,923,000	7,800	1,930,800	
	Cartridge filters	4 ea			166,000	4,600	170,600	
NF/RO Subtotal								10,178,200
MF/UF								
	MF/UF	8 ea	WesTech		5,720,000	93,000	5,813,000	
	Cartridge filters	2 ea	Fil-Trek		40,900	2,300	43,200	
	Vertical turbine pumps and cans	5/6 ea	Flowserve		715,300	9,300	724,600	
MF/UF Subtotal								6,580,800
Structural								
	Cast-in-place concrete	4000 cy				2,229,000	2,229,000	
	Bldg Fnd & Tilt-up concrete	2,387 cy		Jordan Foster		1,375,000	1,375,000	
	Structural steel & gratings			Structural Steel Services		470,000	470,000	
	Steel canopies	10,580 sf (including second level on one canopy)		Structural Steel Services		105,800	105,800	
	Steel canopy decking			Progressive Roofing		146,000	146,000	
	Roof vents	8 ea			2,000	1,000	3,000	
Structural Subtotal								4,328,800
Electrical								
	Cable tray w/ hangers					98,800	98,800	
	Lighting					335,000	335,000	
	Duct banks					426,300	426,300	
	Fire alarm					43,000	43,000	
	Conduit power/light					120,000	120,000	
	Receptacles & switches					28,300	28,300	
	Power Eq Dwg GI01					1,734,000	1,734,000	
	Motor terminations					26,500	26,500	
	Wire & cable contingency					570,000	570,000	
	Misc. control panels					22,000	22,000	
	Gen Sets 1750kW					966,000	966,000	
	UV system contingency					74,400	74,400	
Electrical subtotal								4,444,300
Instrumentation						437,000		437,000
HVAC/Plumbing/ Fire Protection								
	HVAC		Norman S Wright	Advantage Air Mechanical	285,500	335,500	621,000	
	Plumbing	22 fixtures				66,000	66,000	
	Fire Sprinklers	45,000 sf		Cutler Fire Protection		112,500	112,500	
HVAC/Plumbing/ Fire Protection Subtotal								799,500

		Quantities	Vendor	Subcontractor	Equipment / Material	Subcontractor or Installation	Total	Category Subtotals
UV/AOP			Wedeco		1,310,400	22,000	1,332,400	1,332,400
GAC								
	GAC system		Evoqua		1,489,400	54,000	1,543,400	
	Cartridge filters	2 ea	Fil-Trek		67,100	2,500	69,600	
GAC Subtotal								1,613,000
Chemical System								
	UG piping earthwork					17,000	17,000	
	Tanks & level gauges		Ryan Herco/Kenco		676,300	56,000	732,300	
	Centrifugal Pumps		Flowserve		123,300	5,000	128,300	
	Metering Pumps & Piping		Ryan/Herco		292,000	170,000	462,000	
	Carbon dioxide system		Tomco		250,000	14,000	264,000	
	Safety showers	12 ea			18,000	2,400	20,400	
Chemical System Subtotal								1,624,000
High Service Pump Station								
	Reservoir					301,000	301,000	
	Vertical turbine pumps and cans	4/5 ea	Flowserve		678,000	7,600	685,600	
	Pump station and finish water line		Ryan Herco		404,000	32,500	436,500	
High Service PS Subtotal								1,423,100
Groundwater Blending	N/A							
Architectural								
	Doors	46 ea	APCO Specialties		55,000	13,800	68,800	
	Glass & glazing			Architectural Openings Tucson		208,500	208,500	
	Overhead coiling doors w/operators	9 ea	Overhead Doors	Miner El Paso		124,500	124,500	
	Metal studs & drywall			Standard Drywall		545,500	545,500	
	Insulation	45,000 sf				90,000	90,000	
	Acoustical ceiling	8,740 sf		Standard Drywall		62,000	62,000	
	Stucco			Standard Drywall		227,500	227,500	
	Toilet partitions & accessories	9 ea				13,500	13,500	
	Built-up roofing	45,000 sf		Progressive Roofing		579,600	579,600	
	Flooring covering/ coating	45,000 sf				225,000	225,000	
	Painting			AO Painting		800,000	800,000	
Architectural Subtotal								2,944,900
Civil								
	Clear & grub	7 acres				25,680	25,680	
	Detention basins	8000 cy/73,000 sf				34,560	34,560	
	Structure earthwork (Exc, ABC,Bkfl)	11,805 cy/ 2374 tn/ 6865 cy				339,340	339,340	
	Finish grading, ABC, AC paving, gravel area	(57,000 sf/1964tn 1570 tn / 72 tn				188,900	188,900	
	Striping and bumpers					11,000	11,000	
	Sidewalks	5,000 SF				25,000	25,000	
	Landscaping			Jordan Foster		318,000	318,000	
Civil Subtotal								942,480
Subtotal								40,140,880
General Conditions & Start-up (10%)								4,014,088
OH&P (10%)								4,415,497
Bond (2%)								971,409
Total								49,541,874

EL PASO AQUIFER STORAGE & RECOVERY USING RECLAIMED WATER PROJECT

FINAL PERFORMANCE REPORT

TITLE XVI FEASIBILITY STUDY

By

Scott Reinert -EPWater

Brian Klaes-Moreno Cardenas, Inc.

U.S. Bureau of Reclamation (USBR) Contract -R17AP00323

PLANNING • ENGINEERING • PROJECT MANAGEMENT

Moreno Cardenas Inc.

Leaders in Project Delivery & Performance

July 23rd, 2018 (REVISED AUGUST 31, 2018)

Introduction

El Paso is located in far west Texas on the borders of Mexico and the New Mexico State line. The region around El Paso, Texas (Las Cruces, NM and Ciudad Juarez, Mexico) make up the largest border population in the world. Within the El Paso region, a large portion of the area is composed of the Fort Bliss Military Base. El Paso, Texas is in an arid climate and is experiencing drought like conditions in the desert southwest. These drought like conditions have caused problems for El Paso Water (EPW), which is the largest water utility in the region. EPW is faced with the problem of supplying a long-term reliable water source for the El Paso region. EPW is a world leader in water resources management.

In drought conditions, EPW has met the demand of potable water for the region using different water sources. EPW has relied on groundwater, surface water, reclaimed water, and desalinated water. Each water source comes from water treatment plants throughout El Paso. During the months of mid-February through mid-October, water is released from the Elephant Butte Reservoir and travels down through the Rio Grande to El Paso. The water is then used by the surface water treatment plants for potable water. The amount of water released and for how long is determined yearly based on reservoir recharge and is variable. The locations of the surface water treatment plants can be seen in **Figure ES-1**. The surface water is regulated by the United States Bureau of Reclamation and releases it from Elephant Butte Reservoir.

With the prolonged drought and no relief in sight, EPW has continued to look for more opportunities to provide a long-term reliable water source. This Title XVI Feasibility Study will compare an Aquifer Storage and Recovery (ASR) project alternative to three other alternatives. The ASR Project would supply additional reclaimed and impaired source waters for expanding EPW's aquifer recharge program in an effort to combat declining groundwater levels and a growing water demand.

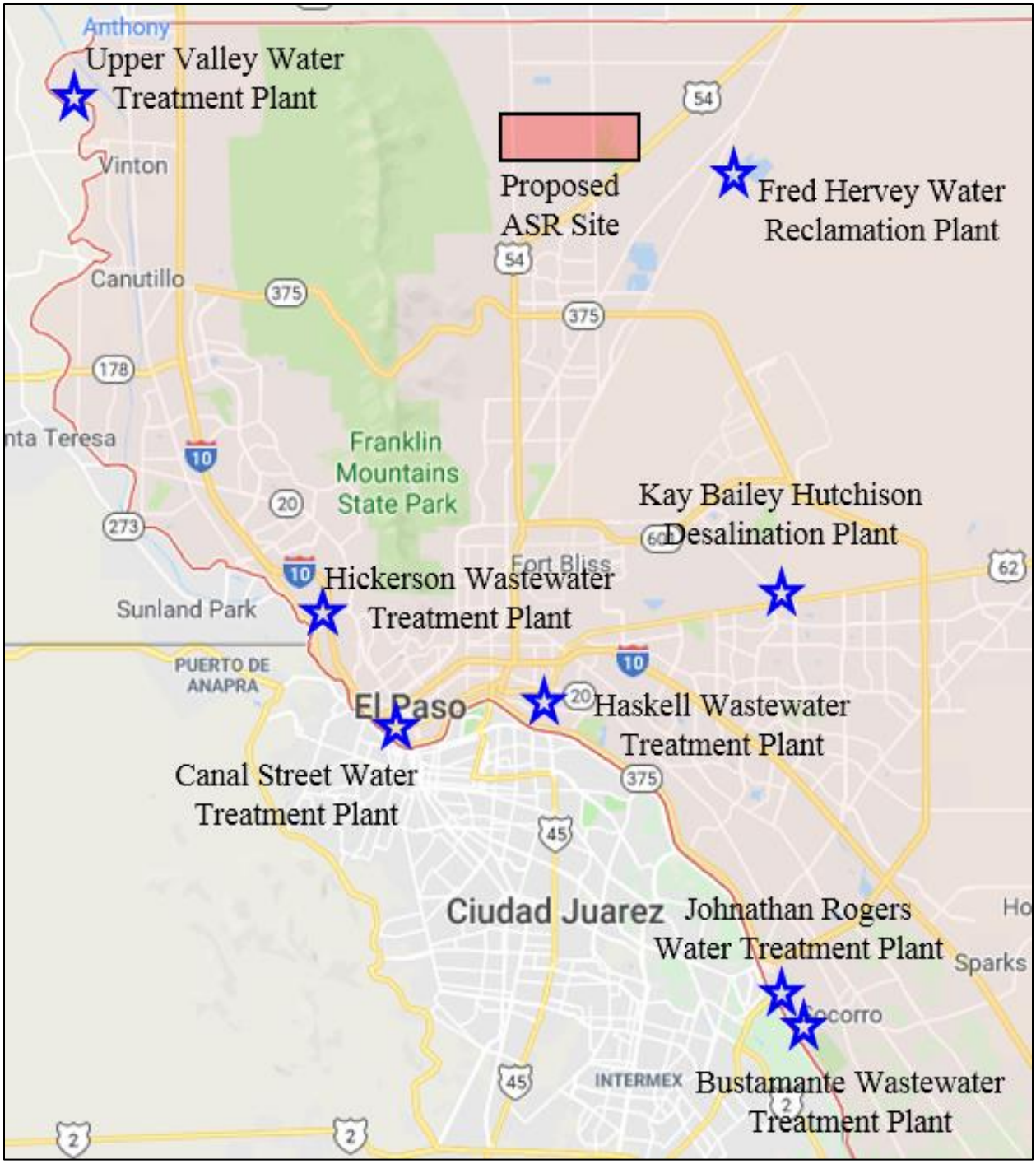


Figure ES-1: Plant Locations

Purpose and Need

With continued drought conditions and no signs of relief causing a significant decrease in the amount of available surface water, EPW has been forced to put more of a need to use groundwater to meet

demand which has depleted water levels over the years. In normal conditions, EPW has surface water rights for 70,200 acre-feet per year (AFY). During a full allocation, current infrastructure and current demands, EPW would produce approximately 60,000 AFY of water. In times of drought, EPW could receive less than 20,000-acre feet per year which places pressure on the groundwater pumping. By using weather and climate data, it is projected that more low-flow periods in the Rio Grande will continue. The expanded ASR Project would provide for additional water supply to help supplement and replenish available reservoirs for the region.

Background

El Paso area continues to face drought-like conditions while providing service to a growing customer base. The population in Texas is increasing and is expected to follow this trend. The Texas Water Plan expects that customer demand will exceed water supply as soon as 2030 due to population growth. Water supply is provided to the El Paso area via surface water and groundwater. Surface water comes from the Rio Grande. The Rio Grande water that is diverted in the El Paso area is primarily from snowmelt runoff in southern Colorado and northern New Mexico. The Elephant Butte and Caballo Reservoirs, both located in New Mexico, are regulating reservoirs for water storage which ultimately discharges to the Rio Grande and serves the El Paso region. The USBR oversees and operate these reservoirs which are critical to the El Paso service area. The continued drought has impacted the reservoirs and their supply; as of June 13, 2018, Elephant Butte Reservoir was at 14.8 percent of its normal storage capacity. In consequence of the drastically reduced water it has reduced and/or delayed deliveries to EPW. These reductions and delays makes EPW increase its groundwater production in order to meet the customer demands. Groundwater recharge is limited because the region only receives an average of 9 inches per year creating a demand pattern that challenges EPW's management of this precious resource.

Although facing this challenge of supply versus demand, EPW has continued to serve its customers while looking for opportunities and strategies that can provide a reliable and sustainable long-term water supply. The purpose of this feasibility study is to evaluate different alternatives for increasing and diversifying water supply sources in the El Paso region. The three alternatives to the no action approach for supply being evaluated as part of this study are: increasing the reclamation of impaired waters by expanding ASR or importing water from either Diablo Farms or Southern Hudspeth County.

Non-Federal Project Sponsor–El Paso Water (EPW)

EPW is the provider of water, wastewater, reclaimed water, and stormwater services for the City of El Paso and most of the El Paso County. EPW serves a population of approximately 850,000 people through over 235,500 meters connections. The entire service territory is located within the El Paso County, and primarily operates within the boundaries of the City of El Paso. **Figure 1-1** and **Figure 1-2**

show the overall geographical location and the current EPW service area which also depicts the existing water and wastewater treatment plants serving the community.

Alternative Evaluation

When comparing all the alternatives, each of the alternatives provides water for the future demand and are sustainable options with exception of the No Action Alternative. The major difference between the alternatives is the capital cost. The ASR Project has the lowest capital cost of the four alternatives. The water for the alternatives would be treated to drinkable standards and would mitigate environmental impacts for the areas. The land use for the ASR Alternative is far lower than the Diablo Farms and the Southern Hudspeth County Groundwater Importation Project. The No Action Alternative does not address near and long-term needs for meeting demand growth versus water supply. **Figure ES-2** summarizes each of the performance measures for the different alternatives.

Performance Measures	ASR Project	SHC Groundwater Importation Project	Diablo Farms Groundwater Importation Project	No Action
Provides 10,000 AFY of Additional Water Supply	✚ 15,000 AFY	○ Potentially up to 10,000 AFY	✚ 10,000 AFY	▬ 0 AFY
Treatment to Drinking Water Standards	✚	✚	✚	▬
Capital Cost	$27,700,000	$89,412,000	$219,380,000	$0*
Cost per 1,000 gallons	$0.77	$5.42	$8.06	$0
Life Cycle Cost	$38,003,000	$195,345,000	$373,401,000	NA
Groundwater Not Depleted in 50 Years	✚	○	✚	▬
No permanent Environmental Impacts	✚	✚	✚	▬
Performance Measures	**ASR Project**	**SHC Groundwater Importation Project**	**Diablo Farms Groundwater Importation Project**	**No Action**
No Cultural Resources Impacts	✚	○	○	▬

Land Removed for Other Uses (Acres)	41	247	411	0
Positive Public Perception in Region E	✚	✚	✚	▬
✚ = Meets Performance	▬ = Does not Meet Performance		◎ = Uncertain in Performance	
** Could lead to loss revenues/economic investment*				

Figure ES-2: Alternative Evaluation for Performance Measures

Recommended Project

After evaluating the different alternatives, the recommended alternative is the ASR Project as the preferred alternative. This project will help meet the future water supply and its capital cost is the lowest of the alternatives. As the climate changes there could be more and more water sent to the aquifer for recharge and future use. The implementation of the ASR Project does not show any major effects to the environment.

The total estimated capital cost is approximately $27,700,000. The ASR Project would require financial commitment from El Paso Water. EPW plans to pay for it and will seek funding from, but not limited to: the U.S. Bureau of Reclamation (USBR) Title XVI program, Texas Water Development Board's State Revolving Fund (TWDB SRF) program, and potentially increase the cost of water rates.

Appendix ASR Project

Description of Recommended Project

The proposed ASR Project would increase the aquifer recharge in the northeast of El Paso, Texas by supplementing treating reclaimed and impaired surface waters, and sending it to an enhanced arroyo for groundwater infiltration purposes to the Hueco Bolson Aquifer. The increased recharge would come from the multiple sources which include: additional treated reclaimed waters from the FHWRP to include additional treated reclaimed waters available through the use of CERRO treatment of power generating plant blowdown water, excess impaired water treated at existing surface WTPs that could be conveyed to the ASR site, and stormwater retention facilities that would retain flows and promote groundwater infiltration. The ASR improvements would consist of added pipelines, valves, meters, monitoring systems and controls to convey the waters for ASR, new infiltration basin facilities, a new CERRO treatment system, and upgrades to existing EPW infrastructure as is generally shown in **Figure A-1**. **Figure A-2 and Figure A-3** both show an example of the enhanced arroyo concept.

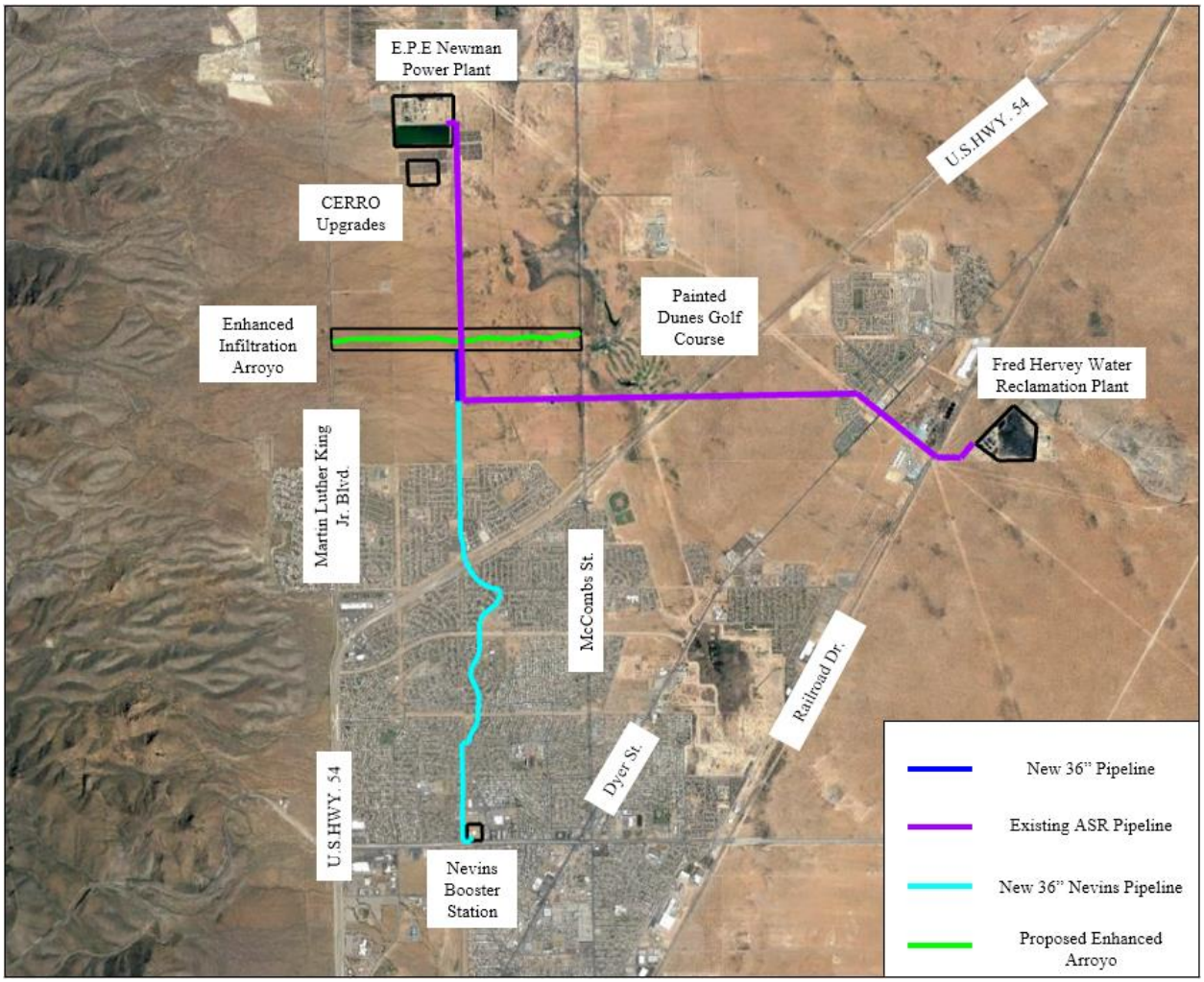


Figure A-3: Title XVI ASR Project Layout

Figure A-4: Existing Enhanced Arroyo

Figure A-5: Title XVI ASR Enhanced Arroyo Concepts

FHWRP Excess Reclaimed Water: FHWRP additional reclaimed water for ASR is available for the project due to the existing 12 MGD WWTP available capacity. The wastewater plant currently treats approximately 5.8 MGD of effluent to drinking water standards. EPW currently has plans to divert wastewater flows to FHWRP (approximately 600 AFY) to utilize this excess treatment capacity and increase flow for ASR purposes. In addition, EPW is currently working with the UTEP to develop a CERRO process to be installed at the local generating station that would be able to save as much as 900 AFY in terms of generation cooling water demand reductions. This is essentially a 25% reduction in cooling water demand at this location and represents new, or conserved, water that will be available for recharge to the aquifer and eventual reuse by the public during time of need. Preliminary findings also indicate that the energy recovery system (booster pump enhancements) contained within the CERRO system itself will recover approximately 20% of the electricity used to operate the CERRO system, thus an equivalent reduction in electrical demand compared to standard RO systems.

Impaired Waters (Groundwater & Surface) for ASR: Additional ASR waters would be supplied via excess system brackish groundwater treated at the KBH Facility and/or excess treated surface waters from the Jonathon Rogers or Canal Street WTPs. The surface WTPs normally operate during the irrigation season, which extends from mid-February to mid-October (depending on the surface water availability). The JR/Canal WTPs do not run at full capacity in the beginning of the irrigation season due to the low demand for potable water. The plants slowly ramp up to meet demand during the hotter months (June through August). During irrigation season, EPW can receive up to its full allocation (70,200 AFY) for the year. On average El Paso uses approximately 60,000 AFY, which would leave an additional 10,200 AFY of treatable water unused by El Paso. This additional water would be treated at the WTPs and sent through the existing water distribution system to the Nevins Booster Station. For the treated water to reach the proposed enhanced arroyo, a new 36-inch pipeline would be constructed starting for the Nevins Booster Station, going north, to the enhanced arroyo. The general layout of the pipeline from the Nevins Booster Station to the enhanced arroyo can be seen in **Figure 4-1**. As the demand for treated water increases, the enhanced arroyo will be designed with valves to regulate the flow to the arroyo or remain in the water distribution system. The treated water that is sent to the arroyo for infiltration would increase the amount of groundwater in the area of the Hueco Bolson Aquifer and would be available during times of prolonged drought. This is an effective process of “banking” excess treated waters in the Hueco Bolson to combat historical depletion of the aquifer while allowing future drinking water access via existing downgradient production wells.

Stormwater for ASR: Potential additional stormwater recharge rates will be available due to expanded recharge enhanced arroyo infrastructure planned which will facilitate Hueco Bolson injectivity past confining subsurface strata conditions. Infiltration flows for recharge would be similar to a full river allotment condition (70,000 AF available for surface water treatment) during higher intensity rainfall events while providing additional levels of storage. Preliminary hydrologic modeling further shows 100-yr rainfall conditions can be met in accordance with City of El Paso Design Standards for the Franklin Mountain foothill contributing areas located west of Martin Luther King Blvd. In addition, the infiltration enhanced arroyo could accommodate additional storm flow diversions for ASR from areas located both

south and north of the arroyo. Although weather patterns are highly unpredictable due to the arid desert environment, average 9-inches per year of rainfall could be retained in the basins for ASR.

The proposed arroyo will provide approximately 843 AF of storage. The existing watershed contributing to Flow Path 54 generates a runoff volume of approximately 390 AF. The proposed arroyo would properly convey the 100-year storm event runoff for Flow Path 54. It will also allow development of up to a half-mile on either side of the proposed arroyo up to discharge developed runoff. **Figure A-4** shows the 100-year flood zone within the proposed arroyo limits. There are infiltration ponds used by EPW's FHWRP that sends excess reclaimed water to these ponds for aquifer recharge.

Figure A-6: 100-Year Flood Zone with proposed Arroyo and Development Boundary

Existing Conditions:

EPW currently owns and operates the existing FHWRP located in northeast El Paso. As previously stated, the plant treats approximately 5.8 MGD of effluent to drinking water standards for

predominantly groundwater recharge purposes, power generating plant cooling tower blowdown water purposes and to irrigate an existing area golf course. Existing pipelines, pumps and storage tanks are used to convey the reclaimed water to the various users and ASR sites. ASR facilities include existing infiltration basins and 2 injection wells.

Figure A-7: Infiltration basins

The location of the proposed Title XVI ASR expansion project would also be located on land owned by EPW/City of El Paso the proposed ASR infiltration area via enhanced arroyos extends from Martin Luther King Jr. Blvd. to McCombs St. This area is currently native desert landscape and is located near existing infiltration basins and an injection well also owned and operated by EPW (see **Figure A-5)**. There is an existing arroyo that was created by the foothills of the Franklin Maintains runoff during times of heavy rain. The existing arroyo is designated as Special Flood Hazard Area (SFHA) and identified as Flow Path 54 in the Flood Insurance Rate Map (FIRM) published by the Federal Emergency Management Agency (FEMA). The extent of the SFHA is depicted in FIRM Panel Numbers 480214 0008 C and 9 480214 0009 D. The proposed arroyo is located east of the Franklin Mountains foothills. **Figure A-6** shows the existing 100-year flood zone (blue) and the general boundary limits of the proposed ASR site (red).

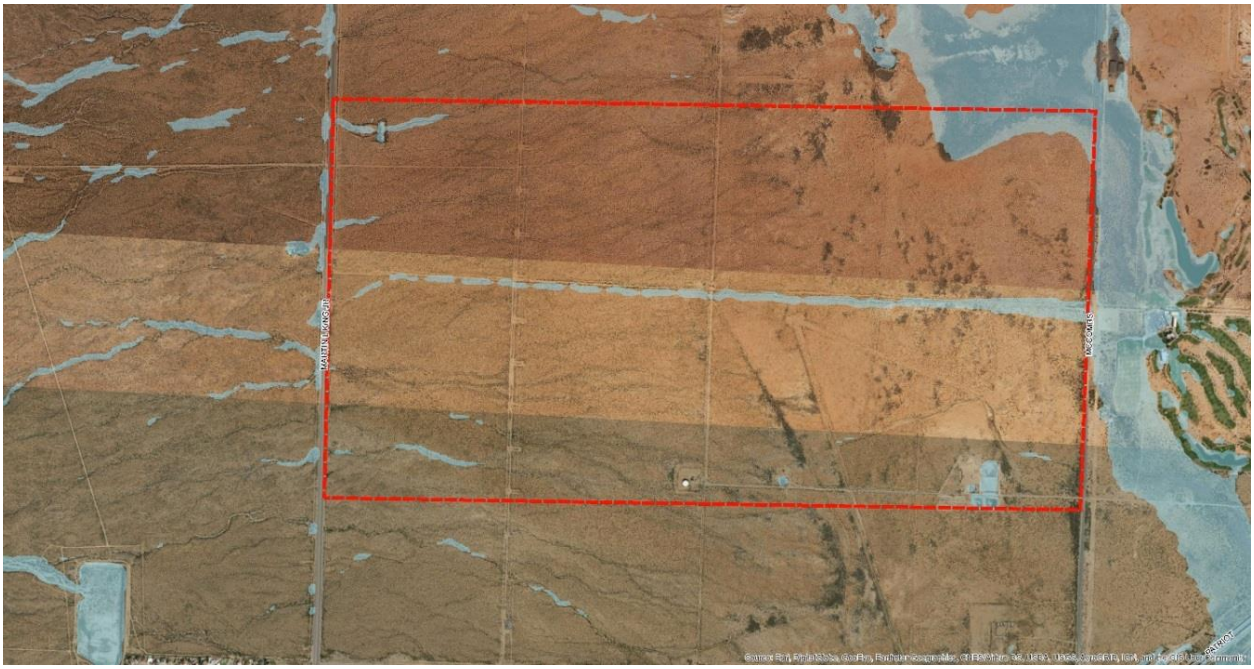


Figure A-8: 100-Year Flood Zone

Hydrologic Conditions:

The Franklin Mountains to the west of the proposed enhanced arroyo site were created over 1 million years ago due to seismic activity. These seismic events caused the Rio Grande to shift from the east side of the mountains to the west side where it flows today. The Hueco Bolson was thus created from the seismic events and from the fresh water that once flowed in the Rio Grande. The fresh water stored in the Hueco Bolson aquifer is the water we pump today. Over the years the amount of fresh groundwater left in the Hueco Bolson has declined due to the pumping in the area to make up the demand of potable water for the El Paso Region. There is approximately 9.4 million AF of fresh water in the Hueco Bolson. The quality of the ground water has decline over the year because as the groundwater is pumped, the more TDS remains in the water.

Alternative Evaluation:

Table A-1 summarizes the evaluation findings of the proposed ASR Expansion Project with respect to the previously outlined objectives and performance measures.

Table A-1: ASR Evaluation

Objective	Performance Measure	Evaluation
Increase EPWs' potable water supply so that the project capacity could support the projected demand	Provide 10,000 AFY additional water supply	15,000 AFY
Provide a source of supply of adequate water quality that is treatable to meet drinking water standards	Can be treated to meet drinking water standards	Water quality is not a concern due to current treatment processes in place that are established in meeting delivery standards.
Minimize capital costs	Lowest capital costs	$27,700,000
Minimize annual costs	Lowest cost 1,000 gallons	$0.77
Life cycle costs	Lowest life cycle cost	$38,003,000
Provide a source of supply that does not lead to groundwater depletion in 50 years	Source area groundwater is not depleted in 50 years through managed mining	Additional exploratory work is required to confirm that the aquifer will not be depleted after 50 years of managed mining; this project promotes combatting declining levels
Mitigate or avoid permanent environmental impacts	Anticipated permanent environmental impacts are avoidable or mitigated	No permanent environmental impacts are anticipated
Avoid impacts to culture resources	Cultural resources could be avoided	There would be no permanent impact in the cultural resources.
Promotes sustainable land use	Area of land resources could be avoided	Removes 41 acres of land from other uses
Receive acceptance and positive support from the public	Positive public perception in Region E and in the EPW service area	No concerns noted and has received positive input response from El Paso Community.

The average water demands for the El Paso region is approximately 60,000 AFY. The full allotment that EPW has rights to is 70,200 AFY which would leave about 10,000 AFY left in Elephant Butte Reservoir that would otherwise go unused. This 10,000 AFY of unused water could be sent down the Rio Grande and processed at the surface WTPs to be then sent through the distribution the proposed ASR site. This additional recharge would take place at the beginning (mid-February to early March) and end of the irrigation season (late September to early October). The water would only need to be treated at the surface WTPs and sent to the ASR site. During the beginning and end of the irrigation seasons the WTPs would send excess water to the ASR site for infiltration. It times on drought or even low surface water

availability the water that infiltrated into the aquifer could then be pumped up and used to meet demand. The proposed enhanced arroyo would take up additional land but would use the existing arroyo. There were no permanent environmental impacts to the area. With the use of the CERRO process, additional water would be supplied to the enhanced arroyo for additional recharge. The recharge would come from water that would normally be sent to the power plant for cooling towers but instead would be redirected to the arroyo. Also, treated water would be sent to the enhanced arroyo from other wastewater treatment plates. This water would be diverted using the existing piping network.

Cost Estimate:

The estimated capital cost for the ASR Expansion Project is approximately $27.7 million mainly from the size of the arroyo that would be constructed to accommodate the 100-year flood and the additional infiltration sent from the surface WTPs. Additional O&M costs would also affect the overall price because the size of the enhanced arroyo. A 25% contingency cost was applied to the overall price. The cost excavation for the arroyo is approximately 28% of the total cost. A summary of the cost can be seen **Table A-2**. **Appendix A** shows the complete breakdown of the for this alternative.

Table A-2: Estimated Cost for ASR

Item	Cost
Total Cost of Facilities	$27,700,000
Total Cost of Project	$38,003,000
Unit Cost (after debt service) Per 1,000 gallons	$0.77

Appendix A

ASR Alternative Cost Breakdown

El Paso Water
Northeast Regional ASR Project Infrastructure Upgrades
Preliminary Order of Magnitude Opinion of Probable Cost
Full Allotment Condition Scenario (2009)

Item No.	Estimated Quantity	Unit	Item Description	Unit Cost	Item Cost
NEVINS PS UPGRADES & TRANSMISSION LINE TO ASR ENHANCED ARROYO					
1	1	LS	Traffic Control Plan/ Implementation	$ 50,000	$ 50,000
2	1	LS	Video Taping of Project Site	$ 2,500	$ 2,500
3	27,920	LF	Furnish & Install 36-inch Transmission Main (Nevins to ASR Enhanced Arroyos)	$ 180	$ 5,025,600
4	0	LF	Furnish & Install 24-inch Transmission Main (FFHWRP to ASR Enhanced Arroyo)	$ 150	$ -
5	1	LS	System Booster Station Upgrades	$ 2,000,000	$ 2,000,000
6	1	LS	Recharge Pressure Regulating Station	$ 100,000	$ 100,000
7	15	EA	Furnish & Install 36-inch Butterfly Valves	$ 22,500	$ 336,600
8	900	LF	48" Steel Casing Installations via Boring/Jacking	$ 550	$ 495,000
9	0	LF	48" Steel Casing Installations via Open Cut	$ 400	$ -
10	0	LF	36" Steel Casing Installations via Open Cut	$ 325	$ -
11	40,000	SY	Remove/Replace HMAC Pavement	$ 40	$ 1,600,000
12	10	EA	4" Combo Air Release Valves	$ 7,000	$ 70,000
			SUB-TOTAL		**$ 9,679,700**
13		5%	Contractor Mobilization, Bonds and Insurance		$ 483,985
14		25%	Contingencies		$ 2,419,925
SUB-TOTAL					**$ 12,583,610**
ENHANCED ARROYO UPGRADES					
1	1	LS	Traffic Control Plan/ Implementation	$ 50,000	$ 50,000.00
2	1	LS	Video Taping of Project Site	$ 2,500	$ 2,500.00
3	720	LF	Furnish & Install 8-inch Transmission Main (Enhanced Arroyo Outlet)	$ 65	$ 46,800.00
4	0	LF	Furnish & Install 12-inch Transmission Main	$ 75	$ -
5	1,311	LF	Furnish & Install 16-inch Transmission Main (ASR Enhanced Arroyos header heading east)	$ 85	$ 111,435.00
6	1,330	LF	Furnish & Install 20-inch Transmission Main (ASR Enhanced Arroyos header heading east)	$ 120	$ 159,600.00
7	1,253	LF	Furnish & Install 24-inch Transmission Main (ASR Enhanced Arroyos header heading east)	$ 150	$ 187,950.00
8	12	EA	Furnish & Install 8-inch Gate Valves	$ 2,000	$ 24,000.00
9	1	EA	Furnish & Install 16-inch Butterfly Valves Valves	$ 10,000	$ 10,000.00
10	1	EA	Furnish & Install 20-inch Butterfly Valves Valves	$ 13,000	$ 13,000.00
11	1	EA	Furnish & Install 24-inch Butterfly Valves Valves	$ 16,000	$ 16,000.00
12	4	EA	4" Combo Air Release Valves	$ 7,000	$ 28,000.00
13	4	EA	2" Combo Air Release Valves	$ 4,500	$ 18,000.00
14	898,743	CY	Excavation and Proper Disposal of Unclassified Material (Cut to Waste for Enhanced Arroyos)	$ 8	$ 7,189,941
15	9,496	CY	Enhanced Arroyo Gabion Drop Structures	$ 100	$ 949,614.55
16	1	LS	Enhanced Arroyos Landscaping Upgrades (Quality of Life Amenities, Garden Walls, Bike Path, etc.)	$ 1,244,048	$ 1,244,048.00
			SUB-TOTAL		**$ 10,050,889**

17		5%	Contractor Mobilization, Bonds and Insurance		$ 502,544
18		25%	Contingencies		$ 2,512,722
			TOTAL		**$ 13,066,155**

MISCELLANEOUS ASR PROJECT UPGRADES					
1	1	LS	CERRO Upgrades (Provided by EPW/Others)	$ 1,500,000	$ 1,500,000
2	0	LS	Additional Contract Water Purchase - excluded	$ -	$ -
3	0	LS	Additional Operational & Treatment Costs - excluded	$ -	$ -
4	0	LS	Additional FHWRP Filter Upgrades to 12 MGD Capacity - excluded	$ -	$ -
5	0	LS	North 9 Infiltration Basin & Amenity Upgrades - excluded (TBD)	$ -	$ -
6	0	LS	Transmission Main (Fred Hervey WRP to ASR Enhanced Arroyo)	$ -	$ -
			SUB-TOTAL		**$ 1,500,000**
5		5%	Contractor Mobilization, Bonds and Insurance		$ 75,000
6		25%	Contingencies		$ 375,000
			TOTAL		**$ 1,950,000**
			CAPITAL TOTAL		**$ 27,599,765**

11	15%	%	Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel		$ 4,139,965
12	15%	%	Project Contingency		$ 4,139,965
13	2%	%	Environmental & Archaeology Studies and Mitigation		$ 551,995
14	1%	%	Land Acquisition and Surveying (41 acres)		$ 275,998
15	4%	%	Interest During Construction (4% for 1 year with a 1% ROI)		$ 1,103,991

	TOTAL	**$ 37,811,678**

NOTE: cost opinion budget is based on 2017 dollars.

THIS OPINION OF COST WAS PREPARED USING STANDARD COST AND/OR ESTIMATING PRACTICES. IT IS UNDERSTOOD THAT THIS IS ONLY AN OPINION, AND THAT THE ENGINEER WILL NOT BE LIABLE TO THE OWNER OR TO ANY THIRD PARTY FOR ANY FAILURE TO ACCURATELY ESTIMATE THE COST OF THE PROJECT, OR ANY PART THEREOF. THIS OPINION OF COST DOES NOT INCLUDE SALES TAX.

ASR

Loan Data	
Loan Amount	$ 39,700,000
Annual Interest Rate	4.0%
Loan Period in Years	20
Number of Payments Per Year	1
Start Date	1-Nov-2019

Project Cost	$ 39,700,000
Debt service Payment	$ 2,755,998
O&M Cost	$ 30,000

Summary	
Payment (per period)	$ 2,755,998
Number of Payments	20
Actual Number of Payments	20
Total Interest Paid	$ 17,219,970.82
Total Interest	43.4%
Total Extra Payments	
Total Payment	$ 56,919,971

Payment No.	Payment Date	Payment	Principal	Interest	Extra Payment	Balance
						$ 39,700,000.00
1	1-Nov-2020	$ 2,755,998.48	$ 1,262,986.29	$ 1,493,012.19		$ 36,637,013.66
2	1-Nov-2021	$ 2,755,998.48	$ 1,314,442.30	$ 1,441,556.18		$ 35,322,571.31
3	1-Nov-2022	$ 2,755,998.48	$ 1,367,994.71	$ 1,388,003.77		$ 33,954,576.54
4	1-Nov-2023	$ 2,755,998.48	$ 1,423,728.91	$ 1,332,269.57		$ 32,530,847.56
5	1-Nov-2024	$ 2,755,998.48	$ 1,481,733.83	$ 1,274,264.65		$ 31,049,113.67
6	1-Nov-2025	$ 2,755,998.48	$ 1,542,101.96	$ 1,213,896.52		$ 29,507,011.65
7	1-Nov-2026	$ 2,755,998.48	$ 1,604,929.56	$ 1,151,068.92		$ 27,902,082.01
8	1-Nov-2027	$ 2,755,998.48	$ 1,670,316.90	$ 1,085,681.58		$ 26,231,765.06
9	1-Nov-2028	$ 2,755,998.48	$ 1,738,368.17	$ 1,017,630.31		$ 24,493,396.83
10	1-Nov-2029	$ 2,755,998.48	$ 1,809,191.97	$ 946,806.51		$ 22,684,204.79
11	1-Nov-2030	$ 2,755,998.48	$ 1,882,901.24	$ 873,097.24		$ 20,801,303.47
12	1-Nov-2031	$ 2,755,998.48	$ 1,959,613.55	$ 796,384.93		$ 18,841,689.86
13	1-Nov-2032	$ 2,755,998.48	$ 2,039,451.24	$ 716,547.24		$ 16,802,238.55
14	1-Nov-2033	$ 2,755,998.48	$ 2,122,541.64	$ 633,456.84		$ 14,679,696.86
15	1-Nov-2034	$ 2,755,998.48	$ 2,209,017.26	$ 546,981.22		$ 12,470,679.54
16	1-Nov-2035	$ 2,755,998.48	$ 2,299,016.04	$ 456,982.44		$ 10,171,663.45
17	1-Nov-2036	$ 2,755,998.48	$ 2,392,681.49	$ 363,316.99		$ 7,778,981.89
18	1-Nov-2037	$ 2,755,998.48	$ 2,490,163.04	$ 265,835.44		$ 5,288,818.80
19	1-Nov-2038	$ 2,755,998.48	$ 2,591,616.11	$ 164,382.37		$ 2,697,202.62
20	1-Nov-2039	$ 2,755,998.48	$ 2,697,202.57	$ 58,795.91		$ -

Life Cycle Cost Table						
Year	Annual Cost (Debt Service Payment), ignore inflation	Annual O&M, ignore inflation	Annual O&M, increases at 3% inflation	Total Annual Cost, ignore inflation	Total Annual Cost, increases at 3% inflation	Total Annual Cost, Debt Service is constant while O&M increases at 3% inflation
0						
1	$ 2,755,998	$ 30,000	$ 30,000	$ 2,785,998	$ 2,785,998	$ 2,785,998
2	$ 2,755,998	$ 30,000	$ 30,900	$ 2,785,998	$ 2,869,578	$ 2,786,898
3	$ 2,755,998	$ 30,000	$ 31,827	$ 2,785,998	$ 2,955,666	$ 2,787,798
4	$ 2,755,998	$ 30,000	$ 32,782	$ 2,785,998	$ 3,044,336	$ 2,788,698
5	$ 2,755,998	$ 30,000	$ 33,765	$ 2,785,998	$ 3,135,666	$ 2,789,598
6	$ 2,755,998	$ 30,000	$ 34,778	$ 2,785,998	$ 3,229,736	$ 2,790,498
7	$ 2,755,998	$ 30,000	$ 35,822	$ 2,785,998	$ 3,326,628	$ 2,791,398
8	$ 2,755,998	$ 30,000	$ 36,896	$ 2,785,998	$ 3,426,427	$ 2,792,298
9	$ 2,755,998	$ 30,000	$ 38,003	$ 2,785,998	$ 3,529,220	$ 2,793,198
10	$ 2,755,998	$ 30,000	$ 39,143	$ 2,785,998	$ 3,635,096	$ 2,794,098
11	$ 2,755,998	$ 30,000	$ 40,317	$ 2,785,998	$ 3,744,149	$ 2,794,998
12	$ 2,755,998	$ 30,000	$ 41,527	$ 2,785,998	$ 3,856,473	$ 2,795,898
13	$ 2,755,998	$ 30,000	$ 42,773	$ 2,785,998	$ 3,972,168	$ 2,796,798
14	$ 2,755,998	$ 30,000	$ 44,056	$ 2,785,998	$ 4,091,333	$ 2,797,698
15	$ 2,755,998	$ 30,000	$ 45,378	$ 2,785,998	$ 4,214,073	$ 2,798,598
16	$ 2,755,998	$ 30,000	$ 46,739	$ 2,785,998	$ 4,340,495	$ 2,799,498
17	$ 2,755,998	$ 30,000	$ 48,141	$ 2,785,998	$ 4,470,710	$ 2,800,398
18	$ 2,755,998	$ 30,000	$ 49,585	$ 2,785,998	$ 4,604,831	$ 2,801,298
19	$ 2,755,998	$ 30,000	$ 51,073	$ 2,785,998	$ 4,742,976	$ 2,802,198
20	$ 2,755,998	$ 30,000	$ 52,605	$ 2,785,998	$ 4,885,265	$ 2,803,098
SUM	$ 55,119,970	$ 600,000	$ 806,111	$ 55,719,970	$ 74,860,822	$ 53,104,971
NPV	$ 37,454,919	$ 407,710	$ 547,766	$ 37,862,629	$ 50,869,150	$ 38,002,685

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
R-4 Groundwater from Dell City Area Phase I

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Transmission Pipeline (54 in dia., 93 miles)	$243,434,000
Primary Pump Stations (13.4 MGD)	$11,136,000
Transmission Pump Station(s) & Storage Tank(s)	$20,456,000
Transmission Pipeline (30 in dia., 18 miles)	$20,159,000
Primary Pump Stations (13.4 MGD)	$5,106,000
Transmission Pump Station(s) & Storage Tank(s)	$6,552,000
Pipeline Crossings	$4,880,000
Well Fields (Wells, Pumps, and Piping)	$27,080,000
Water Treatment Plant (13.4 MGD)	$760,000
TOTAL COST OF FACILITIES	**$339,563,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$105,423,000
Environmental & Archaeology Studies and Mitigation	$53,003,000
Land Acquisition and Surveying (10758 acres)	$56,129,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$15,239,000
TOTAL COST OF PROJECT	**$569,357,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$40,061,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,003,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$963,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$456,000
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (31267085 kW-hr @ 0.08 $/kW-hr)	$2,501,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$46,984,000**
Available Project Yield (acft/yr)	10,000
Annual Cost of Water ($ per acft), based on PF=1.5	$4,698
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$692
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$14.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$2.12
Note: One or more cost element has been calculated externally	

HK *7/24/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
R-4 Groundwater from Dell City Area Phase II

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Transmission Pipeline (42 in dia., 12 miles)	$23,579,000
Transmission Pump Station(s) & Storage Tank(s)	$56,074,000
Transmission Pipeline (18 in dia., 10 miles)	$5,854,000
Well Fields (Wells, Pumps, and Piping)	$50,743,000
Storage Tanks (Other Than at Booster Pump Stations)	$3,911,000
Water Treatment Plant (18 MGD)	$50,948,000
TOTAL COST OF FACILITIES	**$191,109,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$65,417,000
Environmental & Archaeology Studies and Mitigation	$4,000
Land Acquisition and Surveying (10253 acres)	$55,125,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$8,571,000
TOTAL COST OF PROJECT	**$320,226,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$22,531,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$866,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$1,339,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$9,647,000
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (45333898 kW-hr @ 0.08 $/kW-hr)	$3,627,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$38,010,000**
Available Project Yield (acft/yr)	10,000
Annual Cost of Water ($ per acft), based on PF=1.6	$3,801
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.6	$1,548
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.6	$11.66
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.6	$4.75
Note: One or more cost element has been calculated externally	

HK *9/11/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-1 Advanced Water Purification at the Haskell Street WRP

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Transmission Pipeline (36 in dia., 2 miles)	$8,540,000
Primary Pump Stations (12 MGD)	$3,390,000
Well Fields (Wells, Pumps, and Piping)	$16,594,000
Water Treatment Plant (16.8 MGD)	$34,457,000
Advanced Water Treamtent Facility (12 MGD)	$73,427,000
TOTAL COST OF FACILITIES	**$136,408,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$47,316,000
Environmental & Archaeology Studies and Mitigation	$555,000
Land Acquisition and Surveying (30 acres)	$9,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$5,068,000
TOTAL COST OF PROJECT	**$189,356,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$13,323,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$251,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$85,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,412,000
Advanced Water Treamtent Facility	$9,586,000
Pumping Energy Costs (7217346 kW-hr @ 0.08 $/kW-hr)	$577,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$26,234,000**
Available Project Yield (acft/yr)	8,900
Annual Cost of Water ($ per acft), based on PF=1.5	$2,948
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$1,451
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$9.04
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$4.45
Note: One or more cost element has been calculated externally	

HK, Spencer Schnier, Freese and Nichols *2/7/2020*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-2 Treatment and Reuse of Agricultural Drain Water

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Storage/Conveyance Improvements	$3,671,000
Water Treatment Plant (2.4 MGD)	$11,902,000
TOTAL COST OF FACILITIES	**$15,573,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$5,267,000
Environmental & Archaeology Studies and Mitigation	$24,000
Land Acquisition and Surveying (1 acres)	$27,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$575,000
TOTAL COST OF PROJECT	**$21,466,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,510,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$37,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$991,000
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,538,000**
Available Project Yield (acft/yr)	2,700
Annual Cost of Water ($ per acft), based on PF=1	$940
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$381
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.88
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.17
Note: One or more cost element has been calculated externally	

HK *9/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-3 Expansion of Canutillo Mesilla Bolson Well Field

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$4,612,000
TOTAL COST OF FACILITIES	**$4,612,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,614,000
Environmental & Archaeology Studies and Mitigation	$43,000
Land Acquisition and Surveying (5 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$173,000
TOTAL COST OF PROJECT	**$6,444,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$453,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$46,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (275000 kW-hr @ 0.08 $/kW-hr)	$22,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$521,000**
Available Project Yield (acft/yr)	970
Annual Cost of Water ($ per acft), based on PF=1	$537
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$70
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.65
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.22
Note: One or more cost element has been calculated externally	

HK *9/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-4 Lower Valley Well Head RO Desalination

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Transmission Pipeline (18 in dia., 10 miles)	$10,004,000
Primary Pump Stations (5.4 MGD)	$4,276,000
Pipeline Crossings	$140,000
Well Fields (Wells, Pumps, and Piping)	$6,202,000
Storage Tanks (Other Than at Booster Pump Stations)	$3,472,000
Water Treatment Plant (4 MGD)	$13,984,000
TOTAL COST OF FACILITIES	**$38,078,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$12,820,000
Environmental & Archaeology Studies and Mitigation	$337,000
Land Acquisition and Surveying (45 acres)	$36,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,410,000
TOTAL COST OF PROJECT	**$52,681,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,707,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$198,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$107,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,612,000
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (4635964 kW-hr @ 0.08 $/kW-hr)	$371,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$6,995,000**
Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=1.2	$1,399
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.2	$658
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.2	$4.29
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.2	$2.02
Note: One or more cost element has been calculated externally	

HK *9/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-5 Expansion of the Kay Bailey Hutchison Desal Plant

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$7,610,000
Water Treatment Plant (5 MGD)	$11,371,000
TOTAL COST OF FACILITIES	**$18,981,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$6,643,000
Environmental & Archaeology Studies and Mitigation	$140,000
Land Acquisition and Surveying (23 acres)	$17,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$709,000
TOTAL COST OF PROJECT	**$26,490,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,864,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$76,000
Water Treatment Plant	$801,000
Pumping Energy Costs (21254506 kW-hr @ 0.08 $/kW-hr)	$1,700,000
TOTAL ANNUAL COST	**$4,441,000**
Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=1	$888
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$515
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.73
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.58

Note: One or more cost element has been calculated externally

Spencer Schnier, Freese and Nichols *10/9/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-6 Expansion of Jonathan Rogers WTP

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Water Treatment Plant Expansion (20 MGD)	$63,085,000
TOTAL COST OF FACILITIES	**$63,085,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$22,080,000
Interest During Construction (3% for 1.5 years with a 0.5% ROI)	$3,514,000
TOTAL COST OF PROJECT	**$88,679,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$6,239,000
Water Treatment Plant	$2,761,000
TOTAL ANNUAL COST	**$9,000,000**
Available Project Yield (acft/yr)	6,500
Annual Cost of Water ($ per acft), based on PF=1	$1,385
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$425
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.25
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.30

Note: One or more cost element has been calculated externally

Spencer Schnier, Freese and Nichols *10/10/2019*

EL PASO COUNTY WATER IMPROVEMENT DISTRICT No. 1
P.O. BOX 749 | 13247 ALAMEDA AVE. | CLINT, TEXAS 79836-0749
(915) 872-4000 | FAX (915) 851-0091| www.epcwid1.org
DISPATCH (915) 872-4029

VIA EMAIL

November 21, 2019

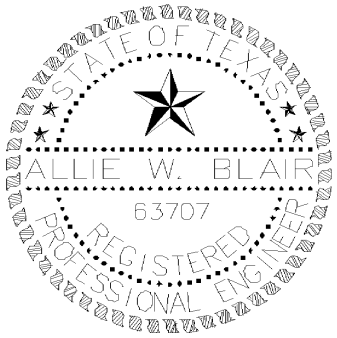
Jennifer Herrera
Regional Project Operations Manager
WSP USA
1101 S. Capital of Texas Hwy. Suite B-220
Austin, TX 78746

RE: Cost Information for Water Management Strategies

Dear Ms. Herrera,

Attached are the project descriptions and cost information for two water management strategies for the El Paso County Water Improvement District No. 1 to be included in the 2021 Far West Texas Regional Water Plan. Please contact me if you have any questions.

Sincerely,



A.W. Blair, P.E. Ph.D.
District Engineer

Enclosures:

1. Riverside Regulating Reservoir Project Description and ROM Cost Estimate and Summary of Cost of Construction and Improvements
2. Wasteway 32 River Diversion Pumping Plant Project Description and ROM Cost Estimate and Summary of Cost of Construction and Improvements

Riverside Regulating Reservoir

In order to make more efficient use of surface water supplies, EPCWCID has proposed purchasing the City of El Paso former Socorro Pond Sewage Treatment Facility located in the city limits of El Paso near the Bustamante Waste Water Facility.

The regulating reservoir will allow more efficient use of stored water releases from the Rio Grande Project storage reservoirs, as well as flows that originate as stormwater runoff below Caballo Reservoir. The primary source of water stored in the reservoir would be from excess flows diverted at American Dam and conveyed to the heading of the Riverside Canal. These excess flows primarily consist of storm runoff and operation spills from upstream water users. The temporary stored water would be used either for downstream irrigators or be pumped to the nearby Jonathan Rogers Water Treatment Plant for municipal use. All of the water sources are already authorized through existing state and federal contracts, agreements and water rights.

The primary benefits of the project are:

Improved farm delivery scheduling and flows

Conservation of water stored in upstream storage reservoir through using water captured in regulating reservoirs to meet downstream demands

A 5 day supply of raw water for use by City of El Paso in case of an emergency such as failure or contamination of American Canal system.

Portions of the project have already been completed, including improvements to the Riverside Franklin Feeder Check Structure; - a concrete bridge to the Jonathan Rogers WTP; - canal lining; and a flood waste-way to the river.

EPCWID is collaborating with municipalities in El Paso County to make capacity upgrades to existing irrigation drain infrastructure to mitigate flooding while facilitating the capture and reuse of stormwater from local storm events. Stormwater capture and reuse would lead to the development of a new water source for EPCWID. Additional studies are needed to determine the quantity and quality of the stormwater that can be captured and the upgrades that are necessary for reuse. EPCWID intends to pursue a mixture of funding options to develop stormwater capture and reuse infrastructure, such as any programs resulting from flood-related legislation passed by the 86th Texas Legislature, including Senate Bill (SB) 7, SB 8, SB 500, and House Joint Resolution 4.

Quantity, Reliability, and Cost – The primary benefit of this strategy is allowing for more efficient use of existing supplies of water. Previous studies of this project have estimated that the project could provide 6,500 acre-feet of water per year. However, there may be some years where the strategy could provide more or less water, depending on available river supplies and the amount of excess water in the canal.

ROM COST ESTIMATE

Item	UOM	Unit Price	Quant.	Cost
Leveling - Reservoir Area				
Cut	CY	$1.50	472,267	$ 708,401
Leveling Fill (compacted)	CY	$2.00	282,899	$ 565,798
To Embankment	CY	$5.00	147,127	$ 735,636
Line exposed cut slope in reservoir (3 ft)	CY	$6.50	21,113	$ 137,235
Net Excess Excavation	CY	$1.50	21,128	$ 31,692
Borrow Area Exc. To Embankment Fill	CY	$6.50	183,831	$ 1,194,902
Toe Drain	CY	$95	11,586	$ 1,100,669
Slope Protection (12" x 24" rip-rap)	CY	$40	25,335	$ 1,013,388
	LF	$350	500	$ 175,000
Inlet and Outlet Structures	Table 1			$ 467,000
Reservoir Pumping Plant to Fill Reservoir	Table 1			$ 1,100,250
Items not Estimated	LS	5%		$ 361,499
SUBTOTAL				**$ 7,591,470**
Mobilization, Indirects, Bonds & Ins.	LS	8%		$ 607,318
Quality Control Testing	LS	1.5%		$ 113,872
TOTAL (w/o Contingency)				**$ 8,312,660**
Contingency	LS	30%		$ 2,493,798
SUBTOTAL Opinion of Probable Construction Cost (Class 5)				**$ 10,806,458**
Engineering 15%				$ 1,620,969
Adminstration 10%				$ 1,080,646
TOTAL Opinion of Probable Construction Cost (Class 5)				**$ 13,508,072**

Table 1: Summary of Cost of Construction & Improvements

Improvement Description	Quanity	Units	Unit Price	Totals
Reservoir Pumping Plant				
Two 60 cfs Pumps (Deliverted and Installed)	2	each	$ 253,500	$ 507,000
Concrete Paving (4" 3500psi slad #4 ocew)	10000	sf	$ 2.75	$ 27,500
Earthwork	3000	cy	$ 7.00	$ 21,000
Electrical and Controls	1	lot	$ 85,000	$ 85,000
Pump Slab 20' x 20' x 12" #5 @ 16" OCEW (two layers)	15	cy	$ 650	$ 9,750
Piping and Mechanical	1	lot	$ 200,000	$ 200,000
Pump Support Pier (bents) and Rails	1	lot	$ 100,000	$ 100,000
Discharge Chute	1	lot	$ 150,000	$ 150,000
			Subtotal:	$ 1,100,250
Inflow/Outflow Gate Structure (two 5' x 5' Sluice Gates) (2x)				
Gates	2	each	$ 30,000	$ 60,000
Operators (Electric)	2	each	$ 6,500	$ 13,000
Electrical	1	lot	$ 10,000	$ 10,000
Base Slab 40' x 20' x 12" #5 @ 16" OCEW (two layers)	30	cy	$ 650	$ 19,500
Cutoff, Side, and Wing Walls	90	cy	$ 900	$ 81,000
Decking	30	cy	$ 1,000	$ 30,000
Gate Wall 20' x 10'	10	cy	$ 1,200	$ 12,000
Outlet Paving and Rip Rap	2000	sf	$ 4	$ 8,000
			Subtotal:	$ 233,500
			2 Sets	$ 467,000
			Total	$ 1,567,250

Wasteway 32 River Diversion Pumping Plant

EPCWID is planning to develop a new diversion point at the Rio Grande at the El Paso Upper Valley. The new diversion point will make irrigation water deliveries to agricultural water users via the La Union East Canal more efficient. In collaboration with EPW, the new diversion point will allow the delivery of surface water to the Upper Valley Water Treatment Plant. The details for collaboration between EPCWID and EPW for this option have yet to be determined and are outside the scope of regional water planning.

Diversions for irrigation water deliveries in the El Paso Upper Valley are currently made in collaboration with Elephant Butte Irrigation District at the Mesilla Dam near Las Cruces, New Mexico. Water for EPCWID is diverted at Mesilla Dam into the Westside Canal and conveyed approximately 20 miles to the heading of the La Union East and West canals and near the Rio Grande Project Wasteway 32. This wasteway canal conveys bypass water from the La Union East Canal to the Rio Grande.

The proposed conversion of Wasteway 32 into a diversion point on the Rio Grande will reduce the amount of water lost to seepage in the Westside Canal and provide EPCWID and EPW access to surface water during time period when no water is or can be diverted at Mesilla Dam.

Portions of the project are already in progress, including concrete lining sections of the La Union East Canal and making sediment control upgrades at Waste Way 32. Additional costs for the Waste Way 32 La Union East River Pumping Plant are included as part of this water management strategy. Further agreements and possible re-routing may be required for surface water deliveries to the Upper Valley Water Treatment Plant.

Quantity, Reliability, and Cost – The primary benefit of this strategy is to increase the resiliency of existing supplies of water, reduction is seepage losses, and increased flexibility in operating the Rio Grande Project.

ROM COST ESTIMATE				
WW32 La Union East River Pumping Plant				
Item	UOM	Unit Price		
Coffer Dam and Construction Dewatering	EA			$400,000
Sedimenation Weir and Inlet to Pumping Bay and Trash Rack	EA			$350,000
Automate Trash Cleaning System	EA			
Canal from River to La Union East	LF	$350	500	$175,000
Inflow/Outflow Gate Structure	Table 1			$233,500
Pumping Plant	Table 1			$1,193,250
Misc. Items not Estimated	LS	5%		$117,588
SUBTOTAL				$2,469,338
Mobilization, Indirects, Bonds & Ins.	LS	8%		$197,547
Quality Control Testing	LS	1.5%		$37,040
TOTAL (w/o Contingency)				$2,703,925
Contingency	LS	20%		$540,785
SUBTOTAL Opinion of Probable Construction Cost (Class 5)				$3,244,709
Engineering 15%				$ 486,706
Adminstration 10%				$ 324,471
TOTAL Opinion of Probable Construction Cost (Class 5)				$ 4,055,887

Table 1: Summary of Cost of Construction & Improvements

Improvement Description	Quanity	Units	Unit Price	Totals
Reservoir Pumping Plant				
Two 60 cfs Pumps (Deliverted and Installed)	2	each	$ 253,500	$ 507,000
Concrete Paving (4" 3500psi slad #4 ocew)	10000	sf	$ 2.75	$ 27,500
Earthwork	3000	cy	$ 7.00	$ 21,000
Electrical and Controls	1	lot	$ 85,000	$ 85,000
Pump Slab 20' x 20' x 12" #5 @ 16" OCEW (two layers)	15	cy	$ 650	$ 9,750
Piping and Mechanical	1	lot	$ 200,000	$ 200,000
Pump Support Pier (bents) and Rails	1	lot	$ 100,000	$ 100,000
Discharge Chute	1	lot	$ 150,000	$ 150,000
			Subtotal:	$ 1,100,250
Inflow/Outflow Gate Structure (two 5' x 5' Sluice Gates) (2x)				
Gates	2	each	$ 30,000	$ 60,000
Operators (Electric)	2	each	$ 6,500	$ 13,000
Electrical	1	lot	$ 10,000	$ 10,000
Base Slab 40' x 20' x 12" #5 @ 16" OCEW (two layers)	30	cy	$ 650	$ 19,500
Cutoff, Side, and Wing Walls	90	cy	$ 900	$ 81,000
Decking	30	cy	$ 1,000	$ 30,000
Gate Wall 20' x 10'	10	cy	$ 1,200	$ 12,000
Outlet Paving and Rip Rap	2000	sf	$ 4	$ 8,000
			Subtotal:	$ 233,500
			2 Sets	$ 467,000
			Total	$ 1,567,250

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-8 Conjunctive Treatment of Groundwater and Surface Water at the Upper Valley WTP

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Terminal Storage (Conservation Pool 100 acft, 3 acres)	$3,745,000
Water Treatment Plant (26 MGD)	$48,789,000
TOTAL COST OF FACILITIES	**$52,534,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$18,387,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,952,000
TOTAL COST OF PROJECT	**$72,873,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$4,762,000
Reservoir Debt Service (3.5 percent, 40 years)	$243,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$56,000
Water Treatment Plant	$3,415,000
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$8,476,000**
Available Project Yield (acft/yr)	10,000
Annual Cost of Water ($ per acft), based on PF=1	$848
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$347
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.60
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.07

HK *9/11/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
A-9 Advanced Water Purification at the Fred Hervey WRP

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Pipeline from WWTP to Advanced Water Treatment Facility (AWTF)	$4,908,000
Pipeline from AWTF to Distribution System (30 in dia., 2 miles)	$2,980,000
Primary Pump Stations (700 HP)	$4,318,000
Injection Wells (Wells, Pumps, and Piping)	$14,176,000
Wastewater Treatment Plant Improvements	$25,651,000
Advanced Water Treatment Facility (10 MGD)	$47,696,000
TOTAL COST OF FACILITIES	**$99,729,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$34,511,000
Environmental & Permitting and Mitigation	$581,000
Land Acquisition and Surveying (13 acres)	$11,000
Interest During Construction (3% for 1.5 years with a 0.5% ROI)	$5,562,000
TOTAL COST OF PROJECT	**$140,394,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$9,878,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$221,000
Pump Stations (2.5% of Cost of Facilities)	$108,000
Wastewater Treatment Plant	$2,107,000
Advanced Water Treatment Facility	$5,100,000
Pumping Energy Costs (6783188 kW-hr @ 0.08 $/kW-hr)	$543,000
Purchase of Water	$0
TOTAL ANNUAL COST	**$17,957,000**
Available Project Yield (ac-ft/yr)	10,000
Annual Cost of Water ($ per ac-ft)	$1,796
Annual Cost of Water After Debt Service ($ per ac-ft)	$808
Annual Cost of Water ($ per 1,000 gallons)	$5.51
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$2.48