City of Santa Fe

Santa Fe County

Santa Fe Water Reuse Feasibility Study

DRAFT EXECUTIVE SUMMARY

September 2016

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

RECLAMATION
Managing Water in the West

carollo
Engineers...Working Wonders With Water®

Executive Summary

The City of Santa Fe (City) and Santa Fe County (County) provide water service to over 85,000 people in northern New Mexico. One of the oldest cities in the United States, Santa Fe has diversified its water supply to include local surface water and groundwater and imported surface water to reliably meet the community's water needs. The City and County are the non-federal project sponsors that worked in partnership with the Bureau of Reclamation (Reclamation) to develop this Santa Fe Title XVI Feasibility Study (Feasibility Study).

The primary objective of this Feasibility Study is to identify the highest value use of the reclaimed water currently available from the City's Paseo Real Water Reclamation Facility (WRF) and potential future flows from the County's Quill WRF, while respecting downstream flow maintenance for cultural and ecological purposes on the lower Santa Fe River.

This Feasibility Study evaluates reasonable water reuse alternatives to mitigate projected water supply shortages, and ranks those alternatives based upon economic, social, environmental, and technical considerations.

Water supply planning and consideration of future conditions is vital in light of projections that the City and County's service area population will nearly double to about 170,000 by 2055, as documented in the Bureau of Reclamation 2015 Santa Fe Basin Study (Basin Study). The Basin Study highlighted the implications of climate change on Santa Fe area water supplies and demands. Under anticipated climate change conditions, the City and County's supplies are projected to fall short of demands by as much as 9,323 acre-feet per year (AFY) by 2055. The Basin Study identified expansion of water reuse as one of the most viable strategies for mitigating the projected shortages in Santa Fe. That finding motivated the City and County to partner with Reclamation to develop this Feasibility Study to assess alternatives for water reuse.

This Feasibility Study builds on a long-standing commitment to water reuse in Santa Fe, dating back to at least the 1950s. Today, up to about 1,500 AFY of recycled water is used to offset potable demands including: dust control and other construction purposes; irrigation of sports fields and other landscaping at the Municipal Recreational Complex (MRC); infield landscaping at the Downs of Santa Fe, the Santa Fe Equestrian Center, the Marty Sanchez Links de Santa Fe and the Santa Fe Country Club; dust control at the regional landfill; and livestock watering on the Caja del Rio. The City's 1998 Treated Effluent Management Plan (TEMP) provided the impetus for expanding reuse in Santa Fe in the years that followed, and the City's 2013 Reclaimed Wastewater Resource Plan (RWRP) characterized additional opportunities to more fully utilize reusable water from the City's Paseo Real WRF. Contracts for water reuse establish supply and operational requirements, but the City does not recover any cost or value for the water provided to reuse customers. The City has identified the potential opportunity for conservation savings in the use of recycled water at several of these sites.

Seven water reuse alternatives were evaluated in this Feasibility Study, using a structured process for prioritizing improvements toward mitigating the projected climate-change induced shortages. The seven alternatives are:

- **Alternative 1:** Expand Non-Potable Reuse
- **Alternative 2:** Full Consumption of San Juan-Chama Project (SJCP) Water via Rio Grande Return Flow Credits
- **Alternative 3:** Enhanced Living River and Aquifer Storage and Recovery
- **Alternative 4:** Aquifer Storage and Recovery via Lower Santa Fe River
- **Alternative 5:** Aquifer Storage and Recovery via Buckman Well Field
- **Alternative 6:** Augment Nichols Reservoir
- **Alternative 7:** Direct Potable Reuse

A screening-level assessment weighed those seven alternatives against four basic criteria, including Cost Effectiveness, Public and Environmental Benefit, Public Acceptance, and Project Risk Mitigation. This resulted in elimination of Alternatives 1, 5, and 6 from further consideration, as the other four alternatives more fully satisfied these criteria. Expansion of Non-Potable Reuse was found to be significantly less effective in providing a water resource benefit than all others, and was far less cost-effective. Aquifer Storage and Recovery via the Buckman Well Field and Augmenting Nichols Reservoir each had significant potential permitting and implementation challenges and failed to provide benefits comparable to the other alternatives.

The remaining four preferred alternatives provide water supply benefits while supporting the community's values:

- **Alternative 2:** Full Consumption of SJCP Water via Rio Grande Return Flow Credits
- **Alternative 3:** Enhanced Living River and Aquifer Storage and Recovery
- **Alternative 4:** Aquifer Storage and Recovery via Lower Santa Fe River
- **Alternative 7:** Direct Potable Reuse

A more detailed assessment of these four alternatives used a multi-criteria analysis, with particular emphasis on implementation challenges and long- term benefits. The triple bottom line criteria included measures related to the economic, social, and environmental performance of these alternatives, along with key technical criteria, as further described in the Feasibility Study report. The highest-ranked alternative is Alternative 2, Full Consumption of SJCP Water via Rio Grande Return Flow Credits.

This Executive Summary highlights the four preferred alternatives, and the overall greater value to the community of the highest-ranked alternative.

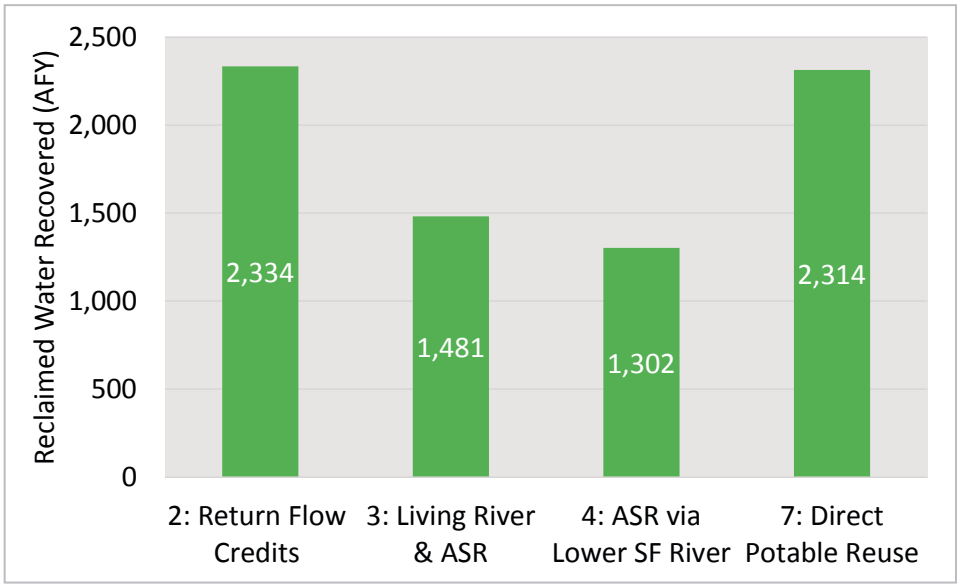
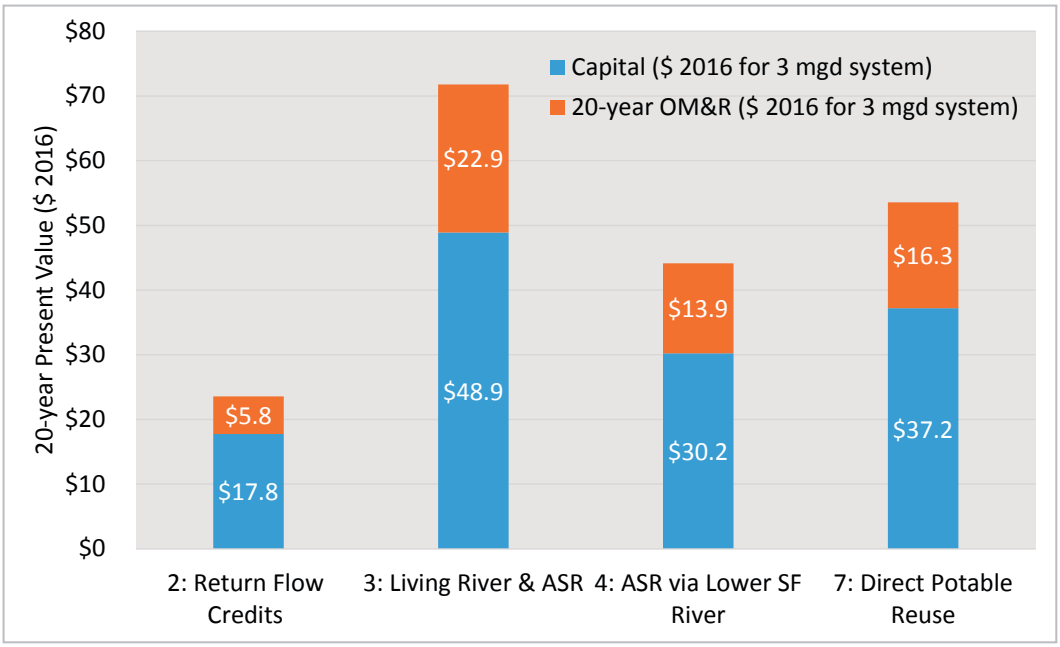


Figure ES-1: Net yields for the preferred alternatives. Any of these alternatives could provide a significant benefit toward avoiding the projected water supply shortages in Santa Fe.

Figure ES-2: Detailed screening-level capital and operations, maintenance and replacement (OM&R) components of net present value (NPV) costs for the preferred alternatives.



Alternative 2: Full Consumption of SJCP Water via Rio Grande Return Flow Credits

This alternative includes constructing a new pipeline to convey reclaimed water from the Paseo Real WRF to a point of discharge to the Rio Grande just downstream of the Buckman Direct Diversion (BDD) diversion site to obtain return flow credits for exchange, using return flows generated from diversions of Santa Fe's SJCP contract water delivered via contract with the Bureau of Reclamation.

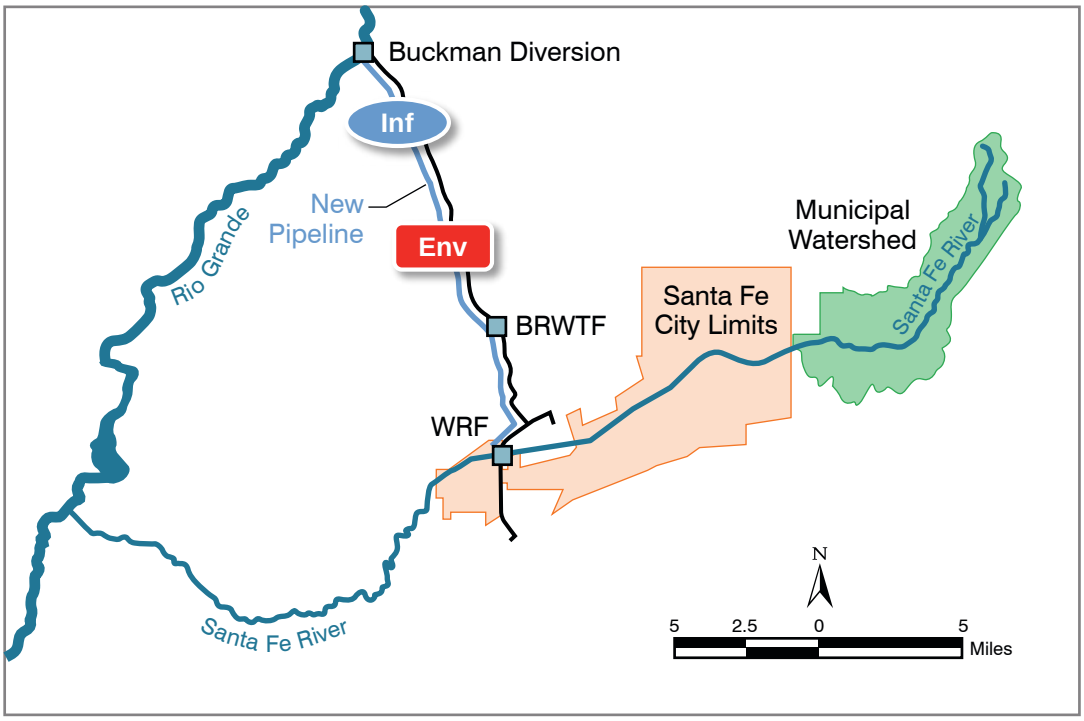
Previous analyses and state precedent indicate that the exchange would allow Santa Fe to divert one acre-foot of additional water through the BDD system for every one acre-foot of reclaimed water discharged (i.e., a one-for-one exchange). The Albuquerque Bernalillo County Water Utility Authority operates a similar exchange on the Rio Grande, demonstrating the feasibility of this alternative in New Mexico.

Reclaimed water would be pumped to the Rio Grande and exchanged for increased diversions through the BDD system under Alternative 2.

The exchange would allow Santa Fe to increase the amount of water diverted and treated through the BDD system, while maintaining the existing BDD conveyance and treatment infrastructure capacity at 15 million gallons per day (mgd). Given Santa Fe's present rate of consumption of 40 percent of the water diverted, were the City to pursue Return Flow Credits and account for repeated cycles of returns, it could increase the amount of consumable water that could be pulled from the BDD diversion by 150 percent, for an overall multiplier of 2.5 times the original consumable water right.

By making this exchange, this alternative comprises an indirect way of reusing the available reclaimed water while not actually diverting, treating, or distributing reclaimed water to Santa Fe's customers. The return flow discharge point was conceptually located immediately downstream of the BDD diversion, to avoid having any significant length of the Rio Grande being impacted by the diversion upstream of return flows. Figure ES-3 is a schematic of this process.

Figure ES-3: Full Consumption of SJCP Water via Rio Grande Return Flow Credits.



LEGEND

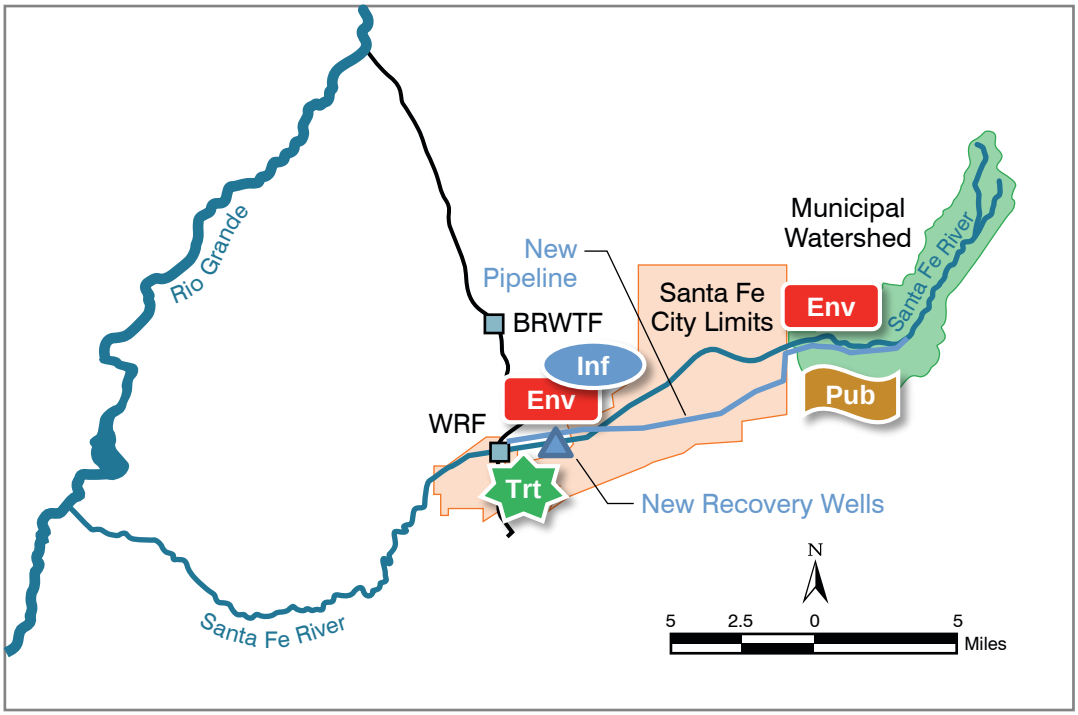
Env	**Environment/ Permitting:** Environmental studies needed for pipeline corridor.
Inf	**Infrastructure:** Pump station, 17.7-mile pipeline.

Alternative 3: Enhanced Living River and Aquifer Storage and Recovery

This alternative involves advanced treatment of up to 3 mgd of reclaimed water from the Paseo Real WRF to a new Advanced Water Purification Facility. From there, the water would be conveyed and discharged to the Upper Santa Fe River near the Two-Mile Reservoir site for recharge of the local aquifer and supplementing bypass flows from McClure and Nichols Reservoirs for a Living River in the downtown area. Water recharged to the aquifer would be withdrawn through new recovery wells in the Lower Santa Fe River and pumped into the potable water distribution system. While this approach to intentional aquifer recharge would be somewhat unique, aquifer recharge and recovery using purified recycled water is practiced in several communities in Arizona, California, and elsewhere.

Reclaimed water would be pumped to the Two-Mile Reservoir site on the upper Santa Fe River to augment living river bypass flows from the reservoirs and recharge groundwater in Alternative 3.

Figure ES-4: Enhanced Living River and Aquifer Storage and Recovery.



LEGEND

Env **Environment/ Permitting:** Environmental studies needed for pipeline corridor. Discharge & recharge permits; Potential algae/aesthetic concerns in Santa Fe River.

Inf **Infrastructure:** 3 pump stations, 13.7-mile pipeline, and recovery wells.

Trt **Treatment:** Advanced treatment adds cost and operational challenges.

Pub **Public:** Continuous Living River flows may become expected or required.

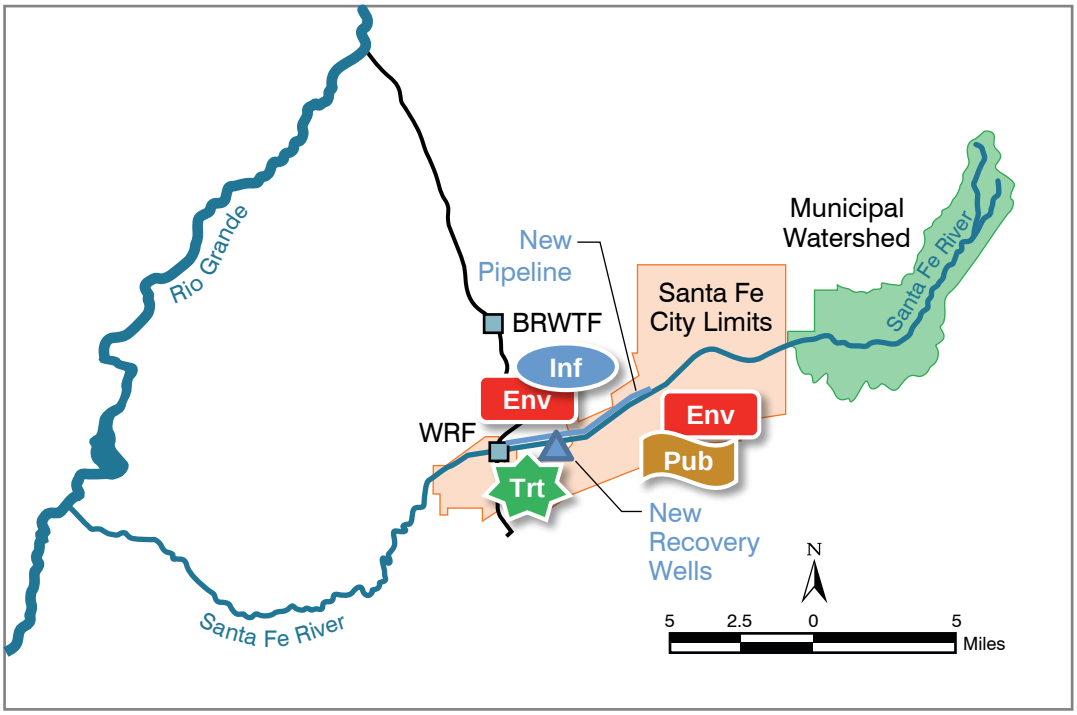
Alternative 4: Aquifer Storage and Recovery via Lower Santa Fe River

This alternative involves additional treatment of up to 3 mgd of reclaimed water for conveyance and discharge to the Lower Santa Fe River near Siler Road for recharge of the local aquifer. Although this alternative is similar to Alternative 3 in many ways, Alternative 4 would not supplement Living River flows in the downtown Santa Fe area. Water recharged to the aquifer would be withdrawn through new recovery wells in the Lower Santa Fe River and pumped into the potable water distribution system.

As an alternative, percolation basins could be constructed adjacent to the Lower Santa Fe River for aquifer recharge. Aquifer recharge and recovery using purified recycled water through percolation basins is practiced in several communities in Arizona, California, and elsewhere.

Reclaimed water would be pumped to a point near Siler Road and discharged to the Santa Fe River to augment streamflow and recharge groundwater in Alternative 4.

Figure ES-5: Aquifer Storage and Recovery via Lower Santa Fe River.



LEGEND

- **Env** — **Environment/ Permitting:** Environmental studies needed for pipeline corridor. Discharge and recharge permits; Potential algae/aesthetic concerns in Santa Fe River.
- **Inf** — **Infrastructure:** Pump station, 6.3-mile pipeline, and recovery wells.
- **Trt** — **Treatment:** Advanced treatment adds cost and operational challenges.
- **Pub** — **Public:** Continuous Living River flows may become expected or required.

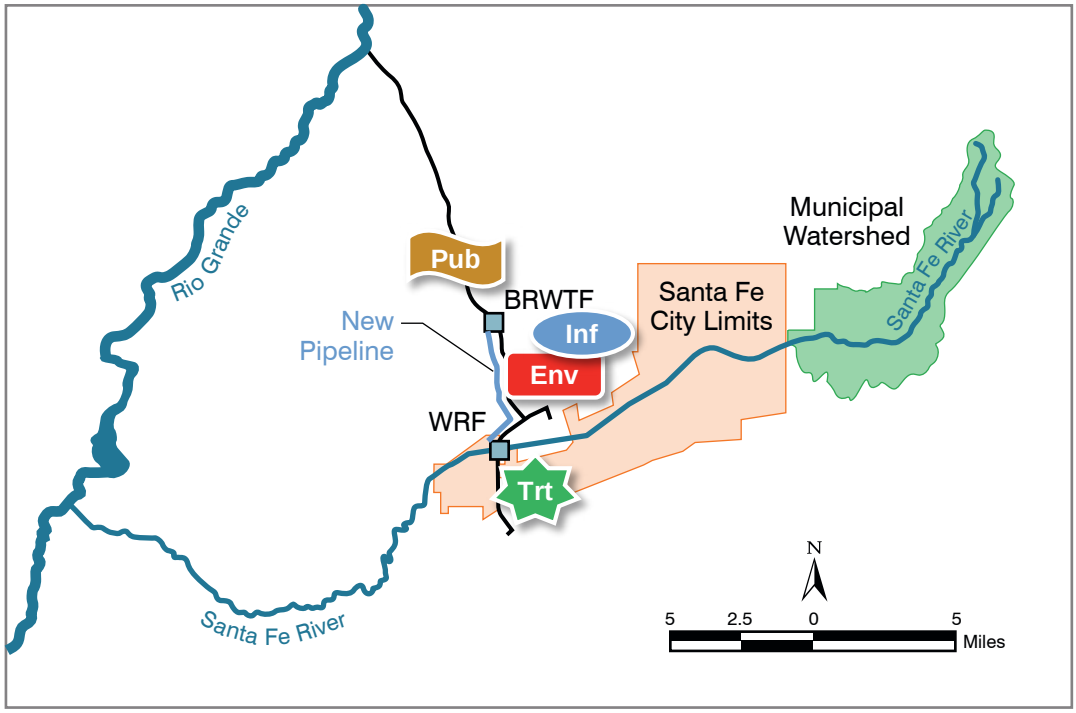
Alternative 7: Direct Potable Reuse

This alternative involves advanced purification of the reclaimed water from the Paseo Real WRF, which is then conveyed northward to the Buckman Regional Water Treatment Facility (BRWTF), where is it blended with raw water diverted from the Rio Grande via the BDD diversion, and the blended water is treated at the BRWTF.

The Colorado River Municipal Water District in Big Spring, Texas operates the only direct potable reuse (DPR) system currently in operation in the United States. The Village of Cloudcroft, New Mexico is also implementing a DPR system, and has worked extensively with the New Mexico Environment Department (NMED) to gain regulatory approvals. Several other DPR systems are either under construction or in various phases of planning in the United States.

Reclaimed water from a new Advanced Water Treatment Facility would be blended with Rio Grande water and treated at the BRWTF (shown here) under Alternative 7.

Figure ES-6: Direct Potable Reuse.



LEGEND

Env	**Environment/ Permitting:** Environmental studies needed for pipeline corridor.
Inf	**Infrastructure:** Pump station, 6.1-mile pipeline.
Trt	**Treatment:** Advanced treatment adds cost and operational challenges.
Pub	**Public:** Perceptions of DPR safety and water quality.

Highest-Ranked Alternative: Full Consumption of SJCP Water via Rio Grande Return Flow Credits

Tables ES-1 and ES-2 provide a comparison of the four alternatives. A comparison of these water reuse alternatives to the "non-Title XVI" alternative, which would not expand water reuse in Santa Fe but instead use additional purchases of native Rio Grande rights for diversion and treatment through the BDD system, concluded that the water reuse alternatives are preferable in terms of economics and the negative implications of additional native Rio Grande water rights purchases and diversions.

The highest-ranked alternative, Full Consumption of SJCP Water via Rio Grande Return Flow Credits, best satisfies the evaluation criteria used to compare the alternatives in detail. From a water exchange perspective, this alternative could increase the amount of consumable water that could be pulled from the BDD diversion by as much as 150 percent, for an overall multiplier of 2.5 times the original consumable water right.

Furthermore, there may be an opportunity to reduce treatment investments and operating costs at the Paseo Real WRF if discharge permit requirements are less stringent for the portion of the flow discharged to the Rio Grande.

This alternative also offers unique flexibility for future adaptation. The Return Flow Credit pipeline would convey water along a route from the Paseo Real to the Rio Grande that passes immediately by the BRWTF. Should demands or water management conditions change in the future, this pipeline could easily be adapted to convey reclaimed water to the BRWTF for treatment as part of a Direct Potable Reuse system. Additional treatment may be warranted in this scenario, as described for Alternative 7 (Direct Potable Reuse).

The actual water supply benefit of the Full Consumption of SJCP Water via Rio Grande Return Flow Credits project would be limited by physical water supply availability at the Paseo Real WRF. Existing commitments to non-potable reuse and minimum target releases to the Santa Fe River from the Paseo Real constrain the supply available for return flow credits at 2,334 AFY under the scenarios contemplated in this Feasibility Study. Increasing the capacity of the return flow credit pipeline for increased wintertime use and implementing additional conservation measures at non-potable reuse sites could increase the amount of water available for exchange under this alternative.

Precedent for this Return Flow Credits approach has been established in New Mexico by the Albuquerque Bernalillo County Water Utility Authority, serving as a full-scale "proof of concept" in terms of both the technical and permitting aspects of such an exchange. The Authority is thereby fully diverting and utilizing its SJCP water. Similarly, this approach would allow Santa Fe to make full consumptive use of its imported water supplies, while potentially avoiding Rio Grande Compact and Rio Grande Environmental Impact Study concerns.

The Santa Fe Water Reuse Feasibility Study determined that this alternative is the highest-ranked water reuse approach, considering that it offers the lowest cost, provides the greatest water supply benefit through drought-resistant recycled water supplies, requires no additional treatment requirements, and leverages Santa Fe's existing investments and available capacity in the BDD diversion, conveyance, and treatment systems.

Implementation steps recommended from this Feasibility Study include confirming that this alternative best meets the community's needs through further public outreach, followed by preliminary design, permitting, and project funding analyses to support implementation of the required infrastructure.

Table ES-1: Costs and Supply Benefits of Highest-Ranked Alternatives.

Consideration	Alternative 2: Full Consumption of SJCP Water via Rio Grande Return Flow Credits	Alternative 3: Enhanced Living River and Aquifer Storage and Recovery	Alternative 4: Aquifer Storage and Recovery via Lower Santa Fe River	Alternative 7: Direct Potable Reuse
Capital Cost	**Best Alternative** $17.8M (2016 $)	2.7 X Cost of Alternative 2	1.7 X Cost of Alternative 2	2.1 X Cost of Alternative 2
Operations and Maintenance Cost	**Best Alternative** $0.3M/year (2016 $)	3.9 X Cost of Alternative 2	2.4 X Cost of Alternative 2	2.8 X Cost of Alternative 2
Reduction in Future Water Shortages	**Best Alternative** 2,300 AFY	37% Less than Alternative 2	44% Less than Alternative 2	Similar to Alternative 2

Table ES-2: Considerations for Highest-Ranked Alternatives.

Consideration	Alternative 2: Full Consumption of SJCP Water via Rio Grande Return Flow Credits	Alternative 3: Enhanced Living River and Aquifer Storage and Recovery	Alternative 4: Aquifer Storage and Recovery via Lower Santa Fe River	Alternative 7: Direct Potable Reuse
Infrastructure (Inf)	Requires 1 pump station and a 17.7-mile pipeline	Requires 3 pump stations and a 13.7-mile pipeline	Requires 1 pump station and a 6.3-mile pipeline	Requires 1 pump station and a 6.1-mile pipeline
Environmental/ Permitting (Env)	Requires environmental studies for pipeline construction	Requires environmental studies for pipeline construction	Requires environmental studies for pipeline construction	Requires environmental studies for pipeline construction
	Requires NPDES for Rio Grande discharge	Requires NPDES permit for Santa Fe River discharge and permit for discharge credits in new well field	Requires NPDES permit for Santa Fe River discharge and permit for discharge credits in new well field	Requires permitting for potable water reuse
		Potentially requires supplemental permitting for potable water reuse	Potentially requires supplemental permitting for potable water reuse	
Treatment (Trt)	No additional treatment required	Advanced treatment required	Advanced treatment required	Advanced treatment required
Public (Pub)	Reduced Santa Fe River flow below Paseo Real WRF	Reduced Santa Fe River flow below Paseo Real WRF	Reduced Santa Fe River flow below Paseo Real WRF	Reduced Santa Fe River flow below Paseo Real WRF
		Sustained water to the Upper Santa Fe River may dictate long term obligations	Sustained water to the Lower Santa Fe River may dictate long term obligations	Potential perceptions of safety and water quality of direct potable reuse
		Low level nutrients may increase algae in Santa Fe River	Low level nutrients may increase algae in Santa Fe River	

carollo

Engineers...Working Wonders With Water®