

REVISED Technical Memorandum 5: Evaluation of Retained Water Management Options

Wholesale Water Management and
Reliability Study

PREPARED FOR
SAN JUAN WATER DISTRICT



PREPARED BY



22 July 2016

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Attachments

- Attachment 1 – San Juan Water District Supply Portfolio
- Attachment 2 – Retained Options Descriptions and Evaluations

List of Abbreviations and Acronyms

ASR	aquifer storage and recovery
Board	Board of Directors
CalAm	California American Water Company
CTP	Cooperative Transmission Pipeline
CVP	Central Valley Project
District or SJWD	San Juan Water District
ID	Identification
MFP	Middle Fork Project
N/A	Not Applicable
O##	Option number
PCWA	Placer County Water Agency
POU	place of use
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
SGA	Sacramento Groundwater Authority
SSWD	Sacramento Suburban Water District
Study	Wholesale Water Management and Reliability Study
SGMA	Sustainable Groundwater Management Act
TAF	thousand acre-feet
TBD	to be determined
TM	technical memorandum
WCA	Wholesale Customer Agency
WD	water district
WSR	Water Supply & Reliability Committee
WTP	water treatment plant

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1.0 Introduction and Background

This Technical Memorandum (TM) is the fifth in a series of memoranda prepared for the Wholesale Water Management and Reliability Study (Study) to improve management of surface water and groundwater resources within the San Juan Water District's (District or SJWD) wholesale service area, and potentially outside the District's current service area. TMs prepared to date include:

- TM1 - Purpose, Goals and Objectives
- TM 2 - Review of Existing Information
- TM3 - Screening Criteria and Methodology
- TM4 - High-Level Evaluation and Screening of Options
- TM5 - Refined Evaluation of Retained Water Management Options

This TM (TM 5) contains the following:

- Review of the identification, screening, and evaluation of the initial options including the evaluation criteria and metrics used in the process.
- Grouping of the retained options by theme into a set of 5 combined options.
- Evaluation and comparison of the 5 combined options.
- Key findings on the combined options.
- Next steps in the Study.

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2.0 Review of Water Management Options Development and Initial Screening

This section summarizes the process of identifying, screening, and evaluating the initial options considered in the Study. The performance of these initial options were examined and assessed to identify a smaller set of retained options for further development and evaluation. TM 4 documents the identification and screening of initial options; the following sections provide a brief overview.

2.1 Initial Option Identification

The District's Request for Proposal for this Study (dated October 7, 2015) included 13 options for better water management of groundwater and surface water identified by the District's Water Supply & Reliability Committee (WSR). During the Study, these 13 options were expanded to 28 initial options through a wide range of input from project meetings and review of available technical documents. Table 2-1 lists the identified initial options.

2.2 Screening of Initial Options

2.2.1 Criteria and Metrics

The initial options were evaluated using both qualitative and quantitative screening criteria to support evaluation, comparison, and scoring of these options. The criteria were vetted with the WSR during the Project Kick-Off Meeting. Details on these criteria are presented in TM 3; the following provides a summary of these criteria:

1. **Cost-effectiveness** – quantitatively measured the cost-effectiveness of an option's water supply benefits (yield) relative to its costs at a conceptual or pre-appraisal level.

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Table 2-1. List of Initial Options

ID	Option Name
O1	Large Surface Water Storage on North Fork American River
O2	Small Off-Surface Surface Water Storage from North Fork American River
O3	Purchase Reservoir Space on American River above Folsom Dam for Storage
O4	Upper Watershed Restoration
O5	Folsom Dam Raise
O6	Surface Water Closed Storage Tank in SJWD Retail or Wholesale Area
O7	Above Ground Surface Water Storage in SJWD Retail or Wholesale Area
O8	Above Ground Surface Water Storage Basin in El Dorado Irrigation District Service Area
O9	In-Lieu Banking Program Within SJWD Wholesale Area
O10	In-Lieu Banking Program With An Agency Other than WCAs
O11	Build New Groundwater Extraction Wells in SJWD Retail Area
O12	Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area
O13	Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline
O14	Purchase CalAm's Lincoln Oaks System
O15	Use Roseville's ASR wells for Active Groundwater Injection and Banking
O16	Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use
O17	Use of a Spreading Basin Within SJWD Retail or Wholesale Area for Groundwater Recharge
O18	Purchase Orange Vale Water Company's Water Supply Wells
O19	Allocate CVP Water to Another Agency
O20	Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County
O21	Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers
O22	Integrate Groundwater and Surface Water Uses in Placer County
O23	Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility
O24	Merger with Another Agency
O25	Establish Non-potable Reuse in SJWD Service Area
O26	Establish Indirect Potable Reuse in SJWD Service Area
O27	Participate in RiverArc
O28	Purchase Water Supply Wells in SJWD Wholesale Area

Key:

ASR = aquifer storage and recovery
 CalAm = California American Water Company
 CVP = Central Valley Project
 ID = Identification

O## = Option number
 PCWA = Placer County Water Agency
 SJWD = San Juan Water District
 WCA = Wholesale Customer Agency

2.0 Review of Water Management Options Development and Initial Screening

2. **Contribution to objectives** – quantitatively and qualitatively assessed an option’s contribution to each of the Study objectives listed below.
 - Increase water supply reliability to the District’s retail customers and Wholesale Customer Agencies (WCA) by integrating surface water and groundwater storage for (1) improving reliability during dry years and (2) mitigating extreme drought conditions (i.e., improving the District’s ability to receive water supplies during an extreme drought when the access to the District’s current water rights and contract entitlements is highly restricted).
 - Perfect the beneficial use of the District’s water rights, contractual entitlements, and facilities
 - Provide long-term financial benefits to District ratepayers, and provide regional and statewide water management benefits
3. **Implementation complexity** – qualitatively assessed how likely it would be that an option would be implemented within a reasonable timeframe to achieve its potential benefits. Implementation complexity considered factors such as water rights and contract approvals, permitting, environmental compliance, land acquisition, public support, and institutional requirements.
4. **Uncertainty** – qualitatively assessed level of confidence in the definition of the option, in both its benefits and costs.

Scores were assigned to each of the criteria and metrics for each initial option based on the results of assessment. These scores were then used to conduct a trade-off analysis to support screening of the initial options.

2.2.2 Initial Trade-off Analysis

The trade-off analysis investigated how the options ranked across two or more criteria. It allowed for identification of options that scored well across multiple criteria and those that scored well on some criteria, but not on others. The following three trade-offs were evaluated:

1. **Cost-Effectiveness and Contribution to Objectives Trade-off** – Options were ranked according to their cost-effectiveness and overall contribution to objectives scores. Higher ranking options are with lower cost per acre-foot and higher overall contribution to objectives scores.
2. **Cost-Effectiveness and Implementation Complexity Trade-off** – Options were ranked according to their cost-effectiveness and implementation complexity scores. Higher ranking options are with lower cost per acre-foot and higher overall implementation factors scores (i.e., easier to implement).
3. **Contribution to Objectives and Implementation Complexity Trade-off** – Options were ranked according to their contribution to objectives and implementation complexity

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scores. Higher ranking options are with higher overall contribution to objectives and higher overall implementation factors scores (i.e., easier to implement).

2.2.3 Initial Performance Groupings

The results of the trade-off analysis were used to identify options that consistently ranked high versus those that consistently ranked low. This allowed for organizing the initial options into three groups: A (high potential), B (moderate potential), and C (low potential).

Using this methodology, the 28 initial options were categorized into A, B, or C groupings. Seven were in Group A, 6 in Group B, and 10 in Group C. Note that 5 initial options were not carried forward for further evaluation as they were deemed unviable or unfavorable at this time. This was either because the opportunity to implement the action already passed or the potential action would be significant in nature and therefore, the District would likely to participate in such an initiative with other regional partners or authorities, but would not initiate it by itself (e.g., O4: Upper Watershed Restoration). These 5 options were not included in any of the above groupings.

Through further examination of the options in these groupings, 11 options were selected for further evaluation as retained options:

- Seven options in the high potential grouping (Group A)
- Four options in the moderate potential grouping (Group B) but with relatively high water supply benefits and moderate implementation complexity (see Figure 2-1)

The results of this initial screening were discussed with the District's WSR and Board of Directors (Board) to solicit feedback and direction for finalizing the retained options shown in Table 2-2.

2.0 Review of Water Management Options Development and Initial Screening

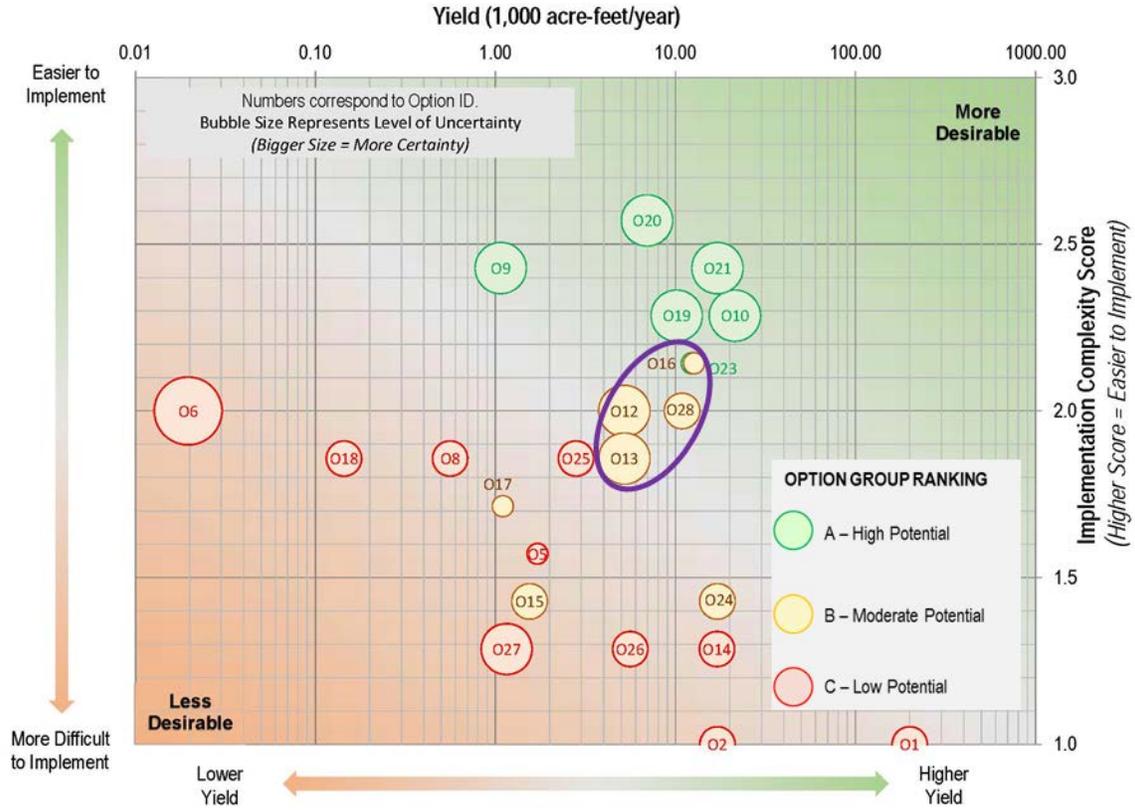


Figure 2-1. Screening and Grouping of Initial Options (from TM 4)

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Table 2-2. Retained Options for Further Evaluation

Initial Options Retained for Further Evaluation	Group
O9: In-Lieu Banking Program Within SJWD Wholesale Area	A
O10: In-Lieu Banking Program With An Agency Other than WCAs	A
O12: Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area	B
O13: Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline	B
O16: Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use	B
O19: Allocate CVP Water to Another Agency	B
O20: Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County	A
O21: Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers	A
O23: Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility	A
O24: Merger with Another Agency	A
O28: Purchase Water Supply Wells in SJWD Wholesale Area	A

Key:

CVP = Central Valley Project

O## = Option number

PCWA = Placer County Water Agency

SJWD = San Juan Water District

WCA = Wholesale Customer Agency

3.0 Refined Option Development and Evaluation

This section describes the further development and evaluation of retained options. A summary of findings is also provided.

3.1 Refining Options through Combination

As discussed in the previous section, 11 of the initial options were retained for further evaluation. As shown in Table 3-1, these 11 retained options were further grouped into 5 combined options based on their similarities with respect to (1) how they would achieve the District's objectives, and (2) their implementation. These 5 combined options are described further in this section.

Additional refinements were also made in each combined option to better contrast the effects of the corresponding water management strategy included in that combined option. ***A combined option presented herein is not necessarily a discrete and complete alternative that fully achieves the Study objectives, meaning that the District would likely not choose one of them and implement it individually. Rather, the combined options highlight and contrast the advantages and limitations of the different water management strategies.*** These findings will support the formulation of a “road map” for the District that identifies elements and tactics of each option to be considered for implementation in the short-, mid-, and long-terms. The road map will form the basis for the next phase of the Study – the feasibility study for implementation purposes. A key consideration in the development and evaluation of the combined options was the need to observe the terms and conditions of water right permits and water service contracts, including their corresponding places of use (POU) and contract service areas.

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Table 3-1. Combined Options by Theme and Corresponding Retained Options

Combined Options	Retained Options for Further Evaluation
Option A: Full Utilization of Water Supplies	O19: Allocate CVP Water to Another Agency
	O20: Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County
	O21: Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers
Option B: In-Lieu Banking Program	O9: In-Lieu Banking Program Within SJWD Wholesale Area
	O10: In-Lieu Banking Program With An Agency Other than WCAs
Option C: Aquifer Storage and Recovery Program	O12: Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area
	O13: Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline
	O16: Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use
	O28: Purchase Water Supply Wells in SJWD Wholesale Area
Option D: SJWD and PCWA Coordination	O23: Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility
Option E: Merger with Another Agency	O24: Merger with Another Agency

Key:

CVP = Central Valley Project

O## = Option number

PCWA = Placer County Water Agency

SJWD = San Juan Water District

WCA = Wholesale Customer Agency

The following provides a summary discussion for each combined option. More details on each of these combined options are presented in Attachment 2.

3.1.1 Option A: Full Utilization of Water Supplies

This option aims to fully utilize the District’s current water rights and contract entitlements and, through the full utilization of those supplies, improve dry year water supply reliability. When fully developed, the District would manage all of its available water supplies as a whole without the need for tracking the use of each supply source separately.

Description: Under this option, the District would pursue institutional arrangements with one or more water agencies outside of the District’s wholesale service area using a combination of (1) short- and long-term transfers, and (2) wholesale agreements. This would allow the establishment of sufficient demands outside of the District’s wholesale service area during Water Forum wet/average years to facilitate full utilization of available water supplies. The targeted water agencies would be within the Sacramento Groundwater Authority (SGA) area (i.e., the

area within the North American River Groundwater Subbasin and south of the Sacramento-Placer county line). Depending on the targeted agency, additional infrastructure improvement may be required.

All water transfers or sales outside of the existing wholesale service area under this option were assumed to be transactional in nature. In other words, the District would not retain rights over the water after sale. The District and existing WCAs would have priority on use of available water supplies prior to any sale to agencies outside of the existing wholesale service area. The resulting additional CVP contract water use would increase the District's dry year supply compared to the current condition.

Scenario of water use: It is likely that with PCWA's consensus, Middle Fork Project (MFP) water would be used first in the initial implementation of this option. Should a wholesale agreement be established with another agency, it would provide justification for the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) to adjust the District's CVP contract service area to allow further flexibility of use. Note that the District may consider using water rights for single-year sales. This tactic may be useful to jump-start the implementation, before an agency becomes a WCA.

3.1.2 Option B: In-Lieu Banking Program

Through in-lieu recharge, this option aims to develop water banking operations outside of the existing retail and wholesale service areas.

Description: Under this option, the District would enter into a banking agreement with one or more agencies within the SGA area, but outside of the District's existing retail and wholesale service areas, to receive surface water in Water Forum wet/average years for use in-lieu of their existing groundwater use. The District would retain the right to the banked water for dry year protection and for potential groundwater substitution transfers with other parties.

The District and existing WCAs would have priority on use of available water supplies prior to any water delivery to a banking partner. The resulting established CVP contract entitlement use would increase the District's dry year supply compared to the current condition. As part of the dry-year protection, the banked groundwater could also be extracted and delivered directly to the District's retail or wholesale service area during dry years when surface water would be highly limited. In addition, groundwater substitution transfer could be facilitated by the District's banking partner reverting back to groundwater use and extracting from the banked groundwater account. This would allow the District to redirect equal amount of surface water to be available for purchase by others. Depending on the targeted banking partner(s), additional infrastructure improvement (e.g., interties, conveyances, and pumps) may be required.

There are in-lieu recharge opportunities within the wholesale service area; however, the quantity of water would be small in comparison with opportunities outside the wholesale service area and were therefore not included in this combined option. Attachment 2 - Option B, documents the analysis of available in-lieu opportunities, including those within the wholesale service area.

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Scenario of water use: It is likely that with PCWA's consensus, MFP water would be used first in the initial implementation of this option. Water rights water could be considered for banking purposes because under this option, the District would retain the right to the banked water. Should the District's CVP contract service area change, the District could have additional flexibility for use of water supplies. However, it is not clear if a banking operation would be sufficient for Reclamation to take action on changing the District's CVP contract service area; therefore, CVP water was considered in the evaluation but the performance could be reduced if it cannot be used for banking purpose under this option.

3.1.3 Option C: Aquifer Storage and Recovery Program

This option aims to employ aquifer storage and recovery (ASR) within the District's retail and wholesale service areas to increase water supply benefits and dry year protection.

Description: Under this option, during Water Forum wet/average years, treated surface water would be injected into the groundwater aquifer for short-term (less than a year) or long-term (more than a year) storage within District's wholesale service area. This stored water would then be recovered using the same or different groundwater wells within the District's wholesale service area during dry years for meeting consumptive demand. The District could also make the stored water available for purchase by others through groundwater substitution. This option would involve developing additional operational agreements with WCAs, and installing new and/or retrofitting existing groundwater wells to allow for the injection and corresponding extraction needs.

Scenario of water use: All available surface water supplies could be considered in this option because the ASR program would be established within the existing District's wholesale service area.

3.1.4 Option D: SJWD and PCWA Coordination

This option aims to provide emergency supplies and operational flexibility by working with PCWA to improve redundancy and dry year protection.

Description: Under this option, emergency operation could be facilitated by using available treatment capacities at District's Peterson Water Treatment Plant (WTP), PCWA's Foothill WTP, and PCWA's future Ophir WTP. The District's access to water supplies from Folsom Reservoir could be significantly restricted or become unavailable if Reclamation's operation of Folsom Reservoir results in severe low storage and water elevation, even when the District still has the legal right to divert water from Folsom Reservoir.

Under this type of emergency condition, PCWA would divert the District's MFP supply through PCWA's American River Pump Station upstream of Folsom Reservoir, and treat it for delivery to the District's retail service area in Placer County (i.e., Granite Bay area). The water could be treated at the Foothill WTP or the future Ophir WTP, where more capacity would be available. As a result, the District's dry year protection could be improved by establishing an alternative access to some of its supplies. Expansion of existing interties and other conveyance may be required to facilitate the treated water delivery. While this operation would also be possible

beyond emergency conditions, it would not be recommended because the District has currently ample capacity at Peterson WTP.

Similarly, the District could also provide PCWA with emergency supplies and operational flexibility from Folsom Reservoir if the situation warrants.

Scenario of water use: The water supplies for this option would be limited to the MFP water for PCWA to divert at its American River Pump Station.

3.1.5 Option E: Merger with Another Agency

This option aims to create a consolidated governing body involving the District and one or more agencies to improve governance, administrative, and operation efficiency, and increase overall water supply reliability and operational flexibility for all participants.

Description: Under this option, the District would pursue a merger agreement through a consensus-based process with an agency or agencies within the SGA area that use groundwater as the primary source of water supply. This arrangement would facilitate the District's ability to make use of its available surface water within the combined service area and maximize the beneficial use of the District's available water supplies. It would also provide the District with access to groundwater for drought protection and operation flexibility. Implementation of this option may involve constructing new and/or expanding existing interties, conveyance, and pumping facilities, in addition to legal and institutional arrangements unique to this option.

Scenario of water use: With the merger, all District's water rights and CVP water supplies could be applied within the combined service areas with the change of District's CVP service area. MFP water would be used within its authorized POU or the combined service area, whichever is less.

3.1.6 Additional Characterization of Combined Options

The following provides additional characterization for the above combined options:

- These combined options would not be mutually exclusive. Implementation strategies could be developed to leverage certain features in each option to maximize the overall District benefits and long-term water supply reliability.
- Under the Sustainable Groundwater Management Act (SGMA), the District should consider adopting groundwater replenishment demand and formalize a portion of that demand for drought protection. The District would likely need to develop allocation and shortage policies for this new demand. Options B and C could readily incorporate such a demand as part of the banking practice.
- The merger option (Option E) would provide a level of flexibility in water management beyond what could be accomplished by other combined options. However, it would also require additional analysis for the intended legal action, such as financial system consolidation and other considerations. These additional considerations are beyond the scope of this Study.

3.2 Evaluation of Combined Options

To support the evaluation of the combined options, a water supply availability analysis was conducted to establish the District’s water supply availability (annual and monthly) for groundwater recharge and other transfers. This analysis is documented in Attachment 1, San Juan Water District Supply Portfolio, which includes the following:

- Description of the District’s surface water rights and contract entitlements
- Overview of the District’s surface water infrastructure
- Overview of groundwater basin conditions and related infrastructure within SGA area
- Demand and availability of surface water supplies, and historical groundwater production for agencies within SGA area

Figure 3-1 shows the District’s water supply use by type (water rights, CVP contract water, MFP contract water) from 1988 through 2014. Historically, the District has used all of its water rights and only a portion of its other contract deliveries.

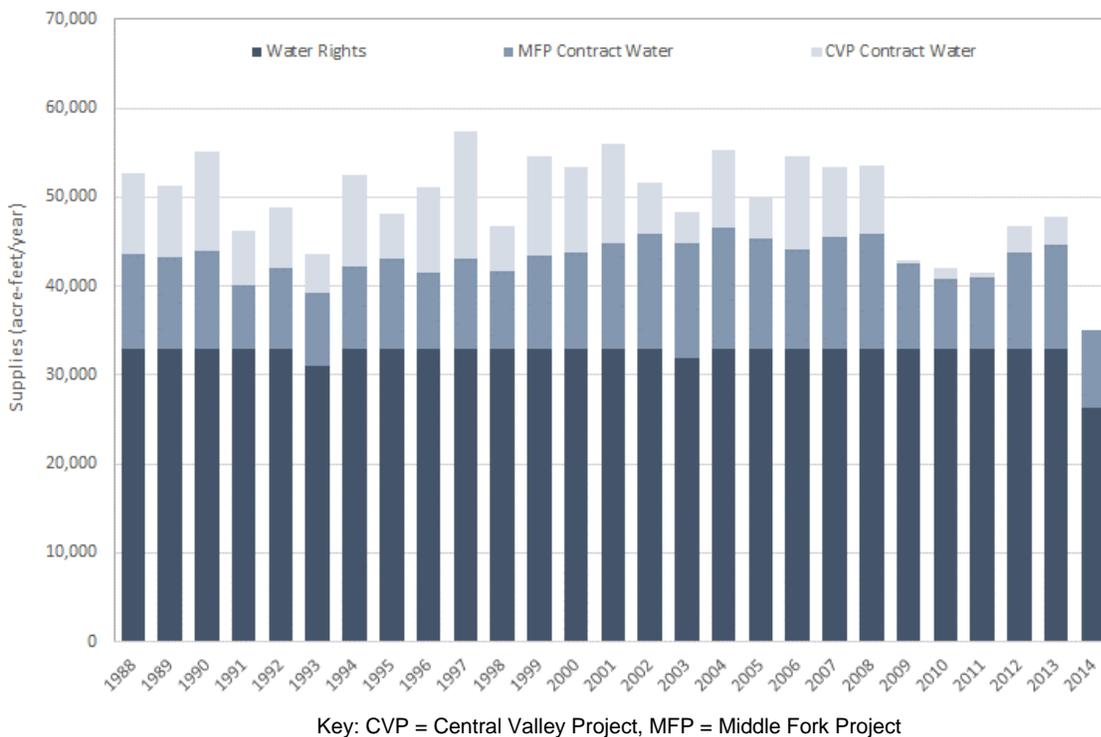


Figure 3-1. San Juan Water District Historical Surface Water Usage by Supply Type

3.0 Refined Option Development and Evaluation

As shown in Table 3-2, the District has approximately 21.3 thousand acre-feet (TAF) per year of available surface water supplies during Water Forum wet/average years. The available supplies are calculated under the condition that all of the District's current projected 2030 demands are met.

Table 3-2. District's Supply and Demand During Water Forum Wet/Average Years

Surface Water Supply	Maximum Surface Water Supplies (acre-feet per year)	Surface Water Usage, 2030 Demands (acre-feet per year)	Difference (acre-feet per year)
Water Rights	33,000	33,000	0
CVP	24,200	11,510	12,690
MFP	25,000	16,313	8,687
Total	82,200	60,823	21,377

Key:

CVP = Central Valley Project

MFP = Middle Fork Project

Evaluations of the each of five combined options are documented in Attachment 2, and include the following:

- Description of the combined option and its formulation, how it would contribute to the Study objectives, and potential partner agencies for implementation.
- Estimates of increased beneficial use of available supplies during Water Forum wet/average years, and increased ability to provide dry-year supplies to the District. This analysis involved consideration of:
 - Volume of available surface water supplies during Water Forum wet/average years, and after the District's 2030 demands are met.
 - Demand for available surface water supplies, estimated as the existing groundwater use within the SGA area during wet/average year.
 - Available monthly available capacity at the District's Peterson WTP.
 - Available conveyance capacity to deliver surface water for replacing groundwater use.
- Assessment of implementation requirements, including environmental and permitting requirements.
- Conceptual cost estimates for structural features, as applicable.

The evaluation and comparison of the combined options are presented in the following section.

3.3 Comparison of Combined Options

The combined options were compared with respect to the following attributes:

- Strategies used to achieve the Study objectives.
- Geographic focus and level of complexity of institutional arrangements.
- Performance and cost, including potential infrastructure requirements and resulting outcomes in additional surface water utilization and dry-year water supply.
- Contribution to the Study objectives.

3.3.1 Strategies to Achieve Objectives

Each of the five combined options would help meet the Study objectives to varying degrees using one or more of the following strategies:

- Increase use of the District's water rights and contract entitlements (helping meet the objectives of perfecting beneficial use and providing long-term financial benefits).
- Develop alternative access to surface water (helping meet the objective of increasing dry-year water supply reliability).
- Diversify the District's water supply portfolio by developing groundwater resources (helping meet the objective of increasing dry-year water supply reliability).

Table 3-3 presents the strategies embedded in each option to address the Study objectives. With the exception of Option D, all other options would increase the beneficial use of District surface water supplies and further diversify the District's water supply portfolio by providing access to groundwater supplies to varying degrees. Option D would allow the District an alternate location for receiving surface water supplies above Folsom Reservoir via interties with PCWA during emergency conditions, but would not increase its existing beneficial use of surface water supplies or further diversify District's water supply portfolio.

Table 3-3. Approach to Addressing Study Objectives in Combined Options

STRATEGY	Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
Increase use of District's Water Rights and Contracts Entitlements	✓	✓	✓		✓
Develop Alternative Access to Surface Water				✓	
Diversify Water Supply Portfolio		✓	✓		✓

Key:

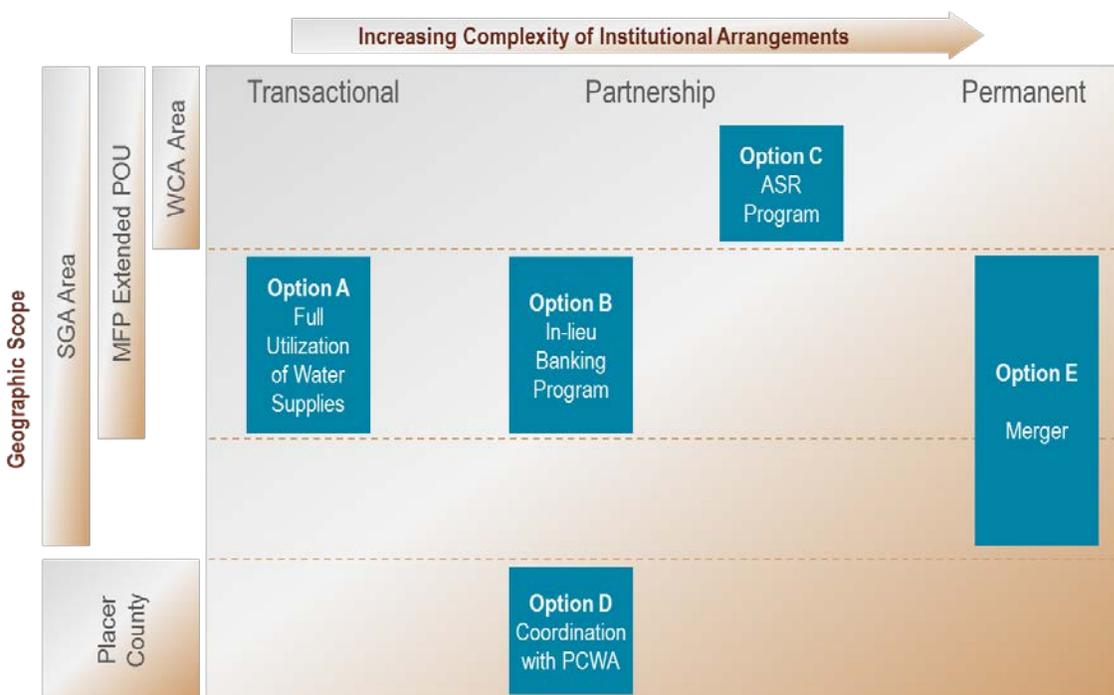
PCWA = Placer County Water Agency

SJWD = San Juan Water District

3.3.2 Geographic Focus and Institutional Arrangements

Each option presents a different geographic focus and would require different institutional arrangements. Figure 3-2 illustrates the comparison. The needed institutional arrangements with partner agencies would vary among options, ranging from transactional, to partnership, to permanent relationships. In general, a transaction-based option would be relatively quick to implement as opposed to a merger that would require substantial time and effort to study, plan, and implement. However, partnerships with mutual benefits have often proven to be more effective and long-lasting.

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Key: ASR = aquifer storage and recovery, PCWA = Placer County Water Agency, POU = Place of Use, SGA = Sacramento Groundwater Authority, WCA = wholesale customer agency

Figure 3-2. Geographic Focus and Institutional Arrangements by Option

3.3.3 Performance and Cost

Table 3-4 provides a summary of potential maximum water supply benefit (yield) and costs associated with each option if implemented in its entirety (see Attachment 2 for more detail). As previously mentioned, it is likely that each option would be implemented through time with many permutations of conditions and corresponding performance. The full implementation scenarios are more illustrative of each option’s potential and provide a consistent basis for comparison. Individual analyses of the possibility of success in, and associated cost for, negotiating necessary agreement(s) for implementation were not developed.

Options A, B, C, and E would all provide the opportunity to maximize the beneficial use of existing supplies (i.e., increase surface water use by 21.3 TAF per year during Water Forum wet/average years). Option A would have limited dry-year benefits equal to the expected increase in CVP allocation due to higher usage of CVP supplies. Option B and C would have higher potential dry year yields because of the establishment of water banking practices. Option D would provide a maximum dry year water supply of 3.4 TAF, which would be limited to the existing capacity of the PCWA-District interties. Option E dry year water supply was assumed similar to that of Options B, depending on the agency with which the District may merge. While Option C would have the highest potential yield during all year types, it also would have the highest implementation costs associated with installing new injection/extraction wells and associated conveyance facilities.

3.0 Refined Option Development and Evaluation

Table 3-4. Performance and Cost

PERFORMANCE & COST METRICS	Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
Potential Water Utilization (TAF) <i>(Water Forum wet/average year)</i>	21.3	21.3	21.3	0	21.3
Potential Dry-Year Yield (TAF) <i>(Water Forum driest year)</i>	5.6 ⁽¹⁾	38.5	61.3	3.4	38.5
Relative Implementation Costs		Varies ⁽²⁾ 			Varies ⁽³⁾ 

Key: ASR = aquifer storage and recovery, PCWA = Placer County Water Agency, TAF= thousand acre-feet

Notes:

⁽¹⁾ Assumes CVP contract allocations during dry years would be 50 percent.

⁽²⁾ Costs will depend on partner agency and required facility upgrades to allow for in-lieu operations.

⁽³⁾ Costs will depend on partner agency, and would include facility upgrades for operational integration, as well as other financial, administrative, and staff integration requirements.

Tables 3-5 and 3-6 are provided to give a better understanding of the effects that partnering with different agencies would have on performance and cost. Table 3-5 shows the potential infrastructure requirements that may be needed for partnering with a given agency. “TBD” (to be determined) is used for conditions where there may be required infrastructure improvements, but they were not verified at this stage of the evaluation. In general, partnering with an existing WCA, Sacramento Suburban Water District (SSWD), or California American Water Company (CalAm) (Sacramento County) would require the least conveyance improvements regardless of the option implemented due to their existing agreements and ability to use the Cooperative Transmission Pipeline (CTP).

Table 3-6 illustrates the ability to maximize beneficial use of the District’s surface water supplies through replacing existing groundwater use (indicated as demand) of agencies within the SGA area. In general, the existing demand or banking capacity would be greater than the District’s available water supply.

Table 3-5. Reconnaissance-Level Assessment of Potential Infrastructure Requirements

Agency	Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
Citrus Heights WD	N/A			N/A	N/A
Fair Oaks WD	N/A			N/A	N/A
Sacramento Suburban WD (North Service Area)				N/A	
Sacramento Suburban WD (South Service Area)				N/A	
CalAm (Sacramento County)				N/A	
Rio Linda Elverta Community WD ²				N/A	
Carmichael WD	TBD	TBD	TBD	N/A	TBD
Golden State Water Company	TBD	TBD	TBD	N/A	TBD
Sacramento County Water Agency (Arden Park Vista)	TBD	TBD	TBD	N/A	TBD
Placer County Water Agency	N/A	N/A	N/A		N/A

Key:

 = Major infrastructure improvements not anticipated,  = aquifer storage and recovery wells,  = Major conveyance and intertie improvements,

CalAm = California American Water Company, N/A = not applicable, TBD = to be determined (infrastructure requirement not assessed), WD = water district

Table 3-6. Potential Demand and Use of San Juan Water District’s Available Surface Water Supplies (in TAF per year)

AGENCY	Demand ⁽¹⁾ (Groundwater use in wet/average years)	Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C ⁽²⁾ Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
Citrus Heights WD	0.3	N/A	0.3	9.2	N/A	N/A
Fair Oaks WD	0.6	N/A	0.6	12.4	N/A	N/A
Sacramento Suburban WD (North Service Area)	4.4	4.4	4.4	-	N/A	4.4
Sacramento Suburban WD (South Service Area)	8.1	8.1	8.1	-	N/A	8.1
CalAm (Sacramento County)	7.8	7.8	7.8	-	N/A	7.8
Rio Linda Elverta <i>Existing</i>	2.2	2.2	2.2	-	N/A	2.2
Community WD <i>Buildout</i>	17.5	17.1	17.1	-	N/A	17.1
Carmichael WD	1.8	1.8	1.8	-	N/A	1.8
Golden State Water Company	0.9	0.9	0.9	-	N/A	0.9
Sacramento County Water Agency (Arden Park Vista)	1.8	1.8	1.8	-	N/A	1.8
Maximum Potential Use⁽³⁾	21.6	17.1	17.1	17.1	Emergency use only	17.1

Notes:

1. Demand is the historical Water Forum Wet/Average year groundwater use, averaged over all year types (i.e., multiplied by 0.8, the frequency at which Water Forum wet/average years have occurred). Also, assumed only 90 percent of groundwater use could be replaced with surface water.
2. Annual proposed injection capacity.
3. The long-term average available SJWD surface water supplies after use within the District retail service area and WCAs would be 17,102 acre-feet per year, including 6,950 acre-feet per year of Middle Fork Project supply.

Key:

CalAm = California American Water Company, N/A = Not applicable, TBD = to be determined, WD = water district

3.3.4 Contribution to Objectives

Table 3-7 lists the Study objectives to which each option would contribute. All options would increase water supply reliability during dry years (as shown quantitatively in Table 3-4). Options A, B, C, and E would also contribute to the other two objectives of helping perfect the beneficial use of the District’s water supply, and providing a long-term financial benefit to existing ratepayers. The ways each of these combined options would contribute to a specific objective are shown in the following tables (Tables 3-8 through 3-10).

Table 3-7. Contribution to Objectives

OBJECTIVE	Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
I. Increase water supply reliability to the District’s retail customers and WCAs during dry years .	✓	✓	✓	✓	✓
II. Perfect the beneficial use of the District’s water rights, contractual entitlements, and facilities.	✓	✓	✓		✓
III. Provide long-term financial benefits to ratepayers, and provide regional and statewide benefits .	✓	✓	✓		✓

Key:

ASR = aquifer storage and recovery
PCWA = Placer County Water Agency
WCA = wholesale customer agency

Table 3-8 shows how each of the options could increase water supply availability during dry-years. Options A, B, C, and E would increase the use of CVP contract supplies (i.e., establish a historical record of beneficial use), which would provide the District with a higher CVP allocation during dry-years. Options B, C, and E would all focus on conjunctive use and could provide the District with access to groundwater supplies during dry years. Option D would provide an alternate access point to the District’s MFP contract water should water be unavailable from Folsom Reservoir during extreme drought conditions.

Table 3-8. Contribution to Study Objective I “Increase Water Supply Reliability during Dry Years”

STUDY OBJECTIVE		Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
I. Increase water supply reliability to the District’s retail customers and WCAs during dry years.	Increase CVP Contract Use & its Dry-Year Allocations	✓	✓	✓		✓
	Expand Conjunctive Use & Groundwater Banking		✓	✓		✓
	Expand Emergency Interties				✓	

Key:

- ASR = aquifer storage and recovery
- PCWA = Placer County Water Agency
- WCA = wholesale customer agency

Table 3-9 illustrates the potential for the District to use its available surface water rights and contract entitlements by option. Currently, the District maximizes use of its water right and uses portions of both its MFP and CVP contract entitlements. Depending on the partner agency and its location, the District could increase its beneficial use of certain surface water supplies. For example, the District would be able to use only water right or MFP contract surface water for groundwater banking so long as the agency was within the MFP Extended POU¹. For existing WCAs, any of the District’s available supplies could be used for groundwater banking. In comparison, partner agencies outside of the MFP Extended POU would be limited to using the District’s water rights (resulting in the District needing to use its water rights to serve the partner agency and backfill the existing use of water rights within the District by using CVP or MFP water). CVP water would only be available to partner agencies if they merged with the District due to the defined service area. Option D would not increase beneficial use of supplies and is therefore left blank in the table.

¹ PCWA’s MFP water right permit has an Extended POU in Sacramento County that covers the SJWD retail and wholesale area, the City of Folsom north of the American River, SSWD’s North Service Area, CalAm (Sacramento County), and Rio Linda/Elverta Community Water District.

Table 3-9. Contribution to Study Objective II “Perfect the Beneficial Use”

STUDY OBJECTIVE		Option A Full Utilization of Water Supplies		Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
		Without WCA status	With WCA status and CVP service area change				
II. Perfect the beneficial use of the District’s water rights, contractual entitlements, and facilities.	Use Within WCA					N/A	N/A
	Use Within Middle Fork Extended Place of Use					N/A	
	Use Within SGA Area					N/A	

Key:

Pre-1914 Water Right Middle Fork Contract Central Valley Project Contract

N/A = not applicable under the option

PCWA = Placer County Water Agency

WCA = wholesale customer agency

Table 3-10 shows how each of the options would contribute to providing long-term financial benefits to ratepayers. All of the options (less Option D) would provide the District with the opportunity to engage in groundwater substitution transfers. However, there are important clarifications related to the nature of the required institutional arrangement under each option. Option A is currently formulated as a transactional arrangement and therefore, groundwater substitution transfers would need to be negotiated separately. As currently formulated, Option B is essentially a paid service for banking the District’s available water supplies, where the District retains rights to the banked water, with certain financial arrangements. Under Option C, there would also be additional financial costs for structuring a groundwater substitution transfer with the WCAs. However, in reality, the implementation of Option A would likely be combined in part with Option B. This would be further explored as part of the “road map” for implementation.

While most of these options would provide long-term financial benefits to ratepayers, there would be upfront costs associated with implementing each of these options that would likely offset near-term financial benefits.

Table 3-10. Contribution to Study Objective III “Provide Long-term Financial Benefit”

STUDY OBJECTIVE		Option A Full Utilization of Water Supplies	Option B In-Lieu Banking Program	Option C Aquifer Storage and Recovery Program	Option D SJWD and PCWA Coordination	Option E Merger with Another Agency
III. Provide long-term financial benefits to ratepayers, and provide regional and statewide benefits .	Support Groundwater Substitution Transfers	✓	✓	✓		✓
	Other Transfers	✓				
	Relative Upfront Costs		Varies ⁽¹⁾ 			Varies ⁽²⁾ 

Key:

ASR = aquifer storage and recovery

PCWA = Placer County Water Agency

Notes:

⁽¹⁾ Costs would depend on partner agency and required facility upgrades to allow for in-lieu operations.

⁽²⁾ Costs would depend on partner agency, and would include facility upgrades for operational integration, as well as other financial, administrative, and staff integration requirements.

3.4 Key Findings

Major findings from this evaluation of the retained options include:

- Maximizing use of CVP contract water would be critical to improving dry-year reliability. Reclamation’s shortage policy specifies the CVP allocation would be based on contract usage in the preceding few years (3 to 5 years). Therefore, increasing the use of CVP contract would directly translate in an increased CVP allocations during dry years.
- The District’s long term stable and flexible operation and use of its available water supply would require that the District expand its service area, and be able to apply its water supplies from all sources in all of its existing and expanded retail and wholesale service areas. One important factor for facilitating this condition would be the justification for changing the District’s CVP service area. Including an agency as a new WCA would likely be easier to implement than a merger, while providing the equivalent justification for a change of the District’s CVP service area.

- Groundwater banking (through in-lieu and/or ASR) would provide the necessary tools to achieve the District's objectives by:
 - Maximizing use of available water supplies, including CVP contract water, by establishing additional groundwater replenishment demands.
 - Preserving ownership of the banked water and accumulating credits for dry year protection and for potential groundwater substitution transfers.
 - Providing adequate groundwater extraction capability and operation inerties.
- The evaluated options are not mutually exclusive and more importantly, there would be potential to leverage the synergy among multiple options. Pursuing a combination of short- and long-term arrangements and partnerships with multiple agencies would be important to achieve all of the District's objectives. Therefore, implementation should consider leveraging elements of each option to form a holistic road map for implementation and long-lasting partnership and outcomes.

4.0 Next Steps

This draft TM5 documents the evaluation of the retained options and the key findings. These findings are subject to revision based on review comments and input from the District staff and Board.

There are two major next steps in this Study. The first one is to develop the draft Study Report to document the Study process, findings, and implementation road map. The draft Study Report will be developed under Study Task 7. The initial focus will be the road map development with input from the District staff and Board.

The other major next step in this Study is to develop a scope of work for the subsequent Feasibility Study for additional technical analyses and development of specific recommendations for implementing the District's water supply reliability strategy. This scope of work will be developed under Study Task 6 and will be documented in TM 6, Feasibility Scope of Work. It is necessary to coordinate the scope development with the road map development. Therefore, the Study schedule and sequence of product development were adjusted accordingly.

The Feasibility Study scope of work will include:

1. Tasks for additional data collection (if any), plan formulation refinement, hydraulic and hydrologic analyses, preliminary engineering design, environmental permit requirements and process, and development of financing plan for the final recommended alternative.
2. Estimated budget.
3. Anticipated Schedule.

This Feasibility Study scope of work may recommend different levels of information development for the various actions considered (e.g., site-specific details vs programmatic evaluations). While environmental considerations will be included, the Feasibility Study will not include environmental review for regulatory compliance purposes.

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